Standard Design
And
Construction Specifications
For Conventional Wastewater Systems

April 2020

Amador Water Agency

12800 Ridge Road
Sutter Creek, California 95685

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# Table of Contents

1. **GENERAL CONDITIONS FOR PRIVATE WORK, PIPELINE EXTENSION AGREEMENTS**...... 1  
   1.1. Release for Construction ................................................................. 1  
   1.2. Standards .......................................................................................... 1  
   1.3. Insurance ........................................................................................... 1  
   1.4. Notification ....................................................................................... 1  
   1.5. Inspection ........................................................................................... 2  
   1.6. Existing Utility Location ................................................................... 2  
   1.7. Staking ............................................................................................... 2  
   1.8. Soils Compaction Testing ................................................................ 3  
   1.9. Hydrostatic Testing & Flushing ....................................................... 3  
   1.10. Submittals ....................................................................................... 3  
   1.11. Construction Water .......................................................................... 3  
   1.12. As Built Record Drawings ............................................................. 3  
   1.13. Acceptance ..................................................................................... 3  

2. **PLAN SHEET REQUIREMENTS** .................................................................. 4  
   2.1. Drawing Size and Scale .................................................................... 4  
   2.2. Drafting Standards .......................................................................... 4  
   2.3. Title Sheet ....................................................................................... 4  
   2.4. Wastewater Line Layout Sheet ....................................................... 5  
   2.5. Plan Details ..................................................................................... 6  
      2.5.1. Right of Way ............................................................................. 6  
      2.5.2. Contours and Elevations ......................................................... 6  
      2.5.3. Plan View .................................................................................. 6  
      2.5.4. Profile View ............................................................................. 6  
      2.5.5. Other Utilities .......................................................................... 6  
   2.6. Project Submittals ........................................................................... 7  

3. **GENERAL DESIGN CRITERIA** .................................................................. 7  
   3.1. Introduction ..................................................................................... 7  
   3.2. Intent of Criteria ............................................................................... 7  
   3.3. Current Standards .......................................................................... 7  
   3.4. Equivalent Dwelling Unit Flow ....................................................... 7  
   3.5. **Wastewater System Design - Mains and Laterals** ....................... 8  
      3.5.1. Hydraulic Analysis ..................................................................... 8  
      3.5.2. Design Conditions .................................................................... 10  
      3.5.3. Sizing ....................................................................................... 10  
      3.5.4. Material ................................................................................... 11  
         3.5.4.1. Gravity Collection Mains ................................................... 11  
         3.5.4.2. Force Mains ...................................................................... 11  
         3.5.4.3. Laterals ............................................................................. 11  
         3.5.4.4. Interconnections ............................................................... 11
Standard Design and Construction Specifications for Wastewater Systems

5.3.4. Installation ............................................................................................................. 24
5.4. Building Sewer ........................................................................................................ 25
  5.4.1. Joints & Fittings .................................................................................................. 25
  5.4.2. Installation .......................................................................................................... 25
5.5. Valves and Appurtenances ...................................................................................... 25
  5.5.1. Gate Valves ........................................................................................................ 25
  5.5.2. Eccentric Plug Valves ....................................................................................... 25
    5.5.2.1. Eccentric Plug Valves 4 Through 12 Inches .................................................. 26
    5.5.2.2. Eccentric Plug Valves 14 Inches and Larger .................................................. 26
  5.5.3. Closed Body Pinch Valves ................................................................................ 26
  5.5.4. Check Valves ...................................................................................................... 27
    5.5.4.1. Swing Check Valves .................................................................................... 27
    5.5.4.2. Globe Check Valves .................................................................................... 27
    5.5.4.3. Ball Check Valves ....................................................................................... 27
  5.5.5. Combination Air and Vacuum Release Valves (CAVRV) .................................. 28
  5.5.6. Nuts and Bolts ..................................................................................................... 28
  5.5.7. Plastic Film Wrap ............................................................................................... 28
  5.5.8. Valve Boxes ....................................................................................................... 28
  5.5.9. Valve Riser Extensions ...................................................................................... 29
  5.5.10. Vaults ................................................................................................................. 29
  5.5.11. Locating Cable & Locator Tape ...................................................................... 29
  5.5.12. Manholes ......................................................................................................... 29
    5.5.12.1. Drop Sewer Manholes ............................................................................. 30
    5.5.12.2. Manhole Bases ........................................................................................ 30
    5.5.12.3. Manhole Covers ...................................................................................... 30
    5.5.12.4. Existing Manholes .................................................................................. 31
  5.5.13. Sewer Cleanouts .............................................................................................. 31
  5.5.14. Sewer Flushing Inlets ..................................................................................... 31
  5.5.15. Waste Interceptors .......................................................................................... 32
    5.5.15.1. Grease Interceptors .................................................................................. 32
    5.5.15.2. Oil-Sand Interceptors .............................................................................. 33
    5.5.15.3. Hair-Fur Interceptors ............................................................................... 33
  5.5.16. Gaskets ............................................................................................................. 33
    5.5.16.1. Flange Fitting Gaskets ............................................................................. 33
5.6. Installation and Testing .......................................................................................... 33
  5.6.1. Location of Existing and New Utilities ............................................................... 33
  5.6.2. Quality Control .................................................................................................. 33
  5.6.3. Laying of Pipe .................................................................................................... 34
  5.6.4. Bedding and Backfill ........................................................................................ 34
  5.6.5. Connections to Existing Pipelines ..................................................................... 35
  5.6.6. Abandonment of Existing Facilities ............................................................... 36
  5.6.7. Hydrostatic Testing .......................................................................................... 36
  5.6.8. Manhole Vacuum Testing ................................................................................ 37
  5.6.9. Video Testing .................................................................................................... 37
  5.6.10. Continuity Testing .......................................................................................... 38
  5.6.11. Facility Markers .............................................................................................. 38
6. **CONCRETE WORK** .................................................................................................................. 39
   6.1. Scope ................................................................................................................................. 39
   6.2. Materials ............................................................................................................................ 39
   6.3. Execution ............................................................................................................................ 39

7. **EARTHWORK** ......................................................................................................................... 39
   7.1. Scope ................................................................................................................................. 39
   7.2. Trench Excavation ............................................................................................................. 39
   7.3. Trench Width ..................................................................................................................... 40
   7.4. Special Foundation Bedding Treatment ............................................................................. 40
   7.5. Trench Backfill ................................................................................................................... 40
     7.5.1. Bedding and Backfill ................................................................................................. 41
     7.5.2. Compaction .............................................................................................................. 41
   7.6. Embankment Construction ................................................................................................. 41
   7.7. Structural Backfill .............................................................................................................. 42

8. **CLEARING, GRUBBING AND STRIPPING** ...................................................................... 42
   8.1. General ............................................................................................................................... 42
     8.1.1. Clearing ....................................................................................................................... 42
     8.1.2. Grubbing ..................................................................................................................... 42
     8.1.3. Stripping ...................................................................................................................... 42
   8.2. Materials ............................................................................................................................. 42
     8.2.1. Trees and Shrubbery ................................................................................................. 42
     8.2.2. Preservation of Trees, Shrubs and Other Plant Material ........................................... 43
   8.3. Execution ............................................................................................................................ 43
     8.3.1. Disposal of Clearing and Grubbing Debris ................................................................. 43
     8.3.2. Areas to be Stripped ................................................................................................... 43
     8.3.3. Disposal of Strippings .............................................................................................. 43

9. **BORING, JACKING AND TUNNELING** ............................................................................. 43
   9.1. Reserved ............................................................................................................................. 44
   9.2. Steel Casing ......................................................................................................................... 44
     9.2.1. Outside Diameter Tolerances ................................................................................... 44
     9.2.2. Wall Thickness Tolerances ...................................................................................... 44
     9.2.3. Wall Thickness Minimums ....................................................................................... 44
     9.2.4. Casing Surface Conditions ....................................................................................... 45
     9.2.5. Lengths and Ends ....................................................................................................... 45
     9.2.6. Straightness ............................................................................................................... 45
     9.2.7. Welding ...................................................................................................................... 45
   9.3. Grouting ............................................................................................................................. 46
   9.4. Wing Cutters/Bands/Flairs ............................................................................................... 46
   9.5. Jacking and Receiving Pits ............................................................................................... 46
   9.6. Alignment Tolerances ...................................................................................................... 47
   9.7. Rotary Drilling ................................................................................................................... 47
   9.8. Casing Insulators/Spacers ............................................................................................... 48
     9.8.1. Band/Shell .................................................................................................................. 48
9.8.2. Connecting Flanges ................................................................. 48
9.8.3. Bolts/Studs ........................................................................ 48
9.8.4. Insulating Liner ................................................................. 48
9.8.5. Skids/Runners .................................................................. 48
9.9. Carrier Pipe ......................................................................... 48
Improvement Standards

This Standard only applies to design and construction of conventional wastewater systems. For Septic Tank Effluent Flow (STEF) or Septic Tank Effluent Pump (STEP), the Agency has prepared separate standards.

1. General Conditions for Private Work, Pipeline Extension Agreements

1.1. Release for Construction

Before release for construction of any work to be done under a Mainline Extension Agreement ("MLX"), the plans shall be approved and signed by the Agency Engineer; the MLX shall be signed by the MLX Applicant and the Agency; all necessary deposits and fees shall be paid; approved insurance shall be received; all required, pre-construction easements and permits shall be submitted and accepted by the Agency; and a faithful performance guarantee for facilities to be constructed within the public right of way shall be given to the Agency. Any work done prior to release for construction may be rejected by the Agency.

Amador Water Agency signatures on plans are only valid for two years from the date of signature, although extensions may be requested in writing.

1.2. Standards

All wastewater facilities to be accepted for ownership and maintenance by the Agency, including but not limited to wastewater and service lines, valves and all miscellaneous appurtenances, shall conform to the latest revision of these Specifications and be designed for a minimum 50 year lifespan. All new wastewater facilities to be accepted by AWA for ownership or maintenance shall be conventional or STEF wastewater collection systems, new STEP systems shall not be allowed. The MLX Applicant, and the MLX Applicant’s Developer, Engineer, Contractor and/or Architects shall be responsible for obtaining all necessary information, requirements, bid and complete the work as shown on the approved plans.

1.3. Insurance

The MLX Applicant or the MLX Applicant’s Contractor shall carry insurance as outlined in the MLX. The insurance shall specifically name the Agency, its directors, officers, and employees as additional insured.

Before work is commenced, the Applicant or its Contractor shall furnish the Agency with certificates of insurance as satisfactory proof that he carries worker’s compensation insurance as required by law and other insurance in compliance with the MLX Agreement requirements.

1.4. Notification

The MLX Applicant shall establish one single point of contact for the duration of design and another for the duration of construction and shall provide the necessary contact information.
The MLX Applicant and/or the MLX Applicant’s Contractor shall contact the Agency Engineering Department at (209) 257-5255, 48 hours or two (2) business days, whichever is greater, prior to the pre-construction meeting, beginning wastewater line installation, or any excavation within twenty feet (20’) of any existing Agency facilities. This information shall include the type of work planned. The Contractor shall contact the Agency Inspector at (209) 257-5255 by 4:00 p.m. prior to each and every day that work shall be performed on or near Agency facilities. The Contractor shall notify all other public agencies affected by the proposed construction and shall obtain and pay all costs for any and all required permits.

1.5. Inspection

One or more inspectors will be assigned by the Agency Engineer to observe any part of the work and materials and shall have full authority to accept or reject said work and materials. Inspection does not relieve the Contractor of the obligation to conduct comprehensive inspections of the work, to furnish acceptable materials, perform acceptable work and to provide adequate safety precautions.

The MLX Applicant shall be billed and shall pay all Agency costs of, but not limited to, inspection, mapping, clerical and administrative support, testing and engineering review.

A pre-construction meeting shall be conducted 48 hours prior to starting construction.

1.6. Existing Utility Location

Contractors, subcontractors and developers shall notify all utility owners within the project area, USA (Underground Service Alert at (800) 227-2600) and WUUA (Western Underground Utilities Alert at (800) 424-3447) at least two (2) full business days, not counting the day the locate is requested, before performing any excavation. Not all existing utility owners participate in U.S.A. or WUUA, and proper procedures for location vary.

Proper location of existing water lines, appurtenances and other utilities is the Developer’s and/or the Contractor’s responsibility. All costs for utility location shall be paid for by the Developer and/or the Contractor. The utility locating shall be completed prior to starting construction by the Developer and/or the Contractor. Only Agency approved locating methodologies shall be used, including Electromagnetic Line Locating (EMLL), Magnetic Detection (Metal Detecting), Ground Penetrating Radar (GPR), Acoustic Pipe Locating, Hydro or Vacuum Excavation, and Potholing. No other means of line location shall be utilized to verify the location of buried water lines, appurtenances, or other utilities. Dowsing, witching, or divining rods of any sort, material, shape, or known by any other name, shall not be used to locate buried water lines, appurtenances, or other utilities. Any utilities found having been marked using non-approved methods shall be deemed inaccurate, at which time, all construction shall cease immediately and may not resume until all utilities have been marked by approved methods.

1.7. Staking

The MLX Applicant or the Applicant’s Contractor shall provide stakes for line and grade for the wastewater installation.
1.8. **Soils Compaction Testing**

The Agency may require soils compaction testing, and the MLX Applicant shall pay the Agency’s costs associated with such testing.

Density of soil will be determined in place by the sand cone method, ASTM D 1556 or by nuclear methods, ASTM D 2922 and D 3017. Compaction tests will be performed as directed by the Owner’s Engineer or Inspector. At a minimum, one test shall be performed per lift, per 500 linear feet of pipe. Laboratory moisture-density relations of soils will be determined per ASTM D 1557. Relative density of cohesionless soils will be determined per ASTM D 4253 and D 4254. Backfill materials will be sampled per ASTM D 75. Compaction shall be deemed to comply with the specifications when no more than one test of any three consecutive tests falls below the specified relative compaction. The one test shall be no more than three percentage points below the specified compaction. The Contractor shall pay the costs of any retesting of work not conforming to the specifications.

1.9. **Hydrostatic Testing & Flushing**

The Contractor shall provide all labor and materials required for hydrostatic testing and flushing. All testing and flushing shall be performed after sub-grade compaction, prior to paving and under the direct supervision of the Agency.

1.10. **Submittals**

The Contractor shall furnish four (4) copies of submittals for approval by the Agency Engineer for all pumping or electrical facilities, for any materials and/or installations not covered and/or specified in the Technical Provisions or detailed on the Plans and as required by the Agency Engineer.

1.11. **Construction Water**

Any and all water to be used shall be arranged through the Agency’s Customer Service Department (209) 223-3018. All construction water charges shall be paid prior to acceptance of the job.

All fire hydrants are to be utilized only for the purpose of fire protection and system analysis. Any attempt to utilize water from a hydrant or service connection or other appurtenance without an Agency approved water meter and Agency approval will result in punishment under California Penal Code Section 490 or 625.

1.12. **As Built Record Drawings**

The Contractor shall maintain and make available to the Inspector on the jobsite one complete plan set. After each portion of the work is installed, the Contractor shall record all deviations from the original design shown in the drawings either by additional sketches or red ink thereon. Upon completion of the job, the MLX Applicant or Contractor shall deliver this record set and a digital set to the Agency Engineering Department.

1.13. **Acceptance**

Agency assumes no obligation for maintenance of the facilities included in a MLX Agreement until such time as they are formally accepted in writing by the Agency.
Any costs incurred by the Agency due to emergency or other repairs prior to final acceptance by the Agency shall be billed to, and paid by, the MLX Applicant.

The system shall not be accepted and wastewater service shall not be initiated until all conditions contained within the MLX Agreement are satisfied, As-Built Record Drawings have been received and AWA has provided a Certificate of Acceptance.

2. Plan Sheet Requirements

2.1. Drawing Size and Scale

All improvement plans shall be prepared on reproducible sheets twenty-two inches by thirty-four inches (22” x 34”) or twenty-four inches by thirty-six inches (24” x 36”). Scales: Horizontal one inch equals twenty feet, forty feet or fifty feet (1” = 20’, 40’ or 50’); Vertical one inch equals two feet, four feet or five feet (1” = 2’, 4’ or 5’). The scales selected shall be that which is appropriate for the sheet and provides clarity within the drawing.

2.2. Drafting Standards

All line work must be clear, sharp and heavy. Letters and numerals must be one eighth of an inch (1/8”) minimum height, well-formed and sharp.

Each sheet within the set of drawings shall have a title block showing the sheet title, number, date, scale and the Consulting Engineer’s name, address, phone number, revision block and California Professional Engineer’s Stamp with wet ink signature, registration number and expiration date.

2.3. Title Sheet

A title sheet shall be prepared showing the following:

- Subdivision map, parcel map or other project boundaries
- Location Map
- Index of Sheets & Sheet Listing. Sheet index shall show a layout of all plan and profile sheets on an overall plan. Sheet index may be incorporated on the wastewater line layout sheet.
- Legend of symbols
- Title Block
- Signature Block for the Amador Water Agency Manager of Engineering & Planning, and County, City or both as applicable. The title sheet and subsequent revised drawing sheets shall have an approved signature block. The approval blocks shall be signed before any construction occurs. Any changes to the plans after initial approval shall be shown as revisions and shall be approved by the Amador Water Agency.
- MLX Applicant’s name, address and phone number
- Standard Notes shall be per Standard Drawing SS001A.
- Wastewater symbols shall be per Standard Drawing SS001.
2.4. **Wastewater Line Layout Sheet**

The wastewater system shall be shown on an overall plan layout with a scale of one inch equals one hundred feet (1” = 100’). This layout shall show pipe size, proposed and existing valving, proposed and existing appurtenances, boundary lines, property lines, lot numbers, street names, section lines and corners and all easements. This layout must be incorporated into the improvement plans and may be shown on the title sheet if desired. Care must be taken to make sure the scale and orientation are correct since the layout sheets are used to generate Agency master wastewater system maps.
2.5. **Plan Details**

The following details shall be shown on Plans submitted for approval.

