

# **STANDARDS AND POLICIES MANUAL**

## **VOLUME II (WATER SYSTEMS)**

**Prepared By Land Development Engineering & Surveying Division  
Dean P. Larson, Manager/County Surveyor**

**For**

### **ENVIRONMENTAL MANAGEMENT/ GENERAL SERVICES AGENCY**

**Paul Yarborough/Director**

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February 17, 1981

Mr. Dean Larson  
Manager/County Surveyor  
County of Santa Clara  
70 West Hedding Street  
San Jose, California 95110

Dear Mr. Larson:

The accompanying manual entitled "Standards and Policies Manual, Volume II, Water Systems" is submitted in accordance with our agreement of December 29, 1979.

The primary purpose of the manual is to present for public use the County's Standards and Policies pertaining to the design of community water systems and their construction. Our work included recording written and unwritten agency and staff policies and coordination of the standards for uniformity between the various County offices and agencies that have an interest in community water systems. Material standards and specifications, installation specifications, check lists and standard details previously recommended by us in earlier studies for the County are included in this manual to aid the design and construction of new water systems.

We wish to acknowledge the assistance we received from Mr. Leonard A. Widen of your office, Mr. F. A. Hoffmier of the Fire Marshal's Office, and Mr. William Mapes of the Environmental Health Services Division. Their assistance in coordinating and simplifying County Standards and review procedures for water system approval was most beneficial.

It has been our pleasure to prepare this manual for you, and we look forward to serving your engineering needs again soon.

Respectfully submitted,

MARK THOMAS & CO. INC.

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## PREFACE

The Environmental Management/General Services Agency is an umbrella organization that includes, among others, the majority of the County departments and divisions that play a significant role in land development related activities. It is planned that all of their standards and policies pertaining to land development will be incorporated into this manual, initially consisting of two volumes. Also, some of the more frequently used development standards and policies of Environmental Health Services, the Transportation Agency, and the Santa Clara Valley Water District have been added, or a convenient reference provided. For more complete information, the user is referred to the separate publications of these other organizations.

## Distribution and Sale

This manual is intended for the use of the general public and the County Staff. Copies are available for sale in whole or in part at the Central Permit Office. Inquiries regarding price, availability and updated material, should be directed to that office at 70 West Hedding Street, San Jose, California, 95110.

## INTRODUCTION

All land development projects involve alterations to the land or existing improvements that are reflected on maps, plans, and specifications prepared by engineers, surveyors, and architects. Approval of these maps and plans involves several County departments and outside agencies. The coordination of these approvals and the final signing of the maps and improvement plans is the responsibility of the County Surveyor's Office which prepared this manual.

### Purpose and Scope

The manual is a compilation of the standards and policies of the Environmental Management/General Services Agency (EMA/GSA) that relate to land development activities within the unincorporated areas of the County. Its purpose is to provide a single ready reference document for the use of engineers, surveyors, architects and the general public, as well as the County staff. Some of the standards and policies were prepared specifically for the manual (largely from existing unpublished procedures and policies) and others are copies or extracts of reports and previously published standards. In situations where it is discovered that a policy or standard has changed from the wording used in the text, a footnote or other explanation is provided.

It is not expected that the general public will understand all the standards and policies, or that the manual will eliminate the need for professional help and advice. Developers and prospective applicants for a land use approval should retain the services of a professional in the early stages of planning a project.

### Other Affected Agencies

It is not practical to incorporate all of the standards and policies of organizations outside EMA/GSA (such as the Transportation Agency, Santa Clara Valley Water District, Environmental Health, and the Sanitation Districts) although they may be of equal importance to any given project. References to these other standards and policies will be found at various locations in the manual.

### How To Use The Manual

The manual consists of two volumes and several sections, each of which pertains to a particular type of work or major concern, such as water systems. To maximize the utility of the manual, the standards and policies regarding a particular subject may be located in more than one section. For example, information on fire hydrants, which is the responsibility of the County Fire Marshal (or fire districts), is located in both the road design and water systems since both types of facilities are affected.



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**SECTION I**

**POLICIES AND STANDARDS PERTAINING TO WATER SYSTEMS**

## Background

County regulations require that each new subdivision lot or single building site proposed for development be supplied with water for domestic and fire protection purposes. While individual wells are sometimes possible, water systems are preferred for reasons of better assurance of quality and quantity of water. In many cases they also are more economical when considering the requirements for fire protection.

During past years, various terms have been used to describe different types of installations, such as "common well" or "shared water system", without a clear understanding by the public as to what these terms mean or what standards or regulations apply. For simplicity, the generic term of "water system" as used in this manual (and County ordinances) means any type of common pipe system that serves two or more domiciles or business entitles. Many variations of design are possible, but all of them are subject to uniform minimum standards. A significant consideration in the adoption of standards is the fact that the majority of small water systems either are expanded to serve additional connections, taken over by a public utility or annexed by a City. To avoid future replacement of facilities at very high costs, it is important for the County to utilize uniform standards as a matter of general public interest.

All water systems in the unincorporated area are regulated either by the State Department of Health, the County, or the Public Utilities Commission (PUC). The County has jurisdiction over water systems with less than 200 connections, and both the County and the Public Utility Commission regulate those with 200 or more. Environmental Health Services enforces both State and County health and safety regulations pertaining to domestic water and issues permits for the most types and sizes of systems. Many other departments and agencies are involved, however, including the County Surveyor, Fire Marshal, Building Inspector, Planning Department, Central Permit Office, Transportation Agency, Santa Clara Valley Water District, the State Corporations Commission, and a City in some cases. Each agency has a special (generally nonduplicating) role in either the approval, design, permit or construction process and enforces certain policies and standards as described in the succeeding paragraphs. The table in the section of the Manual (Volume 11) entitled, "Submittal and Approval Procedure", shows the functions of various State and County offices pertaining to all sizes of water systems. In instances where there are inconsistencies in the standards of various agencies, the higher standards are required. For additional information, the reader is referred to the County ordinances and the following brochures published by the State Department of Health Services Sanitary Engineering Section, 2151 Berkeley Way, Berkeley, California, 94704:

- (1) California Waterworks Standards
- (2) California Safe Drinking Water Act
- (3) California Domestic Water Quality  
and Monitoring Regulations

CODE EXCERPT: LAND DEVELOPMENT

1.1 FROM DIVISION C12, CHAPTER I, ARTICAL 5, PART 6

Part 6. Domestic Water Systems

Sec. C12-195. General

Every lot in a subdivision shall be supplied with water for domestic purposes from a source and/or system which meets applicable state laws, the requirements of Chapter VI of Division B11, the requirements contained herein, and those of the adopted Environmental Management Agency Water Systems Manual and Standards. Drilling of any new well or exploratory hole, and abandonment of any old well shall be done under a permit issued by the Santa Clara Valley Water District in accordance with District Ordinance 75-6.

Sec. C12-196. Use of Existing Domestic Water System; Availability

When the water supply is to be from an existing approved domestic water system not under the ownership or control of the subdivider, the subdivider shall furnish evidence of agreements showing availability of acceptable public water systems to serve the subdivision as required in the adopted Environmental Management Agency Water Systems Manual and Standards. Extensions of approved water systems shall conform to the adopted Environmental Management Agency Water Systems Manual and Standards.

If the existing system does not meet County Standards the system shall be brought into compliance prior to approval. If the basic requirements for supply, storage, allowable pressures and water quality are met but additional work to bring the system into full compliance are not feasible, the County shall determine the extent to which the system shall be brought into compliance before the extension will be approved.

Sec. C12-197. Use of Individual Wells

When a subdivider proposes that each lot in the subdivision will be supplied water from its own well, each well shall be situated on and serve only that lot to which it is appurtenant and shall be developed by the subdivider according to the requirements of Chapter VI of Division B11 and the Santa Clara Valley Water District.

Sec. C12-198. Water System and Improvement Plan

Any water system serving a subdivision shall be

designed and constructed for both domestic water, in accordance with the requirements of Chapter VI of Division B11, and fire protection requirements in accordance with Division B7, and in accordance with the provisions of this Chapter.

If the water system for the subdivision is not an existing public domestic water system operating under a valid permit, the subdivider shall furnish a detailed report, prepared by a registered civil engineer which will confirm that the water system and fire protection facilities will comply with all the requirements of Chapter VI of Division B11, this Chapter, and the adopted Environmental Management Agency Water Systems Manual and Standards.

This report shall be prepared and approved prior to commencing any new water system improvements required by the advisory agency and prior to recording the final map or parcel map.

Any new water system which furnishes or supplies domestic water to two (2) through 199 service connections through an integrated pipe system where the water for two or more service connections is comingled at any point shall be defined as and shall be designed as a Domestic Water System. Any new Domestic Water System serving 5 or more lots or dwelling units shall be organized as a Mutual Water Company under the provisions of the General Corporations Law or the General Nonprofit Corporations Law, California State Code, or other form of water company or water district as approved by the County Surveyor and County Health Officer. Any new Domestic Water System serving two (2) through four (4) lots or dwelling units may be organized as a Shared Water System as defined in the adopted Environmental Management Agency Water Systems Manual and if not shall meet the requirements of a system serving 5 or more lots or dwelling units. County Surveyor or County Health Officer may require that any Domestic Water System meet all requirements for a system serving 5 or more lots or dwelling units and to integrate with and interconnect with any adjacent Domestic Water System.

A dwelling unit shall be defined as one or more habitable rooms which are occupied or which are intended to be or designed to be occupied by one family with facilities for living, sleeping, cooking and eating.

The water system and any fire protection facilities required by the advisory agency shall be shown on the street improvement plans or on separate plans.



