

**IMPROVEMENT STANDARDS,
AND
STANDARD DETAILS
FOR
OLIVEHURST PUBLIC UTILITY DISTRICT**

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Olivehurst, California
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May 2021

Other Applicable Specifications and Details:

- 1. County of Sacramento Improvement Standards & Standard Construction Specifications, (latest revision).**
- 2. State of California, Department of Transportation, Standard Specifications, (1999 Edition).**

IMPROVEMENT STANDARDS

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IMPROVEMENT STANDARD

SECTION 1
ABBREVIATIONS and DEFINITIONS

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SECTION 1

ABBREVIATIONS and DEFINITIONS

- 11 **GENERAL:** These Improvement Standards and Standard Details provide standards to be applied to improvements and private works to be dedicated to and accepted by Olivehurst Public Utility District for maintenance and / or operation. All improvement work shall be done in accordance with the appropriate provisions of these Specifications entitled **Improvement Standards and Standard Details** for Olivehurst Public Utility District.
- 12 **OMISSIONS:** Any items or situations not included in these Improvement Standards and Standard Details shall be designed in accordance with accepted engineering practice, the County of Sacramento Improvement Standards & Standard Construction Specifications, (latest revision), and State of California, Department of Transportation, Standard Specifications, (1999 Edition).
- ◆ **In the case of any and all discrepancies between these Improvement Standards and Standard Details, County of Sacramento Improvement Standards & Standard Construction Specifications, Caltrans Standard Specifications, and the designed construction documents, the District Engineer shall decide the appropriate action.**
- 13 **ABBREVIATIONS:** Whenever the following items, titles, or abbreviations are used in these Specifications, or in any document or instrument where these Specifications govern, the intent and meaning shall be as herein defined. Working titles having a masculine gender, such as "workman" and "journeyman" and the pronoun "he", are utilized in the specifications for sake of brevity, and are intended to refer to persons of either gender.

AAN	American Association of Nurserymen
AASHTO	American Association of State Highway and Transportation Officials
AC	Asphaltic Concrete
ACI	American Concrete Institute
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ARV	Air Relief Valve
ASA	American Standards Association
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AVV	Air Vacuum Valve
AWG	American Wire Gage
AWS	American Welding Society
BBO	Bottom Blow Off
Backflow	Back Prevention Device and/or Assembly
BO	Blow Off
Cal-OSHA	California Occupational Safety and Health Administration
Caltrans	California Department of Transportation
CFM	Cubic Feet Per Minute
CL	Centerline
CSI	Construction Specifications Institute
CY	Cubic Yards
DI	Drain Inlet
D.O.T.	Department of Transportation (CA)
EA	Each

EP	Edge of Pavement
FH	Fire Hydrant
FM	Force Main
FPS	Feet Per Second
FS	Federal Specifications
Hg	Inches of Mercury
Inv	Invert
ISA	International Society of Arboriculture
LB	Pounds
LF	Linear feet
LS	Lump Sum
NBFU	National Board of Fire Underwriters
NCPI	National Clay Pipe Institute
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NSF	National Sanitation Foundation
OPUD	Olivehurst Public Utility District
OSHA	Occupational Safety and Health Act
PCC	Portland Cement Concrete
psf	Pounds per Square Foot
psi	Pounds per Square Inch
SD	Storm Drain
SF	Square Foot / Feet
SS	Sanitary Sewer
STA	Station
Title 8	Title 8 (Construction Safety Orders) of the California Code of Regulations
Title 17	Title 17 California Administrative Code
Title 19	Title 19 (Public Safety) of the California Code of Regulations
Title 24	Title 24 (Building Standards) of the California Code of Regulations
TBC	Top Back of Curb
Typ.	Typical
WV	Water Valve

14 **DEFINITIONS:** Whenever in these said **Improvement Standards** and **Standard Details**, the following terms are used, they shall be understood to mean and to refer to the following:

"Agency": Shall mean the District or another governing body or agency having jurisdiction over the specific partition of the work or project.

"Calendar Day": Every day shown on the calendar. When the Contract Time is stated in Calendar Days, every day will be charged toward the Contract Time.

"Construction Specifications": Specification provided by the Design Engineer of Record.

"Construction Acceptance": Acceptance of only a specific portion of the Improvement project as meeting the District requirements. Upon Construction Acceptance and approval by the District, limited usage of specified systems and / or equipment may begin. (Refer to Final Acceptance)

"Consulting Engineer", "Design Engineer", or "Engineer of Record": A person or persons, firm, partnership, joint venture, corporation, or combination thereof, possessing a current California Registration as a Professional Engineer (or Architect), of the appropriate branch of design for the to be work submitted, who is placing their stamp and signature on any and all of the project construction documents or authorized representative thereof, acting in the capacity of who prepares or submits improvement plans and specifications to OPUD for approval. The Consulting Engineer shall issue directions to the Contractor only through the District.

"Contract": The written agreement signed by an Agency, Developer, and / or the Contractor covering the Work and the furnishing of labor, materials, tools, and equipment in the construction of the Work. The Contract shall include but not be limited to; Notice to Contractors, Bid, Plans, Specifications, Special Provisions, contract bonds, and any project-specific specifications or documents; also any and all supplemental agreements, amending or extending the Work contemplated and that which may be required to complete the Work in a substantial and acceptable manner. Supplemental agreements are written agreements covering alterations, amendments, or extensions to the Contract and include Contract Change Orders.

"Contractor": The person or persons, firm, partnership, corporation, or combination thereof, who have entered into a contract with any Agency, and / or Developer, as a party or parties of the second part or his or her or their legal representatives, and is properly licensed and responsible for performing the specified Contract work.

"County", or "Department of Public Works": The County of Yuba

"Developer": Any person or persons, firms, partnership, corporation or, combination thereof, financially responsible for the Work involved.

"Development": The act, process, or result of any land grading, utility installation, street or building construction on any property.

"District", "The District", or "OPUD": Shall mean the **Olivehurst Public Utilities District** or authorized representative thereof.

"District Engineer" or "Engineer": The District authorized District's Engineer or authorized representative thereof.

"Division of Highways", or "Department of Transportation": State of California, Department of Transportation or Caltrans.

"Final Acceptance": Acceptance of the Improvement Project as being fully completed; the Contractor shall file with the District a Notice of Completion and the District Engineer shall develop a list of comments. All final comments made by the District to the improvement project must be addressed and all required documents, product, files, and information have been received, approved and accepted by the District upon which time the specific guarantees and warranty periods shall begin. (Refer to Construction Acceptance)

"Inspector" or "Field Inspector": The person or persons authorized to act as agent(s) for the District in the inspection of the Work. The District Engineer or authorized representative thereof.

"Laboratory": The testing agency or testing firm which has a current certification issued by the State of California to perform the required designated test procedure, shall provide the District with a copy of the results and is accepted by the District.

"Plans": The plans, drawings, profiles, cross sections, Working Drawings, and Supplemental Drawings, or reproductions thereof, approved and signed by the Agency, which show locations, character, dimensions and details of the Work. All Plans used during construction shall be subject to review and approval by signature of an authorized representative of OPUD.

"Project": Shall mean the Work.

"Record Drawings", "As Built Drawings", or "As Built Plans": Shall mean the Final Construction Documents prepared by the Design Engineer that document changes to, additions to, or deductions from the

Documents, and which represent the Work as constructed. These plans are a requirement for final acceptance of the new utilities.

"Red Noted Drawings", "Red Noted Documents", or "Red Noted Plans": Shall mean Construction Documents marked up in red pen and / or pencil by the Contractor that document changes to, additions to, or deductions from the Documents, and which represent the Work as constructed. These plans are a requirement for final acceptance of the new utilities.

"Sac County", "Sac County Standards", "Sacramento County Standards": County of Sacramento Improvement Standards & Standard Construction Specifications, (latest revision).

"Soils Engineer", or "Geotechnical Engineer": A current California Registered Professional Geotechnical Engineer, who is placing their stamp and / or signature on any of the project soils and / or compaction testing, acting in the capacity of who prepares or submits soils documentation. The Geotechnical Engineer shall issue directions to the Contractor only through OPUD.

"Standard Details": Detail drawings contained in this Improvement Standards and Standard Details Manual, (information that is not shown in these OPUD Standard Details are subject to the current adopted County of Sacramento Improvement Standards and Standard Construction Specifications. Contact the District Engineer for any items requiring clarification).

"Standard Improvements", "Standard Specifications": Specifications contained in this Improvements Standard and Standard Details Manual, (information that is not shown in these OPUD Standard Improvements are subject to the County of Sacramento Improvement Standards and Standard Construction Specifications, (latest revision), State of California, Department of Transportation, Standard Specifications, (1999 Edition). Contact the District Engineer for any and all required clarifications).

"State": California

"State Specifications": California Standard Specifications, Caltrans.

"SubContractor": A properly licensed party under contract to and responsible to the Contractor for performing a specified part of the Work; or a properly licensed party under contract and responsible to a Subcontractor of the Contractor.

"Work": All actions which Contractor is contractually required to do as specified, indicated, shown, contemplated, or implied in the Contract to construct the Work, including all alterations, amendments, or extensions made by Contract Change Order or other written orders or directives of the Agency. Unless specified otherwise in the Contract, the Work includes furnishing all materials, supplies, equipment, tools labor, transportation, supervision, and all incidentals necessary to complete the Work.

"Working Day": Any day except: (a) Saturdays, Sundays and Legal Holidays; (b) days on which the Contractor is specifically required by the special provisions or by law to suspend construction operations; or (c) days on which the Contractor is prevented from proceeding with current controlling operation or operations of Work for at least five (5) hours per day due to inclement weather, or conditions resulting immediately therefrom.

"Working Drawings": Working drawings detail a particular item of work and the manner in which it is to be accomplished or performed. Working drawings are drawings, which have been reviewed and have approval by signature of an authorized representative of OPUD.

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SECTION 2

WATER USAGE, WATERING, AND DUST CONTROL

- 2.1 WATER:** All water used in construction shall conform to Section 17, "Watering" of the State Specifications, these Improvement Standards, and all applicable adopted Federal, State, and Local Codes and Regulations.
- ◆ **An authorized representative of the District shall perform the operation of all valves and fire hydrants on the District water systems.** Fire hydrants shall be accessible and usable at all times by the Fire Department.
 - ◆ **The Olivehurst Public Utility District** main office is located at 1970 9th Ave., Olivehurst, California, 95961, Phone 530-743-4657, Fax 530-743-3023.
- 2.11** No water of any amount is to be obtained from the District's Water Facilities / System without first obtaining a written arrangement / agreement with the District. All arrangements for the obtaining of water for use in construction, and / or development shall be made by the Contractor / Developer and shall be submitted in a written request to the District, which shall include all of the following information;
- A. Proposed point of connection.
 - B. Proposed equipment to be installed for the drawing of the water including, but not limited to, the meter model, serial number, units of measure, and the beginning reading of the meter for each meter to be used. **Note:** The Contractor / Developer is required to provide their own water meter, which shall be approved by the District prior to being installed.
 - C. Proposed dates and times for use.
 - D. Contact Persons with day and night phone numbers for any emergency.
 - E. All District fees, deposits and permits shall be paid in full prior to any connection.
 - F. All water storage tanks (including, but not limited to water trucks and sweepers equipment) shall be inspected by the District for compliance and must have an OPUD Hydrant Use Permit.
- ◆ All proposals are subject to all District standards, conditions and requirements including method of payment.
 - ◆ For special arrangements / agreement other than for a metered connection, a special rate set by the District shall apply.
- 2.12** All arrangements including, but not limited to fire hydrant connection, shall be equipped with a District accepted back flow prevention device. All Back Flow devices shall be annually certified by a District approved company and shall have a tag attached to the device by the District (contact the District for applicable fees). A back flow device shall be required for all connections and equipment.
- 2.13** All back flow devices both temporary and permanent shall have an annual certification on file with the District. Any back flow device which has an expired certification shall have service terminated and /or shall be re-certified by the District, the device owner shall be responsible for paying all associated costs.
- 2.14** The air-gap separation shall be at least double the diameter of the supply pipe, measured vertically from the flood rim of the receiving vessel to the supply pipe. In no case shall the air-gap separation be less than two (2) inches for any pipe smaller than one (1) inch in diameter.
- ◆ **Title 17, Chapter V, Section 7583-7622, California Administrative Code regarding cross-connections and back flow prevention.**

- ◆ **WRITTEN PROOF OF ANY AND ALL ARRANGEMENT WITH THE DISTRICT SHALL BE AVAILABLE FOR REVIEW BY ANY DISTRICT REPRESENTATIVE AT ANY AND ALL TIMES. ALL ARRANGEMENTS ARE SUBJECT TO ADDITIONAL REQUIREMENTS AND / OR RE-REVIEW BY THE DISTRICT AND MAY BE TERMINATED AT ANY TIME.**

215 Fire hydrants shall only be opened and closed by the use of wrenches designed to operate said hydrants. The Contractor shall not leave any hose and / or equipment attached and all caps shall be reinstalled after each and every time water has been drawn from the system. The only exception is when an approved meter and / or back flow device has been installed per the written agreement with the District. The fire hydrant and work area adjacent thereto, along with twenty (20) feet each direction from the centerline of the fire hydrant along the street right a way shall be kept clear for emergency use by any Fire Department representative.

216 All connection to any of the individual water service Curb Stop Valves and / or Meter Setter assemblies shall be approved by the District prior to any attachment and shall have all required back flow prevention devices installed during each and every time water is to be drawn from the system. Any and all connections that are leaking, damaged, altered, or have been tampered with shall have the valve closed and a District locking device installed.

2.2 **DUST CONTROL:** Dust Control measures shall be taken in conformance to Section 10, "Dust Control" of the State Specifications and these Improvement Standards. Contractor shall water the construction site at sufficient intervals to preclude the nuisance of dust caused by the Contractor's operations and / or wind and / or traffic as directed by the Agency having jurisdiction.

2.3 **ENVIRONMENTAL PROTECTION:** During the progress of the work, keep all work areas occupied by the Contractor in a neat and clean condition and protect the environment both onsite and offsite, throughout and upon completion of the construction project. Contractor shall not dispose of any chlorinated water and / or contaminated water and / or any materials into any waterway, drainage system, wetland, or other protected area. Contractor shall meet all requirements as directed by an authorized representative of the District and / or as directed by the Agency having jurisdiction.

- **DIRECT CONNECTION AND/OR UNAUTHORIZED CONNECTION TO ANY PART OF THE OLIVEHURST PUBLIC UTILITY DISTRICT WATER SUPPLY SYSTEM WILL NOT BE PERMITTED. ANY AND ALL UNAUTHORIZED EQUIPMENT SO INSTALLED SHALL BE SUBJECT TO CONFISCATION AND REVOKED WATER PRIVILEGES.**
- **REMOVAL AND / OR UNAUTHORIZED TAMPERING WITH ANY OF THE DISTRICT'S EQUIPMENT AND / OR FACILITIES WILL NOT BE TOLERATED AND IS SUBJECT TO ANY AND ALL APPLICABLE FINES AND PENALTIES.**

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SECTION 3

SAFETY - PRECAUTIONS

- 31 PRESERVATION OF PROPERTY:** Due care shall be exercised to avoid injury to existing improvements, utility facilities, adjacent property, and roadside trees and shrubbery that are not to be removed or relocated.
- 311** Trees and shrubbery that are not to be removed, and pole lines, fences, signs, markers and monuments, buildings and structures, conduits, pipe lines under or above ground, sewer and water lines, all facilities, and any other improvements or facilities within or adjacent to the work shall be protected from injury or damage, and if ordered by the Engineer, the Contractor shall provide and install suitable safeguards to protect such objects from injury or damage. If such objects are injured or damaged by the Contractor's operations, they shall be replaced or restored at the Contractor's expense, to conditions equivalent to, when the Contractor entered upon the work, or equivalent to the requirements of the Specifications accompanying the contract, if any such objects are part of the work being performed under the contract. The Engineer may make or cause to be made such temporary or permanent repairs as are necessary to restore to service any damaged facility. The cost of such repairs shall be borne by the Contractor and when applicable shall be deducted from any and all monies due and/or to become due to the Contractor under the contract.
- 32 OBSTRUCTIONS:** The location of underground utilities shown on any of the Plans represent the best information available to the District, as well as other Agencies, but should be considered as being approximate only. Utilities may exist that are not as shown on the Plans. The exact locations of all existing underground facilities and improvements within the construction area shall be ascertained by the Contractor before using equipment that may damage such facilities or interfere with their service. The Contractor shall be held liable to the owners of such facilities for any damage or interference with service resulting from the Contractor's operations.
- 33 INTERRUPTION OF SERVICE:** No valves or other controls on existing utility systems shall be operated for any purpose by the Contractor without prior approval of the District Engineer, (Section 2 of these Improvement Standards). The District must be able to provide any and all of its customers with a minimum of two (2) Working Days notice for any and all proposed interruption of any and all existing services.
- 34 SAFETY DEVICES:** Sufficient and adequate signs, lights, barricades and cones shall be furnished, placed and maintained throughout the construction project as may be deemed necessary by Public Works, the Engineer, and/or the State Division of Industrial Safety to adequately protect the public from injury or unnecessary inconvenience due to the construction operations. When traffic is to be interrupted or detoured, flagmen, adequately equipped and instructed, shall be provided by the Contractor as deemed necessary by the District Engineer.
- 35 MAINTAINING TRAFFIC:** Attention is directed to the Standard Specification. The Contractor will be required to furnish the District a work schedule sufficiently detailed so that the District may ascertain therefrom what effect the Contractor's proposed construction program will have on traffic through the construction area.
- 351** The Contractor shall conduct his operations so as to offer the least possible obstruction and inconvenience to the public, and he shall have under construction no greater amount of work than he can prosecute properly with due regard to the rights of the public. Temporary approaches at private driveways shall be provided as needed and when ordered by the Engineer, and shall be kept in good condition.
- 352** Spillage resulting from hauling operations along or across any public traveled way shall be removed immediately at the Contractor's expense.

ATTENTION IS DIRECTED TO ANY SPECIAL TRAFFIC CONTROL PROVISIONS.

36 **COMPLIANCE WITH SAFETY AND HEALTH REGULATIONS:** Safety is a Prime consideration in all Agency Contracts and Projects. The Contractor shall conform to all applicable occupational safety and health standards, rules, regulations, and orders established by the State of California or Federal Government. The Contractor must comply with all applicable provisions of the California Occupational Safety and Health ACT (Labor Code Section 6300 et seq.). The foregoing includes, but is not limited to, all applicable Title 8 Safety Orders issued by the State of California Occupational Safety and Health Administration (Cal/OSHA).

361 Failure of the Agency to suspend the work or notify the Contractor of the inadequacy of safety precautions or non-compliance with existing laws and regulations shall not relieve the Contractor of this responsibility.

37 **PRECONSTRUCTION CONFERENCE AND PROGRESS MEETINGS:**

371 Prior to beginning any and all work the Developer shall schedule a Pre-Construction Conference with the District to be held for the purpose of reviewing the Project. [The Contractor must attend this preconstruction conference, and shall invite the Developer, Design Engineer (or their designated representative), Subcontractors, all applicable Agencies and others necessary to ensure all topics are adequately covered.]

372 Progress Meetings shall be scheduled by the Developer as required by the District, and all others necessary to ensure all topics are adequately covered and will be conducted throughout the duration of the contract.

A. Progress Meetings shall be held not less than once each month during all phases of the Construction and should be scheduled between 9:00 AM and 12:00 or 1:00 PM and 4:00 PM.

- ◆ **THE PURPOSE OF THESE MEETINGS IS TO INFORM, DISCUSS, AND RESOLVE ISSUES RELATED TO THE WORK: THE CONTRACTOR (OR THEIR DESIGNATED REPRESENTATIVE), SHALL ATTEND AND THE DEVELOPER, DESIGN ENGINEER (OR THEIR DESIGNATED REPRESENTATIVE), SUBCONTRACTORS, ALL APPLICABLE AGENCIES AND ALL OTHERS NECESSARY TO ENSURE ALL TOPICS WILL BE ADEQUATELY COVERED, ARE TO ATTEND. DISCUSSION SHALL INCLUDE, BUT IS NOT LIMITED TO: PROGRESS, SCHEDULES, SAFETY, SWPPP, REQUESTS FOR INFORMATION, CHANGE ORDERS, FIELD INSTRUCTIONS, FIELD COORDINATION, SUBMITTALS, QUALITY CONTROL & QUALITY ASSURANCE, TESTING, STARTUP, FIELD CONFLICTS, AND OTHER TOPICS RELATED TO THE PROJECT.**

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TRENCHING OPERATIONS

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SECTION 4

TRENCHING OPERATIONS

- 4.1 LEGAL REQUIREMENTS:** Prior to commencement of trenching operations, the Contractor on this project shall have complied with all requirements of the labor Code of the State of California, including:
- A. STATE A.B. No. 2765 which requires that the Contractor submit plans for trench shoring or protection he proposes to use in performing the trenching and pipe installations in this contract; and
 - B. STATE A.B. No. 1366 which requires that the Contractor obtain a permit for trenching operations from the State Division of Industrial Safety prior to any trench work in trenches over five (5) feet deep. (Blank forms for application to the State for this permit are available at the office of the Director of Public Works.)
- 4.2 GENERAL:** Trenching operations shall include cutting of pavement trench excavation, disposal of excess materials, removal of obstructions, bracing and shoring, bedding of pipe, backfilling, compacting, and placing of temporary and permanent pavement restoration.
- 4.3 TRENCH WIDTH AND DEPTH:** The maximum clearance width of the trench, measured at the horizontal diameter (spring line) of the pipe and at one foot above the top of the pipe, shall be the actual outside diameter of the pipe at the bell, plus one (1) foot. The overall depth of the trench shall be as indicated on the approved and signed Construction plans and shall provide a minimum of three (3) inches of bedding under the bell of the pipe. The minimum depth of cover over any pipe shall be thirty-six (36) inches as measured from the top of the actual outside diameter of the pipe at the bell to the finish grade. The Design Engineer shall submit to the District Engineer a written request for any required reduction in the minimum depth to thirty (30) inches, which may be allowed on a case by case, location by location bases only (A two (2) sack cement slurry cover will be required). A minimum clearance of eighteen (18) inches shall be as measured from the top of the actual outside diameter of the pipe at the bell to the bottom of subgrade or any special soil treatment section.
- A. If such trench width or depth is exceeded for any reason, the Contractor shall provide, at his own expense, improved bedding conditions, as approved by the Design Engineer and / or as directed by the District Engineer, to meet the load requirements of the changed conditions.
- 4.4 CUTTING OF PAVEMENT:** When the trench is in an existing paved area, the pavement shall be sawed or scored on neat lines parallel and equidistant from the trench centerline. Pavement between the lines shall be broken and removed immediately ahead of the trenching operations. Additional saw cutting shall be required after trench restoration as directed by the Agency having jurisdiction.
- 4.5 BRACING AND SHORING:** To insure the safety of workmen, and to protect and facilitate the work, sufficient bracing and shoring shall be installed in all excavations. The bracing and shoring shall comply with rules, orders, and regulations of the California Division of Industrial Safety. Failure to comply with any of the above mentioned rules, orders, and regulations shall be sufficient cause for, but shall not place any responsibility upon, the Engineer to immediately suspend the work. The Contractor shall be responsible for the adequacy of all shoring and bracing and compliance with law, and failure of the Engineer to suspend the work or notify the Contractor of the inadequacy of the shoring or bracing, or non-compliance with the law, shall not relieve the Contractor of this responsibility.
- A. Insofar as possible, sheeting shall not extend below the top of the pipe barrel. All sheeting, timbering, lagging, and bracing shall, unless otherwise required by any Engineer(s), be removed during backfilling, and in such a manner as to prevent any movement of the ground or damage to the piping or to the other structures. When the Engineer(s) requires that sheet piling, lagging, and bracing be left in place, such materials shall be cut off where designated and the upper part withdrawn. If sheet piling is utilized, it may be withdrawn, with compacting of backfill to proceed as piling is removed.

- 4.6 MAXIMUM LENGTH OF TRENCH OPEN:** At the end of each working day, there shall be no more than one hundred (100) feet of open trench, none of which shall be within twenty (20) feet of the limits of any private or public driveway or through-street unless otherwise authorized by the Agency having jurisdiction or as directed by Engineer. The remainder of the trench shall be backfilled and compacted, and when in street, traveled way, or driveway, opened to traffic as soon as possible.
- 4.7 SPECIAL FOUNDATION TREATMENT:** Whenever the bottom of the trench is soft or rocky or, in the opinion of the Engineer, otherwise unsuitable as a foundation for the pipe, the unsuitable material shall be removed to a depth such that when replaced with imported crushed rock or gravel (Approved engineered fabric may be required to be installed), it will provide a stable and satisfactory foundation. Unless otherwise directed by the Engineer, the imported crushed rock or gravel shall be graduated so that one hundred percent (100%) will pass the three quarter (3/4) inch sieve and not more than ten percent (10%) will pass the No. 8 sieve. An 18 inch rat slab may be required as directed by the District Engineer and/or Inspector. Whenever ground water occurs, the trench shall be kept reasonably free of water.
- 4.8 BEDDING:** Unless otherwise indicated on the drawings, in the Special Provisions, or as directed by the District, the pipe shall be placed on a firm, prepared bed of the following for the various utilities:
- 4.8.1** Water shall have imported sand with one hundred percent (100%) passing a one-half (1/2) inch sieve and not more than ten percent (10%) passing the No. 8 sieve, or as Directed by the District Engineer.
- 4.8.2** Sanitary Sewer shall have three quarter (3/4) inch maximum crushed rock with one hundred percent (100%) passing a one (1) inch sieve and not more than ten percent (10%) passing the No. 8 sieve.
- 4.8.3** Bedding shall extend at least four (4) inches below the pipe barrel or as indicated on the plans. The pipe shall be bedded uniformly throughout its entire length to a bearing width of at least sixty percent (60%) of the pipe's internal diameter. This bearing shall be achieved by shaping the bedding or by lightly "bouncing" the pipe to set it into the bedding. In lieu of shaping the bedding material, the Contractor may place bedding material to the spring line of the pipe, compacting it by shovel slicing, if gravel, or by light tamping if sand, to provide support. Care shall be used not to disturb the pipe.
- ◆ **Vitrified Clay Pipe (VCP)** shall have bell holes carefully excavated so that no part of the load is supported by the bells or coupling. Consolidation of material around and under the bell and couplings during bedding and back filling should be avoided, (Refer to the current NCPI, Clay Pipe Engineering manual).
- 4.9 INITIAL BACKFILL:** Unless otherwise indicated on the drawings, in the Special Provisions, or as directed by the District, the pipe shall be covered by a minimum of twelve (12) inches above the top of the bell of the pipe with of the following for the various utilities:
- 4.91** Water shall have imported sand with one hundred percent (100%) passing a one-half (1/2) inch sieve and not more than ten percent (10%) passing the No. 8 sieve, or as Directed by the District Engineer.
- 4.92** Sanitary Sewer shall have three quarter (3/4) inch maximum crushed rock with one hundred percent (100%) passing a one (1) inch sieve and not more than ten percent (10%) passing the No. 8 sieve.
- 4.93** The initial backfill shall be carefully placed so as not to disturb or damage the pipe, and shall be brought up evenly on both sides. It shall be placed in layers not exceeding four (4) inches in depth and hand tamped or shovel sliced to the spring line of the pipe. Additional backfill will then be placed to a depth sufficient to keep the pipe from floating.
- 4.10 COMPLETING BACKFILL:** Trench backfill material placed above the initial backfill shall be as approved by the Soils Engineer, and / or District Engineer, and / or as directed by the Agency having jurisdiction and shall be suitable for the approved method of compaction.

4.10.1 Relative compaction of all trench backfill shall be as shown on the accepted and signed documents. The method of compaction shall be suitable for the backfill materials used and the trench condition, and shall be as approved by the Soils Engineer and / or District Engineer. Refer to the specific pipe material manufacturers requirements for any additional backfill precautions.

A. Note jetting of sand backfill, shall only be used when approved by the Soils Engineer and / or District Engineer, and shall be accomplished with a rigid pipe not less than one and one-half (1 1/2) inches in diameter carrying not less than twenty (20) g.p.m. The pipe shall be extended to the bottom of the backfill layer and slowly withdrawn with water flowing in a manner which will accomplish the required compaction.

4.10.2 The trench backfill shall be compacted to the relative compaction shown on the District accepted and signed documents by an approved means, other than ponding or jetting, which will not damage the pipe or other nearby facilities.

4.10.3 In non-structural section areas, the top twelve (12) inches of the trench backfill shall be excavated material compacted to specified relative compaction by any approved means which will not damage the pipe or other nearby facilities.

4.10.4 Relative Density Compaction tests shall be as determined by the current ASTM D1557. The District Engineer or the agency having jurisdiction shall have the option of requiring the use of the current California Test 216 or 231. All compaction testing shall be performed only by a District-approved Soils Engineer, with all of the incurred cost of testing borne by the Contractor / Developer, at no expense to the District. The locations and the number of tests shall be determined by the District Engineer and / or as directed by the agency having jurisdiction.

- ◆ When directed by the District, the Contractor / Developer shall be responsible for submitting a resume of the proposed Soils Engineer to the District Engineer for acceptance.

4.11 RESTORATION OF SURFACING:

4.11.1 Restoration of surfacing shall conform to the requirements of the plans, these Specifications and other applicable portions of the Standard Improvements and / or as directed by the agency having jurisdiction.

4.11.2 Permanent asphalt paving material shall be Type "B", one half (1/2) inch maximum graduation, with AR 4000 penetration type asphalt emulsion and / or as directed by the agency having jurisdiction.

4.11.3 Where required by the Public Works Agency having jurisdiction, all trenches shall be temporarily patched within one (1) calendar day of the initial trench opening using either a cold mix asphalt or other approved material. This surfacing shall be maintained in good condition until replaced with permanent paving and / or as directed by the agency having jurisdiction.

4.11.4 In the event that street surfacing is damaged outside the neat lines of the trench, due to the Contractor's operations and / or failure to adequately maintain temporary patches, the Contractor shall remove and replace such damaged surface at his own expense. Such work shall be in conformance with associated trench restoration requirements herein specified and / or as directed by the agency having jurisdiction.

4.12 SPECIAL TREATMENT OF SOILS: When any Utility trench and / or equipment is located within any area scheduled to have Lime and / or Fly Ash, and / or any other special soils treatment, the following requirements shall apply:

4.12.1 If testing of any of the facilities is currently underway, we suggest that you stop all testing and begin only after treatment is completed. Testing for acceptance of any and all facilities shall only be performed after all soils treatment, all utility crossings have been installed and the sub-grade is finished and ready for the aggregate base to be placed.

4.12.2 All marking tape, twelve (12) inch minimum sand or crush cover over the utility and tracer wire shall be in place after the treatment. The District Engineer and / or the agency having jurisdiction may require field verification and shall require the repair and / or replacement of any and all damaged equipment.

4.12.3 A minimum clearance of eighteen (18) inches as measured from the bottom of the treatment section to the top of the bell of any utility line. However, maintaining eighteen (18) inches minimum clearance does not guarantee damage-free facilities.

- A.** Some approved projects cannot always meet this clearance requirement, therefore special precautions shall be taken, including but not limited to the careful removal of soil from the area around the utility, mixing the treatment, replacing the treated soil and re-compacting using extra care to not disturb the utility. Contractor / Developer shall submit a proposal for review and approval of the District Engineer and / or as directed by the agency having jurisdiction.

4.12.4 Valves, Manholes, Air / Vacuum Relief Assemblies and all other equipment shall be protected at all times from damage by soils treatment and all other heavy equipment. Any and all District facilities or equipment damaged during any phase of construction shall be replaced with an approved new item. All associated costs of the replacement shall be the responsibility of the Contractor / Developer and at no incurred costs to the District or the agency having jurisdiction.

BE ADVISED THAT THE CONTRACTOR / DEVELOPER WILL BE HELD RESPONSIBLE FOR ALL COSTS ASSOCIATED WITH THE TESTING AND / OR RE-TESTING AND INSPECTION OF FACILITIES DAMAGED DURING CONSTRUCTION ACTIVITIES.

SECTION 5
GRAVITY SEWER SYSTEM CONSTRUCTION

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SECTION 5

GRAVITY SEWER SYSTEM CONSTRUCTION

5.1 **GENERAL:** Construction, furnishing and installation of Sewer Mains and appurtenances shall be in accordance with these Improvement Standards and Standard Details, as directed by the District Engineer, and National Clay Pipe Institute Standards.

5.2 **DESIGN CRITERIA:**

5.2.1 **ENGINEERED CALCULATIONS** shall be provided based on the following and the applicable provisions of the current adopted County of Sacramento Public Works Agency, Improvement Standards, or as directed by the District Engineer:

A. **DESIGN FLOW CRITERIA:** Design to the minimum criteria without consideration to the actual project conditions does not guarantee plan approval. Design flow shall be calculated using the average of the upstream service area. Refer to the current adopted County of Sacramento Improvement Standards and Standard Construction Specifications and as directed by the District Engineer for the following:

- a) Area Served (by each Phase of construction and Ultimate)
- b) Development Density (Equivalent Single family Dwelling unit - ESD)
- c) Flow Generation (310 gpd/ESD).
- d) Infiltration (1200 gpd/Acre).
- e) Peaking factors (Refer to County of Sacramento Improvement Standards Section)
- f) Velocity Criteria (Refer to County of Sacramento Improvement Standards Section)
- g) Hydraulic Grade Line (Refer to County of Sacramento Improvement Standards Section)
- h) Friction Factor ($n=0.013$)

B. **PIPE CAPACITY, SLOPE, VELOCITY, AND SIZE:**

- a) Capacity in all cases shall be adequate to carry the design flow from the entire tributary area, even though said area may not lie within the project boundaries.
- b) Slope and Velocity shall be per the Manning's formula.
- c) The minimum size collector shall be eight (8) inches in diameter unless otherwise approved by the District Engineer.

C. **GROUNDWATER REQUIREMENTS:**

- a) A geotechnical report shall be required for all Sewer improvements in high groundwater areas.

5.3 **MATERIALS:** Gravity Sanitary Sewer Systems shall be as specified herein:

5.3.1 **GRAVITY MAIN SEWER** lines shall be Districts choice of **Vitrified Clay Pipe (VCP)** or **PVC-SDR-2600 Sewer Green**(or comparable). Main lines deeper than 15' and greater than 10" shall be C900 Sewer Green. Main lines up to 8 inches shall be SDR-2600. Main lines 10 inches or larger shall be C900 Sewer Green. Fittings shall be extra strength unglazed, bell and spigot pipe and shall conform to ASTM designation C-700. PVC fittings must conform to applicable ASTM standards. The pipe joints shall be of the mechanical compression type, conforming to ASTM designation C-425. Gravity main sewer lines required to be Ductile Iron shall be ANSI A21.51.

5.3.2 **GRAVITY SEWER LATERAL** lines shall be **SDR-2600 up to 8"** Wye connection to the main line. ABS (SDR 23.5) conforming to ASTM designation D 2751 shall be coupled to the SDR using a District-approved coupling once the lateral pipe invert is five (5) feet below finish grade. Gravity sewer

lines required to be Ductile Iron shall be ANSI A21.51. (Rev. 8/05 by GEL)

- 5.3.3** **ALL BURIED METAL PARTS** shall be Ductile Iron, Brass, Bronze, or Stainless Steel. All buried nuts and bolts for flanges and couplings shall be Type 304 stainless steel, and Core ten "T" bolts.
- 5.3.4** **ALL PIPE CONNECTORS** shall be made of a flexible Neoprene-EPDM material resistant to ozone, weathering, aging, and chemicals, including but not limited to acids, alkalis, animal and vegetable fats, oils and petroleum products. Each connector shall have series 304 stainless steel bands and screw assemblies.
- 5.3.5** **LOCATING DEVICES** shall consist of the following:
- A. Marking tape shall be reflective, a minimum of six (6) inches wide, green in color, marked "**BURIED SEWER BELOW**" and shall be placed in all lateral service trenches, twelve (12) inches above the pipe, installed from the main line to the service clean out to grade. Marking tape is also required over any main line which has less than five (5) foot of cover to finish grade. The District shall approve all marking tape prior to installation.
- 5.3.6** **SUBSTITUTION** proposals shall include sufficient information needed for a comparison with the specified product, the projected cost difference between the specified product and substitution product, and shall include the estimated cost for the District Engineer's time to review and provide acceptance or rejection of said substitution product(s).
- A. Any product(s) Substitution proposed by the Contractor / Developer to be included in the construction shall be submitted for review by the District Engineer a minimum of **five (5) working days** prior to the projected installation date.
- 5.3.7** **ACCEPTANCE OF MATERIALS** shall be subject to strength and quality testing in addition to inspection of the completed product. Acceptance of installed piping systems shall be based on inspection and leakage tests as specified hereinafter.

5.4 **INSTALLATION OF SANITARY SEWER:**

- 5.4.1** **MAIN LINE** pipe shall be **SDR-2600/C900** (as designated in 5.3), laid in a trench excavated to the lines and grades established by the Design Engineer, which have been reviewed, approved and signed by the District Engineer. The recommended practice for installing VCP shall be per ASTM D3034.
- A. The bottom of the trench shall be graded and prepared to provide a firm and uniform bearing throughout the entire length of the pipe. The pipe shall have a minimum three (3) inches (as measured under the bell of the pipe) of three-quarter (3/4) inch crushed rock bed, carefully shaped to fit the bottom of pipe before the pipe is lowered into the trench.
- ◆ **SDR-2600/C900** shall have holes carefully excavated so that no part of the load is supported by the bells or coupling. Consolidation of material around and under the bell and couplings during bedding and back filling should be avoided, refer to the NCPI, Clay Pipe Engineering manual.
- B. All pipe joints, boots and connectors shall be clean and lubricated during assembly to provide a leak free connection.
- C. The three-quarter (3/4) inch crushed rock shall extend to the pipe spring line and shall be shovel sliced to provide uniform and even support of the entire section of pipe. All SDR/C900 shall be covered with a minimum of twelve (12) inches of three-quarter (3/4) inch crush over the top or as directed by District Engineer.
- D. When the separation between SDR/C900 sewer main and any other utility is between six (6) inches and twelve (12) inches, ductile iron pipe with compression couplers shall replace the SDR/C900 for a minimum of twenty-four (24) inches each side of the crossing with a two (2) sack slurry placed between utilities. In no case shall the clearance be less than six (6) inches.
- E. Any sewer that is in or will be in the water table will be required to be burrito wrapped. Mains not in the water table shall have fabric separation.

5.4.2 SERVICE LATERAL pipe shall be **SDR/C900** main line connection Wye and laid in a trench excavated to at least a minimum slope of one-quarter (1/4) inch per foot. ABS shall be coupled to the SDR/C900 lateral once the pipe invert is five (5) feet below finish grade. The top of the pipe shall be a minimum of eighteen (18) inches below the road subgrade or treated soil section, or as directed by the District Engineer. In no case shall the top of the lateral be less than thirty-two (32) inches below any finish grade.

- A. The bottom of the trench shall be graded and prepared to provide a firm and uniform bearing throughout the entire length of the pipe. The pipe shall have a minimum four (4) inches (as measured under the bell or coupling of the pipe) of clean sand bedding, carefully shaped to fit the bottom of pipe before the pipe is lowered into the trench.
- B. When the separation between sewer service lateral and any other utility is between six (6) inches and twelve (12) inches, Ductile Iron pipe with compression couplers shall replace the pipe for a minimum of twenty-four (24) inches each side of the crossing with a two (2) sack slurry placed between utilities. In no case shall the clearance be less than six (6) inches.

5.5 MANHOLES: All Manholes to be maintained by the District shall be Armorock Polymer Concrete or proven equal. All others for sanitary sewers shall be constructed of a pre-cast reinforced concrete base, or cast-in-place reinforced concrete base with prior approval of the District. All manhole barrels, risers, concentric cones, flat tops and grade rings shall be pre-cast reinforced concrete and shall conform to ASTM Designation: C478 with the additional requirement that the cement used shall be Type V sulfate resistant. Sewer manhole sections shall be manufactured without the provision for steps. Joints for the barrel section shall be tongue and groove. Manholes shall conform to these Improvement Standards and Standard Details.

5.5.1 Armorock Polymer Concrete manholes (or proven equal) shall conform to ASTM C478. Detail sheets and further specifications can be found at Armorock.com

5.5.2 Refer to Section 8, Force Mains, of these Improvement Standards for special finish requirements of Force Main receiving manholes (transition manholes from force main to gravity).

5.5.3 PRE-CAST reinforced concrete bases, barrels, tapered sections, concentric cones, flat tops, and grade rings, sections shall conform to the Caltrans Standard Specifications except as herein provided.

- A. The pre-cast base shall be placed on a minimum of four (4) inches of three-quarter (3/4) inch crush rock bed.

5.5.4 CAST-IN-PLACE shall be used on a case by case basis as approved by the District Engineer. Reinforced portions of manholes shall be constructed of Class A concrete as specified in Section 90 of the State Specifications. Bar reinforcing steel shall be furnished and installed in accordance with Section 52 of the State Specifications. **The District recommends the use of pre-cast manhole bases with flexible boot connectors for all Sanitary Sewer manholes.**

- A. The base thickness and reinforcement shall be as designed by the Design Engineer.
 - a) For manholes extending to a finish depth of fourteen (14) feet, a minimum of eight (8) inches with a minimum of one (1) mat of number four (#4) reinforcement bars each way.
 - b) For manholes extending to a finish depth of greater than fourteen (14) feet, a minimum of twelve (12) inches with a minimum of two (2) mats of number four (#4) reinforcement bars each way.
- B. The bottoms of manholes, as shown on the plans, shall be neatly shaped to match the pipe inflow and outflow and shall be brushed to a smooth finish with a wet brush.
- C. All work shall be cured for a minimum period of ten days (or as directed by the Design Engineer) after being placed and shall be protected from injury.
- D. **All cast-in-place bases shall be inspected during construction, shall be properly cured, and accepted by the District Engineer before the stacking of any barrels or cones.**

5.5.5 CAST-IN-PLACE SADDLE MANHOLES shall be reinforced concrete and the top half of the pipe shall be removed after the base has properly cured.

- 5.5.6** No pipe shall project more than 0.17 feet into a manhole (except for drop inlet pipes) and in no case shall the bell of a pipe be built into the wall of a manhole or structure.

- 5.5.7** Each pipe shall have a resilient connection to the manhole conforming to ASTM C923 such as KOR-N-SEAL, A-LOK, or equal.
- 5.5.8** All joints in the sewer manhole shaft shall be thoroughly cleaned and sealed watertight with a preformed joint sealant gasket material conforming to ASTM Designation: C923. Kent-Seal, Ram- Nek or approved equal. The joint sealant gasket material shall match the manhole wall thickness.
- 5.5.9** The inside and outside of all sewer manholes shall be sealed as needed to provide a watertight environment and pass the required vacuum testing as specified hereinafter. Armorock Polymer Concrete or equal does not require an interior or exterior coating.
- A.** All manholes shall have the outside of all joints and other openings (including all pin lift holes and all visual imperfections to the outside surface) sealed by the application of an approved flexible six (6) inch minimum mastic tape material, (Henry – RUB'R-NEK or approved equal). The joint tape shall be applied prior to the placement of any backfill material and prior to any testing. A bitumastic material shall be applied around all pipe penetrations of the manhole to provide a watertight seal.
 - B.** Subject to groundwater conditions, the District may require the application of a layer (approximately 1/8" thick) of a waterproofing bitumastic material to the entire exterior surface of any manhole prior to backfilling.
 - C.** All manholes shall have the inside sealed prior to any testing by applying an approved grout which meets or exceeds ASTM CL107 Grade B, and AASHTO T260, mixed to a plastic consistency. All lift holes and all visual imperfections to the inside surface, including joints shall be sealed and brushed to a smooth finish with a wet brush.
 - D.** Subject to ground water conditions, the District may require the application of an interior coating such as: Tamms-HEY'DI, Koester NB1, Tegraproof, or Xypex, to seal the interior surface of any manhole to limit the infiltration of ground water.
- 5.5.10** **The District shall not accept any manholes with any ground water infiltration. Further, the Contractor shall, at no cost to the District, repair any manhole which develops any water infiltration problem after testing for a minimum period of not less than one (1) year after all subdivision improvements are accepted or as directed by the District.**
- 5.6** **BACKFILLING:** Backfilling shall be brought up to subgrade prior to testing. Completing backfill prior to testing shall be per Section 4 of these Improvement Standards. In no case shall there be any placement of permanent pavement prior to successful completion of the test. It shall be the responsibility of the Contractor to locate and repair at his own expense any defective joints, fitting or leaks, until the results of the tests are satisfactory.
- 5.7** **TESTING AND CLEANING OF SEWER LINE:** The sanitary sewers shall be tested between manholes or between manholes and cleanouts by the following method. All testing, except for Vacuum testing, shall be done after all utilities within the roadways (sanitary sewer, storm drain, water, and dry utilities) have been trenched, backfilled and subbase of the roads has been achieved. Tests for final acceptance shall be made in the following order.
- 5.7.1** Contact a minimum of two (2) Working Days prior to any and all testing and / or observations to schedule an inspection Vacuum test and acceptance of the Sanitary Sewer manholes and lines.
 - 5.7.2** Clean and Ball Flush or Hydro-Vac all manholes and sewer lines to be accepted, as needed. All construction debris shall be removed from the lines and manholes before any testing or Closed Circuit Television (CCTV).
 - 5.7.3** Low-pressure test of SDR/C900 shall be only between accepted manholes and all laterals directly out of the accepted manholes.
 - 5.7.4** CCTV all sewer mains, manholes and view all laterals from main line (the District shall be present during testing). Additional CCTV of any lateral services shall be as directed by the District.

5.7.5 Additional cleaning and / or Ball Flushing shall be required of all manholes and sewer lines to remove all construction debris prior to the final acceptance of the project.

5.8 **VACUUM TESTING OF MANHOLES:** All Sanitary Sewer manholes shall be Vacuum tested per ASTM C1244-93 and meet the following requirements prior to acceptance. If the sewer manhole fails the test, the manhole shall be repaired by the Contractor and re-tested. The District may also require any manhole to be re-tested using this method if there is reason to suspect that the sewer manhole has been disturbed during any construction operation or if ground water infiltrates into the manhole. In order to prepare a sewer manhole for this test, the following shall be accomplished:

- 5.8.1 **NO BACKFILL** shall be placed around any manhole until the outside surface of the manhole is inspected and accepted by the District.
- 5.8.2 All lift holes, connections and inside and outside joints shall be sealed watertight. All grout placed on any of the inside surfaces of the manhole shall be brushed to a smooth finish with a wet brush.
- 5.8.3 The manhole must be drained of all liquids. No amount of water shall be allowed inside of the manhole during the vacuum test.
- 5.8.4 All pipes entering the manhole shall be plugged, taking care to securely brace the plug from being drawn into the manhole.
- 5.8.5 The test plate shall be installed and sealed in accordance with the manufacturer's recommendations.
- 5.8.6 A vacuum of ten (10) inches Hg (mercury) shall be drawn, the valves closed, and the vacuum pump shut off.
- 5.8.7 With the valves closed, the time shall be measured for the vacuum to drop to nine (9) inches Hg (mercury). The minimum test time to drop one (1) inch Hg shall be not less than sixty (60) seconds.

The manhole shall pass if the time is greater than the times listed in the following Table 5.7-1 for particular manhole sizes or as directed by the District Engineer.

Table 5.7-1	
Minimum Vacuum Pass Times	
Manhole Size (Inches)	Minimum Time to drop to 9" Hg (seconds)
48	60
54	67
60	75
72	90
84	105
96	120

5.8.8 The Contractor shall supply the vacuum equipment, plugs, acceptable oil filled gauge and a minimum of one spare gauge, along with any necessary ladders or catwalks and safety equipment to provide the inspector with access to view the test gauge. In addition, the District may compare the Contractor's gauge with a District-owned gauge at any time.

5.9 **LOW PRESSURE AIR TEST:** The gravity sewer piping shall be tested in accordance with the current adopted National Clay Pipe Institute Low Pressure Air Test for Sanitary Sewers (Procedures and Tables). All mains and service laterals shall be tested and passed, including service laterals connected directly to a manhole. The minimum duration of time for passage of any segment of the sewer system shall be as indicated within the aforementioned tables, but never less than thirty (30) seconds.

- 5.9.1** The maximum reach to be tested shall be the reach between two consecutive vacuum tested and accepted manholes.
- 5.9.2** The Contractor shall supply the compressor, plugs, necessary piping, and acceptable oil filled gauge and a minimum of one spare gauge, along with any necessary ladders or catwalks and safety equipment to provide the inspector with access to view the test gauge. In addition, the District may compare the Contractors gauge with a District-owned gauge at any time.
- 5.10 CLEANING AND BALL FLUSHING:** Prior to testing and before the sewer lines are acceptable for CCTV, they shall be cleaned, ball flushed, and / or Hydro-Vac removing all foreign matter from all lines and manholes to the satisfaction of the District Engineer. Suitable traps shall be placed in the manholes during cleaning to intercept large material. Such material shall be removed from the line prior to any CCTV.
- 5.11 CLOSED CIRCUIT TELEVISION INSPECTION:** After completely cleaning and flushing all lines, introduce approximately twenty (20) gallons of water, thirty (30) minutes to one (1) hour prior to CCTV. The water is to be introduced at each of the first manholes to have CCTV inspected. The first manhole shall be the highest invert manhole within each area being CCTV inspected. It shall follow the slope downstream to the final manhole within the area. Except at intersecting manholes, the inspection shall again go to the highest invert manhole and proceed to the intersecting manhole before proceeding downstream. The following shall apply to CCTV unless directed otherwise by the District Engineer:
- A.** The Contractor shall contact to schedule with District, a minimum of two (2) Working Days prior to the CCTV to coordinate and have the District Engineer and / or Inspector present during all times of the CCTV recording.
 - B.** The Contractor / Developer shall submit a resume from the CCTV Company for review and acceptance prior to any CCTV. The Contractor / Developer shall supply the CCTV services as required to achieve acceptance of the final pipeline and include said cost within their original bid or as directed by the contract or the District Engineer.
 - C.** The current adopted County of Sacramento requirements for Closed Circuit Television (CCTV) operations shall apply, unless otherwise directed by the District.
 - D.** The CCTV shall be recorded on the format, and printed as specified by the District Engineer. CCTV Company shall have on site during the session all the equipment needed to record, and print all reports, (this shall include but not be limited to, extra printer cartridges and paper, along with extra blank devices of the format required by the District). Only one (1) day and / or project shall be placed on any recording device, and all reports shall be delivered to the District before the end of each workday of CCTV, but no later than two (2) working days, unless otherwise directed by District Engineer.
 - E.** Camera equipment shall have adjustable illumination, and be in solid state color with a pan and tilt, and have adjustable focal distance. It shall be fitted with a target sized per Table 5.11-1 below to a maximum of one (1) inch in outside diameter or as directed by the District Engineer for all pipes. The center of the one (1) inch target shall be of a contrasting color, highly visible during the CCTV recording. The target shall be attached to the front of the camera and in full view at all times. The target attachment rod shall be sized, constructed, and connected to the camera equipment in a manner, which limits the obstruction of the view.
 - F.** Begin recording with a view of the inside of each manhole as viewed from the top of the manhole looking in.
 - G.** Lower the equipment into the manhole. Equipment set footage shall be noted from the centerlines of the manhole to the focal point in the direction of equipment travel. The camera shall travel at a speed not to exceed thirty-two (32) feet per minute or as directed by the District. The Contractor shall verify accuracy of all CCTV footage counters.

- H. The equipment shall slow down and stop to pan as needed to view, identify and document each of the following:
 - a) Inside each service connection.
 - b) Joint separation or Offset joint.
 - c) Damage joint seals.
 - d) Alignment problem.
 - e) Cracked or damaged pipe, including lined or point repaired pipe.
 - f) Debris in the line and/or laterals.
 - g) Identifiable all sags or high points which exceeds Table 5.11-1.
 - h) Root intrusion.
 - i) Inflow or Infiltration.
- I. If the Camera fails to pass through the line because of a blocked section, the inspection shall be temporarily suspended. The Contractor shall clear the obstruction as directed by the District, and then re-started from the beginning or resume the inspection, as directed by the District. The finished Inspection Report shall run from centerline of manhole to centerline of manhole without any blockage.
- J. Additional CCTV of the service laterals is as directed by the District.

5.12 PIPELINE ACCEPTANCE CRITERIA: All new and rehabilitated pipelines shall be inspected in accordance with the requirements of this Section 5, or as directed by the District Engineer. The recorded CCTV shall be delivered to the District upon completion of the inspection, but in no case no later than two (2) working days after. The CCTV recording shall become the property of the District. The District shall review the CCTV inspection records and printout within ten (10) working days and will notify the Contractor if:

5.12.1 The review revealed a satisfactory installation, or if the review revealed deficiencies.

- A. The following deficiencies in sanitary sewer installation that are identified by the Inspector and / or by television inspection shall be corrected by the contractor at no cost to the District:
 - a) Excess joint separation.
 - b) Excessive Offset of joints.
 - c) Excess joint deflection of more than the manufacturer's recommendation.
 - d) Cracked or damaged pipe, including liner pipe.
 - e) Debris in line and /or laterals.
 - f) Identifiable sags or high points for the section tested is more than 1/20 the pipes inside diameter to a maximum of one inch as specified in the following Table 5.11-1:

Table 5.11-1	
Inside Diameter	Maximum Sag or High Point
Inches	Inches
4	1/4
6	3/8
8	1/2
10	1/2
12	5/8
15	3/4
18	7/8
21 or Greater	1

- 5.12.2** All other criteria as set by OPUD Standard Specifications and/or Special conditions shall apply as directed by District Engineer.
- 5.12.3** The Contractor / Developer will be notified by the District of any deficiencies revealed by the Inspector or by the television inspection that will require repair. The Contractor / Developer has the option to request a meeting with the District Engineer to review the CCTV report.
- 5.12.4** Upon completion of the required corrective actions, the sewer will be re-televised in accordance with this Section. This process shall be repeated until the review of the recorded television inspection reveals a satisfactory installation.
- 5.12.5** **REFERENCE POINTS** information file indicating the location of all manholes and main line COTG shall be submitted to the District for acceptance as one of the following:
- A.** GPS reference file (file format shall be as directed by the District),
 - B.** Red noted set of plans indicating the approximate depth to the top and a minimum of three (3) reference point items that are all protected from damage and / or loss during the construction.
- 5.12.6** **NOTE:** The District will issue a letter to the Contractor, Developer, and Yuba County Public Works only after Construction Acceptance of all Sewer and Water facilities for the specific portion of the project or its entirety and the District has accepted the RP information provided by the Contractor. All letters of Acceptance made relative to any project does not relieve the Contractor / Developer from compliance with the requirements of the District or of any other agency having jurisdiction.

5.13 **CONNECTION TO EXISTING FACILITIES:**

- 5.13.1** The Contractor / Developer shall be responsible for providing the District with a preliminary observation report showing the basic condition of the sewer system downstream of the proposed point of connection, as directed by the District.
- 5.13.2** When improvement plans require connection to an existing facility which will require bypassing or storage of existing flows, a note shall be placed on the plans which provides an estimate of the existing flow to be bypassed (in gpm), or the time between which the flow may be stopped. The note shall also require the contractor to contact the District at least two (2) working days prior to initiating the bypass/stoppage operation so the temporary facilities and equipment can be evaluated for adequacy. Where operation will be accomplished on a major trunk or interceptor, submittal of a work plan for review may be required prior to initiation of the operation.
- 5.13.3** New Sanitary Sewer facilities will not be allowed to be put into service until written authorization is obtained from the District.

- 5.13.4** During all phases of construction, Contractors, Developers and Owners shall be held responsible for controlling and preventing the introduction of any infiltration, drainage, construction debris, or hazardous materials (including, but not limited to paints, solvents, petroleum products) of any quantity into any portion of the District's facilities by means of plugs and / or trapping devices.
- A.** The Developer / Contractor and / or Owner shall be responsible for installation, inspections, maintenance, and cleaning of all plugs, trapping devices, and associated equipment. All devices shall be inspected not less than a minimum of once a week.
 - B.** The Developer / Contractor and / or Owner shall be responsible for the sizing of all plugs and trapping devices to fit properly within each of the sewer channels of all manholes leaving all construction zones.
 - C.** All plugs and trapping devices shall be provided with all necessary restraining and safety devices needed to limit movement.
 - D.** All plugs and trapping devices shall remain in place until otherwise directed by the District and shall only be removed in the presence of the District.
 - ◆ Examples of some items, which have been found in the past, include: Drainage water with excess silts, sediments, and rocks, Plastic tarp, Building Paper, Building insulation, Wood, Stucco, Paint, and Plumbing products. These items tend to become lodged within a manhole or even in the main line between the manholes, all of which cause blockage within the system. Such items have also been found in sewer lift station facilities.

5.13.5 All associated costs, fees, and fines for the removal and / or cleaning of all infiltration, drainage, construction debris, or hazardous materials from the system will be billed directly to the Developer, Contractor, and / or Owner responsible for allowing them to enter the system. These costs will include, but may not be limited to, Sewage Pump truck, Hydrovac truck, or other cleaning and inspection equipment, as well as the associated costs for the District to observe the cleaning. It will also include all incurred repairs of associated with any debris reaching a Lift Station or Waste Water Treatment Facility, damaged equipment.

5.14 REHABILITATION OF EXISTING FACILITIES:

5.14.1 PRE-REHABILITATION CCTV INSPECTION. The report shall be clearly labeled as "Pre-Rehabilitation CCTV Inspection". During the Pre-Rehabilitation CCTV Inspection, the camera shall stop at all significant observations to ensure a clear and focused view of the pipe condition. At a minimum, the report shall contain the following:

- A.** A clear view of a minimum of 75% of the pipe wall.
- B.** A list of "significant observation", including, but not limited to: services, blockages, cracks, roots, material deposits and / or debris, offsets, infiltration, changes of materials and any structural decay.

If the camera cannot pass through the entire section of pipeline (blockage, etc.), the Contractor shall reset the equipment at the downstream manhole and attempt to inspect the section of pipe from the opposite direction. If the camera again fails to pass through the blocked section, the video inspection shall be temporarily suspended and the District notified. The Contractor shall clear the obstruction as directed by the District, and then resume the inspection. The finished Inspection Report shall run from centerline to centerline of manhole.

5.14.2 MATERIALS. All proposed products, methods and material shall be considered on a case by case basis and shall be submitted to the District for approval prior to placement. All products, materials, and workmanship shall be provided with guarantee and warranty as directed and approved by the District (Refer to Section 9 of these Standards).

- A.** Broken, cracked or damaged pipes shall be repaired only as directed and approved by the District. When acceptable, an approved sealant material shall be injected from the inside of the pipe to the exterior to stop infiltration. Once infiltration has been stopped, an approved liner sleeve material shall be installed.

- B.** All installation work shall be per the manufacturer's written product specification and shall be performed by the manufacturer's certified / authorized representative.
- 5.14.3 REHABILITATION TESTING AND ACCEPTANCE** shall be in accordance with these Improvement Standards, for new construction or as directed by the District.

SECTION 6
FORCE MAIN SEWER SYSTEM CONSTRUCTION

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SECTION 6

FORCE MAIN SEWER SYSTEM CONSTRUCTION

- 61** **GENERAL:** Construction, furnishing and installation of Sewer Force Mains and appurtenances shall be in accordance with these Improvement Standards and Standard Details, as directed by the District Engineer.
- 62** **DESIGN CRITERIA:**
- 621** **ENGINEERED CALCULATIONS** shall be provided based on the following and the applicable provisions of the current adopted County of Sacramento Public Works Agency, Improvement Standards, or as directed by the District Engineer:
- A. Applicable Standards:**
- a) Environmental Protection Agency Regulations.
 - b) Laws, codes and standards of the State of California, Department of Health Services.
- B. DESIGN FLOW CRITERIA:** Design flow shall be calculated using the average for the upstream service area. Refer to the current adopted County of Sacramento Improvement Standards and Standard Construction Specifications for the following:
- a) Flow Generation output from Lift Stations into force mains (Refer also to Section 7 of these standards).
 - b) Peaking factors from Lift Stations into force mains (Refer also to Section 7 of these standards).
 - c) Design Velocities shall be 2 FPS to 5 FPS.
 - d) Friction Factor.
 - e) Designed operating pressure as directed by the District Engineer.
- C. PIPE CAPACITY, VELOCITY, AND SIZE:**
- a) Capacity in all cases shall be adequate to carry the design flow from the entire tributary area, even though said area may not lie within the project boundaries.
 - b) The minimum size shall be eight (8) inches in diameter unless otherwise approved by the District Engineer. Preferred force main sizes are 8", 10", 12", 18", & 24".
 - c) Maximum 45⁰ bend fittings.
- 622** Pigging launch and retrieval stations shall be required on Force Mains in excess of 1,000 Feet.
- 623** Pipe shall only be designed with gate valves. The maximum spacing of valves shall be three thousand (3000) feet, or less as needed to allow for future repairs and acceptance testing of the facility.
- 624** Discharge manhole shall be designed to only receive materials from the force main and shall maintain liquids within the force main piping in order to contain the sewer gases within the force main piping.
- 625** No sanitary sewer service lateral shall be connected directly to any discharge manhole or closer than twenty (20) feet downstream.
- 626** Discharge manhole shall be specially coated per these Improvement Standards and as directed by District Engineer. If a polymer concrete manhole is used, no coating will be required.
- 627** The design of force main lines shall be closely coordinated between the Design Engineer and the District Engineer.

63 MATERIALS: Sanitary Sewer Force Main Systems shall be as specified herein:

- 631 PIPE** - All piping shall be approved by the District and shall conform to the requirements of the current A.W.W.A. Standards for Water Pipe with a minimum design pressure of one hundred fifty (150) psi.
- A. Ductile iron with a ceramic interior surface liner and a seal coating providing an approved sewage resistant special coatings.
 - B. C-900 DR-18 / C-905 DR-25 PVC (polyvinyl chloride) (green in color) and marked "**SEWER FORCE MAIN**" pipe with reflective tape.
- 632 FITTINGS** - All bends, elbows, tees, crosses, and special fittings shall be approved by the District and shall be in complete conformance with the applicable A.W.W.A. Standards.
- A. All fittings shall be Push-On, Mechanical type, or Flanged ends designed for a minimum working pressure of two hundred fifty (250) psi.
 - B. All buried metal parts shall be brass, bronze, cast iron, ductile iron, or stainless steel.
 - C. All metal parts shall be provided with approved ceramic sewer resistant coatings. All direct burial metal materials and / or equipment shall be sealed by wrapping with a minimum eight (8) mil polypropylene film lapped as needed to provide a seal and taped with a minimum of three (3) wraps of a ten (10) mil HDPE tape, or as directed by the District. Contractor / Developer has the option to provide the District Engineer with a stamped and signed Soils Report, which indicates if the soils conditions are suitable for placement without a polyethylene wrap.
- 633 ALL BURIED METAL PARTS** shall be Ductile Iron, Brass, Bronze, or Stainless Steel. All buried nuts and bolts for flanges and couplings shall be Type 304 stainless steel, and Core ten "T" bolts.
- 634 ALL PIPE CONNECTORS** shall be made of a flexible Neoprene-EPDM material resistant to ozone, weathering, aging, and chemicals, including but not limited to acids, alkalis, animal and vegetable fats, oils and petroleum products. Each connector shall have series 304 stainless steel bands and screw assemblies.
- 635 VALVES:** Types of valves to be installed shall be Mueller or approved equal. All valves shall open to the left (counter-clockwise), and be furnished with flange, or mechanical joint using an elastomeric-gasket seal. Valve shall bear the registered certification mark of the AWWA. All installed valves shall operate smoothly with no more than twenty-five (25) ft-lbs. torque. Valves operating at torques greater than twenty-five (25) ft-lbs. require approval by the District. All valves shall have two (2) inch square operating nuts. All sanitary sewer force mains shall only be equipped with gate valve assemblies.
- A. **Gate Valves** shall be ductile iron body, with bronze stem nuts, glands and bushings, non-rising stem (NRS), working water pressure of two hundred (200) psi, conforming to the requirements of AWWA Standard C509. Resilient-seated gate valves shall have resilient seats bonded or mechanically attached to the gate.
- 636 VALVE BOXES** shall be traffic rated, polymer concrete with composite lid. Covers shall be marked "**SEWER**" and shall have a loose fit in the box.
- A. Valve boxes shall have risers installed as needed to adjust to grade after paving completion, unless otherwise directed or approved by the District Engineer.
 - a) Valve risers shall be installed prior to back fill and shall extend from below the valve nut to a point eighteen (18) inches \pm above construction grade and shall be firmly supported and maintained, and be centered and plumb over the wrench nut of the valve assembly.