2.5.1. **Right of Way**

Right of way lines, the boundaries of lots fronting on the street, drainage easements, utility easements, planting easements, section lines and corners, land grant lines and temporary construction easements, both existing and proposed, shall be shown on the plans. All right of way and easement lines shall be properly dimensioned.

The MLX Applicant shall provide a minimum twenty feet (20’) non-exclusive recordable easement, ten feet (10’) on either side of all wastewater lines, to the Agency for all wastewater lines installed outside a public right of way. The location of the easement and easement language shall be approved by the Agency. The project will not be accepted, nor service provided until the Agency receives the easements and they are recorded.

2.5.2. **Contours and Elevations**

Show existing contours or supporting elevations, and the limits of grading, cuts and fills with finished elevations. Profiles and benchmarks shall be surveyed at minimum two feet (2’) intervals for commercial applicants or subdivisions and USGS elevations at minimum five feet (5’) intervals for single residential lot applications.

2.5.3. **Plan View**

The plans shall show stationing, size and types of pipes, pressure class (PC) or pressure rating (PR), pipe slope, degree of pipe angles, valves, CAVRV’s, services, and all other appurtenances.

2.5.4. **Profile View**

The plan shall show the corresponding profiles of all existing and proposed ground elevations, roadway centerlines, drainage ditches, and utilities. All profiles of proposed improvements shall show elevations, grades, vertical curves, other vertical alignment data and other utilities. The profile of wastewater lines should show total length of pipe in lineal feet (LF), size, type, pressure rating, all fixtures such as CAVRV’s, valves, pipe slope, depth of cover and stationing.

2.5.5. **Other Utilities**

The plans shall show all existing or proposed utilities within twenty feet (20’) of proposed or existing Agency facilities, including water lines and laterals, storm drain lines and laterals, gas, electric, cable and telephone. Where elevations of these utilities may be established, they shall be shown. The plans shall indicate minimum horizontal and vertical clearances where applicable.
2.6. Project Submittals

At the time a MLX Applicant requests a MLX Agreement from the Amador Water Agency, the required plan check deposit, along with two (2) COMPLETE sets of plans shall be given to the Agency. Incomplete or partial submittals will not be accepted and will be returned to the Applicant.

3. General Design Criteria

3.1. Introduction

The following design criteria shall be used for conventional sewer systems to be incorporated into the Agency’s service areas and shall govern the design of all Agency wastewater facilities. Exceptions and deviations from these specifications must be approved in writing by the Agency’s Supervising Engineer.

3.2. Intent of Criteria

The intent of these criteria is to ensure that the wastewater system constructed will dependably and safely collect the required amount of wastewater throughout the system at the least overall cost.

3.3. Current Standards

Pertinent and current requirements of the following agencies or standards shall be complied with:

- Applicable ordinances, rules and regulations of all local agencies, such as Amador County, cities, etc.

3.4. Equivalent Dwelling Unit Flow

Wastewater design flow rates shall be in accordance with the following:

Single Family Residence: Average Daily Flow = 200 gpd (per unit)

Commercial/Industrial: Average Daily Flow =

80% of water meter Hydraulic Capacity, or
80% of projected average daily water use, or
100% of projected average daily wastewater production
(Requires engineered calculations, subject to AWA review)

For purposes of determining wastewater design flow rates:

- One Equivalent Dwelling Unit (EDU) equals 200 gallons per day, 250mg/L of Biochemical Oxygen Demand (BOD) and 200mg/L of Suspended Solids (SS) at average dry weather flow.

- The admission of any wastewater having a five day BOD greater than 250mg/L or containing more than 200mg/L of Suspended Solids into the wastewater system will multiply the EDU count by the applicable percent increase, as approved by the Agency Engineer to obtain the actual EDU count. For example, an average discharge of 200gpd with a BOD count of 750 mg/L (three times the allowable limit) will count as three EDUs.
- Fixture unit calculations shall not be allowed in determining wastewater usage or average daily flow.
- In no event shall the wastewater design flow rate for any residential or commercial parcel be less than charged for one EDU.
- Partial EDUs will not be allowed. Partial EDUs shall be rounded up to the nearest whole number.
- A business with various operations or use categories shall pay according to the appropriate factors for each applicable use category individually and in addition to all other applicable use categories.
- When a commercial user does not conform to Agency established use categories the Agency Engineer shall establish an equitable EDU ratio for the determination of wastewater design flow rates.
- The development shall submit engineered and stamped calculations to the Agency for review and approval under the following conditions:
  - Where new technology or operating conditions will result in significant water conservation
  - For commercial users contributing in excess of 6 EDUs
  - When a commercial user does not conform with the categories listed in the above table
- All wastewater design flow rates will be adjusted at the end of the first two years of operation. The Agency will adjust fees to reflect actual wastewater flows experienced during the first two years of operation, occupancy or discharge. Any additional fee assessed will be paid in accordance with the fees in effect at the time fees are paid.

3.5.  Wastewater System Design - Mains and Laterals

All installations are to be as shown in Amador Water Agency’s Standard Sewer Drawings.

3.5.1.  Hydraulic Analysis

A hydraulic analysis of any proposed wastewater system shall be supplied to the Agency upon request. Each sewer main in the proposed sewer system shall be analyzed for two scenarios:

- Average daily flow plus infiltration as well as peak day flow.
- Peak day flow, where \( Q_{\text{max}} = 3 \times ADF \).

Wastewater models submitted to the Agency are required to be geo-referenced in the NAD83 State Plane California Zone 2 Feet Coordinate System and Lambert Conformal Conic Projection. The models shall be submitted in a H2ONET or EPANET 2.0 format.
<table>
<thead>
<tr>
<th><strong>Residential Users</strong></th>
<th><strong>Equivalent Dwelling Units (EDUs)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Single-family Dwelling</td>
<td>1.0 per unit</td>
</tr>
<tr>
<td>2 Multiple-family Dwelling</td>
<td>1.0 per unit</td>
</tr>
<tr>
<td>3 Studio Units (one bedroom)</td>
<td>1.0 first unit + 0.55 each additional unit</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Commercial Users</strong></th>
<th><strong>Equivalent Dwelling Units (EDUs)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Non-Defined Commercial/Industrial</td>
<td>2.0 per 1,000 sq ft of gross floor area</td>
</tr>
<tr>
<td>2 Auto Dealerships</td>
<td>0.3 per 1,000 sq ft of gross floor area</td>
</tr>
<tr>
<td>3 Bakeries</td>
<td>0.7 per 1,000 sq ft of gross floor area</td>
</tr>
<tr>
<td>4 Banks and Financial Institutions</td>
<td>0.5 per 1,000 sq ft of gross floor area</td>
</tr>
<tr>
<td>5 Bars</td>
<td>1.0 per 1,000 sq ft of gross floor area</td>
</tr>
<tr>
<td>6 Car Washes - Automatic</td>
<td>1.0 per 200 gallons of wastewater flow per day</td>
</tr>
<tr>
<td>7 Car Washes - Self-serve</td>
<td>1.0 per washing stall, with reclamation</td>
</tr>
<tr>
<td>8 Dry Cleaners</td>
<td>2.6 per 1,000 sq ft of gross floor area</td>
</tr>
<tr>
<td>9 Fire Stations</td>
<td>2.0 per station</td>
</tr>
<tr>
<td>10 Garages</td>
<td>0.2 per 1,000 sq ft of gross floor area</td>
</tr>
<tr>
<td>11 Gyms, Health Clubs and Tanning Salons</td>
<td>0.5 per 1,000 sq ft of gross floor area</td>
</tr>
<tr>
<td>12 Halls, Lodges and Auditoriums</td>
<td>0.5 per 1,000 sq ft of gross floor area</td>
</tr>
<tr>
<td>13 Hospitals</td>
<td>1.0 per 200 gallons of wastewater flow per day</td>
</tr>
<tr>
<td>14 Hotel and Motels</td>
<td>1.0 first bed + 0.25 each additional bed</td>
</tr>
<tr>
<td>15 Laundry - Self-serve</td>
<td>0.7 per washing machine</td>
</tr>
<tr>
<td>16 Laundry - Commercial</td>
<td>1.0 per 200 gallons of wastewater flow per day</td>
</tr>
<tr>
<td>17 Markets - High Impact</td>
<td>0.9 per 1,000 sq ft of gross floor area</td>
</tr>
<tr>
<td>18 Markets - Low Impact</td>
<td>0.2 per 1,000 sq ft of gross floor area</td>
</tr>
<tr>
<td>19 Medical, Dental and Massage Therapy Offices</td>
<td>0.6 per 1,000 sq ft of gross floor area</td>
</tr>
<tr>
<td>20 Mini-Storage Facilities</td>
<td>2.0 per facility</td>
</tr>
<tr>
<td>21 Mortuaries</td>
<td>1.2 per slumber room</td>
</tr>
<tr>
<td>22 Office Buildings - under 200,000 sq ft</td>
<td>0.4 per 1,000 sq ft of gross floor area</td>
</tr>
<tr>
<td>23 Office Buildings - over 200,000 sq ft</td>
<td>1.0 per 200 gallons of wastewater flow per day</td>
</tr>
<tr>
<td>24 Parks</td>
<td>1.0 per 200 gallons of wastewater flow per day</td>
</tr>
<tr>
<td>25 Places of Worship</td>
<td>0.3 per 1,000 sq ft of gross floor area</td>
</tr>
<tr>
<td>26 Rest Homes, Convalescent Homes, Boarding Houses, Fraternities, Dormitories, etc.</td>
<td>0.6 per bed</td>
</tr>
<tr>
<td>27 Restaurants - Dine-In</td>
<td>3.1 per 1,000 sq ft of gross floor area</td>
</tr>
<tr>
<td>28 Restaurants - Dine-In Patio Area</td>
<td>1.5 per 1,000 sq ft of gross floor area</td>
</tr>
<tr>
<td>29 Restaurants - Dine-In and Take Out</td>
<td>3.0 per 1,000 sq ft of gross floor area</td>
</tr>
<tr>
<td>30 Restaurants - Take Out</td>
<td>2.6 per 1,000 sq ft of gross floor area</td>
</tr>
<tr>
<td>31 Retail Stores - Under 100,000 sq ft</td>
<td>0.2 per 1,000 sq ft of gross floor area</td>
</tr>
<tr>
<td>32 Retail Stores - Over 100,000 sq ft</td>
<td>1.0 per 200 gallons of wastewater flow per day</td>
</tr>
<tr>
<td>33 Schools - Day-care, Pre-school and Primary</td>
<td>1.5 per 100 Average Daily Attendance</td>
</tr>
<tr>
<td>34 Schools - Secondary</td>
<td>4.0 per 100 Average Daily Attendance</td>
</tr>
<tr>
<td>35 Schools - Colleges and Universities</td>
<td>1.0 per 200 gallons of wastewater flow per day</td>
</tr>
<tr>
<td>36 Service Stations</td>
<td>0.2 per pump</td>
</tr>
<tr>
<td>37 Theaters</td>
<td>0.5 per 100 seats</td>
</tr>
<tr>
<td>38 Warehouses - under 50,000 sq ft</td>
<td>0.2 per 1,000 sq ft of gross floor area</td>
</tr>
<tr>
<td>39 Warehouses - over 50,000 sq ft</td>
<td>1.0 per 200 gallons of wastewater flow per day</td>
</tr>
</tbody>
</table>
3.5.2. Design Conditions

Design conditions apply to an empty conduit with no internal pressure.

- Depth of cover to be minimum thirty-six inches (36”) or twelve inches (12”) below any potable water line invert elevations, whichever is greater.
- Minimum trench width shall be one pipe outside diameter plus eight inches (8”) on either side of the pipe.
- Bedding tamped to twelve inches (12”) above pipe, load factor 1.5.
- Soil density one hundred thirty-five pounds per cubic foot (135 lb/cf).
- Bedding angle ninety (90) degrees.
- Live load AASHTO H-20, sixteen thousand pound (16,000 lbs.) wheel load.
- Rigid pipe 1.5 factor of safety versus crushing.
- Flexible pipe allowable deflection at joints - as specified by pipe manufacturer.
- Wastewater lines placed within Caltrans Right of Way shall be protected with a steel casing that complies with Caltrans and Agency standards, whichever is more restrictive, with a minimum cover of thirty-six inches (36”).

3.5.3. Sizing

Pipeline sizing for gravity lines shall be determined on the basis of the design flow rate and the following criteria:

<table>
<thead>
<tr>
<th>Pipe Diameter</th>
<th>Manning’s Roughness Coefficient</th>
<th>d/D Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>4” to 12”</td>
<td>0.013</td>
<td>0.50</td>
</tr>
<tr>
<td>14” or greater</td>
<td>0.013</td>
<td>0.75</td>
</tr>
</tbody>
</table>

Required velocities at design flow (Q) shall be as follows:

<table>
<thead>
<tr>
<th></th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gravity Pipelines</td>
<td>2 fps</td>
<td>10 fps</td>
</tr>
<tr>
<td>Force Main Pipelines</td>
<td>2 fps</td>
<td>5 fps</td>
</tr>
</tbody>
</table>

Sewer sizes shall not be increased in flat topography to justify use of flatter grades. Under minimal flow conditions, wastewater in larger pipelines can have velocities lower than that in smaller pipelines. If the minimum scouring velocity cannot be maintained during initial operation prior to the design flow capacities being reached, the ability to periodically flush the system shall be required.
Head losses for force mains shall be limited to 5 feet per 1,000 feet. The MLX Applicant’s engineer shall evaluate the need for odor control facilities for all force mains.

Gravity sewer collection mains and laterals shall have a minimum diameter of four inches (4”). Force mains shall have a minimum diameter of six inches (6”).

3.5.4. Material

3.5.4.1. Gravity Collection Mains

Pipe shall be PVC SDR-26 or 35. Pipe shall have bell and spigot joints conforming to ASTM D 3212 and have flexible watertight elastomeric seals conforming to ASTM F 913 or F 477. Neither solvent nor glue-joints shall be permitted.

3.5.4.2. Force Mains

Force mains shall be PVC C900, or where pressures permit, SDR-21/26. PVC pipe shall be PC 165 for internal working pressures up to one hundred thirty (130) PSI and PC 235 for internal working pressures between one hundred thirty (130) and one hundred eighty (180) PSI. For internal working pressures greater than one hundred eighty (180) PSI, pipe PC shall be approved by the Agency Engineer. Pipe shall have bell and spigot joints conforming to ASTM D 3212 and have flexible watertight elastomeric seals conforming to ASTM F 913 or F 477. Neither solvent nor glue-joints shall be permitted. HDPE shall only be allowed in Pine Grove and must meet or exceed the existing HDPE D/R Rating.

3.5.4.3. Laterals

Lateral pipe and fittings shall be Schedule 80 PVC conforming to the requirements of PVC 1120 per ASTM D 1785 and D 2467, respectively. Fittings shall be solvent weld type. Threaded PVC pipe shall not be permitted. Molded threaded adapter fittings may be used.

3.5.4.4. Interconnections

Connections between C900 and Schedule 40 or 80 shall be made with C907 injection molded fittings. Threaded PVC pipe shall not be used.
### 3.5.5. Pipe Slope

<table>
<thead>
<tr>
<th>Pipe Diameter (in)</th>
<th>Minimum Slope</th>
<th>Maximum Slope</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>.012</td>
<td>.150</td>
</tr>
<tr>
<td>6</td>
<td>.010</td>
<td>.120</td>
</tr>
<tr>
<td>8</td>
<td>.007</td>
<td>.085</td>
</tr>
<tr>
<td>10</td>
<td>.005</td>
<td>.060</td>
</tr>
<tr>
<td>12</td>
<td>.004</td>
<td>.050</td>
</tr>
<tr>
<td>15</td>
<td>.003</td>
<td>.035</td>
</tr>
<tr>
<td>18</td>
<td>.002</td>
<td>.030</td>
</tr>
<tr>
<td>24</td>
<td>.002</td>
<td>.020</td>
</tr>
</tbody>
</table>

In extreme conditions, flatter slopes may be considered providing the depth of flow will not be less than 0.3 of the pipe diameter or the velocity less than 1.6 feet per second at design average daily flow and justifiable reasons for the modification are presented to the Agency Engineer. Deviations from these slopes are only allowed with written permission from the Agency Engineer.

In extreme conditions, steeper slopes may be considered provided the following conditions are met:

- Restrained joints are used.
- Cut-Off walls and drainage measures are used to prevent a buildup of hydrostatic pressure in trenches.
- When a sewer with a slope greater than 0.12 passes through a structure with a horizontal change of direction in excess of 30 degrees, design of base channelization shall be required to prevent overflows and yet allow for routine maintenance operations.

Sewer laterals shall have a minimum slope of 0.025 (2.5%, ¼” per 1’) from sewer to property line.

“Sags” or “low-spots” in gravity collection lines shall not exceed ¼-inch.

### 3.5.6. Lift Stations

Lift stations shall be designed by the Developer’s engineer and reviewed and approved by Amador Water Agency staff. Agency staff should be consulted in the early planning stages to assess the need for such installations and to develop the site-specific design criteria.

#### 3.5.6.1. Minimum Lift Station Requirements

- Minimum storage capacity within the lift station shall be 125% of anticipated, ultimate average daily flow for the lift station if the following conditions are met:
• Emergency overflow storage is provided above the alarm point of the lift station; and
• A minimum largest unit pump redundancy is in place; and
• A permanent emergency standby generator capable of running all required pumping equipment simultaneously is installed. Automatic start and auto-transfer switches are required.

If these criteria are not met, additional emergency storage capacity may be required.

• Emergency storage shall be wholly contained within one emergency storage tank. Multiple septic tanks in sequence or parallel shall not be permitted. The use of septic tanks in lieu of traditional wet-well design shall not be permitted. Fiberglass tanks or vaults shall not be permitted.

• The wet well/vault forms shall not be stripped until 48 hours after concrete placement and no backfill will be allowed until concrete cylinder strength tests indicate that it has reached 100% of design strength.