The County Surveyor, the County Health Officer and the agency providing fire protection to the subdivision shall review the improvement plans and any report pertaining to water supply and fire protection facilities to determine if they conform to County Standards and the requirements of the advisory agencies.

The subdivider shall enter into an agreement with the Board of Supervisors requiring the work be completed prior to the occupancy of any homes to be constructed within the subdivision, but not more than one year after the filing of the final map or parcel map or such greater period of time as may be specified in the agreement. The agreement shall provide for inspection services. It may provide for the improvements to be installed in units, or for the extension of time under specified conditions. The agreement shall be secured by a good and sufficient improvement security. Construction inspection and plan check fees shall be as specified in this Chapter.

#### Sec. C12-199. Capacity of System - Design

All facilities of the water system shall be designed and constructed to withstand, with ample safety factors, the physical stresses to which they will be subjected and shall be free from structural or sanitary hazards. All equipment shall be of adequate size and capacity and be correlated with available supply from storage to meet the requirements of this section and the adopted Environmental Management Agency Water Systems Manual and Standards.

Whenever feasible, the individual water source units shall be of such capacity that an outage of any single unit during a period of peak demand will not result in reduction of supply in the distribution system below the requirements of this section.

The quantity of water delivered to the distribution system from all source facilities must be sufficient to supply adequately, dependably and safely the total water requirements of all consumers under maximum consumption.

The total capacity available from the source of supply and storage facilities at periods of maximum demand shall support a rate of flow to the distribution system for two (2) hours of not less than

$$Q = Ncf$$

where "Q" equals the rate of flow in gallons per minute delivered from all facilities to the distribution system:

N = the number of customers;

c = Gallons per minute (g.p.m.), a constant depending upon whether the area is to be served at flat or metered rates and depending upon other factors such as area, experience, community, standard of living, climate, class of consumer, quality and cost of water and sewer facilities and varies between 7 and 9 for flat rate service and 3 and 9 for metered service; and

f = A factor to reflect diversity which varies roughly as follows:

For 5 Customers or less	-----	2.06
For 10 Customers	-----	1.80
For 25 Customers	-----	1.33
For 50 Customers	-----	.97
For 100 Customers	-----	.70
For 200 Customers	-----	.50

A minor subdivision being supplied with water from a shared well through a Shared Water System may use f = 1.84 minimum.

The source of supply shall provide minimum of one third of the capacity required to be delivered to the distribution system.

Distribution storage shall be provided at the rate of five hundred (500) gallons per service connection.

Distribution piping shall be able to handle a flow during the peak hour equivalent to the rate of flow determined by the equation  $Q = Ncf$ , variables as defined above, for the number of customers served by the distribution piping. Restrictions on pipe sizes shall be as required in the adopted EMA Water Systems Manual and Standards.

The capacities set forth above shall be increased as necessary to provide the capability for fire protection and meeting adopted County Standards.

#### Sec. C12-200. Supply System

Definition: Supply system develops the supply source and delivers it to the distribution system at adequate pressures and capacities. Examples of supply system facilities include wells, storage tanks, piping between them, booster pumps and pressure tanks.

All supply facilities shall meet the requirements of this Chapter, Chapter VI of Division B11, and the adopted EMA Water Systems Manual and Standards.



Each pumping unit shall be driven by a separate power unit of adequate size. Construction shall be as to prevent sanitary hazard or structural defects whether the pumping unit is handling raw or treated water.

Minimum pipeline size for supply system shall be 2" except where wholly on well, storage or booster site and adequate data is provided to justify the reduced size.

All supply pipelines not conforming to distribution system standards shall be designed by a registered engineer.

All piping in the source facilities shall be of adequate size to carry the required quantities of water with reasonable velocities and head losses. No pipe conveying contaminated water prior to treatment shall be connected to pipe carrying potable water.

Wherever feasible the source water shall pass through a storage tank prior to delivery to the distribution system. Additional piping shall be provided to bypass source water directly to the distribution system during emergencies or for maintenance (if the source water is potable).

Water meter or other suitable measuring devices shall be provided to register accurately the quantity of water delivered to the distribution system. All service connections shall be metered to aid in the discovery of distribution leaks and leaks in household plumbing.

Housing for all facilities shall provide adequate ventilation and protection against unauthorized entry and vandalism.

Ample space for the performance of all operating, maintenance and repair functions shall be provided.

#### Sec. C12-201. Distribution System

Definition: The distribution system receives water from the supply system and delivers the water to the users.

The distribution system shall be of adequate size and so designed in conjunction with related facilities to maintain a minimum pressure of 40 pounds per square inch gage (psig) at every point in the system during periods of maximum domestic demand, a minimum 20 psig during periods of normal domestic demand plus fire flow, and a maximum of 100 psig during periods of no

demand. Additional restrictions and exceptions shall be as set forth in the adopted Environmental Management Agency Water Systems Manual and Standards.

The maximum length of run of each size of pipe shall in no case be greater than the following:

In unreinforced runs serving domestic water only (dead ends) none smaller than 2 inches in diameter; 2 inches -- 300 feet; 4 inches in diameter -- 1,300 feet; 6 inches in diameter -- 2,600 feet.

In reinforced runs (connections at both ends of runs) none smaller than 2 inches; 2 inches in diameter -- 500 feet.

Dead-end runs shall be provided with means of flushing to prevent deterioration of water quality. Completion of a grid system is required wherever feasible.

#### Sec. C12-202. Materials and Installation

All facilities shall use material and be designed, installed and tested in accordance with the latest American Water Works Association Standards as modified herein and in the adopted Environmental Management Agency Water Systems Manual and Standards.

Pipelines having a diameter of 12 inches or less shall meet the applicable standards shown in Table 1.

Table 1.

#### PIPE STANDARDS

	American Water Works Association (AWWA)	American Society for Testing Material (ASTM)	Federal Specs.
Asbestos-Cement	*C400-77, C402-75	C296-72T	SS-P-351b
Cast Iron	*C106-75		WW-P-421b
	*C108-75, C112-71		
Ductile Iron	*C151-76		
Steel	C200-75		SS-P-385a
Concrete	C300-74, C302-74		SS-P-381a
	C301-72, C303-70		
Polyvinyl Chloride (PVC)	*C900-75, C303-70	D2241-65	PS 22-70

#### SERVICE MATERIAL

Plastic-ABS		D2282-65	CS 270-65
Polyethylene	C901-78	D2239-65	CS 255-63
Polybutylene		D2662-75	
Copper	C800-66	B88-58	WW-T-799b

All piping shall be at least Class 150 AWWA designation where such a designation is used (denoted by an asterisk (\*) in the above table). Where no Class designation is used in the above table the pipe shall withstand at least the maximum anticipated system pressure, but in no case less than 100 psig, with a safety factor of 4.

Asbestos-Cement Pipe: Asbestos-cement pipe shall be selected in accordance with AWWA Standard C401-77 "Standard Practice for the Selection of Asbestos Cement Water Pipe", and shall be installed in accordance with AWWA Standard C603-65.

Cast Iron Pipe: Cast iron pipe shall be selected in accordance with AWWA Standard C101-67 "Computation of Strength and Thickness of Cast Iron Pipe," and shall be installed in accordance with AWWA Standard C600-77. Cast iron pipe shall be cement mortar lined.

Ductile Iron Pipe: Ductile iron pipe shall be selected in accordance with AWWA Standard C150-76 "American Standard for the Thickness Design of Ductile Iron Pipe", and shall be installed in accordance with AWWA Standard C600-77. Ductile iron pipe shall be cement mortar lined.

Plastic Pipe: Polyvinyl Chloride pipe shall be selected in accordance with AWWA Standard C900-75 "AWWA Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. Through 12 in., for Water". PVC pipe less than 4 in. shall have a wall thickness of dimension ratio DR 18 or less. Pipe shall be installed according to manufacturer's recommendation and care shall be observed not to damage pipe with backfill material.

Steel Pipe: Steel pipe shall be selected and installed in accordance with AWWA Manual M-11 (1964) "Steel Pipe Design and Installation". Design shall comply with Sections 6.1 and 6.2 of Manual M-11, except that minimum allowable steel thickness shall be 0.105 inches (12 gauge). The minimum design pressure shall be at least the maximum anticipated system pressure, but in no case shall be less than 160 psig.

All steel pipe shall be adequately protected from internal and external corrosion. Table 2 lists various protective coatings and linings. The selection of the appropriate coating or lining system shall be made by a properly qualified licensed engineer, or based on satisfactory experience with a particular coating in the same or similar environment as that being considered. Cathodic protection

installations shall be designed and installed under the direction of a property qualified and licensed engineer or similarly qualified individual.

Table 2.

STEEL PIPE COATINGS AND LININGS

Coatings	Specification
Cement-Mortar Coated	AWWA C205-71
Extruded Plastic Coating	Federal Spec.LC 00530
Linings	
Cement Mortar Lining	AWWA C205-71
Coal Tar Lining	AWWA C203-73

Service Connection: Service pipe and fittings shall be designed for cold water working pressure of not less than 150 psig. Copper tubing shall be commercial designation type K or L. Plastic tubing shall bear the approval and marking of the National Sanitation Foundation.

Valves: Gate valves shall conform to the American Standard Specification C504-71 for double disc type.

Butterfly valves shall meet or exceed the American Water Works Association Standard Specification C504-74 for rubber seated valves.

Check valves shall meet or exceed the AWWA Standard Specification C508-76 for swing check valves.

Backflow prevention devices shall conform to AWWA Standard Specification C506-69. Backflow prevention devices shall be fitted with a gate valve on either end and with test cocks as specified in AWWA C506-69.