- b) Risers shall consist of a continuous section (having no splices unless approved by the District Engineer) of an eight (8) inch C-900 DR 18 PVC pipe (green for sewer force mains) and should be temporarily covered with a minimum formed 22 gauge GSM lid to limit debris from filling the riser.
- c) When trimmed to below the road subgrade prior to the placement of Aggregate Base and / or Paving, a temporary cover consisting of a minimum formed 22 gauge GSM lid to limit debris from filling the riser shall be installed.
- d) The center of all valve nuts shall be referenced prior to being covered with any materials.
- e) The valve riser shall be raised to finish grade per the Standard Detail. Unless approved by the District Engineer, all valve nuts which are forty two (42) inches or less in depth shall be continuous (no splices). When the valve nut is more than forty two (42) inches, the risers shall be extended by a splice consisting of a continuous section of proper fitting C- 900 DR 18 PVC pipe and with either of the following:
 - i) District approved proper fitting coupling
 - ii) An integral bell joint (gasket maybe removed)

6.37 **LOCATING DEVICES** shall consist of the following: (The District shall approve all marking devices prior to installation.)

- A. **MARKING TAPE** shall be reflective, a minimum of six (6) inches wide, green in color, marked "**SEWER FORCE MAIN BELOW**" and shall be placed twelve (12) inches above the pipe.
- B. Except when located within steel casing, all sewer force main lines not marked **SEWER FORCE MAIN** on the exterior of the pipe shall have identification materials attached directly to the pipe. These materials shall be marked "**SEWER FORCE MAIN**" and shall consist of one or more of the following:
 - a) Green marking tape continuously wrapped around the exterior (at a minimum of thirty (30) inches on center)
 - b) Green adhesive marking tape or
 - c) Green colored polypropylene sleeve
- C. **TRACING WIRE**: All runs of sewer force main pipe shall have a No. 10 gauge UF-rated solid copper wire with plastic insulation, which shall be laid along the top of the pipe to facilitate locating the pipe at a later date. Secure wire to top of pipe with an accepted tape or other approved means at ten (10) feet on center maximum spacing. The wire shall be stubbed up for above grade access within each valve box, but should never exceed six-hundred (600) lineal feet along the force main. If valve spacing is greater than six-hundred (600) feet, raise and secure the tracing wire through a conduit into an approved "Christy" G-5 box (or equal) as shown on Standard Detail Sheet 6-18.
- D. **LOCATION STAKES**: Force Mains in unpaved areas (as directed by Engineer) shall be marked every five hundred (500) lineal feet with a four (4) inch wide by five (5) foot tall, green composite utility marker having a decal stating: "**CAUTION FORCE MAIN - OPUD**". Appurtenances (valves, ARV's, test stations, etc.), and angle points shall also be marked.
- E. **MAINS IN LANDSCAPED AREAS**: Shall be identified as directed by the District Engineer and/or District Inspector.

6.39 **SUBSTITUTION** proposals shall include sufficient information needed for a comparison with the specified product, the projected cost difference between the specified product and substitution product, and shall include the estimated cost for the District Engineer's time to review and provide acceptance or rejection of said substitution product(s).

- A. All product(s) Substitution proposed by the Contractor / Developer to be included in the construction shall be submitted for review by the District Engineer a minimum of **five (5) working days** prior to the projected installation date.

639 **ACCEPTANCE OF MATERIALS** - Acceptance shall be subject to strength and quality testing in addition to inspection of the completed product. Acceptance of installed piping systems shall be based on inspection during construction and on the leakage test as specified hereinafter.

6310 **REFERENCE POINT** information indicating the location of all valves shall be submitted to the District for acceptance in the following forms:

- A. GPS reference file (file format shall be as directed by the District),
- B. Red noted set of plans indicating the approximate depth to the top and a minimum of three (3) reference point items that are all protected from damage and / or loss during the construction.

6311 **NOTE:** The District will issue a letter to the Contractor, Developer, and Public Works only after Construction Acceptance of all Sewer and Water facilities for specific partition of the project and the District has accepted the RP information provide by the Contractor. All letters of Acceptance made relative to any project does not relieve the Contractor / Developer from compliance with the requirements of the District or of any other agency having jurisdiction.

64 **INSTALLATION:**

641 Force mains shall be installed in the locations shown on the plans. The trench shall be of sufficient depth so as to provide thirty-six inches (36") minimum cover over the pipe from the finished grade and shall be to the grades designated on the plans. All installations shall conform to the manufacturer's written specifications.

- A. Pipes shall be handled in such a manner as to avoid damage to the machined ends. When damaged pipe cannot be repaired to the Engineer's satisfaction, it shall be removed from the job. The interior of all pipe and accessories shall be kept free from dirt and foreign matter at all times.
- B. Proper implements, tools and facilities, satisfactory to the Engineer, shall be provided and used for the safe and efficient execution of the work. All pipe fittings, valves, and accessories shall be carefully lowered into the trench by means of derrick, ropes, or other approved equipment, in such a manner as to prevent damage to the pipe and fittings. **Under no circumstances shall any pipe be dropped or dumped into the trench.** The pipe and accessories shall be inspected for defects prior to lowering into the trench. Any defect, damage, or unsound pipe shall be repaired or replaced. All foreign matter shall be removed from the interior of the pipe before lowering into position in the trench. Pipe shall be kept clean by means approved by the Engineer during and after placement.
- C. Pipe shall be installed per manufacturer written instructions and specifications. Pipe shall not be deflected either vertically or horizontally in excess of that recommended by the manufacturer of the coupling. When pipe laying is not in progress, the open ends of the pipe shall be closed watertight by an approved means to prevent entrance of foreign materials into the line. Whenever water is ejected from the interior of the pipe, adequate backfill shall be deposited on the pipe to prevent floating. Any pipe that has floated shall be removed from the trench and re-laid as directed by the Engineer. No pipe shall be laid in water or when, in the opinion of the Engineer, the trench and / or weather is unsuitable for such work.
- D. Protection for buried Ductile Iron Pipe, Connectors, and Adapters: All buried Ductile Iron Pipe, Connectors, and Adapters shall be protected with 10 mil polyethylene film in accordance with AWWA C105. Continuously seal seams and overlaps with approved PVC tape. Gather excess polyethylene to top so as not to block backfill material from getting under the bottom of the pipe.
- E. Contractor shall maintain a clean, controlled, working environment during all phases of the installation of all of the sewer transmission assembly, preventing construction materials from becoming future blockage. All valves must be closed until testing and open pipe ends must be capped by a District-accepted method.

- 642** **VALVE EXTENSIONS:** All valve assembly nuts which are deeper than forty-two (42) inches below finish grade shall be fitted with a District approved steel valve extension, sized as needed to raise the access to within thirty six (36) inches \pm below finish grade, or as directed by the District Engineer. Refer to Standard Details.
- 643** **PLUGS:** Standard plugs shall be inserted into the bells of all dead-end fittings. Spigot ends of fittings and plain ends of pipe shall be capped. Plugs and caps shall be lowered into trench, inspected and cleaned as specified above. Joints to PVC pipe shall be in accordance with the manufacturer's specifications.
- 644** **THRUST BACKING:** Thrust backing shall be applied to all bends, tees, valves, plugs, caps, fittings, and at changes in pipe diameter occurring at reducers.
- A. The size and shape of concrete thrust backing shall be that required and indicated on the plans by the Design Engineer and / or as directed by the District Engineer, adding bell restrains on a case by case basis (but in no case shall it be less than the sizes indicated on the table in the Standard Details).
 - B. All thrust backing shall be of Class "B" concrete having compression strength of not less than 2,500 psi when using standard cement. Backing shall be placed between solid ground and fitting to be anchored.
 - C. The area of bearing on the fitting and on the ground, in each instance, shall be that required by the Design Engineer, but in no case shall it be less than the sizes indicated on the table in the Standard Details.
 - D. The Concrete backing shall be placed so that the pipe and fitting joints will be accessible for any repair.
- 65** **MANHOLES:** Manholes for sanitary sewer force mains shall be constructed of a polymer concrete base, or cast-in-place reinforced concrete base on a case by case basis. All manhole barrels, risers, concentric cones, flat tops and grade rings shall be polymer concrete and shall conform to ASTM Designation: C478 with the additional requirement that the cement used shall be Type V sulfate resistant. Sewer manhole sections shall be manufactured without the provision for steps. Joints for the barrel section shall be tongue and groove. Manholes shall conform to these Improvement Standards and Standard Details.
- 651** **PRE-CAST** reinforced concrete bases, barrels, tapered sections, concentric cones, flat tops, and grade rings, sections shall conform to the Caltrans Standard Specifications except as herein provided.
- A. The pre-cast base shall be placed on a minimum of four (4) inches of three-quarter (3/4) inch crush rock bed.
- 652** **CAST-IN-PLACE (To be used on a case by case basis only)** reinforced portions of manholes shall be constructed of Class A concrete as specified in Section 90 of the State Specifications. Bar reinforcing steel shall be furnished and installed in accordance with Section 52 of the State Specifications. **The District recommends the use of pre- cast manhole bases with flexible boot connectors for all Sanitary Sewer manholes.**
- A. The base thickness and reinforcement shall be as designed by the Design Engineer.
 - a) For manholes extending to a finish depth of fourteen (14) feet a minimum of eight (8) inches with a minimum of one (1) mat of number four (#4) reinforcement bars each way.
 - b) For manholes extending to a finish depth of greater than fourteen (14) feet a minimum of twelve (12) inches with a minimum of two (2) mats of number four (#4) reinforcement bars each way.
 - B. The bottoms of manholes, as shown on the plans, shall be neatly shaped to match the pipe inflow and outflow and shall be brushed to a smooth finish with a wet brush.
 - C. All work shall be cured for a minimum period of ten days (or as directed by the Design Engineer) after being placed and shall be protected from injury.

D. All cast-in-place bases shall be inspected during construction, shall be properly cured, and accepted by the District Engineer before the stacking of any barrels or cones.

- 653** Each pipe shall have a resilient connection to the manhole conforming to ASTM C923 such as KOR- N-SEAL, A-LOK, or equal.
- 654** All joints in the sewer manhole shaft shall be thoroughly cleaned and sealed watertight with a pre- formed joint sealant gasket material conforming to ASTM Designation such as: C923. Kent-Seal, Ram-Nek or approved equal. The joint sealant gasket material shall match the manhole wall thickness.
- 655** Inlet pipes shall project into the manhole, and in no case shall the bell of a pipe be built into the wall of a structure. Outlet pipes shall be SDR/C900 installed per Section 5 of these Improvement Standards. All work shall be cured for a period of ten (10) days after being placed and shall be protected from injury. Each pipe shall have a compression coupler within three (3) feet of the wet well. All connectors shall be made of a flexible Neoprene-EPDM material resistant to ozone, weathering, aging and chemicals, including but not limited to acids, alkalis, animal and vegetable fats, oils and petroleum products. Each connector shall have series 304 stainless steel bands and screw assemblies.
- 656** All manholes shall have the outside of all joints and other openings (including all pin lift holes and all visual imperfections to the outside surface) sealed by the application of an approved flexible six (6) inch minimum mastic tape material, (Henry – RUB’R-NEK or approved equal). The joint tape shall be applied prior to the placement of any backfill material and prior to any testing. A bitumastic material shall be applied around all pipe penetrations of the manhole to provide a watertight seal.
- 657** **INTERIOR COATINGS:** The interior of all force main discharge manholes shall be properly cleaned and dried and shall have one of the following applied and / or installed per the manufacturer’s written instructions and specifications. If polymer concrete manholes are used, no additional coating will be required.

A. Ameron T-Lock material.

B. Protective coating shall be:

- a) Modified Unsaturated Polyester coating applied in multi-layers with a minimum coating thickness of 125 mil.
- b) Spray applied Amine Cured Epoxy coating applied in multi-layers with a minimum coating thickness of 40 mil.

C. All Protective coatings shall be white in color.

- 658** All pipe and conduit penetration of the manhole and all interior seams shall be properly sealed watertight. A spark test shall be performed to verify that no holes and / or defects exist. The Contractor shall coordinate with the District and have the District Engineer and/or Inspector present at the time of the testing.

66 **BACKFILLING AND LOADING:**

- 661** **BACKFILLING** shall be brought up to a minimum depth necessary to securely hold the pipe and fitting during testing. The minimum depth of the compacted backfill shall be the horizontal diameter of the pipe to be tested, but never less than eighteen inches (18") above the top of the pipe during the pressure test. Completing backfill prior to testing shall be per Section 4, of these Improvement Standards. In no case shall there be any placement of permanent pavement prior to successful completion of the test. It shall be the responsibility of the Contractor to locate and repair at his own expense any defective joints, fittings or leaks until the results of the tests are satisfactory.

- 662** **LOADING OF ALL NEW / REPAIRED FORCE MAIN SYSTEM:** The system shall **only** be loaded by a District-approved method. The Contractor shall submit to the District a written request including copies of all current certificates for all equipment that is to be used.

6.6.3 The following are suggested methods:

- A.** A certified back flow device connected to an existing District system and feeding the installed system by approved hose and / or pipe. A copy of any and all Back Flow Device Certification Documents shall be made available upon request to an authorized representative of OPUD. (Title 17, Chapter V, Section 7583-7622, California Administrative Code regarding cross-connections and back flow prevention.)
- B.** Standard water truck.

6.7 **TESTING AND CLEANING OF FORCE MAIN LINE:** The force main will not require disinfecting or water quality testing. The main shall be pre-flushed and flushed again with a properly sized "pig" after the pressure test. Flushing shall occur in the presence of the District Representative.

6.7.1 **HYDROSTATIC LEAKAGE TESTS:** The pipe shall be pressure tested between acceptable points independent of any existing facilities (in reaches between valves only when acceptable by the Engineer) and all stubs for future setup with blow off assemblies and/or test plates. This test shall be achieved by application of hydrostatic pressure of 65 psi or as directed by The Engineer and all air shall be expelled from the pipe.

- A.** The duration of the test shall last a minimum of two (2) hours, unless otherwise authorized in writing by the Engineer.
- B.** The Contractor shall furnish and install the necessary pump, pipe and approved pressure gauges. The tests shall be conducted under the direct supervision of the District Engineer and/or District Inspector.
- C.** Any defective joints, pipe, fittings, or valves shall be removed and replaced and the test repeated until satisfactory to the Engineer.
- D.** Upon completion of the test or as directed by the Engineer, the system shall have water reintroduced from an acceptable clean calibrated container for measurement of makeup water required to replace leakage and to achieve the original test starting pressure.

6.7.2 **ACCEPTABLE TEST RESULTS:** No pipe installation will be accepted until or unless leakage for the section tested is less than the leakage specified below, (Even if the leakage is less than the allowable, all observed leaks shall be repaired):

LEAKAGE ALLOWANCE IN U.S. GALLONS PER HOUR

At 65 psi test pressure

0.02 gallons per inch diameter per 100'

6.8 **CONNECTION TO EXISTING SYSTEMS:** Isolation, or ends caps with thrust restraints, providing a minimum of five (5) feet of net separation, shall be installed for separation between new systems and existing systems. New systems shall not be connected directly to any of the existing system until the District has determined that the proper hydrostatic leakage testing of the new system has been completed and accepted as described above.

6.8.1 All proposed final connection to an existing system shall require a letter stating the proposed date and projected times service will be interrupted. This letter shall be delivered to OPUD a minimum of three (3) working days prior.

6.8.2 Final removal of isolation plates and connection to any and all existing OPUD system shall only be done in the presence of an authorized representative of OPUD.

6.8.3 The Contractor shall have all the necessary equipment and materials to be installed during the connection.

69 **ACCESS TO SYSTEM VALVES:**

- 691** All system valves shall be accessible to the District during all times and during all phases of construction.
- 692** During the paving process, valve risers shall be temporarily covered with a District accepted metal lid to limit debris from filling the riser, and shall be exposed within seven (7) calendar days.
- 693** When paving is in two lift operation with extended time between the lifts (more than seven (7) calendar days), provide risers with an acceptable temporary traffic rated assembly (Christy G-5 or District approved equal and a two sack slurry collar).

SECTION 7
SEWER LIFT STATION CONSTRUCTION

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SECTION 7

SEWER LIFT STATION CONSTRUCTION

71 **GENERAL:** Construction, furnishing and installation of Sewer Lift Stations and appurtenances shall be in accordance with these Improvement Standards and Standard Details as directed by the District Engineer. All of the applicable provisions of the current adopted Local, State, and Federal Standards, Regulations, and / or Codes shall also apply.

72 **DESIGN CRITERIA:**

721 **ENGINEERED CALCULATIONS** shall be provided based on the following and the applicable provisions of the current adopted County of Sacramento Public Works Agency, Improvement Standards, or as directed by the District Engineer:

A. **DESIGN FLOW:** Design to the minimum criteria without consideration to the actual project conditions does not guarantee plan approval. The design flow shall be calculated using the average for the upstream service area. Refer to the current adopted County of Sacramento Improvement Standards and Standard Construction Specifications for the following:

- a) Area Served (by each Phase of Construction and Ultimate)
- b) Development Density (Equivalent Single family Dwelling unit - ESD)
- c) Flow Generation (310 gpd/ESD).
- d) Infiltration (1200 gpd/Acre).
- e) Peaking factors (Refer to County of Sacramento Improvement Standards)

B. **STORAGE CAPACITY AND SIZE:**

- a) **No sanitary sewer main line pipe storage will be allowed.**
- b) Actual wet well storage capacity in all cases shall be adequate to carry the design flow from the entire tributary area, even though said area may not lie within the project boundaries. It shall be calculated so as to provide for at least the minimum design storage multiplied by two (2) plus a minimum of one (1) foot below lowest gravity inlet.
- c) The minimum wet well size shall be eight (8) feet in diameter unless otherwise approved by the District Engineer.

C. **MOTORS:**

- a) Minimum of two (2) submersible, rail system motors, connected to a manifold assembly.
- b) Total start-ups per motor per hour shall not exceed manufacturer's written specifications and recommendations.
- c) A flow meter capable of measuring actual total ultimate flows shall be installed on the outflow piping.

D. **SWITCHES:**

- a) A minimum of four (4) float switches shall be provided: "Lead Pump On", "Lag Pump On", "High Water Alarm" and "Pumps Off". Float switches shall be provided with all hardware necessary to secure and limit the tangling of the cables during normal operation.
- b) "Pumps Off" switch shall be set to provide at least the minimum liquid level over the top of the submersible motor per the manufacturer's written specifications and recommendations.

- c) "High Water Alarm" level shall be set a minimum of one (1) foot below lowest gravity inlet.
- d) All float switches shall be secured with ties to a minimum 1/4" stainless steel cable. The cable shall be secured to the base or be provided with a weight which will hold the switches in place during pump operations.
- e) The last approximately eighteen (18) inches of the switch cable shall be unsecured to allow for proper switch operation.

E. CONTROL VALVES:

- a) Check valves assemblies shall be manufactured of brass, bronze, coated ductile iron, and / or stainless steel.
- b) Gate valve assemblies shall meet the requirements of Section 6 of these Improvement Standards and shall be located above grade or within five (5) feet of finish grade.

7.22 NOTE: Every phase of the sanitary sewer lift station design, including but not limited to site design and layout, inlet piping, and force mains, shall be closely coordinated between the Design Engineer and the District Engineer. Refer to Standard Details for examples of site and section plans.

7.23 Unless otherwise approved by the District, "fee title" shall be granted to Olivehurst Public Utility District.

7.3 MATERIALS: All materials delivered to the job site shall be new, free from defects, and marked to identify the material, class, and other appropriate data such as thickness for piping. The Contractor shall submit all associated materials for acceptance and signature by District Engineer prior to placement. All associated materials shall be of the following materials, unless otherwise designated:

7.31 PUMPS shall be Vaughn Submersible Chopper Pumps, equipped with 3-phase electric explosion proof motor and rail system.

7.32 MOTOR CONTROL PANEL shall be a PLC control panel equipped with bubbler control, a digital level and a touch screen programmable controller. Any program for the PLC shall be furnished to the district. The control panel shall be furnished with an alarm light (which is to be extended above the enclosure and visible from the street), cellular alarm transmitters, and an audible alarm as directed by the District.

7.32 SUBSTITUTION proposals shall include sufficient information needed for a comparison with the specified product, the projected cost difference between the specified product and the substitution product, and shall include the estimated cost for the District Engineer's time to review and provide acceptance or rejection of said substitution product(s).

- A. All product(s) Substitution proposed by the Contractor / Developer to be included in the construction shall be submitted for review by the District Engineer a minimum of **five (5) working days** prior to the projected installation date.

7.3.4 ACCEPTANCE OF MATERIALS - Acceptance shall be subject to strength and quality testing in addition to inspection of the completed product. Acceptance of installed piping systems shall be based on inspection and leakage tests as specified hereinafter.

7.4 WET WELL shall be sized by the Design Engineer to meet the requirements of this Section and shall have the approval by signature of the District Engineer. Wet Wells shall conform to these Improvement Standards and the details shown in the Standard Details.

7.41 The Base thickness and reinforcement shall be as designed by the Design Engineer, and shall be a one piece base and per Armorock Polymer concrete specifications.

7.42 Wet wells for sanitary sewer lift stations shall be constructed of a pre-cast Armorock reinforced polymer concrete. All wet well barrels, risers, and flat tops shall conform to ASTM Designation: C478 with the additional requirements:

- A. Pre-cast reinforced polymer concrete base, barrels and flat top sections shall conform to the Caltrans Standard Specifications except as herein provided. Cement used shall be Type V sulfate resistant. Sewer lift station wet well sections shall be manufactured without the provision for steps.
- 743** Cast-in-place reinforced portions of the wet well shall be constructed of Class A concrete as specified in Section 90 of the State Specifications. Bar reinforcing steel shall be furnished and installed in accordance with Section 52 of the State Specifications. The bottoms of wet wells, as shown on the plans, shall be neatly shaped with a recess to properly stack the barrels. Also wet well bases shall be brushed to a smooth finish with a wet brush.
- 744** The wet well flat top shall be fitted with a District-approved vapor tight and lockable door assembly equipped with a safety cage designed for proper access to the pumps and all other wet well equipment.
- ◆ **No wet well barrels and/or flat tops shall be stacked onto any cast-in-place base until the base has properly cured. All cast-in-place products shall be inspected and accepted by the District Engineer during all phases of the construction.**
- 745** All joints in the sewer wet well shaft shall be thoroughly cleaned and sealed watertight with a pre- formed joint sealant gasket material conforming to ASTM Designation: C923 such as Kent-Seal, Ram- Nek or approved equal. The joint sealant gasket material shall match the wet well wall thickness.
- 746** Pipes and conduit shall project into the wet well as needed to provide an acceptable watertight seal, and in no case shall the bell of a pipe be built into the wall of a wet well structure. All work shall be properly cured after being placed and shall be protected from injury. Each pipe shall have a compression coupler within three (3) feet of the wet well. All connectors shall be made of a flexible Neoprene-EPDM material resistant to ozone, weathering, aging, and chemicals, including but not limited to acids, alkalis, animal and vegetable fats, oils and petroleum products. Each connector shall have series 304 stainless steel bands and screw assemblies.
- 747** **INTERIOR COATINGS:** The interior of all wet wells shall be properly cleaned and dried and shall have one of the following applied and / or installed per the manufacturer's written instructions and specifications:
- A. Ameron T-Lock material.
 - B. Additional protective coating shall be:
 - a) Modified Unsaturated Polyester coating applied in multi-layers with a minimum coating thickness of 125 mil.
 - b) Spray applied Amine Cured Epoxy coating applied in multi-layers with a minimum coating thickness of 40 mil.
 - C. All Protective coatings shall be white in color.
 - D. **SEALING OF JOINTS AND PENETRATION:** All pipe and conduit penetrations into the wet well and all interior seams shall be properly sealed watertight.
 - E. **SPARK TESTING** shall be performed over the entire surface of the wet well to verify that no holes and / or any defects exist. The Contractor shall coordinate with the District and have the District Engineer and / or Inspector present during the testing.
- 748** **EXTERIOR COATINGS:** All wet wells shall have the outside of all joints and other openings (including all pin lift holes and all visual imperfections to the outside surface) sealed with an approved epoxy and by the application of an approved flexible 6" minimum mastic tape material, (Henry – RUB'R-NEK or approved equal). The joint tape shall be applied prior to the placement of any backfill material and prior to any testing. A bitumastic material shall be applied around all pipe penetrations of the wet well to provide a watertight seal.
- ◆ Subject to groundwater conditions, the District may require the application of a layer (approximately 1/8" minimum thickness) of a waterproofing bitumastic material and / or require the application of a coating: Tamms-HEY'DI, Koester NB1, Tegraproof, or Xypex to the entire

exterior surface of the wet well prior to backfill. This coating will seal the surface of the wet well to limit the infiltration of groundwater.

- 749** The inside and outside of all sewer lift stations shall be sealed as needed to provide a watertight environment and pass any required testing.
- A.** The District shall not accept any Sanitary Sewer Lift Stations with any traces of groundwater infiltration. The Contractor, as directed the District Engineer, shall repair, at no cost to the District, any wet well that develops any water infiltration problem after testing.
- 75** **BACKFILLING** shall be brought up to grade per Section 4 of these Improvement Standards.
- 76** **GENERATOR** shall be a Cummins Generator, designed to be a Quiet Operating, Low Exhaust Emissions, Duty Rated-Standby Power system with a self-contained fuel supply.
- A.** All generators shall be designed and sized to meet the requirements of the lift station during all power outages.
- B.** Automatic transfer switching equipment shall be supplied and shall verify the quality of the main line power supply prior to switching off the generator.
- C.** The Contractor / Developer shall coordinate with the District and obtain all of the necessary permits, including, but not limited to, air quality and environmental.
- 77** **ODOR CONTROL** shall be provided by a ventilation system, which consists of replaceable filter device(s) (see Standard Details), designed to properly vent the wet well assembly and limit the escape of all obnoxious sewage gases and odors. The ventilation piping shall be located a maximum of twelve (12) inches below the lid and shall be a minimum of eight (8) inches in diameter. The diversion of odor to the filter devices(s) shall be achieved by positive flow of a mechanical fan (flow of 500 CFM, or as approved by District Engineer) located within twenty-four (24) inches of the ventilation piping, or as directed by the District Engineer.
- 78** **FLOW METER** shall be installed on the outflow force main piping and shall be sized for a minimum of 150% of the design flow. The meter shall be installed within an access box and shall be designed for sewage application.
- 79** **PERIMETER WALLS** shall consist of an engineered, 8 foot full grout masonry wall with an anti-graffiti coating, decorative columns and accent band for address, and with a District approved multi-agency lockable gate assembly.
- 7.10** **WATER SUPPLY** shall be provided on-site by providing a District approved water pipe with a minimum air gap of twelve (12) inches to a drain grate inlet. Alternate designs include the installation of a District Standard wharf valve assembly having a standard one and one-half (1 1/2) inch pentagon nut and two and one-half (2 1/2) inch hose outlet or the installation a District Standard Fire Hydrant.
- 7.11** **LIFT STATION SITE** shall have a finish surface consisting of a minimum of four (4) inches reinforced (number three (3) rebars centered at eighteen (18) inches on center each way) concrete slab over six (6) inches of Class II Aggregate Base compacted to 95% relative density. An approved yard service light shall be provided within the enclosure area which limits spillover onto adjoining properties (limit at property line of 0.5 ft-candle in residential areas and 1.5 ft-candle in park/open space areas), but allows for night time work on equipment.
- 7.12** **LIFT STATION ACCEPTANCE CRITERIA:** All new and rehabilitated Sanitary Sewer Lift Stations shall be inspected in accordance with the requirements of this Section, or as directed by the District Engineer. The following items are required prior to acceptance:
- 7.121** Contractor / Developer shall be required to schedule a pre-run meeting for the purpose of Construction Acceptance. The following persons or their designated authorized representative must attend this meeting: Developer, Design Engineer, Contractor, Subcontractors, all applicable Manufacturers and others necessary to ensure that all tests are properly performed and acceptable to the District. This meeting shall be scheduled a minimum of two (2) working days prior to the proposed meeting date. The following shall be verified at the pre-run meeting:
- A.** All float level settings.

- B.** All control panel settings.
 - C.** All meters and alarms.
 - D.** All pump motor proper operations (using both primary main line power and standby backup power).
 - E.** Standby backup generator.
- 7.122** A punch list of items to be corrected may be developed.
- 7.123** All punch list items (if any) must be finalized and the Contractor shall schedule for a re-inspection.
- 7.124** All equipment manuals, spare parts, operational documents and plaques, etc., shall be delivered to the District.
- 7.125** The complete site and a permanent all weather access to a public way shall be grant deeded to the District, along with all required right of way documentation..
- 7.126** All Record Documents shall be provided to the District Engineer prior to Final Acceptance of the facility.

SECTION 8
WATER SYSTEM CONSTRUCTION

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SECTION 8

WATER SYSTEM CONSTRUCTION

8.1 GENERAL: Construction, furnishing and installation of Water Mains and appurtenances shall be in accordance with the Contract Documents as accepted by the District Engineer, these Improvement Standards and Technical Specifications, District Standard Details, and A.W.W.A. Standards for Water Pipe. All of the applicable provision of the current adopted Local, State, and Federal Standards, Regulations, and / or Codes shall also apply.

8.2 DESIGN CRITERIA:

8.2.1 ENGINEERED CALCULATIONS shall be provided based on the following and the applicable provisions of the current adopted County of Sacramento Public Works Agency, Improvement Standards, or as directed by the District Engineer:

A. Applicable Standards:

- a) Environmental Protection Agency Regulations.
- b) Laws, codes and standards of the State of California, Department of Health Services relating to Domestic Water Supply.
- c) Applicable provisions of the current adopted County of Sacramento Public Works Agency, Improvement Standards.
- d) General Order No. 103 of the California Public Utilities Commission.
- e) Title 17, Chapter V, Section 7583-7622, California Administrative Code regarding cross-connections and back flow prevention.
- f) Current adopted Uniform Fire Code.

B. DESIGN FLOW CRITERIA: Design flow shall be calculated for the entire service area. Refer to the current adopted County of Sacramento Improvement Standards and Standard Construction Specifications for the following:

- a) Development Density.
- b) Designed operating Pressure at service connections are no less than 40 psi and no higher than 100 psi. Test pressure shall be a minimum of 150 psi or as directed by the District Engineer and/or District Inspector.
- c) Friction Factor.
- d) Design Fire flows and fire hydrant locations to meet the current fire protection requirements of the Agency having jurisdiction and as directed by the District Engineer.

C. PIPE CAPACITY, VELOCITY, AND SIZE:

- a) Design, demand and sizing of the water distribution system shall be per County of Sacramento Improvement Standards and as directed by the District Engineer.
- b) The minimum main size shall be eight (8) inches in diameter. Water main sizes are 8", 10", 12", 18", 24", & 30".
- c) The service lines shall be sized per design demand, but not less than the following:
 - i) Single Family Residential = One and a half (1 ½) inch minimum.
 - ii) Commercial, and Industrial = two (2) inch minimum Back-flow device may be required.
 - iii) Fire Service line = Six (6) inch minimum. Back-flow device required.
 - iv) Irrigation and Park facility = two (2) inch minimum. (Preferred sizes are 2", 4", 6", & 8"). Back-flow device required.

- d) Capacity in all cases shall be adequate to carry the design flow into the entire service area, even though said area is not within the project boundaries.
- e) 2- 45° fittings. Maximum 90° bend fittings on a case by case basis.
- f) Pipe shall be preferably designed with gate valves. The maximum spacing of valves shall be one thousand (1000) feet, or less as needed to allow for future repairs of the facility.
- g) Locating fire hydrants near most high points.
- h) Fire Hydrants shall be located at extreme low points as directed by the District Engineer and/or District Inspector.
- i) Two (2) inch blow-off valves shall be used if dead-end runs are temporary and the main is twelve inches in diameter or less. Four (4) inch blow-off valves shall be used on temporary dead-end runs larger than twelve inches in diameter.

D. Fire Hydrants.

- a) Shall be placed at street intersections wherever possible and located to minimize the hazard of damage by traffic. They shall have a normal maximum spacing per current California Fire Code (or closer if deemed necessary by the local Fire District):
 - i) Residential = 500' O.C.
 - ii) Commercial = 350' O.C.
 - iii) Industrial = 300' O.C.
 - iv) Undeveloped = 1000' O.C.
- b) The minimum size main serving a fire hydrant shall be six (6) inches in diameter, with a gate valve flange connected to the main. Not more than one hydrant shall be placed on a six (6) inch main.
- c) A fire Hydrant shall be installed on all permanent dead-end runs including cul-de-sacs.

E. The design and layout of water lines shall be closely coordinated with the District Engineer and/or District Inspector.

8.3 DESIGN OPERATING SYSTEM PRESSURE FOR RESIDENTIAL FIRE SUPPRESSION SPRINKLER SYSTEMS

8.3.1 For the purposes of the design of residential fire suppression sprinkler systems, the target pressure at the water main in the street shall be a maximum of 40 psi. This is a system target pressure for design purposes only and the District makes no guarantee as to what the system pressure will be at any time (i.e. the system pressure at the water main in the street could be higher or lower than the target pressure of 40 psi at any time). The target pressure of 40 psi maximum shall be used at the water main in the street and not at the water meter, home etc.

8.3.2 **Disclaimer: Olivehurst Public Utility District makes no warranty expressly or implied that the minimum system pressure in its water mains will be maintained at all times at or above 40-psi. Olivehurst Public Utility District merely provides that 40 psi in the water mains is the maximum stipulated pressure for the purposes of designing residential fire suppression sprinkler systems.**

8.4 MATERIALS: All materials delivered to the job site shall be new, free from defects, and marked to identify the material, class, and other appropriate data such as thickness for piping. The Contractor shall submit all water pipe and associated materials for acceptance and signature by the District Engineer prior to placement. All water piping and associated materials shall be of the following materials, unless otherwise designated:

8.4.1 PIPE - All piping shall be approved by the District and shall conform to the requirements of the current A.W.W.A. Standards for Water Pipe with a minimum designed pressure 150 psi.

A. Ductile iron with an AWWA accepted interior surface liner and a seal coating

B. C-900 DR-18 / C-905 DR-25 PVC (polyvinyl chloride) (white or blue in color) pipe

8.4.2 PIPE JOINTS - All joints shall be Push-On or Mechanical type with rubber gaskets, unless otherwise specified. All push on gaskets shall be properly lubricated per the manufacturer's written specifications.

8.4.3 **FITTINGS** - All bends, elbows, tees, crosses and special fittings shall be approved by the District and shall be in complete conformance with the applicable A.W.W.A. Standards.

- A. All fittings shall be Push-On, Mechanical type, or Flanged ends designed for a minimum working pressure of two hundred fifty (250) psi.
- B. All buried metal parts shall be brass, bronze, cast iron, ductile iron, or stainless steel.
- C. All metal parts shall be provided with an AWWA approved special coatings. All buried metal materials and / or equipment shall be sealed by wrapping with a minimum ten (10) mil polypropylene film lapped as needed to provide a seal and taped with a minimum of three (3) wraps of a ten (10) mil HDPE tape, or as directed by the District. Contractor / Developer has the option to provide the District Engineer with a stamped and signed Soils Report, which indicates if the soils conditions are suitable for placement without a polyethylene wrap.

8.4.4 **BURIED NUTS AND BOLTS** - All buried nuts and bolts, flanges and couplings shall be Type 304 stainless steel and Core ten "T" bolts and shall conform to the requirements of the current A.W.W.A. Standards for Water Pipe.

8.4.5 **VALVES**: Types of valves to be installed shall be Mueller or approved equal. All valves shall open to the left (counter-clockwise) and be furnished with flange or mechanical joint using an elastomeric-gasket seal. All valves shall bear the registered certification mark of the AWWA. All installed valves shall operate smoothly with no more than twenty-five (25) ft-lbs. torque. Valves operating at torques greater than twenty-five (25) ft-lbs. require approval by the District. All valves shall have two (2) inch square operating nuts. All valves shall be coated and lined with a two-part Polyamide epoxy having a minimum dry thickness of six (6) mils and NSF approval for potable water.

A. **Gate Valves** shall be ductile iron body with bronze stem nuts, glands and bushings, non-rising stem (NRS), working water pressure of two hundred (200) psi conforming to the requirements of AWWA Standard C509. Resilient-seated gate valves shall have resilient seats bonded or mechanically attached to the gate.

B. **Butterfly Valves(Case by Case only)** shall meet AWWA Standard C504 For Rubber-Seated Butterfly Valves, Class 150B, Short Body and the requirements of this Section. Butterfly valves shall be rated at one hundred fifty (150) psi working pressure and provide drip tight shut-off at one hundred fifty (150) psi of pressure. Butterfly valves shall have flanged ends that meet the requirements of AWWA C207 Class D flanges.

◆ Butterfly valves shall be constructed of the following materials:

- a) Shaft - Type 304 Stainless Steel, ASTM A276
- b) Disc - Cast Iron, ASTM A126 Class B or ASTM A48 Class 40
- c) Disc Edge - Type 316 Stainless Steel
- d) Rubber Seat - Neoprene or Buna-N
- e) Body - Cast Iron, ASTM A126, Class B

◆ Valve body shall be a one-piece casting and shall include two integral B 16.1 Class 125 flat-face flanges, two trunnions and a pad for mounting bonnet with actuator.

8.4.6 **VALVE BOXES**, shall be traffic rated, precast concrete ("Christy - G5" or approved equal) with a cast iron face and a cast iron traffic rated lid. Covers shall be marked "**WATER**" and shall have a loose fit in the box.

A. Valve boxes shall have risers installed as needed to adjust to grade after paving completion, unless otherwise directed or approved by the District Engineer.

- a) Valve risers shall be installed prior to back fill and shall extend from below the valve nut to a point eighteen (18) inches \pm above construction grade and shall be firmly supported and maintained, and be centered and plumb over the wrench nut of the valve assembly.

- b) Risers shall consist of a continuous section (having no splices unless approved by the District Engineer) of an eight (8) inch C-900 DR 18 PVC pipe (blue for potable water mains) and should be temporarily covered consisting of a minimum formed 22 gauge GSM lid to limit debris from filling the riser.
- c) When trimmed to below the road subgrade prior to the placement of Aggregate Base and / or Paving, a temporary cover consisting of a minimum formed 22 gauge GSM lid to limit debris from filling the riser shall be installed.
- d) The center of all valve nuts shall be referenced prior to being covered with any materials.
- e) The valve riser shall be raised to finish grade per the Standard Detail. Unless approved by the District Engineer, all valve nuts which are forty two (42) inches or less in depth shall be continuous (no splices). When the valve nut is more than forty two (42) inches the risers shall be extended by a splice consisting of a continuous section of proper fitting C-900 DR 18 PVC pipe and with either of the following;
 - i) District approved proper fitting coupling,
 - ii) Or an integral bell joint (gasket maybe removed).

8.4.7 **LOCATING DEVICES** shall consist of the following: (The District shall approve all marking devices prior to installation.)

A. MARKING TAPE shall be reflective, a minimum of six (6) inches wide and placed twelve (12) inches above the pipe. Service line tape shall be a minimum of three (3) inches wide and placed six (6) inches above the line. The tape shall be marked:

- ◆ "WATER MAIN BELOW" for processed potable water and shall be blue in color.
- ◆ "RAW WATER MAIN BELOW" for raw untreated, unprocessed water and shall be green in color.

a) Except when located within steel casing, all raw water main lines not marked "**RAW WATER MAIN**" on the exterior of the pipe shall have identification materials attached directly to the pipe. These materials shall be marked "**RAW WATER MAIN**" and shall consist of one or more of the following:

- i) Green Reflective marking tape continuously wrapped around the exterior (at a minimum of thirty (30) inch on center),
- ii) Green adhesive marking tape or,
- iii) Green colored polypropylene sleeve.

B. TRACING WIRE: All runs of non-metallic water pipe shall have a No. 10 gauge UF-rated solid copper wire with plastic insulation, which shall be laid along the top of the pipe to facilitate locating the pipe at a later date. Secure wire to top of pipe with an accepted tape or other approved means at ten (10) foot on center maximum spacing. The wire shall be stubbed up for above grade access within each valve box, but should never exceed six-hundred (600) lineal feet along the water main. If valve spacing is greater than six-hundred (600) feet, raise and secure the tracing wire through a conduit into an approved "Christy" G-5 box (or equal) as shown on Standard Detail Sheet 8-18.

C. LOCATION STAKES: Water Mains in unpaved areas (as directed by Engineer) shall be marked every five hundred (500) lineal feet with a four (4) inch wide by five (5) foot tall, blue composite utility marker having a decal stating: "**CAUTION WATER MAIN - OPUD**". Appurtenances (valves, ARV's, test stations, etc.), and angle points shall also be marked.

D. MAINS IN LANDSCAPED AREAS: Shall be identified as directed by the District Engineer.

8.4.8 **FIRE HYDRANTS** - Fire hydrants shall be as shown on the standard details.

- 8.4.9 SERVICES** - All service materials and fittings shall be brass, bronze or stainless steel (Refer to Standard Details) except for service lines from the water main to the curb stop which shall be Polyethylene Water Service Pipe (poly pipe). The poly pipe shall be installed per manufacturers and The Plastic Pipe and Fittings Association's installation guides. In case of discrepancy between the two guides, the manufacturer's guide shall take precedence. Any deviation from the guides shall require the approval of the District Engineer. Install Mueller Co. (or approved equal) corporation stops & curb stops. In no case shall services shall be installed off six (6) inch diameter fire hydrant mains.
- 8.4.10 WATER METERS, SETTERS AND BOXES** - All water meters shall be "Badger" and/or Sensus, and shall read in hundred cubic feet (CCF), have TRPL with MXU (Radio Read). Standard residential shall be 1"ø. All larger diameter commercial meters to be SAME Badge model with the same requirements as residential meters, unless otherwise specified by the District.
- A. Meter setters shall be used for 1" with a brass nipple out the back of the setter for 1" services, and shall be Mueller Co.
 - B. Meter boxes shall include risers as needed, and shall be per the District Standard Details.
 - C. All meter box lids shall be provided with a touch pad hole. Provide traffic rated lids for driveway locations.
- 8.4.11 DRY BARREL WATER QUALITY SAMPLING STATION:** - Shall be manufactured by Placer Waterworks Inc., model "PW / WS-DB30", shall be a minimum of one (1) per village / unit or as directed by the District and shall be located within a park area or as directed by the District.
- 8.4.12 SUBSTITUTION** proposals shall include sufficient information needed for a comparison with the specified product, the projected cost difference between the specified product and the substitution product, and shall include the estimated cost for the District Engineer's time to review and provide acceptance or rejection of said substitution product(s).
- A. All product(s) Substitution proposed by the Contractor / Developer to be included in the construction shall be submitted for review by the District Engineer a minimum of **five (5) working days** prior to the projected installation date.
- 8.4.13 ACCEPTANCE OF MATERIALS** - Acceptance shall be subject to strength and quality testing in addition to inspection of the completed product. Acceptance of installed piping systems shall be based on inspection and leakage tests as specified hereinafter.
- 8.4.14 REFERENCE POINT** information indicating the location of all valves shall be submitted to the District for acceptance in one of the following forms:
- A. GPS reference file (file format shall be as directed by the District),
 - B. Red noted set of plans indicating the approximate depth to the top and a minimum of three (3) reference point items that are all protected from damage and / or loss during the construction.
- 8.4.15 NOTE:** The District will issue a letter to the Contractor, Developer, and Public Works only after Construction Acceptance of all Sewer and Water facilities for specific partition of the project and the District has accepted the RP information provide by the Contractor. All letters of Acceptance made relative to any project does not relieve the Contractor / Developer from compliance with the requirements of the District or of any other agency having jurisdiction.
- 8.4.16 SALVAGED MATERIALS** - All items including fittings, boxes, and other materials which are salvageable and are to be removed, as directed by the District, shall be the property of OPUD and shall be delivered to the District Corporation Yard.
- A. All existing fire hydrants, wharf hydrants and valve assemblies shall be excavated and salvaged such that they are not damaged in any way.

8.5 INSTALLATION:

- 8.5.1** Water mains shall be installed in the locations shown on the plans. The trench shall be of sufficient depth so as to provide thirty-six inches (36") minimum cover over the pipe from the finished grade and

shall be to the grades designated on the plans. All installations shall conform to the manufacturer's written specifications.

- A. Water pipes shall be handled in such a manner as to avoid damage to the machined ends. When damaged pipe cannot be repaired to the Engineer's satisfaction, it shall be removed from the job. The interior of all pipe and accessories shall be kept free from dirt and foreign matter at all times.
- B. Service taps of the water mains shall be done to insure that cuttings, fillings and plugs do not enter the water mains.
- C. Proper implements, tools, and facilities, satisfactory to the Engineer, shall be provided and used for the safe and efficient execution of the work. All pipe fittings, valves, hydrants and accessories shall be carefully lowered into the trench by means of derrick, ropes, or other approved equipment, in such a manner as to prevent damage to the pipe and fittings. **Under no circumstances shall any pipe be dropped or dumped into the trench.** The pipe and accessories shall be inspected for defects prior to lowering into the trench. Any defect, damage, or unsound pipe shall be repaired or replaced. All foreign matter shall be removed from the interior of the pipe before lowering into position in the trench. Pipe shall be kept clean by means approved by the Engineer during and after placement.
- D. Pipe shall be installed per manufacturer written instructions and specifications. Pipe shall not be deflected either vertically or horizontally in excess of that recommended by the manufacturer of the coupling. When pipe laying is not in progress, the open ends of the pipe shall be closed watertight by an approved means to prevent entrance of foreign materials and/or trench water into the line. Whenever water is ejected from the interior of the pipe, adequate backfill shall be deposited on the pipe to prevent floating. Any pipe that has floated shall be removed from the trench and re-laid as directed by the Engineer. No pipe shall be laid in water or when, in the opinion of the Engineer, the trench and/or weather are unsuitable for such work.
- E. Protection for buried Ductile Iron Pipe, Connectors, and Adapters: All buried Ductile Iron Pipe, Connectors, and Adapters shall be protected with 10 mil polyethylene film in accordance with AWWA C105. Continuously seal seams and overlaps with approved PVC tape. Gather excess polyethylene to top so as not to block backfill material from getting under the bottom of the pipe. Refer to "ASTM A 888" for standard requirements.
- F. Contractor shall maintain a clean, controlled, working environment during all phases of the installation of all of the water transmission assembly, preventing contamination from any and all ground waters, soils and other infiltration of possible bacteriological materials. All valves must be closed until testing and open pipe ends must be capped by a District-accepted method.

8.5.2 VALVES AND FITTINGS: Cast iron valves, hydrants and / or fittings for use with PVC pipe may have bells or spigots with special dimensions as recommended by the pipe manufacturer in order to provide a flexible seal between the pipe and the fitting with a rubber ring gasket of the same composition, design and dimension as used with the pipe couplings.

- ◆ Before laying the valves, hydrants, or fittings, all lumps, blisters and excess coal-tar coatings shall be removed from the bells and spigot ends. The outside of all spigots and the inside of all bells shall then be wire brushed as needed and wiped clean and dry, prior to any required lubrication and/or assembly.

8.5.3 VALVE EXTENSIONS: All valve assembly nuts which are deeper than forty-two (42) inches below finish grade shall be fitted with a District approved steel valve extension, sized as needed to raise the access to within thirty six (36) inches \pm below finish grade, or as directed by the District Engineer. Refer to Standard Detail.

8.5.4 PLUGS: Standard plugs shall be inserted into the bells of all dead-end fittings. Spigot ends of fittings and plain ends of pipe shall be capped. Plugs and caps shall be lowered into trench, inspected and

cleaned as specified above. Joints to PVC pipe shall be in accordance with manufacturer's specifications.

8.5.5 **THRUST BACKING** shall be applied to all bends, tees, valves, plugs, caps, fire hydrants, fittings, and at changes in pipe diameter occurring at a reducer.

- A. The size and shape of concrete thrust backing shall be that required and indicated on the plans by the Design Engineer and / or as directed by the District Engineer, (but in no case shall it be less than the sizes indicated on the table in the Standard Details).
- B. All thrust backing shall be of Class "B" concrete having compression strength of not less than 2,500 psi when using standard cement. Backing shall be placed between solid ground and fitting to be anchored.
- C. The area of bearing on the fitting and on the ground, in each instance, shall be that required by the Design Engineer, but in no case shall it be less than the sizes indicated on the table in the Standard Details.
- D. The Concrete backing shall be placed so that the pipe and fitting joints will be accessible for any repair.

8.5.6 **FIRE HYDRANTS** shall be located as shown on the plans and as directed by the District. All hydrants shall stand plumb with nozzles at right angles to the curb or as directed by the District. Hydrants shall be cleaned of foreign matter before setting.

- A. Fire hydrants shall have proper bury length and extension spools so that the base of the fire hydrant flange is two (2) inches (to 5 1/2") above the finish grade. The break-off riser spool groove shall be exposed and 12" by 12" concrete shall be poured around the center of the check valve.
- B. All Fire Hydrants shall be painted with an approved paint consisting of one primer coat red and two finish coats of #1147 "Bright Safety Yellow".

8.6 **BACKFILLING AND TESTING:**

8.6.1 **BACKFILLING** shall be brought up to a minimum depth necessary to securely hold the pipe and fitting during testing. The minimum depth of the compacted backfill shall be the horizontal diameter of the pipe to be tested, but never less than eighteen inches (18") above the top of pipe during the pressure test. Completing backfill prior to testing shall be per Section 4 of these Improvement Standards. In no case shall there be any placement of permanent pavement prior to successful completion of the test. It shall be the responsibility of the Contractor to locate and repair at his own expense any defective joints, fitting or leaks until the results of the tests are satisfactory.

8.6.2 **LOADING OF ALL NEW / REPAIRED WATER SYSTEM:** The water system shall **only** be loaded by a District-approved method. The Contractor shall submit to the District a written request including copies of all current certificates for all equipment that is to be used. An approved disinfectant shall be introduced into the new / repaired system during the loading.

A. The following are suggested methods:

- a) A certified back flow device connected to an existing District system and feeding the installed system by a clean, approved **Disinfected** hose and/or pipe. A copy of any and all Back Flow Device Certification Documents shall be made available upon request to an authorized representative of OPUD. (Title 17, Chapter V, Section 7583-7622, California Administrative Code regarding cross-connections and back flow prevention.)
- b) California State Health Department certified potable water truck / tank.

8.6.3 **TESTING:** Test shall be made in conformance with the applicable provisions of A.W.W.A. Standard C-603-78. Test pressures shall be 150 psi. for a duration of 2 hours. Contact the District two (2) working days prior to any testing and/or sampling to schedule an inspection.

- A. The Contractor shall supply the pumping equipment, plugs, acceptable oil filled gauge and a minimum of one spare gauge, along with any necessary ladders or catwalks and safety equipment to provide the Inspector with access to view the test gauge. In addition, the District may compare the Contractors gauge with a District-owned gauge at any time.

8.6.4 HYDROSTATIC LEAKAGE TESTS: The pipe shall be pressure tested between acceptable points independent of any existing facilities (in reaches between valves only when acceptable by the Engineer) and all stubs for future setup with blow off assemblies and/or test plates. This test shall be achieved by application of hydrostatic pressure of 150 psi or as directed by The Engineer and all air shall be expelled from the pipe.

- A. The duration of the test shall last a minimum of two (2) hours, unless otherwise authorized in writing by the Engineer.
- B. The Contractor shall furnish and install the necessary pump, pipe and approved pressure gauges. The tests shall be conducted under the direct supervision of the Engineer.
- C. Any defective joints, pipe, fittings, valves or hydrants shall be removed and replaced and the test repeated until satisfactory to the Engineer.
- D. Upon completion of the test or as directed by the Engineer, the system shall have water reintroduced from an acceptable, clean, calibrated container for measurement of makeup water required to replace leakage and to achieve the original test starting pressure.

8.6.5 ACCEPTABLE TEST RESULTS: No pipe installation will be accepted until or unless leakage for the section tested is less than the leakage specified below, (Even if the leakage is less than the allowable, all observed leaks shall be repaired):

LEAKAGE ALLOWANCE IN U.S. GALLONS PER HOUR

_____ At 150 psi test pressure _____
0.02 gallons per inch diameter per 100'

8.7 DISINFECTION AND FLUSHING: Before being placed in service, all new water systems, valve sections to such extensions, any replacement in existing water system, or exposed section of the existing system shall be disinfected to the satisfaction of the Engineer. The system shall be chlorinated so that a chlorine residual of not less than ten (10) parts per million remains in the water after a minimum of twenty-four (24) hours retention in the pipe. Under average circumstances, this chlorination may be expected by application of a minimum of twenty-five (25) parts per million or as directed by the District. Flushing of the system shall be done only as directed by the District, and unless directed otherwise, shall require de-chlorination of the water being flushed by an approved method.

8.8 BACTERIOLOGICAL TESTING: Bacteriological testing shall be provided by the contractor at no cost to the District and shall be done by a District-accepted California Department of Health and Safety Accredited / Registered testing facility. The Contractor shall be responsible for submitting adequate information to the District for acceptance of the testing laboratory prior to any sampling for Bacteriological contamination of the system. All of the applicable provisions of the current adopted Local, State, and Federal Standards, Regulations and / or Codes shall also apply to the Bacteriological sampling and testing.

- A. All hydrostatic leakage testing, disinfection and flushing as described above shall be completed prior to the sampling of any portion of the newly installed and / or repaired water system.
- B. Contact the District two (2) working days prior to any sampling to schedule with the District.
- C. Test samples shall only be drawn with an authorized representative of the District present. The District shall have the option to require any and all test sample containers to be officially sealed by a District representative.
- D. The District's preferred testing method should be **Multiple-Tube Fermentation Technique (9221)** with a minimum forty eight (48) hour lab test, which will determine if the water quality of

the lines meets the current U.S. Environmental Protection Agency Standards and shall use the fermentation technique with ten (10) replicate tubes each containing 10mL.

- ◆ An alternate test method shall be considered on a case by case basis and shall be requested from an authorized representative of the District for approval prior to the drawing of the samples. It shall be SM 9223 (E. coli) with a minimum twenty four (24) hour lab test.
- E. OPUD shall have the option to take secondary samples to verify any and all lab results.
- F. All test results shall be delivered to the District Main Office within two (2) working days of test completion.
- G. Final connections to any existing system shall be as described below and shall not be performed prior to OPUD acceptance of the entire test results.

8.9 CONNECTION TO EXISTING WATER SYSTEMS:

- 8.9.1** Isolation plates, certified back flow prevention devices (Unless otherwise approved by OPUD, the State of California Back flow Certification shall be within the last six months and shall have the original certification tag attached to the device), or ends caps with thrust restraints, providing a minimum net separation per District Standard Details, shall be installed for separation between new water systems and existing water systems. New water systems shall not be connected directly to any of the existing system until the District has determined that the new water system has been properly hydrostatic leakage tested, disinfected and flushed, and all Bacteriological testing has been completed and accepted as described above.
- A. All proposed final connections to existing water transmission lines shall require a letter stating the proposed date and projected times service will be interrupted, which shall be delivered to the District a minimum of three (3) working days prior.
 - B. Upon acceptance of the letter by the District, the contractor shall provide copies and shall distribute, as directed by the District, to all of the affected customers a minimum of two (2) working days prior to the proposed service interruption. The two (2) working days shall be to allow the affected customers to prepare for the interruption in service.
 - C. Final removal of isolation plates and connection to any and all of the existing OPUD system shall only be done with an authorized representative of the District present.
 - D. The Contractor shall have all the necessary equipment and materials and shall **PROPERLY DISINFECT** any and all items to be installed during the connection.

8.10 ACCESS TO WATER SYSTEM VALVES:

- 8.10.1** All water system valves shall be accessible to the District during all times and during all phases of construction.
- 8.10.2** During the paving process, valve risers shall be temporarily covered with a District accepted metal lid to limit debris from filling the riser, and shall be exposed within seven (7) calendar days.
- 8.10.3** When paving is in two lift operation with extended time between the lifts (more than seven (7) calendar days), provide risers with an acceptable temporary traffic rated assembly (Christy G-5 or District approved equal and a two sack slurry collar).

SECTION 9
CONSTRUCTION PLANS PROCESSING PROCEDURES

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SECTION 9

CONSTRUCTION PLANS PROCESSING PROCEDURES

- 91 APPLICABLE STANDARDS:** Pertinent and the most current requirements of the following agencies and standards shall apply to the design of all of the District's systems: (In case of conflict between the requirements of these Standards and the agencies and documents listed below, the District Engineer shall decide the appropriate action)
- A. Environmental Protection Agency Drinking Water Regulations.
 - B. Laws, codes, and Standards of the State of California, Department of Health Services relating to Domestic Water Supply.
 - C. General Order No. 103 of the California Public Utilities Commission.
 - D. Title 17, Chapter V, Section 7583-7622, California Administrative Code regarding cross-connections and back flow prevention.
 - E. Uniform Fire Code.
 - F. Standard Specifications and Standard Details of the District.
- 92 DESIGN CRITERIA:** Per the applicable sections of these Improvement Standards.
- 93 IMPROVEMENT DOCUMENT SUBMITTAL:** All improvement plans for developments (including, but not limited to, commercial, industrial, single family, multi-family, street improvements, and landscape, parks and corridors) that will be served by any District facility shall be reviewed, approved and signed by an authorized representative of the District. The following must occur before the plans can be reviewed:
- A. Submit two (2) hardcopies and one pdf copy of all Construction Documents including, but not limited to Plans and Profiles (scaled and on full size (24"x36") drawing sheets), Engineers Estimate, Details, and one (1) copy of the Specifications for the District review and approval.
 - B. All applicable Plan Review Fees as prescribed in Section 9.4.
- 94 PLAN REVIEW AND INSPECTION FEES:** When improvement documents are initially submitted to the District for review, plan review fees (2% of the Design Engineer's sewer and water construction estimate) for the development will be required before the review of plans can begin. Inspections and testing fees (3% of the estimate) must be paid in full prior to plan approval. Additional fees may be required to be paid during plan review and / or inspection if the accumulated costs expended by the District on the development exceed the original fee amounts paid. Failure of a developer to complete a project does not relieve the developer of paying all costs incurred by the District.
- 95 IMPROVEMENT DOCUMENT RESUBMITTAL:** The process of plan review may involve the resubmission of plans according to the District's comments upon review. The District Representative shall indicate the number of improvement plans to be resubmitted at the time of releasing the comments. Revisions, corrections or additions to the reviewed plans shall be resubmitted to the authorized representative of the District for approval. The Design Engineer shall notify the District if plans being resubmitted contain revisions or alterations other than those required by the District on previously corrected plans. Revision notations shall not be shown on plans until after the District Engineer has formally approved the plans.
- 96 APPROVAL OF IMPROVEMENT DOCUMENTS:** At such time as the Design Engineer preparing the plans has made the necessary revisions and signed and stamped the original plans, and all required fees have been paid, the District Engineer will sign the plans on the cover sheet in the space provided. Plans will NOT be approved nor construction authorized until the District Engineer signifies approval by signature on the plans. The District Engineer's approval is valid for a period of twelve (12) months. Should work not commence within the twelve (12) month period, the plans shall be resubmitted for re-approval. The District Engineer shall order any Contractor to cease work on any project if said Contractor does not have properly approved plans in his possession.

- 9.6.1** All improvement and landscape projects to be served by the District must be approved and plans signed by an authorized representative of the District. The following must occur before the plans can be approved:
- A.** All comments made by the District to the improvement plans must be addressed.
 - B.** The location(s) of all wells in use and all abandoned wells that are affected by the project must be shown on the improvement plans and properly destroyed in accordance with all applicable requirements of the Yuba County Environmental Health, State of California Health and any Federal Agencies. Copies of well destruction permits for all destroyed wells must be provided to the District prior to obtaining plan approval.
 - C.** All applicable plan review, construction inspection, etc. fees are paid. If the project is within any special District development zone, all applicable development fees must be paid.
 - D.** Upon District and Yuba County approval, submit two (2) full size copies of all of the approved signed Documents, and five (5) copies of reduced 11x17 plans.

9.6.2 APPROVAL OF CONSTRUCTION PLANS, NO RELEASE FROM LIABILITY. The review and / or approval by the District of any working drawing and / or method of work proposed by the Design Engineer / Contractor / Developer shall not relieve the Design Engineer / Contractor / Developer of responsibility for any errors and shall not be regarded as any assumption of risk or liability by the District or any officer, official, agent, employee, member, volunteer, affiliate, or their duly authorized representatives. The Design Engineer / Contractor / Developer shall have no claim against the District because of the failure or partial failure or inefficiency of any reviewed or approved plan or method. The District review and / or approval means that the District has no objection to the Design Engineer / Contractor / Developer using the proposed plan or method at the responsibility and risk of the Design Engineer / Contractor / Developer.

97 IMPROVEMENT DOCUMENT REVISIONS: All construction document revisions made after initial document approval that affects any system to be maintained and operated by the District shall be reviewed, approved and signed by an authorized representative of the District prior to any and all deviation from the currently signed and approved documents. Upon signature of approval, submit two (2) copies of revised documents and five (5) copies of reduced 11x17 plans.

98 CONFLICTS, ERROR AND OMISSIONS: Excepted from approval are any features of the plans / documents that are contrary to, in conflict with, or do not conform to any California State Law, District Standard Specification, Yuba County Code or Resolution, conditions of approval, or generally accepted engineering practice, in keeping with the standards of the professions, even though such errors, omissions or conflicts may have been overlooked in the District review of the plans and documents. All construction conflicts, error and omissions shall be resolved by the Design Engineer prior to proceeding with construction work so involved.

A. Documents prepared by the Design Engineer to resolve the conflicts shall be submitted for review, approval and signature by an authorized representative of the District prior to any and all deviation from the signed and approved documents. The following shall be submitted for District review:

a) Submit two (2) copies of all Construction Documents needed to review and resolve the problem including, but not limited to Plans and Profiles, Specifications and Details for the District to review and approve.

b) Plans and Profiles shall be drawn to an adequate scale that clearly identifies the conflict and shall include any and all elevation / grade corrections, all other existing and proposed utilities and shall address how the problem is to be resolved.

99 ANNEXATION REQUIREMENT: When improvement plans are submitted for an area that is not currently within jurisdiction of the District, said plans will not be approved until a request for annexation to the District has been completed, unless approved otherwise. Information relative to annexation procedures is available from the District office.