• Level sensing shall be via transducers. Additionally, a high level float switch connected to an auto-dialer with battery back-up shall also be provided. A minimum of two high level alarms shall be required.

• A manual bypass and valve (same pipe size) to drain the force main back into the lift station shall be required. This drain should be of an elevation to allow the fluid in the force main to flow by gravity back to the lift station wet-well.

• The maximum wet-well depth shall be 18 feet.

• All interior concrete surfaces of the wet well, emergency storage, etc. shall be coated with an approved epoxy coating. Approved coatings are Tnemec 434 @ 125 mils with Tnemec 435 @ 15 mils or Carboline Plasite 4550S @ 100 mils.

• All exterior concrete surfaces of the wet well, emergency storage, etc. shall be coated with an approved epoxy coating. Approved coatings are Tremco Tremproof 250 GC, 100mils of Hydro-Pox 204 or Thoroseal (MasterSeal 581).

• All tanks vaults to be properly screened and vented with odor control equipment. All vaults shall provide 24-inch working clearance to all fittings.

• All doors and lids shall require no more than 50 lb force to open, provide lift assistance as required. Fall protection shall also be provided.
• A pump minute meter and cycle counter is required. Pump operating cycles shall be a maximum of 3 cycles per hour and 10 minute cycles based on a full average day design flow within an 8 hour period. Pumps shall remain fully submerged under normal operation.

• For standardization, spare part and maintenance purposes, pumps shall be those manufactured by ITT Flygt USA. All pumps shall be installed with VFDs by Allen Bradley, Siemens, Cutler-Hammer or an approved equal.

• Provide appropriate hoists with stainless steel lifting changes and stainless steel guide rails for pump removal.

• Suction and discharge piping shall be class 50 ductile iron. All exposed piping shall have adequately sized and located thrust rods. A check valve isolated by shut off valves is required on all outlet piping. All sewer valves shall be plug type designed for use in wastewater systems.

• A permanent, emergency generator shall be provided at the site. Fuel type shall be natural gas where possible. If not possible, propane gas shall be permitted, however the storage tank shall be sized to provide a minimum of 36 hours of generator run time under full load. The Developer shall be responsible for permitting all generators with the Amador Air District.

• Permanent phone connectivity, where possible, and a backup radio transmitter shall be provided for systems communications.

• All electrical equipment placed in minimum NEMA 4x rated enclosures.

• All above grade electrical conduit shall be PVC coated rigid conduit.

• Provide sun and weather protection as appropriate for all equipment and working spaces.

• Sufficient site and panel lighting shall be provided for Agency crews to perform night work.

• A 2-inch water meter shall be provided as well as a 2-inch freeze-proof service connection and 5/8-inch freeze-proof hose bib.

• The entire site shall be paved with a) 2-inches of Asphalt Concrete over 5-inches of Class II Aggregate Base or b) 4-inches of Portland Cement Concrete.

• The site shall be accessible either via a minimum 12-foot driveway with a hammerhead turnaround and constructed of a) 2-inches of Asphalt Concrete over 5-inches of Class II Aggregate Base or b) 4-
inches of Portland Cement Concrete. The driveway shall be accessible from a PUE or access easement dedicated to the Agency.

- The entire site shall be enclosed with 6 foot chain link fence with colored slats and 3-strand barbed wire and a minimum 16-foot double gate.
- The site shall be a separate lot deeded to the Agency. The site shall be sized to allow for 20’ clearance on all sides from any equipment, fencing or piping.
- Complete O&M manuals shall be submitted and the Contractor shall provide all training necessary for maintenance and operation of facility.

3.5.7. Manholes

All manholes with a depth less than 12’ shall have a diameter of 48”. All manholes with a depth of 12 feet or more shall have a diameter of 60”. In no instance shall manholes have a depth of more than eighteen feet (18’) without prior written consent of the Agency Engineer. Manholes shall be spaced at 400 foot maximum intervals. In addition, manholes shall be placed at all the following locations: changes in horizontal or vertical alignment, changes in sewer diameter, at street intersections, at sewer pipe intersections, at connections with laterals 6” or larger in diameter, and at the beginning of sewer runs such as cul-de-sacs. Junction manholes shall be designed with the invert elevation of the intersecting sewer at the same elevation as the invert elevation of the upstream sewer.

Clean-outs must be installed at the end of a sewer pipeline if the distance from a manhole is less than 200 feet.

Manholes shall be directly accessible from public roadways where possible. Where not possible, manholes shall be accessible via a minimum twelve foot (12’) wide dedicated access easement from a public right-of-way access point. The driveway shall be constructed of 2-inches of Asphalt Concrete over 5-inches of Class II Aggregate Base compacted to 95% relative compaction or 4-inches of Portland Cement Concrete.

3.5.7.1. Slopes Through Manholes

When sewers of uniform slope pass through a manhole, the slope will be maintained and the invert at the center of the manhole will be given.

When sewers change slope at a manhole, incoming and outgoing invert elevations shall be shown on the plans.

Provide sufficient drop through a manhole to compensate for energy loss caused by change of alignment. A drop of 0.2 feet for straight runs, 0.1 feet for a change of alignment greater than 30 degrees and 0.2 to 0.5 feet for 90° bends shall occur across manholes.
When pipe sizes change at structures, design the inlet crown at least as high as the outlet crown.

3.6. Wastewater System Design - Building Sewer

3.6.1. General

The building sewer is the line between the building served and the service connection. Pipe material and installation of the building sewer shall meet all the requirements of Sections 3.2 & 3.3.

3.6.2. Line Sizing

Single family residence building sewer lines shall be minimum three inch (3”) diameter. High density, commercial and industrial building sewer lines shall be sized based on flows and shall be minimum four inch (4”) pipe diameter.

3.6.3. Material

PVC and ABS are acceptable materials for the building sewer and shall be Schedule 40, with Schedule 40 solvent welded fittings or SDR-35 PVC with bell and spigot fittings.

ABS and Schedule 40 PVC fittings shall conform to ASTM D 3311 and be solvent welded. All 90 degree bends shall be long-radius sweeps, “hard” 90 degree fittings are not permitted.

ABS pipe and fittings shall be Schedule 40 and conform to ASTM D 2661. Solvent cement used on ABS shall conform to ASTM D 2235.

Schedule 40 PVC pipe shall conform to ASTM D 1785 or D 2665 (or both). Solvent cement used on PVC shall conform to ASTM D 2564.

SDR-35 PVC pipe and fittings shall conform to ASTM D 3034 and shall be joined using bell and spigot joints conforming to ASTM D 3212 and flexible watertight elastomeric seals conforming to ASTM F 913 or F 477.

3.6.4. Pipe Slope

Building sewer lines shall comply with Section 3.5.5 and if smaller than 4” shall have a minimum slope of 0.025.

3.6.5. Building Sewer Cleanout

A two-way sewer cleanout shall be installed a maximum of five feet (5’) from the building and spaced every one-hundred feet (100’) as measured from the initial building cleanout, to the service connection. Cleanouts are also required at all bends of 22 degrees or greater.

Cleanouts shall be a minimum pipe diameter of three inches (3”) and be SDR-35, schedule 40 PVC or ABS.

3.6.6. Backflow Prevention Valve

Each property owner will be required to provide and maintain a backflow prevention device on the building sewer line, if any floor of a structure is at or below the sewer main or lateral top-of-pipe elevation. Each property owner
will likewise be required to provide and maintain a backflow prevention device on the building sewer line if the lateral is lower than the sewer main at any point along its length.

3.7. Wastewater System Layout Requirements

3.7.1. Wastewater Line Locations and Clearances

Wastewater lines shall be placed in a public right of way unless the Agency deems the alignment impractical, in which case a twenty foot (20’) easement is required. Wastewater lines shall be installed in the center of the required 20’ easement. Wastewater lines shall be placed five feet (7’) off centerline on South and east alignments when in public street right of ways. Wastewater lines shall be installed with a minimum of three feet (3’) clearance from the lip of the gutter within public street right of ways. Wastewater lines that parallel sidewalks, drainage ditches, curbs, or gutters shall not be installed under said improvements, and shall have a minimum of two feet (2’) horizontal clearance from said improvements.

 Unless otherwise approved by the Agency, all sewer locations shall not interfere with other existing utilities. Horizontal curves are allowed on all pipe sizes 8” and larger, but are not encouraged except where necessary to maintain the required clearance from water pipelines. The minimum curve radius for sewers shall conform to the manufacturer’s minimum recommendations. Agency staff shall review, modify, and/or approve all proposed horizontal curved sewer designs. Vertical curves shall not be permitted within sewer systems except when approved by Agency staff. Application for exceptions shall be in writing prior to plan check submittal and include justification. The minimum depth of cover over the sewer pipeline should be sufficient to sewer adjacent properties, where practical. Sewer installations near water pipelines shall be in accordance with State Department of Health Services, Title 17 & 22, or the Agency’s criteria, whichever is most restrictive.

 Wastewater/sewer lines shall maintain a minimum of ten feet (10’) horizontal separation and one foot (1’) vertical clearance below any potable water line. Wastewater/sewer lines shall maintain a minimum of ten feet (10’) horizontal separation and one foot (1’) vertical clearance below any raw water line intended for use as drinking water.

 All parallel dry utilities and other utilities shall be installed with a minimum of twenty-four inches (24”) horizontal separation and twelve inches (12”) vertical separation from the wastewater line, except water lines as noted above. At a minimum, unless otherwise listed as requiring additional separation, all parallel utilities, including other wastewater pipelines, shall be installed with a minimum of twenty-four inches (24”) horizontal separation from the wastewater line.

 When crossing other utilities, a minimum vertical clearance of one foot (1’) shall be provided (nearest outside diameter to nearest outside diameter). All crossings shall be made at ninety degree (90°) angles, unless otherwise
approved by the Agency Engineer. Sewer installation shall provide a minimum clearance of 100 feet from all potable, non-potable, and water quality monitoring wells.

When in a highway right of way and where required by the Agency Engineer, wastewater lines shall be cased. Casings shall extend five feet (5’) beyond the right of way wherever possible. Wastewater lines parallel to highways shall be installed with a minimum of five feet (5’) horizontal separation from the edge of pavement.

Wastewater lines shall be placed in a minimum twenty-foot (20’) public utility easement within the public right of way unless the Agency deems the alignment impractical. Wastewater lines shall be installed in the center of the required 20’ easement. Easements dedicated solely to the Amador Water Agency may be substituted where a public utility easement is not practicable. Back-lot lines are prohibited unless a request for exceptions is provided in writing prior to plan check submittal and includes justification. Wastewater lines shall be placed five feet (5’) off centerline on south and east alignments when in public street right of ways.

Wastewater distribution lines shall be looped and connected wherever possible by development, even if outside the boundaries of the development and where required by the Agency Engineer. In all cases, wastewater lines shall be extended to the property lines of the development along all access roads or routes, where looping is possible, and where potential future development or connections may exist.

When an area outside the development, but in reasonably close proximity as determined by Amador Water Agency Staff, can be logically served by future extension of a proposed sewer, the sewer pipeline shall extend to the tract boundary or to the end of a paved street in a manner to facilitate the future extension and include any necessary diameter over sizing and extra depth.

Private or non-Agency facilities shall not be allowed within Agency trench sections, without written approval from the Agency Engineer.

Wastewater service connections shall not be allowed on transmission pipelines.

3.7.2. Service Lines

Service lines from the wastewater main to the property line or edge of easement shall normally be installed at the time the main is constructed. Service lines from mains installed in private roads shall extend 1 foot (1’) beyond the edge of the pavement. Service boxes shall not be located in driveways unless they are H-20 traffic rated. An accessible walking path, from the street to each service box shall be provided with a maximum 10% slope.

Service lines shall be placed at property lines avoiding other utilities. Service lines shall have a maximum length of one hundred (100) LF from the wastewater line to the main. Manifold services to more than one parcel shall not be permitted.
Multi-family residential, commercial and industrial customers shall have separate collection line connections.

### 3.7.3. Line Valves

The wastewater system shall be equipped with a sufficient number of line valves so that no single shut-down will result in shutting down a pressurized transmission main of more than one thousand feet (1,000’), a pressurized collection main of more than five hundred feet (500’) or necessitate the removal from service of length of pipe greater than five hundred feet (500’) in other areas.

Valves shall preferably be located at street intersections. If it is necessary to install valves between street intersections, they shall be located on property lines.

All valves shall be flanged or flange x M.J. Valves are required on all sides of tees and crosses. Use three (3) valves on all tees and four (4) valves on all crosses. Exceptions shall be shown on the plans and approved by the Agency Engineer.

Valve size shall conform to pipe size, unless clearly stated and approved otherwise on the plans. Ten inch (10”) and smaller valves shall be gate type. Twelve inch (12”) and larger valves shall be plug type. Valves sixteen inches (16”) and larger shall have a minimum two inch (2”) bypass valve.

### 3.7.4. Combination Air-Vacuum Release Valve (CAVRV)

A combination air-vacuum release valve, with specific suitability and design for wastewater systems, shall be installed at all high points, of force mains and between valved sections of pipe as determined by the Agency engineer.

Charcoal lined lids or other suitable measures approved by the Agency Engineer for odor control shall be installed at all CAVRVs. Lids must be placed flush against a factory edge for proper attachment to the riser. Cut riser edges are not permitted.

### 3.8. Minimum Site and Equipment Requirements

- Inlet and outlet piping shall be pressure class 350, with isolation valves on all inlet and outlet piping. All exposed piping shall have adequately sized and located thrust blocks. A check valve isolated by shut off valves is required on all inlet and outlet piping.

- Fall protection shall be provided where appropriate.

- Site, building and equipment drains shall be provided.

- Permanent phone connectivity, where possible, direct wire to Agency SCADA systems, and a backup radio transmitter shall be provided for systems communications.
• SCADA controls operating with the Agency SCADA system and compliant with Agency SCADA Standards shall be provided. All equipment shall be remotely controlled and alarmed via SCADA.

• Level sensing shall be via transducers. Additionally, a backup alarm system connected to an auto-dialer with battery back-up shall also be provided.

• Three phase PG&E power shall be brought to the site, where available. The service shall be sized to allow startup of the largest pump, with all other equipment running. Where not available, solar power shall be provided, with sizing based on the coincidence of peak demand and 50% cloud cover for seven consecutive days.

• All electrical equipment shall be placed in minimum NEMA 4x rated enclosures.

• Arc Flash certification, labeling and working space requirements shall be provided.

• All above grade electrical conduit shall be PVC coated rigid conduit.

• Provide sun and weather protection as appropriate for all equipment and working spaces.

• 48 hour battery backup for all equipment is required. Surge protection and lighting arrestors shall be provided.

• Sufficient interior and exterior lighting shall be provided for Agency crews to perform night work. Interior and exterior receptacles shall be provided.

• The entire site shall be paved with a) 2-inches of Asphalt Concrete over 5-inches of Class II Aggregate Base or b) 4-inches of Portland Cement Concrete.

• The site shall be accessible either via a minimum 12-foot driveway with a hammerhead turnaround and constructed of a) 2-inches of Asphalt Concrete over 5-inches of Class II Aggregate Base or b) 4-inches of Portland Cement Concrete. The driveway shall be accessible from a PUE or access easement dedicated to the Agency.

• The entire site shall be enclosed with 6 foot chain link fence with colored slats and 3-strand barbed wire. A minimum of one 16-foot wide double gate and one man gate, on the opposing side of the site, shall be provided.

• The site shall be a separate lot deeded to the Agency. The site shall be sized to allow for 20’ level clearance on all sides from any equipment, buildings, fencing or piping, and shall include a replacement tank site.

• Complete O&M manuals shall be submitted and the Contractor shall provide all training necessary for maintenance and operation of facility.

3.8.1. Minimum Pump Station Requirements

  o Full size redundant/backup domestic pumps shall be installed, for a minimum of two full size domestic pumps. Pumps shall be designed for maximum use with largest unit out of service. Pumps shall operate lead-lag and cycle the lead pump.
Pumps and Motors shall have a minimum combined efficiency of 80%. All pumps shall be VFD controlled. Pumps shall run in automatic or hand mode.

- Rubber expansion joints are required on all suction and discharge piping.
- Full size pump bypass piping is required.
- Pumps, VFD’s and pump control wiring shall be installed in a fully enclosed, secure, sound attenuated and waterproof concrete or CMU building. A maximum of 60 dBA at the nearest tank property line is allowed. Maximum allowed internal ambient air temperature shall be 110 degrees. Provide HVAC or proper ventilation as required. Minimum 3’ working spaces shall be provided in front of all equipment and on three sides of all pumps.
- A permanently mounted backup propane generator and tank with automatic transfer switch is required. The generator shall be sized to allow startup of the largest pump, with all other equipment running. Sound attenuation, as described above, and silencer are required.

**Technical Provisions**

**4. Equipment, Piping and Materials Demolition**

**4.1. General**

Perform demolition, removal, abandonment, and relocation work specified and indicated in the drawings. Prepare remaining surfaces to receive new scheduled and specified materials and finishes or finish to match adjacent surfaces if no additional work is scheduled or indicated.

**4.2. Existing Piping**

Shut off or disconnect utilities affecting demolition work. Schedule shutdowns with the Owner; notify the Owner ten working days in advance of any shutdown that is required to perform the work. The Owner will open/close valves on piping and appurtenances required for the shutdowns.

**4.3. Plugging Abandoned Piping**

Plug pipes of all sizes to be abandoned by placing a 3-foot-long concrete or non-shrink grout plug in the open ends.

**4.4. Removal of Existing Asbestos Cement Pipe**

If the existing pipeline to be removed is asbestos cement pipe, remove the pipe to the limits shown in the drawings and dispose.

Removal procedures shall be in accordance with OSHA 29 CFR 1926.1101, Class II, and California CCR Title 8, Division I, Chapter 4, Subchapter 4, Article 4, Section 1529.