Pits: Chambers or pits containing vacuum or air-relief valves shall be protected against flooding. Drains shall not be directly connected by pipe or other closed conduit to sewers or storm drains.

Joints: Pipe joints and appurtenances of all types shall safely withstand the same working pressure for which the pipe is designed. Where backup gaskets are required, rubber or asbestos shall be used.

Other Pipeline Materials: Other pipeline materials unless allowed herein or in the adopted EMA Water Systems Manual and Standards shall not be used except

when requested in writing and approved in writing by the County Surveyor. Approval will be based on a finding that the material is equivalent in integrity, service life and is interchangeable with allowed material and is readily available.

Pressure Tanks: Pressure tanks shall conform to American Society of Mechanical Engineers Boiler and Pressure Vessel Code. Vessel shall have a manhole for cleaning and no crevices which could collect debris. No more than one pressure tank per pressure system will be permitted without prior written approval of the County Surveyor.

Mains Installation: Water mains shall not have less than 30 inches of cover over the top of the pipe in public streets or alleys.

Water mains shall be laid at least 10 feet horizontally from and at a higher level than paralleling sanitary sewers unless otherwise approved by the County Health Officer and the County Surveyor.

All pipe or conduits, before being placed in service, shall be disinfected according to the AWWA Standard Specification C601-68 for disinfecting water mains. Water samples shall be collected from new or repaired pipe for bacteriological examination following disinfection.

All materials to be installed shall be new or approved by the subdivider's engineer as having a life expectancy substantially equal to new materials.

Lesser or higher requirements may be imposed by the County Surveyor and County Health Officer when the water system improvements are within an existing or proposed service area of a City or public utility that may incorporate the facilities into its water system at a future date. Such requirements shall be in accordance with the Standards of the City or utility.

#### Sec. C12-203. State Mandated Standards

Standards as set forth in Sections C12-195 through C12-202 shall not be altered such that said standards do not at least meet the standards of the State Health Department for Domestic Water Systems (199 service connections or less).

#### Sec. C12-315. Environmental Health Service

- a. Upon receipt of the application and site development plan, the County Health Officer shall review the site with respect to compliance with Chapter II Division B11 (Sewage Disposal) and the quantity,

quality and well construction standards for public water systems in Chapter IV Division B11 (water supply).

CODE EXCERPT: FIRE PROTECTION

1.2 FROM DIVISION C12, CHAPTER I, ARTICAL 5

Part 4. Fire Protection

Fire protection facilities and water supply for fire protection for a subdivision shall be provided in conformance with Division B-7 of the Santa Clara County Ordinance Code.

Division B-7 (Section 23.301 (c), Uniform Fire Code) defines an adequate water supply as being in compliance with the Insurance Services Office publication "Guide for Determination of Required Fire Flow". In addition, subdivision water supplies shall meet minimum requirements as established in the Insurance Services Office publication "Grading Schedule for Municipal Fire Protection". When an approved water supply system for fire protection is available or can be provided, the extension or installation of the system and any additions thereto which are necessary for the proposed development shall be provided. Where water supplies for fire protection are not available, or it is not practicable to provide a system, the following shall be provided:

- (a) A deferred improvement agreement for a future water system which would be equal to the requirements of the Insurance Services Office.
- (b) Interim water supplies for fire protection equal to 200 gallons per minute for twenty minutes for each dwelling unit.

A minimum acceptable water supply for rural residential development is an approved storage facility installed and maintained to provide the required fire flow.

When fire hydrants, gated connections and appurtenances are required and not shown on the improvement plans to be installed by the subdivider, fees sufficient to install and maintain such hydrants, gated connections and appurtenances shall be paid to the County, as determined by the local agency providing fire protection.

The advisory agency may require the owners of a subdivision to petition to have the subdivision annexed to a fire protection agency or district.

1.2 SUMMARY OF REFERENCED CODES

A. General

This portion summarizes the requirements of Division B7 of the Santa Clara County Ordinance Code and the requirements of other Codes and Standards as referenced in Division B7. A complete recital would be voluminous.

B. Codes

Applicable codes include Land Development Code Artical 5, Part 4; Section C12-315 (b); Uniform Fire Code Sections 13.301 and 13.302.

C. Water System

- 1) Must be of type as required by Insurance Services Offices in their publication "Grading Schedule for Municipal Fire Protection". Consult Fire Marshal's Office for detailed information. The following is a summary of requirements.
- 2) Minimum Acceptable Fire Flow: 250 GPM at 20 psi residual for a minimum of 2 hours. Higher flow rate requirements occur as construction, occupancy and building density varies from the minimum.
- 3) 6" minimum pipe diameter when main is looped or temporarily a dead end.
- 4) 8" minimum pipe diameter for permanent dead ends.
- 5) Acceptable materials for pipeline include Cast Iron, Asbestos Cement, PVC (see AWWA C900), lined and coated Steel.
- 6) Mains to be located in rights-of-way or easements only.
- 7) Hydrants shall be spaced at a maximum of 500' apart for rural residential, a maximum of 300' apart for urban residential.

D. Individual or Interim System

- 1) Acceptable only for one through four lots developed with individual water systems or organized as a Shared Water System.
- 2) Acceptable Storage Facilities are limited to tanks, ponds, built-in swimming pools, reservoirs and cisterns.



1.2.D

- 3) Minimum Storage is as follows:
  - 1 dwelling - 4,000 gallons + domestic
  - 2 dwellings - 6,000 gallons + domestic
  - 3 dwellings - 8,000 gallons + domestic
  - 4 dwellings -10,000 gallons + domestic
- 4) Acceptable material for piping include Cast Iron, Asbestos Cement, approved PVC, Steel. No PVC above ground.
- 5) Minimum pipe size is 4" unless pressure is sufficient to provide 200 gpm from the hydrant.
- 6) Connection directly to an above ground tank may be 2½" gate valve with hook-up adaptor.
- 7) Wharf-type hydrant to be single barrel, 2½"outlet.
- 8) Fire Hydrant with outlets matching fire department specifications are acceptable.
- 9) Pumper Outlet to be 4" or 4½" per fire department.
- 10) Wells to produce a minimum of 200 GPM for a minimum of 20 minutes, have automatic controls and be certified by a licensed well drilling contractor or registered civil engineer. Electrical supply for the pumps shall be seperate from that for all buildings.

## GENERAL POLICIES

### 1.3.1 GENERAL

- A. Water systems are preferred to individual wells, and large systems generally are preferred over small systems for reasons of better controls on quantity, quality and maintenance.
- B. PUC-regulated water systems are preferred to non-PUC systems because of their larger size, rate controls by PUC and other refinements.
- C. Water systems must be designed for both domestic and fire protection purposes unless specifically approved otherwise. The higher standards for either type of service with respect to volume and purity apply to the design of all domestic water systems (unless a separate interim type fire protection system is allowed meeting only the fire protection standards). All systems serving domestic water must comply with the standards for design and construction contained in the California Health and Safety Code and the California Administrative Code (Title 22) as well as the County Subdivision Ordinance.
- D. Service by a city water system is required whenever such service is feasible and available. (For more information, see the resolution of the Board of Supervisors on utilities and facilities at the end of this section).
- E. Connection to an existing available system and/or the extension of the lines of such a system may be required for County approval. If the system does not currently meet the State and County minimum standards, or would not after the additional service connections, an upgrading of the system must be completed, or assured, prior to final County approval of the subdivision or building site. When justified, the County may consider stage improvement in accordance with comprehensive engineered plans and an implementation schedule.
- F. In the event the service is to be provided from an existing non-PUC system, the owner of the system must demonstrate that the system, or any independent portion providing the extended service, meets minimum County standards.
- G. Water system reports to the County prepared by registered civil engineers are required for all non-PUC water systems, and extensions to existing systems. The purpose of the reports is to (1) provide an analysis of the proposed (or existing) system by competent persons, and (2) provide reasonable assurance that the system can be completed (or upgraded) in accordance with adopted County standards. Water system reports must accompany the plans in the checking and review process.

- 1.3.1 H. All new non-PUC water system installations, including the extension of existing pipes, must have County approved plans prepared by a registered civil engineer in accordance with State and County water system standards. The policies and procedures described in the section of the manual (Volume 1) entitled, "Improvement Plans, Grading Plans and Construction," are applicable to the plans for water systems.
- I. Public Utilities Commission-regulated water companies (only) are exempt from County plan review and bonding requirements if the plans reflect compliance with State and County standards.
- J. Within urban service areas, any higher standards of the affected city take precedence over County minimum standards. In situations where service is to be provided by a city-operated system, the County approvals for subdivisions or other types of development are handled in a manner similar to those for private water companies.
- K. Ex post facto water systems which are constructed (or proposed for construction) after County permits are issued for development on the basis of water service by individual wells on each lot (rather than a water system) are subject to the same plan preparation, review and inspection requirements as regular water system construction. These requirements must be met prior to County approval of the system and the issuance of permits to operate.
- L. In situations where reimbursement to a developer may be appropriate due to his installing or financing of a water main extension (or additional storage tank, etc.) which will serve future additional connections, it is his responsibility to make arrangements with the owners of the water system for such reimbursement.
- M. The County does not regulate or arbitrate water system connection fees or conditions of service. In the event of disagreement between the applicant and the company, he may appeal the County's conditions of approval requiring service by that company by following the standard appeal process. To avoid possible loss of appeal rights, the applicant should assure himself regarding the cost of service and other relevant facts before the County's appeal period lapses.
- N. The use of wood tanks is discouraged because leakage problems occur when portions of the tank become dry, and the wood provides a favorable environment for the growth of bacteria.