9.10 PROJECT RECORD DOCUMENTS: The Contractor shall be responsible for maintaining Red-Noted documents during all phases of the construction including, but not limited to changes made by change order and / or field order. The record construction documents shall be legibly marked to record the actual as-constructed conditions of the installed or modified systems, equipment, and material of the project under the following requirements:

- A. Provide all document field correction markings:
 - a) **Red** - Additions including notes and dimensions.
 - b) **Green** - Deletions (by hash marks or appropriate lines through the deletion.).
 - c) **Graphite (gray)** - General comments and notes used by Contractor or District and not required on the as-built.
 - d) **Yellow** - Work completed as shown and used by District in field review of the as-built, during the submittal phase.
 - e) **Blue** - District verification and notes required to be added and noted by the District in review of the as-built, during submittal phase.
- B. Label each document "**Project Record**" in two (2) inch high red printed letters.
- C. Keep record documents current. All requirements listed in this section shall be kept accurately on a daily basis and available to any District Representative upon request. If this is not done, daily inspections of the project may be withheld until the record documents are brought up to date and verified by the District's Representative for accuracy (Refer to Inspections Requirements of this section). The Contractor shall not permanently conceal any work until the required information has been properly recorded.
- D. The following shall be Red-Noted on the construction documents: horizontal and vertical depths of all various elements of the improvement project and finish grade elevation referenced to visible features including, but not limited to location of all utilities and appurtenances, both visible and concealed.
- E. All field changes made to field location, dimension and details.
- F. All changes made by change order and / or field order and not on currently signed and approved construction documents.
- G. With regard to specifications and addenda, legibly mark up each section to record the following: manufacturer, trade name, catalog number and supplier of each product and item of equipment actually installed.
- H. Other matters not originally specified.
- I. Shop Drawings shall be maintained as record documents and legibly marked to record changes made during construction.

9.11 RECORD DOCUMENTS AND/OR AS BUILT: Upon completion of the construction of the improvement plans, "Record Drawing and/or As-Built" documents shall be compiled and shall be approved by the District prior to final acceptance of the improvement project.

9.11.1 The following shall be required of the Design Engineer:

- A. At construction completion, the Design Engineer shall obtain all Project Record (Red-Noted) Documents from Contractor indicating all deviations, corrections and modifications from the signed and approved documents. A copy of all Project Record (Red-Noted) Documents shall be made available upon request to the District Engineer for review and comparison with the Field Inspectors notes.
- B. "Record Drawing and/or As Built" documents shall be reviewed and approved by the Design Engineer.

- C. After Design Engineer’s review, forward “Record Drawing and/or As Built” documents to the District and Yuba County for approval and acceptance.

9.11.2 The following shall be provided to the District Engineer prior to final acceptance of the project:

- A. District and Yuba County approved “Record Drawing and/or As Built” documents computerized, as directed by the District.
- B. Hardcopies of each sheet of the improvement plans shall be marked “Record Drawing and/or As Built”, as directed by the District.
- C. Electronic files to the District of all “Record Drawings and/or As Built” documents, as directed by the District.
- D. Blue Line and Electronic files of Water System only and separate files of Sanitary Sewer only to the District of all “Record Drawing and/or As Built” documents, as directed by the District.
- E. Final Maps recorded and copies of Recorded Maps to the District.
- F. All necessary Easements or Fee Title Properties necessary to support Water and / or Sanitary Sewer installations submitted to the District for approval and the granting process completed.
- G. All Interim System Capacities and Ultimate System Capacities Design Criteria for the following:
 - ◆ Sanitary Sewer System.
 - ◆ Lift Stations.
 - ◆ Booster Stations.
 - ◆ Water Systems including, but not limited to, Production Plants.
 - ◆ All similar facility information shall be included in the “Record Drawing and/or As Built” documents, as directed by the District.

9.12 **PARTIAL PLANS:** Where the improvement plans submitted cover only a portion of the ultimate development, the plans submitted shall be accompanied by the approved tentative plan or study plan of the ultimate development.

9.13 **OTHER AGENCY NOTIFICATIONS:** Prior to District approval, the Design Engineer is responsible for obtaining the approval and necessary permits of other governmental or municipal agencies when their facilities are involved.

9.14 **INSPECTION REQUIREMENTS:** Any and all improvement projects which will ultimately be maintained by the District shall be inspected during all phases of construction by an authorized representative of the District. Each phase of construction shall be inspected and approved prior to proceeding to any subsequent phases.

- A. Any improvement constructed without inspection as provided above or constructed contrary to the order or instruction of the District Engineer will be deemed as not complying with these Standard Specifications and Standard Details and may not be accepted by the District for maintenance purposes.
- B. The Design Engineer shall notify the District Engineer when the Contractor first calls for grading and staking and shall provide the District Engineer with a copy of all cut sheets upon request.
- C. Upon receiving the request for final inspection, the District Engineer shall inspect the work. The Contractor, Design Engineer and Developer will be notified as to any particular defects or deficiencies at the earliest possible date. At such time as the work has been completed, a second inspection shall be made by the District Engineer to determine if the previously mentioned defects have been repaired, altered and completed in accordance with the plans. At such time as the District Engineer approves and accepts the work for the District, the Contractor, Design Engineer, and Developer will be notified in writing as to the date of final approval and acceptance.

9.15 **SPECIAL NOTICES:** The Design Engineer shall be responsible for advising the Contractor as follows:

- A. Contractors shall be in receipt of the official plans approved and signed by an authorized representative of the District prior to beginning any construction.
- B. Contractor shall notify all utility companies involved in the development prior to the beginning of work.
- C. Contractor shall notify "Underground Service Alert" two (2) working days in advance before any excavation.
- D. Contractor shall be responsible for the protection of all existing utilities and survey monuments and shall notify the appropriate agency of any and all damage.
- E. Contractor shall notify all of the appropriate agencies and/or property owners a minimum of two (2) working days prior to commencing any work.
- F. Contractor shall not dispose of any chlorinated water and / or contaminated materials into any waterway, drainage system, wetland, or other protected area.
- G. Contractor shall notify the District of all work schedule changes including, but not limited to, beginning and ending work hours and the days of the week work that will be performed.
- H. Contractor shall be responsible for scheduling all required special inspections and / or observations a minimum of two (2) working days prior.
- I. Contractor shall be responsible for maintaining red-noted documents during all phases of the construction and shall submit them to the Design Engineer upon completion of the improvement project.

916 RIGHT TO RETAIN IMPERFECT WORK: If any portion of the work done or materials furnished for the project shall prove defective or not in accordance with the District Requirements, and if the defect in work or materials is not of sufficient magnitude or importance to make the work dangerous or undesirable, or if the removal of such work or materials is impracticable or will create conditions which are dangerous or undesirable, the District shall have the right and authority to retain the work or materials instead of requiring it to be removed and reconstructed or replaced.

917 REMOVAL OF REJECTED MATERIALS OR WORK: The Contractor / Developer shall remove all rejected or condemned materials or structures brought to or incorporated in the Work within two (2) Working Days of the District's written order. No such rejected or condemned materials shall again be offered for use in any District project. The Contractor / Developer shall, at the Contractor's / Developer's expense, bring into District compliance all rejected materials or work in a manner acceptable to the District.

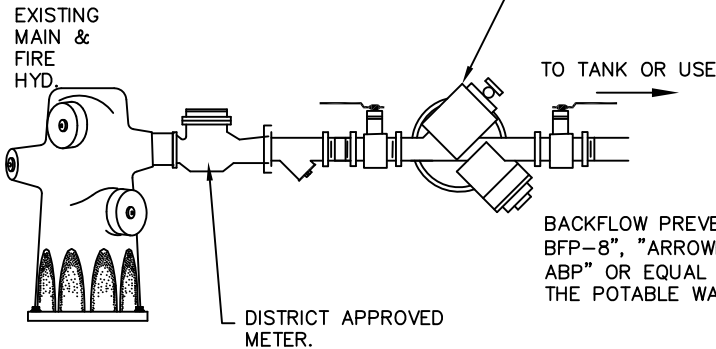
The District may bring into District compliance the rejected materials if the Contractor / Developer fails to comply with this Section. All associated costs shall be paid for by the Contractor / Developer, at no expense to the District.

918 PROPERTY RIGHT IN MATERIALS: Nothing in the Project shall be construed as vesting in the Contractor / Developer any right of property in the materials used after they have been installed, attached or affixed to the Project, and on which construction acceptance has been made by the District. All such materials shall be the property of the Contractor / Developer and the District jointly as their interests may appear, and shall not be removed from the project or the District by the Contractor / Developer without the District's consent.

9.19 GUARANTEE - WARRANTY: The Contractor / Developer shall provide guarantees and warranty that the improvement project has been done in accordance with the signed and approved Construction Documents and that the Work, as installed, will fulfill the requirements of the guarantee-warranty. The Contractor / Developer shall agree to the following:

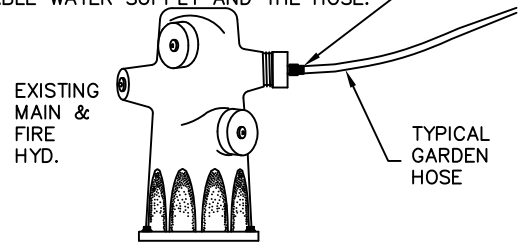
- A.** The minimum period of one (1) year after all village improvements are done, or as approved by the District, shall begin on the date of final acceptance by the District for Workmanship and Materials of the specified portion of the improvement project.
- B.** The District shall bear no additional expense of any and all repair / replacement of the Work that may prove to be defective in its workmanship and / or materials.
- C.** Normal ordinary wear and tear and all unusual abuse or neglect on the part of the District shall not be included.
- D.** The guarantee-warranty period shall restart from the date of acceptance of any and all repair / replacement work and shall apply only to the item and / or equipment so repaired / replaced, unless otherwise agreed in writing with the District.

BACKFLOW PREVENTION DEVICE. THE INSTALLED DEVICE MUST BE CERTIFIED AND INSPECTED BY THE DISTRICT PRIOR TO THE DRAWING OF ANY WATER FROM THE EXISTING SYSTEM. PROVIDE SUPPORTS AS NEEDED TO PREVENT DAMAGE TO THE FIRE HYDRANT ASSEMBLY AND BACKFLOW DEVICE.



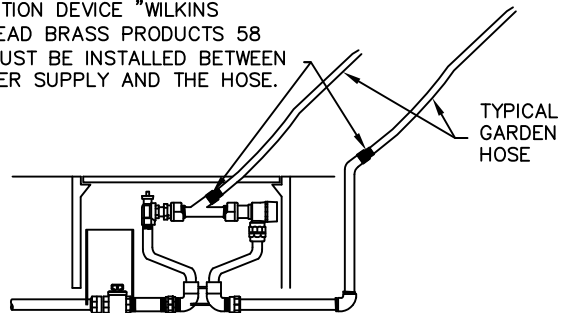
2" TEMPORARY FIRE HYDRANT FEED

BACKFLOW PREVENTION DEVICE "WILKINS BFP-8", "ARROWHEAD BRASS PRODUCTS 58 ABP" OR EQUAL MUST BE INSTALLED BETWEEN THE POTABLE WATER SUPPLY AND THE HOSE.



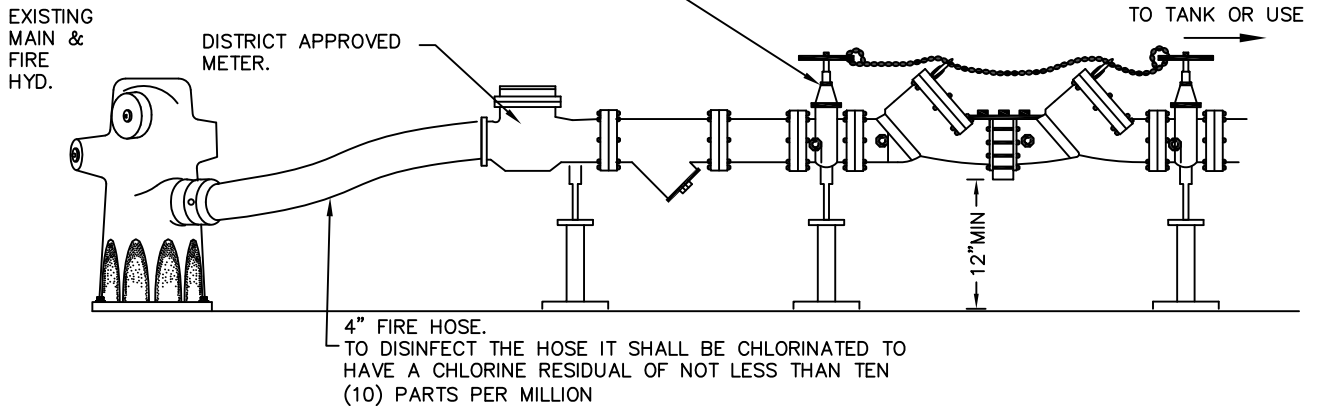
3/4" TEMPORARY FIRE HYDRANT FEED

BACKFLOW PREVENTION DEVICE "WILKINS BFP-8", "ARROWHEAD BRASS PRODUCTS 58 ABP" OR EQUAL MUST BE INSTALLED BETWEEN THE POTABLE WATER SUPPLY AND THE HOSE.



3/4" TEMPORARY AT METER SETTER OR CURB STOP

BACKFLOW PREVENTION DEVICE. THE INSTALLED DEVICE MUST BE CERTIFIED AND INSPECTED BY THE DISTRICT PRIOR TO THE DRAWING OF ANY WATER FROM THE EXISTING SYSTEM. PROVIDE SUPPORTS ON FIRM GRADE TO PREVENT DAMAGE TO THE BACKFLOW DEVICE.



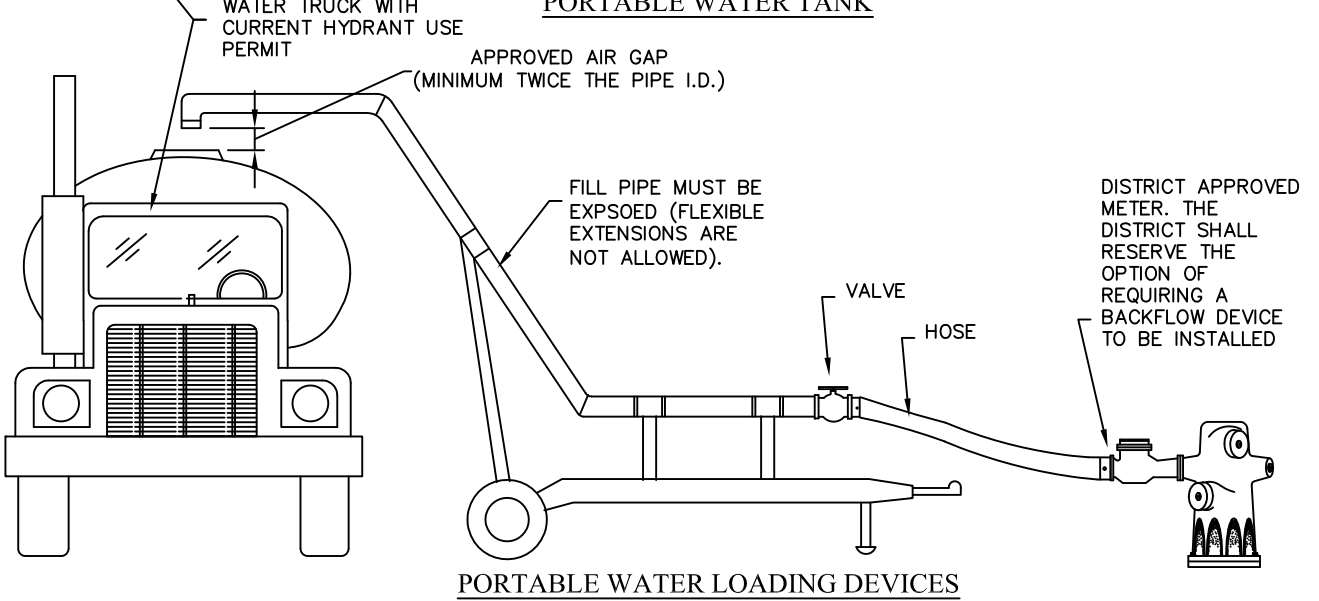
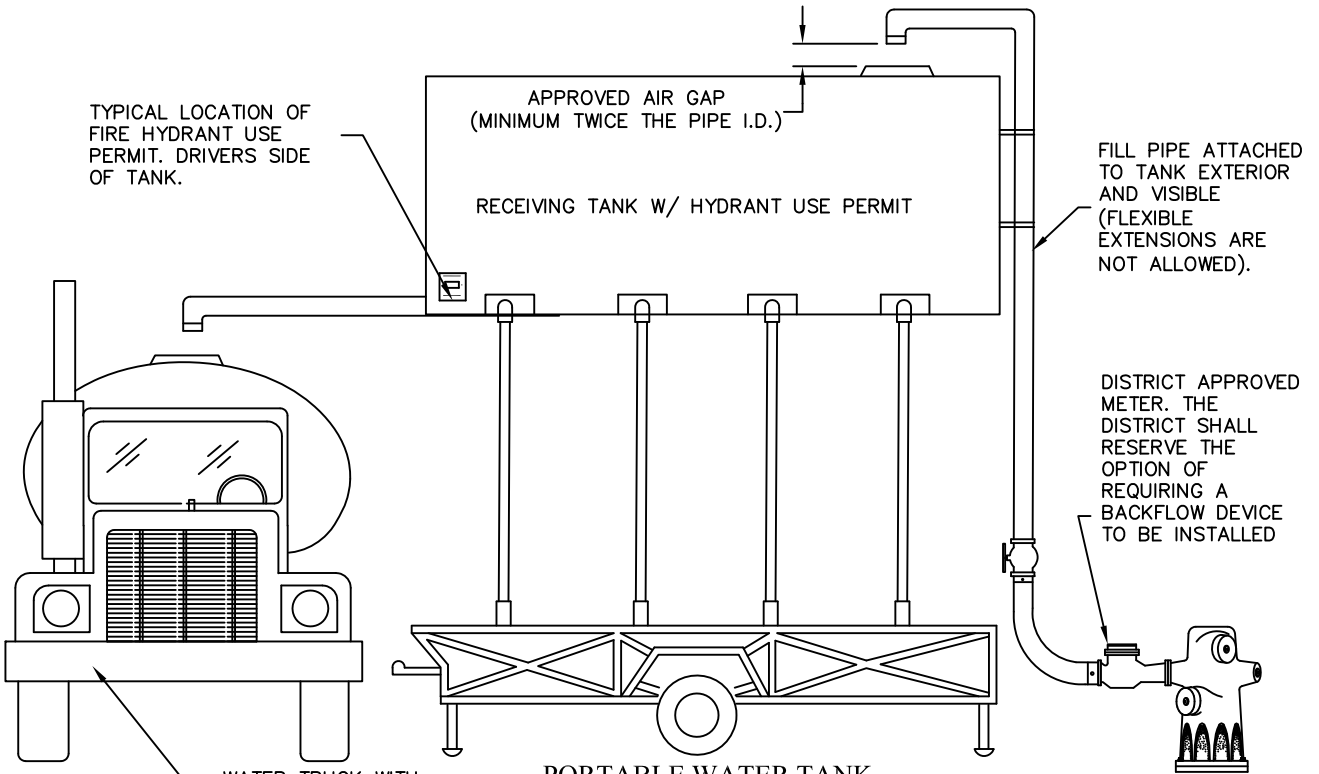
LARGE TEMPORARY FIRE HYDRANT FEED

NOTES:

1. OPUD IMPROVEMENT STANDARDS, SECTION 2.1.1; "NO WATER OF ANY AMOUNT IS TO BE OBTAINED FROM THE DISTRICT'S WATER FACILITIES / SYSTEM WITHOUT FIRST OBTAINING A WRITTEN ARRANGEMENT / AGREEMENT WITH THE DISTRICT. ALL ARRANGEMENTS FOR THE OBTAINING OF WATER FOR USE IN CONSTRUCTION, AND / OR DEVELOPMENT SHALL BE MADE BY THE CONTRACTOR / DEVELOPER AND SHALL BE SUBMITTED IN A WRITTEN REQUEST TO THE DISTRICT".
2. OPUD IMPROVEMENT STANDARDS, SECTION 2.1.4; "FIRE HYDRANTS SHALL ONLY BE OPENED AND CLOSED BY THE USE OF WRENCHES DESIGNED TO OPERATE SAID HYDRANTS. THE CONTRACTOR SHALL NOT LEAVE ANY HOSE AND / OR EQUIPMENT ATTACHED AND ALL CAPS SHALL BE REINSTALLED AFTER EACH AND EVERY TIME WATER HAS BEEN DRAWN FROM THE SYSTEM".
3. LOCATION OF TEMPORARY WATER SUPPLY SHALL BE SITE SPECIFIC.
4. NO HOSES SHALL BE LAID ACROSS STREETS OR TRAFFIC AREAS.

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			TEMPORARY CONNECTION TO WATER	
5-05	FORMERLY STD. DTL. NO. W-20	SCD	Garry E. Laughlin	
DATE	REVISIONS	BY	District Engineer	5-6-2005
			APPROVED	DATE

2-01

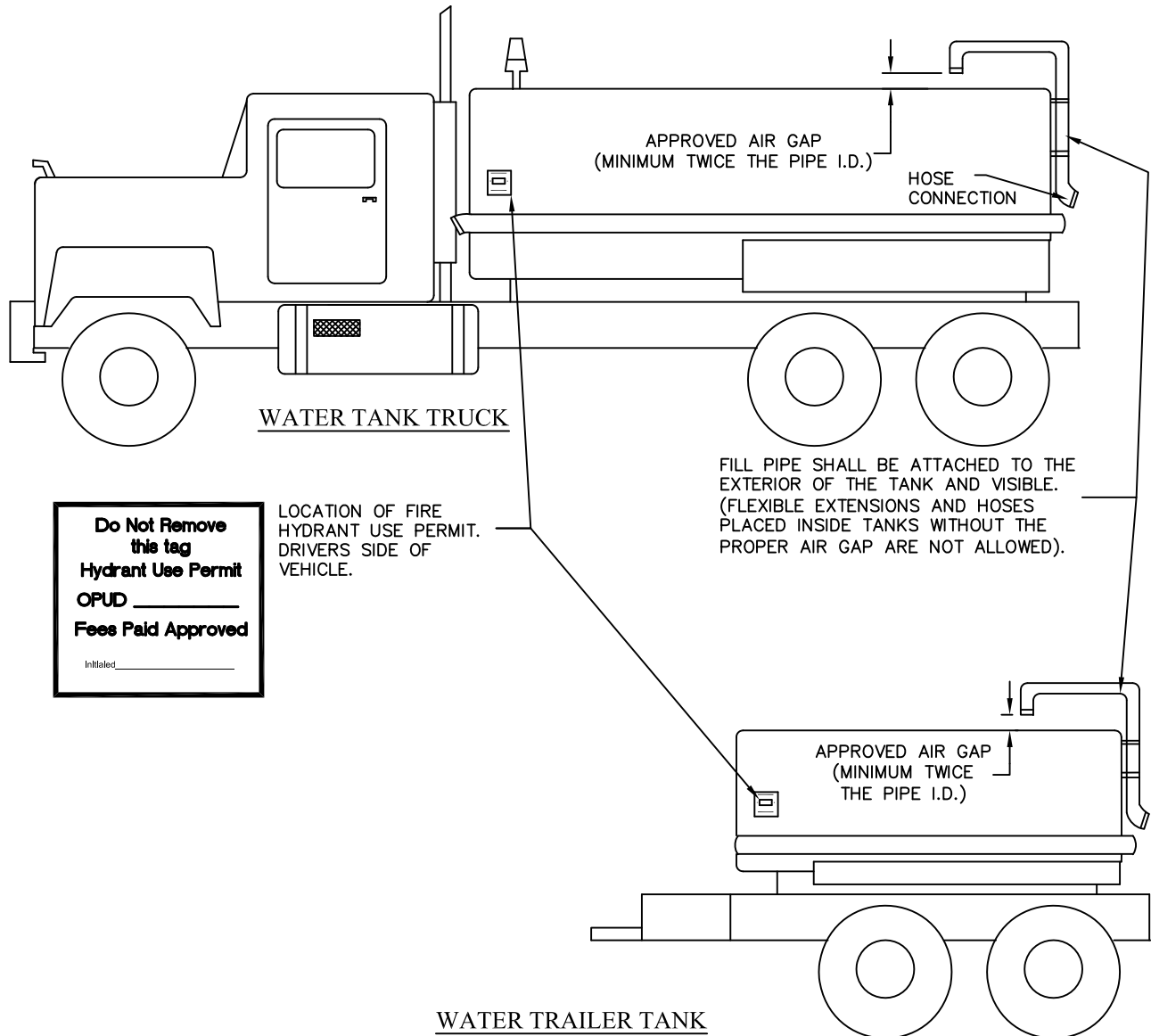


NOTES:

1. OPUD IMPROVEMENT STANDARDS, SECTION 2.1.1; "NO WATER OF ANY AMOUNT IS TO BE OBTAINED FROM THE DISTRICT'S WATER FACILITIES / SYSTEM WITHOUT FIRST OBTAINING A WRITTEN ARRANGEMENT / AGREEMENT WITH THE DISTRICT. ALL ARRANGEMENTS FOR THE OBTAINING OF WATER FOR USE IN CONSTRUCTION, AND / OR DEVELOPMENT SHALL BE MADE BY THE CONTRACTOR / DEVELOPER AND SHALL BE SUBMITTED IN A WRITTEN REQUEST TO THE DISTRICT".
2. PORTABLE WATER TRUCK FILL STATIONS SHALL BE INSPECTED ANNUALLY BY THE DISTRICT PRIOR TO THEIR USE.
3. ALTERNATIVE WATER TRUCK FILL STATIONS SHALL BE SUBMITTED TO THE DISTRICT PRIOR TO USE.
4. ONLY WATER TRUCKS WITH CURRENT PERMIT STICKER SHALL BE ALLOWED TO FILL AT PORTABLE WATER TRUCK STATIONS.
5. LOCATION OF PORTABLE WATER TRUCK FILL STATIONS SHALL BE SITE SPECIFIC.
6. NO HOSES SHALL BE LAID ACROSS STREETS OR TRAFFIC AREAS.

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			WATER EQUIPMENT LOADING DEVICES	
5-05	NEW DETAIL	SCD	Garry E. Laughlin	
DATE	REVISIONS	BY	District Engineer	5-6-2005
			APPROVED	DATE

2-02



Do Not Remove this tag
Hydrant Use Permit
 OPUD _____
Fees Paid Approved
 Initialed _____

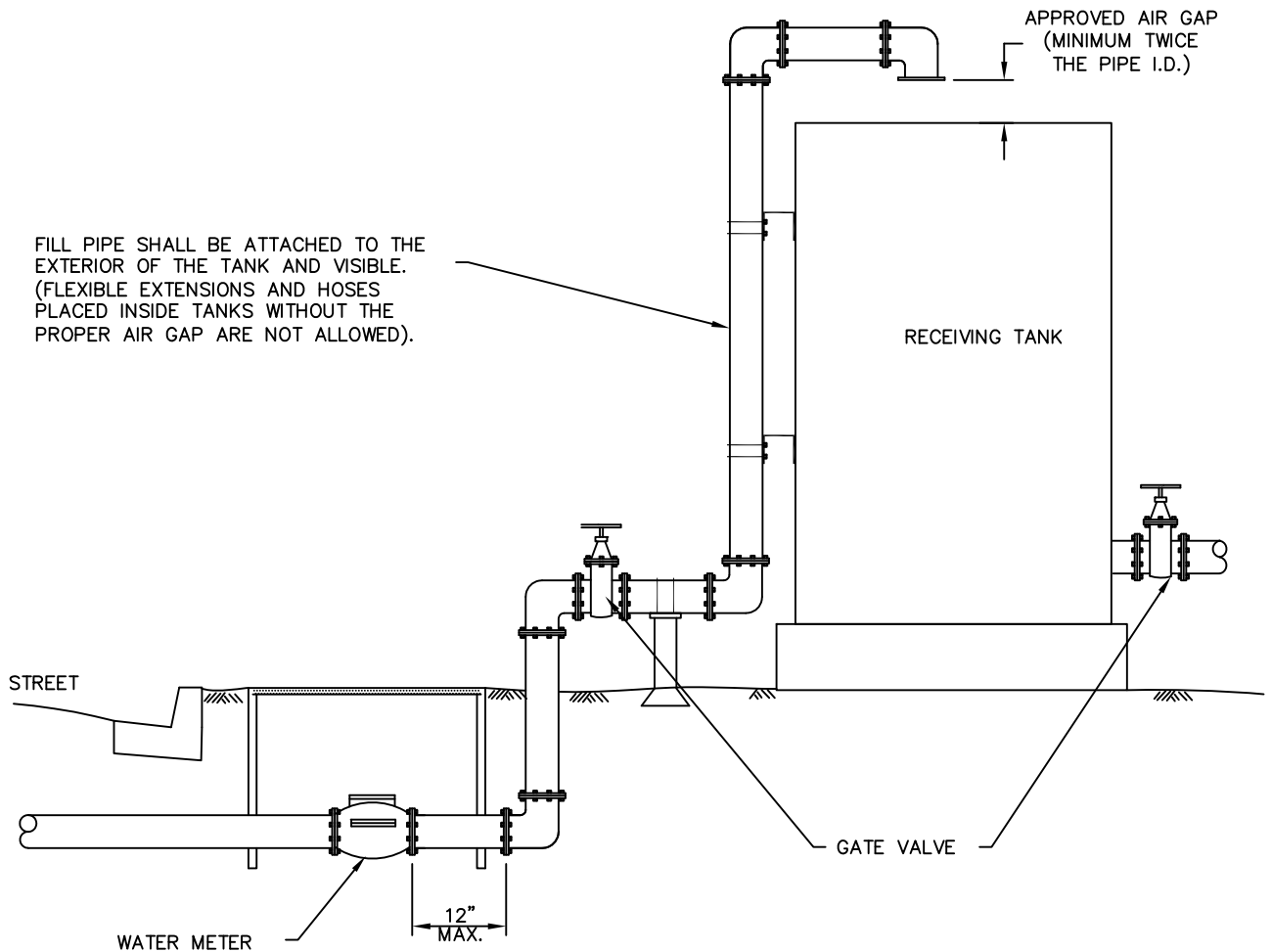
LOCATION OF FIRE HYDRANT USE PERMIT. DRIVERS SIDE OF VEHICLE.

FILL PIPE SHALL BE ATTACHED TO THE EXTERIOR OF THE TANK AND VISIBLE. (FLEXIBLE EXTENSIONS AND HOSES PLACED INSIDE TANKS WITHOUT THE PROPER AIR GAP ARE NOT ALLOWED).

NOTES:

1. OPUD IMPROVEMENT STANDARDS, SECTION 2.1.1; "NO WATER OF ANY AMOUNT IS TO BE OBTAINED FROM THE DISTRICT'S WATER FACILITIES / SYSTEM WITHOUT FIRST OBTAINING A WRITTEN ARRANGEMENT / AGREEMENT WITH THE DISTRICT. ALL ARRANGEMENTS FOR THE OBTAINING OF WATER FOR USE IN CONSTRUCTION, AND / OR DEVELOPMENT SHALL BE MADE BY THE CONTRACTOR / DEVELOPER AND SHALL BE SUBMITTED IN A WRITTEN REQUEST TO THE DISTRICT". A COPY OF THE AGREEMENT SHALL BE AVAILABLE FOR REVIEW BY ANY DISTRICT REPRESENTATIVE AT ALL TIMES.
2. "AIR GAP SEPARATION" MEANS A PHYSICAL SEPARATION BETWEEN THE DISCHARGE END OF A POTABLE WATER SUPPLY PIPELINE AND AN OPEN OR NON-PRESSURE RECEIVING TANK.
3. AN "APPROVED AIR GAP SEPARATION" SHALL BE AT LEAST TWICE THE DIAMETER OF THE SUPPLY PIPE MEASURED VERTICALLY ABOVE THE OVERFLOW RIM OF THE ALL RECEIVING TANK. IN NO CASE SHALL THE AIR GAP BE LESS THAN TWO (2) INCHES. THIS INCLUDES BUT IS NOT LIMITED TO ALL WATER TRUCKS, TRAILERS, STREET SWEEPERS, AND ALL TEMPORARY STORAGE TANKS NO MATTER HOW SMALL THE TANK MAY BE.
4. HYDRANT USE PERMITS SHALL BE VALID FOR A PERIOD OF ONE (1) YEAR FROM THE DATE OF ISSUE.
5. ANY PERMITS ISSUED BY THE DISTRICT CAN BE TERMINATED BY THE DISTRICT AT ANY TIME.
6. ANY MODIFICATION TO THE RECEIVING TANK, PERMANENTLY INSTALLED SUPPLY PIPING, AIR GAP (SUCH A CLAMPING A HOSE FROM THE SUPPLY INTO THE TANK) OR LOADING CONNECTION SHALL VOID THE PERMIT AND SHALL REQUIRE A RE-INSPECTION AT AN ADDITIONAL COST.

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			HYDRANT USE PERMIT	
5-05	NEW DETAIL	SCD	Garry E. Laughlin	
DATE	REVISIONS	BY	District Engineer	5-6-2005
			APPROVED	DATE
				2-03



NOTES:

1. OPUD IMPROVEMENT STANDARDS, SECTION 2.1.1; "NO WATER OF ANY AMOUNT IS TO BE OBTAINED FROM THE DISTRICT'S WATER FACILITIES / SYSTEM WITHOUT FIRST OBTAINING A WRITTEN ARRANGEMENT / AGREEMENT WITH THE DISTRICT. ALL ARRANGEMENTS FOR THE OBTAINING OF WATER FOR USE IN CONSTRUCTION, AND / OR DEVELOPMENT SHALL BE MADE BY THE CONTRACTOR / DEVELOPER AND SHALL BE SUBMITTED IN A WRITTEN REQUEST TO THE DISTRICT". A COPY OF THE AGREEMENT SHALL BE AVAILABLE FOR REVIEW BY ANY DISTRICT REPRESENTATIVE AT ALL TIMES.
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4. NO OUTLET, TAP, TEE, OR CONNECTION BETWEEN THE WATER MAIN AND AIR GAP SEPARATION IS ALLOWED.
5. ANY PERMITS ISSUED BY THE DISTRICT CAN BE TERMINATED BY THE DISTRICT AT ANY TIME.
6. ANY MODIFICATION TO THE RECEIVING TANK, PERMANENTLY INSTALLED SUPPLY PIPING, AIR GAP (SUCH A CLAMPING A HOSE FROM THE SUPPLY INTO THE TANK) OR LOADING CONNECTION SHALL VOID THE PERMIT AND SHALL REQUIRE A RE-INSPECTION AT AN ADDITIONAL COST.

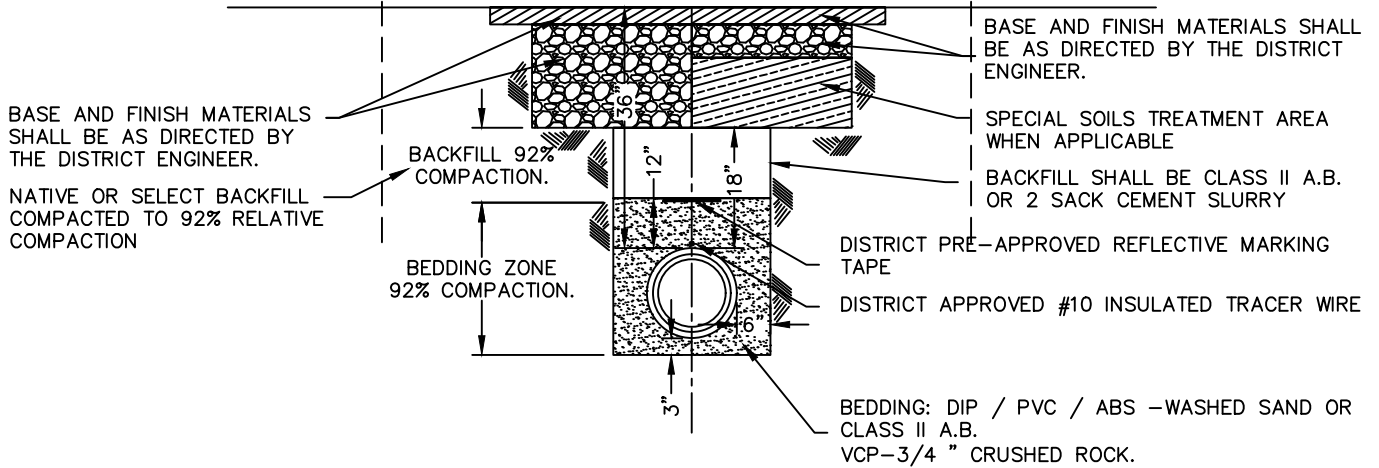
.	.	.	OLIVEHURST PUBLIC UTILITY DISTRICT
.	.	.	
.	.	.	Garry E. Laughlin District Engineer <small>APPROVED</small>
5-05	NEW DETAIL	SCD	
DATE	REVISIONS	BY	DATE

2-04

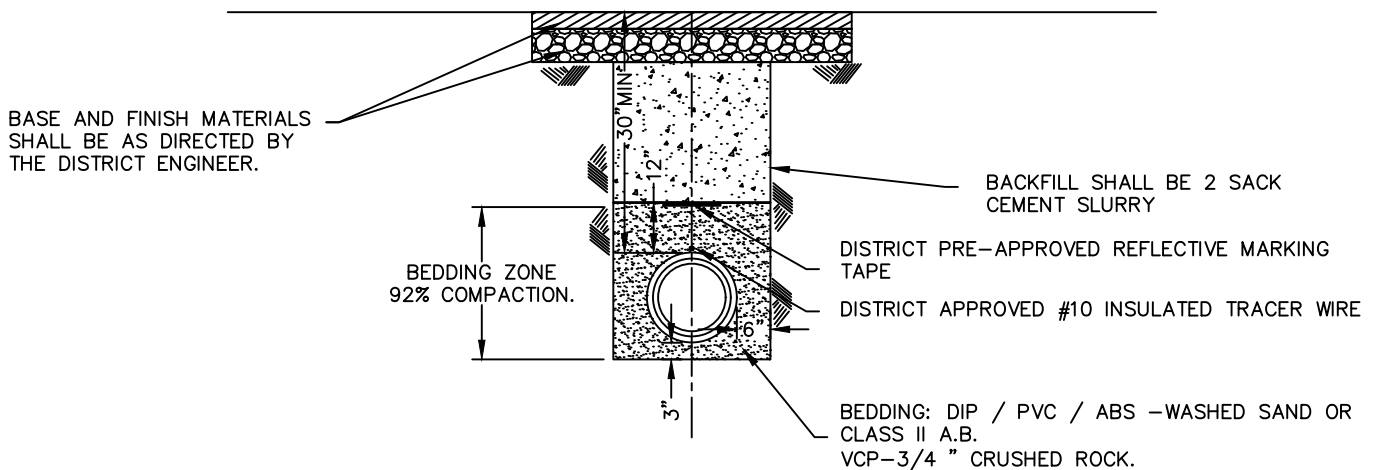
TRENCH WALL AND / OR BACKFILL MATERIALS HAS A MOISTURE LESS THAN 5% OVER OPTIMUM

TRENCH REQUIREMENTS WITHIN UNIMPROVED AREAS (WITHIN OPUD EASEMENT)

TRENCH WALL AND / OR BACKFILL MATERIALS HAS A MOISTURE GREATER THAN 5% OVER OPTIMUM



TRENCH REQUIREMENTS WITHIN UNIMPROVED AREAS WITH LESS THAN THIRTY-SIX (36) INCHES (WITHIN OPUD EASEMENT)

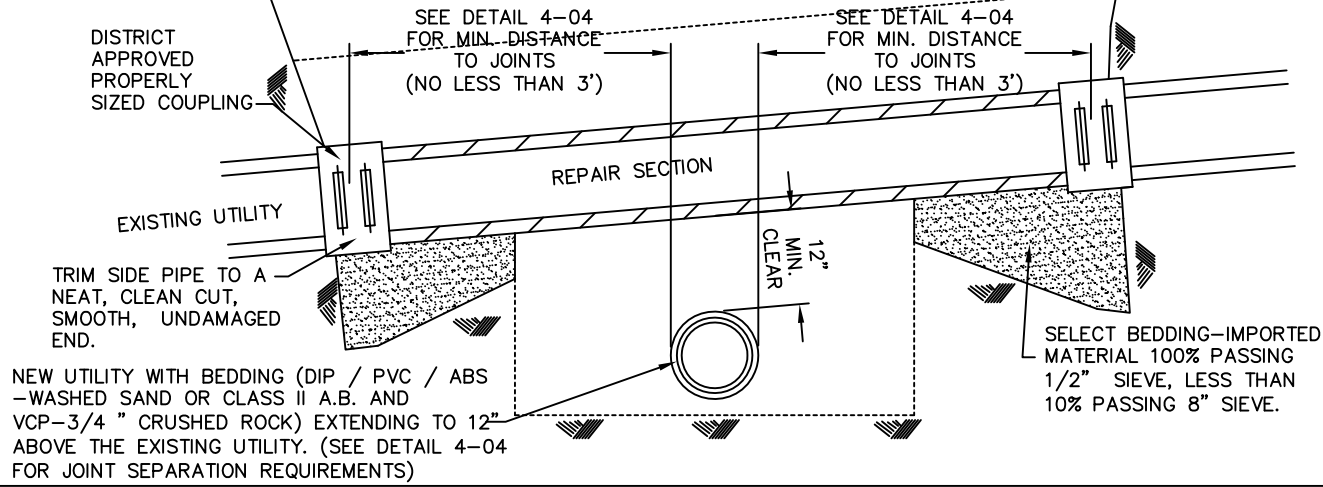


NOTES:

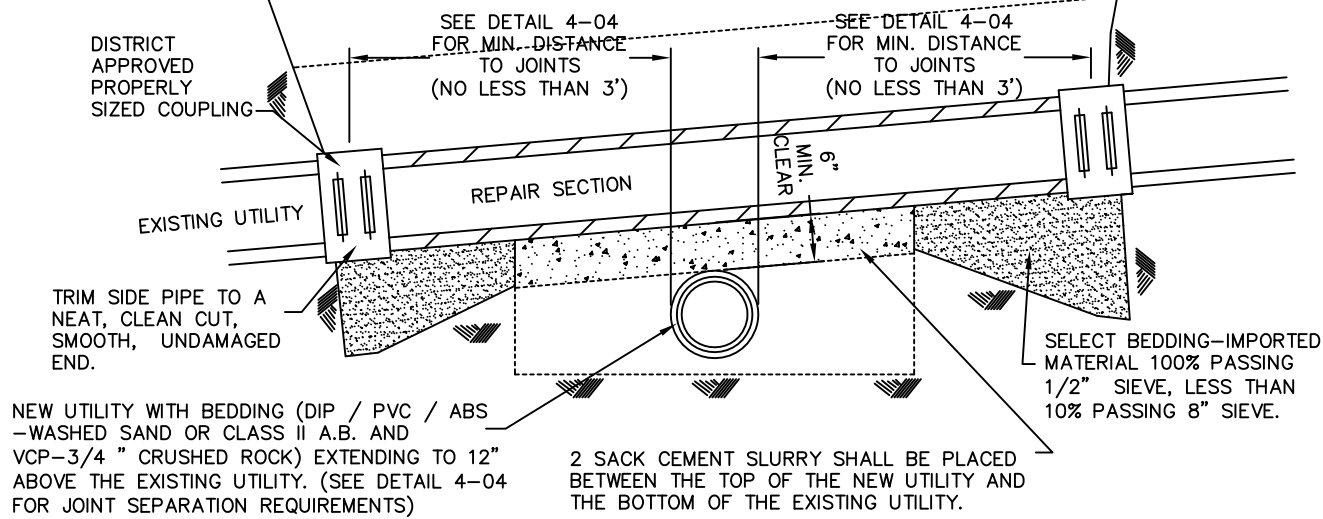
1. ALL CONSTRUCTION PERMITS SHALL BE REQUIRED PRIOR TO CONSTRUCTION.
2. ALL TRENCH WORK DEPTHS FIVE (5) FEET OR GREATER SHALL BE PROVIDED WITH STATE AND FEDERAL APPROVED SAFETY SHORING.
3. ALL BACKFILL MATERIALS SHALL BE APPROVED BY THE DISTRICT PRIOR TO PLACEMENT.
4. COMPACTION TESTING SHALL BE AS DIRECTED BY THE DISTRICT ENGINEER AND SHALL BE PERFORMED BY A DISTRICT APPROVED GEOTECH ENGINEER.
5. CERTIFICATION OF TRENCH BACKFILL COMPACTION SHALL BE REQUIRED PRIOR TO ANY DISTRICT ACCEPTANCE.
6. MINIMUM COVER OVER UTILITIES SHALL BE EIGHTEEN (18) INCHES BELOW FINISH SUBGRADE OR BOTTOM OF SPECIAL SOILS TREATMENT SECTION AND THIRTY-SIX (36) INCHES BELOW FINISH GRADE, REFER TO THE CURRENT DISTRICT IMPROVEMENT STANDARDS.
7. ALL UTILITY PIPING OR CONDUIT INSTALLATION SHALL BE PER THE CURRENT DISTRICT IMPROVEMENT STANDARDS.
8. ALL UTILITY PIPING OR CONDUIT PLACED WITHIN THE TRENCH SHALL HAVE A DISTRICT APPROVED MARKING TAPE (PER THE CURRENT DISTRICT IMPROVEMENT STANDARDS) LOCATED DIRECTLY OVER EACH UTILITY ON TOP OF THE BEDDING MATERIAL (TWELVE (12) INCHES ± ABOVE THE UTILITY).
9. PRESSURIZED LINES SHALL BE PROVIDED WITH A TRACER WIRE PER THE CURRENT DISTRICT IMPROVEMENT STANDARDS.

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			TRENCH DETAIL UNIMPROVED AREA	
5-05	FORMERLY STD. DTL. NO. S-1	SCD	Garry E. Laughlin District Engineer	
DATE	REVISIONS	BY	APPROVED	DATE
				5-6-2005
			4-02	

**TRENCH CROSSING OF EXISTING UTILITY
(CLEARANCE GREATER THAN 12")**



**TRENCH CROSSING OF EXISTING UTILITY
(CLEARANCE 12" TO 6")**

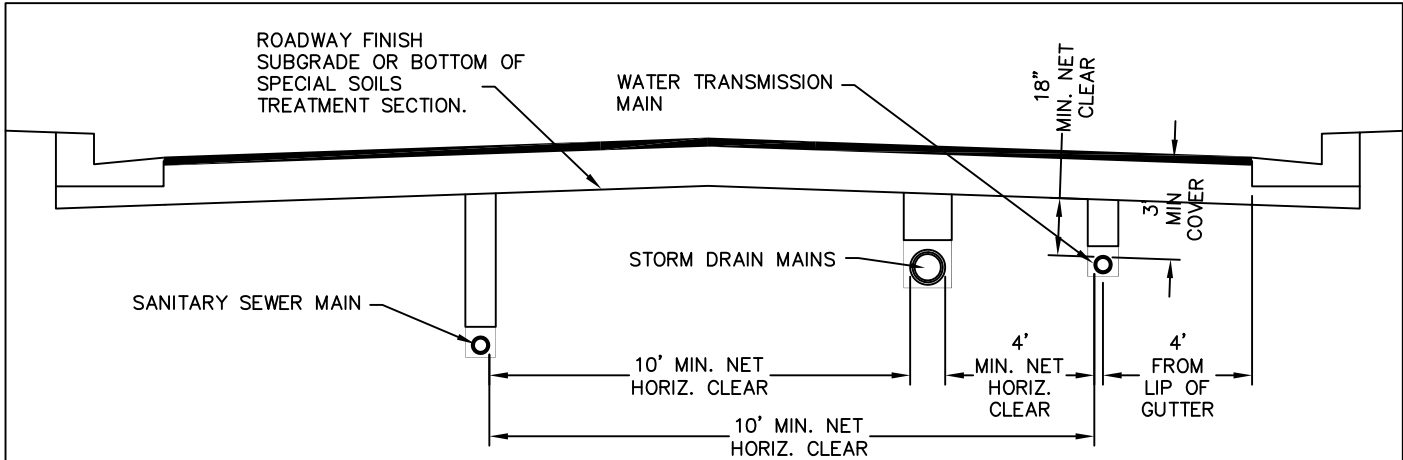


NOTES:

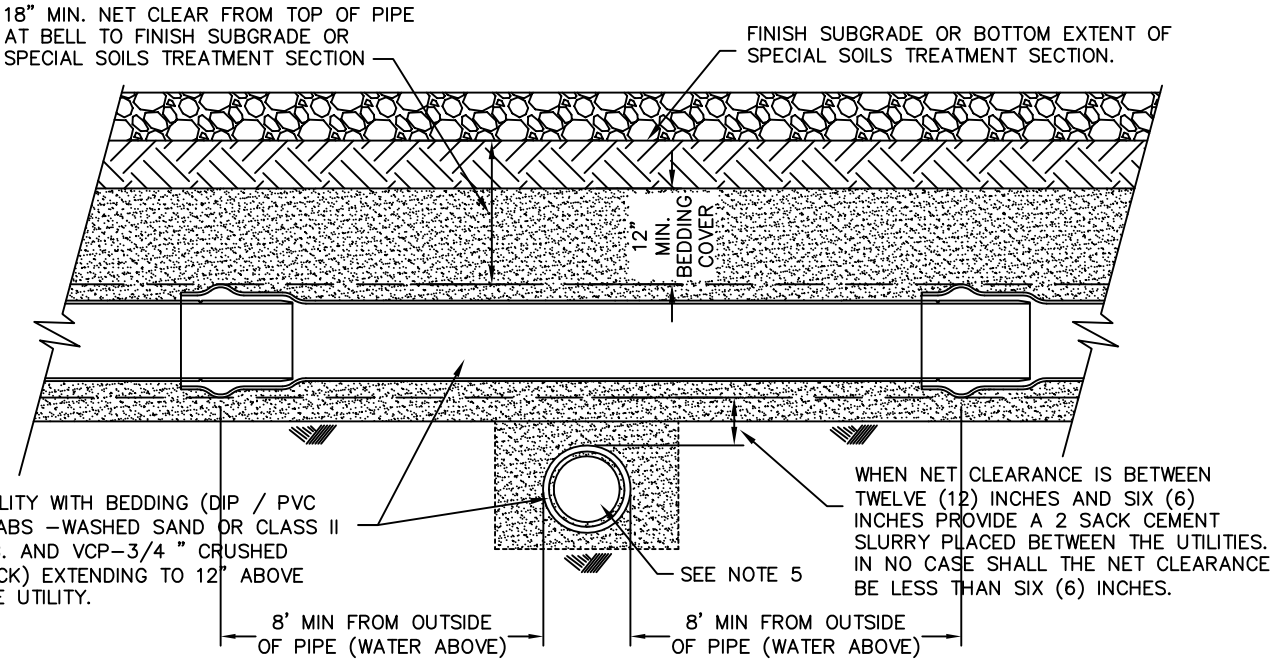
1. ALL REPAIRING AND CUTTING OF ANY EXISTING DISTRICT UTILITY PIPE OR CONDUIT SHALL BE PERMITTED ONLY IN THE PRESENCE OF A DISTRICT REPRESENTATIVE.
2. THE EXISTING PIPE / CONDUIT SHALL BE NEATLY TRIMMED TO A CLEAN CUT, SMOOTH, AND UNDAMAGED END.
3. INSIDE DIAMETER OF NEW PIPE OR CONDUIT SHALL BE THE SAME AS THE EXISTING BEING REPAIRED.
4. THE REPAIR MATERIAL AND CONNECTOR COUPLERS SHALL BE APPROVED BY THE DISTRICT PRIOR TO PLACEMENT AND SHALL BE OF A TYPE DESIGNED FOR THE APPLICATION.
5. ALTERATIONS TO THE EXISTING SLOPE GRADE SHALL ONLY BE PERMITTED AFTER APPROVAL HAS BEEN RECEIVED FROM THE DISTRICT ENGINEER.
6. THE PLACEMENT OF DISTRICT APPROVED SELECT BEDDING MATERIALS SHALL BE REQUIRED UNDER THE EXISTING UTILITY A MINIMUM OF EIGHTEEN (18) INCHES EACH SIDE OF THE NEW CROSSING AND SHALL EXTEND TO A MINIMUM OF TWELVE (12) INCHES EACH SIDE OF THE EXISTING UTILITY.

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			CROSSING UNDER EXISTING UTILITY	
8-06	CLARIFICATION OF JOINT SEPARATION	ADC	Garry E. Laughlin District Engineer	5-6-2005
5-05	FORMERLY STD. DTL. NO. S-8	SCD		
DATE	REVISIONS	BY		

4-03



TYPICAL HORIZONTAL CLEARANCE



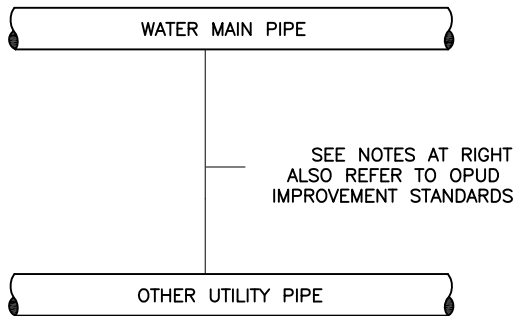
TYPICAL VERTICAL CLEARANCE

NOTES:

1. MINIMUM COVER OVER ANY DISTRICT UTILITIES SHALL BE EIGHTEEN (18) INCHES BELOW FINISH SUBGRADE OR BOTTOM OF SPECIAL SOILS TREATMENT SECTION AND THIRTY-SIX (36) INCHES BELOW FINISH GRADE, REFER TO THE CURRENT DISTRICT IMPROVEMENT STANDARDS.
2. TEN (10) FEET SHALL BE THE MINIMUM HORIZONTAL SEPARATION BETWEEN WATER TRANSMISSION MAINS AND SANITARY SEWER MAINS OR RAW WATER MAINS.
3. WATER MAINS SHALL BE A MINIMUM OF FOUR (4) FEET FROM THE LIP OF THE GUTTER.
4. WATER MAINS SHALL MAINTAIN A MINIMUM OF ONE (1) FOOT NET VERTICAL CLEARANCE OVER SANITARY SEWER & STORM DRAIN MAINS AND A MINIMUM OF THREE (3) FEET NET VERTICAL CLEARANCE OVER SANITARY SEWER FORCE MAIN LINES.
5. A NEW WATER MAIN INSTALLED BELOW A SANITARY SEWER OR STORM DRAIN MAIN SHALL NOT HAVE JOINTS 10' EITHER SIDE OF SEWER OR STORM MAIN (AS MEASURED FROM OUTSIDE OF PIPE) AND SHALL BE CONSTRUCTED OF DUCTILE IRON PIPE WITH HOT DIP BITUMINOUS COATING OR CL 200 PRESSURE RATED PVC PIPE. (REFER TO DEPT. OF HEALTH SERVICES 10/16/03 MEMO RE: SEPARATION OF WATER MAINS AND NON-POTABLE PIPELINES)
6. SANITARY SEWER AND WATER MAINS SHALL NOT BE LOCATED WITHIN THE TYPICAL VEHICULAR WHEEL TRACK AREA OF THE STREET OR ROAD.
7. ALL DISTRICT UTILITIES SHALL MAINTAIN A MINIMUM OF ONE (1) FOOT NET VERTICAL CLEARANCE BETWEEN ALL UTILITIES OF ANY KIND (EXCEPT AS OTHERWISE NOTED IN THESE STANDARDS).
8. THE CA DEPARTMENT OF HEALTH SERVICES APPROVAL IS REQUIRED FOR ANY VARIANCE FROM THIS DRAWING.

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			TYPICAL UTILITY CLEARANCE	
8-06	ADDITION TO NOTE 4 / JOINT SEPARATION	ADC	Garry E. Laughlin District Engineer APPROVED _____ DATE 5-6-2005	
5-05	NEW DETAIL	SCD		
DATE	REVISIONS	BY		

4-04

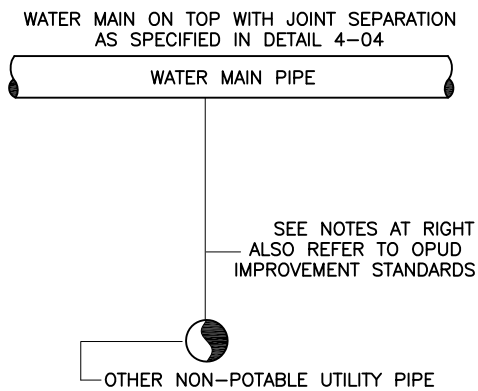


PLAN VIEW

WATER MAIN TO OTHER PIPING TYPE	MINIMUM NET HORIZONTAL SEPARATION (FEET) ⊙ OUTSIDE OF BELL
1. WATER LINE	4
2. GRAVITY SANITARY SEWER	10
3. GRAVITY SANITARY SEWER (SPECIAL CASE, DUCTILE IRON & SLURRY)	4
4. SEWAGE FORCE MAIN	10
5. GRAVITY STORM SEWER	4
6. RECLAIMED WATER	10
7. ELECTRIC	4
SEWER MAIN TO OTHER PIPING TYPE	
1. WATER LINE	10
2. WATER LINE (SPECIAL CASE, DUCTILE IRON & SLURRY)	4
3. GRAVITY SANITARY SEWER	4
4. SEWAGE FORCE MAIN	10
5. GRAVITY STORM SEWER	10
6. RECLAIMED WATER	10
7. ELECTRIC	4

MINIMUM HORIZONTAL SEPARATION REQUIREMENTS

NOTE: THE PLANTING OF TREES WITHIN 24 INCHES (HORIZONTAL CLEARANCE) OF THE MAIN SHALL BE PROHIBITED.



SECTION VIEW

WATER MAIN TO OTHER PIPING TYPE	MINIMUM NET VERTICAL SEPARATION (INCHES) ⊙ OUTSIDE OF BELL
1. WATER LINE	12
2. GRAVITY SANITARY SEWER	12
3. SEWAGE FORCE MAIN	12
4. GRAVITY STORM SEWER	12
5. RECLAIMED WATER	12
6. ELECTRIC	12
SEWER MAIN TO OTHER PIPING TYPE	
1. WATER LINE	12
2. GRAVITY SANITARY SEWER	12
3. SEWAGE FORCE MAIN	12
4. GRAVITY STORM SEWER	12
5. RECLAIMED WATER	12
6. ELECTRIC	12

MINIMUM VERTICAL SEPARATION REQUIREMENTS

NOTE: IF THE WATER MAIN IS BELOW THE SEWER PIPE, THEN A MINIMUM OF 12" VERTICAL SEPARATION AND SLURRY IS REQUIRED (SEE DETAIL 4-04, NOTE 5 FOR JOINT SEPARATION AND SPECIAL PIPE TYPE).

.	.	.	OLIVEHURST PUBLIC UTILITY DISTRICT	
.	.	.		MINIMUM SEPARATION
.	.	.		
8-06	SECTION VIEW NOTES CLARIFICATION	ADC	Garry E. Laughlin District Engineer APPROVED _____	
5-05	NEW DETAIL	SCD		5-6-2005 DATE _____
DATE	REVISIONS	BY		

4-05

**OPUD ALT. TRENCH RESTORATION
 SPECIFICATION OR ELIMINATION OF SPECIFIED
 CLASS II BASE AT MOISTURE CONDITIONS
 GREATER THAN 5% OVER OPTIMUM**

1. PROVIDE FULL TIME GEOTEC ENGINEER ACCEPTABLE TO YUBA COUNTY AND OPUD WITH EACH PIPE INSTALLATION CREW.
2. GEOTEC TO PROVIDE REPORTS AND TEST RESULTS WEEKLY TO COUNTY AND OPUD
3. NO FREE WATER IN TRENCH ZONE
4. GEOTEC FABRIC BETWEEN CRUSHED ROCK AND BACKFILL
5. BACK FILL LIFTS
 18" FIRST LIFT
 12" REMAINING LIFTS
6. MINIMUM TESTING OF ALL LIFTS PER YUBA COUNTY REQUIREMENTS, WITH A MINIMUM COMPACTION @ 92%

REFERENCE:
 OPUD DETAIL 4-01
 OPUD DETAIL 4-02
 YUBA COUNTY DETAIL 300

.	.	.	OLIVEHURST PUBLIC UTILITY DISTRICT	
.	.	.	TRENCH RESTORATION	
.	.	.	Garry E. Laughlin District Engineer	
.	.	.		
DATE	REVISIONS	BY	APPROVED _____ <small>DATE</small>	4-06

GENERAL SEWER LINE DESIGN:

VITRIFIED CLAY PIPE (VEL. 2-5 FPS)

PIPE DIAM. (inches)	MIN. SLOPE (ft. per ft.)	VELOCITY (2-5 fps)	FLOW-MGD (flowing full)
6	0.005	2.02	0.256
8	0.0032	2.05	0.461
10	0.0025	1.99	0.701
12	0.002	2.03	1.03
15	0.0015	2.00	1.60
18	0.0012	2.00	2.35
24	0.0011	2.00	4.95

MANNING'S FORMULA

$$v = \frac{1.486}{n} r^{2/3} s^{1/2}$$

$$Q = Av$$

WHERE,

n = 0.013 for all pipes

HAZEN WILLIAMS' FORMULA

$$Q_{cfs} = (432) s^{0.54} C d^{2.63}$$

WHERE,

C = 110 for clay pipe

C = 130 for plastic pipe

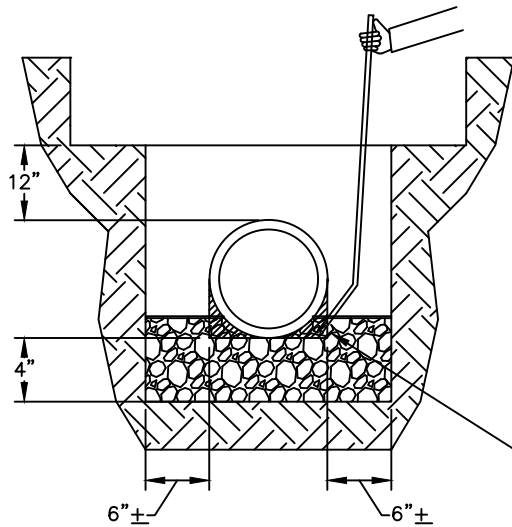
d is measured in feet

GENERAL SEWER LINE REQUIREMENTS:

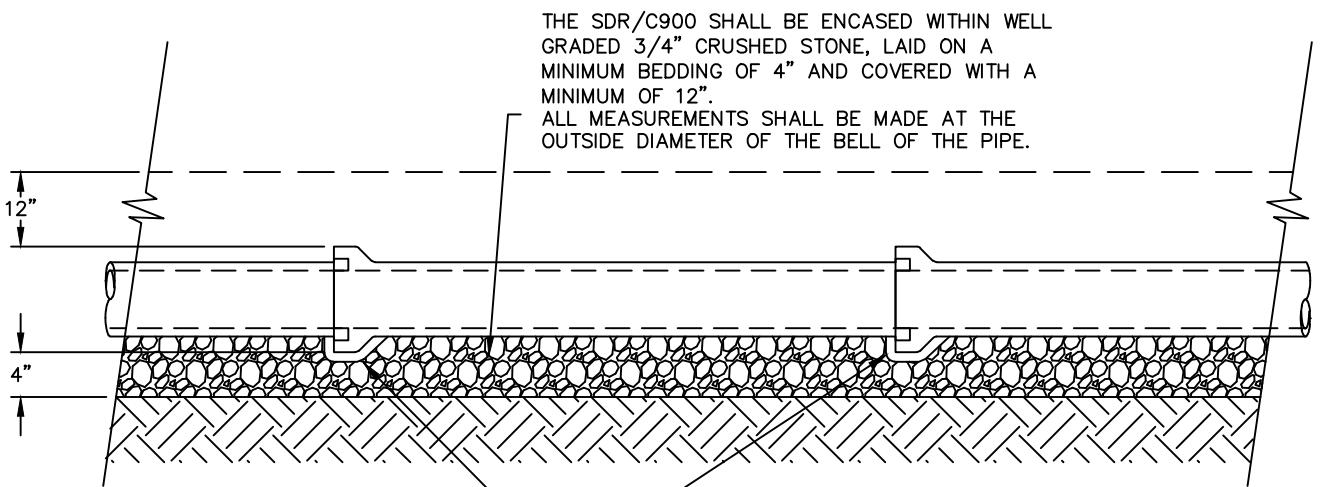
- 1 ALL SEWER SYSTEM DESIGN, MATERIALS, INSTALLATION, AND TESTING SHALL BE PER THE CURRENT OPUD IMPROVEMENT STANDARDS.