Excavate the sections of pipe to be removed. Determine the airborne concentrations of asbestos to which employees may be exposed during removal operations per 29CFR...
1926.1101, Appendices A and B. If the measured asbestos concentrations exceed the permissible exposure limit (PEL), provide temporary enclosures with ventilation systems, respiratory protection, wetting methods, or other procedures complying with 29 CFR 1926.1101.

Cover or seal the sections of pipe removed to prevent asbestos from becoming airborne during pipe removal and transportation operations.

4.5. Demolition

Existing structures, boxes, pipes, pavements, curbs, and other items are to be removed, altered, salvaged, and disposed of as indicated in the drawings. Remove and dispose of all portions of these items which interfere with project construction.

Remove and dispose of all facilities to be demolished in their entirety including belowground footings, foundations, and other associated appurtenances, as shown in the drawings or as specified herein. Backfill and compact all site areas disturbed by demolition work with earth backfill material in accordance with standards of the local agency having jurisdiction or Section 19-3.02 of the State Standard Specifications.

Perform the work in a manner that will not damage parts of the structure not intended to be removed. If, in the opinion of the Owner's Representative, the method of demolition used may endanger or damage parts of the structure or affect the satisfactory operation of the facilities, promptly change the method when so notified by the Owner's Representative.

5. Piping and Plumbing

5.1. Gravity Collection Lines

5.1.1. Polyvinyl Chloride (PVC) Pipe - SDR-21, 26 or 35

5.1.1.1. Small Diameter PVC

Collection Lines sized 3 through 15 inches shall conform to Section 3.5.4 and ASTM D3034.

5.1.1.2. Larger Diameter PVC

Collection Lines sized 18 through 24 inches shall conform to ASTM F679, T-1.

5.1.1.3. Joints

Joints between PVC pipe and fittings shall be slip-on type and shall be sealed by means of rubber rings designated for use with the type of pipe being installed and conforming to ASTM D 3212 and F 477 or F 913.

Use of Calder type couplings shall not be permitted.

Joints between PVC and other types of pipe shall be made by means of the proper sized compression type adapter.

5.1.1.4. Fittings

Fittings for pipe 4 through 12 inches shall conform to the same requirements as the pipe being used in the collection.
Fittings for pipe 14 through 24 inches shall be fabricated of the same material as the pipe and shall comply with ASTM F 679.

All 90 degree bends shall be long radius sweeps, “hard” 90 degree fittings shall not be permitted.

5.1.1.5. Mandrel for Field Testing of Pipe Deflection

The mandrel shall:

- Be a rigid, nonadjustable, odd-numbering-leg (nine legs minimum) mandrel having an effective length not less than its nominal diameter.

- Be fabricated of steel; be fitted with pulling rings at each end; be stamped or engraved on some segment other than a runner indicating the pipe material specification, nominal size, and mandrel OD (e.g., PVC, D 3034-8”-7.524”); and be furnished in a carrying case labeled with the same data as stamped or engraved on the mandrel.

- All costs incurred by the Contractor attributable to mandrel and deflection testing, including any delays, shall be borne by the Contractor at no cost to the Agency.

- Have a minimum mandrel diameter of 0.125” less than the pipe inside diameter.

5.1.2. Polyvinyl Chloride (PVC) Pressure Pipe - C900

PVC C900 shall also be permitted for Gravity Collection Lines upon written approval from Amador Water Agency Engineering Supervisor. See Section 5.2 for requirements.

5.2. Force Mains

5.2.1. Small and Large Diameter PVC

Force Mains sized 4 through 24 inches shall conform to AWWA C900 standards and Section 3.5.4.

5.2.2. Septic Tank Effluent Pumped (STEP) Systems

See additional requirements in the AWA STEP Specifications.

STEP pressurized collection systems and force mains shall be looped in all cases. The STEP system shall be equipped with a sufficient number of line valves and looped wastewater mains so that no single shut-down will result in shutting down a pressurized transmission main of more than one thousand feet (1,000’), a pressurized collection main of more than five hundred feet (500’) or necessitate the removal from service of length of pipe greater than five hundred feet (500’) in other areas.

5.2.3. Joints

Lengths of PVC shall be joined by a locked-in flexible elastomeric gasket coupling with bell and spigot configuration.
Joints between PVC pipe and fittings shall be slip-on type or mechanical type as shown on the plans. Slip-on type joints shall be sealed by means of rubber rings designated for use with the type of pipe being installed. Use of Caulder-couplings shall not be permitted.

Joints between PVC pipe and other types of pipe shall be made by means of the proper sized compression type adapter.

### 5.2.4. Ductile Iron Fittings

Ductile Iron fittings shall conform to AWWA C110 with a minimum pressure rating of 250 psi. Size bells specifically for OD of cast iron equivalent PVC pipe including rubber ring retaining groove. Mechanical joint fittings conforming to AWWA C153 may be used in lieu of AWWA C110 fittings. Fittings shall be cement-mortar lined cast or ductile iron fittings or fusion bonded epoxy lined and coated fabricated steel fittings.

Injection-molded, PVC, PC 150, gasketed fittings conforming to AWWA C907-04 shall be permitted in PC 150 applications from sizes four inch (4") to twelve inch (12"). Fabricated PVC fittings shall not be permitted.

### 5.2.5. Mandrel for Field Testing of Pipe Deflection

The mandrel shall conform to Section 5.1.1.5.

### 5.3. Sewer Laterals

#### 5.3.1. Small and Large Diameter PVC

Sewer Laterals pipe shall conform to Section 3.5.4.

#### 5.3.2. Joints

Sewer Lateral joints shall conform to Section 3.5.4.

#### 5.3.3. Fittings

All PVC fittings shall be molded fittings manufactured of the same material as the pipe and shall be suitable for solvent weld connections. Fitting shapes shall conform to ASTM D 3311 and shall be of a type recommended by the pipe manufacturer. All 90 degree bends shall be long radius sweeps, “hard” 90 degree fittings shall not be permitted. Priming and solvent welding of pipe and fittings shall be per manufacturer’s recommendations.

Threaded PVC pipe shall not be used. Molded threaded adapters may be used in transition joints.

Fabricated fittings shall not be used.

#### 5.3.4. Installation

Each wye branch fitting shall have its barrel diameter equal to the diameter of the sanitary sewer main and the spur (or branch) diameter as indicated on the plans. Do not place wye branches within 5 feet of any structure.

Install wye fittings so that the outlet branch is inclined upward at an angle of 45 degrees. Plug wye branch fittings that are to be left unconnected with a
stopper or plug. Join laterals to wye branch fittings at the sanitary sewer main by eighth bends. Eighth bends and quarter bends are a part of sewer lateral.

Where possible, laterals shall run perpendicular to the sewer main at a minimum grade of 2.5%. Bed laterals the same as the sewer main into which they connect.

Plug laterals with stopper in the socket of the last joint. Seal stopper in place so that it will withstand the internal pressure during the test for leakage and so that it may be removed without damage to the socket.

5.4. Building Sewer

5.4.1. Joints & Fittings
Building sewer materials shall conform to Section 3.6.3.

5.4.2. Installation
Building sewer lines shall be assembled, inspected and installed per this standard, ASTM D 2321 and state and local requirements.

5.5. Valves and Appurtenances

5.5.1. Gate Valves

Gate valves shall be allowed on raw sewage collection lines and raw sewage force mains that are four inches (4") to ten inches (10") in diameter.

Gate valves shall be resilient seated wedge type, two hundred (200) PSI WOG rated, conform to AWWA specification C509 and shall be mechanical joint, flanged, or mechanical joint by flanged type as required. All interior ferrous surfaces shall be protected against corrosion by factory applied fusion-bonded epoxy coating, which shall be a minimum of eight (8) mils thick and per AWWA C550. Valves shall have a smooth inside bore on the bottom half so that sediment cannot accumulate. Valves shall open counter-clockwise, have a non-rising stem and a two inch (2") square operating nut that is accessible through a valve box.

Stems shall be Type 304 or 316 stainless steel. Stem nuts shall be made of stainless steel or solid bronze. Bronze shall be a low-zinc alloy conforming to ASTM B 61 or ASTM B 584 (Alloy C92200) or ASTM B 62 or ASTM B 584 (Alloy C83600).

End connections for exposed gate valves shall be flanged.

5.5.2. Eccentric Plug Valves

Plug valves shall only be allowed on raw sewage collection lines and force mains.

Plug Valves shall be eccentric type and shall comply with MSS SP-108 and the following. Provide a rectangular plug design, with an associated rectangular seat. Provide bidirectional seating design. The valve shall seat with the rated
pressure both upstream and downstream of the closed plug. Provide geared actuators sized for bidirectional operation.

The metallic portion of the plug shall be one-piece design and shall be without external reinforcing ribs which result in there being a space between the rib and the main body of the plug through which water can pass. Valves shall be repackable without any disassembly of valve or actuator. The valve shall be capable of being repacked while under the design pressure in the open position. Sleeve bearings shall be stainless steel. Provide enclosed worm gear actuators for valves 6 inches and larger. All interior ferrous surfaces shall be protected against corrosion by factory applied fusion-bonded epoxy coating, which shall be a minimum of eight (8) mils thick and per AWWA C550.

5.5.2.1. Eccentric Plug Valves 4 Through 12 Inches

Eccentric plug valves, 4 inches through 12 inches, shall be nonlubricated type. Minimum pressure rating shall be 175 psi. Bodies shall be cast iron per ASTM A 126, Class B. Ends shall be flanged, Class 125 per ANSI B16.1. Plugs shall be cast iron (ASTM A 126, Class B), or ductile iron (ASTM A 536, Grade 65-45-12) with Buna-N facing. Valve body seats shall be Type 304 or 316 stainless steel or have a raised welded-in overlay at least 1/8-inch thick of not less than 90% nickel. Body cap screws and bolts and nuts shall be Type 316 stainless steel. Packing shall be butadiene-filled Teflon. Valves shall be DeZurik, Clow or equal.

5.5.2.2. Eccentric Plug Valves 14 Inches and Larger

Eccentric plug valves, 14 inches and larger, shall be nonlubricated type. Minimum pressure rating shall be 150 psi. Bodies shall be cast iron per ASTM A 126, Class B. Ends shall be flanged, Class 125 per ANSI B16.1. Plugs shall be cast iron (ASTM A 126, Class B), or ductile iron (ASTM A 536, Grade 65-45-12) with Buna-N facing. Valve body seats shall be Type 304 or 316 stainless steel or have a raised welded-in overlay at least 1/8-inch thick of not less than 90% nickel. Plug shall be of the one-piece design. Body cap screws and bolts and nuts shall be Type 316 stainless steel. Packing shall be butadiene-filled Teflon. Valves shall be DeZurik, Clow or equal.

5.5.3. Closed Body Pinch Valves

Pinch valves shall only be allowed on raw sewage collection lines.

Pinch valves shall have cast-iron (ASTM A 48, Class 30) bodies with totally enclosed actuators. Sleeves shall be neoprene, Buna-N, or Hypalon. Ends shall be flanged, ANSI B16.1, PC 125. Valves shall have 2-inch square AWWA operating nuts with extension stem actuators. Valves shall have full port area, over pinch guard and the valve position shall be clearly visible. Valves shall be Cla-Val, Red Valve Series 75, or equal.

All interior ferrous surfaces shall be protected against corrosion by factory applied fusion-bonded epoxy coating, which shall be a minimum of eight (8) mils thick and per AWWA C550.
5.5.4. Check Valves

5.5.4.1. Swing Check Valves

Swing check valves shall only be allowed on backflow prevention devices and shall be stainless steel with threaded connections. Valve shall be a stainless steel swing check with removable flapper and self-lubricating hinge. Valve shall be watertight with a ten-foot (10’) water column. The valve shall have a quick-open inspection cover and be installed in a valve access box for ease of inspection. Utility box shall be a minimum twenty-four inches by eighteen inches (24” x 18”) with extensions as required and a lid to be installed at grade. Box shall be pre-cast concrete or fiber-lite.

Boxes for backflow prevention at lift stations shall be Hot Box brand. Swing check valves shall have cast iron (ASTM A 48, Class 30, or ASTM A 126, Class B) body and cover. All interior ferrous surfaces shall be protected against corrosion by factory applied fusion-bonded epoxy coating, which shall be a minimum of eight (8) mils thick and per AWWA C550. The flapper shall consist of a steel disc insert and a stainless steel shaft (hinge pin) supported by stainless steel or polymer bearings and sealed by an adjustable packing gland. The seat ring shall be stainless steel and a Buna-N seal shall be furnished to provide zero leakage and shall be vulcanized to the flapper plate. Valve shall be designed for a working pressure of not less than one hundred seventy-five (175) PSI and tested at three hundred fifty (350) PSI. They shall be of the balanced, swing gate type with a clear opening at least equal to that of the connecting pipe and shall have an external lever and counter weight. Cast in place or pre-cast concrete vaults will be required for all buried swing check valve installations. Swing check valves shall be Cla-Val Series 501A or equal.

5.5.4.2. Globe Check Valves

Globe check valves shall be allowed on raw sewage collection lines and raw sewage force mains.

Globe check valves shall have a cast iron (ASTM A 48, Class 30, or ASTM A 126, Class B) body, stainless steel seat and disc, and stainless steel spring. All interior ferrous surfaces shall be protected against corrosion by factory applied fusion-bonded epoxy coating, which shall be a minimum of eight (8) mils thick and per AWWA C550. The valve disc shall be center guided at both ends with an integral shaft and shall be spring loaded with a helical or conical spring. The flow area through the body shall be equal to or greater than the cross-section area of the equivalent pipe size. Globe check valves shall be Flomatic 402ST or equal.

5.5.4.3. Ball Check Valves

Ball check valves shall be allowed on raw sewage collection lines and raw sewage force mains.
Ball check valves shall have a cast iron (ASTM A 48, Class 30, or ASTM A 126, Class B) body. All interior ferrous surfaces shall be protected against corrosion by factory applied fusion-bonded epoxy coating, which shall be a minimum of eight (8) mils thick and per AWWA C550. The ball shall be Type 316 stainless steel and upon discontinuation of flow, automatically roll back to the closed position, providing a positive seal against back pressure or backflow. Ball check valves shall be Flomatic Model 408 or equal.

5.5.5. Combination Air and Vacuum Release Valves (CAVRV)

Combination air and vacuum release valves shall combine the operation features of both a vacuum valve and an air release valve in one housing. The inlet and outlet of the valve shall have the same cross-sectional area. The float shall be guided by a stainless steel guide shaft and seat drip-tight against a synthetic rubber seal. The float shall be of all stainless steel construction and capable of withstanding maximum system surge pressure without failure. The body and cover shall be cast iron (ASTM A 48, Class 30, or ASTM A 126, Class B) and concentrically located and the valve internal parts shall be of stainless steel with Buna-N rubber seat. Combination air and vacuum release valves shall be Cla-Val, or equal.

Provide one inch (1”) CAVRV on line sizes up to three inches (3”), two inch (2”) CAVRV on line sizes four inches (4”) to ten inches (10”) and three inch (3”) CAVRV on line sizes greater than ten inches (10”+). The CAVRV size shall be approved by the Agency Engineer.

Pipe taps for CAVRV shall always be at actual high points of wastewater lines.

See Standard Drawing SS002.

5.5.6. Nuts and Bolts

Nuts and bolts, not specified elsewhere, shall be cadmium plated, zinc coated or Grade 2. They shall be coated with “Loctite” anti-seize. The bolt shall extend at least three (3) threads through the nut and no more than one half inch (½”).

5.5.7. Plastic Film Wrap

This wrap shall be used around all buried valves, bolted flanges and other fittings. The polyethylene film shall be of virgin polyethylene as produced from DuPont Alathon resin and shall meet the requirements of ASTM D3350 or AWWA C105, and shall have a flow rate or nominal melt index of 0.4 g/min maximum.

The polyethylene film shall be minimum six (6) mils in thickness. The length shall be sufficient to firmly attach the film to the pipe on either side of the valve, flange or fitting with ten (10) mil tape.

5.5.8. Valve Boxes
Valve boxes shall be provided for all underground valves and shall be pre-cast concrete. Christy G05 or equal. Lids shall be cast iron traffic type G5C and marked “SEWER.” If noted on the plans additional markings may be necessary.

5.5.9. Valve Riser Extensions

Eight inch (8”) diameter PVC conforming to AWWA C900 water pipe or SDR35 sewer pipe shall be used and installed as shown on Standard Drawing SW003.

5.5.10. Vaults

Cast in place or pre-cast concrete vaults will be required for all buried valves and appurtenances. Valve vaults shall provide twenty-four inches (24”) minimum clearance from the inner wall of the vault to any piping, valves or appurtenances. Traffic rated lids shall be used in all traffic areas. Lids weighing over 50 lbs. shall be equipped with mechanical lift assistance devices so that no more than 50 lbs. of effort is required to open the lids. All vaults and boxes shall have a 12” x 12” concrete collar with two horizontal #4 rebar placed vertically 4” apart and 4” from any edge. The exterior and interior of all vaults shall be thoroughly coated with Thoroseal (MasterSeal 581) or equal.

5.5.11. Locating Cable & Locator Tape

Direct burial green copper wire solid, Soft Drawn No. 10 insulated, shall be taped to the top of pipe every ten (10) feet, before backfilling where the pipe does not proceed in a straight line between two manholes that are simultaneously within line of sight. The wire shall be procured from the vendor complete with an approved splice and insulation kit and cable joints shall be spliced in accordance with the manufacturer’s instruction to form a set of continuous electrical conductors throughout the pipe system. Where pipe branches occur, the wire shall be branched also so that wire is provided to each valve and to the locating wire of the branch if the existing branch has one.

All sewer pipe shall be marked with a 3” green metallic locator tape, located 12” directly above the pipe and bedding material. The tape shall be marked with 1½” black “CAUTION – SEWER LINE BURIED BELOW” lettering and be placed face up in the trench.

5.5.12. Manholes

All manholes shall be precast units and shall be manufactured and tested in accordance with ASTM C 478. Where precast units are not possible, written permission shall be required from the Agency Engineer. Riser sections shall be reinforced in accordance with ASTM C 478 and shall have a minimum wall thickness of 5”. All cones shall be of the eccentric type and shall be reinforced with a minimum wall thickness of 5”. All reinforcement shall have a minimum of two inches (2”) of cover.