- 1.3.1 O. Fencing of tank sites typically is required for reasons of public health and safety. The standards for fencing are set forth elsewhere in the manual.
- P. Annexation to a fire protection district may be required. For processing policies see heading below, "Fire Marshal Functions and Policies."
- Q. Loop systems are required wherever feasible. Long dead-end pipes are discouraged.
- R. Elevated tanks providing adequate static head are preferred to mechanically pressurized systems. If adequate static head for the complete system is not feasible, a centrally operated pressure tank system (as opposed to individual pressure tanks) may be required.
- S. Water systems serving five or more lots or domiciles must be either mutual water companies or PUC-regulated. (Note: Currently the PUC does not regulate new water companies with less than 400 service connections.
- T. Shared (non-community) water system may be used when there are less than five lots or wells. Such systems must meet both domestic water and fire protection standards. An appropriate legal document must be submitted with the application for approval by Environmental Health Services and be fully executed prior to final approval of the plans.

### 1.3.2 COUNTY SURVEYOR FUNCTIONS AND POLICIES

#### A. Functions

The County Surveyor's functions with respect to water systems are to approve the engineered plans and report, and to coordinate their review with affected agencies, collect clearance letters, receive and enforce bonds, sign the plans and agreements and inspect the work during construction.

#### B. Policies

- 1) Water system plans are reviewed by the County surveyor for general compliance with the conditions of approval immediately after they are received from the engineer, then copies are distributed to Environmental Health Services and other agencies as appropriate in each case. After Environmental Health Services completes its plan check, it forwards its comments to the County Surveyor's Office, which in turn forwards them to the private engineer with the comments of all other affected agencies.

- 2) Water system improvements for a subdivision that come under the purview of the Uniform Building Code, such as storage tanks, must be shown on the water system plans and covered by performance bond and construction agreement. Permits for these items must be issued (or ready for issue, with all fees paid) before the subdivision map is recorded. Inspection fees for items covered by the building permit are deducted from the overall water system inspection fees collected by the County Surveyor.
- 3) If used materials are proposed to be installed in the water system, the permittee must provide evidence that they meet minimum State and County ordinance requirements and have a life expectancy substantially equal to new materials. Laboratory tests and/or private engineer's certification are required.
- 4) Adequate and appropriately located easements for water system pipes, tanks and necessary access roads must be provided. If the development is a subdivision, the easements must be shown on the map and dedicated in the owner's certificate. Under normal conditions, tank site easements (and other water system easements) are not deducted from the net lot area required by the zoning ordinance.
- 5) Water systems must be designed with adequate safety factors and be free from structural and sanitary hazards. If they are in flood hazard areas, they must be designed to prevent infiltration of flood water into the system. Pipe lines are not permitted in active slide areas. If they cross an active fault line, the pipe and fittings must be designed in a manner that will minimize the damages and repair costs due to movement of the fault. Storage tanks must be located away from fault lines and designed (per building code) for earthquake induced forces.
- 6) When the water system is within the urban service area of a city or the service area of a public utility that may incorporate the facilities into its own system, any higher standards of that agency shall apply.
- 7) Either the developer or the water company (not a mixture of both) may post the necessary bonds and sign the agreement. If the company posts the bond and signs the agreement, the water system plans must be separate from the developer's plans for the roads or other work. If the company employs a

registered civil engineer on a regular basis to to its water system design, this engineer may be authorized by the County Surveyor to perform the inspection work.

- 8) Polyvinyl chloride (PVC) pressure pipe sizes 4" through 12" may be used provided it is Class 150 pipe conforming to American Water Works Association specification C900-75.
- 9) Requests to construct a water system prior to final County approval of a subdivision are handled in the same manner as described in the section of this manual entitled, "Policies and Standards Pertaining to Improvement Plans, Grading Plans and Construction," under the sub-heading, "Bond Pre-emption Policy."
- 10) A clearance letter from the private water company to the County Surveyor is required in all cases (PUC and non-PUC systems) prior to final approval of the subdivision map, or issuance of building permits for single sites, stating that service will be provided and that the developer has made all necessary arrangements for the work--including financial. Clearance letters from Environmental Health Services and other affected agencies also are required.

### 1.3.3 ENVIRONMENTAL HEALTH SERVICES FUNCTIONS AND POLICIES

#### A. Functions

Environmental Health Services enforces State and County laws regulating the operation and maintenance of water systems. This includes field investigations, recommended conditions of approval for development, the checking of plans, the review of water system reports and legal documents such as mutual water company bylaws and articles of incorporation, the checking of quality and quantity of water and issuance of permits to operate.

#### B. Policies

- 1) Wells must be drilled, tested and certified prior to approval of a tentative subdivision map or single building site unless Environmental Health Services has sufficient information on the ground water in the area to justify waiver of this requirement. In all cases, the well drilling and supply requirements must be met prior to final approval of the subdivision map, or issuance of building permits. The well test results must meet the California Domestic Water Quality Monitoring and Regulation (Title 22) requirements.

- 2) When water supply is to be from an existing approved system not under the ownership or control of the developer, evidence of an agreement for service is required prior to tentative map approval.
- 3) Existing wells that are not approved for continued service must be sealed in accordance with well-sealing standards approved by Environmental Health Services and administered by the Santa Clara Valley Water District prior to the recording of subdivision maps or the issuance of building permits for single sites.
- 4) Legal documents must be approved prior to final approval of the subdivision map. These documents may include shared water system agreements, articles of incorporation, bylaws and permit to issue securities as a mutual water company. County concerns include such matters as service delivery, reasonable rates that include proper water system maintenance and replacement, voting rights, transferability of shares and ownership of water rights.
- 5) Anyone may apply for an inspection report. Environmental Health Services checks for contamination and integrity of the system and obvious water supply problems. An in-depth water system investigation and report by a registered civil engineer competent in the field of water system design may be required. An application (or status determination) for regulation by PUC also may be required.
- 6) A permit to operate must be issued before use of any water system. Permits for the selling of water are not issued to individuals. If pipelines or tanks are constructed without permits issued by the County Surveyor and/or the Building Inspector, no permit to operate will be issued until the plans and report have been processed in the standard manner assuring compliance with State and County standards and the ordinance requirements.
- 7) New systems serving five or more connections must be set up and operated as mutual water companies.
- 8) The use of springs is not allowed for new water systems, and strongly discouraged for individual services.
- 9) Environmental Health Services checks the health and safety features of the system after construction and tests samples of water from appropriate locations. This must be accomplished prior to final construction acceptance and release of the bond.



### 1.3.4 FIRE MARSHAL FUNCTIONS AND POLICIES

#### A. Functions

A Deputy Fire Marshal is part of the Central Permit Office staff. His primary function in land development is to enforce County ordinance and standards pertaining to fire protection. This includes preparing recommended conditions of approval for tentative maps and reviewing improvement plans with respect to fire protection facilities. He also functions as a link with the fire protection districts and city fire departments.

#### B. Policies

- 1) The County enforces the Uniform Fire Code as compiled and published by the International Conference of Building Officials of the Western Fire Chiefs Association. Adequate water supply is defined as being in compliance with the Insurance Services Office publication, "Guide for Determining Required Fire Flow".
- 2) Water supply from an existing approved water system meeting fire protection standards and capable of serving additional connections is preferred to single lot or small marginal systems. A connection to an existing adequate and available water system may be required.
- 3) Fire hydrants, storage tanks and appurtenances meeting adopted minimum fire protection standards must be shown on the engineered water system plans. The Deputy Fire Marshal in the Central Permit Office reviews the plans with respect to these items and furnishes a clearance letter to the County Surveyor when the plans are satisfactory and other fire protection requirements are met.
- 4) Water systems must have sufficient storage to provide fire flows of not less than 250 gallons per minute for two hours at 20 psi residual pressure. Booster pumps in the systems are required if they are needed to meet this minimum standard. Minimum pipe diameters are 6" in a closed loop and 8" in a dead-end main.
- 5) Fire hydrant design must equal or exceed the specifications for Rich Valve #950. Spacing maximums are 500' in rural areas and 300' in urban areas. Fire hydrants at street intersections generally are required.
- 6) If a fire protection district requests that property be annexed to the district in connection with a land development project, the Fire Marshal includes this request as a recommendation to the advisory agency as a condition of approval of the tentative



map. Prior to final approval of the subdivision map or issuance of a building permit for a single site, the applicant must apply to LAFCO for annexation to the fire district and furnish evidence to the Fire Marshal that the annexation either has taken place or that all arrangements have been made with the district for the annexation to proceed.

- 7) LAFCO has a policy that requires land to be annexed to a special district to also be annexed to a city if it is reasonably feasible (generally land within the urban service areas). If this policy is applied by LAFCO, it is the Fire Marshal's policy to require that prior to final subdivision or site approval, the developer must obtain a clearance letter from the city stating all its requirements have been met to conclude the annexation. In the absence of such a clearance letter, the developer must request a waiver of the LAFCO requirement from the County advisory agency or the Board of Supervisors if he proposes to continue with the project
- 8) If service from a regular water system approved for fire protection is not available and not feasible to construct, an interim system for fire protection only will be considered provided it conforms to the following fire protection requirements:

Storage

1 dwelling	4,000 gallons
2 dwellings	6,000 gallons
3 dwellings	8,000 gallons
4 dwellings	10,000 gallons

C. Pipe Requirements

Minimum pipe diameter is 4" provided, however, 3" pipe may be used if the pressure is sufficient to provide 200 gpm. Any above ground pipe must be steel.

D. Fire Hydrants

Fire hydrants may be either wharf type, single barrel, with 2-1/2" gate valve and adaptor or a municipal type hydrant with 4" or 4-1/2" outlet (as specified).

E. Wells and Pumps

Wells and pumps must be capable of delivering 200 gpm for twenty minutes and provided with automatic controls. The electrical supply to the pump must be separate from all buildings.