THE MINIMUM COVER SHALL BE FIVE (5) FEET, (AN EXCEPTION OF THREE (3) FEET MAY BE GRANTED BY THE DISTRICT ENGINEER ON A CASE BY CASE BASIS ONLY). MINIMUM NET VERTICAL CLEARANCE BETWEEN SUB-GRADE / BOTTOM OF SPECIAL TREATED SOIL SECTION SHALL BE THREE (3) FEET, (AN EXCEPTION OF EIGHTEEN (18) INCHES MAY BE GRANTED BY THE DISTRICT ENGINEER ON A CASE BY CASE BASIS ONLY). THE MINIMUM CLEARANCE SHALL BE TWELVE (12) INCHES BETWEEN UTILITIES. COVER / CLEARANCE SHALL BE AS MEASURED FROM THE MAXIMUM OUTSIDE DIAMETER AT THE BELL OF THE PIPE.
- 2 MATERIALS:
1. SEWER MAIN LINE SHALL BE SDR/C900
2. SEWER SERVICE LATERALS SHALL BE SDR/C900
3. FLEXIBLE COUPLINGS SHALL BE FERNCO WITH SHEAR BANDS ONLY OR PROVEN EQUAL, INDIANA, SEAL OR APPROVED EQUAL. NO BUSHINGS ACCEPTABLE.
- 3 THE TRENCHING, BEDDING, LAYING, COVER, AND BACKFILL SHALL BE PER OPUD IMPROVEMENT STANDARDS, SECTION 4 AND SECTION 5.
- 4 SEWER LINE TEST: AIR TEST PER NATIONAL CLAY PIPE INSTITUTE (SEE LOW PRESSURE AIR TEST FOR SANITARY SEWERS PAMPHLET) TEST PROCEDURES AND REQUIREMENTS WITH MINIMUM TEST LENGTH OF 60 SECONDS. AIR TEST APPLICABLE TO BOTH SEWER LINES & MANHOLES.
- 5 MANHOLE TESTING: VACUUM TEST PROCEDURES AND REQUIREMENTS PER OPUD IMPROVEMENT STANDARDS WITH MINIMUM TEST LENGTH OF 60 SECONDS.
- 6 VIDEO INSPECTION: THE CONTRACTOR IN PRESENCE OF THE DISTRICT SHALL PERFORM CLOSE CIRCUIT VIDEO TAPE TO THE DISTRICT IMPROVEMENT STANDARDS. ANY DEFECTS FOUND OR SEWER LINES OUT OF GRADE BY 1/20 DIA., (BUT NOT EXCEEDING 1" FOR LARGER PIPE), WILL BE REPAIRED OR REMOVED AND REPLACED. ALL LINES TO BE HYDROFLUSHED PRIOR TO VIDEO RECORDING (FORMAT AS DIRECTED BY THE DISTRICT).
- 7 ALL SEWER LINES AND SEWER MANHOLES TO BE TESTED, HYDROFLUSHED AND THE DISTRICT APPROVED PRIOR TO PLACEMENT OF ROAD STRUCTURAL SECTIONS.

.	.	.	OLIVEHURST PUBLIC UTILITY DISTRICT		
.	.	.			GENERAL SEWER REQUIREMENTS
.	.	.	Garry E. Laughlin District Engineer		
5-05	FORMERLY STD. DTL. NO. SS-10, WS-01	SCD			5-6-2005
DATE	REVISIONS	BY	APPROVED	DATE	5-01



"THE BEDDING OR BACKFILL SHOULD BE SHOVEL SLICED UNDER THE HAUNCHES OF THE PIPE TO FILL THE VOIDS IN THIS AREA. SLICING SHOULD BE DONE WHEN THE BEDDING MATERIAL IS NO HIGHER THAN ABOUT ONE-FOURTH OF THE PIPE DIAMETER IF IT IS TO BE EFFECTIVE."
 ASTM C-12 "AFTER EACH PIPE HAS BEEN BROUGHT TO GRADE, ALIGNED, AND PLACED IN FINAL POSITION, DEPOSIT AND SHOVEL SLICE OR SPADE BEDDING MATERIAL UNDER THE PIPE HAUNCHES. WYES AND TEES SHALL BE BEDDED TO PREVENT SHEAR LOADING."



THE SDR/C900 SHALL BE ENCASED WITHIN WELL GRADED 3/4" CRUSHED STONE, LAID ON A MINIMUM BEDDING OF 4" AND COVERED WITH A MINIMUM OF 12".
 ALL MEASUREMENTS SHALL BE MADE AT THE OUTSIDE DIAMETER OF THE BELL OF THE PIPE.

PER THE NATIONAL CLAY PIPE INSTITUTE, CLAY PIPE INSTALLATION HANDBOOK, CHAPTER 4: "HOLES MUST BE DUG AT EACH BELL OR COUPLING SO THAT THE LOAD IS SUPPORTED BY THE PIPE BARREL, NOT THE PIPE BELL. THE BELL OR COUPLING MUST NOT SUPPORT ANY PORTION OF THE LOAD. THE HOLES SHOULD BE NO LARGER THAN NECESSARY TO MAKE SURE THAT THE PIPE BARREL IS RESTING FIRMLY AND EVENLY ON THE TRENCH BOTTOM OR BEDDING MATERIAL."
 ASTM C-12 "BELL HOLES SHALL BE EXCAVATED TO PREVENT POINT LOADING OF THE BELLS OR COUPLINGS OF LAID PIPE, AND TO ESTABLISH FULL-LENGTH SUPPORT OF THE PIPE BARREL."

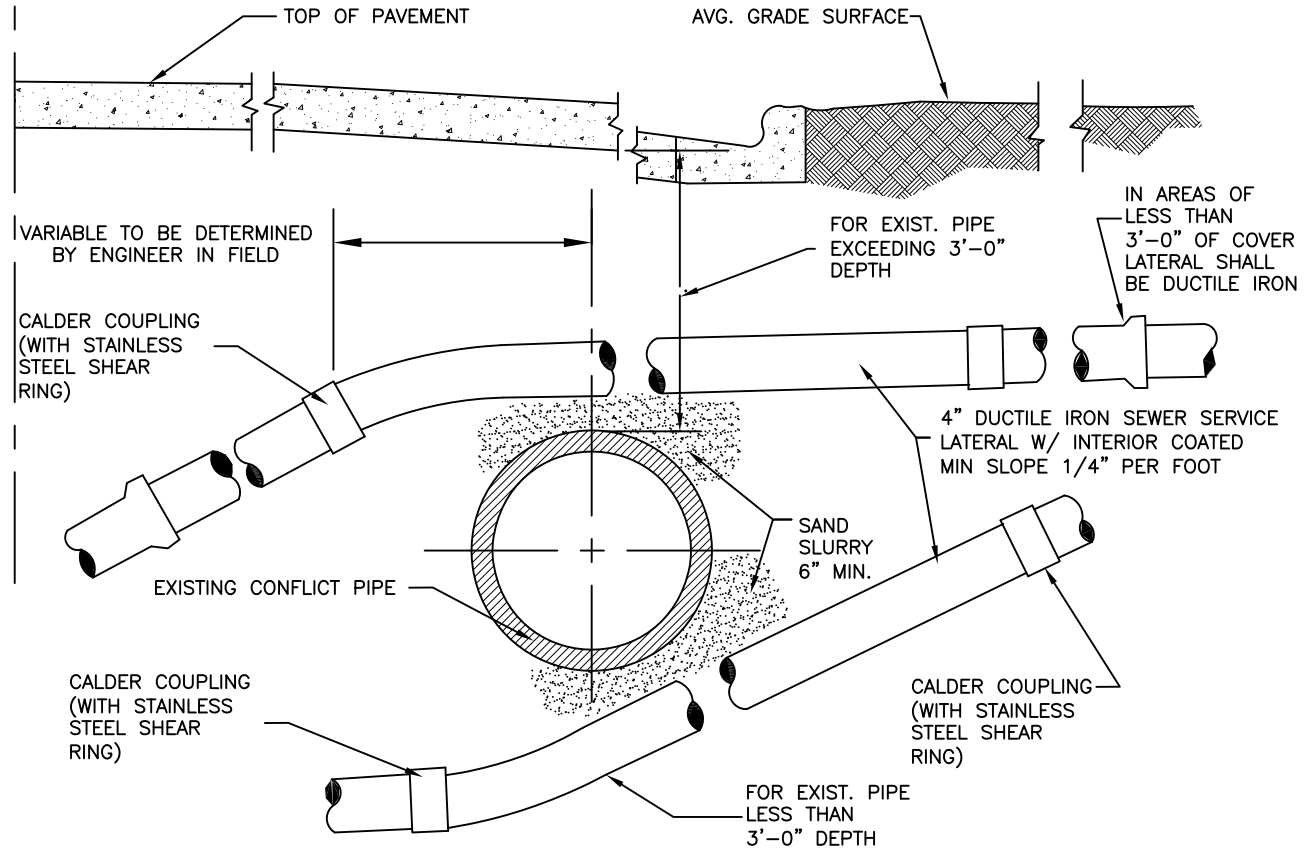
NOTES:

1. MAXIMUM SAG OR HIGH POINT FOR ANY SECTION OF PIPE SHALL BE NO MORE THAN 1/20 THE PIPES INSIDE DIAMETER TO A MAXIMUM OF ONE INCH IN LARGER PIPE, AS SPECIFIED IN THE OPUD IMPROVEMENT STANDARDS.

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			TYPICAL PIPE BEDDING	
			Garry E. Laughlin	
			District Engineer	
5-05	NEW DETAIL	SCD	5-6-2005	
DATE	REVISIONS	BY	APPROVED	DATE

5-02

STREET

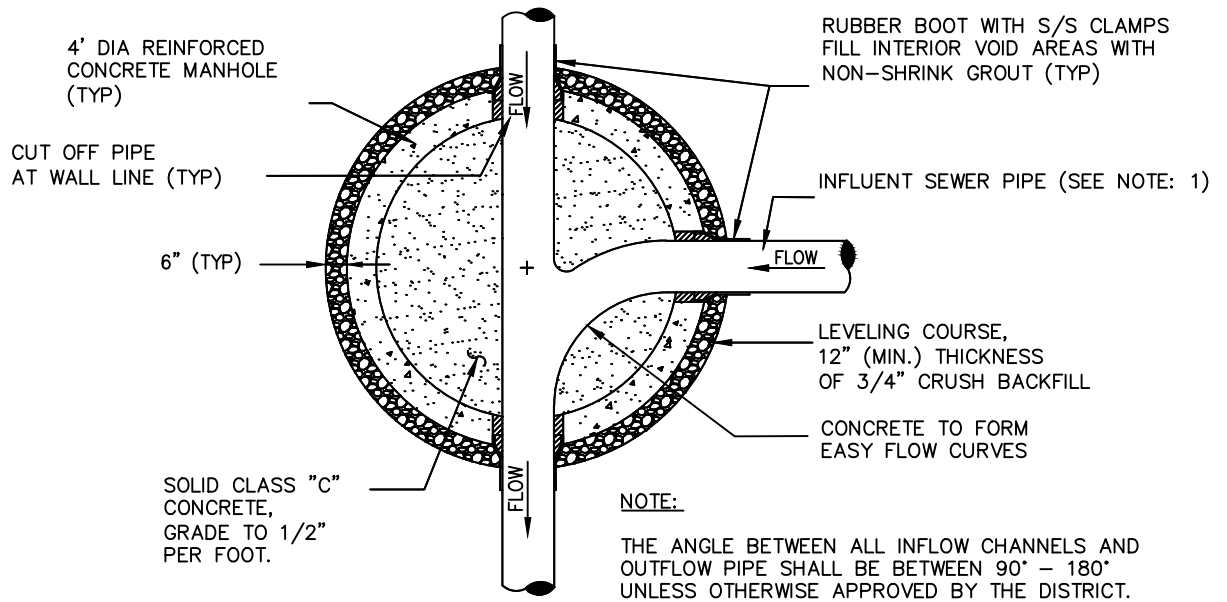


NOTES:

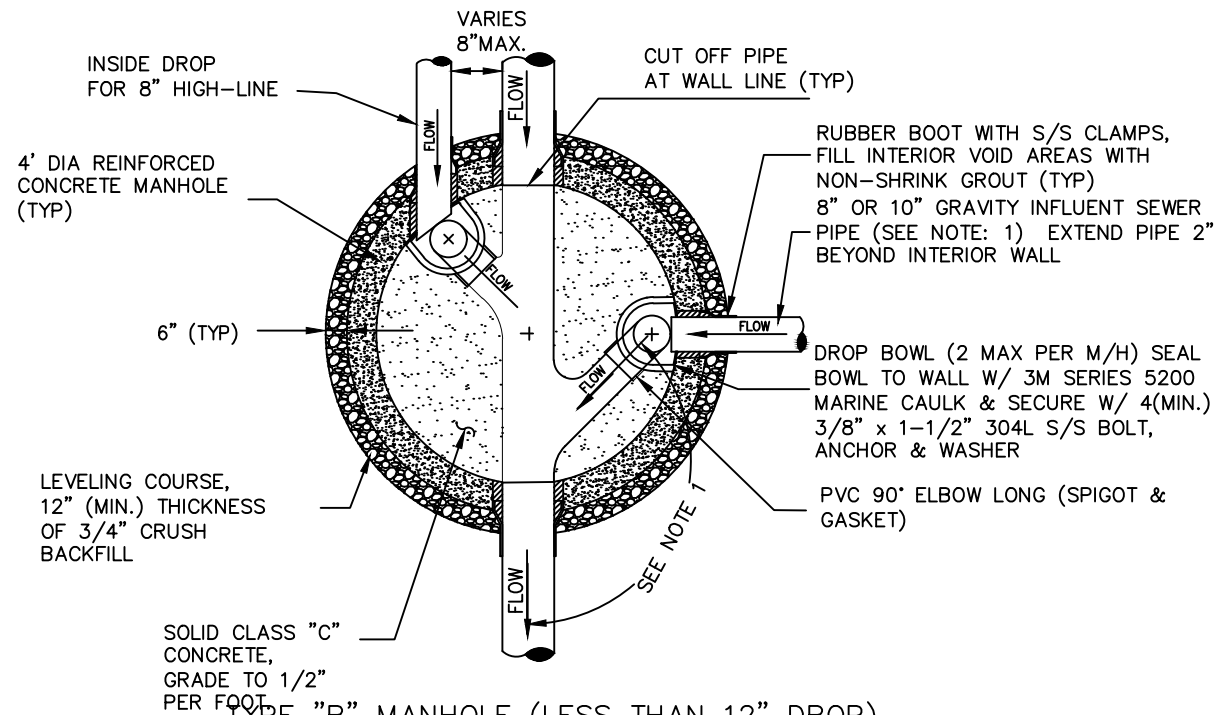
1. LATERAL SEWERS AT CONFLICTS WITH EXISTING UTILITIES WHICH REQUIRE A FLATTER SLOPE THAN 1/4 PER FOOT MUST BE PRE-APPROVED BY THE DISTRICT PRIOR TO CONSTRUCTION.

			OLIVEHURST PUBLIC UTILITY DISTRICT
			CONFLICTS WITH EXISTING UTILITIES
			Garry E. Laughlin District Engineer
5-05	NEW DETAIL	SCD	5-6-2005
DATE	REVISIONS	BY	DATE

5-03



TYPE "A" MANHOLE



TYPE "B" MANHOLE (LESS THAN 12" DROP)

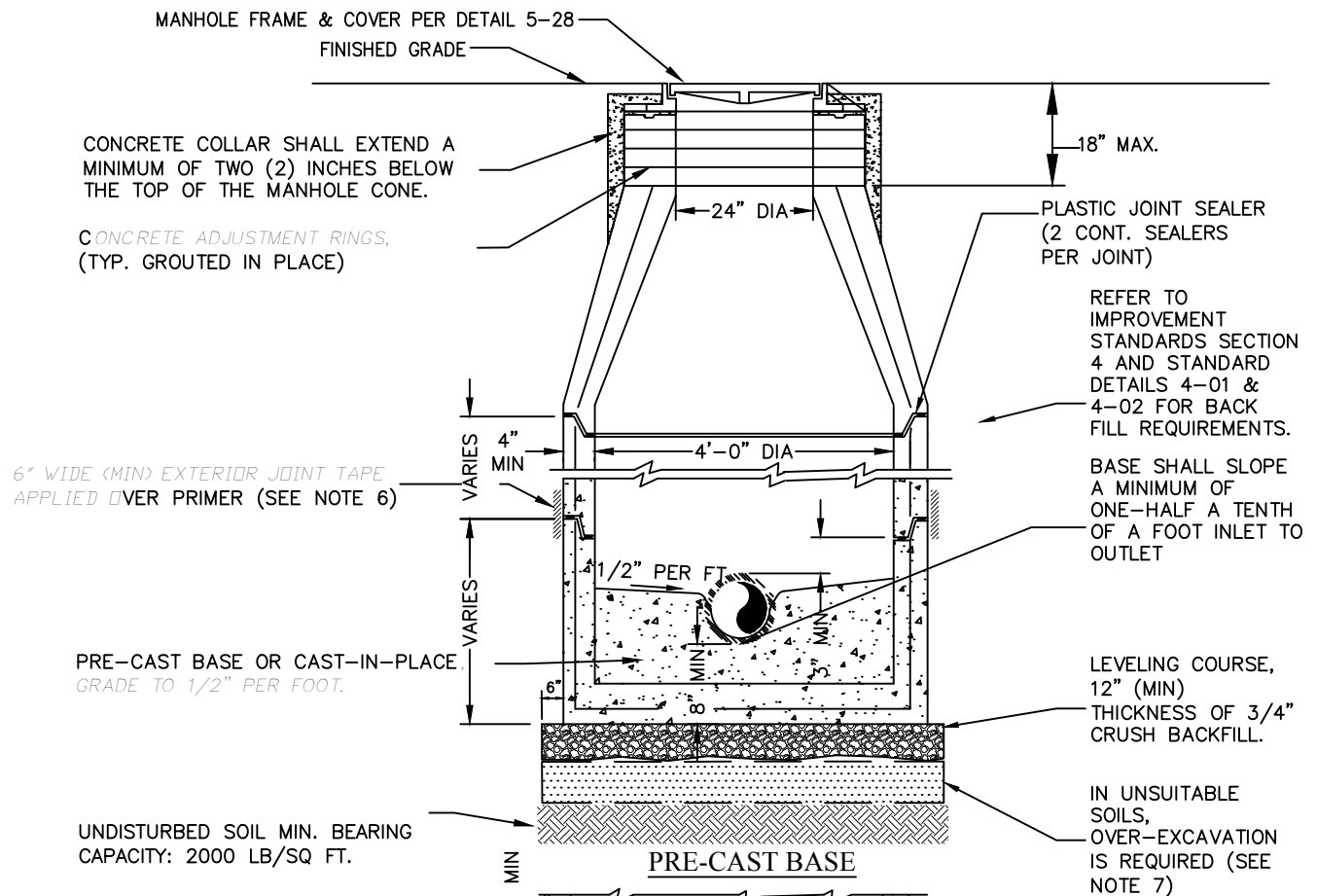
MAY BE USED WHEN TYING INTO EXISTING INFRASTRUCTURE ON A CASE BY CASE BASIS ONLY

NOTES:

1. THE ANGLE BETWEEN ALL INFLUENT FLOW CHANNELS AND EFFLUENT PIPE SHALL BE 90° OR GREATER UNLESS APPROVED OTHERWISE BY THE DISTRICT.
2. THE 8" HIGH-LINE, WHERE UTILIZED, SHALL ENTER THE MANHOLE ON-CENTER OR OFF-CENTER AS SHOWN ABOVE.

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			MANHOLE TYPE "A" & "B" BASE DETAILS	
			Garry E. Laughlin	
			District Engineer	
5-05	NEW DETAIL	SCD	5-6-2005	
DATE	REVISIONS	BY	APPROVED	DATE

5-10



THE CAST-IN-PLACE BASE THICKNESS AND REINFORCEMENT SHALL BE AS DESIGNED BY THE DESIGN ENGINEER.

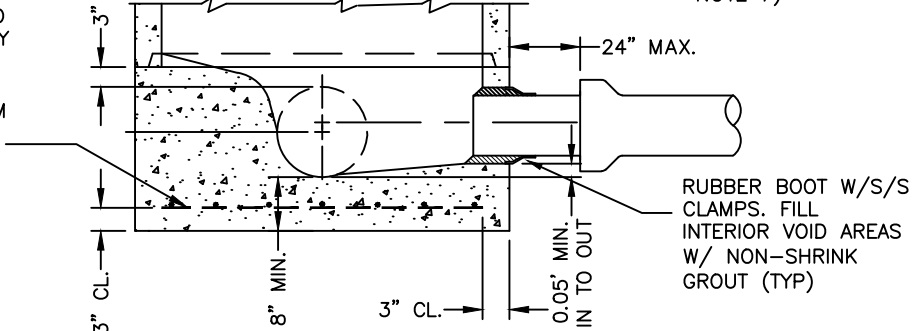
A) FOR MANHOLES EXTENDING TO A FINISH DEPTH OF FOURTEEN (14) FEET, A MINIMUM OF EIGHT (8) INCHES WITH A MINIMUM OF ONE (1) MAT OF NUMBER FOUR (#4) REINFORCEMENT BARS EACH WAY.

B) FOR MANHOLES EXTENDING TO A FINISH DEPTH OF GREATER THAN FOURTEEN (14) FEET, A MINIMUM OF TWELVE (12) INCHES WITH A MINIMUM OF TWO (2) MATS OF NUMBER FOUR (#4) REINFORCEMENT BARS EACH WAY.

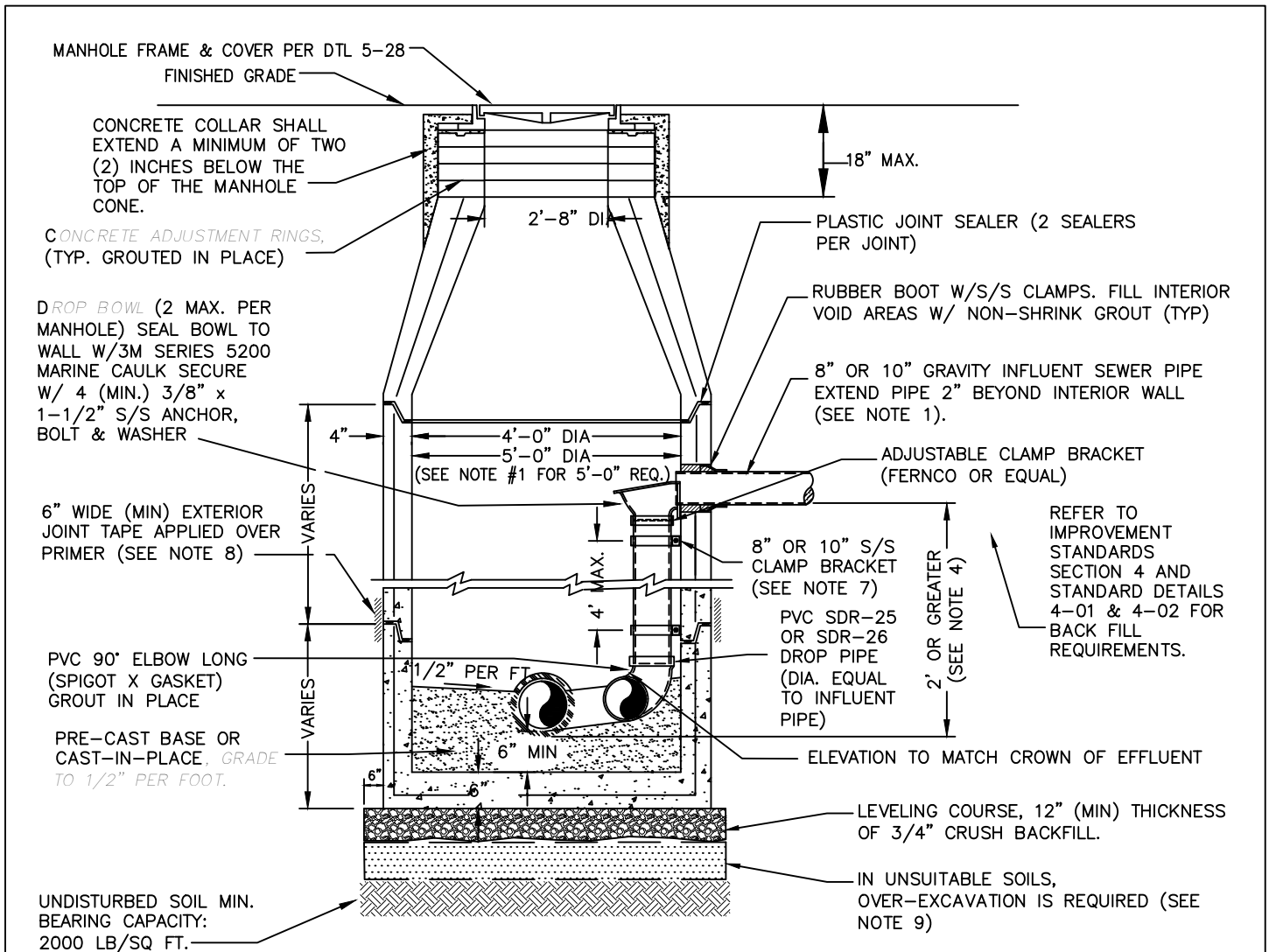
NOTES:

1. PRECAST POLYMER CONCRETE MANHOLE SECTIONS TO BE MANUFACTURED IN ACCORDANCE WITH THE LATEST EDITIONS OF A.S.T.M. C-478 WITH 4000 LB. CONC., TYPE II CEMENT. ALL LIFTING HOLES AND OUTSIDE INSERTS SHALL BE FILLED WITH NON-SHRINK GROUT.
2. THE DISTRICT MAY REQUIRE THE APPLICATION OF TWO COATS OF BITUMINOUS WATERPROOFING MATERIAL TO THE INTERIOR AND EXTERIOR OF THE MANHOLE AND THE INTERIOR OF ADJUSTMENT RINGS IN AREAS WITH GROUND PROBLEMS.
3. TYPE "B" MANHOLE MUST BE USED FOR 2' OR GREATER INFLUENT PIPE DROPS..
4. (CASE BY CASE BASIS ONLY) THE DROP BOWL ASSEMBLY SHALL BE INSTALLED PRIOR TO APPLICATION OF SPECIALTY LINING MATERIAL.
5. (CASE BY CASE BASIS ONLY) A TYPE "D" MANHOLE SHALL BE UTILIZED WHEN THREE OR MORE (2' OR GREATER) DROPS ARE INVOLVED OR WHEN INFLUENT PIPES AREA LARGER THAN 10" IN SIZE.
6. ALL MANHOLE JOINTS BELOW THE TOP CONE SECTION SHALL INCLUDE A 6" WIDE (MIN) EXTERIOR JOINT TAPE (W/PRIMER). TAPE ON THE CONE SECTION IS REQUIRED.
7. IN SILTS, CLAY OR HIGHLY ORGANIC SOILS (FINE-GRAINED SOILS INCLUDING SOIL GROUPS ML, CL, OL, MH, CH, OH AND PT) THE SOILS SHALL BE OVER-EXCAVATED AN ADDITIONAL 24" (AT A MIN.) AND BACKFILLED WITH AASHTO CLASS A-3 SOIL (COMPACTED TO 95%, ASTM D1557) OR OVER-EXCAVATE AN ADDITIONAL 12" (AT A MIN.) AND BACKFILL WITH GRANULAR BACKFILL AND RAT SLAB.

CAST-IN-PLACE BASE(CASE BY CASE ONLY)



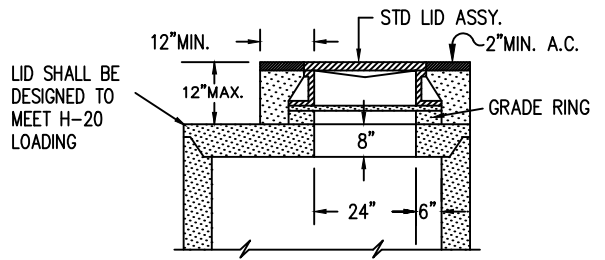
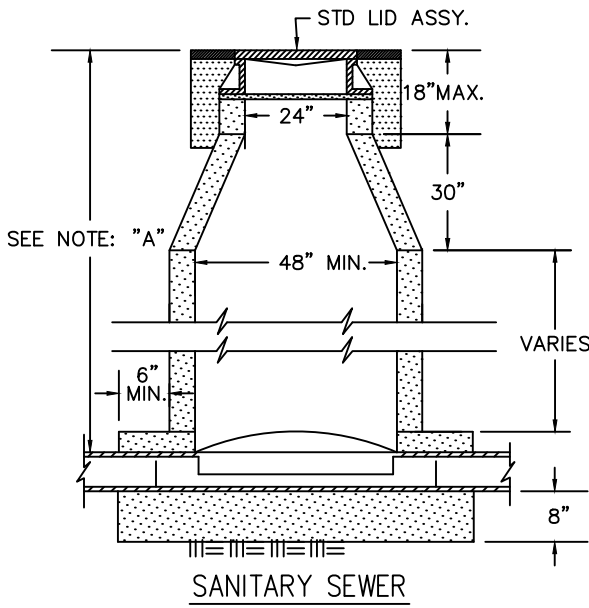
			OLIVEHURST PUBLIC UTILITY DISTRICT	
			TYPE "A" MANHOLE	
			Garry E. Laughlin District Engineer	
			5-6-2005	
5-05	FORMERLY STD. DTL. NO. SS-5	SCD	5-14	
DATE	REVISIONS	BY		



NOTES: TYPE B MANHOLES MAY BE USED FOR TYING INTO EXISTING INFRASTRUCTURE ON CASE BY CASE BASIS ONLY

1. THE STANDARD ASSEMBLY IS FOR 8" OR 10" GRAVITY INFLUENT LINES ONLY. NO DROPS ALLOWED FOR FORCE MAINS. MAXIMUM OF 2 INSIDE DROP BOWLS PER MANHOLE. A 5'-0" DIA. MANHOLE (4" MIN THICK WALLS) IS REQUIRED IF TWO INSIDE DROPS ARE CONSTRUCTED WITH ONE OR BOTH BEING 10" SIZE. DROP BOWL BY RELINER OR APPROVED EQUAL REQUIRED. THE INSIDE DROP FOR AN 8" HIGH-LINE SHALL BE CONSTRUCTED SIMILAR TO ABOVE.
2. PRECAST MANHOLE SECTIONS TO BE MANUFACTURED IN ACCORDANCE WITH THE LATEST EDITIONS OF A.S.T.M. C-478 WITH 4000 LB. CONC., TYPE II CEMENT. ALL LIFTING HOLES AND OUTSIDE INSERTS SHALL BE FILLED WITH NON-SHRINK GROUT.
3. THE DISTRICT REQUIRES THE APPLICATION OF TWO COATS OF BITUMINOUS WATERPROOFING MATERIAL TO THE INTERIOR AND EXTERIOR OF THE MANHOLE AND THE INTERIOR OF ADJUSTMENT RINGS.
4. TYPE "B" MANHOLE MUST BE USED FOR 2' OR GREATER INFLUENT PIPE DROPS..
5. THE DROP BOWL ASSEMBLY SHALL BE INSTALLED PRIOR TO APPLICATION OF SPECIALTY LINING MATERIAL.
6. A TYPE "C" MANHOLE SHALL BE UTILIZED WHEN THREE OR MORE (2' OR GREATER) DROPS ARE INVOLVED OR WHEN INFLUENT PIPES AREA LARGER THAN 10" IN SIZE.
7. ADJUSTABLE CLAMPING BRACKET (MIN. 2 PER DROP BOWL ASSY). 1-1/2" WIDE, 11 GA. W/ 3/8" DIA. 18-8 PINCH BOLTS AND NUTS. SECURE TO M/H WALL WITH (2) 3/8" X 1" BOLT, ANCHOR & WASHER PER BRACKET ASSY. ALL 304 OR 316 STAINLESS STEEL MATERIALS.
8. ALL MANHOLE JOINTS BELOW THE TOP CONE SECTION SHALL INCLUDE A 6" WIDE (MIN) EXTERIOR JOINT TAPE (W/PRIMER). TAPE ON THE CONE SECTION IS REQUIRED.
9. IN SILTS, CLAY OR HIGHLY ORGANIC SOILS (FINE-GRAINED SOILS INCLUDING SOIL GROUPS ML, CL, OL, MH, CH, OH AND PT) THE SOILS SHALL BE OVER-EXCAVATED AN ADDITIONAL 24" (AT A MIN.) AND BACKFILLED WITH AASHTO CLASS A-3 SOIL (COMPACTED TO 95%, ASTM D1557) OR OVER-EXCAVATE AN ADDITIONAL 12" (AT A MIN.) AND BACKFILL WITH GRANULAR BACKFILL AND RATSLAB

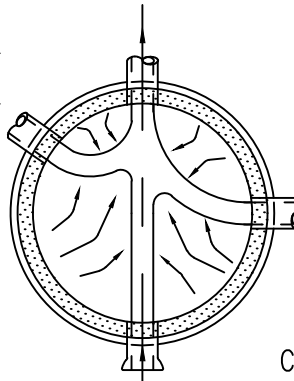
			OLIVEHURST PUBLIC UTILITY DISTRICT	
			DROP CONNECTION TYPE "B" MANHOLE	
6-19	CHANGED LANGUAGE IN NOTE 3	CNO	Garry E. Laughlin District Engineer APPROVED _____ DATE 5-6-2005	
5-05	NEW DETAIL	SCD		
DATE	REVISIONS	BY		
			5-15	



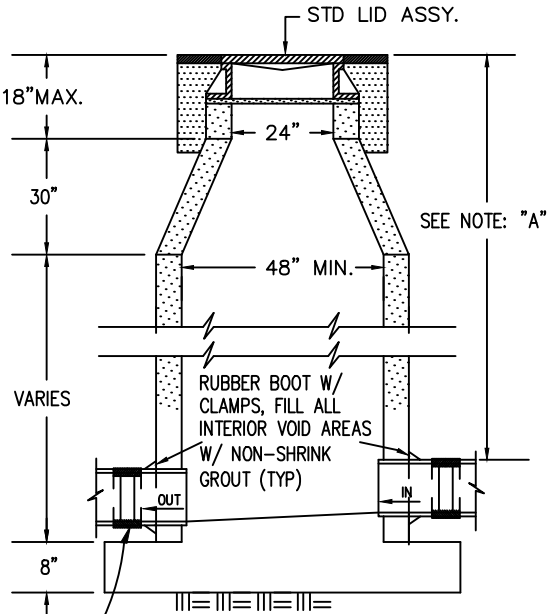
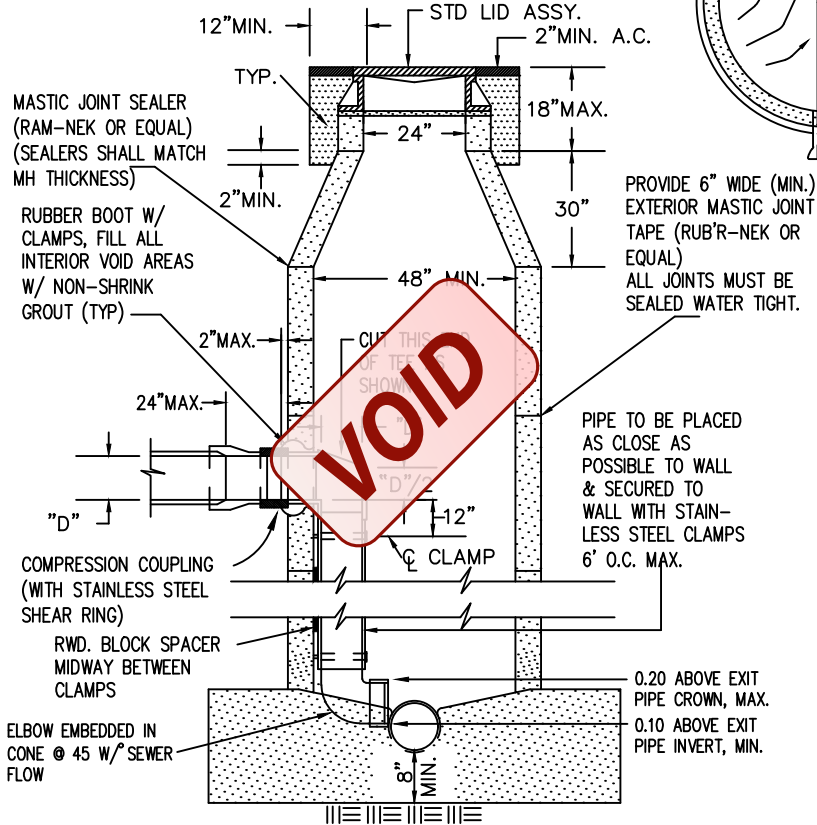
SHALLOW MANHOLE DETAIL
(FOR PIPES WITH LESS THAN 4' COVER)

NOTES:
A.) FOR PIPES WITH LESS THAN 4' COVER USE THE SHALLOW MANHOLE DETAIL

- DROP INLET NOTES:**
1. ALL INSIDE DROP PIPING TO BE P.V.C.
 2. CEMENT ALL JOINTS.
 3. DROP CONNECTION PIPE AND FITTINGS TO BE SAME SIZE AS LATERAL.
 4. CLAMPS TO BE 1 1/2" X 12 ga. STAINLESS STEEL, ANCHORED TO M.H. WALL WITH 2 1/2" STAINLESS STEEL WEDGE OR EPOXY SET.
 5. USE DROP CONNECTION WHENEVER INVERT OF CONNECTING SEWER IS 2'-0" OR MORE ABOVE M.H. INVERT.



CHANNELIZATION FOR SANITARY SEWER MANHOLES

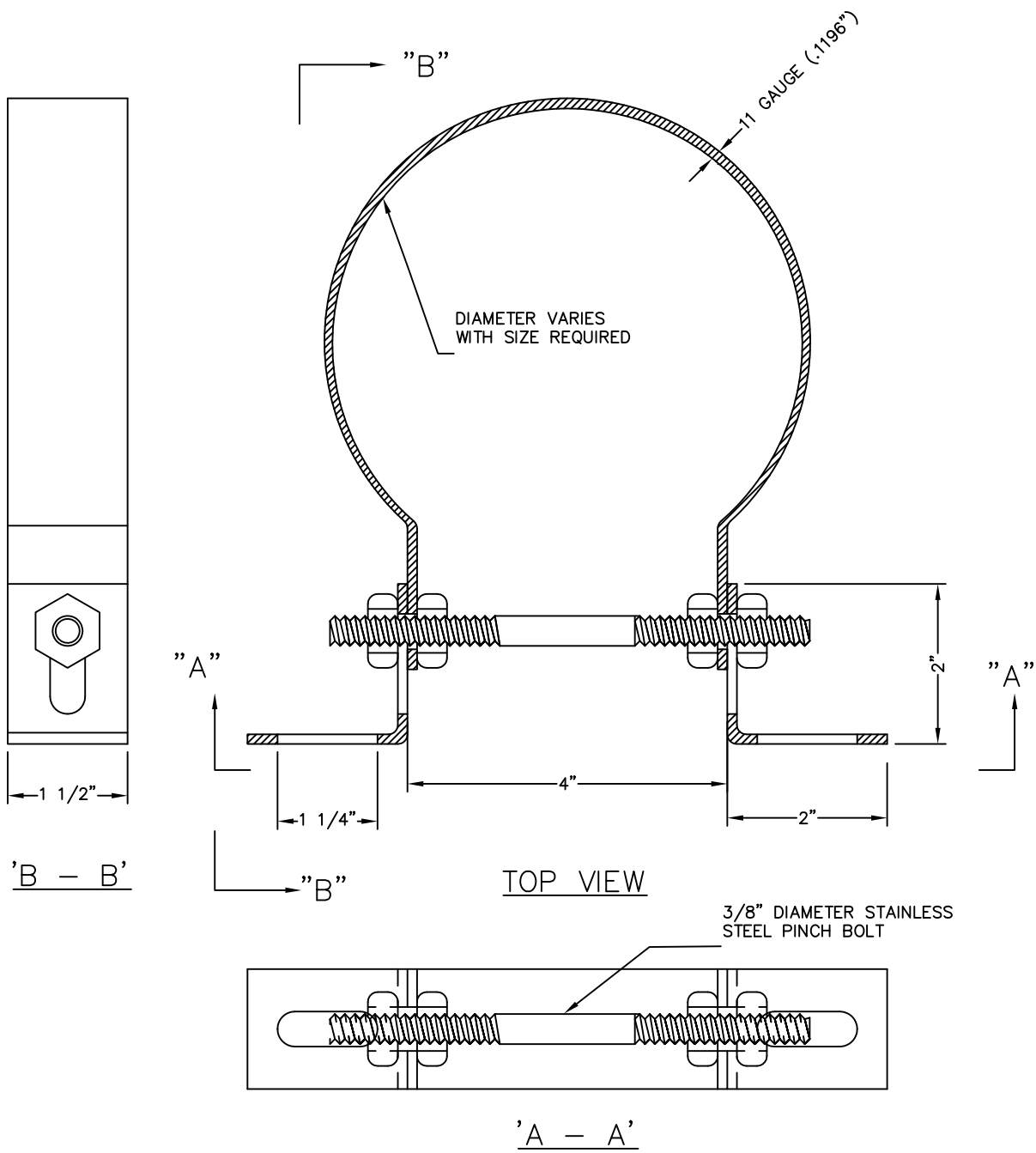


SANITARY SEWER
(INSIDE DROP)

CAST-IN-PLACE (CASE BY CASE ONLY)
INSIDE BOTTOM SHALL BE WET BRUSHED SMOOTH

- NOTES:**
1. OPUD WILL REQUIRE AN APPROVED BITUMASTIC BE APPLIED TO THE ENTIRE EXTERIOR OF ANY MANHOLE TO LIMIT ANY INFILTRATION OF GROUND WATERS.*NOT REQUIRED FOR ARMOROCK MANHOLES
 2. INTERIOR JOINTS AND LIFT HOLES OF ALL MANHOLES SHALL HAVE A NON-SHRINK GROUT APPLIED W/ A WET BRUSH SMOOTH FINISH
 3. ALL MANHOLES SHALL BE INSPECTED BY OPUD PRIOR TO ANY BACKFILL BEING PLACED.
 4. ANY AND ALL MANHOLES WITH ANY GROUND WATER INFILTRATION SHALL NOT BE ACCEPTED BY OPUD AND MUST BE REPAIRED.

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			TYPICAL MANHOLES	
6-19	CHANGED LANGUAGE IN NOTE 1	CNO	Garry E. Laughlin District Engineer	
5-05	FORMERLY STD. DTL. NO. SS-5	SCD		
DATE	REVISIONS	BY	APPROVED	5-6-2005 DATE

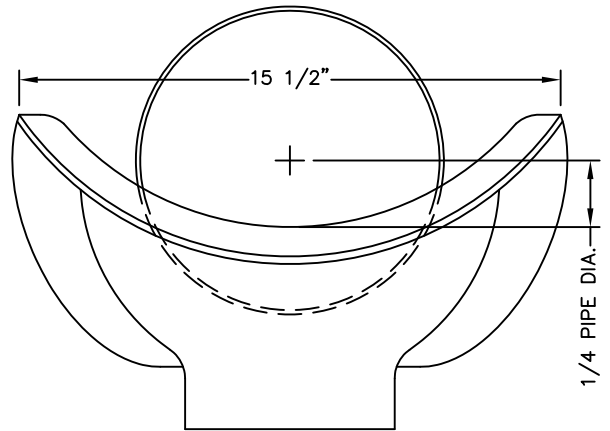
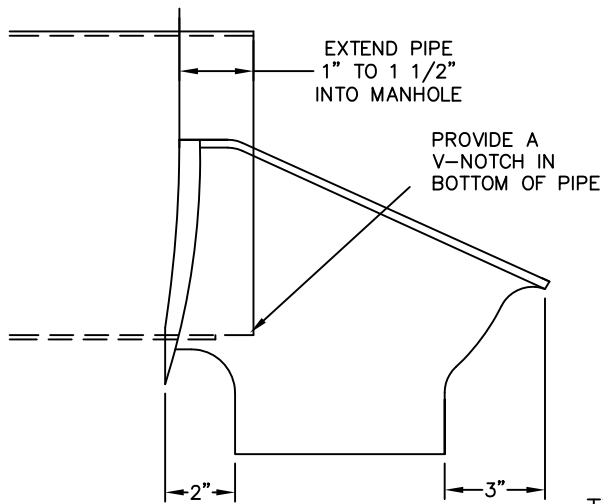


NOTES:

1. DROP INLET PIPE CLAMP AND BRACKET SHALL BE AS SPECIFIED BELOW:
 (RELINER / DURAN, INC., 800-508-6001; FAX: 860-434-3195);
- A) CLAMP AND BRACKETS ARE TYPE 304 STAINLESS STEEL, 11 GAUGE (.1196").
- B) 3/8" Ø PINCH BOLT AND NUTS IS TYPE 18-8 STAINLESS STEEL.
- C) SIZED TO FIT APPROVED PVC, (4" -30").

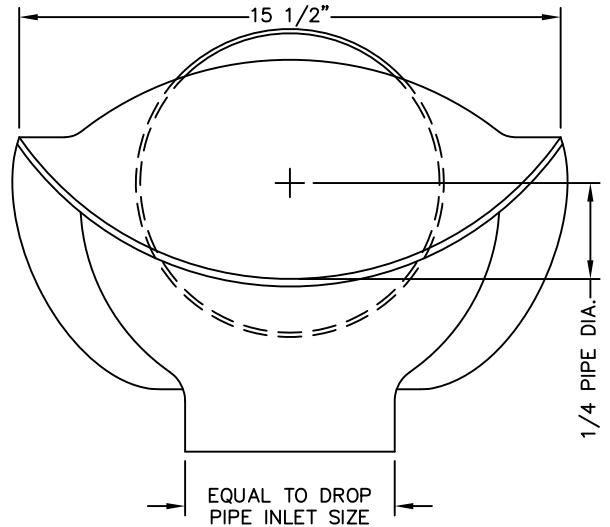
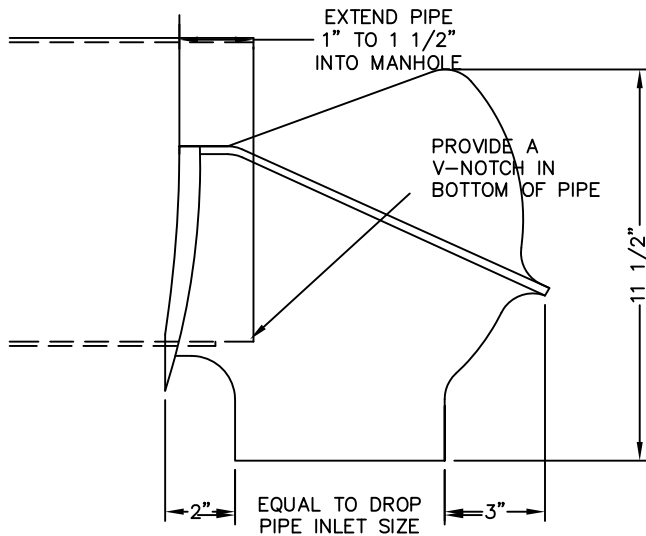
			OLIVEHURST PUBLIC UTILITY DISTRICT
			SS ADJUSTABLE CLAMPING BRACKETS
5-05	NEW DETAIL	SCD	Garry E. Laughlin
DATE	REVISIONS	BY	District Engineer
			APPROVED _____ DATE 5-6-2005

5-22



TYPICAL DROP BOWL

(ATTACH TO MANHOLE WITH A MINIMUM OF 4- 3/8" TYPE 304 STAINLESS STEEL EPOXY ANCHOR BOLTS & FLAT WASHERS - REFER TO NOTES BELOW)



DROP BOWL WITH OPTIONAL FORCE LINE HOOD

(ATTACHES WITH A MINIMUM OF 4- 3/8"x 1 1/2" TYPE 304 STAINLESS STEEL BOLTS & FLAT WASHERS)

NOTES:

1. MANHOLE DROP INLET BOWLS SHALL BE AS SPECIFIED BELOW:

(RELINER / DURAN, INC., 800-508-6001, FAX: 860-434-3195):

A) THE "A-4" BOWL WILL SERVICE UP THROUGH FULL 6" INLETS.

B) THE "A-6" BOWL WILL SERVICE UP THROUGH FULL 8" INLET.

(ALL LINES 10" AND LARGER SHALL BE AS DIRECTED BY THE DISTRICT).

C) ALL SIZES ARE FOR RETROFIT OR NEW CONSTRUCTION. FABRICATED IN MARINE GRADE FIBERGLASS AND FINISHED IN BRIGHT WHITE GEL COAT.

2. THE USE OF FORCE MAIN HOOD ATTACHMENT SHALL BE PRE-APPROVED BY THE DISTRICT ENGINEER.

3. SECURE THE DROP INLET BOWL AND EACH CLAMPING BRACKET TO THE MANHOLE WALL WITH 3/8" x 3 3/4" RAMSET/RED HEAD STAINLESS STEEL BOLTS, PRE-ROTO DRILL AND SET BOLTS IN PLACE WITH EPOXY PASTE.

4. EPOXY SHALL MEET THE FOLLOWING REQUIREMENTS:

A) A TWO COMPONENT, 100% SOLID SYSTEM, (SIKADUR 31 HI-MOD GELL BY SIKA CORP OR EQUAL).

B) A MINIMUM COMPRESSIVE STRENGTH OF 5,000 PSI IN 28 DAYS WHEN TESTED IN ACCORDANCE WITH ASTM.

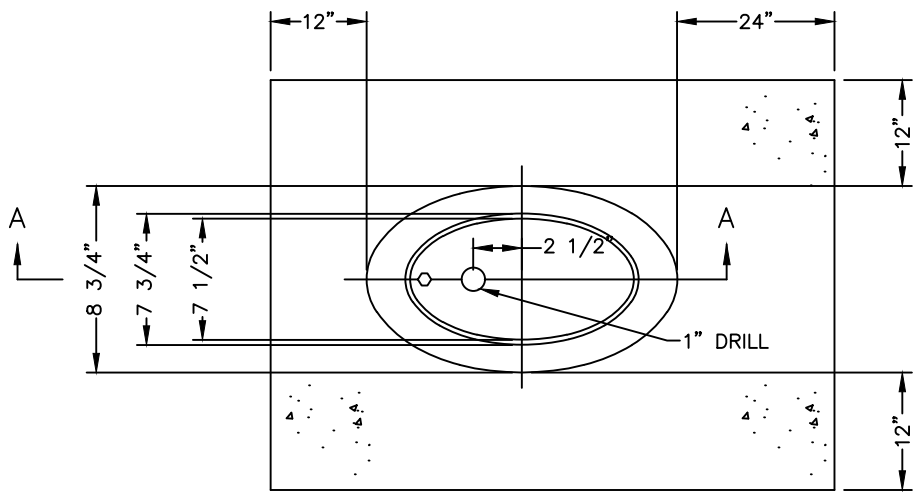
C) A MINIMUM TENSILE STRENGTH OF 3,000 PSI IN 14 DAYS WHEN TESTED IN ACCORDANCE WITH ASTM .

D) A MINIMUM BOND STRENGTH OF 2,000 PSI IN 2 DAYS WHEN TESTED IN ACCORDANCE WITH ASTM.

E) MANUFACTURER'S INSTRUCTIONS SHALL BE PRINTED ON EACH CONTAINER IN WHICH THE MATERIALS ARE PACKAGED.

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			TYPICAL MANHOLE DROP BOWL	
5-05	NEW DETAIL	SCD	Garry E. Laughlin	
DATE	REVISIONS	BY	District Engineer	5-6-2005
			APPROVED	DATE

5-23

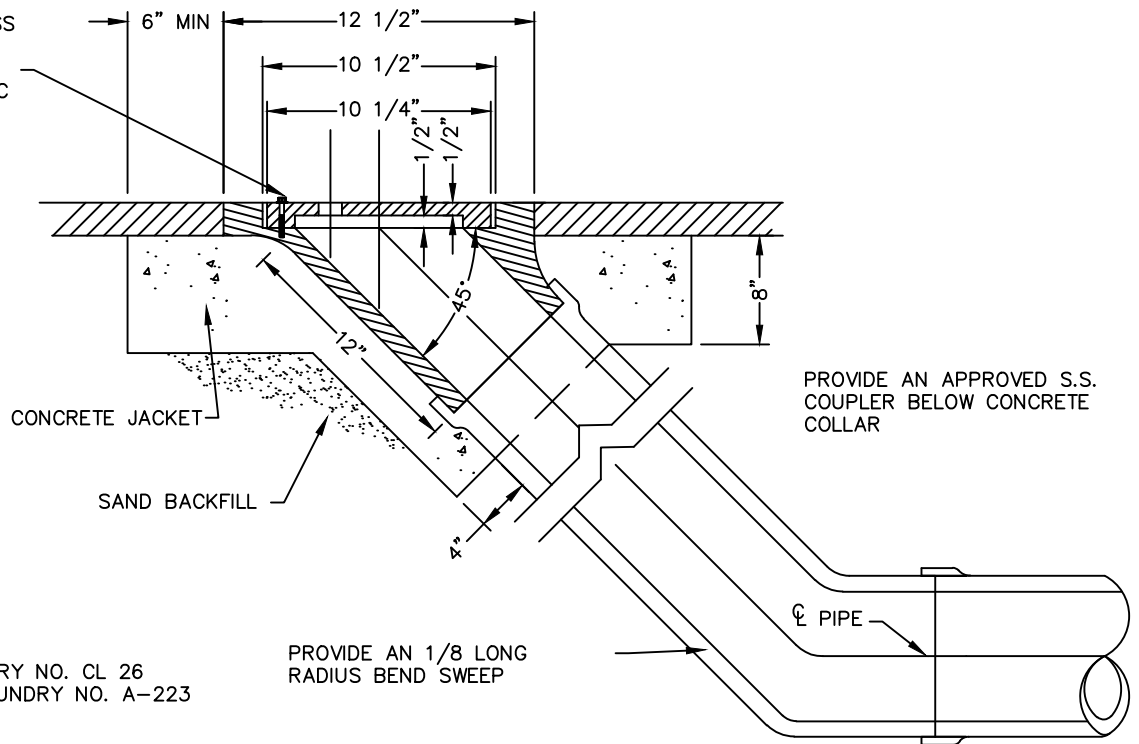


****TEMPORARY ONLY. TOP OF LINE REQUIRES MANHOLE****

LID SHALL STATE "SEWER COTG" ON TOP

PLAN

1/4" X 1-1/2" BRASS HEX HD. CAP SCREW - 20 NC-2 WHEN LOCATED IN A PUBLIC UTILITY EASEMENT



PROVIDE AN APPROVED S.S. COUPLER BELOW CONCRETE COLLAR

CONCRETE JACKET

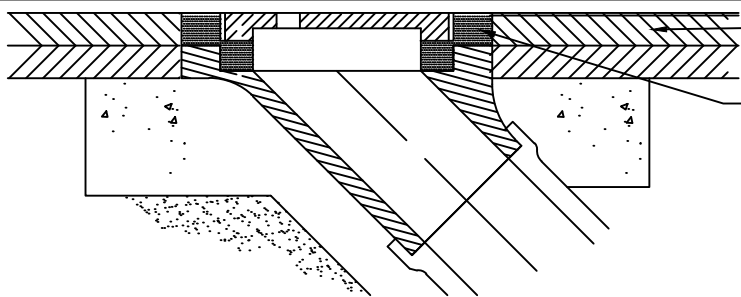
SAND BACKFILL

PROVIDE AN 1/8" LONG RADIUS BEND SWEEP

PIPE

EMPIRE FOUNDRY NO. CL 26
PINKERTON FOUNDRY NO. A-223
OR EQUAL.

SECTION A-A



FINISH AS DIRECTED BY THE YUBA COUNTY PUBLIC WORKS.