Joints shall be tongue & groove conforming to ASTM C 478 Section 14. All joints shall be sealed with a preformed plastic or rubber ring to form a water-tight seal. Rubber boot and stainless steel clamps, meeting the requirements of ASTM
C 923 shall be supplied with the manhole bases to tie the pipe to the base section of the manhole.

Manhole bases, sections, grade rings, eccentric cones, covers, etc. shall all be made by the same manufacturer for each complete manhole.

The exterior and interior of grade rings, cones and rims shall be coated Thoroseal (MasterSeal 581) or equal. The interior of manholes with turbulent flows (e.g. drops, right angles, force main terminations, etc.) shall be coated and sealed with 100 mils of Hydro-Pox 204 UHB or equal.

See Standard Drawings SS005 and SS006.

5.5.12.1. Drop Sewer Manholes

Drop sewer manholes shall be permitted wherever necessary as determined by the engineer and approved by the Agency Engineer. Manholes shall be precast units. All of the pipe for the sewer and the drop inlet shall be the same material as the sewer. Where two or more drop inlets are required in a single manhole, each drop inlet shall be constructed as a separate drop inlet.

See Standard Drawing SS007.

5.5.12.2. Manhole Bases

Pre-cast manhole bases shall be a minimum six inches (6”) thick. The depth of channel shall equal the pipe diameter for all sizes of pipe. Bedding for bases shall be a minimum of six inches (6”) of ¾” crushed rock. Manhole bases shall be of the precast type where possible.

Precast manhole bases shall conform to ASTM C 478 and shall have a minimum cover of the reinforcing steel of two inches (2”).

Cast-in-place manhole bases shall be constructed of a minimum 3,500 psi concrete and shall be poured in one operation. Concrete finish of shelves shall be a rough broom finish or other non-skid finish as approved by the Agency Engineer.

See Standard Drawing SS008.

5.5.12.3. Manhole Covers

Manhole covers shall be constructed of cast iron in conformance with ASTM A 48 Class 35B.

Covers shall be cast with the word “SEWER”. The letters shall be approximately 2 ½” high with ½” line width and placed in the center of the cover. All letters shall be flush with the finished surface of the cover.

Joints between manhole risers and rims shall be made watertight and sealed with rubber rings or Sauereisen Manhole Chimneyseal No. F-88 or equal.
Covers located in easements, alleys, parkways and all other places except paved streets shall have socket set screw locking devices. Drill and tap two holes to a depth of 1” at 90 degrees to pick hole and install 3/8” recessed stainless steel hex head screws. All threads shall be N.C.

5.5.12.4. Existing Manholes

Contractors may reuse the existing manhole frames and covers where they comply with current AWA standards and where they are undamaged as determined by the Agency Engineer. Existing steps located within removal limits shall be removed. Precast concrete manholes may be raised only by the use of grade rings with not more than two inches (2”) of new mortar (1 part cement to 2.5 parts sand ratio) used for final adjustment. Precast manholes may be lowered by the removal of grade rings where not more than two inches (2”) of new, Class “D” mortar per the “Greenbook” Standard Specifications for Public Works Construction 2015, is used for final adjustment. In no case shall removal of grade rings result in a shaft height less than twelve inches (12”).

Breaking into existing manholes shall be accomplished by a core cut hole made with equipment specially designed to cut a smooth hole without spalling or damage to the reinforcing steel or structure. New stub invert elevations shall be a minimum of 0.10 feet higher than the existing outlet invert elevation. Sealing of penetrations may be accomplished by the use of Class “D” mortar per the “Greenbook” Standard Specifications for Public Works Construction 2015 or a flexible pipe-to-manhole connector such as KOR-N-SEAL, PSX or equal. The connector shall comply with ASTM C 923 and consist of EPDM and 304 stainless steel.

5.5.13. Sewer Cleanouts

A two-way sewer cleanout shall be installed a maximum of five feet (5’) from the building and spaced every one-hundred feet (100’) as measured from the initial building cleanout. Cleanouts are also required following all bends of 22° or greater.

All cleanouts shall be constructed with standard fittings and have a screw cap located at or just below the final grade or paving surface. The frame and cover of all cleanout shall be adjusted to match finish grade. Cleanouts shall have water proof frames and covers. Cleanouts on sanitary mainlines are prohibited. Cleanouts shall be a minimum pipe diameter of three inches (3”) and be SDR-35, schedule 40 PVC or ABS. Details are shown on Standard Drawing SS009.

5.5.14. Sewer Flushing Inlets

Sewer flushing inlets shall be installed a maximum of five feet (5’) from the wastewater pumping station and spaced every one-thousand feet (1,000’) as measured from the initial flushing inlet. Flushing inlets are also required following all bends of 22° or greater.
Flushing inlets shall be located at the edge of the road and within five-hundred feet (500’) of a fire hydrant.

Flushing inlets shall be a minimum pipe diameter of two inches (2”), and be C900, schedule 80 or greater. Details are shown on Standard Drawing SS010.

5.5.15. Waste Interceptors

Grease, oil-sand or other interceptors shall be provided for the proper handling of liquid wastes containing grease, oil, flammable wastes, fur, hair, rice, fish scales, lint, unprocessed food, solids, particulates or other constituents which may be harmful to or cause obstruction of the Agency’s wastewater system. All interceptors shall be of a type and capacity in accordance with Section 3.2 and approved by the Agency. Interceptors shall be located as to be easily accessible for cleaning and inspection, constructed of impervious materials capable of withstanding abrupt and extreme changes in temperature. They shall be of substantial construction, watertight and equipped with easily removable covers which, when bolted in place, shall be gastight and watertight. A clean out or inspection tee shall be provided within two feet of inlet and outlet piping. Fiberglass tanks or vaults shall not be permitted. All interceptors shall be properly vented. The exterior of all interceptors shall be thoroughly coated with Thoroseal (MasterSeal 581) or equal.

The owner/lessee shall be jointly and severally responsible for the efficient cleaning and maintenance of the interceptor. The interceptor shall be placed in continuous efficient operation at all times. The interceptor shall be completely cleaned when grease, oil and solids occupy 25% of the holding capacity. The owner/lessee shall inspect interceptors monthly or more frequently if required by the Agency. Maintenance records shall be kept on site for at least three years.

No grey water from toilets, urinals, bathroom sinks or similar fixtures shall flow through interceptors. Interceptors shall not be installed in drive-through driveway locations or require the use of ladders or the removal of bulky equipment such as dumpsters.

The waste discharge from all facilities will be evaluated by the Agency to determine if other more appropriate interceptors shall be required.

5.5.15.1. Grease Interceptors

All drains from the kitchen, food preparation and dishwashing areas shall be connected to the grease interceptor. Fixtures to be connected include, but are not limited to, scullery sinks, pot and pan sinks, garbage disposals, food waste disposal units, dishwashing and sanitizing machines, soup kettles and floor drains located in areas where grease containing material may exist. Grease traps are not allowed.

The minimum grease interceptor size is 1,000 gallon capacity.

Grease interceptors shall not be located in a food or utensil handling area.
5.5.15.2. Oil-Sand Interceptors

Oil-sand interceptors are required for any business that stores, washes, repairs, fuels or services motor vehicles or any similar facility which may introduce sand or oil into the wastewater system. Oil-sand traps will not be allowed.

The minimum oil-sand interceptor size is 1,000 gallon capacity.

See Standard Drawing SS011.

5.5.15.3. Hair-Fur Interceptors

Hair-Fur interceptors are required for any business that cuts or treats hair, to include salons and barber shops. Also, any business that grooms, washes or provides medical services to animals is required to install a hair-fur interceptor. Hair-fur traps will not be allowed. Hair-fur interceptors shall be provided by J.R. Smith Manufacturing, Watts, Wade, or approved equivalent.

See Standard Drawing SS012.

5.5.16. Gaskets

Gaskets for fittings in wastewater applications shall be NBR or Neoprene

5.5.16.1. Flange Fitting Gaskets

Flange gaskets shall be “full face” and one eighth of an inch (1/8”) thick. Flanged gaskets shall be U.S. Pipe FLANGE-TYTE II or pre-approved equal. The flange face shall be free of any foreign matter and/or rough surface.

5.6. Installation and Testing

5.6.1. Location of Existing and New Utilities

Location of all utilities shown on plans is approximate. At least two working days prior to starting work on the project, not counting the day it is called in, Underground Service Alert (USA) shall be contacted at (800) 227-2600 and Western Underground Utility Alert (WUUA) shall be contacted at (800) 424-3447 for location by the Contractor. The locations of various utilities shown on the plans are solely an accommodation to the Contractor without any representation or guarantee concerning completeness and/or accuracy. The Contractor is responsible for ascertaining the location of, and providing protection for, all utilities that may be encountered in the performance of the required work.

5.6.2. Quality Control

The Contractor shall use appropriate quality control procedures to ensure that all pipe and fittings shall be of the first grade and quality conforming to these Specifications. Pipe shall be stored and transported in a proper manner and
kept clean after delivery to the job site. All work on pipe shall be performed in a skillful and professional manner in accordance with the manufacturer’s recommendations.

5.6.3. Laying of Pipe

Pipe trenching and/or excavations shall not be permitted until the site has been brought to finish grade or the roadway has been brought to subgrade.

Pipe shall be laid and joined in accordance with the manufacturer’s and/or Agency Engineer’s directions. Necessary facilities including slings shall be provided for lowering and properly placing pipe sections into the trench without damage.

Each section of pipe shall be thoroughly cleaned before it is lowered into the trench.

If clean pipe sections and fittings cannot be placed in the trench without getting dirt into open pipe, the Agency Engineer may require a piece of material to be tied over the ends of the pipe or fitting until it has been lowered into position in the trench. After the pipe has been lowered into the trench, all foreign matter shall be completely brushed from the pipe ends before assembly.

The pipe shall be cut to provide closure pieces of correct lengths to permit the proper location of the pipe sections, or to locate valves, fittings and appurtenant structures where specified on plans.

The pipe and fittings shall be laid to the lines and grades specified on the plans and centered in the trench. Where pipe slopes are greater than 10%, pipe shall be laid uphill. Provide cut-off walls every two hundred feet (200’) for slopes in between 10% and 20%, and every one hundred feet (100’) for slopes greater than 20%.

For force mains, all horizontal and/or vertical bends greater than or equal to eleven and one fourth (11¼) degrees shall have thrust blocks as shown on Standard Drawing SS014 and SS014A.

The alignment and elevation of the pipeline as shown on the drawings are designed to avoid conflict with new and existing underground utilities. Utility locations are obtained from sources of varying reliability and are the responsibility of others.

Trenches must be kept dry until pipe has been laid, joints closed and backfill completed to a depth of one foot (1’) above top of pipe. Crushed rock for drainage and/or bedding shall be provided as necessary.

Temporary water tight plugs shall be provided for closure of the open ends of the pipelines each time pipe laying activity stops and at the end of each working day to prevent the entry of dirt and/or other contaminants. Plywood and plastic film shall not be acceptable means of closure.

5.6.4. Bedding and Backfill
Bedding and backfill in pipe trenches shall be of the type, placement and compaction as shown in Standard Drawing SS004. Pipe shall be bedded or laid on six inches (6”) of approved imported sand or 3/8” pea gravel. Material placed from trench bottom to twelve inches (12”) above top of pipe shall be imported sand or 3/8” pea gravel. See SS004 for additional requirements regarding trenching and backfilling.

Sub grade and final grade materials and compaction shall be as designated by the roadway controlling Agency/district/etc.

All backfill shall be carefully placed and spread in uniform eight inch (8”) maximum horizontal layers (lifts). Backfill shall be placed to about the same elevation on both sides of the pipe to prevent unequal loading and displacement of pipe. If compaction tests indicate insufficient density of the completed backfill in the trench, the Contractor shall be required to remove the backfill, and re-compact the backfill until the proper density is obtained at the Contractor’s expense. Backfill shall be placed to a minimum depth of thirty-six inches (36”) above the top of the pipe and a maximum depth of sixty inches (60”) above the top of the pipe.

5.6.5. Connections to Existing Pipelines

All connections to existing pipelines shall be made as shown on the plans and in accordance with these Specifications.

Where the existing main is provided with fittings for connecting to the new main, the face of the connection shall be clean and free of all foreign materials. The Contractor shall remove the plug, cap or blind flange, clean the ends and make the new joint.

Where the existing main is not provided with fittings for connecting to the new main, connections shall be made either by hot tap or by cutting and inserting sections of pipe and fittings, as shown on the plans or as directed by the Agency Engineer.

For hot tap installations, the tapping saddle shall have a test plug and shall be air tested at fifty (50) PSI for five (5) minutes. Tapping valves shall be flange by flange. All hot taps shall be witnessed by the Agency Inspector.

When deemed necessary by the Agency Engineer, shutdowns of existing in-service pipeline and other collection facilities shall be made by the Agency as required to complete pipeline connections. A shutdown shall be for as short a period as amount of lead time necessary for shutdown and connection to existing mains varies with each job and must be planned accordingly. Unless dictated by wastewater system consideration, or emergencies, in no case will a shutdown and/or connection be scheduled with less than seven (7) days’ notice. Interference with the operation of the Agency’s collection system shall be kept at a minimum. While an existing pipeline is shut down, the connection work shall be performed without interruption, continuing after regular working hours if necessary, until completed, unless otherwise directed by the Agency Engineer. In some cases, shutdowns must occur at times other than normal.
working hours and/or days. Shutdowns shall not be scheduled Fridays through Mondays. All costs for labor, equipment and meals shall be the responsibility of the Contractor.

In all cases, shutdowns shall be made under the direction of the Agency Engineer. The Agency shall close all valves in making a shutdown and shall open all valves to restore the existing main, as well as initiate service to the new installation.

The Agency Engineer shall be notified at least ten (10) working days prior to any connection so that advance preparation on the part of the Agency can be made, and shall confirm such advance notice in writing. In no case shall any connection operations occur prior to passing pressure tests.

5.6.6. **Abandonment of Existing Facilities**

Existing facilities shall be abandoned as indicated on the plans and specifications. Ends of pipelines four inches (4”) and larger to be abandoned in place shall be plugged with concrete for a distance of not less than twelve inches (12”), unless otherwise shown on the plans. Valve boxes to be abandoned shall be removed and the valve risers shall be filled with concrete.

5.6.7. **Hydrostatic Testing**

The Agency Engineer shall be notified forty-eight (48) hours prior to testing and must approve any wastewater placement in any portion of the pipeline. All lines shall be cleaned via a ball and flush method prior to hydrostatic testing. The contractor shall remove and dispose of all debris generated during the cleaning process. All testing shall occur in the presence of an Agency Inspector.

Building sewer lines shall be air or water tested for leakage. The internal pressure in the pipe shall be raised to five (5) psi and maintained for ten (10) minutes. Any pressure loss over the ten minute period is unacceptable.

Gravity collection lines and sewer service laterals shall be air or water tested for leakage. The internal pressure in the pipe shall be raised to five (5) psi and maintained for five (5) minutes. Any pressure loss over the five minute period is unacceptable.

Force mains shall be water tested for leakage. The internal pressure shall then be slowly increased to one hundred fifty (150) PSI or one hundred fifty percent (150%) of working pressure, whichever is greater. The test pressure shall be maintained for measuring the quantity of water required to maintain full pressure in the line for the test period of two (2) hours. The maximum make-up water allowance shall be per the pipe manufacturer’s recommendations, AWWA, or as directed by the Agency Engineer, whichever is more stringent. Any leakage shall be unacceptable.

After successful completion of the hydrostatic test, the Contractor shall flush the pipeline for a minimum of thirty (30) minutes prior to video testing. The Contractor shall make the necessary piping connections and furnish and install all necessary equipment required for the high velocity flushing operations. The
Contractor shall provide for safe and legal disposal of water from such flushing. The Contractor shall remove all temporary flushing facilities. All costs for flushing shall be paid by the Contractor or MLX applicant.

All leaks discovered during testing, regardless of size, must be repaired.

All or part of the pipeline may be drained as necessary to repair leaks. All leaks shall be repaired in a manner approved by the Agency Engineer and retested before acceptance by the Agency. The contractor shall provide all labor, equipment and materials required for filling and testing the pipeline(s).

5.6.8. **Manhole Vacuum Testing**

This practice covers procedures for testing precast concrete manhole sections to demonstrate the integrity of the installed materials and the construction procedures. This practice is used for testing concrete manhole sections utilizing mortar, mastic or gasketed joints.

Preparation of the manhole shall include plugging all lift holes and pipes entering the manhole. Care shall be taken to securely brace the pipes and plugs to prevent them from being drawn into the manhole.

The test head shall be placed at the top of the cone of the manhole in accordance with the manufacturers’ recommendations. A vacuum of 9.5 inches of mercury shall be drawn on the manhole, the valve on the vacuum line of the test head closed and the vacuum pump shut off. The time shall be measured for the vacuum to drop to 9 inches of mercury. The manhole shall pass if the time for the vacuum reading to drop from 9.5” of mercury to 9” of mercury meets or exceeds one minute.

If the manhole fails the initial test, necessary repairs shall be made by an approved method. The manhole shall then be retested until a satisfactory test is obtained. Use or failure of this vacuum test shall not preclude acceptance by appropriate water infiltration or exfiltration testing, (See Practice C969), or other means.

5.6.9. **Video Testing**

The Contractor shall video all sewer collectors and laterals prior to pavement placement in accordance with the following.

The complete job is ready for television inspection when the following work has been completed and inspected by the Agency.

- All sewer pipelines are installed, backfilled and compacted.
- All manholes are in place and pipelines are accessible from manholes and pressure testing of pipelines and vacuum testing of manholes is completed.
- All other underground facilities, utility piping and conduits are installed.
- Final street subgrade is complete.
• Pipelines to be inspected have been cleaned and flushed for a minimum of 30 minutes per Section 5.6.7.