F. Materials

If the system is to be upgraded in the future, or connected

to another regular water system that provides both domestic water and fire protection, the ordinance requirements for the materials to be used in regular water systems are required. If the system is strictly temporary, the materials must be adequate for the pressures and have a life expectancy consistent with the County approval.

#### G. Deferred Improvement Agreements

The Fire Marshal implements a deferred improvement agreement policy similar to the one for roads when a regular water system is not feasible and development is allowed to proceed on the basis of an interim fire protection system. These agreements are recorded, and they set forth County requirements with respect to utilization of a future adequate water system.

### 1.3.5 BUILDING INSPECTION FUNCTIONS AND POLICIES

#### A. Functions

Permits are required for electrical facilities and for the construction of water storage tanks that are 5,000 gallons or larger in size. The Building Inspector's functions with respect to water systems are to issue the necessary permits and inspect the work during construction. (Note: Any exemption from the Building Code does not exempt the tanks from regulation under other applicable County ordinances).

#### B. Policies

- 1) Building permits are required for water tanks (above ground or below) that are 5,000 gallons or larger in size (Building Code requirements). The structures supporting elevated tank of any size may need a building permit.
- 2) Applications for building and electrical permits must be signed off by affected County departments prior to issuance of the permit. These offices check to see that the ordinance requirements have been met pertaining to use permit, approved water system plans, etc.
- 3) After completion of construction of water tanks, the Building Inspector notifies Environmental Health Services and/or the County Surveyor. The total system then is checked for compliance with health, fire protection and other project or ordinance requirements.

### 1.3.6 PLANNING DEPARTMENT FUNCTIONS AND POLICIES

#### A. Functions

The Planning Department functions as an arm of the Planning Commission with respect to water systems. It presents applications for use permits to the Commission and performs the principal staff work for the Architectural and Site

Committee.

B. Policies

- 1) Use permits in all zoning districts are required for all water systems (PUC regulated or not) except those that (1) are developed and approved with a new subdivision and (2) the plans have been signed by the County
- 2) Architectural and site approval typically is a requirement for water tank use permits. The conditions of approval embrace the spectrum of regulations and policies administered by the various County departments and agencies.
- 3) Aesthetic improvement measures related to underground wiring, landscaping, screening and painting of water tanks are typical requirements. These items are field checked prior to final construction approval and release of the bond by the County Surveyor.

1.3.7 TRANSPORTATION AGENCY FUNCTIONS AND POLICIES

A. Functions

Any portion of a water system within a County maintained road right of way must have an encroachment permit issued by the Transportation Agency.

B. Policies

- 1) A representative of the Transportation Agency is stationed at the Central Permit Office. Water system plans that show work in a County road are reviewed and encroachment permits are issued when they are satisfactory.
- 2) Plans are reviewed for conformance with the published standards of the Agency pertaining to pipe location, trenching, backfill and surface restoration. The permit specifies the general requirements relating to traffic, hours of work, etc. A bond may or may not be required depending upon the circumstances in each case.
- 3) Boring and jacking of pipes across the traffic lanes of major roads generally is required.

1.3.8 SANTA CLARA VALLEY WATER DISTRICT FUNCTIONS AND POLICIES

A. Functions

The District regulates the construction and abandonment of wells throughout the County under District Ordinance 75-6 and a parallel set of adopted standards. A District employee is stationed at the Central Permit Office and a part of his duties is to issue well permits.

B. Policies

- 1) The District administers only well standards that have been approved by Environmental Health Services. The purpose of these standards is to protect the underground aquifers as well as the water entering the distribution system.
- 2) The District does not require the number of wells or the location of wells other than enforcing the minimum distance separation of the well from sources of potential pollution set forth in the District standards.
- 3) The District does not regulate the use of water from wells nor does it duplicate any of the functions of the Environmental Health Services with respect to enforcement of operational health and safety standards.
- 4) If the property to be developed has an existing well, it must be either improved to District standards for operational wells or abandoned and sealed in accordance with adopted standards.

C. Well Standards

See attachments pertaining to the construction and sealing of wells.

## DESIGN POLICIES

### 1.4.1 GENERAL

The following design policies have been established to coordinate minimum design standards of the State Department of Health, State Department of Corporations, State Public Utilities Commission, County Environmental Health Services Division, County Land Development Engineering and Surveying Division and the County Fire Marshal's Office to provide for an orderly development of water systems within the County. Variance from these policies, if within County authority to grant a variance, must be requested in writing and approved in writing from the County Surveyor in coordination with County Health Officer and Fire Marshal.

Changes may be made in these policies from time to time. It shall be the responsibility of everyone engaged in work in the County to keep himself informed of any changes made. Additional requirements as set forth in the Codes excerpted in Sections 1.1, 1.2 and 1.3 are not repeated in this section. Refer directly to the codes for additional requirements.

### 1.4.2 CAL-OSHA COMPLIANCE

If the water company as an employer will have any full time or part time employees as defined by Cal-OSHA, the facilities designed shall be in compliance with Cal-OSHA as required by state law. Cal-OSHA will review the plans and assist in meeting their requirements. Santa Clara County does not review for compliance with Cal-OSHA. The County may require proof of compliance or proof that Cal-OSHA will not have jurisdiction.

### 1.4.3 SUPPLY SYSTEM

#### A. Storage Reservoirs

- 1) Basic Design of Storage Reservoirs.
  - a) Storage reservoirs shall be covered and watertight except for necessary openings.
  - b) Vents, overflows, drain outlets and other openings to the atmosphere shall be terminated at least two feet above grade, or at least 30 feet below the bottom of the reservoir and above the maximum flood level. Vents and overflows shall be screened. Vents shall not open upward. Overflows shall be large enough to dispose of reservoir overflow rates equal to the maximum reservoir filling rate.

1.4.3.A.1)

- c) Provision shall be made for removal of floating material from the water surface.
  - d) Outlets shall be designed and constructed to minimize movement of sediment from the reservoir floor to the distribution system water mains.
  - e) Provisions shall be made for isolating reservoirs and appurtenant facilities from the distribution system.
  - f) Unless the Health Department's approval is obtained, reservoir sites shall not be used for nonwaterworks purposes that would:
    - (1) Result in unrestricted public access, or
    - (2) Create a contamination hazard.
  - g) Reservoirs shall be disinfected in accordance with AWWA Standard D102-78. At least two water samples collected from the reservoir shall indicate that the water is free of coliform organisms before the reservoir is placed into operation.
  - h) Nonpressurized steel reservoirs shall comply with AWWA Standard D100-73.
- 2) Subsurface Storage Reservoirs.
- a) Subsurface reservoirs shall be located:
    - i) Above maximum anticipated ground water level.
    - ii) At least 100 feet from the nearest sewer and at least 150 feet from all other sewage handling facilities.
  - b) The land adjacent to a subsurface reservoir shall be graded to route surface water away from the reservoir.

3) Corrosion Protection.

Major metal surfaces of reservoirs shall be protected against corrosion. Paints or other protective coatings shall comply with AWWA Standard D102-78.

B. Pumping Facilities

1) Basic Design of Booster Pumping Plants.

- a) Pumping facilities shall be designed to protect the quality of the water.

1.4.3.B.1)

- b) Pumping stations shall be located and/or constructed so as not to be subject to damage by flooding.

2) Water Sealed Pumps.

Seal water for water sealed pumps shall conform with Domestic Water quality and Monitoring Regulations.

Adequate drainage shall be provided for disposal of used seal water.

- 3) All booster pumps shall be enclosed and properly ventilated.

C. Wells

- 1) All wells shall be fitted with a permanent sample tap with non threaded fittings.
- 2) All gravel packed wells shall be fitted with a permanent gravel fill pipe and be capped.
- 3) All wells shall be fitted with a capped sounding tube.
- 4) Wells shall be fitted with a blowoff with capacity equal to that of well and provision provided for disposal of blowoff water.
- 5) Well pump test shall be made during a period of the year such that the test will be representative of the conditions to be expected during the dry portion of a normal year. If this is not feasible a statement setting forth expected water levels and supply available during the dry portion of the year may be required and shall be over the signature of a licensed well drilling contractor, registered geologist or registered civil engineer.
- 6) Vertical Turbine Pumps shall be housed in a vandal resistant enclosure with adequate ventilation.

D. Supply Piping

1) Definitions:

- a) Supply Piping is restricted to that which connects supply system facilities only, and from which there are no service connections.
- b) On-Site Supply Piping is that which is on the piece of property on which the well, storage tank, booster, pressure tank or any other supply facility is located. Pipeline easements which at no point cross a right of way are included.

- 1.4.3.D.1) c) Off-Site Supply Piping is that which will be in a pipeline easement, right-of-way or other location not covered in b, above.

2) Sizing:

- a) Off-Site Supply Piping shall meet the sizing requirements for distribution mains except that the requirements for reinforced and unreinforced mains shall not apply.
- b) On-Site Supply Piping shall be sized such that velocities and pressure losses are within normal limits. 1½ inside diameter shall be the absolute minimum.
- c) All supply piping shall operate at reasonable velocities and pressure losses.
- d) Any supply pipeline less than that which would be required if the line were in the distribution system shall be sized by a registered engineer and calculations setting forth the total flow, total head loss, capital expense and estimated annual pumping costs shall be submitted with the design.