PROVIDE PINKERTON OR EQUAL RISER RING

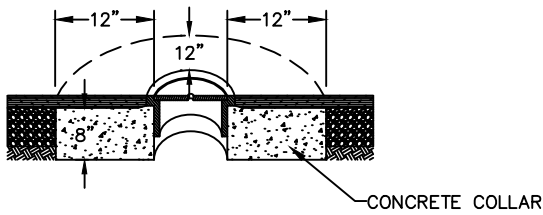
REMOVE EXIST. A.C. AROUND CLEANOUT COVER & INSTALL RISER RING & RESURFACE OR PATCH AS NECESSARY

EXTENSION FOR REPAVING AREAS

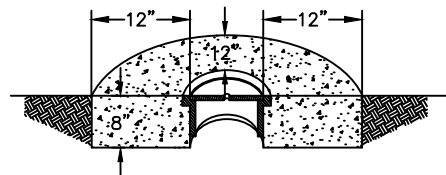
			OLIVEHURST PUBLIC UTILITY DISTRICT	
			MAIN LINE CLEANOUT TO GRADE	
5-05	FORMERLY STD. DTL. NO. SS-2, & SS-3	SCD	Garry E. Laughlin	
DATE	REVISIONS	BY	District Engineer	5-6-2005
			APPROVED	DATE

5-25

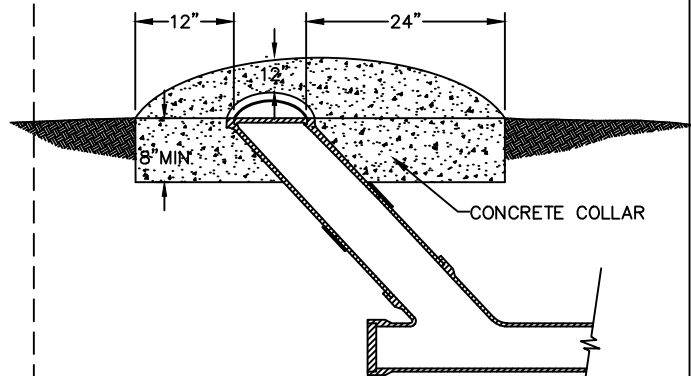
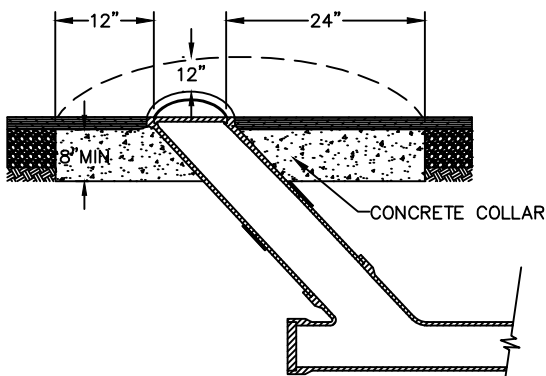
TYPICAL IN IMPROVED AREAS



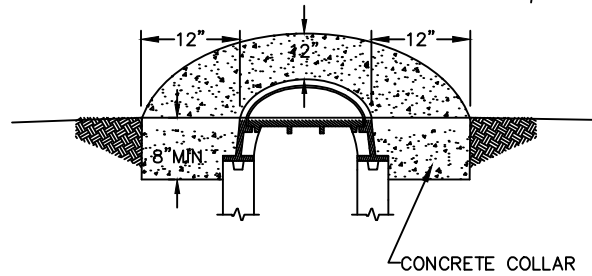
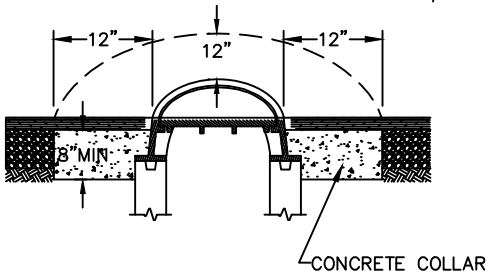
TYPICAL IN UNIMPROVED AREAS



G-5 TYPE BOX



CLEAN-OUT-TO-GRADE BOX

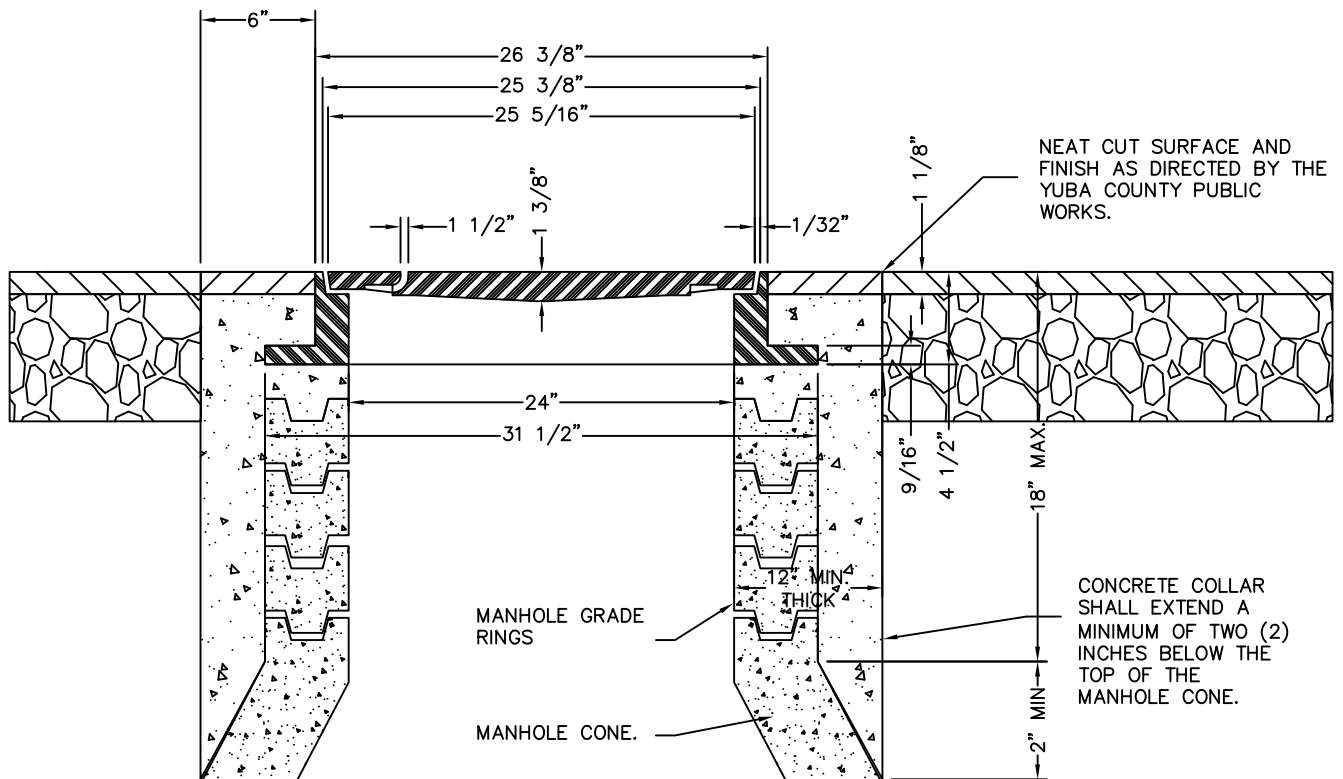
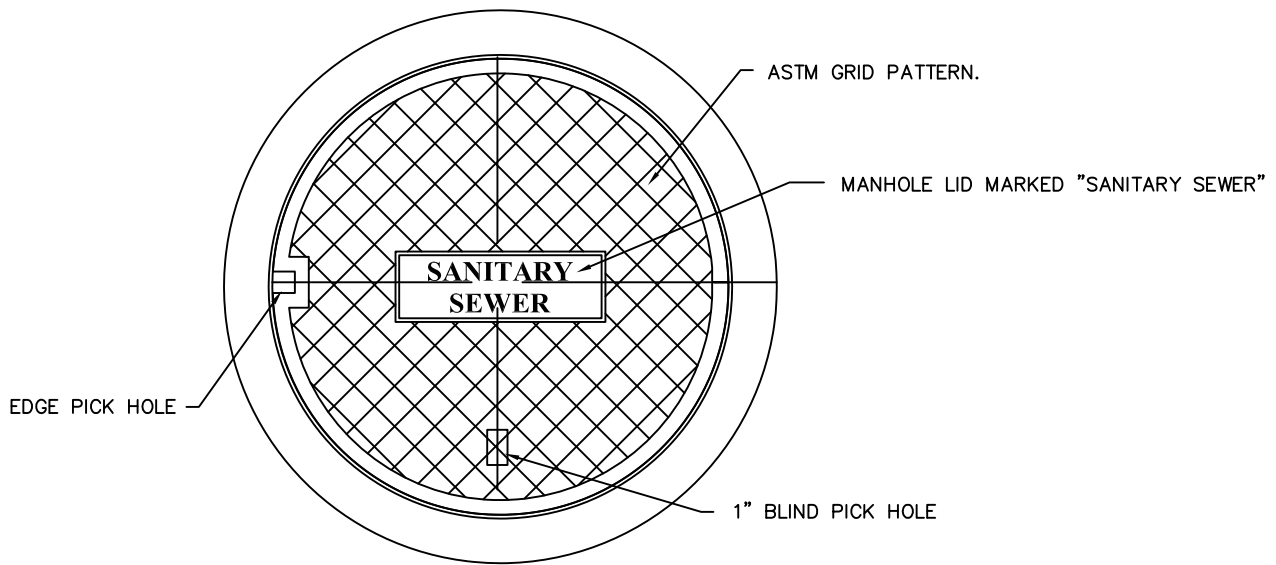


MANHOLE

TEMPORARY ONLY. TOP OF LINE REQUIRES MANHOLE

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			TYPICAL CONCRETE COLLARS	
5-05	NEW DETAIL	SCD	Garry E. Laughlin	
DATE	REVISIONS	BY	District Engineer	5-6-2005
			APPROVED	DATE

5-26

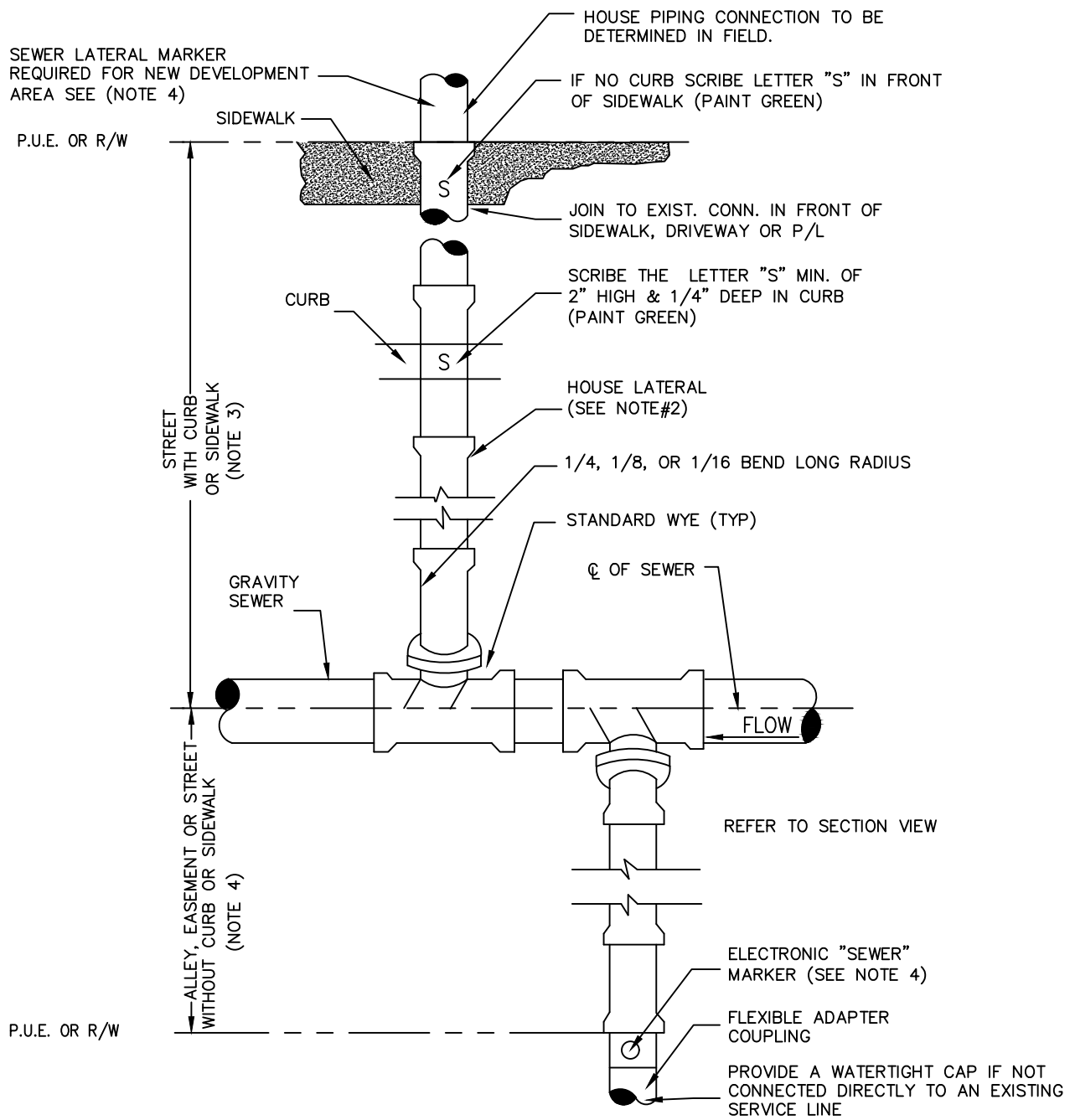


NOTES:

1. ALL CASTING SHALL CONFORM TO ASTM A48 CLASS 30.
2. FRAME AND COVER SHALL MEET H-20 LOAD SPECIFICATIONS.
3. FRAME AND COVER SHALL BE COATED WITH A BITUMINOUS MATERIAL.
4. LOCKING COVER TYPE FRAME AND COVER ASSEMBLY SHALL BE USED WHEN DIRECTED BY THE DISTRICT ENGINEER.
5. ONLY WHEN APPROVED BY THE DISTRICT ENGINEER A MANHOLE WHICH IS LOCATED IN A FUTURE ROAD OR SUBDIVISION PHASE, MAY HAVE A TEMPORARY 2 SACK SLURRY COLLAR REPLACING THE CONCRETE COLLAR. IT SHALL EXTEND A MINIMUM OF THREE (3) INCHES ABOVE ADJACENT GRADE. SLOPE FINISH GRADE AROUND MANHOLE AND SLOPE TO DRAIN AWAY FROM LID.

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			CAST IRON MANHOLE FRAME & COVER	
5-05	FORMERLY STD. DTL. NO. SD-2, & SS-7	SCD	Garry E. Laughlin	
DATE	REVISIONS	BY	District Engineer	5-6-2005
			APPROVED	DATE

5-28



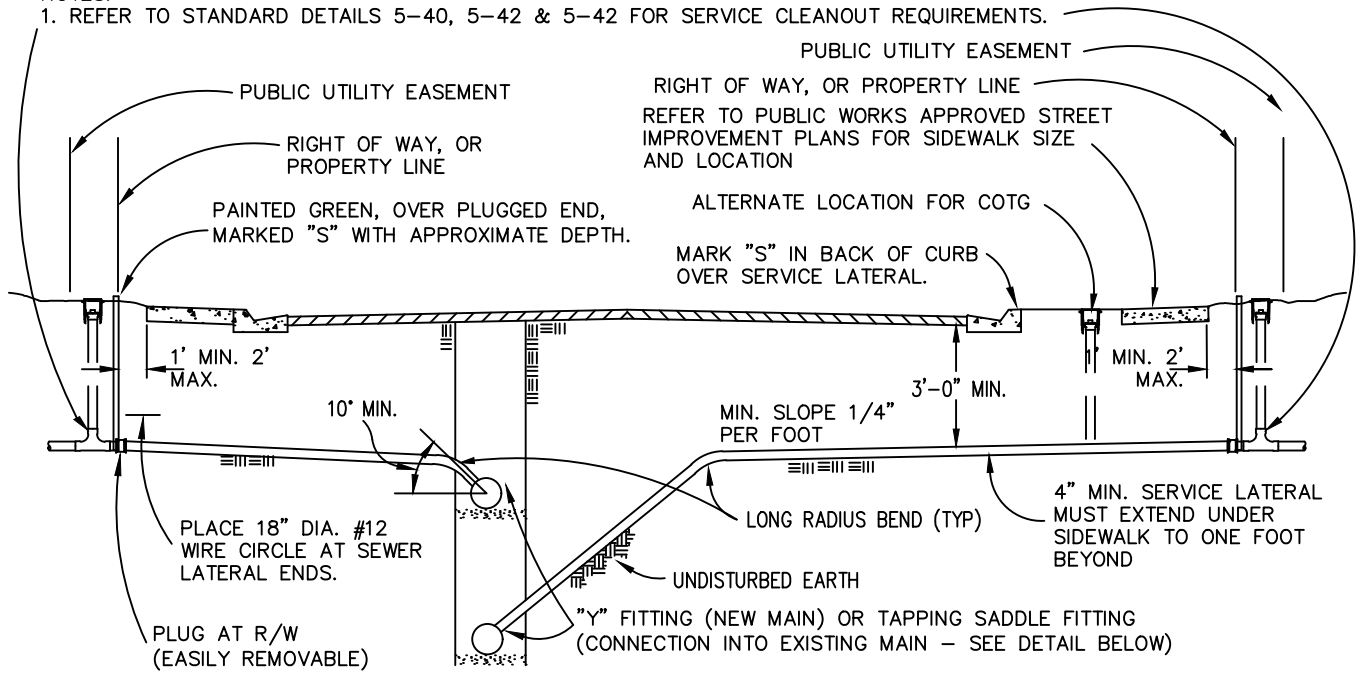
NOTES:

1. ALL PIPING, FITTINGS, AND PLACEMENT SHALL BE PER O.P.U.D. IMPROVEMENT STANDARDS AND TECHNICAL SPECIFICATIONS.
2. FINAL INSTALLATION DETAILS TO BE SUBMITTED TO O.P.U.D. FOR APPROVAL.
3. IN AREAS WITH CURB - THE LETTER "S" IS TO BE STAMPED ON THE BACK TOP OF THE CURB AT EACH SERVICE LOCATION. THE STAMP SHALL BE APPROVED BY THE DISTRICT PRIOR TO USE.
4. FOR SEPTIC TANK PHASE-OUT PROJECTS WHERE NO CONCRETE CURB EXIST, AN ELECTRONIC "SEWER" MARKER IS REQUIRED FOR ALL LATERALS WHICH ARE "NOT IN USE". FOR NEW DEVELOPMENT AREAS WHERE THE SEWER LATERAL IS "NOT IN USE", A LANDSCAPE TIMBER OR 3x3 MIN. P.T. POST (TOP PAINTED GREEN) SHALL BE INSTALLED UP TO GRADE AND CAPPED.
5. THE MINIMUM SIZE OF ALL RESIDENTIAL SERVICE LINES SHALL BE FOUR (4) INCHES. THE MAXIMUM LENGTH OF A RESIDENTIAL SERVICE LINE SHALL BE 60 FEET (LENGTH BETWEEN SEWER MAIN OR MANHOLE TO CUSTOMERS PROPERTY LINE).
6. THE MINIMUM SIZE OF ALL COMMERCIAL SERVICE LINES SHALL BE SIX (6) INCHES.
7. NO SEWER SERVICE CONNECTIONS PERMITTED ON ANY GRAVITY SEWER LINE WHICH IS SIXTEEN (16) INCHES OR LARGER.

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			SEWER CONNECTION PLAN VIEW	
5-05	NEW DETAIL	SCD	Garry E. Laughlin District Engineer	
DATE	REVISIONS	BY	APPROVED	DATE
				5-6-2005

NOTES:

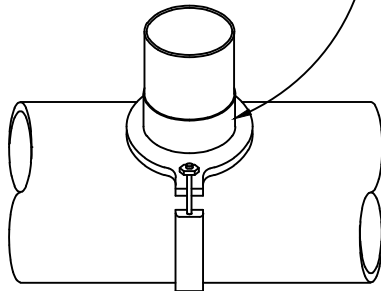
1. REFER TO STANDARD DETAILS 5-40, 5-42 & 5-42 FOR SERVICE CLEANOUT REQUIREMENTS.



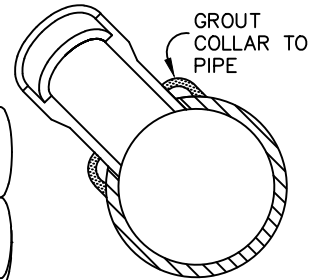
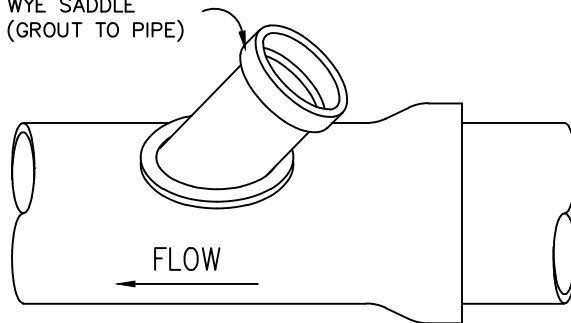
NOTES:

- SERVICES SHALL HAVE SAME BEDDING AND BACKFILL AS MAIN SEWER.
- ANY REPAIRS DONE TO SERVICES OR MAINS SHALL HAVE COMPRESSION COUPLINGS WITH STAINLESS STEEL SHEAR RINGS

ROMAC INDUSTRIES, INC., "CB" SEWER SADDLE (CONNECTED TO PIPE W/STAINLESS STEEL STRAP) OR DISTRICT APPROVED EQUAL.



TAPPING COLLAR WYE SADDLE (GROUT TO PIPE)

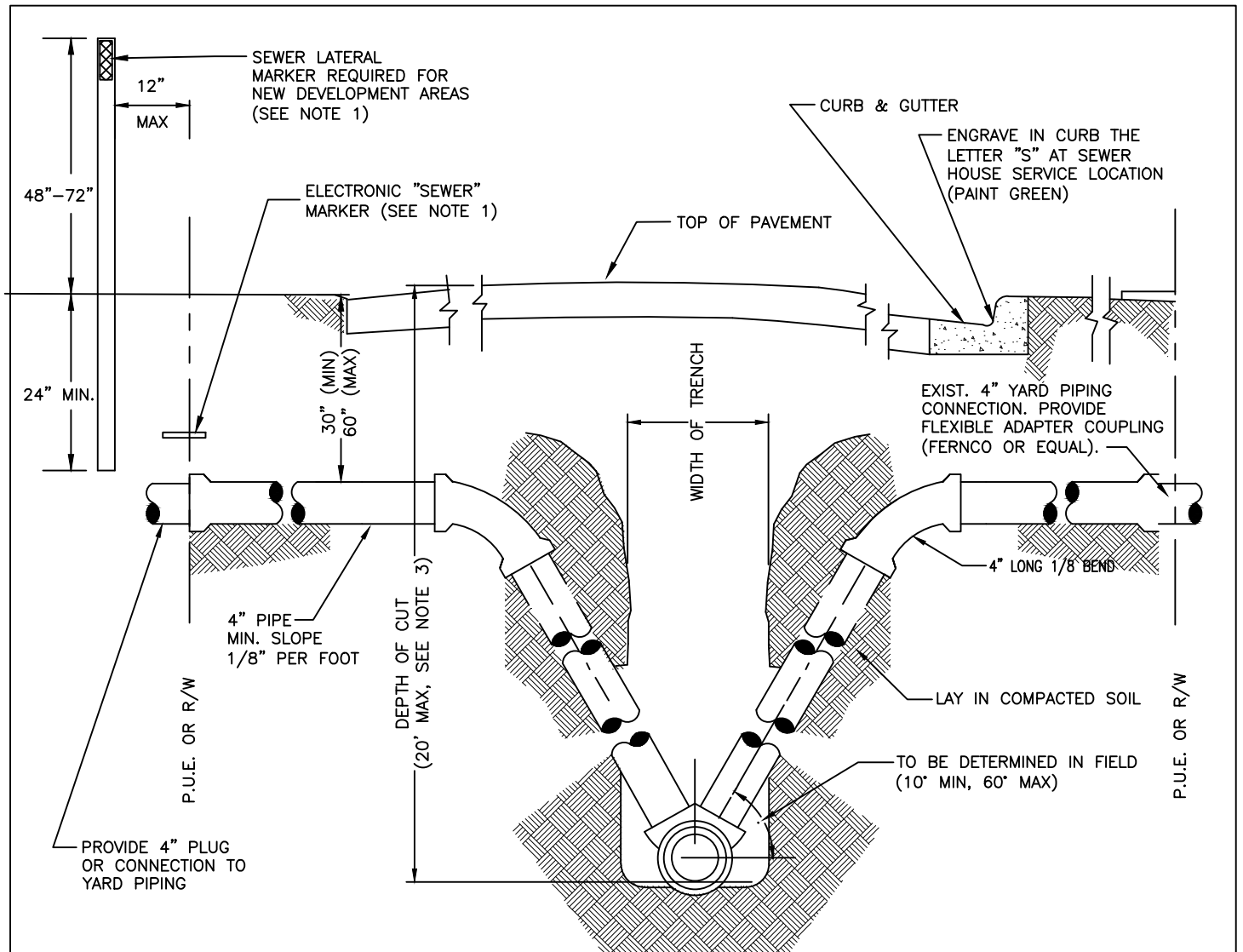


NOTES:

- ALL PIPING, FITTINGS, AND PLACEMENT SHALL BE PER O.P.U.D. IMPROVEMENT STANDARDS AND TECHNICAL SPECIFICATIONS.
- FINAL INSTALLATION DETAILS TO BE SUBMITTED TO O.P.U.D. FOR APPROVAL.
- IN AREAS WITH CURB - THE LETTER "S" IS TO BE STAMPED ON THE BACK TOP OF THE CURB AT EACH SERVICE LOCATION. THE STAMP SHALL BE APPROVED BY THE DISTRICT PRIOR TO USE.
- FOR SEPTIC TANK PHASE-OUT PROJECTS WHERE NO CONCRETE CURB EXIST, AN ELECTRONIC "SEWER" MARKER IS REQUIRED FOR ALL LATERALS WHICH ARE "NOT IN USE". FOR NEW DEVELOPMENT AREAS WHERE THE SEWER LATERAL IS "NOT IN USE", A LANDSCAPE TIMBER OR 3x3 MIN. P.T. POST (TOP PAINTED GREEN) SHALL BE INSTALLED UP TO GRADE AND CAPPED
- THE MINIMUM SIZE OF ALL RESIDENTIAL SERVICE LINES SHALL BE FOUR (4) INCHES. THE MAXIMUM LENGTH OF A RESIDENTIAL SERVICE LINE SHALL BE 60 FEET (LENGTH BETWEEN SEWER MAIN OR MANHOLE TO CUSTOMERS PROPERTY LINE).
- THE MINIMUM SIZE OF ALL COMMERCIAL SERVICE LINES SHALL BE SIX (6) INCHES.
- NO SEWER SERVICE CONNECTIONS PERMITTED ON ANY GRAVITY SEWER LINE WHICH IS SIXTEEN (16) INCHES OR LARGER.

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			SEWER CONNECTION SECTION VIEW	
8-05	DELETE VERTICAL LATERAL CONNECTION	ADC	Garry E. Laughlin District Engineer	
3-05	FORMERLY STD. DTL. NO. SS-6	SCD		
DATE	REVISIONS	BY	APPROVED	3-17-2005 DATE

5-31

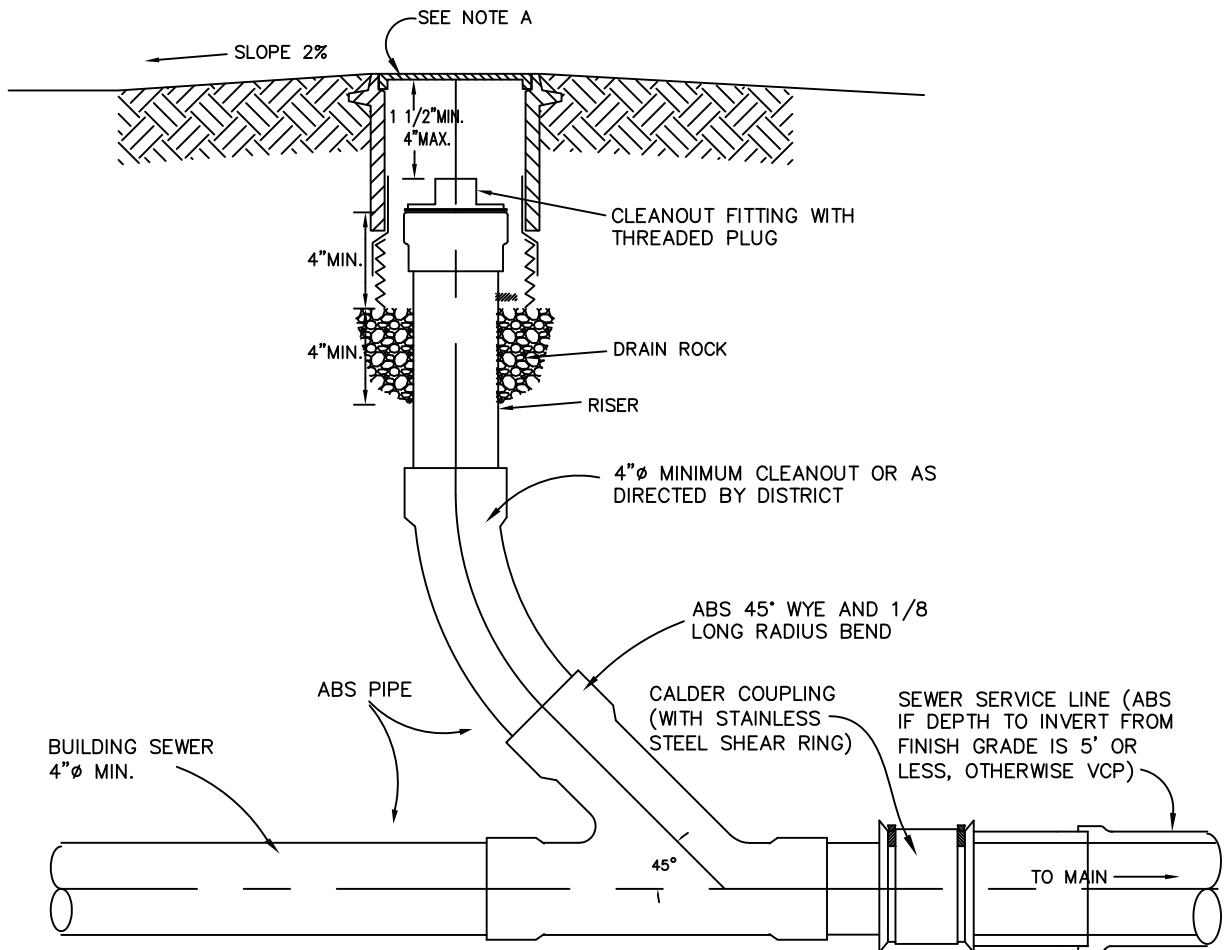


NOTES:

1. FOR SEPTIC TANK PHASE-OUT PROJECTS WHERE NO CONCRETE CURB EXIST, AN ELECTRONIC "SEWER" MARKER IS REQUIRED FOR ALL LATERALS WHICH ARE "NOT IN USE". FOR NEW DEVELOPMENT AREAS WHERE THE SEWER LATERAL IS "NOT IN USE", A LANDSCAPE TIMBER OR 3x3 MIN. P.T. POST (TOP PAINTED GREEN) SHALL BE INSTALLED UP TO GRADE AND CAPPED
2. THE MINIMUM SIZE OF ALL HOUSE LATERALS SHALL BE 4 INCHES. THE MAXIMUM LENGTH OF A HOUSE LATERAL SHALL BE 60 FEET (LENGTH BETWEEN SEWER MAIN OR MANHOLE TO CUSTOMERS PROPERTY LINE).
3. UNLESS APPROVED OTHERWISE BY THE DISTRICT, NO GRAVITY SEWER MAIN WITH SEWER SERVICE LATERALS SHALL BE CONSTRUCTED WITH A "DEPTH OF CUT" GREATER THAN 20 FEET. SEWER SERVICE LATERALS ASSOCIATED WITH GRAVITY SEWER MAINS WHICH ARE DEEPER THAN 20 FEET, MUST BE ROUTED TO A GRAVITY SEWER HIGH-LINE, A MANHOLE OR OTHER DISTRICT APPROVED METHOD.

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			SERVICE LATERALS	
			Garry E. Laughlin	
			District Engineer	
5-05	NEW DETAIL	SCD	5-6-2005	
DATE	REVISIONS	BY	APPROVED	DATE

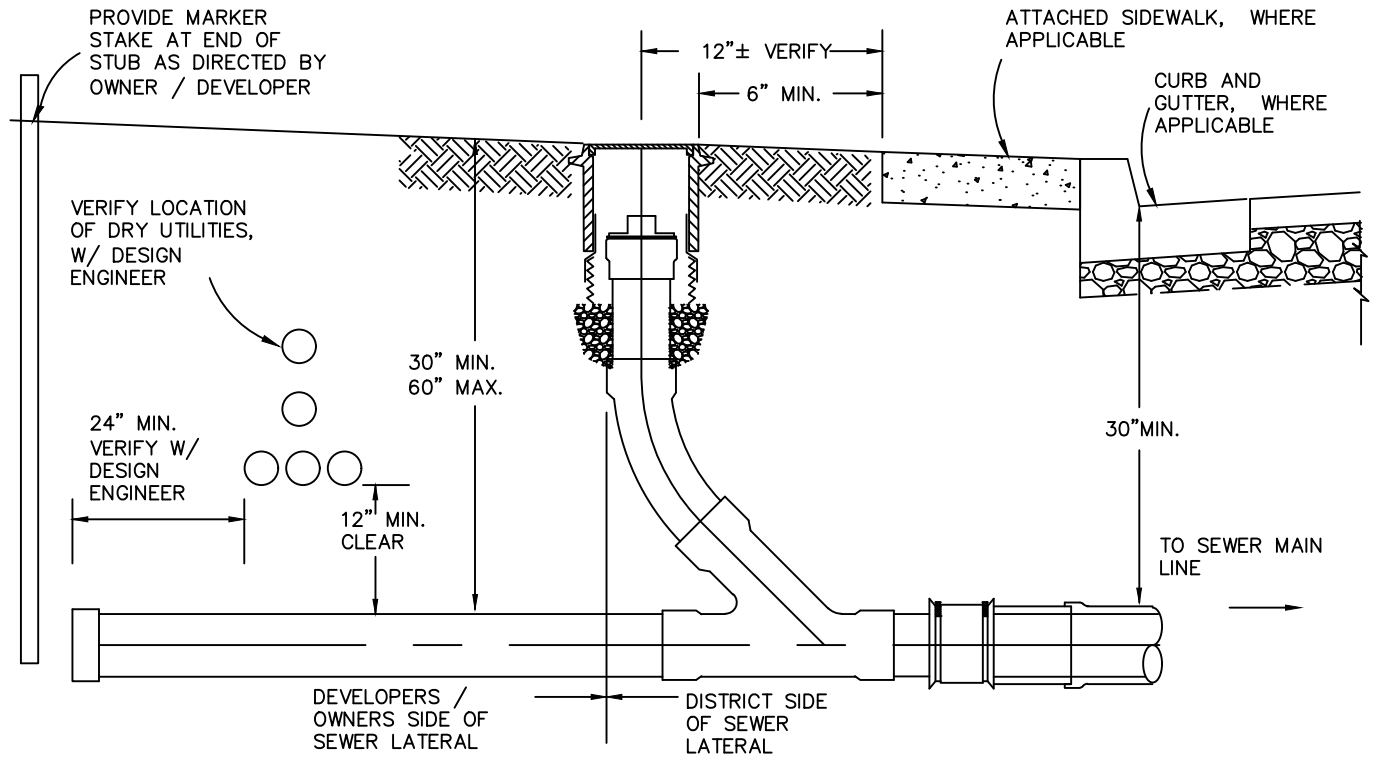
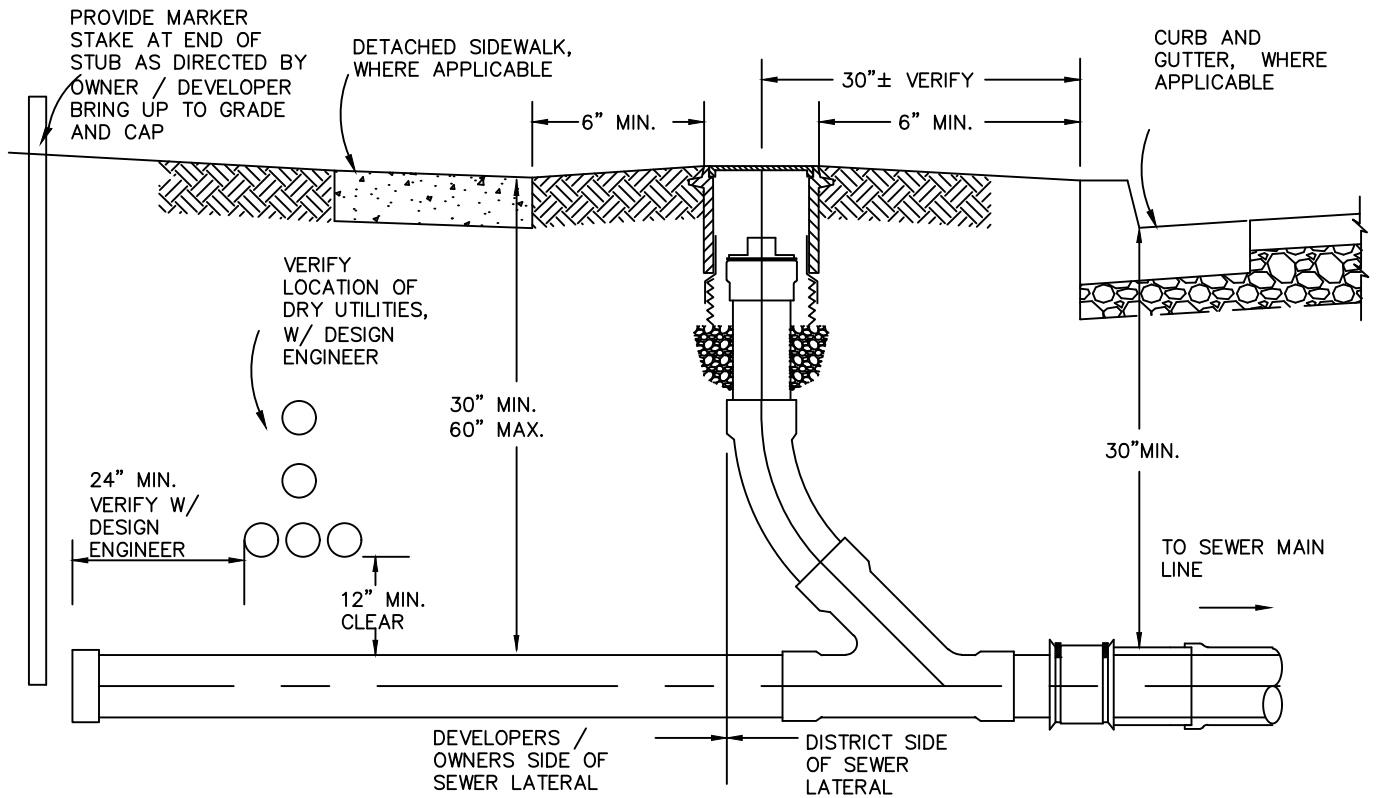
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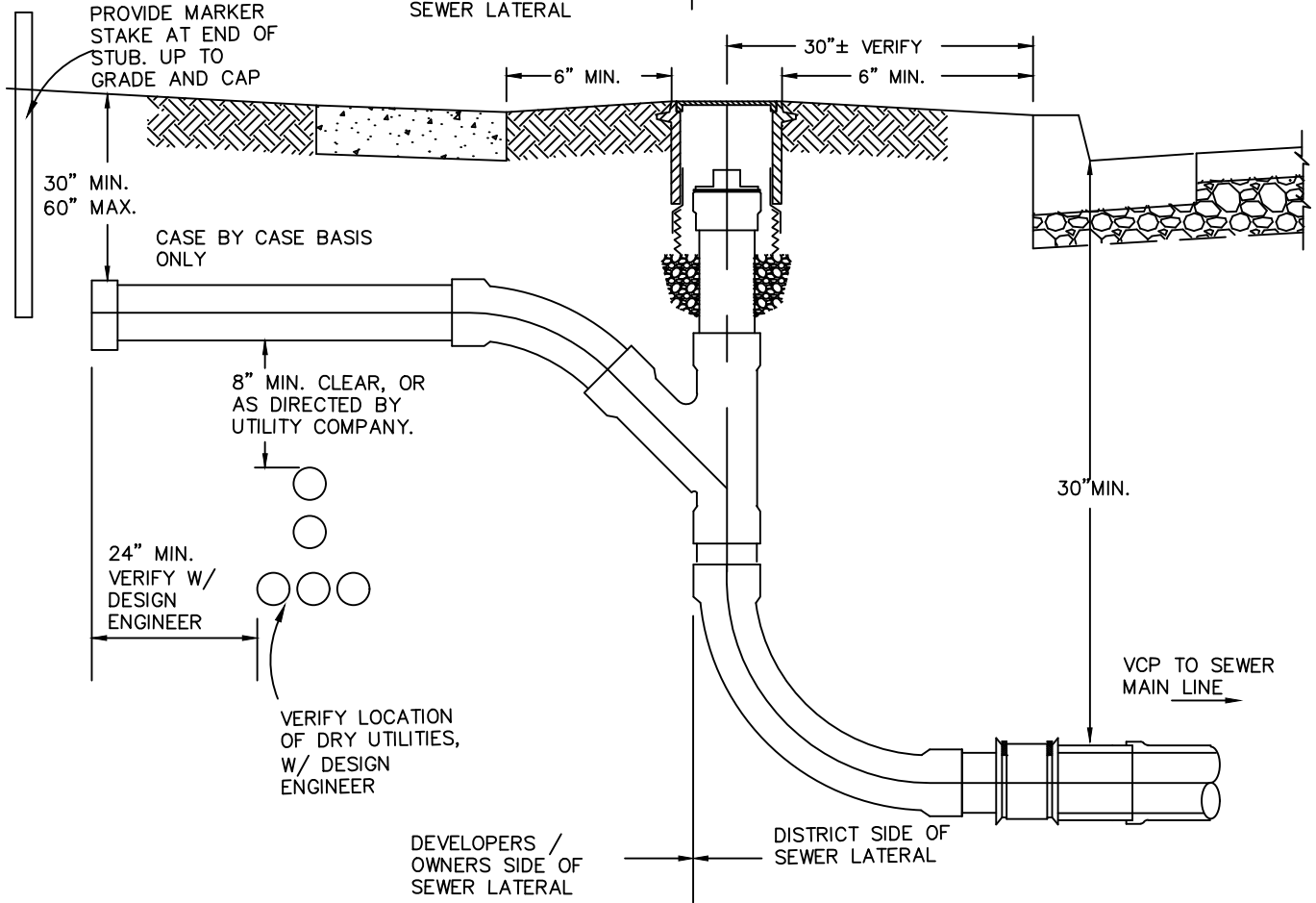
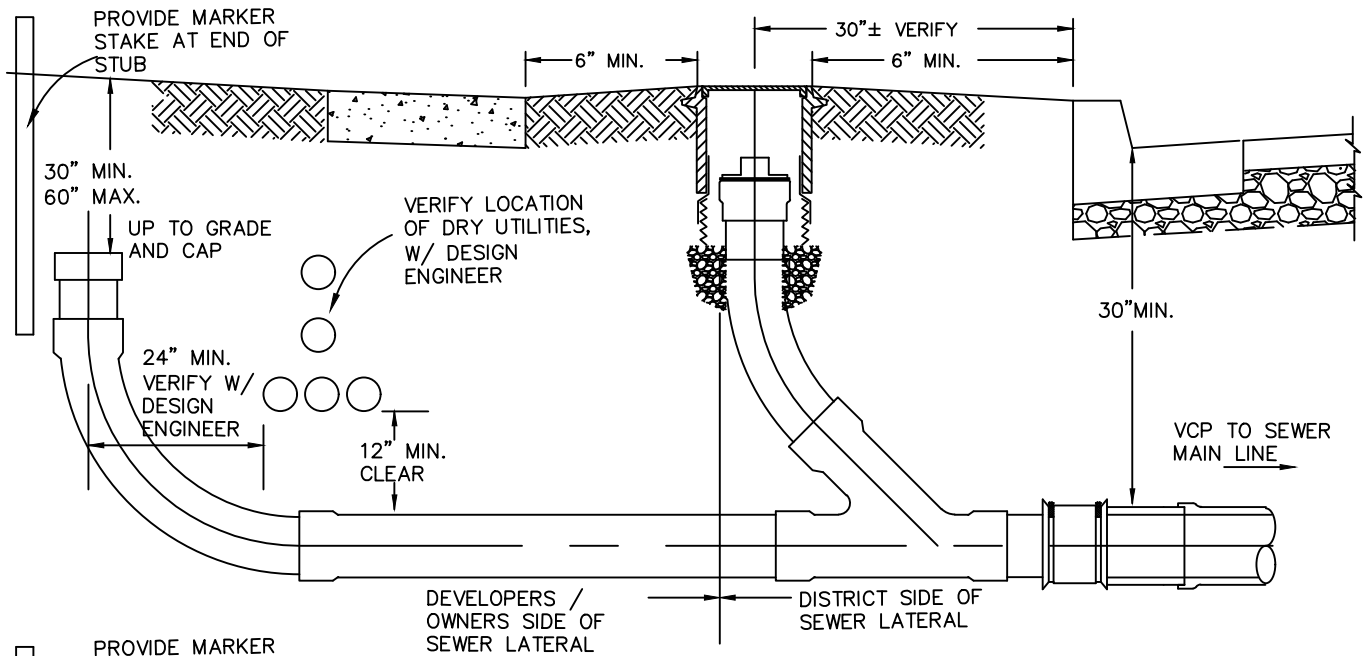
NOTE A:

USE CHRISTY F8 OR F14 CURB VALVE BOX W/ FL8D LID OR GREEN CARSON-BROOK 910 FOR LAWN & LANDSCAPE AREAS. IN TRAFFIC AREAS SUCH AS DRIVEWAYS OR PARKING AREAS USE CHRISTY G5 TRAFFIC BOX W/ G5C LID AND 24" SQ. x 3 1/2" MIN. CONCRETE PAD AROUND THE BOX . ALL BOXES SHALL BE MARKED "SEWER".

.	.	.	OLIVEHURST PUBLIC UTILITY DISTRICT
.	.	.	TYPICAL SEWER CLEANOUT TO GRADE
.	.	.	Garry E. Laughlin
5-05	FORMERLY STD. DTL. NO. SS-4	SCD	District Engineer
DATE	REVISIONS	BY	APPROVED
			5-6-2005 DATE
			5-40



			OLIVEHURST PUBLIC UTILITY DISTRICT
			SEWER SERVICE LATERAL
5-05	FORMERLY STD. DTL. NO. SS-11	SCD	Garry E. Laughlin District Engineer
DATE	REVISIONS	BY	APPROVED
			5-6-2005 DATE
			5-41



			OLIVEHURST PUBLIC UTILITY DISTRICT	
			SEWER SERVICE LATERAL	
5-05	FORMERLY STD. DTL. NO. SS-12	SCD	Garry E. Laughlin District Engineer	
DATE	REVISIONS	BY	APPROVED	5-6-2005 DATE

5-42

GENERAL FORCE MAIN REQUIREMENTS:

- 1 ALL FORCE MAIN SYSTEM DESIGN, MATERIALS, INSTALLATION, AND TESTING SHALL BE PER THE CURRENT OPUD IMPROVEMENT STANDARDS.
- 2 THE MINIMUM COVER SHALL BE THIRTY-SIX (36) INCHES. MINIMUM NET VERTICAL CLEARANCE BETWEEN SUB-GRADE / BOTTOM OF SPECIAL TREATED SOIL SECTION SHALL BE EIGHTEEN (18) INCHES AND TWELVE (12) INCHES BETWEEN UTILITIES. COVER / CLEARANCE SHALL BE AS MEASURED FROM THE MAXIMUM OUTSIDE DIAMETER AT THE BELL OF THE PIPE.

 PIPING MATERIALS: ALL PIPING SHALL BE APPROVED BY THE DISTRICT AND SHALL CONFORM TO THE REQUIREMENTS OF THE CURRENT STANDARDS FOR PIPE WITH A MINIMUM DESIGNED PRESSURE 150 PSI.
 A. DUCTILE IRON WITH A SEAL COATING PROVIDING AN APPROVED SEWAGE RESISTANT SPECIAL INTERIOR LINER,
 B. C-900 DR-18 (NOMINAL SIZE 4" TO 12") OR C-905 DR-25 (NOMINAL SIZE 14" TO 24") PVC (POLYVINYL CHLORIDE) (GREEN IN COLOR), MANUFACTURED FROM COMPOUNDS THAT MEET ASTM D1784, CELL CLASS 12454B.
- 3 THE MAXIMUM DEFLECTION OR BENDING ON ANY PVC PIPE SHALL NOT EXCEED THE MANUFACTURERS WRITTEN SPECIFICATIONS OR APPROXIMATELY 5" AND SHALL NOT BE WITHIN THE ACTUAL PIPE JOINT UNLESS APPROVED IN WRITING BY THE PIPE MANUFACTURER. APPROXIMATE BENDING RADIUS 4" = 125', 6" = 175', 8" = 225', 10" = 275', 12" = 325', 14" = 400', LARGER PIPE AND AN SMALLER RADIUS SHALL BE ACHIEVED BY THE USE OF DUCTILE IRON FITTINGS.
- 4 THE TRENCHING, BEDDING, LAYING, COVER, AND BACKFILL SHALL BE PER OPUD IMPROVEMENT STANDARDS, SECTION 4 AND SECTION 6.
- 5 THE NEW / REPAIRED FORCE MAIN SYSTEM SHALL ONLY BE LOADED BY A DISTRICT-APPROVED METHOD.
- 6 ALL FORCE MAIN LINES SHALL BE PRESSURE TEST: HYDROSTATIC @ 65 PSI FOR A MINIMUM OF TWO (2) HOURS AND OBSERVED BY A REPRESENTATIVE OF THE DISTRICT. THE MAXIMUM LOSS RATE SHALL BE: 0.02 GALLONS PER HOUR PER INCH OF PIPE DIAMETER PER 100 FOOT OF PIPE.
- 7 FLUSHING: BEFORE BEING PLACED IN SERVICE, ALL NEW FORCE MAIN SYSTEMS AND ANY REPLACEMENT IN EXISTING FORCE MAIN SYSTEM, OR EXPOSED SECTION OF THE EXISTING SYSTEM SHALL BE FLUSHED TO THE SATISFACTION OF THE DISTRICT.
- 8 NO BACTERIOLOGICAL TESTING SHALL BE REQUIRED.
- 9 ALL FORCE MAIN SYSTEMS MUST BE PRESSURE TESTED & OPUD APPROVED PRIOR TO CONSTRUCTING ANY ROADWAY STRUCTURAL SECTIONS.

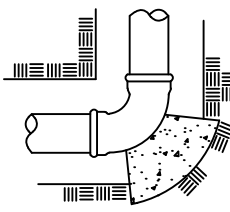
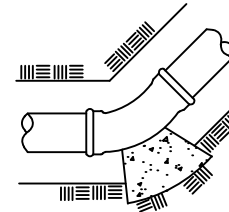
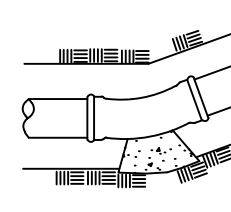
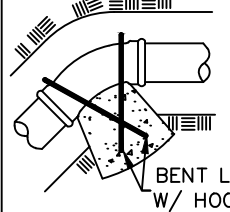
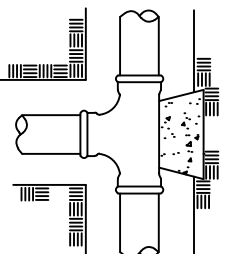
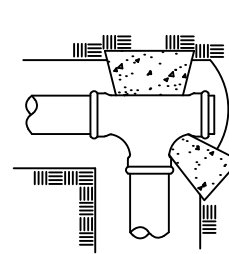
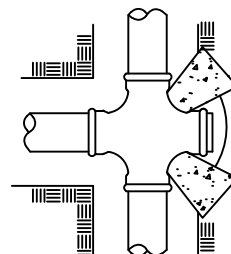
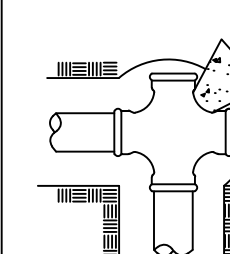
ADDITIONAL NOTES:

- 1. ALL PIPING AND FITTINGS SHALL BE DISTRICT APPROVED DUCTILE IRON, CAST IRON, OR PVC.
- 3. ALL BURIED BOLTS SHALL BE DISTRICT APPROVED STAINLESS STEEL OR CORE TEN "T" BOLTS.

			OLIVEHURST PUBLIC UTILITY DISTRICT
			GENERAL FORCE MAIN REQUIREMENTS
			Garry E. Laughlin
			District Engineer
5-05	NEW DETAIL	SCD	5-6-2005
DATE	REVISIONS	BY	DATE

6-01

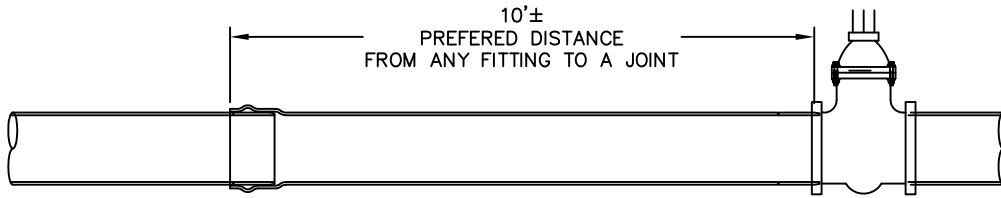
MINIMUM REQUIRED BEARING AREA IN TOTAL SQUARE FEET

TYPE OF FITTING		90° BEND	45° BEND	22 1/2° BEND 11 1/4° BEND	BEND WITH HANGING RESTRAINT
TYPICAL INSTALLATION					 BENT LOOP W/ HOOKED END
SIZE OF PIPE	4"	2	1	1	1 CU. YD.
	6"	4	2	1	1 CU. YD.
	8"	7	4	2	1.5 CU. YD.
	10"	11	6	3	2 CU. YD.
	12"	15	8	5	2.5 CU. YD.
	18"	32	17	8	3 CU. YD.
TYPE OF FITTING		TEE OR DEAD END	TEE WITH PLUG	CROSS W/ PLUG	CROSS W/PLUGS
TYPICAL INSTALLATION					
SIZE OF PIPE	4"	2	2 EA	2 EA	2
	6"	4	4 EA	4 EA	4
	8"	7	7 EA	7 EA	7
	10"	11	11 EA	11 EA	11
	12"	15	15 EA	15 EA	15
	18"	32	32 EA	32 EA	32

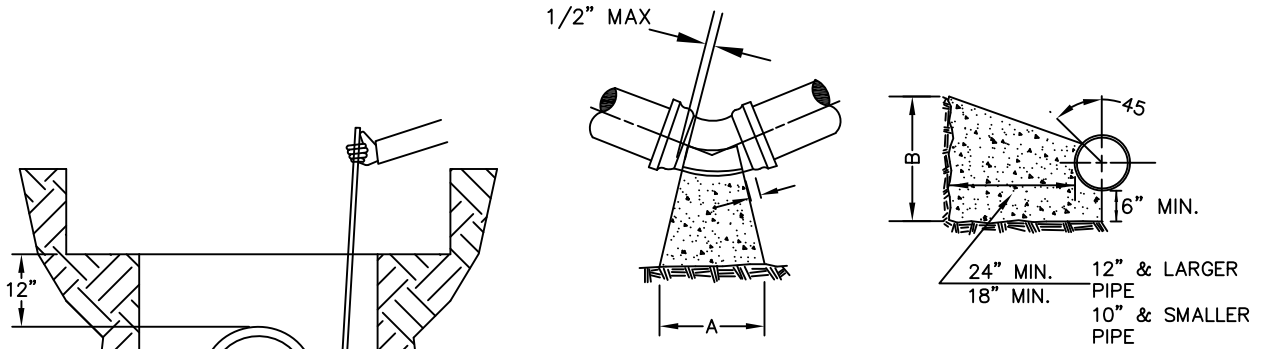
NOTES:

1. THRUST BLOCKS SHALL BE CONSTRUCTED OF CLASS "B" CONCRETE.
2. BEARING AREAS GIVEN ARE FOR CLASS 150 PIPE AT TEST PRESSURE OF 65 P.S.I. IN SOIL WITH 2,000 P.S.F. BEARING CAPACITY. INSTALLATIONS USING DIFFERENT PIPE, TEST PRESSURES, AND/OR SOIL TYPES SHOULD ADJUST AREAS ACCORDINGLY, SUBJECT TO APPROVAL OF DISTRICT ENGINEER.
3. THRUST BLOCKS SHALL BE POURED AGAINST FIRM UNDISTURBED SOIL.
4. PROVIDE A COATING ON ALL BOLTS AND A MINIMUM OF TWO WRAPS OF A 10 mil POLYETHYLENE ENCASEMENT OF ALL PIPING AND FITTING TO PREVENT CONCRETE FROM DIRECT CONTACT.
5. ALL JOINTS AND BOLTS SHALL BE KEPT CLEAR OF CONCRETE.
6. THRUST BLOCKS SHALL BE PLACED 48 HOURS BEFORE TESTING.
7. ALL PLUGS SHALL BE SECURED WITH THRUST BLOCKS OR JOINT RESTRAINTS.

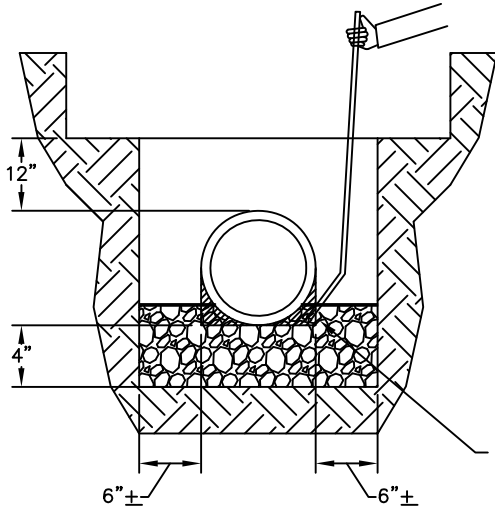
.	.	.	OLIVEHURST PUBLIC UTILITY DISTRICT THRUST BLOCKS
.	.	.	
.	.	.	
.	.	.	
5-05	FORMERLY STD. DTL. NO. W-14	SCD	
DATE	REVISIONS	BY	Garry E. Laughlin District Engineer APPROVED
			5-6-2005 DATE
			6-02



TYPICAL DISTANCE BEYOND A FITTING



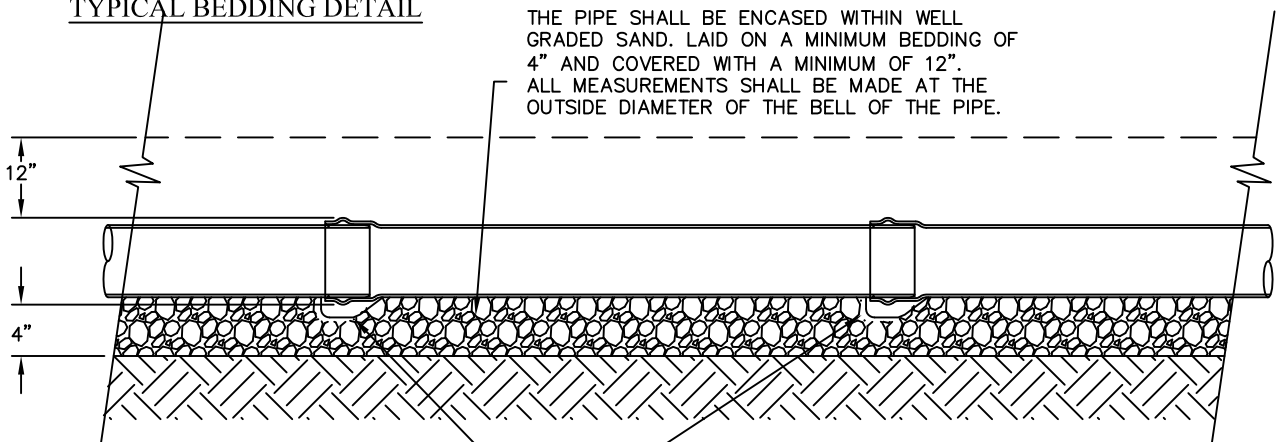
TYPICAL THRUST BLOCK DETAIL



TYPICAL BEDDING DETAIL

PER THE TYPICAL MANUFACTURER "AFTER EACH PIPE HAD BEEN BROUGHT TO GRADE, ALIGNED, AND PLACED IN FINAL POSITION, DEPOSIT AND SHOVEL SLICE OR SPADE BEDDING MATERIAL UNDER THE PIPE HAUNCHES. ALL FITTINGS SHALL BE BEDDED TO PREVENT SHEAR LOADING."

THE PIPE SHALL BE ENCASED WITHIN WELL GRADED SAND. LAID ON A MINIMUM BEDDING OF 4" AND COVERED WITH A MINIMUM OF 12". ALL MEASUREMENTS SHALL BE MADE AT THE OUTSIDE DIAMETER OF THE BELL OF THE PIPE.



TYPICAL BEDDING DETAIL

PER THE TYPICAL MANUFACTURER "BELL HOLES SHALL BE EXCAVATED TO PREVENT POINT LOADING OF THE BELLS OR COUPLINGS OF LAID PIPE, AND TO ESTABLISH FULL-LENGTH SUPPORT OF THE PIPE BARREL."

NOTES:

1. REFER TO THE OPUD IMPROVEMENT STANDARDS.

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			TYPICAL PIPE DETAILS	
5-05	NEW DETAIL	SCD	Garry E. Laughlin	
DATE	REVISIONS	BY	District Engineer	5-6-2005
			APPROVED	DATE
			6-03	

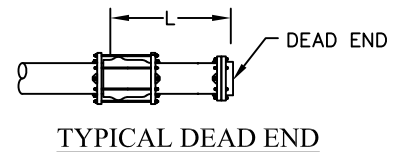
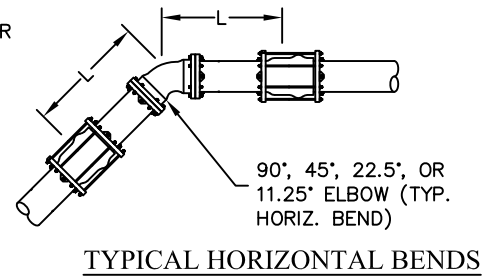
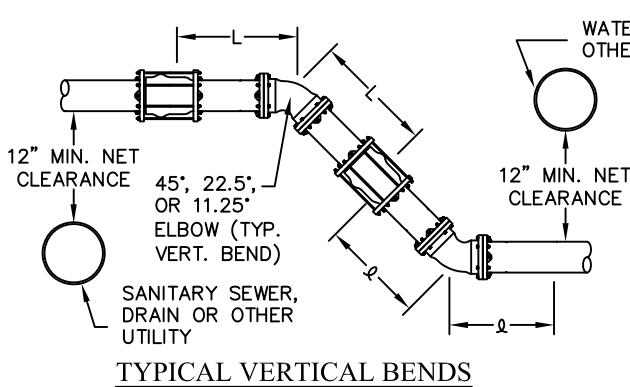
RESTRAINT JOINT LENGTH SCHEDULE (PVC)

TRENCHED IN INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY
& BACKFILLED W/ NATIVE OR GRANULAR MATERIAL

EACH SIDE OF VERTICAL BEND									EACH SIDE OF HORIZONTAL BEND						
PIPE SIZE	11.25° BEND		22.5° BEND		45° BEND		DEPTH OF BEND		PIPE SIZE	11.25° BEND	22.5° BEND	45° BEND	90° BEND	DEAD END	AVERAGE DEPTH
	L	ℓ	L	ℓ	L	ℓ	HIGH	LOW		L	L	L	L	L	
3"	2'	1'	3'	1'	7'	2'	3'	6'	3"	1'	1'	2'	4'	15'	3'
4"	2'	1'	4'	1'	8'	2'	3'	6'	4"	1'	1'	2'	5'	18'	3'
6"	3'	1'	5'	1'	11'	3'	3'	6'	6"	1'	1'	3'	7'	25'	3'
8"	4'	1'	7'	2'	15'	4'	3'	6'	8"	1'	2'	4'	10'	33'	3'
10"	4'	1'	9'	2'	18'	4'	3'	6'	10"	1'	2'	5'	12'	39'	3'
12"	5'	1'	10'	2'	22'	5'	3'	6'	12"	1'	3'	6'	14'	46'	3'
14"	6'	1'	12'	3'	25'	6'	3'	6'	14"	2'	3'	6'	16'	53'	3'
16"	7'	2'	13'	3'	28'	6'	3'	6'	16"	2'	4'	7'	18'	60'	3'
18"	7'	2'	15'	3'	31'	7'	3'	6'	18"	2'	4'	8'	20'	66'	3'
20"	8'	2'	16'	4'	34'	8'	3'	6'	20"	2'	4'	9'	22'	72'	3'
24"	10'	2'	19'	4'	40'	9'	3'	6'	24"	2'	5'	10'	25'	84'	3'

L = UPPER BEND RESTRAINED JOINT LENGTH (REFER TO DETAILS BELOW)

ℓ = LOWER BEND RESTRAINED JOINT LENGTH (REFER TO VERTICAL DETAIL BELOW)



NOTES:

1. ALL JOINTS WITHIN THE RESTRAINED LENGTH MUST BE RESTRAINED.
2. THE ABOVE TABLE OF RESTRAINT JOINTS LENGTHS IS BASED ON EBAA RESTRAINT JOINT CALCULATION PROGRAM (4.0) USING THE SOILS TYPE LISTED AND USING POLYVINYL CHLORIDE (PVC) PRESSURE PIPE MEETING THE REQUIREMENTS OF ANSI/AWWA C900, C905, OR ASTM D2241 WITH A MINIMUM OF THREE (3) FEET OF COMPACTED COVER AT A TEST PRESSURE OF 65 psi AND USING A MINIMUM SAFETY FACTOR 1.5 TO 1.
3. THE TRENCH TYPE USED FOR THE CALCULATIONS ASSUMED A PIPE BED IN COMPACTED GRANULAR MATERIAL TO 8 INCHES MINIMUM ABOVE THE TOP OF THE PIPE, AND 4 INCHES MINIMUM UNDER THE PIPE. COMPACTED BACKFILL MATERIALS SHALL ONLY BE DISTRICT APPROVED NATIVE, GRANULAR, OR SELECT MATERIALS. (COMPACTION OF ALL MATERIALS SHALL BE AS NEEDED TO MEET THE CURRENT DISTRICT REQUIREMENTS)
4. RESTRAINED JOINT LENGTHS FOR TRENCHING IN OTHER MATERIALS AND FOR SHORTER RESTRAINT LENGTHS THE DESIGN ENGINEER SHALL SUBMIT A SOILS REPORT AND THRUST RESTRAINT CALCULATIONS FOR REVIEW.