After the above work is complete, the Contractor shall schedule the video inspection. The video test shall be done in the presence of the Agency inspector. Water is to flow through the lines for 12 hours prior to the video work. During the video for service, some water must be flowing for camera orientation. The camera shall have a device to measure depths.

Contractor shall prepare and deliver a DVD copy of the video to the Agency. Should any corrective action be necessary, the Agency reserves the right to require another test of any repair, and the deficient areas shall be video tested again after the repairs are completed.

Observations from video inspections that will be considered defects and will require correction prior to paving include, but are not limited to:

• Low spots (1/4-inch or greater).
• Offset pipe, joint separations.
• Cocked joints.
• Cracked, “ovalled”, “egged” or otherwise damaged pipe.
• Infiltration.
• Debris or other foreign matter.
• Irregular condition without logical explanation.
• Standing water in service laterals.
• Other obvious deficiencies.

The Developer shall also video all sewer collectors and laterals eleven (11) months after the wastewater system has been accepted, in accordance with the above conditions. The Agency shall be notified a minimum of 72 hours before video of the system. The wastewater video shall be provided to the Agency by the Developer no later than forty-eight hours after completion of the video. Any defects observed will require correction and repair prior to the release of the warranty bond.

5.6.10. Continuity Testing
The Contractor shall test for the continuity of the locating wire at time of final walk-thru. The Contractor shall provide all labor, equipment and materials required for testing the continuity of the locating wire. Should continuity not be present and/or observed, the Contractor shall repair, replace and retest as necessary, entirely at Contractor’s expense.

5.6.11. Facility Markers
Whenever any wastewater facilities are located outside of traveled roadways, approved facility markers shall be installed unless otherwise approved by the
Agency Engineer. Facility markers shall be placed every five hundred feet (500') (force mains only), at horizontal angle points, valves, CAVRV’s or any other appurtenances. Facility markers shall conform to Standard Drawing No. SS015.

6. Concrete Work

6.1. Scope
Concrete work includes the construction of all manholes, vaults, encasement, and other concrete items completed with reinforcement steel as detailed and specified on the plans.

6.2. Materials
All concrete work and materials shall conform to the requirements of California Department of Transportation “Standard Specifications”, latest revision, Sections 52 and 90 and applicable items under Sections 51 and 73, except as modified herein or on the plans.
All concrete shall be Type II with a three quarter inch (¾”) aggregate and a maximum four-inch (4”) slump unless otherwise noted on the plans. Concrete admixtures shall not be used without prior written approval of the Agency Engineer.

6.3. Execution
The Agency shall be notified a minimum of twenty-four (24) hours prior to concrete placement. The maximum allowable combined transit and holding time before concrete placement shall be one and one half (1½) hours.

The surface finish shall be as shown on the plans or as directed by the Agency Engineer. All newly placed concrete shall be cured as directed by the Agency Engineer.

7. Earthwork

7.1. Scope
This work shall consist of: performing all operations necessary to excavate earth and rock or other material, of whatever nature, including removing water, regardless of character and subsurface conditions necessary for the construction of the project facilities; placing backfill for all project facilities, including site grading, structures, transmission piping, electrical underground conduit, ditch and channel excavation, culverts, minor concrete structures, roadwork; removing and replacing unsuitable material; placing embankment material for all required project facilities; other earthwork shown on the plans and indicated in the Specifications including excavating and backfilling all structures, trenches and depressions resulting from the removal of obstructions, removing and replacing unsuitable material.

7.2. Trench Excavation
Trench excavation shall include the removal of all materials or obstructions of any nature, except as otherwise specified to be protected; the installation and removal of all sheeting and bracing and the control of water, necessary to construct the work as shown. Unless otherwise indicated on the drawings or permitted by the Agency Engineer, excavation shall be open cut. Trenching machines may be used except
where their use will result in damage to existing facilities or where hand trenching is required to prevent damage to trees, tree roots or other utilities.

Excavate the trench to the lines and grades shown in the drawings with allowance for pipe thickness, sheeting and shoring if used, and for pipe base or special bedding. If the trench is excavated below the required grade, refill any part of the trench excavated below the grade at no additional cost to the Owner with pea gravel or imported sand. Place the refilling material over the full width of trench in compacted layers not exceeding 8 inches deep to the established grade with allowance for the pipe base or special bedding.

All paving shall be saw cut to a neat line, which is wider than the trench wall. Where concrete paving is encountered it shall be saw cut to a minimum of six inches (6”) wider than the trench at each trench wall.

7.3. Trench Width

Maximum trench width at the top of the trench shall be as shown on the Standard Drawings for the designated type bedding.

Trenches shall meet OSHA requirements.

7.4. Special Foundation Bedding Treatment

Whenever the bottom of the trench is soft, yielding or, in the opinion of the Agency Engineer, otherwise unsuitable as a foundation for the pipe, the unsuitable material shall be removed to a depth such that when replaced with bedding material or three quarters of an inch (¾”) minus drain rock, it will provide a stable and satisfactory foundation. Whenever the trench bottom is in rocky material, the trench shall be excavated to six inches (6”) below the flow line and backfilled with bedding material as specified.

7.5. Trench Backfill

Pipe shall be bedded and backfilled uniformly throughout its length. The specified bedding shall be placed to give the required minimum thickness after placing the pipe and shall be compacted to give a uniform surface for laying the pipe.

Pipe shall not bear on bells, couplings or joints. The trench shall be excavated at these locations as necessary to provide at least two inches (2”) of bedding material below the bell, coupling or joint. No permanent wedging and/or blocking of pipe shall be permitted. Care shall be taken when compacting the material around the bells, couplings or joints.

In connection with these Specifications, tests shall be made in accordance with the Caltrans Standard Specifications, and these requirements:

<table>
<thead>
<tr>
<th>Tests</th>
<th>ASTM</th>
<th>Test method No. California</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sieve Analysis</td>
<td></td>
<td>302</td>
</tr>
</tbody>
</table>

In trenches placed in easements, which are not in traveled County, City, Town and State road rights-of-way, backfill shall be compacted to mound so that drainage to the trench shall not occur. Upon request, a sample and gradation report shall be given.
to the Agency for all imported trench backfill material for Agency review and approval.

7.5.1. Bedding and Backfill

Backfill shall be the material placed between the top of the bedding and twelve inches (12”) above the top of the pipe.

Bedding and backfill material shall consist of select import clean, non-corrosive sand. Bedding and backfill shall be clean and free from vegetative matter, clay and other deleterious substances and shall be of such a nature that it can be compacted readily to form a firm, stable base.

Imported sand used in the pipe zone or for the pipe base shall have the following gradation:

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percent Passing by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8-Inch</td>
<td>100</td>
</tr>
<tr>
<td>No. 4</td>
<td>75 - 100</td>
</tr>
<tr>
<td>No. 30</td>
<td>12 - 60</td>
</tr>
<tr>
<td>No. 100</td>
<td>5 - 20</td>
</tr>
<tr>
<td>No. 200</td>
<td>0 - 10</td>
</tr>
</tbody>
</table>

One half inch (½”) river run pea gravel shall be used only in areas with groundwater and with approval and direction of the Agency Engineer.

The initial backfill shall be placed immediately after the pipe joints have been completed and inspected. The backfill shall be carefully placed so as not to disturb and/or damage the pipe and/or joints, and shall be brought up evenly on both sides of the pipe. The initial backfill shall be manually compacted using care not to damage the pipe or joints to a relative compaction of ninety percent (90%). “Manually compacted” does not exclude careful use of hand-controlled, power-operated units such as air tampers, vibrating tampers other hand-controlled tools used so as not to damage the pipe or joints.

7.5.2. Compaction

Compaction of backfill shall be by means other than jetting. Jetting of backfill shall not be permitted. Compaction shall be performed in layers not exceeding eight inches (8”) and be compacted to a density as shown on Standard Drawing No. SW004.

The location and depth of all compaction tests shall be determined by the Agency Engineer. If a test fails, the area shall be reworked and retested to the satisfaction of the Agency and until passing test are achieved. Contractor shall pay all costs associated with testing.

Jetting of backfill shall not be permitted.

7.6. Embankment Construction
Embankment shall be constructed of excavated or imported material that is free from organic matter, roots, debris, rocks larger than 3” in the greatest dimension, and shall not have more than fourteen percent (14%) of the rocks larger than one and a half inches (1½”), and shall have these properties:

- Maximum Plasticity Index: 15
- Maximum Percent Passing the No 200 Sieve: 50

Placement and compaction of embankment material shall be in conformance with Caltrans Standard Specifications Sections 19 - 6.1 and 19 - 6.2.

7.7. Structural Backfill

Backfill around structures shall be select import or native earth if it is suitable for compaction. This backfill material shall consist of clean sandy material with one hundred percent (100%) passing a three quarter inch (¾”) sieve and shall be clean and free from vegetative matter and other deleterious substances and shall be of such a nature that it can be compacted readily under watering to form a firm, stable base.

8. Clearing, Grubbing and Stripping

8.1. General

This section describes the work included in clearing, grubbing, stripping and otherwise preparing the project site for construction operations.

8.1.1. Clearing

Remove and dispose of shrubs, brush, limbs and other vegetative growth. Remove all evidence of their presence from the surface including sticks and branches greater than two inches (2”) in diameter or thickness. Remove and dispose of trash piles, rubbish and fencing. Protect trees, shrubs, vegetative growth and fencing which are not designated for removal.

8.1.2. Grubbing

Remove and dispose of wood or root matter below the ground surface remaining after clearing, including stumps, trunks, roots or root systems greater than two inches (2”) in diameter or thickness, to a depth of twelve inches (12”).

8.1.3. Stripping

Remove and dispose of all organic sod, top soil, grass and grass roots, and other objectionable material remaining after clearing and grubbing from the areas designated to be stripped.

8.2. Materials

8.2.1. Trees and Shrubbery

Existing trees, shrubbery and other vegetative material may not be shown on the plans. Inspect the site as to the nature, location, size and extent of vegetative material to be removed or preserved, as specified herein. Preserve trees that are specifically shown on the plans as designated to be preserved.
8.2.2. Preservation of Trees, Shrubs and Other Plant Material

All plant materials (trees, shrubbery and plants) beyond the limits of clearing and grubbing shall be saved and protected from damage resulting from the work. No filling, excavating, trenching or stockpiling of materials will be permitted within the drip line of these plant materials. To prevent soil compaction within the drip line area, no equipment shall be permitted with this area.

When trees are close together, restrict entry to drip line area by fencing. In areas where no fence is erected, the trunks of all trees two inches (2”) or greater in diameter shall be protected by encircling the trunk entirely with boards held securely by twelve (12) gage wire and staples. This protection shall extend from ground level to a height of six feet (6’).

8.3. Execution

4.1.1. Clearing and Grubbing Limits

All excavation areas associated with new pipelines, structure, slabs and special areas shown on plans shall be cleared and grubbed.

8.3.1. Disposal of Clearing and Grubbing Debris

Do not burn combustible materials. Remove all cleared and grubbed material from the worksite and dispose of in accordance with all local laws, codes and ordinances.

8.3.2. Areas to be Stripped

All excavation areas associated with new pipelines, structures, slabs and special areas shown on plans shall be stripped.

8.3.3. Disposal of Strippings

Remove all stripped material and dispose of site.

9. Boring, Jacking and Tunneling

Allowable casings shall be steel, see Standard Detail SS016. Alternate casings may be permitted by the Agency Engineer if they meet or exceed steel strength specifications and pose no health or safety hazards. Lap weld or corrugated pipe shall not be used for boring nor open cut casing. Casing shall be of a size to permit installation and removal of the carrier pipe. Multiple casing installations shall conform to the latest revised copy of the California Department of Transportation’s specifications.

When practical, the bores and tunnels shall be installed before open cut carrier pipe. If (due to permits, etc.) it is not possible to install bores or tunnels at the start of construction, then one hundred feet (100’) of carrier pipe at the bore pit side, and three hundred feet (300’) at the receiving pit side shall not be constructed until after completion of the bore or tunnel.

For casing pipe crossing under roadways, railroads, or other installations not within the jurisdiction of the Owner, comply with regulations and permit requirements of said authority.
State highway casing installations shall be as specified in the California Department of Transportation specifications.

Casing installations for railroads shall be as specified by the American Railway Engineering Association, Part 5, Section 5.2, "Specifications for Pipelines Conveying Non-Flammable Substances."

9.1. Reserved

9.2. Steel Casing

Fabrication of casing shall be in accordance with AWWA C200, as modified below. Casing material shall conform to ASTM A 283, Grade C; ASTM A 139, Grade B; or ASTM A 36. Spiral weld steel casing shall have three sixteenths of an inch (3/16) maximum weld height over plate thickness. Spiral welds shall be one hundred percent (100%) of the welds.

9.2.1. Outside Diameter Tolerances

The outside diameter (O.D.) shall not vary by more than the following (percent of O.D.):

<table>
<thead>
<tr>
<th>Diameter Range</th>
<th>Tolerance (±)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6” through 18” O.D.</td>
<td>+0.75% - 0.75%</td>
</tr>
<tr>
<td>20” O.D. and larger</td>
<td>+1.00% - 1.00%</td>
</tr>
</tbody>
</table>

For casing used in any one bore, maximum variation between maximum and minimum outside diameter shall not exceed a quarter inch (¼) for six inches (6”) O.D. to forty-eight inches (48”) O.D. and one half inch (½) for over forty-eight inches (48”) O.D.

9.2.2. Wall Thickness Tolerances

The wall thickness in any one location on the casing shall not vary from the required thickness by more than the following (percent of wall thickness):

<table>
<thead>
<tr>
<th>Diameter Range</th>
<th>Tolerance (±)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6” through 18”</td>
<td>+15.0% - 10.0%</td>
</tr>
<tr>
<td>23” and larger</td>
<td>+17.5% - 10.0%</td>
</tr>
</tbody>
</table>

9.2.3. Wall Thickness Minimums

Minimum wall thickness for steel pipe casing shall be as shown on the table that follows. However, in no case shall wall thickness be less than a quarter inch (¼).

The Contractor may select a greater thickness and diameter to accommodate the method of work, loadings involved, the site and possible interferences, but at no additional cost to Owner.

Lengths listed as “Maximum” may be exceeded, if ground conditions are favorable, and the Agency Engineer can give larger alignment tolerances than shown in Paragraph 5.6.

For six inches to forty inches (6”-40”), a heavy wall lead joint may be required due to adverse ground conditions. If a heavy wall lead joint is required, it should be ten feet (10’) long, but must be one (1) diameter long, and shall have
a minimum wall thickness of one and a half (1½) times the wall thickness of the casing being used.

**Minimum Casing Dimensions**  
(Smooth Steel Pipe)

<table>
<thead>
<tr>
<th>Diameter Pipe</th>
<th>Min. Casing Diameter</th>
<th>Length (1'-100')</th>
<th>Length (100'-200')</th>
<th>Length (Over 200')</th>
</tr>
</thead>
<tbody>
<tr>
<td>6”</td>
<td>18”</td>
<td>¼”</td>
<td>Max Length 100’</td>
<td></td>
</tr>
<tr>
<td>8” - 10”</td>
<td>20”</td>
<td>¼”</td>
<td>Max Length 120’</td>
<td></td>
</tr>
<tr>
<td>12” - 14”</td>
<td>24”</td>
<td>¼”</td>
<td>3/8”</td>
<td>Max Length 150’</td>
</tr>
<tr>
<td>16” - 18”</td>
<td>30”</td>
<td>¼”</td>
<td>3/8”</td>
<td>Max Length 200’</td>
</tr>
<tr>
<td>20” - 26”</td>
<td>36”</td>
<td>¼”</td>
<td>5/16”</td>
<td>3/8”</td>
</tr>
<tr>
<td>28” - 32”</td>
<td>TBD</td>
<td>5/16”</td>
<td>3/8”</td>
<td>½”</td>
</tr>
<tr>
<td>34” - 40”</td>
<td>TBD</td>
<td>3/8”</td>
<td>3/8”</td>
<td>½”</td>
</tr>
<tr>
<td>42” - 48”</td>
<td>TBD</td>
<td>3/8”</td>
<td>½”</td>
<td>½”</td>
</tr>
<tr>
<td>50” - 60”</td>
<td>TBD</td>
<td>3/8”</td>
<td>½”</td>
<td>½”</td>
</tr>
<tr>
<td>Over 60”</td>
<td>TBD</td>
<td>5/8”</td>
<td>5/8”</td>
<td>¾”</td>
</tr>
</tbody>
</table>

### 9.2.4. Casing Surface Conditions

Casing shall be bare or coated with pneumatically applied enamel. The enamel coating is not required, but when it is used, it shall not exceed three (3) mils in thickness. No wrapped casing shall be allowed.

### 9.2.5. Lengths and Ends

Unless otherwise approved, the casing shall be square cut by mechanical methods. Torches held by machinery shall be considered to meet this requirement. This does not apply to field cutting. All casing lengths shall be equal to the auger length.

### 9.2.6. Straightness

Casing shall be measured by the cord method with either string or wire stretched taut to take out all visible sag. Maximum cord measured along the casing shall be true length x 0.02 percent. This is to be measured on actual lengths before loading for delivery to the job site.

### 9.2.7. Welding

All welding shall be done by qualified welders in accordance with the requirements of the American Welding Society (AWS). Welders and welding operations shall be qualified by tests as prescribed in AWS D1.1. Section 5.
Proposed operators may be examined at the site of work and upon satisfactory completion of test welds, designated by the Engineer, may be permitted to perform welding operations on the project. The Contractor shall furnish to the Agency upon request records the welder has been engaged in similar processes of welding for which he/she is pre-qualified for a period of six (6) months prior to the work and records of all welding test results and certifications of any welder prior to and during that period.