1.4.4 DISTRIBUTION SYSTEM

A. Sizing

- 1) No water main installed within 35 feet of the centerline of an existing County road shall be smaller than six (6) inches in diameter except in cul-de-sacs of lengths not exceeding 300 feet.
- 2) A main extension shall be the size of the existing main to be extended or a minimum of six (6) inches inside diameter whichever is greater.
- 3) No water main which is unreinforced shall extend more than 300 feet if it is less than four (4) inches inside diameter, more than 1,300 feet if it is four (4) inches inside diameter, or more than 2,600 feet if it is six (6) inches inside diameter.
- 4) No fire hydrant shall be installed off of a temporary dead end main less than six (6) inches inside diameter. No fire hydrant shall be installed off of a permanent dead end main less than eight (8) inches inside diameter.
- 5) Easements shall be provided to cross-tie water mains in cul-de-sacs that are 500 feet or longer in length, and as may be required by County.



1.4.4.A

- 6) Water mains serving industrial, commercial, multiple residential or school development will be sized by Developer's Engineer and approved by County Surveyor.
- 7) All distribution piping shall be looped when feasible.
- 8) Only mains of 2", 4", 6", 8" or 10" nominal inside diameter may be installed if the main is to be less than 12" inside diameter. Main sizes 12" and above shall be approved by County Surveyor.
- 9) If a new main is outside of any street right-of-way or the street is a cul-de-sac with no possibility of extension, has no fire protection facilities appurtenant to it, and a larger main is not required for any other reason, the following exceptions may be granted:
  - a) A Domestic Water System may install a minimum size of two (2) inches inside diameter pipeline to serve two (2) or less services;
  - b) A Domestic Water System may install a minimum size of four (4) inches inside diameter pipeline to serve 10 or less services;
  - c) A Shared Water System may install a minimum size of 2 inches inside diameter main.

B. Allowable Pressures

- 1) Codes require a minimum of 40 psig at every point in the distribution system during periods of maximum domestic demand, a minimum of 20 psig during periods of normal domestic demand plus fire flow, and a maximum of 100 psig during periods of no demand. Additional restrictions and exceptions are as follows:
  - a) All exceptions must be approved by County Surveyor in coordination with Health Division and Fire Marshal.
  - b) "Hillside Subdivisions", the minimum pressure may not be less than 20 psig at any point during maximum domestic demand or under fire flow conditions with normal domestic demand, nor exceed 100 psig at any service connection.
  - c) Any Domestic Water System may supply a maximum of four dwelling units served at pressures less than 40 psig but more than 20 psig at the service connection or over 100 psig if each dwelling unit is fitted with an individual system which adjusts the pressure at the dwelling unit to

1.4.4.B.1)C

between 40 psig and 80 psig.

1.4.5 MATERIALS AND INSTALLATION

A. Location and Alignment

- 1) Generally, water mains should be located five (5) feet off the face of curb on the north and east side of streets.
- 2) At least five (5) foot horizontal clear distance between horizontal projections of water facilities and other facilities, except sanitary sewers which shall be located as noted below, and not less than twelve (12) inches vertical clearance shall be provided.
- 3) Water mains shall be installed at least:
  - a) Ten feet horizontally from and one foot higher than sanitary sewers located parallel to the main, and
  - b) One foot higher than sanitary sewers crossing the main, and
  - c) Ten feet, and preferably 25 feet horizontally from sewage leach fields, cesspools, seepage pits, septic tanks, and sewer manholes.

B. Minimum Cover

The minimum depth of cover listed below shall be provided between the top of the water main and the undisturbed subgrade or finished grade whichever provides the greater cover.

	Undisturbed Subgrade	Finished Grade
2", 4", 6" and 8" Diameter	2'0"	3'0"
10" and 12" Diameter	2'6"	3'6"
14" and larger	3'0"	4'0"

Developer's Engineer shall indicate on the plans the distance from finished pavement or road surface grade to the bottom of the undisturbed subgrade.

C. Appurtenances

1) Valves:

- a) All line valves smaller than twelve (12) inches shall be gate valves; all line valves larger than twelve (12) inches diameter may be either gate valves or butterfly valves.

1.4.5.C.1)

- b) Sufficient valves are to be arranged so as to provide minimum disruption of service in case of a water main break.
- c) At least three (3) valves are to be installed at each cross.
- d) At least two (2) valves are to be installed at each tee.
- e) Generally, the distance between line valves shall be not more than 800 feet on six (6) inch and eight (8) inch mains and 1,000 feet on twelve (12) inch and larger water mains.
- f) All underground valves shall have a valve box per standard details.
- g) Swing Check Valves shall conform to AWWA C508-76.
- h) Ball Valves shall conform to AWWA C507-73.

2) Blowoffs:

- a) Permanent blowoffs are to be provided at all deadends and at all low points as determined by the Engineer. Blowoffs shall be as shown in the Standard Details.
- b) Temporary blowoffs shall be provided as necessary to pressure test and chlorinate the water mains.
- c) Fire Hydrants with a minimum outlet size of 4" are generally acceptable in place of permanent blowoffs.

3) Air or Vacuum and Air Release Valves:

- a) Air or vacuum and air release valves are to be installed at all summits in the water mains and the downhill side of all line valves. Automatic valves are to be placed only where a break in the line or loss of pressure would collapse the pipe or a regular build-up of air is indicated.
- b) Vent openings for air and vacuum relief valves shall be:
  - i) Extended at least one foot (0.3) meters) above grade and above maximum recorded high water, and
  - ii) Provided with a screened, downward facing vent opening.

1.4.5.C.3)

c) Where the requirements of (b) (1) cannot be practically met, vent openings may be located in a sub-surface chamber or pit provided:

i) Adequate pit drainage is provided; and

ii) Pit drains are not connected by pipe or other closed conduit to sewers or storm drains without an air gap separation.

4) Pressure Reducing Valves:

Where pressure reducing valves are 6" or larger and are sized as such mainly for fire flow considerations a parallel low flow pressure reducing valve shall be installed and sized for normal or low domestic flows. Where pressure reducing valves are 6" or larger and a low flow pressure reducing valve is not installed sufficient data supporting that conclusion shall be presented in the Engineer's Report.

5) Service Connections:

The minimum size service connection shall be one (1) inch in diameter.

Service connections greater than one (1) inch diameter shall be provided where necessary to satisfy the flow requirements of the customer. Consultation with County is recommended for proper sizing of service connections.

6) Miscellaneous Appurtenances:

Miscellaneous appurtenances such as approved cross-connection control devices, pressure regulators, detector checks, etc. will be required as dictated by specific needs. These appurtenances shall be noted on the plans as directed by the County.

## HEALTH AND SANITATION POLICIES

### 1.5.0 GENERAL

These policies cover Environmental Health Services Division (EHS) policies for Domestic Water Systems which are not covered in other sections.

Many of the requirements of EHS have been used to set minimum standards in other sections due to EHS requirements being more strict. Therefore any lessening of requirements in other sections must be coordinated with EHS.

Environmental Health Services has been mandated by the State Health Department to enforce State Health Department requirements for Domestic Water Systems. It is therefore possible that a lessening of County requirements could result in being in violation of State codes.

### 1.5.1 MISCELLANEOUS POLICIES

#### A. Wheel Operated Valves

All wheel operated valves shall either have removable wheels or be locked such that they may not be operated by other than authorized individuals. Removable wheels shall be stored in a secure place to assure that they may not be operated by other than authorized individuals.

#### B. Anti-Climb Protections

All outside ladders on tanks, etc., shall be provided with sufficient means of prohibiting unauthorized climbing of the structure.

#### C. Safety-Climb Precautions

All ladders over 20' tall shall be provided with approved safety climb apparatus.

#### D. Chlorinator Tap

Wells and Tanks must occasionally be fitted with a non-threaded chlorinator tap. EHS will indicate the need for them. Installation without EHS requiring them is discouraged for sanitation reasons.

## FIRE PROTECTION POLICIES

### 1.6.1 PRELIMINARY MAP

- A. Shall show proposed method of supplying water for fire protection.
- B. If on or near an approved water system the system shall be extended.

#### C. Two Through Four Parcels

If not on or near an approved system an Interim System as a minimum shall be installed. If domestic water will also be taken from system the system is a Domestic Water System and shall be designed to include those standards.

#### D. Five or More Parcels

A water system shall be developed to Insurance Services Office and Uniform Fire Code standards. If domestic water will also be taken from the system the system is a Domestic Water System and shall be designed to meet those standards.

### 1.6.2 TENTATIVE MAP

- A. Shall show detailed method of supplying water for fire protection. Sufficient detail shall be provided such that major changes in scope or design are not needed in order to comply with standards for approval and such that it is apparent to reviewing agency.

### 1.6.3 IMPROVEMENT PLANS

- A. Complete detailed plans for construction and review.

### 1.6.4 RECORDING

- A. A bond covering complete installation cost or the system shall be installed and approved prior to recording.

### 1.6.5 DESIGN CRITERIA

#### A. Tank Capacity

- 1) Governed by Insurance Services Office (ISO) "Guide for Determination of Required Fire Flow".

a) Separation of dwellings over 100' : 500 GPM

b) Separation of dwellings 31'-100' : 750-1000

- 1.6.5.A.1)
- c) Separation of dwellings 11-31' :1000-1500
  - d) Separation of dwellings less than 10' :1500-2000
  - e) Required flow for two (2) hours minimum.
- 2) Minimum water supply : 250 GPM for 2 hours or 500 GPM for 1 hour.
- 3) The maximum daily consumption rate shall be added to the above capacity if the supply is also used for potable water.

#### 1.6.6 REFERENCED STANDARDS

##### A. Tanks

- 1) Per National Fire Protection Association Standards #22 (NFPA)
- a) Steel: Chapter 2
  - b) Wood: Chapter 4
  - c) Foundations: Chapter 6
  - d) Pipe Connections and Fittings: Chapter 8

##### B. Pumps

Shall be installed, tested and maintained in conformance with NFPA Standard #20.