			OLIVEHURST PUBLIC UTILITY DISTRICT
			RESTRAINT LENGTHS FOR PVC
5-05	FORMERLY STD. DTL. NO. W-19	SCD	Garry E. Laughlin
DATE	REVISIONS	BY	District Engineer
			5-6-2005 DATE
			6-04

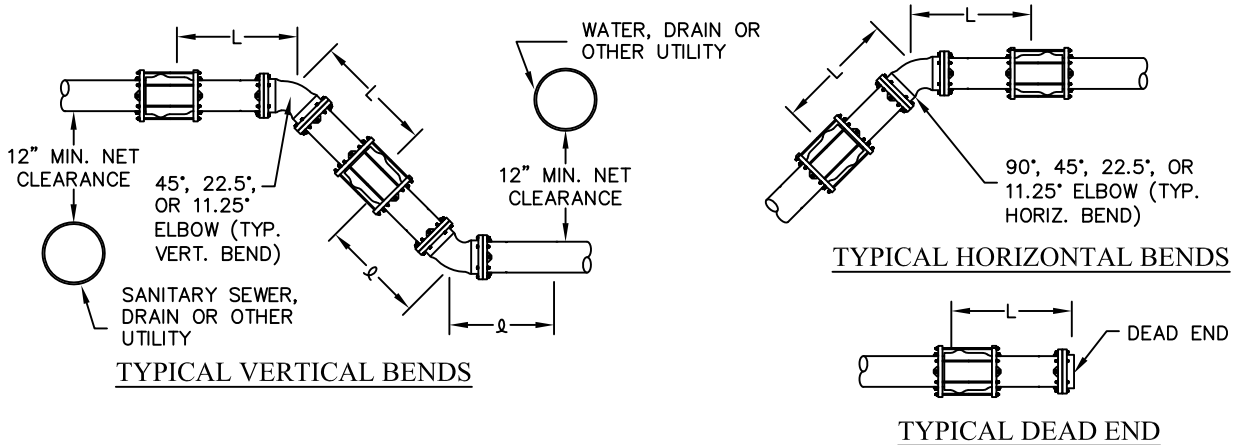
RESTRAINT JOINT LENGTH SCHEDULE (DI w/ WRAP)

TRENCHED IN INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY
& BACKFILLED W/ NATIVE OR GRANULAR MATERIAL

EACH SIDE OF VERTICAL BEND									EACH SIDE OF HORIZONTAL BEND						
PIPE SIZE	11.25° BEND		22.5° BEND		45° BEND		DEPTH OF BEND		PIPE SIZE	11.25° BEND	22.5° BEND	45° BEND	90° BEND	DEAD END	AVERAGE DEPTH
	L	ℓ	L	ℓ	L	ℓ	HIGH	LOW		L	L	L	L	L	
3"	2'	1'	5'	1'	9'	2'	3'	6'	3"	1'	1'	2'	5'	23'	3'
4"	3'	1'	5'	1'	11'	2'	3'	6'	4"	1'	1'	2'	6'	27'	3'
6"	4'	1'	8'	1'	16'	3'	3'	6'	6"	1'	2'	3'	8'	39'	3'
8"	5'	1'	10'	2'	21'	4'	3'	6'	8"	1'	2'	4'	11'	50'	3'
10"	6'	1'	12'	2'	25'	4'	3'	6'	10"	1'	3'	5'	13'	60'	3'
12"	7'	1'	14'	2'	29'	5'	3'	6'	12"	1'	3'	6'	15'	71'	3'
14"	8'	1'	16'	3'	33'	6'	3'	6'	14"	2'	3'	7'	17'	81'	3'
16"	9'	2'	18'	3'	38'	7'	3'	6'	16"	2'	4'	8'	20'	91'	3'
18"	10'	2'	20'	3'	42'	7'	3'	6'	18"	2'	4'	9'	22'	100'	3'
20"	11'	2'	22'	4'	45'	8'	3'	6'	20"	2'	5'	10'	24'	110'	3'
24"	13'	2'	25'	4'	53'	9'	3'	6'	24"	3'	6'	12'	28'	127'	3'

L = UPPER BEND RESTRAINED JOINT LENGTH (REFER TO DETAILS BELOW)

ℓ = LOWER BEND RESTRAINED JOINT LENGTH (REFER TO VERTICAL DETAIL BELOW)

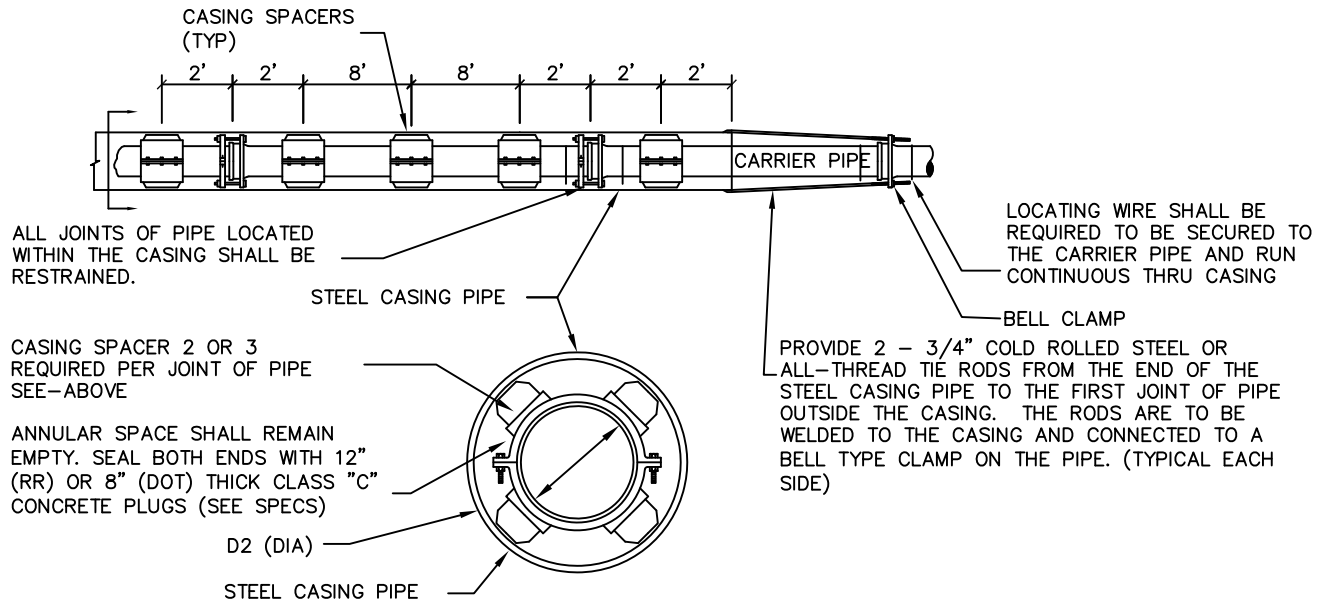


NOTES:

1. ALL JOINTS WITHIN THE RESTRAINED LENGTH MUST BE RESTRAINED.
2. THE ABOVE TABLE OF RESTRAINT JOINTS LENGTHS IS BASED ON EBAA RESTRAINT JOINT CALCULATION PROGRAM (4.0) USING THE SOILS TYPE LISTED AND USING DUCTILE IRON PIPE IN POLYETHYLENE ENCASEMENT MEETING THE REQUIREMENTS OF, AND INSTALLED PER ANSI/AWWA C105/A21.5 WITH A MINIMUM OF THREE (3) FEET OF COMPACTED COVER AT A TEST PRESSURE OF 65 psi AND USING A MINIMUM SAFETY FACTOR 1.5 to 1.
3. THE TRENCH TYPE USED FOR THE CALCULATIONS ASSUMED A PIPE BED IN COMPACTED GRANULAR MATERIAL TO 8 INCHES MINIMUM ABOVE THE TOP OF THE PIPE, AND 4 INCHES MINIMUM UNDER THE PIPE. COMPACTED BACKFILL MATERIALS SHALL ONLY BE DISTRICT APPROVED NATIVE, GRANULAR, OR SELECT MATERIALS. (COMPACTION OF ALL MATERIALS SHALL BE AS NEEDED TO MEET THE CURRENT DISTRICT REQUIREMENTS)
4. RESTRAINED JOINT LENGTHS FOR TRENCHING IN OTHER MATERIALS AND FOR SHORTER RESTRAINED LENGTHS THE DESIGN ENGINEER SHALL SUBMIT A SOILS REPORT AND THRUST RESTRAINT CALCULATIONS FOR REVIEW.

			OLIVEHURST PUBLIC UTILITY DISTRICT
			RESTRAINT LENGTHS FOR DIP W/ WRAP
5-05	FORMERLY STD. DTL. NO. W-19	SCD	Garry E. Laughlin
DATE	REVISIONS	BY	District Engineer
			APPROVED _____ DATE 5-6-2005

6-05



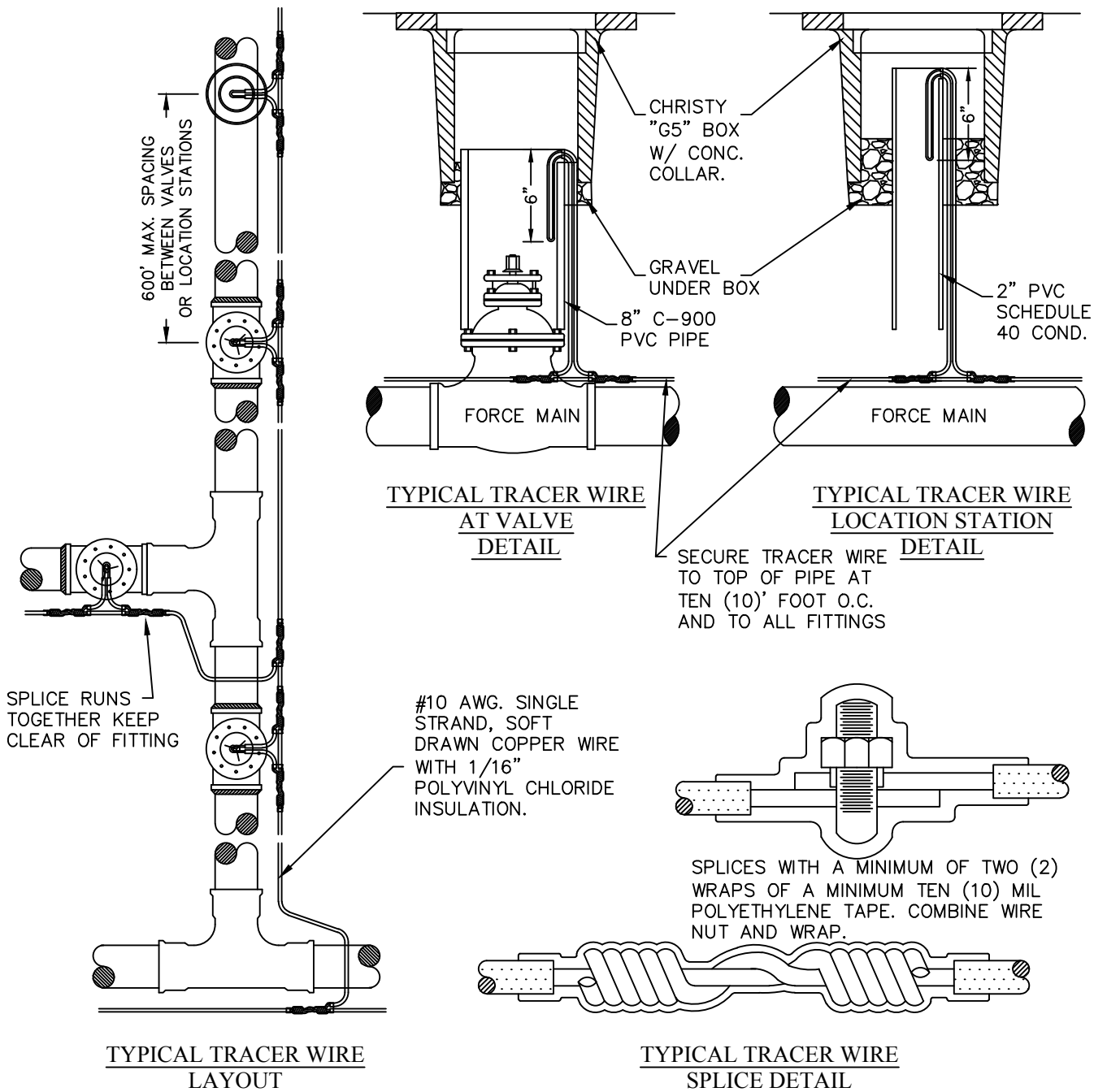
CASING SPACER DETAIL

CARRIER PIPE AND CASING PIPE SIZES (MIN.) IN INCHES														
CARRIER PIPE NOM. DIA. (D ₁)	4	6	8	10	12	14	16	18	20	24	30	36	42	48
CASING PIPE NOM. DIA (D ₂)	14	16	20	20	24	30	30	30	36	42	48	54	60	66
WALL THICKNESS RAILROAD-(FEC)	0.25	0.25	0.375	0.375	0.375	0.50	0.50	0.50	0.562	0.625	0.625	0.688	0.781	0.781
WALL THICKNESS RAILROAD-(CSX)	0.25	0.281	0.375	0.375	0.375	0.469	0.469	0.469	0.562	0.625	0.688	0.781	0.844	0.938
WALL THICKNESS-DOT	0.25	0.25	0.25	0.25	0.25	0.312	0.312	0.312	0.375	0.50	0.50	0.50	0.50	0.50

NOTES:

1. MIN. COVER TO TOP OF CASING; a) FEDERAL D.O.T.-3.0' b)RAILROAD-5.5' TO BASE OF RAIL, 4.5' FOR SECONDARY OR INDUSTRIAL TRACKS.
2. THE INSIDE DIAMETER OF THE CASING PIPE SHALL BE A MINIMUM OF 4 INCHES GREATER THAN THE OUTSIDE DIAMETER OF THE CARRIER PIPE BELL OR COUPLING. HOWEVER, A MINIMUM OF 6 INCHES IS REQUIRED FOR R.R. CROSSINGS.
3. THE MINIMUM COVER FOR CASING SHALL BE 5.0 FEET BELOW FINISH GRADE OR AS DIRECTED BY THE AGENCY HAVING JURISDICTION.
4. ALL JOINTS WITHIN CARRIER PIPE SHALL BE MECHANICAL RESTRAINED JOINTS.
5. FOR STREET USES WHICH ARE NOT DOT OR RAILROAD, USE D.O.T. CASING THICKNESS UNLESS OTHERWISE INDICATED BY DESIGN ENGINEER AND APPROVED BY THE DISTRICT ENGINEER.
6. CASING PIPE SHALL BE FURNISHED IN NOMINAL 8 FOOT LENGTHS (MIN.) UNLESS OTHERWISE INDICATED ON THE DRAWING OR APPROVED BY THE DISTRICT.
7. PIPE TO BE USED AS A CASING SHALL CONFORM TO EITHER ASTM STANDARD A139 FOR "ELECTRIC FUSION (ARC) WELDED STEEL PIPE" WITH A MINIMUM YIELD STRENGTH OF 35,000 PSI OR "API SPECIFICATION API-5LX, GRADE X-42 WELDED STEEL PIPE".

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			CASING FOR CARRIER PIPE	
5-05	NEW DETAIL	SCD	Garry E. Laughlin	
DATE	REVISIONS	BY	APPROVED	DATE
				6-06

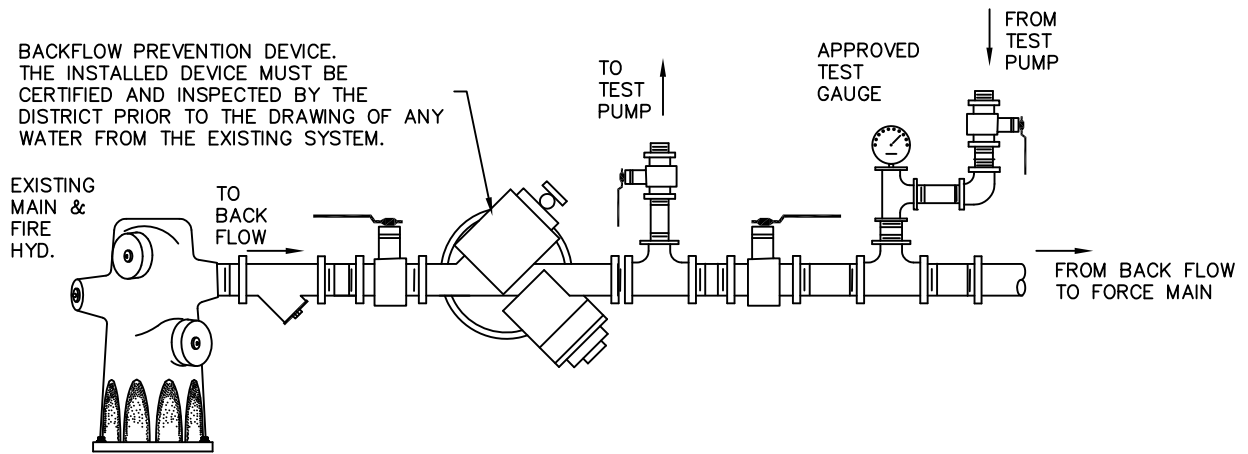


NOTES:

1. ALL TRACER WIRE SHALL BE #10 AWG. SINGLE STRAND, SOFT DRAWN COPPER WIRE WITH 1/16" POLYVINYL CHLORIDE INSULATION (FOR DIRECT BURIAL USE ONLY).
2. ALL TRACER WIRE SHALL BE CONTINUOUS BETWEEN VALVE BOXES AND TRACER WIRE STATIONS.
3. TRACER / LOCATING WIRE SHALL BE LAID ON TOP OF THE LINE, AND SHALL BE SECURED BY TAPE (OR OTHER APPROVED METHOD) TO THE LINE (OR THE POLYETHYLENE ENCASEMENT IF DUCTILE IRON) AT TEN (10) FOOT MAXIMUM INTERVALS AND TAPPED AT ALL FITTINGS. TAPE SHALL BE TEN (10) MIL POLYETHYLENE.
4. ALL SPLICES SHALL BE TIGHT WRAPPED (A MINIMUM OF 12 TIMES TOTAL) AND SOLDERED OR CLAMPED WITH ONE (1) ELECTRICAL SPLIT BOLT CONNECTOR. COVER ALL SPLICES WITH A MINIMUM OF TWO (2) WRAPS OF A MINIMUM TEN (10) MIL POLYETHYLENE TAPE.
5. THE CONTRACTOR SHALL CONDUCT A CONTINUITY TEST ON ALL SPLICES AND BETWEEN THE WIRE RISER LOOPS.
6. A FINAL CONTINUITY TEST SHALL BE DONE IN THE PRESENCE OF THE DISTRICT.
7. BARE TRACER WIRE SHALL NOT TOUCH ANY VALVES OR FITTINGS.

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			TRACER WIRE	
5-05	FORMERLY STD. DTL. NO. W-8	SCD	Garry E. Laughlin District Engineer	
DATE	REVISIONS	BY	APPROVED	DATE
				6-08

BACKFLOW PREVENTION DEVICE.
THE INSTALLED DEVICE MUST BE
CERTIFIED AND INSPECTED BY THE
DISTRICT PRIOR TO THE DRAWING OF ANY
WATER FROM THE EXISTING SYSTEM.



FEED FROM FIRE HYDRANT, WHARF OR BLOW OFF

.	.	.	OLIVEHURST PUBLIC UTILITY DISTRICT	
.	.	.		NEW MAIN LOADING AND TESTING
.	.	.		
5-05	FORMERLY STD. DTL. NO. W-20	SCD		Garry E. Laughlin District Engineer
DATE	REVISIONS	BY	APPROVED _____ DATE 5-6-2005	

6-50

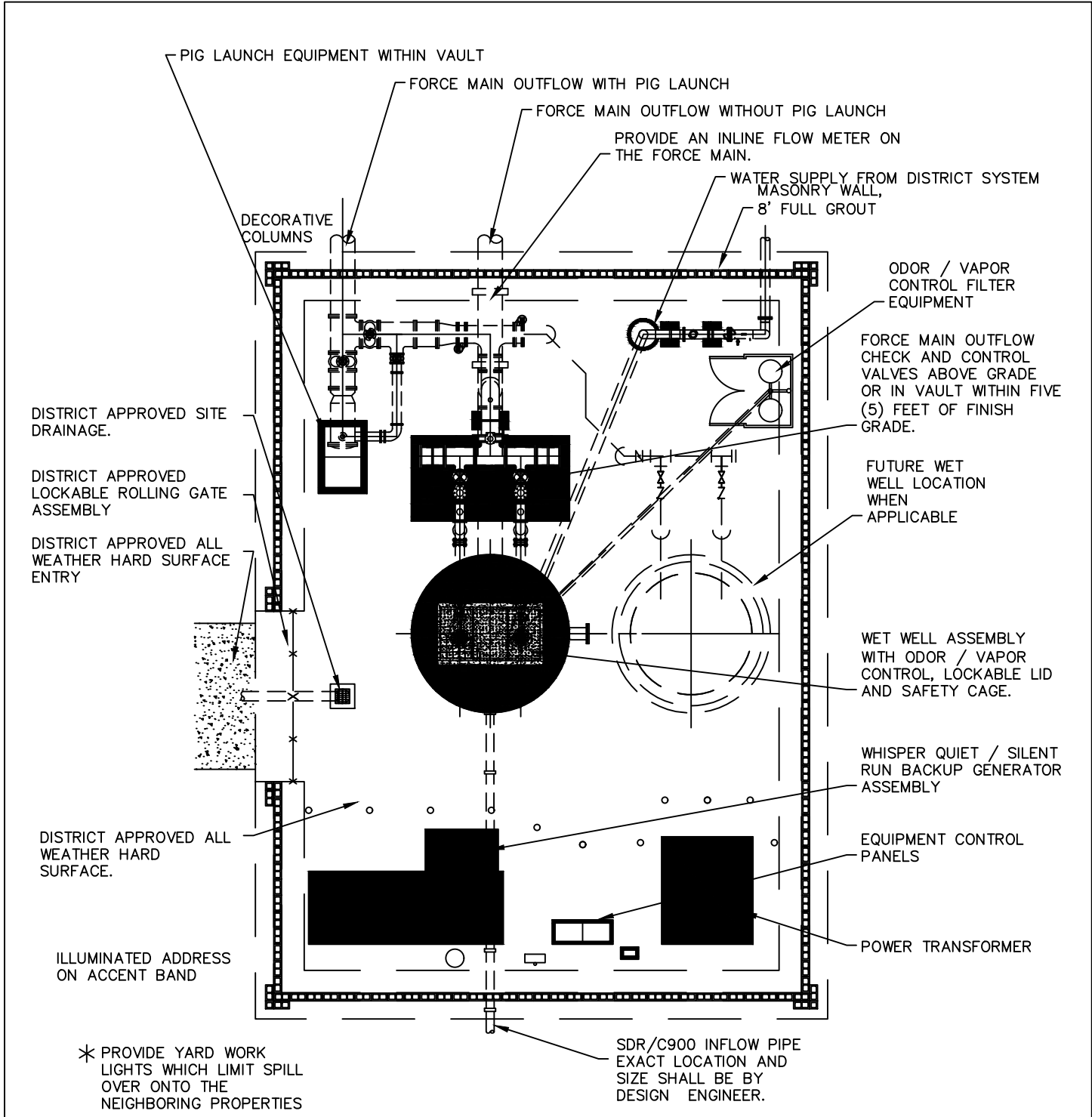
GENERAL SEWER LIFT STATION REQUIREMENTS:

- 1 ALL SANITARY SEWER LIFT STATION SYSTEM DESIGN, MATERIALS, INSTALLATION, AND TESTING SHALL BE PER THE CURRENT OPUD IMPROVEMENT STANDARDS.

 WET WELL STORAGE, CAPACITY, AND SIZE:
 A) NO SANITARY SEWER MAIN LINE PIPE STORAGE WILL BE ALLOWED.
 B) ACTUAL WET WELL STORAGE CAPACITY IN ALL CASES SHALL BE ADEQUATE TO CARRY THE DESIGN FLOW FROM THE ENTIRE TRIBUTARY AREA, EVEN THOUGH SAID AREA MAY NOT LIE WITHIN THE PROJECT BOUNDARIES. IT SHALL BE CALCULATED SO AS TO PROVIDE FOR AT LEAST THE MINIMUM DESIGN STORAGE MULTIPLIED BY TWO (2) PLUS A MINIMUM OF ONE (1) FOOT BELOW LOWEST GRAVITY INLET.
 C) THE MINIMUM WET WELL SIZE SHALL BE EIGHT (8) FEET IN DIAMETER UNLESS OTHERWISE APPROVED BY THE DISTRICT ENGINEER.
- 2
- 3 THE PUMPS SHALL BE VAUGHN SUBMERSIBLE CHOPPER PUMPS, EQUIPPED WITH 3-PHASE ELECTRIC EXPLOSION PROOF MOTOR AND RAIL SYSTEM.
 MOTOR CONTROL PANEL SHALL BE A TOUCHSCREEN PANEL EQUIPPED WITH A DIGITAL LEVEL AND PROGRAMMABLE CONTROLLER. THE DISTRICT MUST RECEIVE A COPY OF THE PROGRAMMING SOFTWARE FOR TROUBLESHOOTING AND DIAGNOSTIC NEEDS. THE PANEL SHALL BE FURNISHED WITH AN ALARM LIGHT (EXTENDED ABOVE THE ENCLOSURE AND VISIBLE FROM THE STREET), REMOTE ALARM TRANSMITTERS, AND AUDIBLE ALARM AS DIRECTED BY THE DISTRICT.
- 4
- 5 THE INTERIOR OF ALL WET WELLS SHALL BE PROPERLY CLEANED AND DRIED AND SHALL BE ARMOROCK POLYMER CONCRETE OR PROVEN EQUAL. MANUFACTURER SPECIFICATIONS AND INSTALLATION INSTRUCTIONS CAN BE FOUND AT ARMOROCK.COM
- 6 ALL LIFT STATION WET WELLS SHALL HAVE A SPARK TEST PERFORMED OVER THE ENTIRE SURFACE OF THE WET WELL TO VERIFY THAT NO HOLES AND / OR ANY DEFECTS EXIST. THE CONTRACTOR SHALL COORDINATE WITH THE DISTRICT AND HAVE THE DISTRICT ENGINEER AND / OR INSPECTOR PRESENT DURING THE TESTING.
- 7 A GENERATOR SHALL BE DESIGNED TO BE A QUIET OPERATING, LOW EXHAUST EMISSIONS, DUTY RATED-STANDBY POWER SYSTEM WITH A SELF-CONTAINED FUEL SUPPLY.

 THE SEWER LIFT STATION SYSTEM SHALL BE PROVIDED WITH AN ODOR CONTROL VENTILATION SYSTEM, WHICH CONSISTS OF REPLACEABLE FILTER DEVICE(S), DESIGNED TO PROPERLY VENT THE WET WELL ASSEMBLY AND LIMIT THE ESCAPE OF ALL OBNOXIOUS SEWAGE GASES AND ODORS. THE DIVERSION OF ODOR TO THE VENTILATION PIPING SHALL BE ACHIEVED BY POSITIVE FLOW FROM A MECHANICAL FAN (500 CFM, OR AS DIRECTED BY THE DISTRICT ENGINEER).
- 8
- 9 WATER SUPPLY SHALL BE PROVIDED ON-SITE BY PROVIDING A DISTRICT APPROVED WATER PIPE.
- 10 PERIMETER WALLS SHALL CONSIST OF AN ENGINEERED MASONRY WALL WITH A LOCKABLE GATE ASSEMBLY.
- 11 LIFT STATION SITE SHALL HAVE A DISTRICT APPROVED HARD ALL WEATHER FINISH SURFACE.

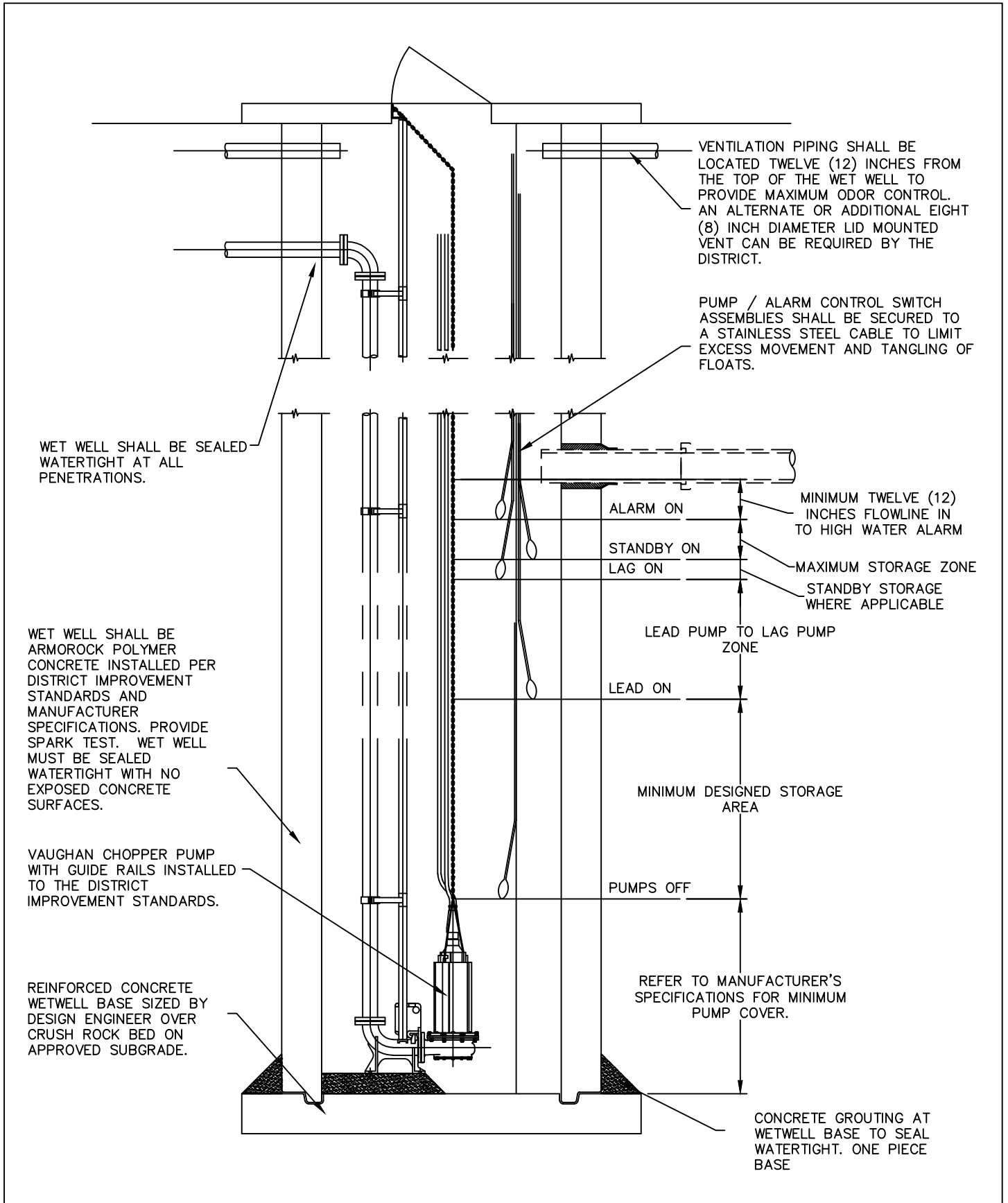
			OLIVEHURST PUBLIC UTILITY DISTRICT
			GENERAL LIFT STATION REQUIREMENTS
6-19	CHANGED NOTE 4	CNO	Garry E. Laughlin District Engineer APPROVED _____ DATE 5-6-2005
5-05	NEW DETAIL	SCD	
DATE	REVISIONS	BY	
			7-01



NOTES:

1. DESIGN ENGINEER SHALL SUBMIT TENTATIVE DESIGN PLAN FOR REVIEW AND COMMENT PRIOR TO FINAL DESIGN OF SANITARY SEWER LIFT STATION.
2. THE COMPLETE SITE AND ACCESS TO A PUBLIC WAY SHALL BE GRANT DEEDED TO THE DISTRICT PRIOR TO FINAL ACCEPTANCE OF THE PROJECT.

			OLIVEHURST PUBLIC UTILITY DISTRICT
			TYPICAL WET WELL SITE PLAN
			Garry E. Laughlin District Engineer
5-05	NEW DETAIL	SCD	7-10
DATE	REVISIONS	BY	
			5-6-2005 DATE



			OLIVEHURST PUBLIC UTILITY DISTRICT	
			TYPICAL WET WELL SECTION	
5-05	NEW DETAIL	SCD	Garry E. Laughlin	
DATE	REVISIONS	BY	District Engineer	5-6-2005
			APPROVED	DATE

7-20

GENERAL WATER LINE REQUIREMENTS:

- 1 ALL WATER SYSTEM DESIGN, MATERIALS, INSTALLATION, AND TESTING SHALL BE PER THE CURRENT OPUD IMPROVEMENT STANDARDS.
- 2 THE MINIMUM COVER SHALL BE THIRTY-SIX (36) INCHES. MINIMUM NET VERTICAL CLEARANCE BETWEEN SUB-GRADE / BOTTOM OF SPECIAL TREATED SOIL SECTION SHALL BE EIGHTEEN (18) INCHES AND TWELVE (12) INCHES BETWEEN UTILITIES. COVER / CLEARANCE SHALL BE AS MEASURED FROM THE MAXIMUM OUTSIDE DIAMETER AT THE BELL OF THE PIPE.
- PIPING MATERIALS: ALL PIPING SHALL BE APPROVED BY THE DISTRICT AND SHALL CONFORM TO THE REQUIREMENTS OF THE CURRENT A.W.W.A. STANDARDS FOR WATER PIPE WITH A MINIMUM DESIGNED PRESSURE 150 PSI.
 - A. DUCTILE IRON WITH AN AWWA ACCEPTED INTERIOR SURFACE LINER AND A SEAL COATING,
 - B. C-900 DR-18 (NOMINAL SIZE 4" TO 12") OR C-905 DR-25 (NOMINAL SIZE 14" TO 24") PVC (POLYVINYL CHLORIDE) (BLUE IN COLOR), MANUFACTURED FROM COMPOUNDS THAT MEET ASTM D1784, CELL CLASS 12454B.
- 3 THE MAXIMUM DEFLECTION OR BENDING OF ANY PVC PIPE SHALL NOT EXCEED THE MANUFACTURERS WRITTEN SPECIFICATIONS OR APPROXIMATELY 5' AND SHALL NOT BE WITHIN THE ACTUAL PIPE JOINT UNLESS APPROVED IN WRITING BY THE PIPE MANUFACTURER. APPROXIMATE BENDING RADIUS 4" = 125', 6" = 175', 8" = 225', 10" = 275', 12" = 325', 14" = 400', LARGER PIPE AND AN SMALLER RADIUS SHALL BE ACHIEVED BY THE USE OF DUCTILE IRON FITTINGS.
- 4 THE TRENCHING, BEDDING, LAYING, COVER, AND BACKFILL SHALL BE PER OPUD IMPROVEMENT STANDARDS, SECTION 4 AND SECTION 8.
- 5 THE NEW / REPAIRED WATER SYSTEM SHALL ONLY BE LOADED BY A DISTRICT-APPROVED METHOD.
- 6 ALL WATER LINES SHALL BE PRESSURE TESTED PER THE FOLLOWING: HYDROSTATIC @ 150 PSI FOR A MINIMUM OF TWO (2) HOURS AND OBSERVED BY A REPRESENTATIVE OF THE DISTRICT. THE MAXIMUM LOSS RATE SHALL BE: 0.02 GALLONS PER HOUR PER INCH OF PIPE DIAMETER PER 100 FOOT OF PIPE.
- 7 DISINFECTION AND FLUSHING: BEFORE BEING PLACED IN SERVICE, ALL NEW WATER SYSTEMS AND ANY REPLACEMENT OF THE EXISTING WATER SYSTEM, OR EXPOSED SECTION OF THE EXISTING SYSTEM SHALL BE DISINFECTED TO THE SATISFACTION OF THE DISTRICT.
- 8 BACTERIOLOGICAL TESTING SHALL BE DONE BY A DISTRICT APPROVED TESTER AND PROVIDED BY THE CONTRACTOR / DEVELOPER AT NO COST TO THE DISTRICT.
- 9 ALL WATER SYSTEMS MUST BE PRESSURE TESTED & OPUD APPROVED PRIOR TO CONSTRUCTING ANY ROADWAY STRUCTURAL SECTIONS.
- 10

ADDITIONAL NOTES:

- 1. ALL PIPING AND FITTINGS LESS THAN 3" SHALL BE A.W.W.A. AND DISTRICT APPROVED BRASS, BRONZE, POLY , OR STAINLESS STEEL.
- 2. ALL PIPING AND FITTINGS 3" AND LARGER SHALL BE A.W.W.A. AND DISTRICT APPROVED DUCTILE IRON OR PVC.
- 3. ALL BURIED BOLTS SHALL BE A.W.W.A. AND DISTRICT APPROVED STAINLESS STEEL OR CORE TEN "T" BOLTS.

			OLIVEHURST PUBLIC UTILITY DISTRICT
			GENERAL WATER LINE REQUIREMENTS
			Garry E. Laughlin
5-05	FORMERLY STD. DTL. NO. WS-01	SCD	District Engineer
DATE	REVISIONS	BY	APPROVED
			5-6-2005
			DATE
			8-01

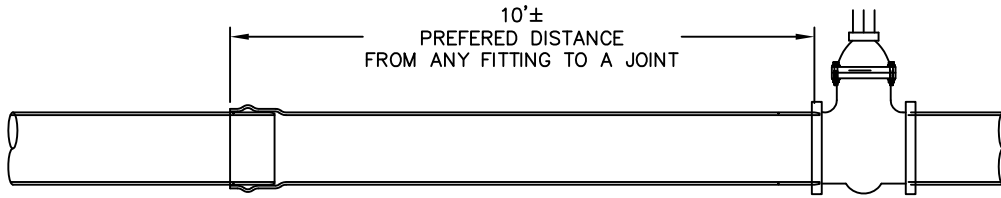
MINIMUM REQUIRED BEARING AREA IN TOTAL SQUARE FEET

TYPE OF FITTING		90° BEND	45° BEND	22 1/2° BEND 11 1/4° BEND	BEND WITH HANGING RESTRAINT
TYPICAL INSTALLATION					
SIZE OF PIPE	4"	2	1	1	1 CU. YD.
	6"	4	2	1	1 CU. YD.
	8"	7	4	2	1.5 CU. YD.
	10"	11	6	3	2 CU. YD.
	12"	15	8	5	2.5 CU. YD.
	18"	32	17	8	3 CU. YD.
TYPE OF FITTING		TEE OR DEAD END	TEE WITH PLUG	CROSS W/ PLUG	CROSS W/PLUGS
TYPICAL INSTALLATION					
SIZE OF PIPE	4"	2	2 EA	2 EA	2
	6"	4	4 EA	4 EA	4
	8"	7	7 EA	7 EA	7
	10"	11	11 EA	11 EA	12
	12"	15	15 EA	15 EA	16
	18"	32	32 EA	32 EA	28

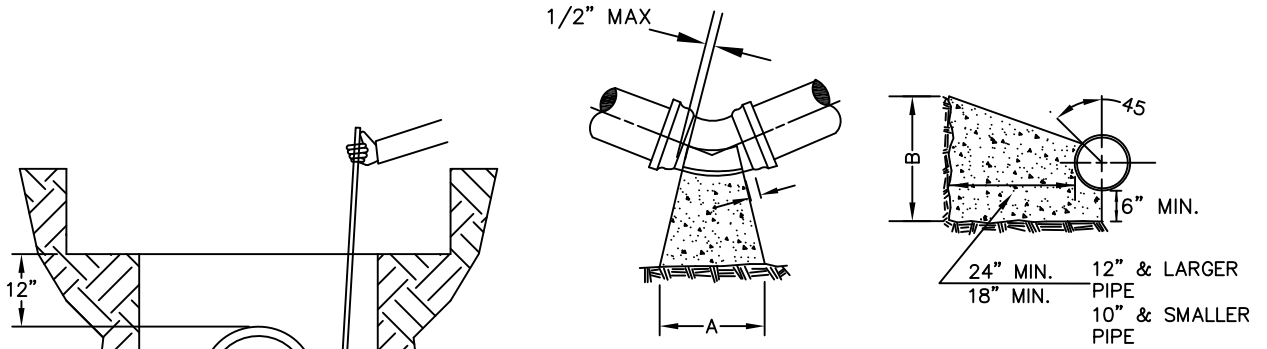
NOTES:

1. MINIMUM REQUIRED THRUST BLOCK BEARING AREAS LISTED IN THE ABOVE TABLE ARE SHOWN IN SQUARE FEET UNLESS OTHERWISE NOTED AND ARE FOR CLASS 150 PIPE AT TEST PRESSURE OF 150 P.S.I. IN SOIL WITH A MINIMUM 2,000 P.S.F. BEARING CAPACITY.
2. INSTALLATION IN ANY AREA HAVING A SOIL TYPE WITH A LESSER BEARING CAPACITY AND/OR SITE CONDITIONS AND PIPE SIZES NOT INDICATED IN THE ABOVE TABLE SHALL BE ENGINEERED BY THE DESIGN ENGINEER, AND ARE SUBJECT TO ACCEPTANCE BY THE DISTRICT ENGINEER. (THE DISTRICT SHALL BE PROVIDED WITH A COPY OF THE GEOTECHNICAL ENGINEER'S REPORT)
3. ALL THRUST BLOCKS SHALL BE CONSTRUCTED OF CLASS "B" CONCRETE AND SHALL BE POURED AGAINST FIRM UNDISTURBED SOIL. (THRUST BLOCKS SHALL EXTEND OUT A MINIMUM OF 18" FROM 4" THRU 10" PIPE AND 24" FROM 12" AND LARGER PIPE)
4. PROVIDE A COATING ON ALL BOLTS AND A MINIMUM OF TWO WRAPS OF A 8 mil POLYETHYLENE ENCASUREMENT OF ALL PIPING AND FITTING TO PREVENT CONCRETE FROM DIRECT CONTACT.
5. ALL JOINTS AND BOLTS SHALL BE KEPT A MINIMUM OF 1/2" CLEAR OF CONCRETE.
6. THRUST BLOCKS SHALL BE PLACED 48 HOURS BEFORE TESTING.
7. ALL PLUGS SHALL BE SECURED WITH THRUST BLOCKS OR JOINT RESTRAINTS.
8. ALL BURIED METAL STRAPS SHALL BE STAINLESS STEEL OR COATED AND PROTECTED FROM CORROSION AND BE A GAUGE AND SIZE CAPABLE OF ACHIEVING THE DESIGN STRENGTHS.

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			THRUST BLOCKS	
			Garry E. Laughlin	
5-05	FORMERLY STD. DTL. NO. W-14	SCD	District Engineer	
DATE	REVISIONS	BY	APPROVED	DATE
				8-02

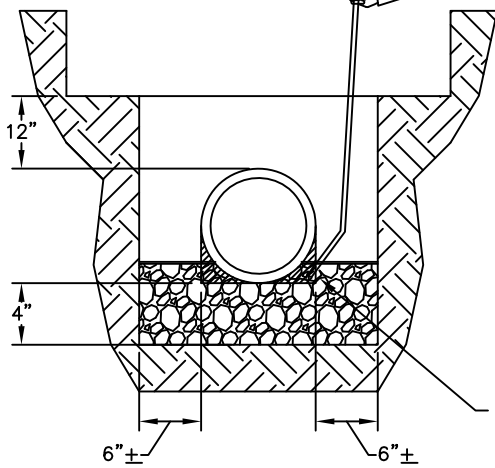


TYPICAL DISTANCE BEYOND A FITTING



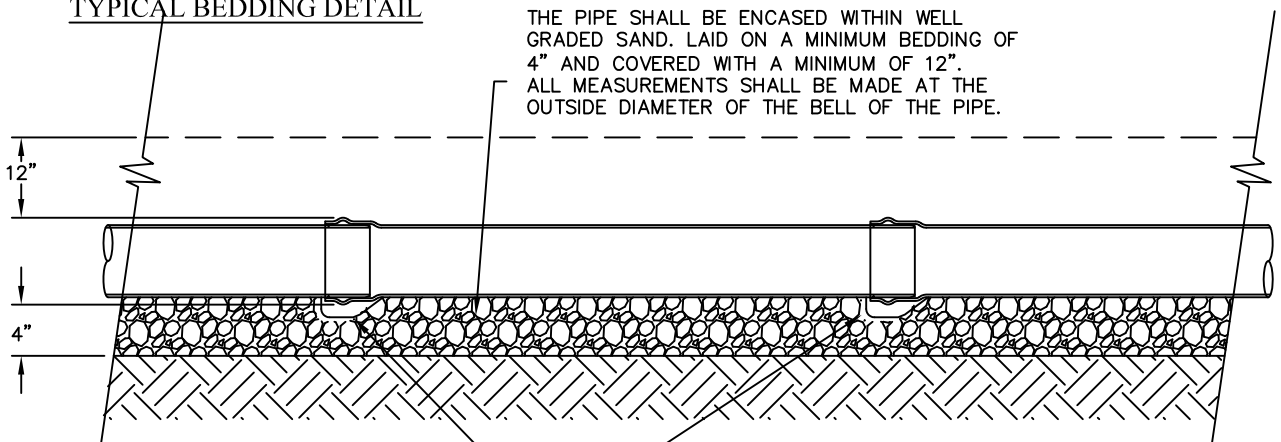
TYPICAL THRUST BLOCK DETAIL

PER THE TYPICAL MANUFACTURER "AFTER EACH PIPE HAD BEEN BROUGHT TO GRADE, ALIGNED, AND PLACED IN FINAL POSITION, DEPOSIT AND SHOVEL SLICE OR SPADE BEDDING MATERIAL UNDER THE PIPE HAUNCHES. ALL FITTINGS SHALL BE BEDDED TO PREVENT SHEAR LOADING."



TYPICAL BEDDING DETAIL

THE PIPE SHALL BE ENCASED WITHIN WELL GRADED SAND. LAID ON A MINIMUM BEDDING OF 4" AND COVERED WITH A MINIMUM OF 12". ALL MEASUREMENTS SHALL BE MADE AT THE OUTSIDE DIAMETER OF THE BELL OF THE PIPE.



TYPICAL BEDDING DETAIL

PER THE TYPICAL MANUFACTURER "BELL HOLES SHALL BE EXCAVATED TO PREVENT POINT LOADING OF THE BELLS OR COUPLINGS OF LAID PIPE, AND TO ESTABLISH FULL-LENGTH SUPPORT OF THE PIPE BARREL."

NOTES:

1. REFER TO THE OPUD IMPROVEMENT STANDARDS.

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			TYPICAL PIPE DETAILS	
5-05	NEW DETAIL	SCD	Garry E. Laughlin	
DATE	REVISIONS	BY	District Engineer	5-6-2005
			APPROVED	DATE

8-03

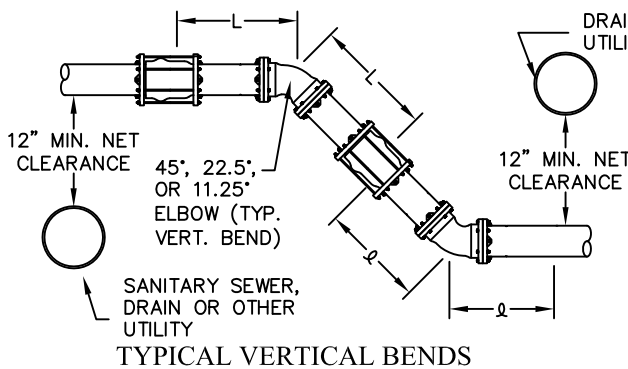
RESTRAINT JOINT LENGTH SCHEDULE (PVC)

TRENCHED IN INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY
& BACKFILLED W/ NATIVE OR GRANULAR MATERIAL

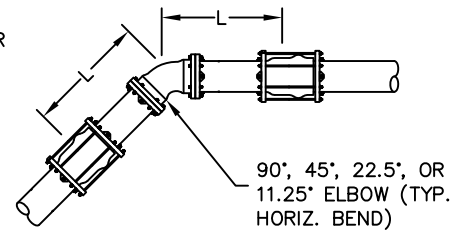
EACH SIDE OF VERTICAL BEND									EACH SIDE OF HORIZONTAL BEND						
PIPE SIZE	11.25° BEND		22.5° BEND		45° BEND		DEPTH OF BEND		PIPE SIZE	11.25° BEND	22.5° BEND	45° BEND	90° BEND	DEAD END	AVERAGE DEPTH
	L	ℓ	L	ℓ	L	ℓ	HIGH	LOW		L	L	L	L	L	
3"	4'	1'	8'	2'	16'	4'	3'	6'	3"	1'	2'	4'	11'	37'	3'
4"	5'	1'	10'	2'	20'	5'	3'	6'	4"	1'	3'	5'	13'	44'	3'
6"	7'	2'	13'	3'	28'	7'	3'	6'	6"	2'	4'	7'	18'	62'	3'
8"	9'	2'	18'	4'	37'	9'	3'	6'	8"	2'	5'	10'	24'	81'	3'
10"	11'	2'	21'	5'	45'	10'	3'	6'	10"	3'	6'	12'	28'	97'	3'
12"	13'	3'	25'	6'	53'	13'	3'	6'	12"	3'	7'	14'	34'	114'	3'
14"	14'	3'	29'	7'	61'	14'	3'	6'	14"	4'	8'	16'	38'	130'	3'
16"	16'	4'	33'	8'	69'	16'	3'	6'	16"	4'	9'	18'	43'	146'	3'
18"	18'	4'	37'	8'	77'	18'	3'	6'	18"	5'	10'	20'	48'	162'	3'
20"	20'	5'	40'	9'	84'	19'	3'	6'	20"	5'	11'	22'	43'	177'	3'
24"	24'	5'	48'	11'	99'	23'	3'	6'	24"	6'	12'	26'	62'	206'	3'

L = UPPER BEND RESTRAINED JOINT LENGTH (REFER TO DETAILS BELOW)

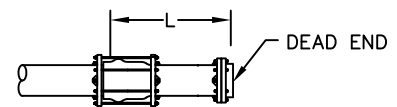
ℓ = LOWER BEND RESTRAINED JOINT LENGTH (REFER TO VERTICAL DETAIL BELOW)



TYPICAL VERTICAL BENDS



TYPICAL HORIZONTAL BENDS



TYPICAL DEAD END

NOTES:

1. ALL JOINTS WITHIN THE RESTRAINED LENGTH MUST BE RESTRAINED.
2. THE ABOVE TABLE OF RESTRAINT JOINTS LENGTHS IS BASED ON EBAA RESTRAINT JOINT CALCULATION PROGRAM (4.0) USING THE SOILS TYPE LISTED AND USING POLYVINYL CHLORIDE (PVC) PRESSURE PIPE MEETING THE REQUIREMENTS OF ANSI/AWWA C900, C905, OR ASTM D2241 WITH A MINIMUM OF THREE (3) FEET OF COMPACTED COVER AT A TEST PRESSURE OF 160 psi AND USING A MINIMUM SAFETY FACTOR 1.5 to 1.
3. THE TRENCH TYPE USED FOR THE CALCULATIONS ASSUMED A PIPE BED IN COMPACTED GRANULAR MATERIAL TO 8 INCHES MINIMUM ABOVE THE TOP OF THE PIPE, AND 4 INCHES MINIMUM UNDER THE PIPE. COMPACTED BACKFILL MATERIALS SHALL ONLY BE DISTRICT APPROVED NATIVE, GRANULAR, OR SELECT MATERIALS. (COMPACTION OF ALL MATERIALS SHALL BE AS NEEDED TO MEET THE CURRENT DISTRICT REQUIREMENTS)
4. RESTRAINED JOINT LENGTHS FOR TRENCHING IN OTHER MATERIALS AND FOR SHORTER RESTRAINED LENGTHS THE DESIGN ENGINEER SHALL SUBMIT A SOILS REPORT AND THRUST RESTRAINT CALCULATIONS FOR REVIEW.

.	.	.	OLIVEHURST PUBLIC UTILITY DISTRICT
.	.	.	RESTRAINT LENGTHS FOR PVC
.	.	.	Garry E. Laughlin
5-05	FORMERLY STD. DTL. NO. W-19	SCD	District Engineer
DATE	REVISIONS	BY	APPROVED
			5-6-2005 DATE

8-04

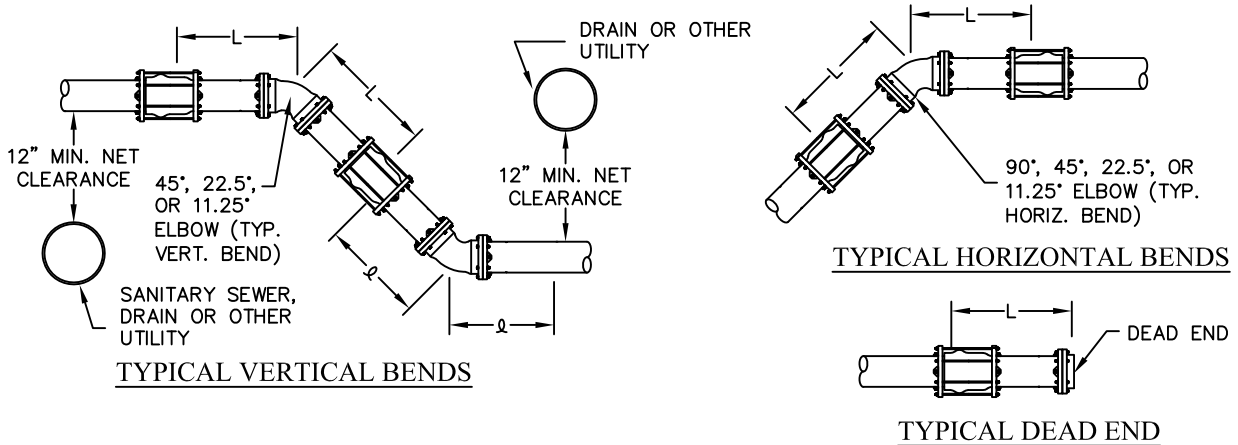
RESTRAINT JOINT LENGTH SCHEDULE (DI w/ WRAP)

TRENCHED IN INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY
& BACKFILLED W/ NATIVE OR GRANULAR MATERIAL

EACH SIDE OF VERTICAL BEND									EACH SIDE OF HORIZONTAL BEND						
PIPE SIZE	11.25° BEND		22.5° BEND		45° BEND		DEPTH OF BEND		PIPE SIZE	11.25° BEND	22.5° BEND	45° BEND	90° BEND	DEAD END	AVERAGE DEPTH
	L	ℓ	L	ℓ	L	ℓ	HIGH	LOW		L	L	L	L	L	
3"	6'	1'	11'	2'	23'	4'	3'	6'	3"	1'	2'	5'	12'	56'	3'
4"	7'	1'	13'	2'	28'	5'	3'	6'	4"	1'	3'	6'	14'	67'	3'
6"	9'	2'	19'	3'	39'	7'	3'	6'	6"	2'	4'	8'	20'	95'	3'
8"	12'	2'	25'	4'	51'	9'	3'	6'	8"	3'	5'	11'	26'	124'	3'
10"	15'	3'	29'	5'	61'	11'	3'	6'	10"	3'	6'	13'	32'	148'	3'
12"	17'	3'	35'	6'	72'	13'	3'	6'	12"	4'	7'	15'	37'	174'	3'
14"	20'	3'	39'	7'	82'	14'	3'	6'	14"	4'	9'	18'	43'	198'	3'
16"	22'	4'	44'	8'	92'	16'	3'	6'	16"	5'	10'	20'	48'	223'	3'
18"	24'	4'	49'	9'	102'	18'	3'	6'	18"	5'	11'	22'	54'	247'	3'
20"	27'	5'	54'	9'	112'	20'	3'	6'	20"	6'	12'	24'	59'	270'	3'
24"	31'	5'	62'	11'	130'	23'	3'	6'	24"	7'	14'	29'	69'	314'	3'

L = UPPER BEND RESTRAINED JOINT LENGTH (REFER TO DETAILS BELOW)

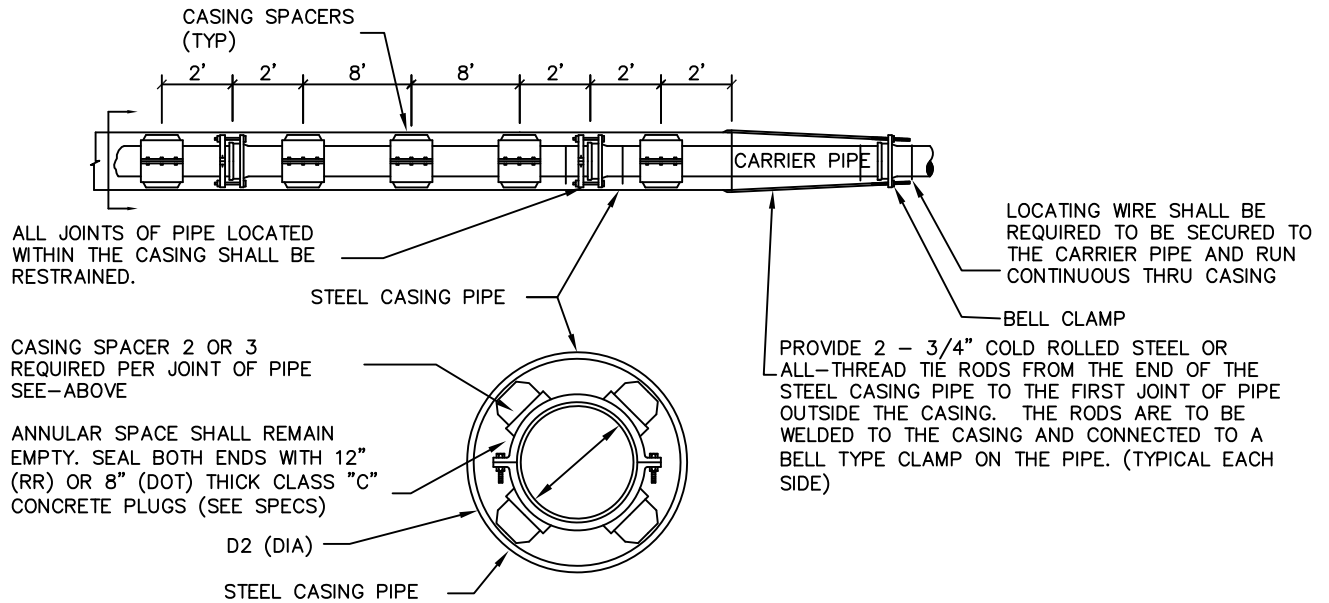
ℓ = LOWER BEND RESTRAINED JOINT LENGTH (REFER TO VERTICAL DETAIL BELOW)



NOTES:

1. ALL JOINTS WITHIN THE RESTRAINED LENGTH MUST BE RESTRAINED.
2. THE ABOVE TABLE OF RESTRAINT JOINTS LENGTHS IS BASED ON EBAA RESTRAINT JOINT CALCULATION PROGRAM (4.0) USING THE SOILS TYPE LISTED AND USING DUCTILE IRON PIPE IN POLYETHYLENE ENCASUREMENT MEETING THE REQUIREMENTS OF, AND INSTALLED PER ANSI/AWWA C105/A21.5 WITH A MINIMUM OF THREE (3) FEET OF COMPACTED COVER AT A TEST PRESSURE OF 160 psi AND USING A MINIMUM SAFETY FACTOR 1.5 TO 1.
3. THE TRENCH TYPE USED FOR THE CALCULATIONS ASSUMED A PIPE BED IN COMPACTED GRANULAR MATERIAL TO 8 INCHES MINIMUM ABOVE THE TOP OF THE PIPE, AND 4 INCHES MINIMUM UNDER THE PIPE. COMPACTED BACKFILL MATERIALS SHALL ONLY BE DISTRICT APPROVED NATIVE, GRANULAR, OR SELECT MATERIALS. (COMPACTION OF ALL MATERIALS SHALL BE AS NEEDED TO MEET THE CURRENT DISTRICT REQUIREMENTS)
4. RESTRAINED JOINT LENGTHS FOR TRENCHING IN OTHER MATERIALS AND FOR SHORTER RESTRAINED LENGTHS THE DESIGN ENGINEER SHALL SUBMIT A SOILS REPORT AND THRUST RESTRAINT CALCULATIONS FOR REVIEW.

.	.	.	OLIVEHURST PUBLIC UTILITY DISTRICT RESTRAINT LENGTHS FOR DIP W/ WRAP
.	.	.	
.	.	.	
.	.	.	
5-05	FORMERLY STD. DTL. NO. W-19	SCD	Garry E. Laughlin District Engineer
DATE	REVISIONS	BY	APPROVED
			5-6-2005 DATE
			8-05



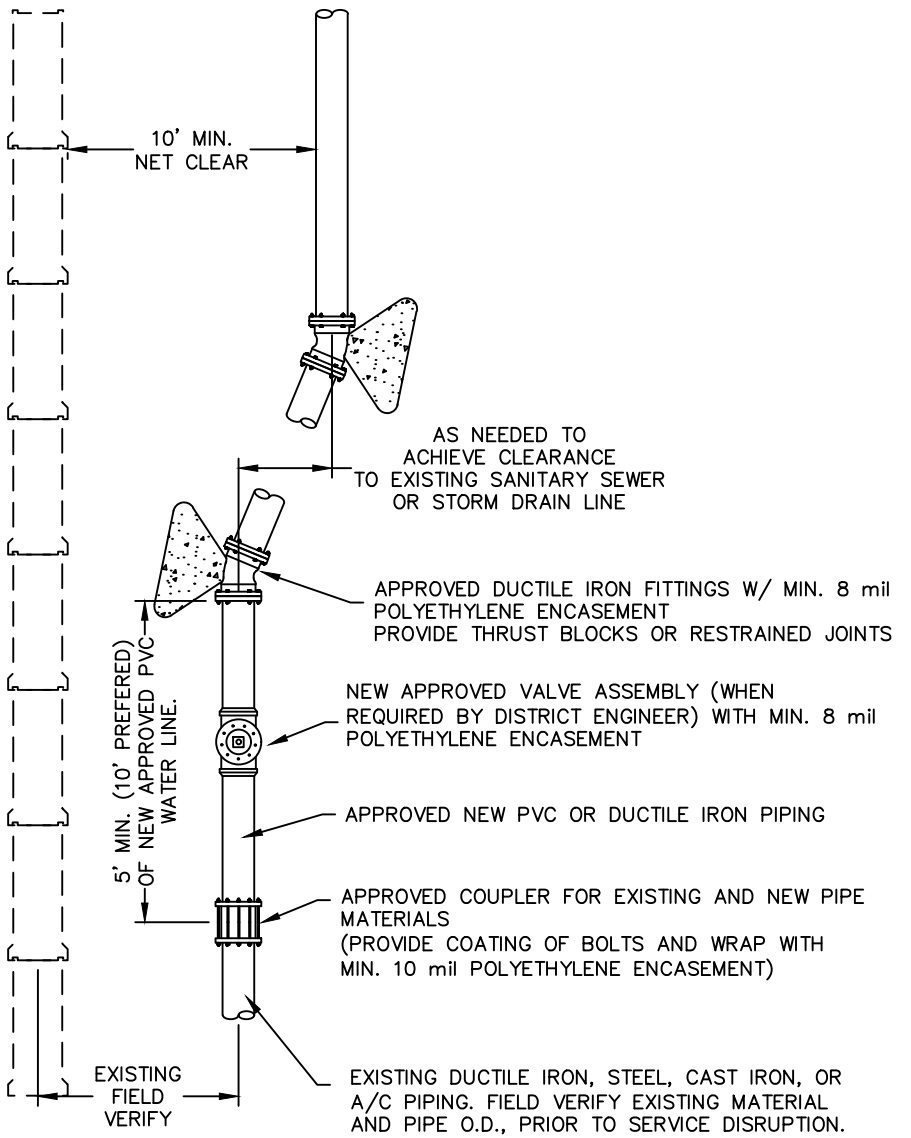
CASING SPACER DETAIL

CARRIER PIPE AND CASING PIPE SIZES (MIN.) IN INCHES														
CARRIER PIPE NOM. DIA. (D ₁)	4	6	8	10	12	14	16	18	20	24	30	36	42	48
CASING PIPE NOM. DIA (D ₂)	14	16	20	20	24	30	30	30	36	42	48	54	60	66
WALL THICKNESS RAILROAD-(FEC)	0.25	0.25	0.375	0.375	0.375	0.50	0.50	0.50	0.562	0.625	0.625	0.688	0.781	0.781
WALL THICKNESS RAILROAD-(CSX)	0.25	0.281	0.375	0.375	0.375	0.469	0.469	0.469	0.562	0.625	0.688	0.781	0.844	0.938
WALL THICKNESS-DOT	0.25	0.25	0.25	0.25	0.25	0.312	0.312	0.312	0.375	0.50	0.50	0.50	0.50	0.50

NOTES:

1. MIN. COVER TO TOP OF CASING; a) FEDERAL D.O.T.-3.0' b)RAILROAD-5.5' TO BASE OF RAIL, 4.5' FOR SECONDARY OR INDUSTRIAL TRACKS.
2. THE INSIDE DIAMETER OF THE CASING PIPE SHALL BE A MINIMUM OF 4 INCHES GREATER THAN THE OUTSIDE DIAMETER OF THE CARRIER PIPE BELL OR COUPLING. HOWEVER, A MINIMUM OF 6 INCHES IS REQUIRED FOR R.R. CROSSINGS.
3. THE MINIMUM COVER FOR CASING SHALL BE 5.0 FEET BELOW FINISH GRADE OR AS DIRECTED BY THE AGENCY HAVING JURISDICTION.
4. ALL JOINTS WITHIN CARRIER PIPE SHALL BE MECHANICAL RESTRAINED JOINTS.
5. FOR STREET USES WHICH ARE NOT DOT OR RAILROAD, USE D.O.T. CASING THICKNESS UNLESS OTHERWISE INDICATED BY DESIGN ENGINEER AND APPROVED BY THE DISTRICT ENGINEER.
6. CASING PIPE SHALL BE FURNISHED IN NOMINAL 8 FOOT LENGTHS (MIN.) UNLESS OTHERWISE INDICATED ON THE DRAWING OR APPROVED BY THE DISTRICT.
7. PIPE TO BE USED AS A CASING SHALL CONFORM TO EITHER ASTM STANDARD A139 FOR "ELECTRIC FUSION (ARC) WELDED STEEL PIPE" WITH A MINIMUM YIELD STRENGTH OF 35,000 PSI OR "API SPECIFICATION API-5LX, GRADE X-42 WELDED STEEL PIPE".