9.3. **Grouting**

Fittings shall be put at the proper position to fill all known cavities. When grouting, the road or railroad surface and the casing being installed shall be watched closely so that the road, railroad surface, casing or other structure(s) nearby, are not altered or damaged. Grouting pressure shall be the minimum pressure to feed the grout, but in no case shall it be more than four (4) PSI measured at the grouting fitting. For safety reasons, the minimum size casing allowable for inside grouting shall be thirty inches (30”). Grouting shall be necessary only if there is reason to believe that voids, exceeding one inch (1”) over the outside diameter of casing or liner plate, are present. If grouting is required, grout fittings shall be at a maximum of two (2) rows. Each row shall be twenty-two and a half (22½) degrees off top center, one (1) row left and one (1) row right. If casing joints are ten feet (10’) or in multiples of ten feet (10’), each row shall have fittings spaced at a minimum of ten feet (10’) on centers, staggered so there is one fitting for every five lineal feet (5 LF) of casing.

If the casing joints are eight feet (8’) or in multiples of eight feet (8’), each row shall have fittings spaced at a minimum of eight feet (8’), on centers, staggered so one fitting for every four lineal feet (4 LF) of casing. In tunneling, when liner plates or sets are used, the fittings shall be placed uniformly in sets, but shall not exceed the five lineal feet (5 LF) on centers specified as maximum spacing. Small casings shall be grouted from top of ground in severe conditions only, and shall be five feet (5’) on centers on center line of casing. Reinforced concrete pipe (RCP) grout fittings shall be at least two feet (2’) from edge of the joint. After completion of grouting, close the grout connections with cast-iron threaded plugs.

9.4. **Wing Cutters/Bands/Flairs**

Wing cutters, if they are used shall cut a maximum of one inch (1”) larger than the casing measured on the outside diameter. Any voids that occur from the use of wing cutters are required to be grouted in accordance with Section 5.3. Bands or flairs shall not create a hole over one inch (1”) larger than the outside diameter of the casing.

9.5. **Jacking and Receiving Pits**

Casing placed within conventional highways shall extend five feet (5’) from the back of the curb on one side to five feet (5’) in the back of the curb on the opposite side, or to the right-of-way of the road line if less than five feet (5’). Where Portland cement concrete (PCC) cross-gutter exists, the casing shall extend at least five feet (5’) beyond the back of the cross-gutter. In rural areas, the distance from the edge of the pavement to each end of the bore shall be ten feet (10’) or five feet (5’) beyond
the outside toe of the slope. Jacking and Receiving Pits shall conform to these specifications or to the Roadway Authority’s requirements, whichever is more stringent.

All boring, jacking, and receiving pits shall be:
A. located at least ten feet (10’) from edge of pavement on conventional highways in rural areas;
B. located five feet (5’) behind concrete curb or asphalt concrete (AC) dike on conventional highways in urban areas;
C. located five feet (5’) outside toe of slope in embankment areas;
D. located at least twenty feet (20’) from center line of main line Railroad;
E. adequately protected with fencing and/or type “K” barriers; fence shall be a minimum of six foot (6’) high, in panel sections, securely fastened together with reflectors secured to the side of the fence that faces the traffic. Partially buried posts with fencing attached to form a continuous fence, with reflectors secured to the side of the fence that faces traffic may also be used; and
F. adequately shored in accordance with Cal/OSHA or FED-OSHA.

9.6. **Alignment Tolerances**

The centerline of the casing shall not vary in line or grade from the desired alignment by more than one percent (1%) or one foot (1’) per hundred feet (100’) of casing.

9.7. **Rotary Drilling**

The face must be mechanically cut (not cut with fluid pressure); the water must be mixed with bentonite, as required by ground conditions; the fluid must be supplied to the face from a controlled tank; under no circumstances shall the fluid line be hooked directly to the water system or the water truck while drilling; the controlled tank must be able to mix and agitate the fluid; the controlled tank must also be capable of regulating volume and pressure; and the fluid mix shall be used only for lubrication and to bring back cuttings, not to cut the face. This method can be used for various sizes, lengths and ground conditions.
9.8. **Casing Insulators/Spacers**

Lined steel casing insulators with plastic runners or skids shall be used to support and insulate the carrier pipe within the casing. The size, type, spacing, installation and manufacture of these insulators shall be per the manufacturer’s recommendations and these Specifications. If a discrepancy exists between the two, these Specifications shall override. Casing insulators shall be by PSI Inc., Cascade Waterworks Mfg. Co., Calpico Inc., or approved equal, see Standard Drawing SS016.

9.8.1. **Band/Shell**

The bank, shell, or body of the insulator shall be constructed of fourteen (14) gage 304 stainless steel, or shall be hot rolled, pickled, fourteen (14) gage steel with a coating of rust-inhibiting enamel or hot fused PVC.

9.8.2. **Connecting Flanges**

The connecting flanges shall be of the same material as the shell and shall be ribbed or gusseted for rigidity.

9.8.3. **Bolts/Studs**

All bolts or studs shall be five sixteenths of an inch (5/16”) or larger in diameter and shall be cadmium plated steel or stainless steel.

9.8.4. **Insulating Liner**

The insulator shall have an insulating liner made of Polyvinyl Chloride. It shall have a thickness of 0.090 inches or greater and shall be 85-90 durometer.

9.8.5. **Skids/Runners**

The insulator shall have high density plastic skids. The skids shall have a high resistance to abrasion and a low coefficient of friction. The skids may be supported by a riser to be of the same material as the shell and welded thoroughly to the shell. The skids shall be either bolted or have a stud welded connection to the shell or riser. Glued connections are not acceptable.

Skids shall be greased before installation of carrier pipe into casing.

9.9. **Carrier Pipe**

Carrier pipe shall be ductile iron pipe. All carrier pipe joints shall be fully restrained using a method approved by the Agency Engineer, see Standard Drawing SS016. All carrier pipe shall be installed with tracer wire.
WASTEWATER STANDARD DETAILS

LIST OF FIGURES

SS001A  WASTEWATER GENERAL NOTES
SS001   WASTEWATER SYMBOLS LEGEND
SS002   COMBINATION AIR & VACUUM RELEASE VALVE
SS003   VALVE AND LOCATING WIRE INSTALLATION
SS004   PIPE TRENCH BEDDING AND BACK FILL
SS005   SEWER MANHOLE
SS006   SHALLOW SEWER MANHOLE
SS007   DROP MANHOLE
SS008   PRECAST REINFORCED CONCRETE MANHOLE BASE
SS009   BUILDING SEWER CLEANOUTS
SS010   FLUSHING INLET
SS011   GREASE INTERCEPTOR
SS012   OIL-SAND INTERCEPTOR
SS013   HAIR-FUR INTERCEPTOR
SS014   THRUST BLOCK DETAILS
SS014A  THRUST BLOCK DETAILS - LARGE PIPE
SS015   WASTEWATER FACILITY MARKER
SS016   CASING AND CARRIER PIPE
GENERAL NOTES:

1) THE TYPES, LOCATIONS, SIZES, AND DEPTHS OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THESE IMPROVEMENT PLANS WERE OBTAINED FROM SOURCES OF VARYING RELIABILITY AND ARE APPROXIMATE. A REASONABLE EFFORT HAS BEEN MADE TO LOCATE AND DELINEATE ALL KNOWN UNDERGROUND FACILITIES. HOWEVER, THE ENGINEER CAN ASSUME NO RESPONSIBILITY FOR THE COMPLETENESS OR ACCURACY OF THE DELINEATION OF SUCH UNDERGROUND FACILITIES, NOR THE EXISTENCE OF OTHER BURIED OBJECTS OR FACILITIES WHICH MAY BE ENCOUNTERED BUT WHICH ARE NOT SHOWN ON THE DRAWINGS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING THE EXISTING UTILITIES, WHETHER SHOWN OR NOT SHOWN ON THE DRAWINGS AND TO FIELD VERIFY THE EXACT LOCATION OF ALL EXISTING UTILITIES. THE CONTRACTOR SHALL EXPOSE ALL UNDERGROUND FACILITIES THAT ARE TO BE CONNECTED TO OR THAT ARE IN THE PATH OF THE PROPOSED IMPROVEMENTS FOR VERIFICATION OF LOCATION AND ELEVATION PRIOR TO THE COMMENCING OF CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONSTRUCTING THE WATER LINE AND APPURTENANCES PER THE IMPROVEMENT PLANS DESPITE THE PRESENCE OF BURIED OBJECTS OR FACILITIES WHICH WERE NOT EXPECTED TO BE ENCOUNTERED, AND THE CONTRACTOR SHALL NOT BE REIMBURSED FOR ANY EXPENSES Brought UF By SUCH BURIED OBJECTS OR UTILITIES. THE CONTRACTOR OR ANY SUBCONTRACTOR SHALL NOTIFY UNDERGROUND SERVICES ALERT (USA) AT (800) 227-2600 IN ACCORDANCE WITH THE SPECIFICATIONS PRIOR TO ALL EXCAVATION.

2) AMADOR WATER AGENCY (AGENCY) INSPECTOR AT (209) 223-3018. THE CONTRACTOR SHALL CONTACT THE AGENCY INSPECTOR 48 HOURS OR TWO (2) BUSINESS DAYS, WHICHEVER IS GREATER, PRIOR TO COMMENCEMENT OF THE PRE-CONSTRUCTION MEETING AND INITIAL WATER LINE CONSTRUCTION, AND TWENTY-FOUR HOURS PRIOR TO EACH DAY WORK ON WATER LINE INSTALLATION OCCURS.

3) ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE MOST CURRENT AMADOR WATER AGENCY STANDARDS AND “STANDARD SPECIFICATIONS OF THE STATE OF CALIFORNIA, DEPARTMENT OF TRANSPORTATION, 2010”, WHERE THERE IS ANY CONFLICT, AGENCY STANDARDS SHALL PREVAIL.

4) THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT EXISTING IMPROVEMENTS THAT ARE TO REMAIN IN PLACE, ALL IMPROVEMENTS DAMAGED BY THE CONTRACTOR’S OPERATIONS SHALL BE EXPEDITIOUSLY REPAIRED OR RECONSTRUCTED AT THE CONTRACTOR’S EXPENSE AND INSPECTED BY THE AGENCY OR CONTROLLING AGENCY, WITHOUT ADDITIONAL COMPENSATION.

5) ALL WASTEWATER MAINS SHALL BE TELEVISION INSPECTED (CCTV PROVIDED TO AWA), FLUSHED AND TESTED FOR DEFORMATION WITH AN APPROVED SEWER BALL AND PASS A LEAKAGE TEST IN CONFORMANCE WITH AWA STANDARD SPECIFICATIONS PRIOR TO ACCEPTANCE. ALL TESTING SHALL BE PERFORMED AFTER SUB-GRADE COMPACTION AND PRIOR TO PAVING.

6) ALL DRAINAGE PIPING SHALL HAVE 36” MINIMUM COVER EXCEPT WHERE SPECIFICALLY NOTED ON THE PROJECT PLANS. IF INVERT ELEVATION SHOWN ON PROFILE DRAWINGS RESULTS IN LESS THAN 30” OF COVER, THEN 30” OF COVER SHALL PREVAIL, EXCEPT FOR COLLECTION LINES.

7) PIPE BENDS AND TIE IN DETAILS INDICATED ON THE PLANS ARE APPROXIMATE HORIZONTAL ANGLES AND ARE INTENDED TO SHOW THE ESSENTIAL ELEMENTS OF THE CONNECTION. ACTUAL FIELD PIPING ANGLES MAY BE DIFFERENT, THE CONTRACTOR SHALL SUPPLY ALL LABOR, STANDARD OR FABRICATED FITTINGS, AND APPURTENANCES REQUIRED FOR THE BEND OR TIE-IN INSTALLATION, WITH NO ADDITIONAL REIMBURSEMENT. THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR ALL CUSTOM FABRICATED FITTINGS.

8) THE CONTRACTOR SHALL NOT EXCEED THE MANUFACTURERS RECOMMENDATION FOR LAYING PIPE ALONG HORIZONTAL CURVES. WHEN SLOPES ARE GREATER THAN 10% PIPE SHALL BE LAID UPHILL UNLESS OTHERWISE NOTED. CUT OFF WALLS SHALL BE INSTALLED EVERY 20’ FOR SLOPES BETWEEN 10% AND 20% AND EVERY 10’ FOR SLOPES GREATER THAN 20% UNLESS OTHERWISE NOTED.

9) THE CONTRACTOR SHALL PROVIDE THE LABOR AND MATERIALS REQUIRED FOR HYDROSTATIC TESTING. ALL TESTING SHALL BE OBSERVED AND ACCEPTED BY THE AGENCY. ACTUAL CONNECTIONS TO EXISTING AGENCY WASTEWATER LINES WILL NOT BE PERMITTED PRIOR TO THE COMPLETION OF TESTING OF NEW WASTEWATER MAINS. ALL EXISTING WASTEWATER VALVES SHALL BE OPERATED BY AGENCY PERSONNEL ONLY.

10) THE CONTRACTOR SHALL BE RESPONSIBLE FOR LAYOUT OF THE LINE AND GRADE OF ALL PIPING WITHIN THE PROJECT SITE.

11) THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING RECORD DRAWINGS FOR ALL WORK THROUGHOUT THE COURSE OF CONSTRUCTION, SUCH DRAWINGS SHALL RECORD THE LOCATION AND GRADE OF ALL UNDERGROUND IMPROVEMENTS CONSTRUCTED AND SHALL BE DELIVERED TO THE OWNER PRIOR TO, AND IN CONSIDERATION OF THE OWNER’S ACCEPTANCE OF WORK.

12) THE CONTRACTOR SHALL REMOVE AND PROPERLY DISPOSE OF ALL SURPLUS EXCAVATION MATERIAL AND DEBRIS PROMPTLY FROM THE SITE AND SHALL MAINTAIN THE SITE IN A NEAT AND ORDERLY CONDITION. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY FILL AND GRADING PERMITS.

13) THE CONTRACTOR SHALL ADJUST ALL GRADE RINGS AND VALVE BOXES TO FINISHED GRADE UNLESS OTHERWISE SHOWN ON DRAWINGS OR DIRECTED.

14) PIPE STATIONING IS BASED ON HORIZONTAL DISTANCE AND DOES NOT REPRESENT ACTUAL LENGTH OF PIPE.

15) CONTRACTOR SHALL AT ALL TIMES COMPLY WITH THE SAFETY RULES AND REGULATIONS ESTABLISHED BY CAL-OSHA AND OTHER AGENCIES HAVING JURISDICTION OVER THE WORK AND SHALL BE REQUIRED TO OBTAIN ALL PERMITS. CONTRACTOR SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT, INCLUDING THE SAFETY OF ALL PERSONS AND PROPERTY.

16) WASTEWATER SERVICE LINES SHALL BE MARKED WITH THE LETTER “S” STamped ON THE BACK OF THE SIDEWALK OR ON THE TOP OF CURB. THE UNDERGROUND CONTRACTOR SHALL PROVIDE SUFFICIENT RECORDS AND SHALL LEAVE ADEQUATE MARKS IN THE FIELD FOR THE CONCRETE CONTRACTOR TO ACCURATELY STAMP THE LETTER “S” FOR ALL WASTEWATER SERVICES.

17) ALL EXISTING IMPROVEMENTS, INCLUDING BUT NOT LIMITED TO LANDSCAPING, DRIVEWAYS, DRAINAGE DITCHES AND MONUMENTS, SHALL BE RESTORED TO THE CONDITION IN WHICH THEY WERE PRIOR TO CONSTRUCTION, OR BETTER.

18) A WRITTEN REQUEST TO REMOVE AND/OR TRIM ANY TREES SHALL BE SUBMITTED IN WRITING TO THE OWNER; NO REMOVAL AND/OR TRIMMING SHALL TAKE PLACE WITHOUT WRITTEN RESPONSE BY THE OWNER.

19) ALL DRAINAGE DITCHES SHALL BE GRADED TO DRAIN IN ORIGINAL DIRECTION AND PROTECTED FROM EROSION. DRIVEWAYS ARE TO BE REPLACED IN KIND.

20) THRUST BLOCKS SHALL BE INSTALLED PER SS014.

21) PLAN APPROVAL IS VALID FOR TWO YEARS FROM DATE OF AGENCY SIGNATURE OR CONDITIONAL WILL SERVE COMMITMENT, WHICHEREVER COMES FIRST.
NOTES:

1. THESE SYMBOLS SHALL BE USED ON ALL PLANS TO BE APPROVED BY THE A.W.A.

2. VALVE SIZE IS SAME AS LINE SIZE UNLESS OTHERWISE NOTED.
NOTES
UNLESS OTHERWISE NOTED:
1. ALL MATERIALS TO BE 2"Ø SCHEDULE 80 PVC. JOINTS SHALL BE SOLVENT WELDED. THREADED PVC PIPE IS NOT ALLOWED, MOLDED THREAD ADAPTERS SHALL BE USED WHERE NECESSARY.
2. VENT SHALL BE 4"Ø GALVANIZED SCHEDULE 40 PIPE, WRAPPED WITH 10 MIL. TAPE.
3. ALL SADDLES, BALL VALVES, VENTS, ETC. SHALL COMPLY WITH AWA STANDARD SPECIFICATIONS AND MATCH COMBINATION AIR & VACUUM RELEASE VALVE ("CAVRV") SIZE.
4. CAVRV MUST BE PLACED IN BOX SO THAT IT MAY BE REMOVED WITHOUT REMOVING THE BOX.
5. PLACE CAVRV AT BACK OF SIDEWALK OR OUTSIDE TRAVELED WAY OR AS DIRECTED BY AGENCY ENGINEER.
6. LOCATE CAVRV AT ALL INTERMEDIATE HIGH POINTS AND AS CALLED FOR ON THE PLANS.
7. ATTACH RISER TO POST TWO PLACES WITH ANVIL INT'L STRAP #262 OR EQUAL.
8. RODENT EXCLUSION MESH SHALL BE 19 GA. (MINIMUM), 3/4" OPENING (MAXIMUM), STEEL, GALVANIZED AFTER WELDING, OR STAINLESS STEEL WIRE SCREEN.