##### C. Pipes and Valves

Shall be installed, tested and maintained in conformance with NFPA Standard #24.

##### D. Hydrant

Shall be installed, tested and maintained in conformance with NFPA Standard #24, Chapter #4.

- E. Water Systems designed in conformance with the codes excerpted in this section of the Manual and the Design Policy for Domestic Water Systems will comply substantially with the requirements of these references standards.

#### 1.6.7 INSPECTION AND TESTING

- A. System shall be inspected during construction by Fire Marshal's Office. Contact them a minimum of 24 hours

1.6.7.A

prior to beginning construction. No system will be approved without proper inspection.

- B. Upon completion of the system and prior to Fire Marshall's approval the system shall be tested for leakage, pressure and for available flow at the fire hydrants with 20 psi in the main.

1.6.8 APPROVAL

When the Fire Marshal is satisfied that the Fire Protection facilities conform to the Codes and policy, the Fire Marshal will approve the system and recommend bond reduction to the County Surveyor.

1.6.9 FIRE PROTECTION ONLY WATER SYSTEMS

A. General

Fire Protection Only Water Systems (F.P.W.S.) must meet the requirements of the Fire Marshal's Office. Approval of the FPWS shall be coordinated through the Fire Marshal's Office (FMO). No review by Land Development Engineering and Surveying Division is necessary if approved by FMO.

B. Review by Environmental Health Services (EHS)

The FPWS is reviewed and approved by EHS for Health and Safety requirements. Of particular importance are safeguards taken to prevent human consumption or comingling the FPWS water with domestic water (Cross-Connections).



## SUBMITTAL AND APPROVAL PROCEDURE

### 1.7.0 GENERAL

Table 1.8.1 shows the types of legal organization for water systems of increasing size, the government agencies which review the systems for compliance with their standards and agencies which grant operating permits for the systems.

Domestic Water Systems as defined in Section 1.9 are reviewed by LDES, County Health Division and County Fire Marshal's Office for compliance with County and State Health Department codes and policies.

This section sets forth the organization and material to be presented for review. These requirements shall be met when a new Domestic Water System is developed or when additional facilities other than main extensions are added to an existing system. Requirements for system extensions are condensed and may be found in Section 1.8.10.

### 1.7.1 WATER SYSTEM PLAN PRESENTATION

#### A. General Requirements - All Sheets

- 1) All sheets shall be 24" x 36".
- 2) County File Number in bold characters in lower right corner.
- 3) North Arrow and appropriate engineering scale.
- 4) Registered Civil Engineer's signature.

#### B. Cover Sheet

- 1) The County has available a cover sheet with all standard items included on the sheet. See standard Details section for requested location of items noted below and reduced copy of blank sheet and example sheet.
- 2) County's Standard Title Block
- 3) Engineer's Statement, signed
- 4) As Built Plans Statement
- 5) County Surveyor's Note
- 6) County location map
- 7) Vicinity Map

TABLE 1.7.1

No. of Users	LEGAL ORGANIZATION		REVIEW FOR STANDARDS				PERMITS REQUIRED				
	No Legal	SWs	MWS	PLI	Generic Term	LDES	H	F	DOC	PLC	SH
1	<input type="checkbox"/>										
2						Co. standards					
3											
4						State Health & Co. Health Stds.					
5											
199											
200											
201											

H: Health Division  
 F: Fire Marshall's Office  
 DOC: Dept. of Corporations, State of California  
 PLC: Public Utilities Commission, State of California  
 SH: State Health Dept.  
 MWS: Mutual Water Company  
 PLI: Public Utility  
 LDES: Land Development Engineering & Surveying  
 SWs: Shared Water System  
 All others as defined in sect. 1.9.  
 NIFP: Not Including Fire Protection Water Systems

1.7.1.B

- 8) Legend of Water System Symbols
- 9) Water System Profile Schematic
- 10) Water System Map
  - a) The Water System Map is to be placed on the cover sheet at 1"=100' or 1"=40'. If the Water System Map will not fit on the cover sheet it may be placed on the second sheet by itself. If the second sheet will not hold the distribution map at 1"=100', a smaller scale may be used for submittal. A 1"=100' scale map shall be kept for company records.
  - b) The Water System Map is intended to present the entire system and all major appurtenances for system management, design and operation and shall show the following items.
  - c) The boundaries of the distribution system with a heavy line.
  - d) All properties to be serviced by the water system including lot lines and lot numbers.
  - e) Names of new and surrounding streets in the subdivision.
  - f) All street rights-of-way and utilities easements.
  - g) All existing and proposed water mains serving the development showing their respective sizes, type and relation to property lines and roadway sections.
  - h) All existing and proposed valves including but not limited to air valves, check valves and pressure reducing valves, flowmeters, fire hydrants, and blowoffs or on Water System Plans.
  - i) All distances along the water mains between all crosses, blowoffs, and tees except fire hydrant runs.
  - j) All existing and proposed wells, pumping stations and storage facilities.
  - k) Contours within the system boundary at not less than ten (10) foot intervals with elevations based on USGS datum.
  - l) The date of construction of all existing principal items of plant and extensions of all existing mains.

1.7.1.B.10)

- m) Location of any major mapped or known fault trace within the system boundary, the age and name if any. (Reference: USGS Geology Quadrangles)
- n) Typical cross-sections of the proposed street structural section for the development showing the depth from the finished grade to the bottom of the undisturbed subgrade.
- o) Approximate location and elevation of all building sites.
- p) All other information as may be required to adequately portray the general plan of the proposed water system.
- q) The Distribution System Map and Water Plans may be consolidated on to one sheet if all requirements for the Map and Plans can be met on one sheet at 1"=40' scale.

C. Water Plans and Profile

- 1) The Water Plan shall be presented at a scale of 1"=20' through 1"=50' and show all information necessary to construct the system including:
  - a) The horizontal location of the water mains, valves, fire hydrants, blowoffs and other appurtenances in reference to the face of curb, property line, or center line.
  - b) The size, type and class of pipe to be installed and location of any changes.
  - c) Sanitary sewers and/or storm sewers if such are present or proposed within the development.
  - d) The location and size of all service connections, fire service connections and fire hydrants in relation to the front property corners and/or driveways.
  - e) The location of all driveways.
  - f) All utilities within 10 feet and parallel to the main, and all utilities crossing the main.
  - g) Existing major features which will effect construction: trees near pipeline alignment, steep slopes, etc.

#### 1.7.1.C

- 2) Service connections shall be located no closer than five (5) feet horizontally from the sanitary sewer house lateral unless otherwise approved by the County and Environmental Health Services.
- 3) Profiles shall be made for all water mains and may be shown on the same drawings as the sanitary sewer, storm sewer, and/or street improvement profiles. This requirement may be waived if no sanitary sewers or storm sewers exist, none are proposed, there are no street improvements proposed and the water line will be placed to a specified depth below the existing grade.

#### D. Water System Profile Schematic

- 1) If the system has more than one supply source or storage facility a profile of the entire water system shall be presented with a vertical scale required and horizontal scale optional and shall show the following:
  - a) Source of supply and elevation including well-head and bottom of well.
  - b) Pumping stations and elevation.
  - c) Storage facilities and elevation.
  - d) Pressure reducing valves and elevation of valve.
  - e) Significant line valves and check valves (elevation optional).
  - f) Distribution piping with street names to aid location on the distribution system map. Beginning and ending elevations.
- 2) This requirement may be waived if the system does not vary more than 40' in elevation or the system is a Shared Water System.

#### E. Site Plans

All land on which a major item of water system equipment is situated is a site. Examples are well sites, pump station sites, storage sites, water treatment sites. Site plans shall be submitted for each site and shall not appear on the cover sheet or Plan and Profile, and be at a large enough scale to clearly show the following:

##### 1) General Requirements

- a) All property lines, easement lines and dimensions for each site.

1.7.1.E.1)

- b) North Arrow and scale.
- c) Location of structures, wells, etc. with respect to property lines.
- d) Existing and proposed structures, wells, etc.
- e) Sizes and description of all piping, fittings, valves, etc.
- f) Existing and final topography, landscaping, surfacing, fencing and gates.
- g) Method of access for routine and repair vehicles and parking area if necessary.
- h) Temporary benchmark to approximate USGS datum.
- i) All above-ground valves to be non-wheel operated or the wheel is to be removable and a locked storage space provided.

2) Well Sites

a) Wellhead Details:

- i) sealing arrangement (concrete to 50' deep with some exceptions)
  - ii) non-threaded sample tap
  - iii) air-release vacuum-relief valve (not required when pumping directly into storage tank)
  - iv) gravel fill pipe (capped)
  - v) sounding tube (capped)
  - vi) totalizing flow meter
  - vii) discharge column size
- b) Location of column check valve, if any.
  - c) Blowoff point for the well and where the expended water flows to.
  - d) Finished elevation of wellhead. Well pump depth below wellhead. Elevation at bottom of well.

3) Storage Sites

- a) Tank accessories and location on tank:
  - i) ladders

1.7.1.E.3)A)

- ii) anti-climb enclosure for outside tank ladders
- iii) inlets and outlets
- iv) cleanout provisions and drains per Standard Details
- v) overflows
- vi) vents screened with vandal resistant material
- b) Type, capacity from outlet to overflow (not from floor to roof), diameter, and depth from floor to overflow of tank.
- c) Previous uses of the tank, if previously used.
- d) Finished elevation of inside bottom and center-line of outlet.
- e) Foundation detail and gutter if necessary.
- f) Overflows and drains are required and are to be turned down, air-gapped a minimum of 2d, and screened. The overflow may be piped into the drain
- g) All piping connected to the tank should have at least one flexible coupling as near the tank as possible to provide flexibility during earthquakes.
- h) Outside painting and inside coating.
- i) AWWA min. steel wall thickness = .25".
- j) Suggest periodic checks for need for cathodically protecting steel tanks.
- k) Access to inside of tank locked and lock protected from vandals.
- l) Show provision to discharge drain and overflow water to a drainageway.
- m) If the system is a Shared Water System, a storage tank may be eliminated if the pressure tank contains sufficient usable storage to meet the storage requirements. Eliminating the storage tank is not recommended.