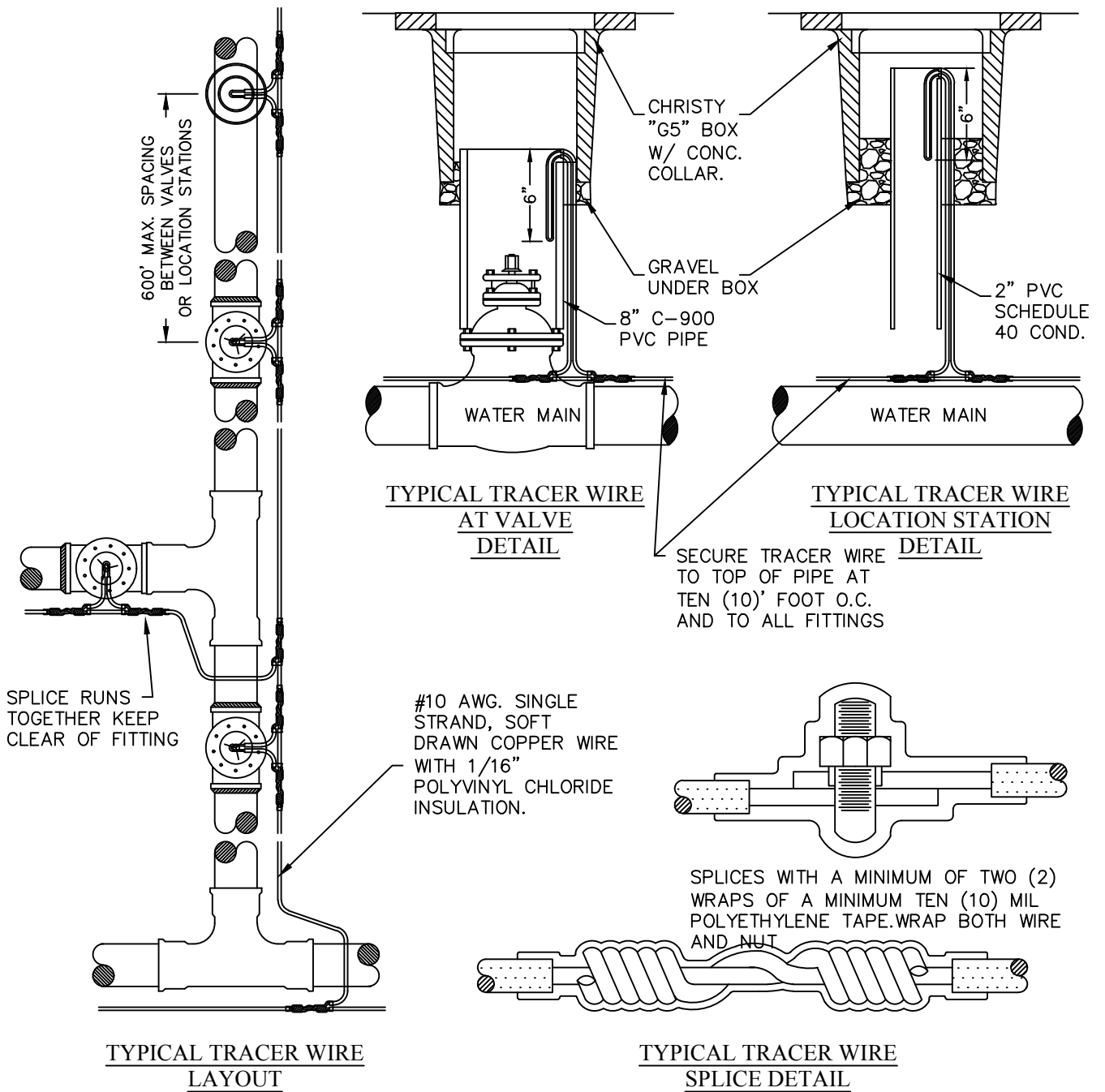
			OLIVEHURST PUBLIC UTILITY DISTRICT
			CASING FOR CARRIER PIPE
5-05	NEW DETAIL	SCD	Garry E. Laughlin District Engineer
DATE	REVISIONS	BY	APPROVED _____ DATE 5-6-2005
			8-05



NOTES:

1. REFER TO SECTION 4 OF THE IMPROVEMENT STANDARDS FOR TRENCH REQUIREMENTS.

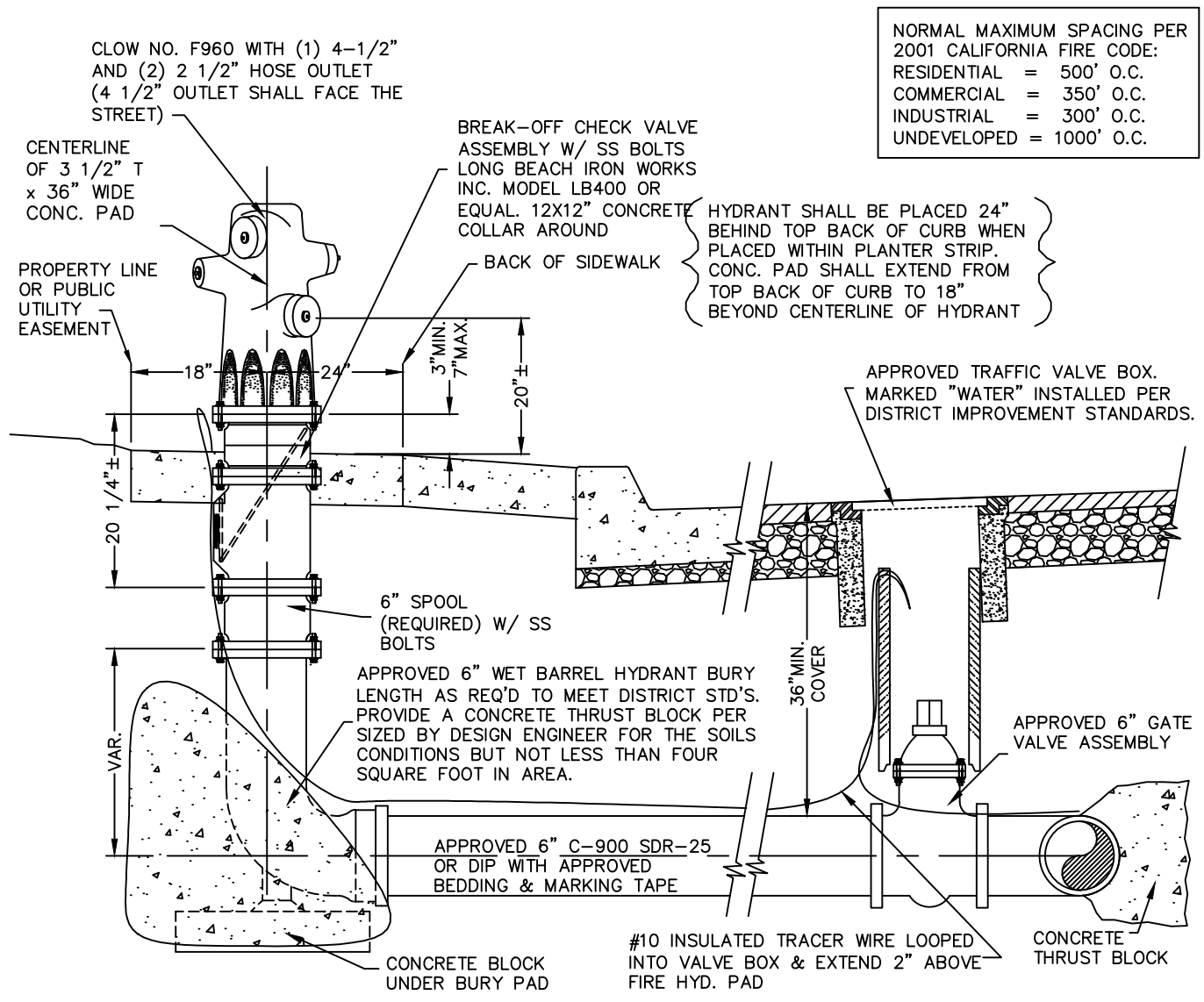
			OLIVEHURST PUBLIC UTILITY DISTRICT	
			CONNECTING TO EXISTING WATER MAIN	
			Garry E. Laughlin District Engineer	
5-05	FORMERLY STD. DTL. NO. W-10	SCD	5-6-2005	8-06
DATE	REVISIONS	BY	DATE	



NOTES:

1. ALL TRACER WIRE SHALL BE #10 AWG. SINGLE STRAND, SOFT DRAWN COPPER WIRE WITH 1/16" POLYVINYL CHLORIDE INSULATION (FOR DIRECT BURIAL USE ONLY).
2. ALL TRACER WIRE SHALL BE CONTINUOUS BETWEEN VALVE BOXES AND TRACER WIRE STATIONS.
3. TRACER / LOCATING WIRE SHALL BE LAID ON TOP OF THE LINE, AND SHALL BE SECURED BY TAPE (OR OTHER APPROVED METHOD) TO THE LINE (OR THE POLYETHYLENE ENCASEMENT IF DUCTILE IRON) AT TEN (10) FOOT MAXIMUM INTERVALS AND TAPPED AT ALL FITTINGS. TAPE SHALL BE TEN (10) MIL POLYETHYLENE.
4. ALL SPLICES SHALL BE TIGHT WRAPPED (A MINIMUM OF 12 TIMES TOTAL) CLAMPED WITH ONE (1) ELECTRICAL SPLIT BOLT CONNECTOR. COVER ALL SPLICES WITH A MINIMUM OF TWO (2) WRAPS OF A MINIMUM TEN (10) MIL POLYETHYLENE TAPE.
5. THE CONTRACTOR SHALL CONDUCT A CONTINUITY TEST ON ALL SPLICES AND BETWEEN THE WIRE RISER LOOPS.
6. A FINAL CONTINUITY TEST SHALL BE DONE IN THE PRESENCE OF THE DISTRICT.

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			TRACER WIRE	
5-05	FORMERLY STD. DTL. NO. W-8	SCD	Garry E. Laughlin District Engineer	
DATE	REVISIONS	BY	APPROVED	DATE
				8-08



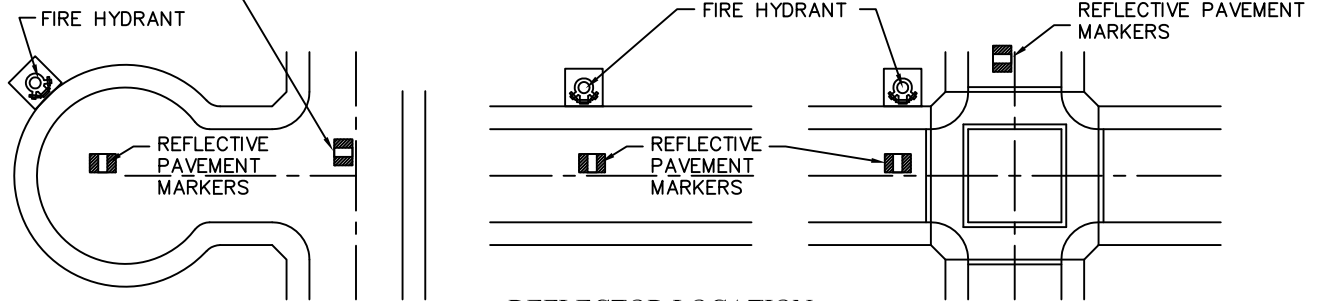
NORMAL MAXIMUM SPACING PER 2001 CALIFORNIA FIRE CODE:	
RESIDENTIAL	= 500' O.C.
COMMERCIAL	= 350' O.C.
INDUSTRIAL	= 300' O.C.
UNDEVELOPED	= 1000' O.C.

NOTES:

1. REFLECTIVE PAVEMENT MARKERS SHALL BE PLACED PER STANDARD DETAIL 8-11, UNLESS INSTRUCTED OTHERWISE BY THE DISTRICT.
2. ALL BOLTS, PIPING AND FITTINGS TO BE DUCTILE IRON, CLASS 150 C-900, BRASS, BRONZE, OR STAINLESS STEEL.
3. THE FIRE HYDRANT SHALL BE PAINTED WITH ONE COAT OF A SOUND METAL PRIMER AND TWO COATS OF # 1147 "BRIGHT SAFETY YELLOW".

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			FIRE HYDRANT	
5-05	FORMERLY STD. DTL. NO. W-1	SCD	Garry E. Laughlin	
DATE	REVISIONS	BY	APPROVED	5-6-2005
				8-10

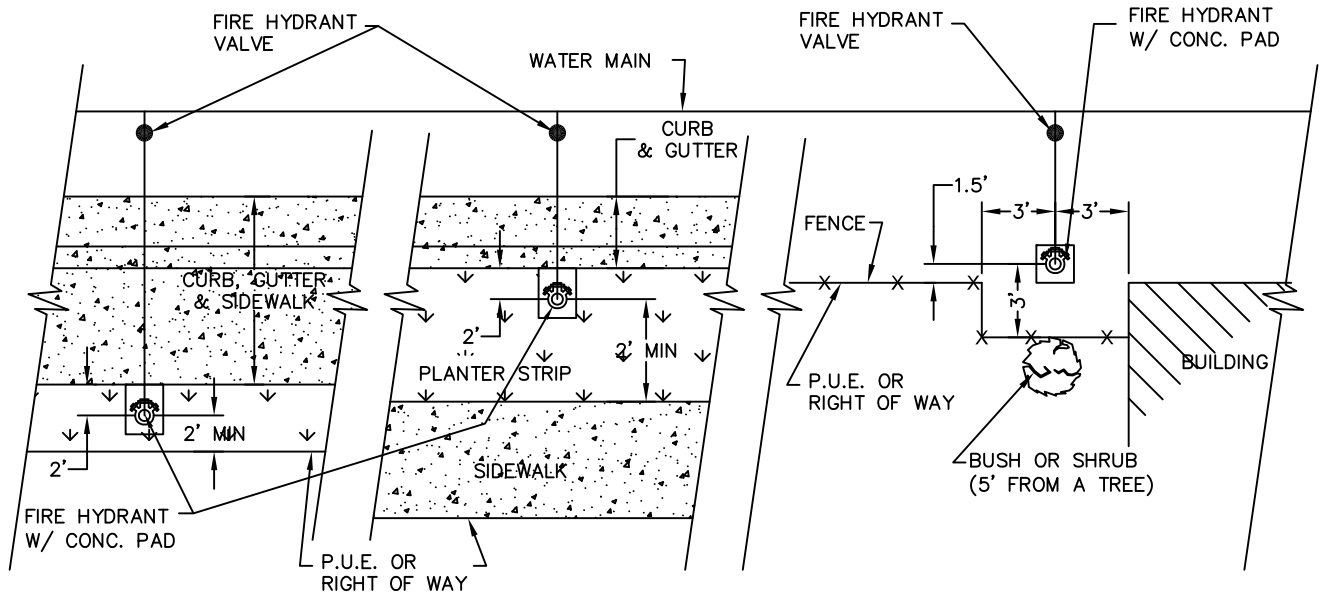
AN ADDITIONAL REFLECTIVE PAVEMENT MARKER SHALL BE PLACE AT THIS LOCATION WHEN THE CUL-DE-SAC IS LESS THAN 500' LONG



REFLECTOR LOCATION

IDENTIFICATION:

1. REFLECTIVE PAVEMENT MARKERS SHALL BE PLACED 6" FROM CENTERLINE ON SIDE NEAREST THE HYDRANT ON TWO OR MULTI-LANE STREETS. TWO MARKERS ARE REQUIRED AT INTERSECTIONS HAVING A HYDRANT. THE MARKER SHALL BE PLACED 6" FROM THE EDGE OF THE CONTINUOUS LEFT TURN LANE LINE ON SIDE NEAREST THE HYDRANT. FOUR LANE STREETS WITH TURN LANE AT INTERSECTION, THE MARKER SHALL BE PLACED 6" FROM NEAREST WHITE LINE ON THE SIDE NEAREST THE HYDRANT.
2. THE MARKER COLORS SHALL BE AS SPECIFIED IN THE CURRENT NFPA 291 CHAPTER 3. THE CONTRACTOR SHALL FURNISH AND INSTALL BLUE REFLECTIVE MARKERS UNLESS INSTRUCTED OTHERWISE BY THE DISTRICT.
3. THE FIRE HYDRANT SHALL BE PAINTED WITH ONE COAT OF A SOUND METAL PRIMER AND TWO COATS OF # 1147 "BRIGHT SAFETY YELLOW".



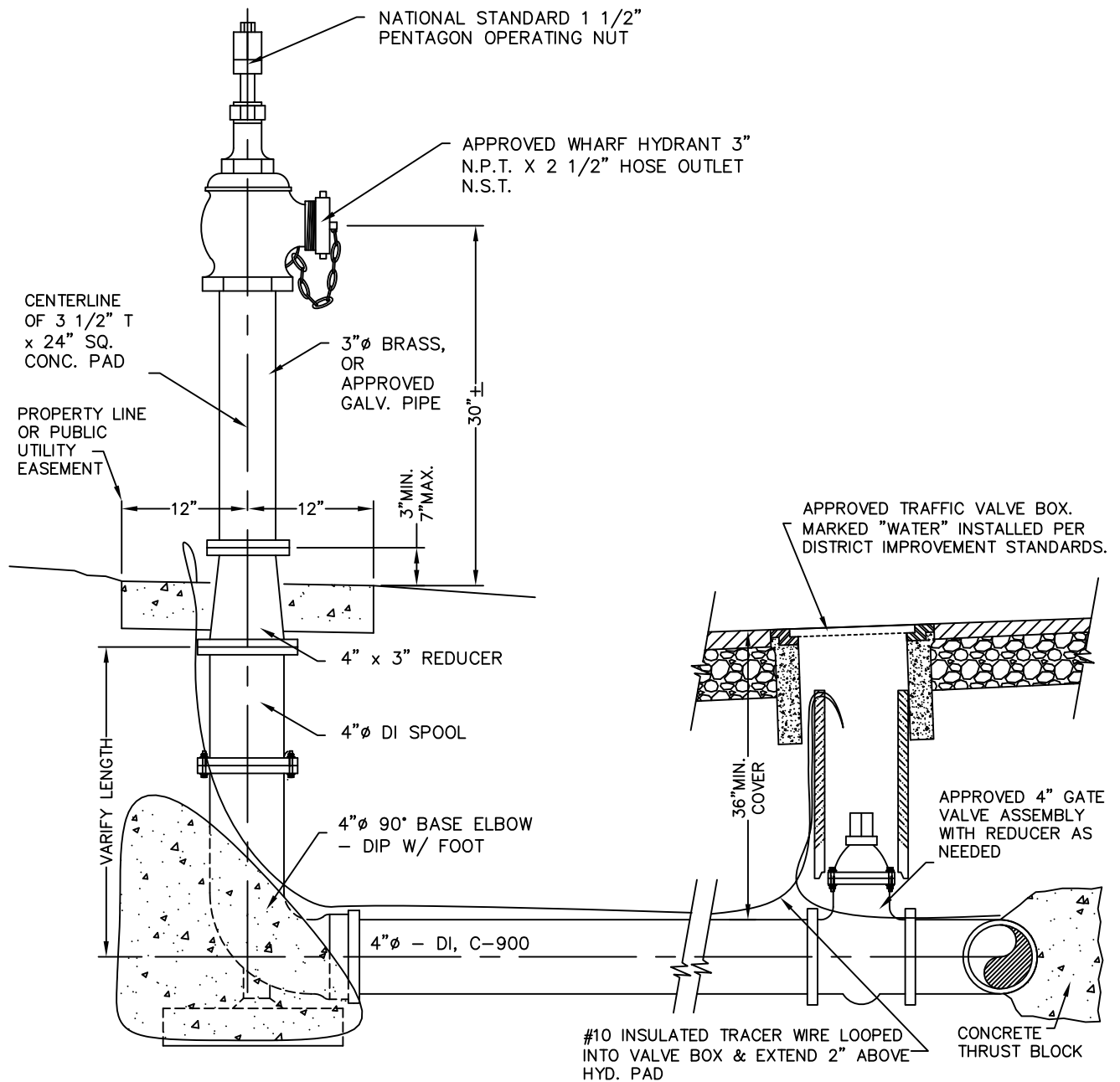
FIRE HYDRANT LOCATION

NOTES:

1. PROVIDE A MINIMUM THREE (3) FOOT (PREFERRED FIVE (5) FOOT) NET CLEAR LEVEL AREA AROUND ALL FIRE HYDRANTS.
2. REFER TO STANDARD DETAIL 8-10.

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			FIRE HYDRANT LOCATIONS	
5-05	NEW DETAIL	SCD	Garry E. Laughlin	
DATE	REVISIONS	BY	District Engineer	5-6-2005
			APPROVED	DATE

8-11

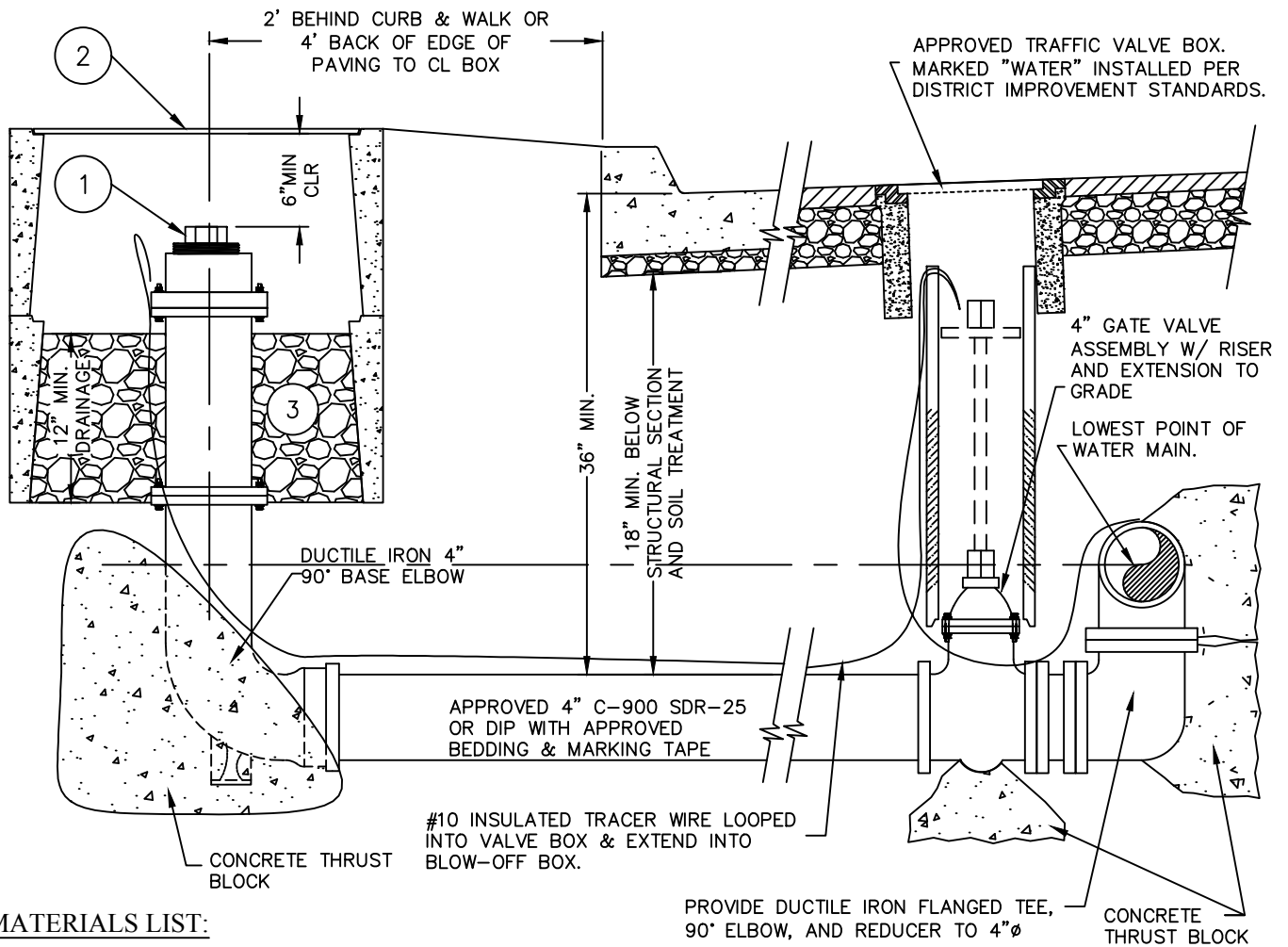


NOTES:

1. ALL BURIED PIPING AND FITTINGS SHALL BE BRASS, BRONZE, DUCTILE IRON, C-900 OR STAINLESS STEEL.
2. MIN. DEPTH OF COVER SHALL BE 36".
3. ALL BOLTS SHALL STAINLESS STEEL.
4. CONTRACTOR SHALL SUBMIT ALL PROPOSED PIPING, VALVES, EQUIPMENT AND HARDWARE ALONG WITH FINAL INSTALLATION DETAILS TO O.P.U.D. FOR APPROVAL PRIOR TO ANY CONSTRUCTION.
5. ALL WHARF HYDRANT LOCATIONS SHALL BE REVIEWED FOR APPROVAL BY THE DISTRICT ENGINEER ON A CASE BY CASE BASIS.

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			WHARF HYDRANT	
5-05	FORMERLY STD. DTL. NO. W-1a	SCD	Garry E. Laughlin District Engineer	
DATE	REVISIONS	BY	APPROVED	5-6-2005 DATE
				8-02

NO BLOWOFF, INSTALL HYDRANT



MATERIALS LIST:

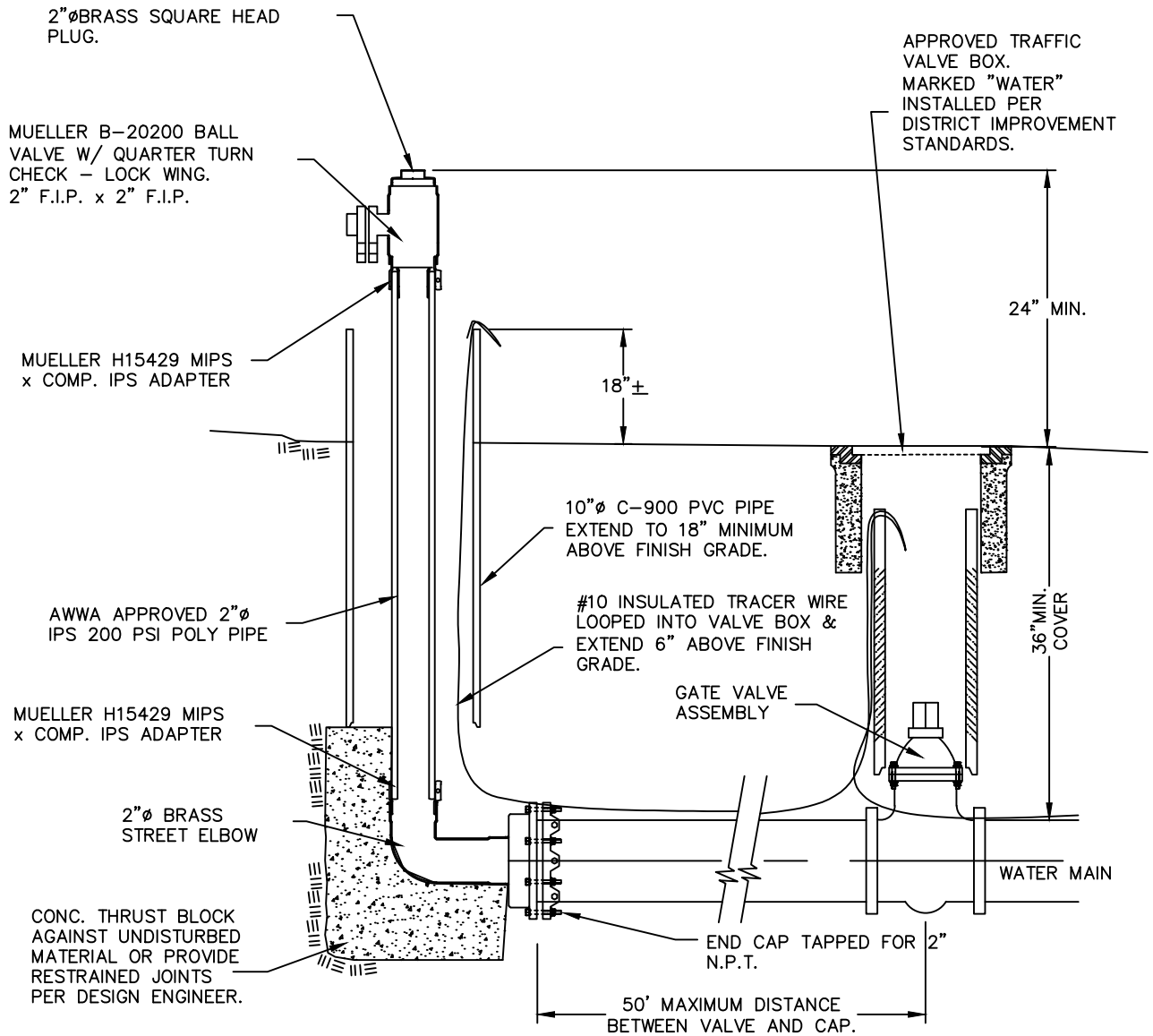
- 1 4" BRASS SQUARE HEAD PLUG
- 2 CHRISTY B1324BOX (B1324X12 EXTENSIONS AS NEEDED) W/ B1324-61JH BOLT DOWN LID.
- 3 PROVIDE 12" MIN. OF 3/4" CRUSH ROCK IN BOTTOM OF BOX FOR DRAINAGE.

NOTES:

- 1. ALL BOLTS, PIPING AND FITTINGS TO BE DUCTILE IRON, CLASS 150 C-900, BRASS, BRONZE, COPPER, OR STAINLESS STEEL.
- 2. NO BOTTOM BLOW-OFF SHALL EVER BE PLACED WITHIN ANY VEHICLE OR PEDESTRIAN TRAFFIC AREAS.
- 3. A BOTTOM BLOW-OFF SHALL ONLY BE INSTALLED AT EXTREME LOW POINTS ALONG MAIN LINES.

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			BOTTOM BLOW-OFF ASSEMBLY	
5-05	NEW DETAIL	SCD	Garry E. Laughlin	
DATE	REVISIONS	BY	District Engineer	
			APPROVED	5-6-2005
				DATE

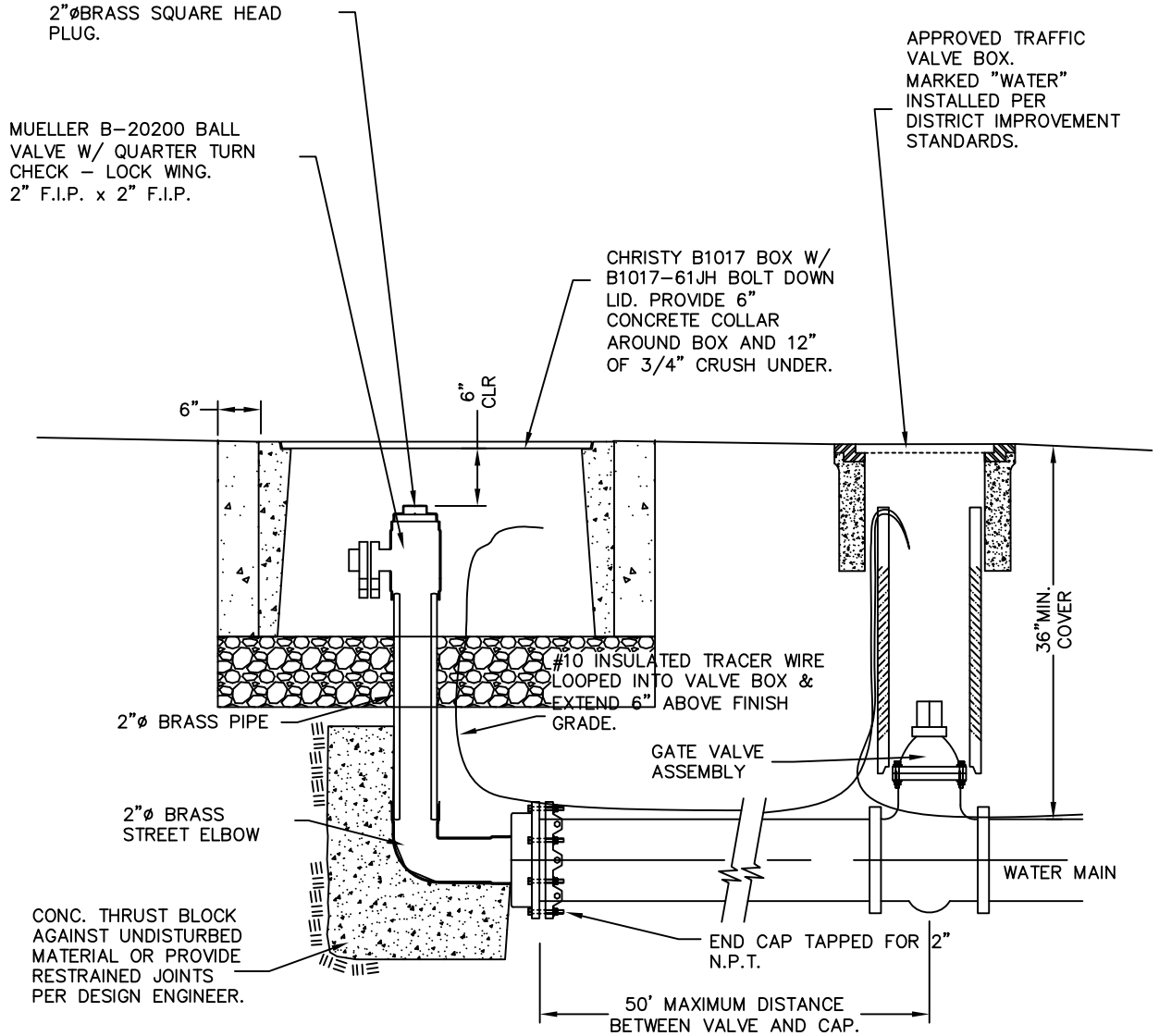
8-14



NOTES:

1. PAINT BLOWOFF ASSEMBLY AND RISER PIPE WITH A BRIGHT SAFETY ORANGE COLOR AND PROVIDE 2" WIDE WHITE REFLECTIVE TAPE AROUND 4"± FROM TOP OF RISER.
2. THRUST BLOCKS SHALL BE POURED AGAINST FIRM UNDISTURBED SOIL.
3. PROVIDE A COATING ON ALL BOLTS AND A MINIMUM OF TWO WRAPS OF A 8 mil POLYETHYLENE ENCASEMENT OF ALL PIPING AND FITTING TO PREVENT CONCRETE FROM DIRECT CONTACT.
4. ALL JOINTS AND BOLTS SHALL BE KEPT CLEAR OF CONCRETE.
5. TEMPORARY BLOWOFFS MUST BE PUT IN BOX TO PREVENT TAMPERING

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			TEMPORARY 2" BLOWOFF	
			Garry E. Laughlin	8-16
			District Engineer	
5-05	FORMERLY STD. DTL. NO. W-9A	SCD	5-6-2005	
DATE	REVISIONS	BY	APPROVED	DATE



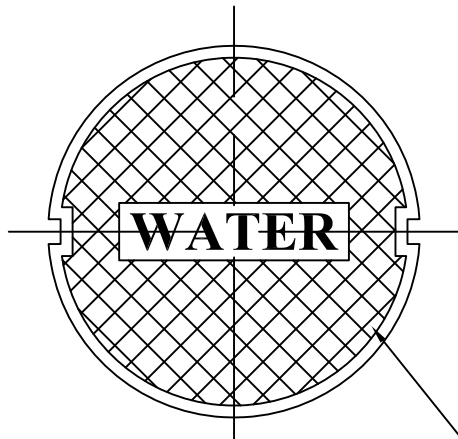
THIS BLOW OFF ASSEMBLY REQUIRES APPROVAL BY THE DISTRICT ENGINEER AND WILL ONLY BE CONSIDERED ON A CASE BY CASE BASIS .

NOTES:

1. PAINT BLOWOFF ASSEMBLY AND RISER PIPE WITH A BRIGHT SAFETY ORANGE COLOR AND PROVIDE 2" WIDE WHITE REFLECTIVE TAPE AROUND 4"± FROM TOP OF RISER.
2. THRUST BLOCKS SHALL BE POURED AGAINST FIRM UNDISTURBED SOIL.
3. PROVIDE A COATING ON ALL BOLTS AND A MINIMUM OF TWO WRAPS OF A 8 mil POLYETHYLENE ENCASEMENT OF ALL PIPING AND FITTING TO PREVENT CONCRETE FROM DIRECT CONTACT.
4. ALL JOINTS AND BOLTS SHALL BE KEPT CLEAR OF CONCRETE.

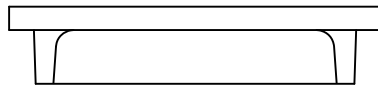
			OLIVEHURST PUBLIC UTILITY DISTRICT	
			SOLID BLOWOFF ASSEMBLY	
5-05	FORMERLY STD. DTL. NO. W-9	SCD	Garry E. Laughlin	
DATE	REVISIONS	BY	District Engineer	5-6-2005
			APPROVED	DATE

8-17



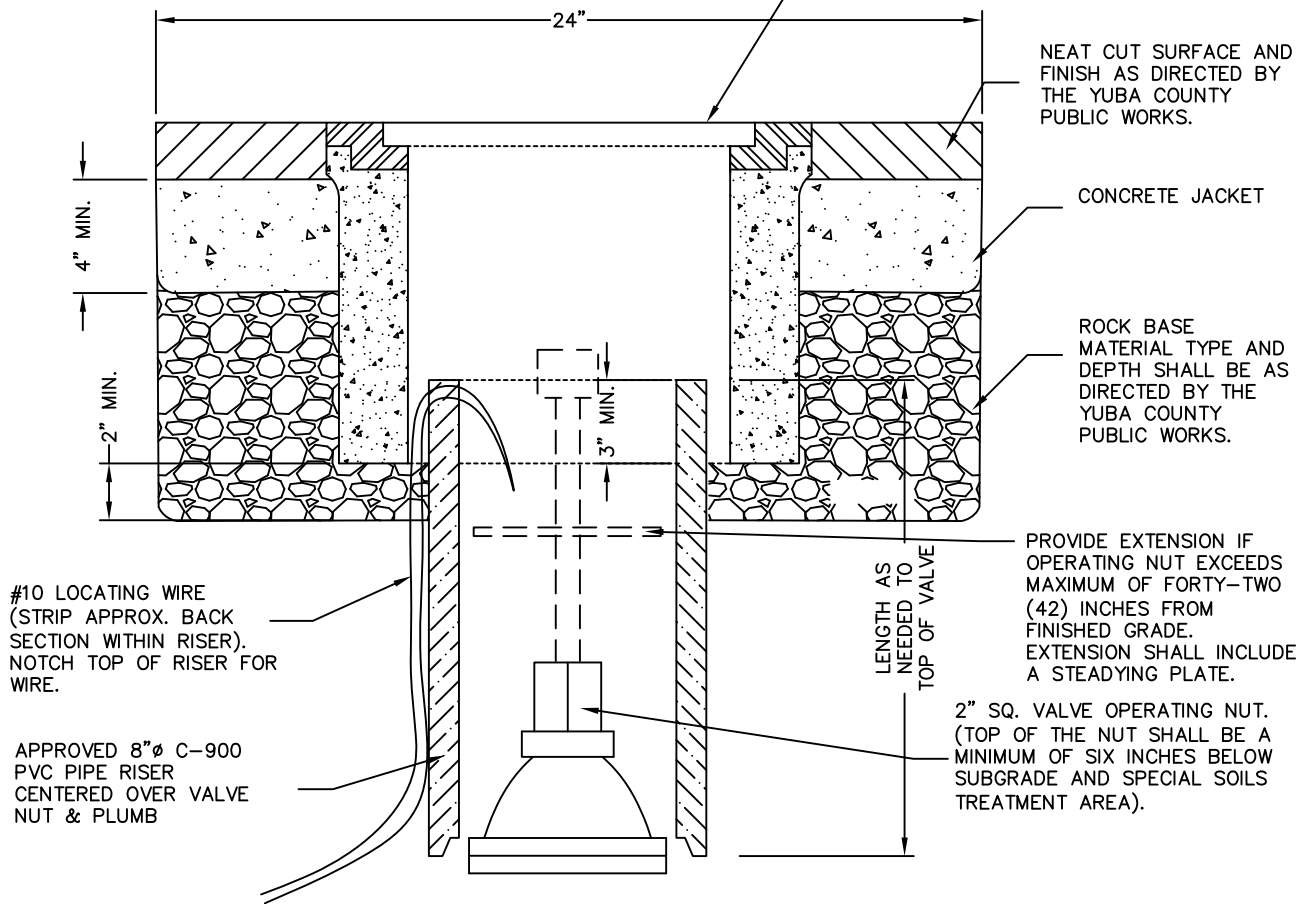
NOTES:

1. WHEN VALVE BOX IS INSTALLED IN AN UNIMPROVED AREA PROVIDE A 4" THICK x 24" SQ. CONC. PAD CENTERED ON VALVE BOX.



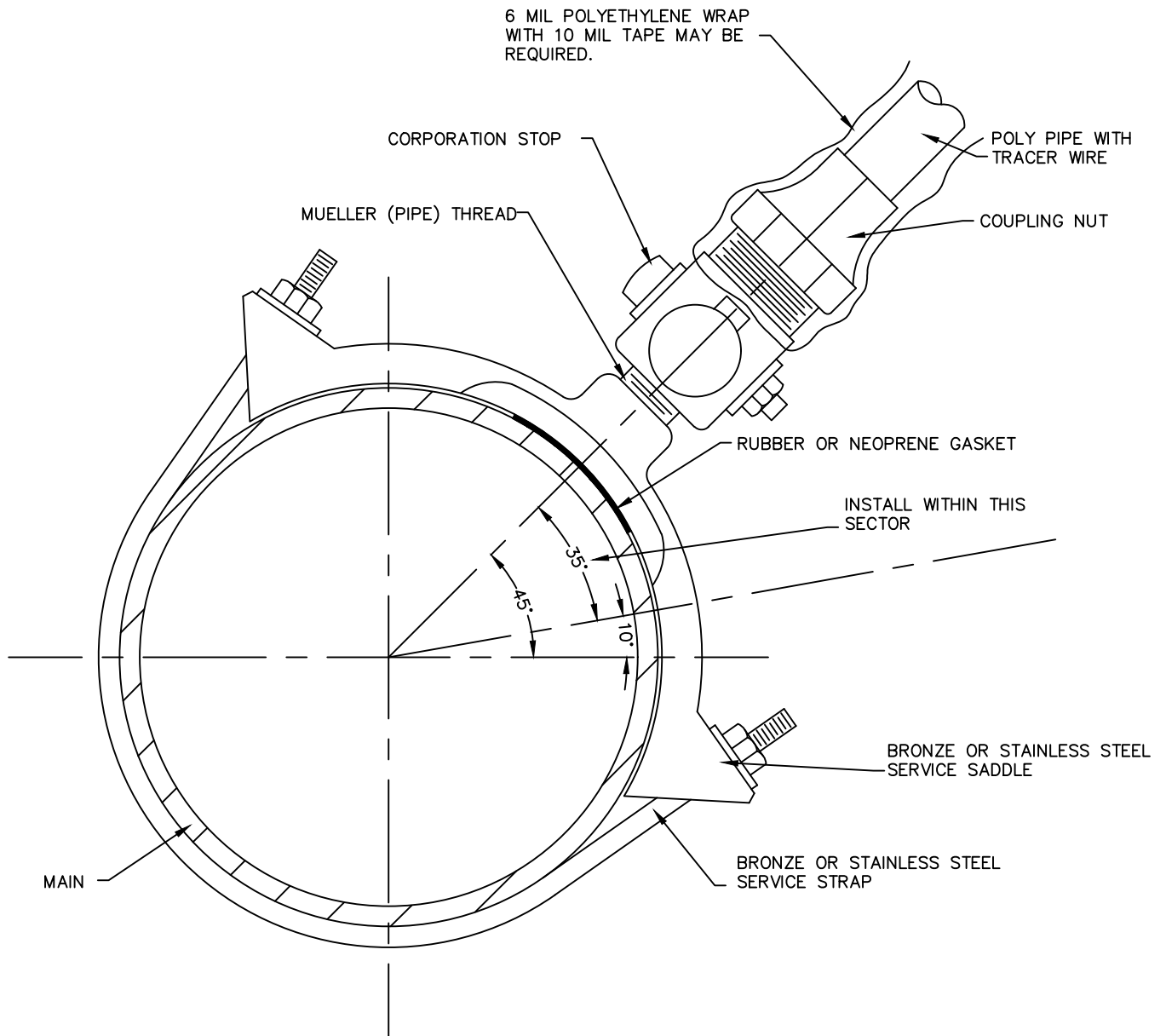
COVER DETAIL

CHRISTY G5 OR EQUAL TRAFFIC VALVE BOX APPROVED EQUAL. MARKED "WATER" FOR WATER VALVES



			OLIVEHURST PUBLIC UTILITY DISTRICT	
			WATER VALVE BOX	
5-05	FORMERLY STD. DTL. NO. W-11	SCD	Garry E. Laughlin	
DATE	REVISIONS	BY	District Engineer	5-6-2005
			APPROVED	DATE

8-18

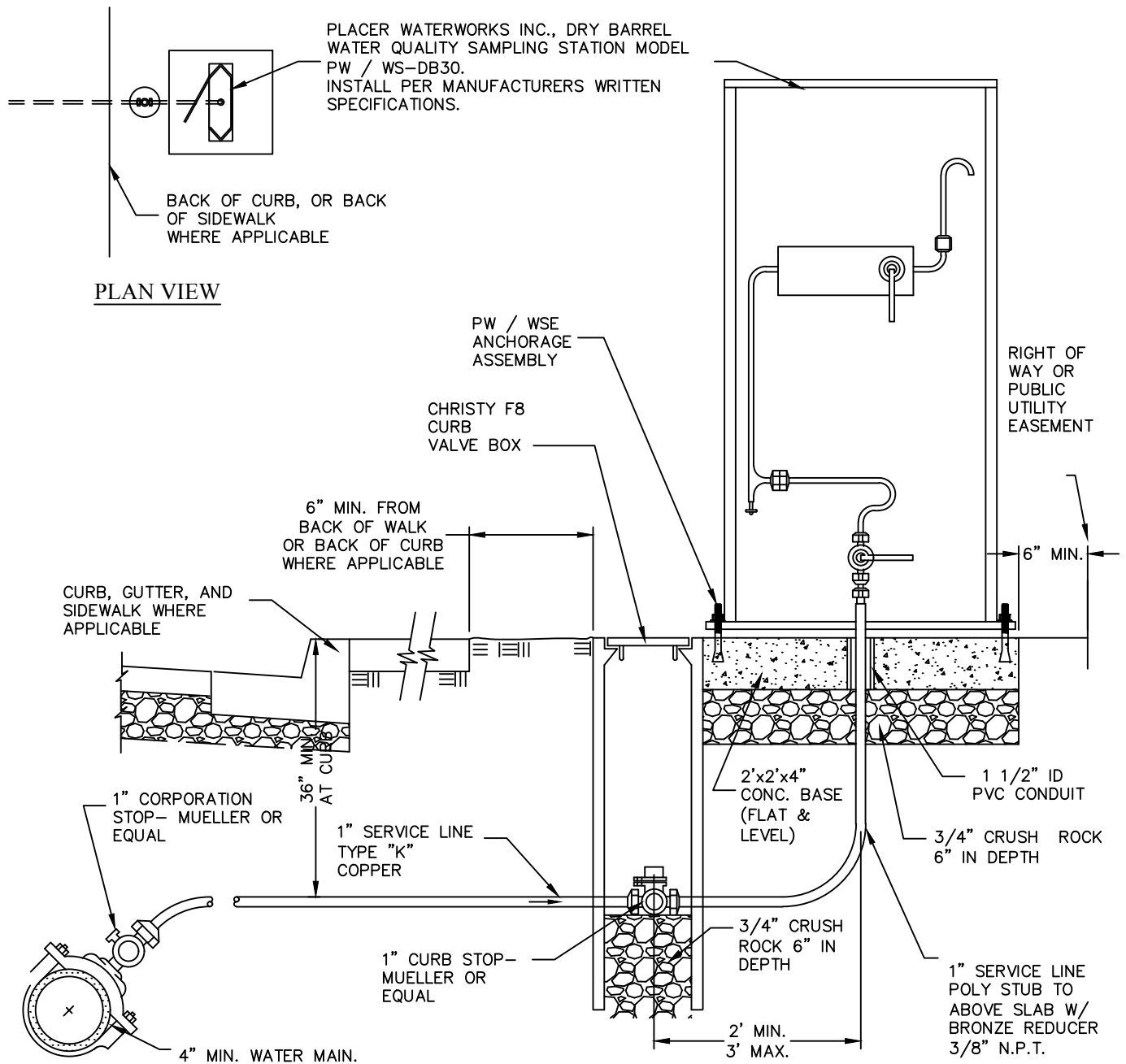


NOTES:

1. ALL SERVICE MATERIALS AND FITTINGS SHALL BE A.W.W.A. STANDARD, POLY, BRASS, BRONZE OR STAINLESS STEEL. INSTALL MUELLER CO. CORPORATION STOPS.
2. SERVICE TAPS OF THE WATER MAINS SHALL BE DONE TO INSURE THAT CUTTINGS, FILLINGS AND PLUGS DO NOT ENTER THE WATER MAINS.

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			TYPICAL SERVICE SADDLE	
			Garry E. Laughlin	
5-05	NEW DETAIL	SCD	District Engineer	
DATE	REVISIONS	BY	APPROVED	5-6-2005 DATE

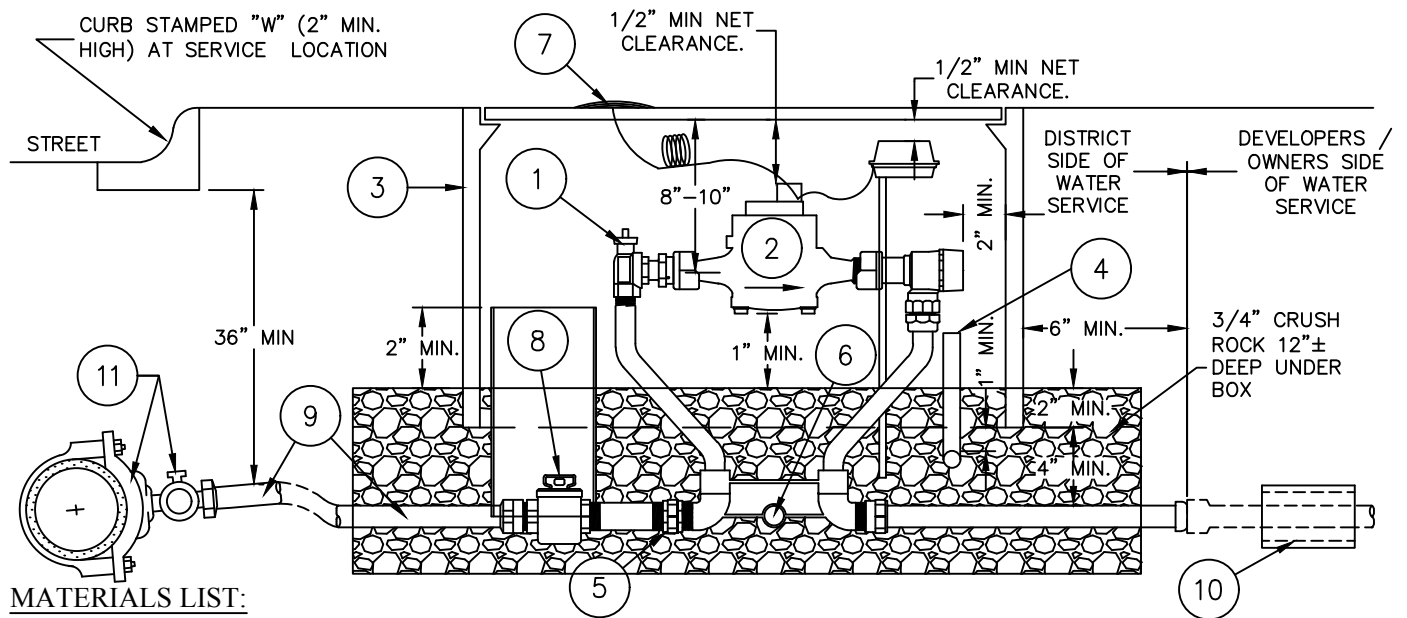
8-30



NOTES:

1. ALL PIPING AND FITTINGS TO BE BRASS, BRONZE, POLY, OR STAINLESS STEEL.
2. MINIMUM DEPTH OF COVER SHALL BE 36".
3. SHALL BE LOCATED WITHIN THE PLANTER AREA BETWEEN BACK OF CURB AND THE SIDEWALK IN DETACHED WALK AREAS AND BEHIND THE SIDEWALK IN ATTACHED WALK AREAS, OR AS DIRECTED BY THE DISTRICT.
4. ALL HARDWARE & EQUIPMENT SHALL BE PROVIDED AND INSTALLED BY CONTRACTOR.
5. ALL PRODUCT INFORMATION AND FINAL INSTALLATION DETAILS TO BE SUBMITTED TO O.P.U.D. FOR APPROVAL PRIOR TO ANY INSTALLATION.
6. A WATER SAMPLER STATION SHALL BE INSTALLED AT EACH PARK, BUT NOT LESS THAN A MINIMUM OF ONE PER EVERY TWO-HUNDRED AND FIFTY (250) LIVING UNITS, OR AS DIRECTED BY THE DISTRICT.

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			WATER SAMPLING STATION	
			Garry E. Laughlin	8-31
			District Engineer	
5-05	FORMERLY STD. DTL. NO. W-22	SCD	APPROVED	5-6-2005
DATE	REVISIONS	BY	APPROVED	DATE



MATERIALS LIST:

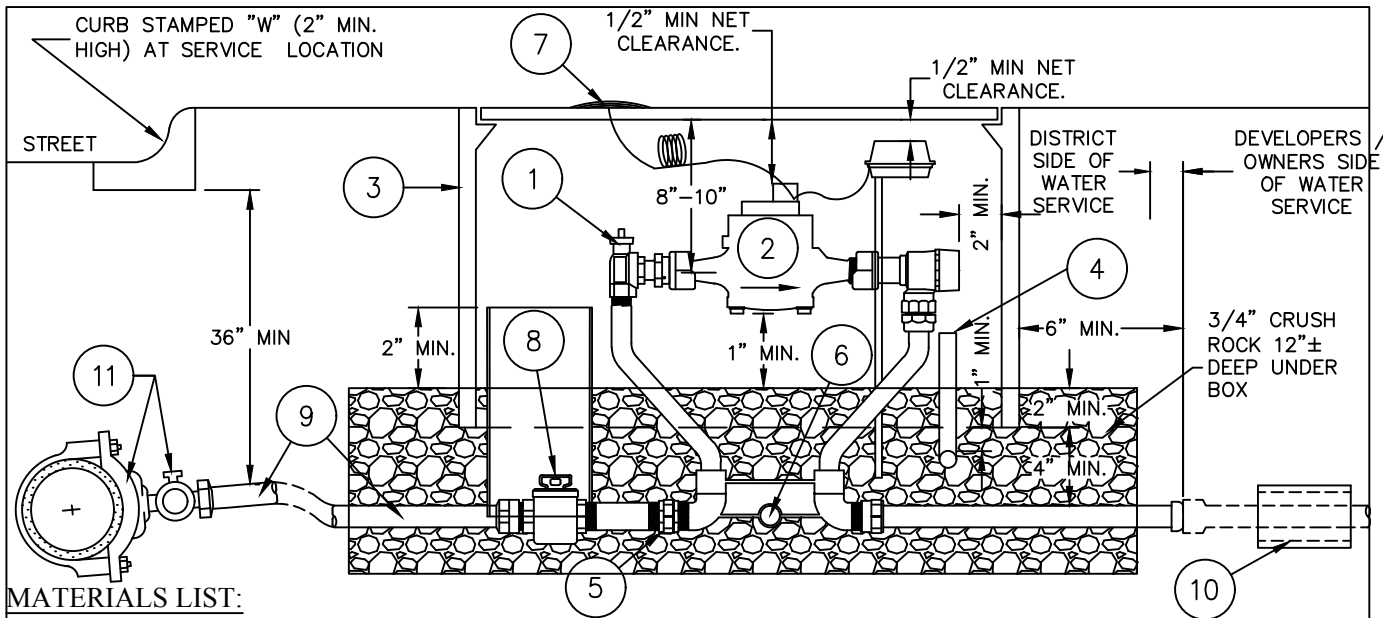
- 1 METER SETTER MUELLER COPPER METER YOKE/SETTER (BALL STYLE W/DUAL CHECKS), W/ LOCKWING ANGLE BALL STOP VALVE AND DUAL CHECK VALVE (W/ MIP METER THREADS ON INLET AND OUTLET). STANDARD SERVICE SIZE SHALL BE 3/4" MODEL B-24118-2A (THE DISTRICT RECOMMENDS USING THE 12" HIGH SETTER).
- 2 WATER METER SHALL BE BADGER METERS, READING CU. FT., TRPL WITH MXU. DEVELOPER / CONTRACTOR SHALL PROVIDE THE METER & CERTIFICATE FOR MXU. STANDARD SERVICE SIZE SHALL BE 3/4" RCDL 9.0" LL. THE REMOTE TRANSMITTER ASSEMBLY SHALL ONLY BE INSTALLED BY THE METER MANUFACTURER'S REPRESENTATIVE.
- 3 METER BOX & LID FOR TOUCH PAD. INSTALL BOX EXTENSION SHALL BE SIZED AS NEEDED FOR METER TO LID CLEARANCE. CONTRACTOR / DEVELOPER RESPONSIBILITY. USE CHRISTI MODEL B30 W/ B30P LID FOR 3/4" & 1" METERS, B36 W/ B36P FOR 1 1/2" & 2" METERS. INSTALL BRICK BLOCKS UNDER EACH CORNER AND AT THE MIDDLE EACH OF THE LONG SIDE OF THE PERIMETER OF THE METER BOX. (MINIMUM OF SIX (6) BLOCKS PER BOX). PROVIDE TRAFFIC RATED BOX & LID IN ALL TRAFFIC AREAS.
- 4 -
- 5 METER COUPLING MUELLER H-10890 OR EQUAL (3/4" X 4" M.I.P. X SWIVEL NUT)
- 6 -
- 7 TOUCH PAD ASSEMBLY PURCHASED AND INSTALLED BY CONTRACTOR / DEVELOPER. APPROX. THREE (3) FEET OF SLACK IN WIRE)
- 8 CURB STOP MUELLER B-25166 BALL METER VALVE W/ LOCKWING OR EQUAL. PROVIDE 3"Ø MIN. PVC RISER EXTENDING TO 2" ABOVE GRAVEL W/ A REMOVABLE SEAL. (RECOMMEND 90° CURB STOP AND CLOSE NIPPLE TO SETTER)
- 9 TYPE K COPPER PIPE, NO SPLICING ALLOWED UNDER ANY HARD SURFACE AREAS. STANDARD SERVICE SHALL BE 3/4"Ø.
- 10 CONTRACTOR / DEVELOPER SHALL PROVIDE MIN. 2"Ø CONDUIT SLEEVE FOR WATER SERVICE UNDER SIDEWALK.
- 11 MUELLER-BRONZE SERVICE SADDLES - H13000 SERIES, BR2B SERIES, WITH MUELLER BRONZE CORPORATION BALL VALVE.

NOTES:

- 1. ALL BOLTS, PIPING AND FITTINGS TO BE BRASS, BRONZE, COPPER, OR STAINLESS STEEL.
- 2. ONLY TO BE USED FOR EXISTING CONNECTIONS

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			STANDARD 3/4"Ø WATER SERVICE	
			Garry E. Laughlin	
			District Engineer	
5-05	FORMERLY STD. DTL. NO. W-18	SCD	5-6-2005	
DATE	REVISIONS	BY	APPROVED	DATE

8-32A



MATERIALS LIST:

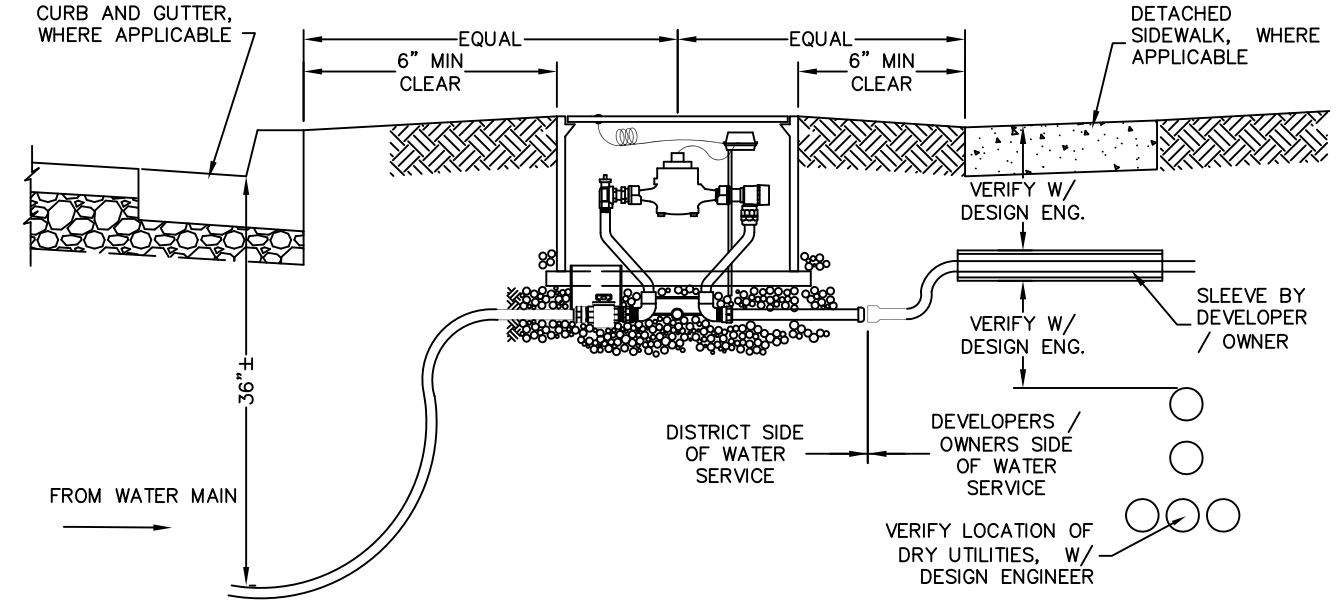
- 1 METER SETTER MUELLER COPPER METER YOKE/SETTER (BALL STYLE W/DUAL CHECKS), W/ LOCKWING ANGLE BALL STOP VALVE AND DUAL CHECK VALVE (W/ MIP METER THREADS ON INLET AND OUTLET).THE DISTRICT RECOMMENDS USING THE 12" HIGH SETTER.
- 2 WATER METER SHALL BE BADGER METERS, READING CU. FT., TRPL WITH MXU. DEVELOPER / CONTRACTOR SHALL PROVIDE THE METER & CERTIFICATE FOR MXU. THE REMOTE TRANSMITTER ASSEMBLY SHALL ONLY BE INSTALLED BY THE METER MANUFACTURER'S REPRESENTATIVE OR THE DISTRICT.
- 3 METER BOX & LID FOR TOUCH PAD. INSTALL BOX EXTENSION SHALL BE SIZED AS NEEDED FOR METER TO LID CLEARANCE. CONTRACTOR / DEVELOPER RESPONSIBILITY. USE CHRISTI MODEL B36 W/ B36P FOR 1 1/2" & 2" METERS. INSTALL BRICK BLOCKS UNDER EACH CORNER AND AT THE MIDDLE EACH OF THE LONG SIDE OF THE PERIMETER OF THE METER BOX. (MINIMUM OF SIX (6) BLOCKS PER BOX). PROVIDE TRAFFIC RATED BOX & LID IN ALL TRAFFIC AREAS.
- 4 -
- 5 METER COUPLING MUELLER WITH SWIVEL NUT.
- 6 -
- 7 TOUCH PAD ASSEMBLY PURCHASED AND INSTALLED BY CONTRACTOR / DEVELOPER. APPROX. THREE (3) FEET OF SLACK IN WIRE)
- 8 CURB STOP MUELLER B-25166 BALL METER VALVE W/ LOCKWING OR EQUAL. PROVIDE 3"Ø MIN. PVC RISER EXTENDING TO 2" ABOVE GRAVEL W/ A REMOVABLE SEAL. (RECOMMEND 90° CURB STOP AND CLOSE NIPPLE TO SETTER)
- 9 Polyethylene Water Service PIPE, must be continuous run from water main to curb stop. STANDARD SERVICE SHALL BE 1 1/2"Ø. See installation guide by Plastic Pipe & Fitting Assn.
- 10 CONTRACTOR / DEVELOPER SHALL PROVIDE MIN. 3"Ø CONDUIT SLEEVE FOR WATER SERVICE UNDER SIDEWALK.
- 11 MUELLER-BRONZE SERVICE SADDLES - H13000 SERIES, BR2B SERIES, WITH MUELLER BRONZE CORPORATION BALL VALVE.