COMBINATION AIR & VACUUM RELEASE VALVE

DRAWN BY: BMC
SCALE: N.T.S.
DRAWING NO.: SS002
REV.: 8/19/15

AMADOR WATER AGENCY
NOTES:

1. WIRE TO BE CONTINUOUS BETWEEN VALVE BOXES. A CONTINUITY TEST SHALL BE PERFORMED BY CONTRACTOR PRIOR TO FINAL ACCEPTANCE BY AGENCY.

2. ALL FITTINGS TO BE WRAPPED W/ MINIMUM 6 MIL. POLYETHYLENE FILM.

PLAN VIEW

WIRE REQUIRED BETWEEN VALVES

SPLICE DETAIL

INSULATE SPLICE WITH SHRINK-PACK OR EQUAL.

G5 CONCRETE VALVE BOX WITH G5C CAST IRON LID, MARKED "SEWER"

CLASS B CEMENT CONCRETE 6" WIDE x 12" DEEP W/ 2-#4 REBAR

6" LOOP OF WIRE.

#10 A.W.G. COATED SOFT DRAWN COPPER WIRE TAPE WIRE TO PIPE EVERY 10' PER AWA STANDARDS.

8" PVC GATEWELL EXTENSION SINGLE CONTINUOUS LENGTH OF PIPE.

FACWELL TO EXTEND INTO VALVE BOX NOT LESS THAN 6" AND NO MORE THAN 10"

FORCE MAIN

NOTE: ALL BOXES SET OUTSIDE OF TRAVELED WAYS SHALL BE SET 3" HIGH W/CONCRETE COLLAR INSTALLED TO TOP OF BOX

PROFILE

VALVE INSTALLATION

VALVE AND LOCATING WIRE INSTALLATION

DRAWN BY: BMC SCALE: N.T.S. DRAWING NO.: SS003
APPROVED: JRG DATE: 10/26/06

AMADOR WATER AGENCY
ROAD SECTION SHALL CONFORM TO ROAD CONTROLLING ENTITY'S SPECIFICATIONS

SAW CUT EXISTING PAVEMENT

6" MIN.

INTERMEDIATE BACK FILL
95% COMPACTION

GREEN METALLIC LOCATOR TAPE

#10 A.W.G. SOLID COATED SOFT DRAWN COPPER WIRE PER AWA STANDARDS

PIPE BEDDING AND BACKFILL
90% COMPACTION, ASTM D-1557

8" MIN.

PIPE BEDDING: COMPLY WITH A.W.A. STANDARD SPECIFICATION 7.5

INTERMEDIATE BACK FILL: IMPORTED OR NATIVE MATERIAL WITH ALL ROCKS OVER 3" REMOVED AND FREE OF VEGETATIVE MATERIAL.

NOTES:
1. MINE TAILINGS ARE UN-ACCEPTABLE FOR ANY TRENCH BACKFILLING.
2. GREEN LOCATOR TAPE AT TOP OF SAND TO BE MARKED: "CAUTION – SEWER LINE BURIED BELOW".
3. LOCATING WIRE NOT REQUIRED ON PIPE SECTIONS LINEAR BETWEEN TWO MANHOLES

PIECE TRENCH BEDDING AND BACK FILL

DRAWN BY: BMC
SCALE: N.T.S.
DRAWING NO.: SS004
REV.: 12/11/09
APPROVED: JRG
DATE: 10/26/06

AMADOR WATER AGENCY
1. Except as noted herin, the precast units shall be manufactured and tested in accordance with ASTM C 478.

2. Riser sections shall be reinforced in accordance with ASTM 478 and shall have a minimum wall thickness of 5".

3. The 24" x 48" eccentric cones shall be reinforced. The wall thickness shall not less than 5".

4. Joints shall be tongue and groove and shall conform with ASTM C 478 section 14.

5. All joints shall be sealed with a preformed plastic or rubber ring to form a watertight seal.

6. If 30" diameter manhole frame and cover is required, it shall be installed where the reducer ring is shown in the section.

7. All reinforcement shall have a minimum of 2" of cover over the steel on the inside face.

8. The top opening of the manhole shall be placed directly over the outlet of the structure except as otherwise noted on plans.

9. Concrete base and stub walls shall be poured in one operation to a point 2" above the inlet and outlet pipes. All pipes shall be rigidly supported by temporary piers or other methods during the operation. Concrete shall set for 24 hours before placing precast units.

10. The interior and exterior of manhole grade rings, cones and rims shall be coated & sealed with thoroseal or equal. The interior of manholes with turbulent flows shall be coated and sealed with 100 mils of hydro-poxx 204 uhb or equal.

11. Covers for manholes located in easements, alleys, parkways and all other places except paved streets shall be provided with socket set screw locking devices. Drill and tap two holes to a depth of 1” at 90 to pick hole and install 3/8” recessed hex head. All threads shall be NC.

12. Manhole bedding shall be per AWA wastewater standards section 5.5.12.2.
1. EXCEPT AS NOTED HERELN OR ON THE PROJECT PLANS, MANHOLES SHALL CONFORM TO STANDARD DETAIL SEWER MANHOLE SS007.

2. MANHOLE BEDDING SHALL BE PER AWA WASTEWATER STANDARDS SECTION 5.5.12.2.
NOTES:

1. ALL PIPE FOR THE DROP INLET SHALL BE OF THE SAME SIZE, TYPE AND MATERIAL AS THE INLET PIPE.

2. PRECAST CONCRETE MANHOLES SHALL BE PLUGGED DURING FABRICATION AT REQUIRED LOCATIONS TO PROVIDE FOR SEWER PIPE INLETS AND OUTLETS.

3. WHEN THE PROJECT PLANS INDICATE TWO OR MORE DROP INLETS ARE REQUIRED IN A SINGLE MANHOLE, EACH DROP INLET SHALL BE CONSTRUCTED AS A SEPARATE DROP INLET.

4. DROP PIPE SHALL BE FLUSH WITH THE INSIDE OF THE MANHOLE BARREL.

5. PIPE STRAPS SHALL BE FASTENED TO THE WALL WITH 3" STAINLESS STEEL WEDGE ANCHOR BOLTS OR EPOXY ANCHORS. STRAPS SHALL BE MADE OF 2" MINIMUM WIDTH, 10 GAUGE, TYPE 304, STAINLESS STEEL. STRAPS SHALL BE SPACED EVERY 4' ON CENTER WITH A 3 STRAP MINIMUM.

6. MANHOLE BEDDING SHALL BE PER AWA WASTEWATER STANDARDS SECTION 5.5.12.2.
NOTES:

1. CONCRETE BASE AND STUB WALLS SHALL BE POURED IN ONE OPERATION.

2. CONCRETE FOR ALL PRECAST UNITS SHALL BE COMPACTLY VIBRATED IN THE FORMS. IT SHALL BE CURED ACCORDING TO APPROVED PRACTICE EITHER BY STEAM, SPRINKLING, MEMBRANE SOLUTION OR A COMBINATION OF THESE. IT SHALL DEVELOP 3500 PSI OR GREATER STRENGTH IN 28 DAYS.

3. THE DEPTH OF CHANNEL SHALL EQUAL THE PIPE DIAMETER FOR ALL SIZES OF PIPE. FOR SPECIAL CHANNELS IN TRAP OR GAUGING MANHOLES, SEE SPECIAL PLANS.

4. CEMENT MORTAR INSIDE JOINTS SHALL BE NEATLY STRUCK AND POINTED AND SHALL NOT EXCEED 3⁄4" IN THICKNESS.

5. STUB WALLS AND BASE SHALL CONFORM TO ASTM C 478 AND SHALL HAVE A MINIMUM OF 2 IN. COVER THE STEEL ON THE INSIDE FACE.

6. INVERT CHANNELS AND SHELF MAY BE POURED AT THE FACTORY OR IN THE FIELD AT THE OPTION OF THE CONTRACTOR.

7. BEDDING FOR PRECAST BASE SHALL BE EQUAL TO BEDDING FOR PIPE. USE 6 IN. MINIMUM CRUSHED ROCK UNDER BASE OVER UNDISTURBED NATIVE MATERIAL.

8. MANHOLE BEDDING SHALL BE PER AWA WASTEWATER STANDARDS SECTION 5.5.12.2.

MIN. DISTANCE BETWEEN HOLES APPROX. 3⁄8 OF SMALLEST PIPE O.D.

MAX. O.D. = 0.707 X M.H. I.D.

MANHOLE WALL

PRECAST REINFORCED CONCRETE MANHOLE BASE

DRAWN BY: BMC
SCALE: N.T.S.
DRAWING NO.: SS008
REV.: 12/11/09
APPROVED: JRG
DATE: 7/23/03
AMADOR WATER AGENCY
NOTES:

1. 6" WIDE BY 12" THICK STEEL REINFORCED CONCRETE COLLAR SHALL BE INSTALLED AROUND CLEANOUT BOX IN ALL AREAS.

2. CLEANOUTS SHALL BE SPACED EVERY 100' FROM THE INITIAL CLEANOUT AT THE BUILDING TO THE SERVICE CONNECTION.

3. PIPE MATERIAL SHALL BE SDR-35, SCH. 40 SOLVENT WELDED PVC OR ABS (3" MIN.)

4. CLEANOUTS REQUIRED FOLLOWING ALL BENDS 22 ½" OR GREATER.
NOTES:

1. FLUSHING INLETS SHALL BE PLACED ON SEWER MAINS AND FORCE MAINS EVERY 1,000', LOW POINTS, AT HORIZONTAL ANGLE POINTS OF 22' OR GREATER, AND AS REQUIRED.

2. FLUSHING INLET SHALL BE THE SAME MATERIAL AS MAIN.

3. CHRISTY B17X30 UTILITY BOX WITH STEEL CHECKER PLATE H/20 LOADING MARKED "SEWER", OR APPROVED EQUAL, FOR ALL TRAFFIC RATED AREAS.

4. FIRE HYDRANTS SHALL BE PROVIDED WITHIN 500' OF FLUSHING INLETS.
1. GREASE INTERCEPTOR REQUIRED FOR ALL COMMERCIAL KITCHEN OR FOOD PREPARATION FACILITIES.

2. BEDDING MATERIAL SHALL BE A MINIMUM OF 6" IN DEPTH OF EITHER 3/8" CRUSHED ROCK, OR CLEAN SAND.

3. INSTALL RISER WITH BUTYLE TAPE AND ORENCO TANK ADAPTER FRTA24 OR PRTA24, OR APPROVED EQUAL. ALL JOINTS MUST BE WATER TIGHT.

4. TANK MUST BE WATER TIGHT, MONOLITHICALLY CONSTRUCTED AND THERMOSEALED INSIDE AND OUT.

5. TRAFFIC LIDS AND RISERS REQUIRED FOR ALL TRAFFIC RATED AREAS.

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**NOTES:**

**GREASE INTERCEPTOR**

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AMADOR WATER AGENCY
NOTES:

1. OIL-SAND INTERCEPTOR REQUIRED FOR ALL COMMERCIAL CARWASHES, SERVICE STATIONS, REPAIR GARAGES OR ANY FACILITY WHICH MAY INTRODUCE OIL OR SAND INTO THE SEWER SYSTEM.

2. BEDDING MATERIAL SHALL BE A MINIMUM OF 6" IN DEPTH OF EITHER ¾" CRUSHED ROCK, OR CLEAN SAND.

3. INSTALL RISER WITH BUTYLE TAPE AND GRENCO TANK ADAPTER FRITA24 OR PTIA24, OR APPROVED EQUAL. ALL JOINTS MUST BE WATER TIGHT.

4. TANK MUST BE WATER TIGHT, MONOLITHICALLY CONSTRUCTED AND THOROSEALED INSIDE AND OUT.

5. TRAFFIC LIDS AND RISERS REQUIRED FOR ALL TRAFFIC RATED AREAS.

6. OIL ABSORBENT BAGS SHALL BE SPILTECH WPL10 6"X18"X21" POLYPROPYLENE BAGS OR APPROVED EQUAL AND SHALL BE EQUIPPED WITH RETAINING CORD, SECURED TO OR UNDER COVER FRAME, FOR HAND ACCESS BY OTHERS.
NOTES:

1. HAIR-FUR INTERCEPTOR REQUIRED FOR ALL PET FACILITIES, GROOMING STATIONS, PET STORES OR ANY FACILITY WHICH MAY INTRODUCE HAIR OR FUR INTO THE SEWER SYSTEM.

2. BEDDING MATERIAL SHALL BE A MINIMUM OF 6" IN DEPTH OF EITHER 3/8" CRUSHED ROCK, OR CLEAN SAND.

3. TRAFFIC LIDS AND RISERS REQUIRED FOR ALL TRAFFIC RATED AREAS.
NOTES:
1. THRUST BLOCK AREAS & VOLUMES GIVEN ARE FOR A TEST PRESSURE OF 150 psi AND A SOIL BEARING PRESSURE OF 2000 lb/sf. INSTALLATIONS USING HIGHER PRESSURES OR LOWER SOIL BEARING PRESSURES WILL REQUIRE ADJUSTMENT OF THRUST BLOCK SIZE; SUBJECT TO APPROVAL BY AGENCY ENGINEER. CONTRACTOR SHALL CONFIRM SOIL CONDITIONS.
2. THRUST BLOCKS TO BE CONSTRUCTED OF CLASS "B" CONCRETE & SHALL BE POURED AGAINST UNDISTURBED SOIL.
3. WRAP ALL FITTINGS, NUTS, & BOLTS WITH 6 MIL. POLYETHYLENE FILM.
4. JOINTS, FACE OF PLUGS AND NUTS & BOLTS TO BE KEPT CLEAR OF CONCRETE AND MUST BE ABLE TO OPERATE WITHOUT DISTURRING THRUST BLOCK.
5. VERTICAL BENDS SHALL USE RESTRAINED JOINTS AND A FULL LENGTH OF PIPE ON EACH SIDE OF FITTING.
6. #5 REBAR SHALL BE PLACED AS SHOWN, REBAR TO BE SHAPED WITH 90° BEND AT EACH END, AND COATED WITH TWO COATS OF CHRISTY’S HD50 OR APPROVED EQUAL, 18 MILS EACH COAT.

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<tr>
<th>NOMINAL PIPE DIA. (IN.)</th>
<th>HORIZONTAL THRUST BLOCK</th>
<th>VERTICAL THRUST BLOCK</th>
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<td>VOLUME OF CONCRETE (CU. YD.)</td>
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AMADOR WATER AGENCY
NOTES:
1. THRUST BLOCK AREAS & VOLUMES GIVEN ARE FOR A TEST PRESSURE OF 150 psi AND A SOIL BEARING PRESSURE OF 2000 lb/sf. INSTALLATIONS USING HIGHER PRESSURES OR LOWER SOIL BEARING PRESSURES WILL REQUIRE ADJUSTMENT OF THRUST BLOCK SIZE; SUBJECT TO APPROVAL BY AGENCY ENGINEER. CONTRACTOR SHALL CONFIRM SOIL CONDITIONS.
2. THRUST BLOCKS TO BE CONSTRUCTED OF CLASS "B" CONCRETE & SHALL BE POURED AGAINST UNDISTURBED SOIL.
3. WRAP ALL FITTINGS, NUTS, & BOLTS WITH 6 MIL. POLYETHYLENE FILM.
4. JOINTS, FACE OF PLUGS AND NUTS & BOLTS TO BE KEPT CLEAR OF CONCRETE AND MUST BE ABLE TO OPERATE WITHOUT DISTURBING THRUST BLOCK.
5. VERTICAL BENDS SHALL USE RESTRAINED JOINTS AND A FULL LENGTH OF PIPE ON EACH SIDE OF FITTING.
6. #5 REBAR SHALL BE PLACED AS SHOWN, REBAR TO BE SHAPED WITH 90° BEND AT EACH END, AND COATED WITH TWO COATS OF CHRISTY’S HD50 OR APPROVED EQUAL, 18 MILS EACH COAT.

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<th>TEE</th>
<th>TEE W/ BLD. FLG.</th>
<th>CROSS</th>
<th>DEAD END</th>
<th>IN LINE VALVE</th>
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EACH HORIZONTAL THRUST BLOCK BEARING AREA (SQ. FT.)

THrust BLOCK DETAILS - LARGE PIPE

DRAWN BY: BMC
SCALE: N.T.S.
DRAWING NO.: SS014A
APPROVED: JRG
DATE: 7/23/03
REV.: 12/11/09

AMADOR WATER AGENCY
1. LOCATION OF MARKER SHALL BE APPROVED BY AGENCY ENGINEER BEFORE PLACEMENT.

2. TARGET PLATE & POST SHALL CONFORM TO SECTION 82 OF CALIFORNIA STANDARD SPECIFICATIONS.

3. ALL NUMBERS AND LETTERS SHALL BE STENCILED IN WHITE.
NOTES:
1. SKIDS OF CARRIER PIPE SUPPORTS SHALL BE GREASED BEFORE INSTALLATION.
2. SPACING OF CARRIER PIPE SUPPORTS SHALL BE PER MANUFACTURES’ RECOMMENDATION OR 9’, WHICH EVER IS LESS.
3. CARRIER PIPE SHALL BE TESTED BEFORE SEALING ENDS.
4. BELLS OF CARRIER PIPE SHALL NOT REST ON CASING PIPE.
5. CASING LENGTH & THICKNESS SHALL CONFORM TO AGENCY STANDARDS OR ROADWAY CONTROLLING AGENCY’S SPECIFICATIONS WHICH EVER IS MORE STRINGENT.
6. CARRIER PIPE TO BE DUCTILE IRON PIPE WITH RESTRAINED JOINTS.
7. VALVES SHALL BE LOCATED ON EACH SIDE OF CASING.

ELEVATION

36” MIN.

CARRIER PIPE SUPPORT

PSI OR EQUAL NEOPRENE END SEAL

CARRIER SUPPORT & INSULATOR

PSI MODEL PE OR APPROVED EQUAL

STAINLESS STEEL BAND CLAMPS

CASING PER SPECIFICATIONS

END VIEW