NOTES:

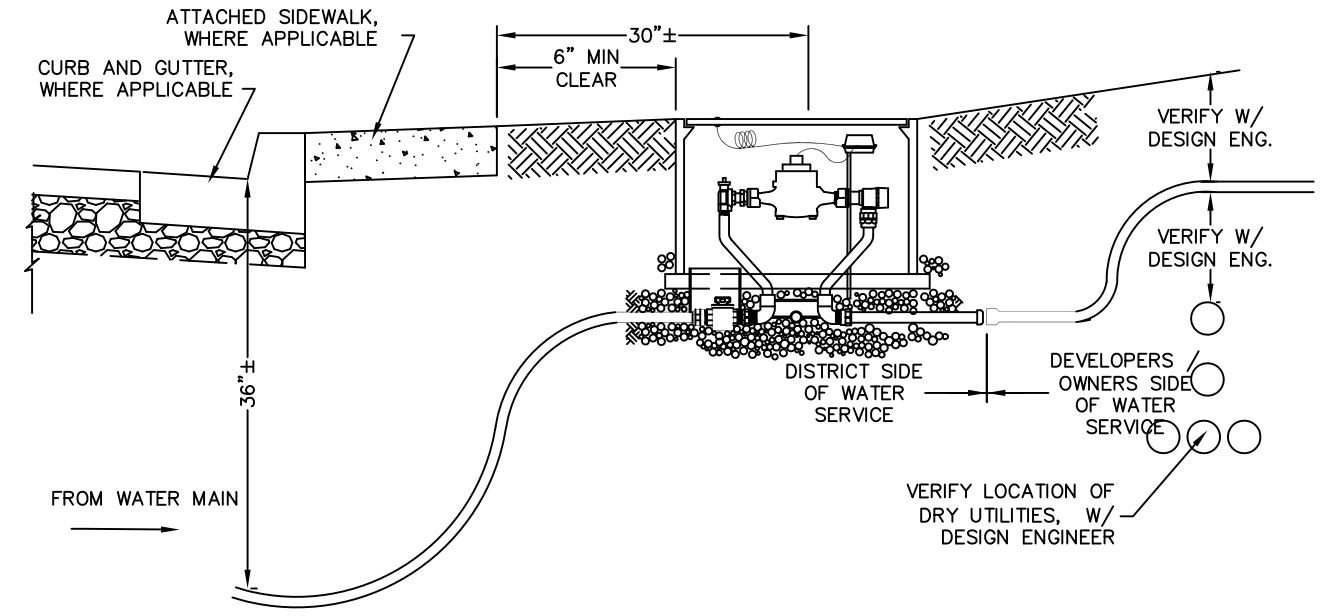
1. ALL BOLTS, PIPING AND FITTINGS TO BE BRASS, BRONZE, POLY, OR STAINLESS STEEL.

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			STANDARD 1 1/2"Ø WATER SERVICE	
10-16	CHANGE SERVICE LINE MATERIAL	JCT	John C. Tillotson, P.E. District Engineer	8-32
6-14	CHANGE METER MFR	JCT		
9-12	CHANGE SVC SIZE TO 1 1/2, FIRE SPRINKLER	JCT		
5-05	FORMERLY STD. DTL. NO. W-18	SCD		
DATE	REVISIONS	BY		
			APPROVED	DATE 8-10-2016

SIDEWALK DETACHED TO CURB AND GUTTER



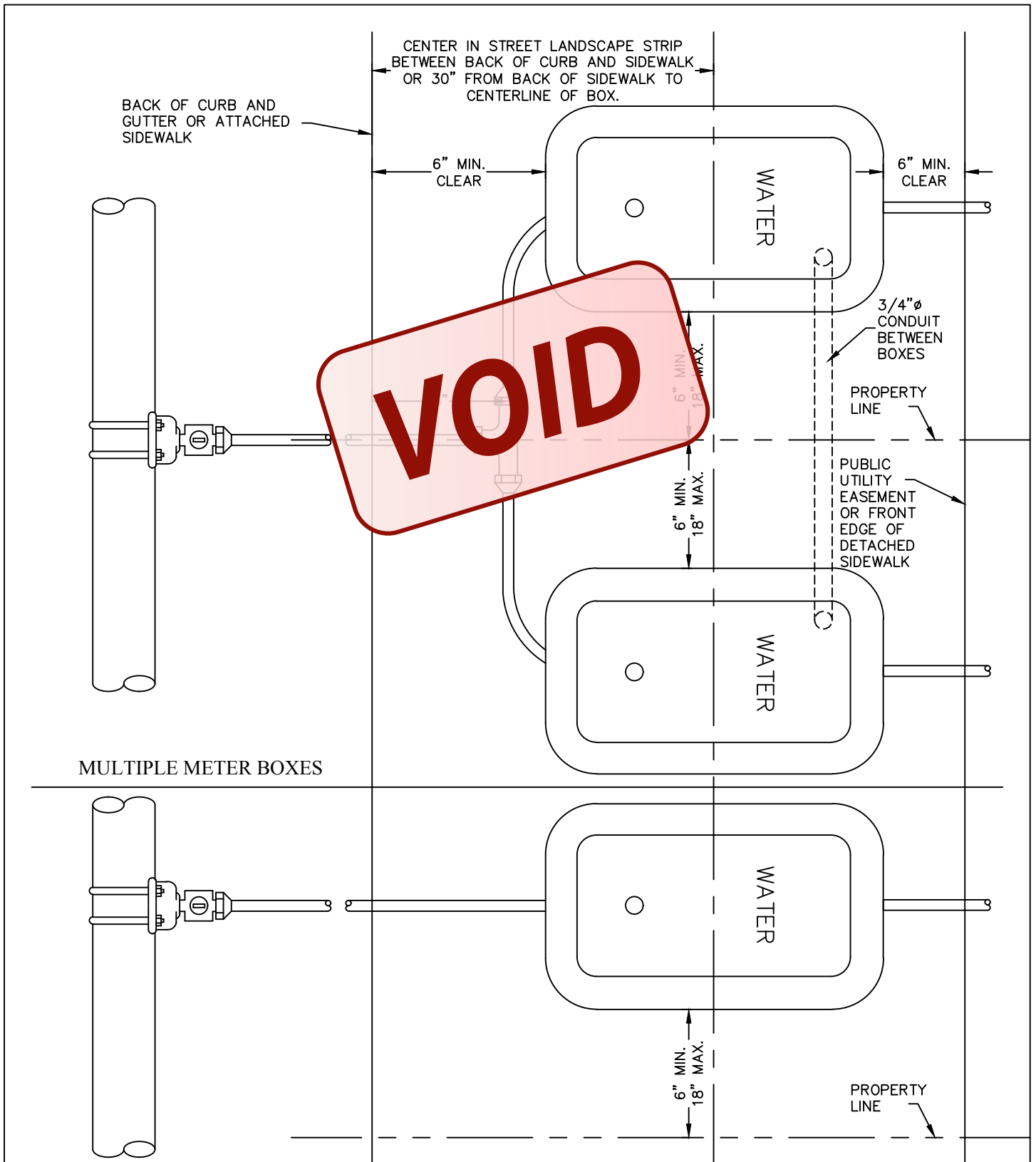
SIDEWALK ATTACHED TO CURB AND GUTTER



NOTES:

1. REFER TO IMPROVEMENT STANDARD DETAILS FOR METER BOXES FOR ADDITIONAL REQUIREMENTS AND MATERIALS.

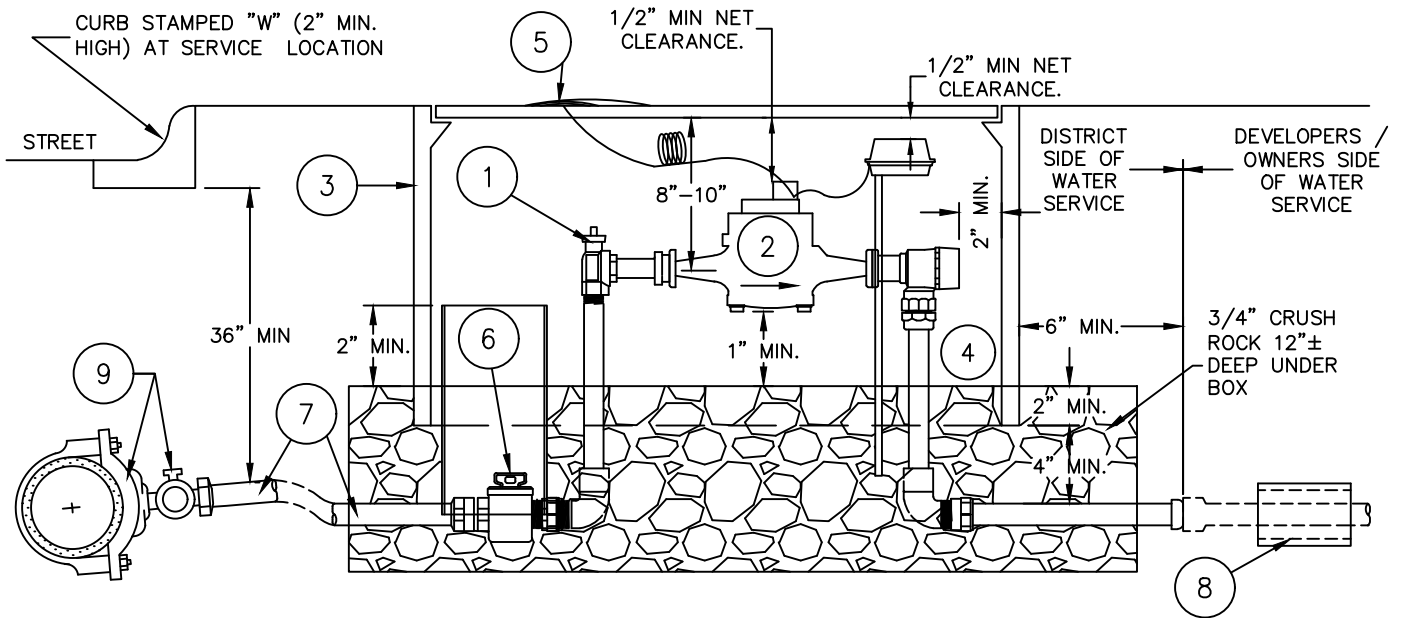
			OLIVEHURST PUBLIC UTILITY DISTRICT
			TYPICAL WATER METER BOX LOCATION
5-05	FORMERLY STD. DTL. NO. W-18A	SCD	Garry E. Laughlin District Engineer
DATE	REVISIONS	BY	APPROVED
			5-6-2005 DATE
			8-33



NOTES: SINGLE METER BOX

1. REFER TO IMPROVEMENT STANDARD DETAILS FOR METER BOXES FOR ADDITIONAL REQUIREMENTS AND MATERIALS.
2. BOXES REQUIRE MINIMUM OF 5' SEPARATION (CENTER TO CENTER) FROM HYDRANTS, STREETLIGHTS, TRANSFORMERS, ETC

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			WATER METER BOXES	
			Garry E. Laughlin	8-34
			District Engineer	
5-05	FORMERLY STD. DTL. NO. W-2C	SCD		5-6-2005
DATE	REVISIONS	BY	APPROVED	DATE



MATERIALS LIST:

- 1 MUELLER FLANGED LOCKWING ANGLE BALL STOP VALVE AND DUAL CHECK VALVE FOR 1 1/2" OR LARGER COMMERCIAL METER SERVICE .
- 2 WATER METER SHALL BE BADGER METERS, READING CU. FT., TRPL WITH MXU. DEVELOPER / CONTRACTOR SHALL PROVIDE THE METER & CERTIFICATE FOR MXU. THE REMOTE TRANSMITTER ASSEMBLY SHALL ONLY BE INSTALLED BY THE METER MANUFACTURER'S REPRESENTATIVE OR THE DISTRICT.
METER BOX & LID FOR TOUCH PAD. INSTALL BOX EXTENSION SHALL BE SIZED AS NEEDED FOR METER TO LID CLEARANCE. CONTRACTOR / DEVELOPER RESPONSIBILITY. USE CHRISTI MODEL B36 W/ B36P FOR 1 1/2" & 2" METERS (LARGER BOX FOR LARGER SERVICE). INSTALL BRICK BLOCKS UNDER EACH CORNER AND AT THE MIDDLE EACH OF THE LONG SIDE OF THE PERIMETER OF THE METER BOX. (MINIMUM OF SIX (6) BLOCKS PER BOX). PROVIDE TRAFFIC RATED BOX & LID IN ALL TRAFFIC AREAS.
- 3
- 4 CASE BY CASE BASIS ONLY: PROVIDE A 3/4" SCH 80 CONDUIT SHALL BE INSTALLED BY CONTRACTOR / DEVELOPER TO CONNECT BETWEEN MULTIPLE WATER METERS (SEE NOTE 2). THE CONDUIT SHALL BE SECURED TO THE BACK OF EACH SETTER AND SHALL HAVE 90° SWEEPING AT BOTH END CONNECTIONS. PROVIDE A REMOVABLE SEAL OVER BOTH END OF CONDUIT.
- 5 TOUCH PAD ASSEMBLY PURCHASED AND INSTALLED BY CONTRACTOR / DEVELOPER. APPROX. THREE (3) FEET OF SLACK IN WIRE)
- 6 CURB STOP MUELLER BALL METER VALVE W/ LOCKWING OR EQUAL. PROVIDE 3"Ø MIN. PVC RISER EXTENDING TO 2" ABOVE GRAVEL W/ A REMOVABLE SEAL.
- 7 POLY PIPE WITH TRACER WIRE, NO SPLICING ALLOWED UNDER ANY HARD SURFACE AREAS.
- 8 CONTRACTOR / DEVELOPER SHALL PROVIDE CONDUIT SLEEVE FOR WATER SERVICE UNDER SIDEWALK.
- 9 MUELLER-BRONZE SERVICE SADDLES – H13000 SERIES, BR2B SERIES, WITH MUELLER BRONZE CORPORATION BALL VALVE.

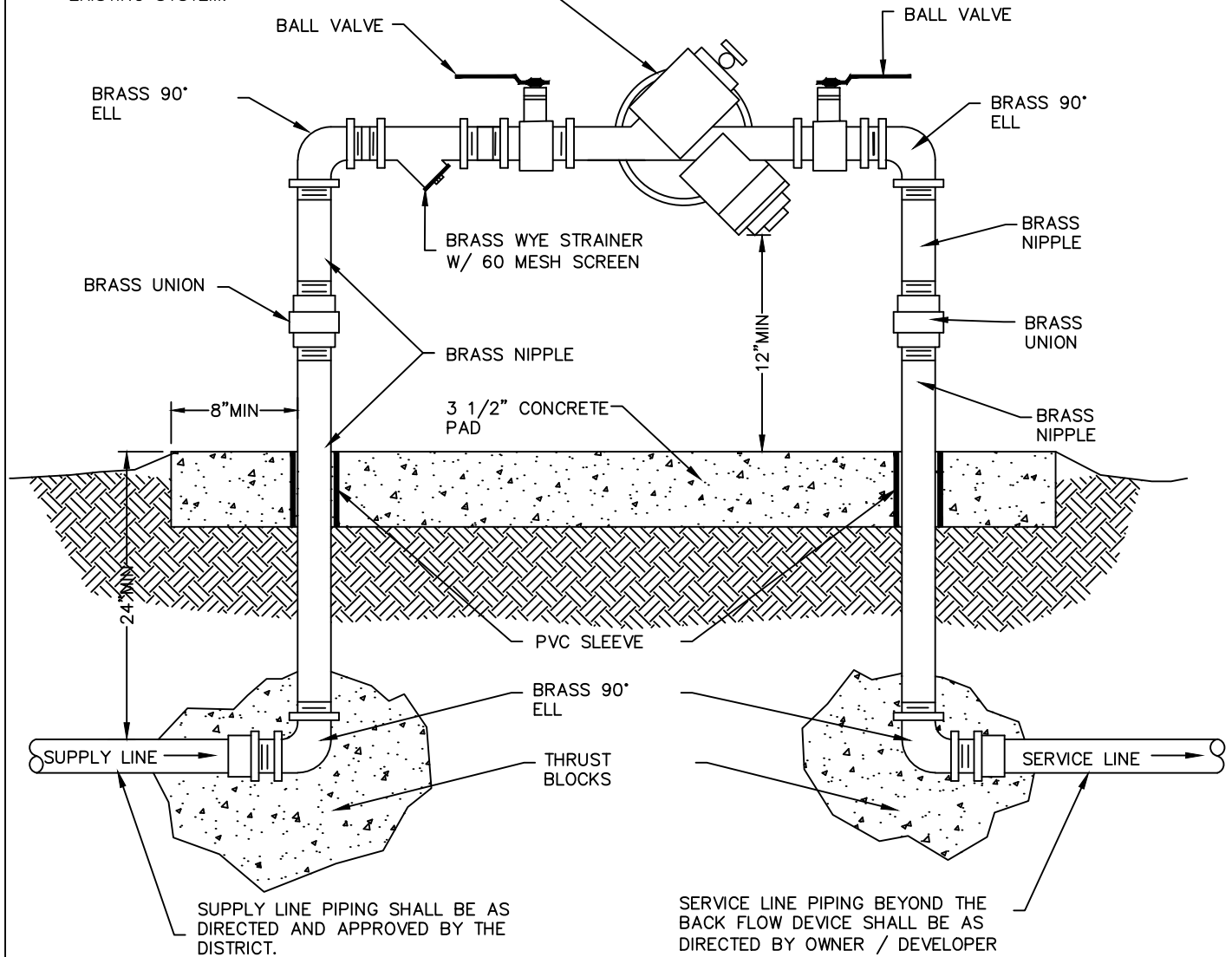
NOTES:

1. ALL BOLTS, PIPING AND FITTINGS TO BE BRASS, BRONZE, OR STAINLESS STEEL.

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			LARGE COMMERCIAL WATER SERVICE	
			Garry E. Laughlin	
			District Engineer	
5-05	NEW DETAIL	SCD	5-6-2005	
DATE	REVISIONS	BY	APPROVED	DATE

8-35

BACKFLOW PREVENTION DEVICE.
 THE INSTALLED DEVICE MUST BE CERTIFIED
 AND INSPECTED BY THE DISTRICT PRIOR TO
 THE DRAWING OF ANY WATER FROM THE
 EXISTING SYSTEM.



SUPPLY LINE PIPING SHALL BE AS DIRECTED AND APPROVED BY THE DISTRICT.

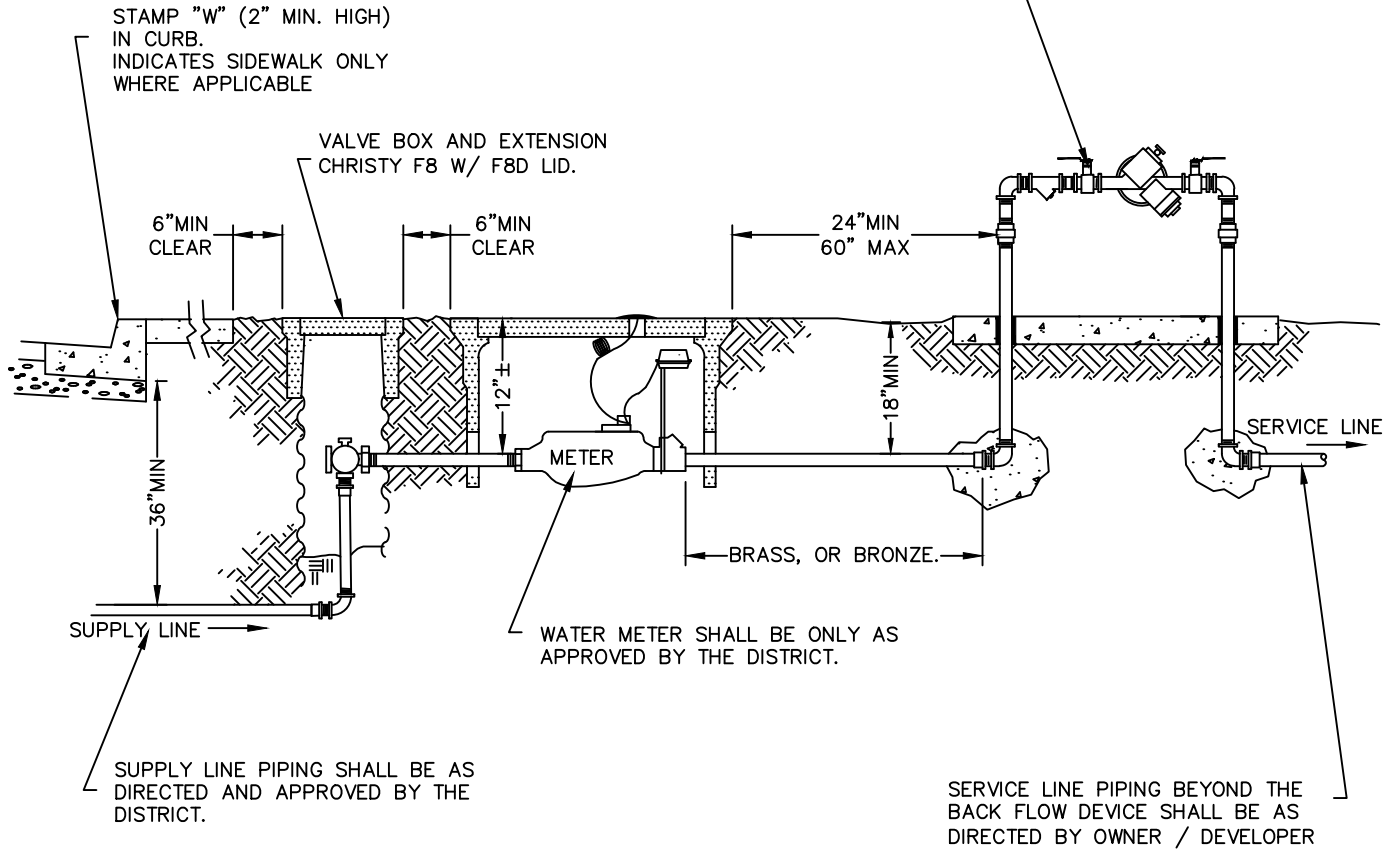
SERVICE LINE PIPING BEYOND THE BACK FLOW DEVICE SHALL BE AS DIRECTED BY OWNER / DEVELOPER

NOTES:

1. ALL PIPING AND FITTINGS SHALL BE BRASS, BRONZE, OR STAINLESS STEEL.
2. ALL BOLTS SHALL BE TYPE 304 STAINLESS STEEL.
3. ALL BACK FLOW PREVENTION DEVICES SHALL BE TESTED BY A DISTRICT APPROVED CERTIFIED TESTER WITH A CURRENT AWWA CERTIFICATION AND INSPECTED BY THE DISTRICT PRIOR TO BEING PLACED INTO SERVICE.
4. THE BACK FLOW PREVENTION DEVICE SHALL BE INSTALLED ABOVE GROUND, IN A HORIZONTAL & LEVEL POSITION. THE ASSEMBLY SHALL BE LOCATED ON THE CUSTOMER'S SIDE & NO FURTHER THAN FIVE (5) FEET FROM THE WATER METER.
5. DEVICE EQUIPMENT SHALL BE INSTALLED A MIN. OF 24" FROM ANY STRUCTURE OR HARDSCAPING.
6. WHEN UNIT IS NEAR A STRUCTURE - MOUNT TEST COCKS ON OPEN OR NON-OBSTRUCTED SIDE.
7. ALL ABOVE GROUND ASSEMBLY SHALL RECEIVE TWO (2) COATS OF RED PRIMER & ONE COAT OF EXT. BLACK ENAMEL.
8. CONTRACTOR / DEVELOPER SHALL PROVIDE A LOCKABLE INSULATED CAGE.
9. NO OUTLET, TAP, TEE, OR CONNECTION BETWEEN THE WATER MAIN AND THE BACK FLOW PREVENTER IS ALLOWED UNLESS APPROVED BY THE DISTRICT ENGINEER.

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			2" & LESS BACKFLOW DEVICE	
5-05	NEW DETAIL	SCD	Garry E. Laughlin District Engineer APPROVED _____ DATE 5-6-2005	
DATE	REVISIONS	BY		
			8-40	

BACKFLOW PREVENTION DEVICE.
THE INSTALLED DEVICE MUST BE CERTIFIED
AND INSPECTED BY THE DISTRICT PRIOR TO
THE DRAWING OF ANY WATER FROM THE
DISTRICT SYSTEM.

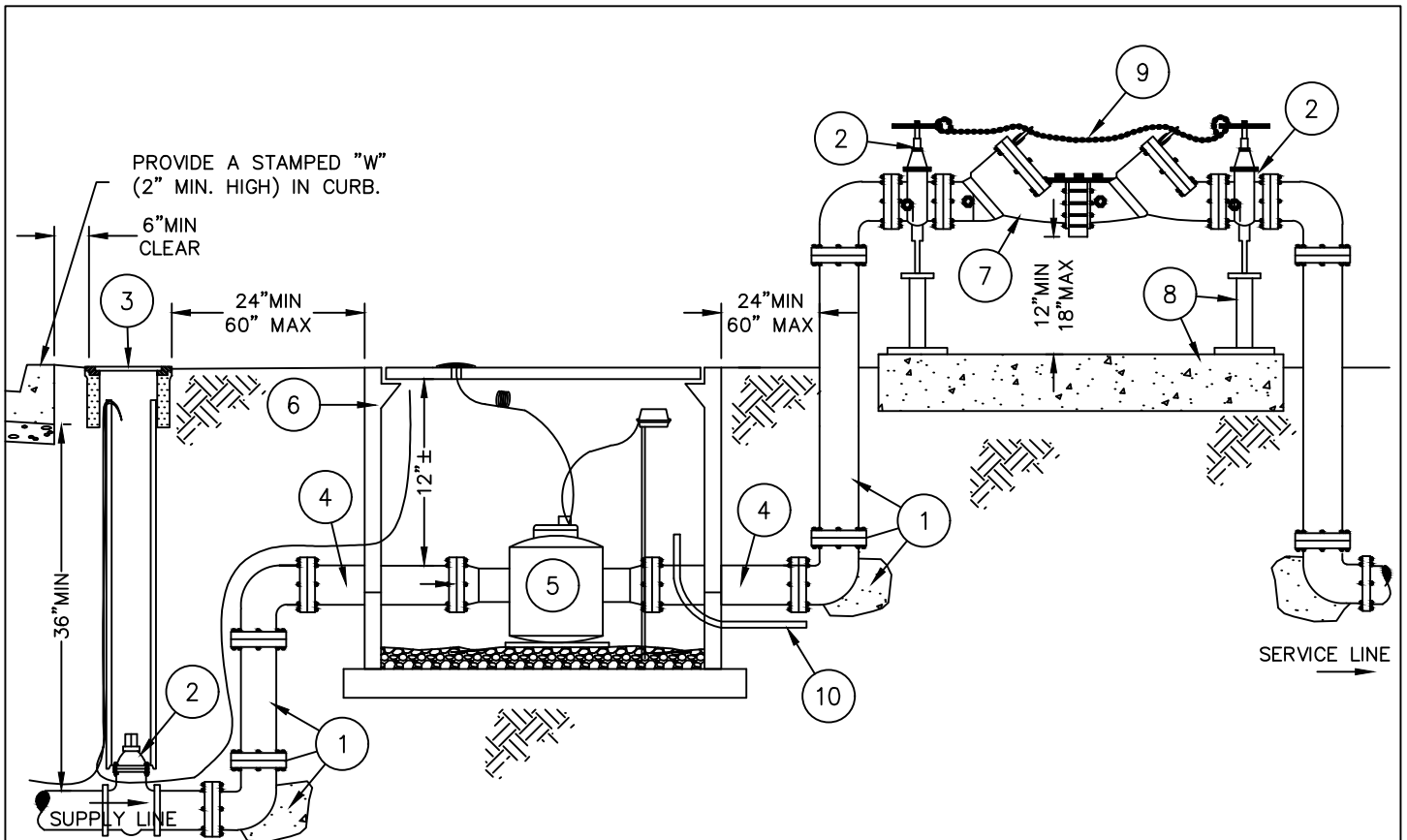


NOTES:

1. ALL PIPING AND FITTINGS SHALL BE BRASS, BRONZE, OR STAINLESS STEEL.
2. ALL BOLTS SHALL BE TYPE 304 STAINLESS STEEL.
3. ALL BACK FLOW PREVENTION DEVICES SHALL BE TESTED BY A DISTRICT APPROVED CERTIFIED TESTER WITH A CURRENT AWWA CERTIFICATION AND INSPECTED BY THE DISTRICT PRIOR TO BEING PLACED INTO SERVICE.
4. THE BACK FLOW PREVENTION DEVICE SHALL BE INSTALLED ABOVE GROUND, IN A HORIZONTAL & LEVEL POSITION. THE ASSEMBLY SHALL BE LOCATED ON THE CUSTOMER'S SIDE & NO FURTHER THAN FIVE (5) FEET FROM THE WATER METER.
5. DEVICE EQUIPMENT SHALL BE INSTALLED A MIN. OF 24" FROM ANY STRUCTURE OR HARDSCAPING.
6. WHEN UNIT IS NEAR A STRUCTURE - MOUNT TEST COCKS ON OPEN OR NON-OBSTRICTED SIDE.
7. ALL ABOVE GROUND ASSEMBLY SHALL RECEIVE TWO (2) COATS OF RED PRIMER & ONE COAT OF EXT. BLACK ENAMEL.
8. CONTRACTOR / DEVELOPER SHALL PROVIDE A LOCKABLE, INSULATED CAGE.
9. NO OUTLET, TAP, TEE, OR CONNECTION BETWEEN THE WATER MAIN AND THE BACK FLOW PREVENTER IS ALLOWED UNLESS APPROVED BY THE DISTRICT ENGINEER.

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			2" & LESS BACKFLOW DEVICE	
			Garry E. Laughlin	
			District Engineer	
5-05	NEW DETAIL	SCD	5-6-2005	
DATE	REVISIONS	BY	APPROVED	DATE

8-41



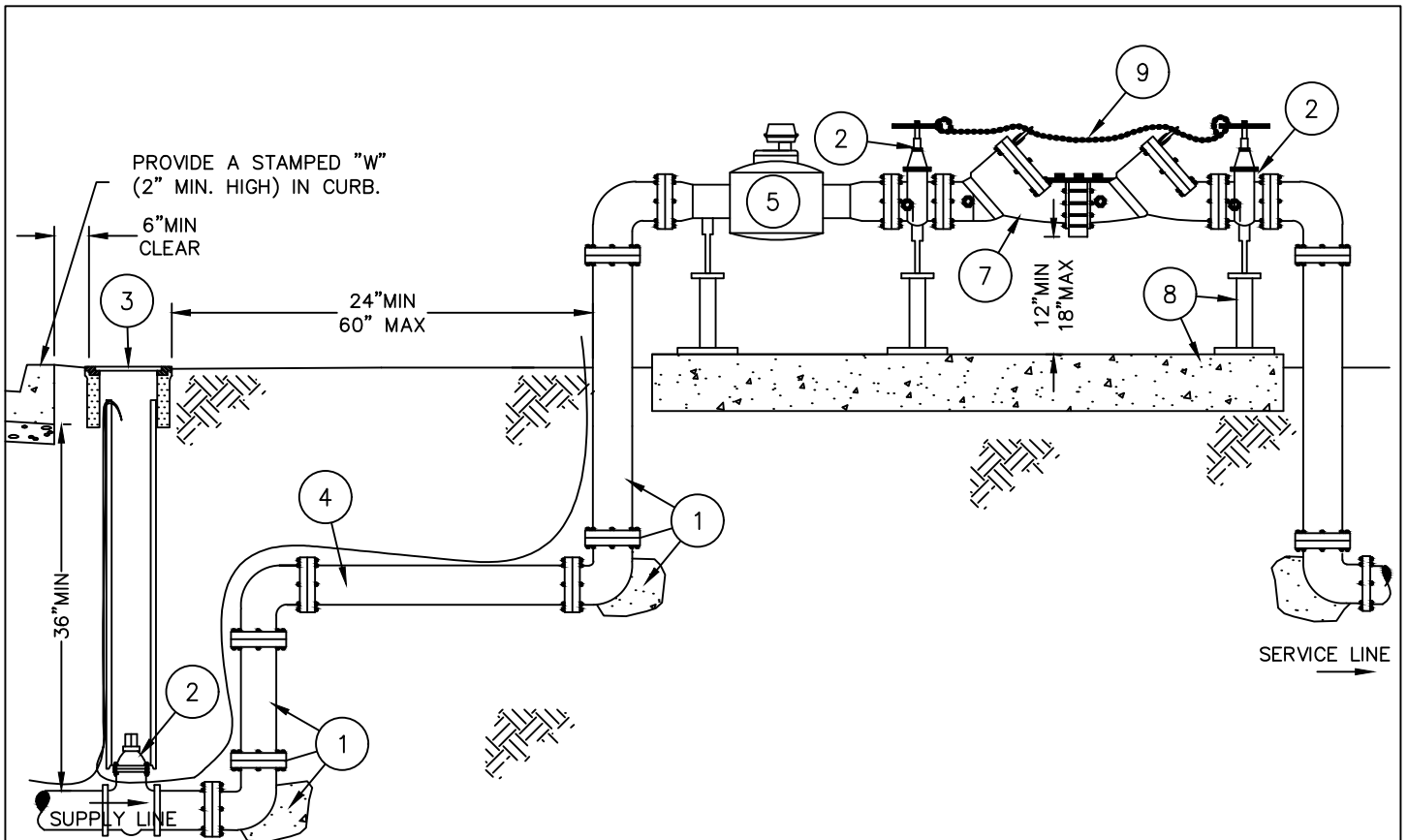
- 1 FLANGED DUCTILE IRON PIPE AND FITTINGS W/ TYPE 304 STAINLESS STEEL BOLTS. PROVIDE TRACER WIRE AND THRUST BLOCKS PER OPUD IMPROVEMENT STANDARDS SECTION 8.
- 2 MUELLER GATE VALVE, REFER TO IMPROVEMENT STANDARDS SECTION 8. PROVIDE HANDLE ON ABOVE GRADE VALVES.
- 3 CHRISTY G5 TRAFFIC VALVE BOX. MARKED "WATER" INSTALLED PER DISTRICT IMPROVEMENT STANDARDS.
- 4 MINIMUM SPOOL LENGTH UPSTREAM AND DOWNSTREAM OF METER SHALL BE FIVE (5) TIMES THE PIPE DIAMETER.
WATER METER SHALL BE INVENSYS "W" TURBO METER W/ STRAINER, READING CU. FT., TRPL WITH MXU. DEVELOPER / CONTRACTOR SHALL PROVIDE THE METER & CERTIFICATE FOR MXU. THE REMOTE TRANSMITTER ASSEMBLY SHALL ONLY BE INSTALLED BY THE METER MANUFACTURER'S REPRESENTATIVE.

- 6 CHRISTY B40 METER BOX W/ B40P LID FOR TOUCH PAD. PROVIDE CONC. OR BRICK BLOCK UNDER THE ENTIRE BOTTOM PERIMETER OF THE METER BOX.
- 7 BACKFLOW PREVENTION DEVICE. THE INSTALLED DEVICE MUST BE CERTIFIED AND INSPECTED BY THE DISTRICT PRIOR TO THE DRAWING OF ANY WATER FROM THE EXISTING SYSTEM.
- 8 3 1/2" CONC. SLAB W/ ADJUSTABLE SUPPORT STAND BOLTED INTO CONC. W/ A MINIMUM OF TWO (2) WEDGE BOLTS.
- 9 INSTALL 3/8" NON-CASE HARDENED CHAIN W/ ONE (1) DISTRICT LOCK.
- 10 PROVIDE 3/4"Ø PVC CONDUIT TO OTHER MANIFOLD BOXES.

NOTES:

- 1. ALL PIPING AND FITTINGS SHALL BE FLANGED DUCTILE IRON.
- 2. ALL BOLTS SHALL BE TYPE 304 STAINLESS STEEL.
- 3. ALL BACK FLOW PREVENTION DEVICES SHALL BE TESTED BY A DISTRICT APPROVED CERTIFIED TESTER WITH A CURRENT AWWA CERTIFICATION AND INSPECTED BY THE DISTRICT PRIOR TO BEING PLACED INTO SERVICE.
- 4. THE BACK FLOW PREVENTION DEVICE SHALL BE INSTALLED ABOVE GROUND, IN A HORIZONTAL & LEVEL POSITION. THE ASSEMBLY SHALL BE LOCATED ON THE CUSTOMER'S SIDE & NO FURTHER THAN FIVE (5) FEET FROM THE WATER METER.
- 5. DEVICE EQUIPMENT SHALL BE INSTALLED A MIN. OF 24" FROM ANY STRUCTURE OR HARDSCAPING.
- 6. WHEN UNIT IS NEAR A STRUCTURE – MOUNT TEST COCKS ON OPEN OR NON-OBSTRUCTED SIDE.
- 7. CONTRACTOR / DEVELOPER SHALL PROVIDE A LOCKABLE INSULATED CAGE.
- 8. NO OUTLET, TAP, TEE, OR CONNECTION BETWEEN THE WATER MAIN AND THE BACK FLOW PREVENTER IS ALLOWED UNLESS APPROVED BY THE DISTRICT ENGINEER.

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			3" & LARGER BACKFLOW DEVICE	
			Garry E. Laughlin	
			District Engineer	
5-05	NEW DETAIL	SCD	8-42	
DATE	REVISIONS	BY		
			APPROVED	DATE



PROVIDE A STAMPED "W"
(2" MIN. HIGH) IN CURB.

6" MIN
CLEAR

24" MIN
60" MAX

12" MIN
18" MAX

- 1 FLANGED DUCTILE IRON PIPE AND FITTINGS W/ TYPE 304 STAINLESS STEEL BOLTS. PROVIDE TRACER WIRE AND THRUST BLOCKS PER OPUD IMPROVEMENT STANDARDS SECTION 8.
- 2 MUELLER GATE VALVE, REFER TO IMPROVEMENT STANDARDS SECTION 8. PROVIDE HANDLE ON ABOVE GRADE VALVES.
- 3 CHRISTY G5 TRAFFIC VALVE BOX. MARKED "WATER" INSTALLED PER DISTRICT IMPROVEMENT STANDARDS.
- 4 MINIMUM SPOOL LENGTH UPSTREAM AND DOWNSTREAM OF METER SHALL BE FIVE (5) TIMES THE PIPE DIAMETER.
- 5 WATER METER SHALL BE INVENSYS "W" TURBO METER W/ STRAINER, READING CU. FT., TRPL WITH MXU. DEVELOPER / CONTRACTOR SHALL PROVIDE THE METER & CERTIFICATE FOR MXU. THE REMOTE TRANSMITTER ASSEMBLY SHALL ONLY BE INSTALLED BY THE METER MANUFACTURER'S REPRESENTATIVE.

- 7 BACKFLOW PREVENTION DEVICE. THE INSTALLED DEVICE MUST BE CERTIFIED AND INSPECTED BY THE DISTRICT PRIOR TO THE DRAWING OF ANY WATER FROM THE EXISTING SYSTEM.
- 8 3 1/2" CONC. SLAB W/ ADJUSTABLE SUPPORT STAND BOLTED INTO CONC. W/ A MINIMUM OF TWO (2) WEDGE BOLTS.
- 9 INSTALL 3/8" NON-CASE HARDENED CHAIN W/ ONE (1) DISTRICT LOCK.

NOTES:

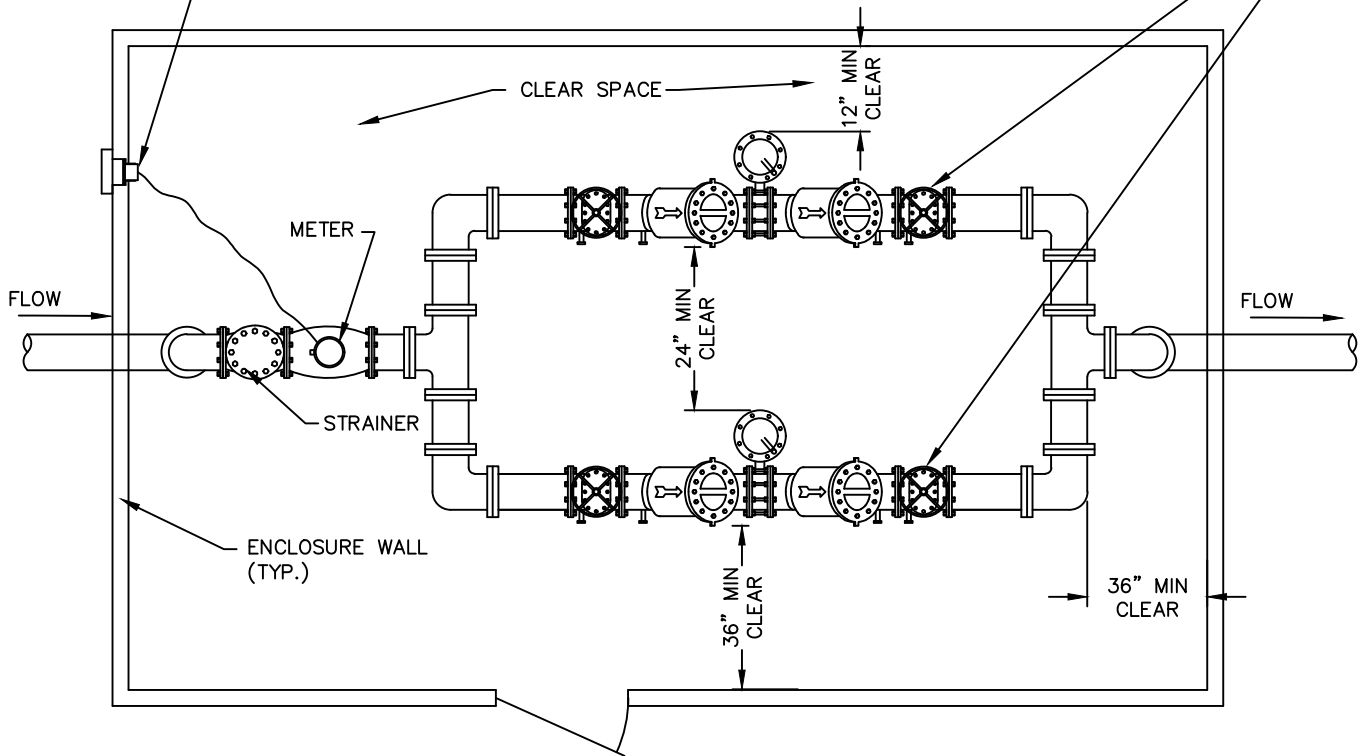
- 1. ALL PIPING AND FITTINGS SHALL BE FLANGED DUCTILE IRON.
- 2. ALL BOLTS SHALL BE TYPE 304 STAINLESS STEEL.
- 3. ALL BACK FLOW PREVENTION DEVICES SHALL BE TESTED BY A DISTRICT APPROVED CERTIFIED TESTER WITH A CURRENT AWWA CERTIFICATION AND INSPECTED BY THE DISTRICT PRIOR TO BEING PLACED INTO SERVICE.
- 4. THE BACK FLOW PREVENTION DEVICE SHALL BE INSTALLED ABOVE GROUND, IN A HORIZONTAL & LEVEL POSITION. THE ASSEMBLY SHALL BE LOCATED ON THE CUSTOMER'S SIDE & NO FURTHER THAN FIVE (5) FEET FROM THE WATER METER.
- 5. DEVICE EQUIPMENT SHALL BE INSTALLED A MIN. OF 24" FROM ANY STRUCTURE OR HARDSCAPING.
- 6. WHEN UNIT IS NEAR A STRUCTURE – MOUNT TEST COCKS ON OPEN OR NON-OBSTRUCTED SIDE.
- 7. CONTRACTOR / DEVELOPER SHALL PROVIDE A LOCKABLE INSULATED CAGE.
- 8. NO OUTLET, TAP, TEE, OR CONNECTION BETWEEN THE WATER MAIN AND THE BACK FLOW PREVENTER IS ALLOWED UNLESS APPROVED BY THE DISTRICT ENGINEER.

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			3" & LARGER BACKFLOW DEVICE	
5-05	NEW DETAIL	SCD	Garry E. Laughlin	
DATE	REVISIONS	BY	District Engineer	5-6-2005
			APPROVED	DATE

8-43

OWNER/CONTRACTOR SHALL PROVIDE AND INSTALL CONDUIT FOR A REMOTE METER READER AND "MXU" RADIO READ THROUGH ENCLOSURE WALL. THE OWNER HAS THE OPTION TO FURNISH AND INSTALL A FLUSH MOUNT OR SURFACE LOCKABLE BOX AND CONDUIT.

BACKFLOW PREVENTION DEVICES. THE INSTALLED DEVICE MUST BE CERTIFIED AND INSPECTED BY THE DISTRICT PRIOR TO THE DRAWING OF ANY WATER FROM THE DISTRICT SYSTEM.

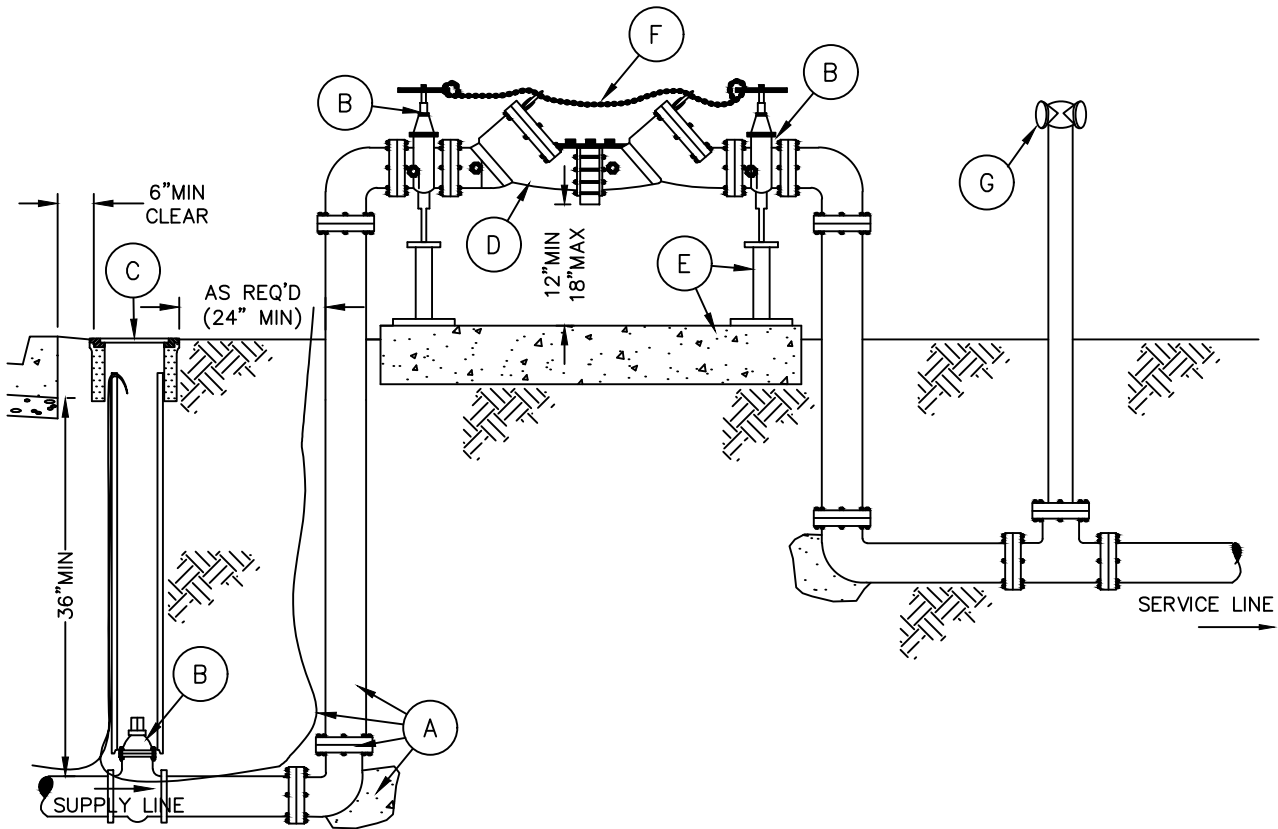


NOTES:

1. ALL PIPING AND FITTINGS SHALL BE FLANGED DUCTILE IRON.
2. ALL BOLTS SHALL BE TYPE 304 STAINLESS STEEL.
3. ALL BACK FLOW PREVENTION DEVICES SHALL BE TESTED BY A DISTRICT APPROVED CERTIFIED TESTER WITH A CURRENT AWWA CERTIFICATION AND INSPECTED BY THE DISTRICT PRIOR TO BEING PLACED INTO SERVICE.
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5. DEVICE EQUIPMENT SHALL BE INSTALLED A MIN. OF 24" FROM ANY STRUCTURE OR HARDCAPING.
6. WHEN UNIT IS NEAR A STRUCTURE - MOUNT TEST COCKS ON OPEN OR NON-OBSTRUCTED SIDE.
7. CONTRACTOR / DEVELOPER SHALL PROVIDE A LOCKABLE INSULATED CAGE.
8. NO OUTLET, TAP, TEE, OR CONNECTION BETWEEN THE WATER MAIN AND THE BACK FLOW PREVENTER IS ALLOWED UNLESS APPROVED BY THE DISTRICT ENGINEER.
9. BACKFLOW ASSEMBLIES SHALL NOT BE INSTALLED IN BASEMENTS OR VAULTS.
10. SUPPORTS RECOMMENDED FOR ASSEMBLIES 3" AND LARGER.

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			LARGE PARALLEL BACKFLOW UNITS	
			Garry E. Laughlin	
			District Engineer	
5-05	NEW DETAIL	SCD	5-6-2005	
DATE	REVISIONS	BY	APPROVED	DATE

8-44



- (A) FLANGED DUCTILE IRON PIPE AND FITTINGS W/ TYPE 304 STAINLESS STEEL BOLTS. PROVIDE TRACER WIRE AND THRUST BLOCKS PER OPUD IMPROVEMENT STANDARDS SECTION 8.
- (B) MUELLER GATE VALVE, REFER TO IMPROVEMENT STANDARDS SECTION 8. PROVIDE HANDLE ON ABOVE GRADE VALVES.
- (C) CHRISTY G5 TRAFFIC VALVE BOX, MARKED "WATER" & INSTALLED PER DISTRICT IMPROVEMENT STANDARDS.
- (D) BACKFLOW PREVENTION DEVICE. THE INSTALLED DEVICE MUST BE CERTIFIED AND INSPECTED BY THE DISTRICT PRIOR TO THE DRAWING OF ANY WATER FROM THE EXISTING SYSTEM.

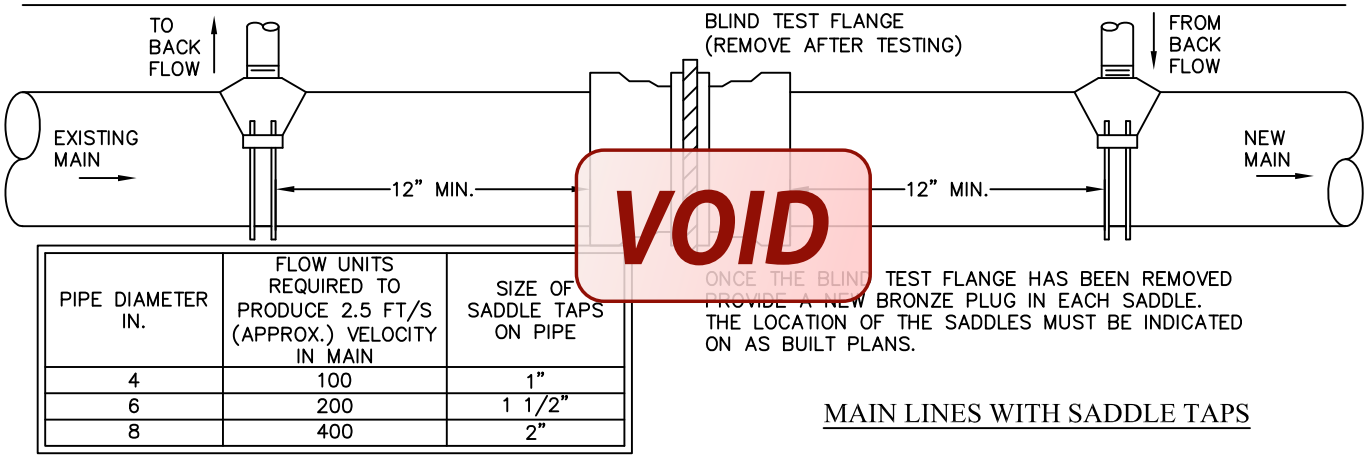
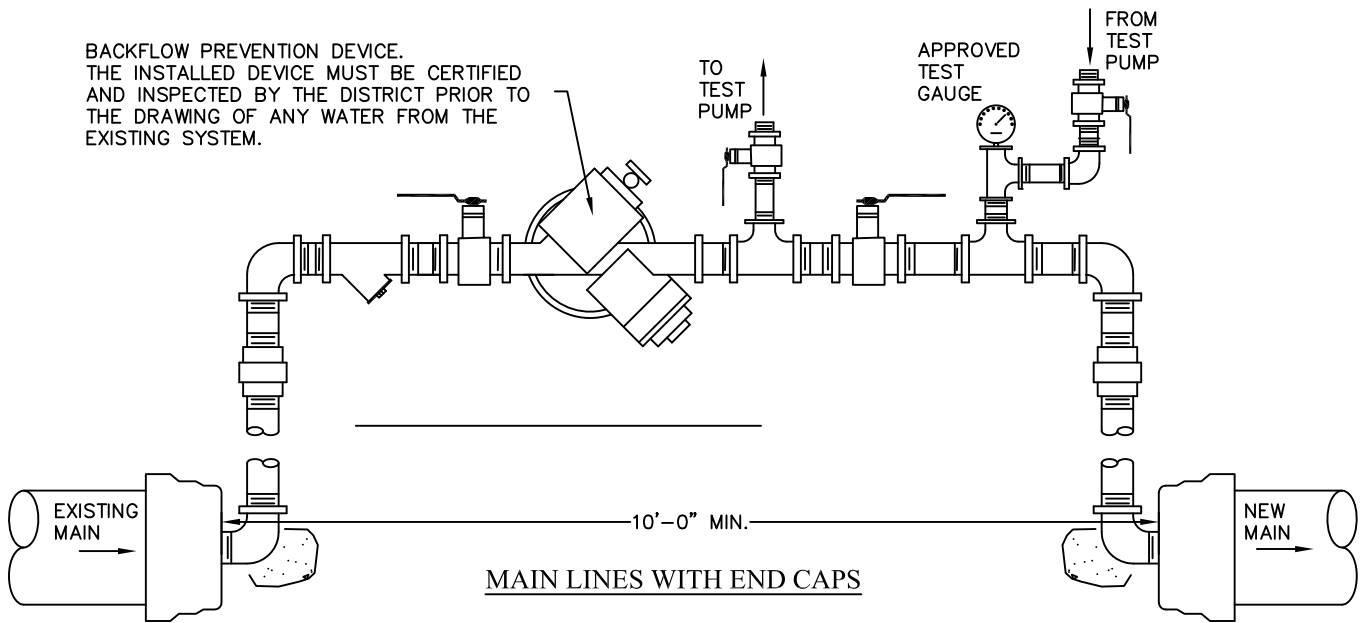
- (E) 3 1/2" CONC. SLAB W/ ADJUSTABLE SUPPORT STAND BOLTED INTO CONC. W/ A MINIMUM OF TWO (2) WEDGE BOLTS.
- (F) INSTALL 3/8" NON-CASE HARDENED CHAIN W/ ONE (1) DISTRICT LOCK.
- (G) FIRE DEPARTMENT CONNECTION (FDC) SHALL BE INSTALLED 18" FROM BACK OF S/W (OR AS CLOSE AS POSSIBLE), 30' MIN./50' MAX FROM A FIRE HYDRANT. IF THE FDC SERVES MORE THAN ONE BUILDING, A POST INDICATOR VALVE IS REQUIRED FOR EACH BUILDING.

NOTES:

1. INSTALLATION & TESTING OF THE SERVICE CONNECTION SHALL BE AS SPECIFIED IN THE STANDARD SPECIFICATIONS.
2. ALL PIPING AND FITTINGS SHALL BE FLANGED DUCTILE IRON.
3. ALL BOLTS SHALL BE TYPE 304 STAINLESS STEEL.
4. ALL BACKFLOW PREVENTION DEVICES SHALL BE TESTED BY A DISTRICT APPROVED CERTIFIED TESTER WITH A CURRENT AWWA CERTIFICATION AND INSPECTED BY THE DISTRICT PRIOR TO BEING PLACED INTO SERVICE.
5. THE BACKFLOW PREVENTION DEVICE SHALL BE INSTALLED ABOVE GROUND, IN A HORIZONTAL & LEVEL POSITION.
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7. WHEN UNIT IS NEAR A STRUCTURE - MOUNT TEST COCKS ON OPEN OR NON-OBSTRUCTED SIDE.
8. CONTRACTOR / DEVELOPER SHALL PROVIDE A LOCKABLE INSULATED CAGE.
9. NO OUTLET, TAP, TEE, OR CONNECTION BETWEEN THE WATER MAINLINE AND THE BACKFLOW PREVENTER IS ALLOWED UNLESS APPROVED BY THE DISTRICT ENGINEER.

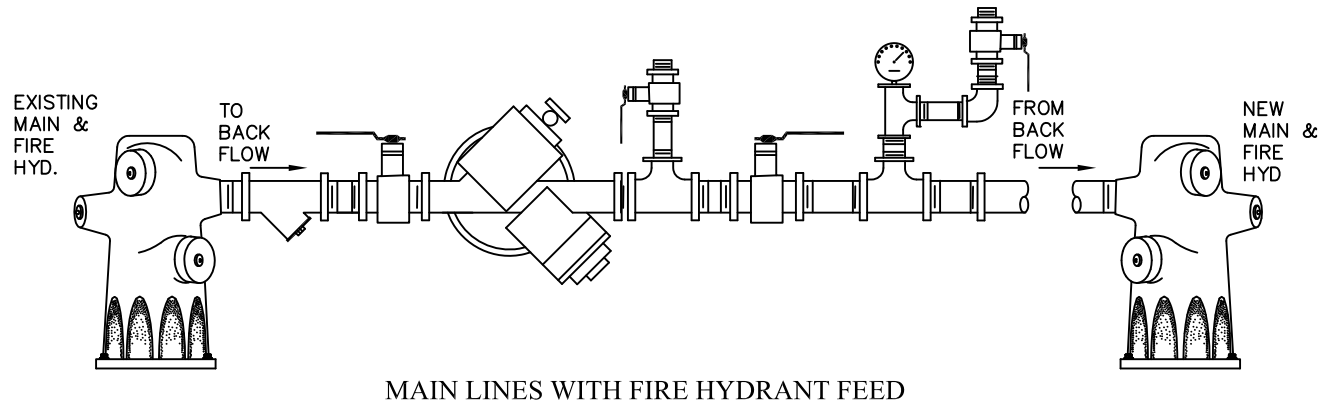
			OLIVEHURST PUBLIC UTILITY DISTRICT	
			FIRE SERVICE CONNECTION	
			Garry E. Laughlin	
			District Engineer	
12-06	NEW DETAIL	ADC	8-45	
DATE	REVISIONS	BY		
			APPROVED	DATE

BACKFLOW PREVENTION DEVICE.
THE INSTALLED DEVICE MUST BE CERTIFIED
AND INSPECTED BY THE DISTRICT PRIOR TO
THE DRAWING OF ANY WATER FROM THE
EXISTING SYSTEM.



PIPE DIAMETER IN.	FLOW UNITS REQUIRED TO PRODUCE 2.5 FT/S (APPROX.) VELOCITY IN MAIN	SIZE OF SADDLE TAPS ON PIPE
4	100	1"
6	200	1 1/2"
8	400	2"

ONCE THE BLIND TEST FLANGE HAS BEEN REMOVED
PROVIDE A NEW BRONZE PLUG IN EACH SADDLE.
THE LOCATION OF THE SADDLES MUST BE INDICATED
ON AS BUILT PLANS.



NOTES:

1. THE SIZE OF BYPASS PIPING SHALL BE AS REQUIRED TO PRODUCE 2.5 FT/S VELOCITY IN THE NEW MAIN FOR FLUSHING. BYPASS PIPING SHALL BE APPROXIMATELY 1/3 OF THE DIAMETER OF THE NEW MAIN.

			OLIVEHURST PUBLIC UTILITY DISTRICT	
			NEW MAIN LOADING AND TESTING	
5-05	FORMERLY STD. DTL. NO. W-20	SCD	Garry E. Laughlin	8-50
DATE	REVISIONS	BY	District Engineer	
			APPROVED	DATE 5-6-2005