4) Booster and Pressure Tank Sites

- a) Power supply source - identify whether overhead or buried.

- 1.7.1.E.4)
- b) Location of pressure switch which controls the boosters or well.
  - c) Vital statistics of boosters and pressure tanks: diameter, usable capacity, high and low pressure, how air will be added, etc.
  - d) Provision for expansion, as applicable.
  - e) Pressure gages located at significant points of the station piping.
  - f) Indicate direction of flow through check valves.
  - g) Sufficient piping and valving to mitigate the effect of maintaining or repairing wells, tanks, or boosters.
  - h) Elevation of booster and pressure tank inlets and outlets.

F. Standard Details

Reference to Standard Details shall be made where applicable.

G. Water System Master Plan

If the system will support more customers than the present improvements on the Distribution System Plan show, a Water System Master Plan shall be developed showing probable areas of future growth, number of customers in those areas, and how this system proposes to serve them (approximate size and location of mains, etc.).

1.7.2 ENGINEER'S REPORT

An Engineer's report shall be submitted for all water systems. All items listed below shall be covered in a report for a Mutual Water System. A condensed report may be submitted for a Shared Water System which specifically addresses items 13, 17, 18, 19, 20.b, 20.c, 20.d, 21, and 22. All other items may be condensed or omitted as applicable.

A. A Complete Engineer's Report Shall Contain The following:

- 1) Scope of the system.
- 2) A description of how the system functions normally, to achieve fire flow, and during repair of equipment.
- 3) A description of the source of supply.



1.7.2.A

- 4) A description of the pumping equipment.
- 5) A description of the transmission and distribution.
- 6) A description of the water storage facilities.
- 7) A description of fire protection facilities.
- 8) A description of the suggested maintenance program.
- 9) A summary of the quality and chemistry of the water and proposed methods of treatment to correct undesirable characteristics.
- 10) A statement that state law requires all water systems to take water samples on an approved regular schedule, have them tested by an approved laboratory and the results reported to them and to the Environmental Health Services Division.
- 11) Specifications covering all material and construction methods.
- 12) Supporting data for major equipment: pump curves, pressure tank selection data, etc.
- 13) A detailed estimate of the cost of the completed system.
- 14) Total acreage and number of lots to be served. Number of dwellings per acre.
- 15) Maximum number of lots into which the area can be subdivided.
- 16) Estimates of the immediate and ultimate water consumption in the area to be served.
- 17) Reports showing: 1) the minimum sustained capacity of the source of supply over the time stipulated by Environmental Health Services; 2) static water level; 3) recovery time; 4) drawdown.
- 18) A copy of the California State Water Well Drillers Report and the Santa Clara Valley Water District's permit to drill the well.
- 19) Legal descriptions of all water system land and easements and evidence of dedication or acquisition.
- 20) The following water system calculations where applicable:
  - a) Sizing of mains.

- 1.7.2.A.20)
- b) Meeting fire flow requirements.
  - c) For determining minimum and maximum working pressures to significant lots at peak and off-peak hours.
  - d) Sizing the pressure tank.
  - e) Sizing of storage facilities.
  - f) Selecting booster pumps.
  - g) Structural calculations and details for water system structures: tanks, buildings, foundations, etc.
- 21) A description of significant security and safety precautions for the system.
- 22) A description of the Emergency Notification Plan as required by Section 4029 of the Health and Safety Code.

### 1.7.3 LABORATORY

#### A. General

All of the following are required to be tested for from samples from each source prior to approval of a system. If any of the constituents tested for are above allowable limits the Environmental Health Department may not issue an operating permit for the system upon completion of the system construction. Therefore no system will be approved until all sources have been tested and proof has been presented that all constituents will be within acceptable levels upon completion of the water system. Additional coliform tests will be required upon completing construction.

#### B. Required Analyses, Well or Spring Source

- 1) Coliform Count
- 2) Arsenic
- 3) Barium
- 4) Cadmium
- 5) Chromium
- 6) Lead
- 7) Mercury
- 8) Selenium

1.7.3.B

- 9) Silver
- 10) Flouride
- 11) Nitrate (as N)
- 12) Total Hardness
- 13) Bicarbonate Alkalinity
- 14) Hydroxide Alkalinity
- 15) Carbonate Alkalinity
- 16) Chloride
- 17) Calcium
- 18) Magnesium
- 19) Iron
- 20) Manganese
- 21) Zinc
- 22) Copper
- 23) Cyanide
- 24) Sulfate
- 25) Sodium
- 26) PH
- 27) Turbidity
- 28) Odor - Threshold
- 29) Color
- 30) Temperature (at the site)
- 31) Specific Conductance
- 32) Total dissolved solids
- \*33) Boron
- 34) Foaming Agent (MBAS)

\* - Occasionally required by Santa Clara County for specific situations.

### 1.7.3

#### C. Required Analyses, Surface Source

If any of the water comes from a surface source, all of the above and all of the following organic chemicals are also required:

- 1) Endrin
- 2) Lindane
- 3) Methoxychlor
- 4) Toxaphene
- 5) 2,4 - D
- 7) 2, 4, 5 - D Silvex

D. Additional constituents shall be tested for upon request by Environmental Health Services Division.

#### E. Notes

- 1) All EPA limited concentrations are to be analyzed in conjunction with the full text of the Interim Primary Drinking Water Regulations effective June 24, 1977, and subsequent amendments.

### 1.7.4 LEGAL DOCUMENTS

#### A. General

The water system must be organized either as a Shared Water System or as a Mutual Water System or the Company will be regulated by the Public Utilities Commission of the State of California. If the system is to be regulated by the Public Utilities Commission of the State of California the system shall be approved by them prior to submittal to the County.

#### B. Shared Water System

If the system is organized as a Shared Water System the Agreement setting forth the terms and conditions under which the co-owners will share the system shall be submitted.

#### C. Mutual Water System

- 1) If the system is organized as a Mutual Water Company the Articles of Incorporation, Bylaws, and Permit to Issue Securities as a Mutual Water Company must be submitted before the system may be approved.

1.7.4.C

- 2) All of the following should be provided in either the Articles of Incorporation or the Bylaws in order to obtain the Permit to Issue Securities as a Mutual Water Company. These are summarized from Section 25113 of the Corporate Securities Law of 1968 and compliance with them is determined by the California Department of Corporations. Items marked with an asterisk (\*) must be satisfactorily covered in the Articles of Incorporation or the Bylaws in order to receive system approval from the County regardless of the California Department of Corporations findings or their grant of a Permit to Issue Securities as a Mutual Water Company.
- \* a) Provide service to all landowners in the service area.
  - \* b) Only deliver water and related activities.
  - \* c) Rate structure will include funds for a fund to replace system facilities.
  - \* d) Rates resemble the cost of furnishing water.
  - \* f) Units of securities and areas of lots are to be reasonably equal.
  - \* g) No fractional shares.
  - \* h) Securities are appurtenant to the several economic units within the service area.
  - \* i) Transferability of shares.
  - \* j) Voting rights of the security holders.
  - k) A description of any necessary or contemplated expansion of the facilities.
  - l) Any further subdivision of the area to be served.
  - \* m) Reasonable limitations on salaries.
  - \* n) All water rights to Mutual Water Company.

1.7.5 WATER SYSTEM PACKAGE SUBMITTAL

A. First Submittal

No review will be commenced until all required material has been received. Six (6) copies of the engineered Water System Plan and Engineer's Report and four (4) copies of the Laboratory Analysis and Legal Documents

#### 1.7.5.A

shall be submitted to the Santa Clara County Environmental Management Agency Central Permit Counter. The Central Permit Counter passes the entire package to the Land Development Engineering and Surveying Division who in turn distributes two (2) copies of each of the above to the Environmental Health Services Division for review and comments. Two (2) copies of the Water System Plan and the Engineer's Report are distributed to the County Fire Marshal or governing Fire District for review and comments. Health and Fire may approve a system as submitted, approve contingent upon making revisions if a few minor problems were found or may return it unapproved if major problems were found. The Land Development Engineering and Surveying Division receives these reviews back, adds their own review to the package and determines if the Water System Package may be approved. If not approved all pertinent reviews are returned to the Developer's Engineer for corrections.

#### B. Resubmittal

After all requirements have been met from the previous submittal the Water System Package may be resubmitted. In addition to the number of revised copies as noted above, the Developer's Engineer shall return the marked up Plan, Engineer's Report, Detailed Review, all other material returned to him from the previous review, and the tracings. NO REVIEW WILL BE COMMENCED UNTIL ALL REQUIRED MATERIAL HAS BEEN SUBMITTED. The distribution and review procedures generally follow those outlined for the first submittal.

#### 1.7.6 WATER SYSTEM APPROVAL

After all required changes have been made and all governing agencies have approved the package the County Surveyor will sign the General Approval Note on the original tracings of the Water System Plans. No changes in the Water System will be permitted after the Plans have been approved unless approved in conformance with Section 1.8.7 "Changes in Water Plans After Water System Approval". Changes made in the Water System without approval by the County Surveyor may result in revocation of the "Water System Approval" and refusal by the County to accept any portion of the water system installed. Water system shall be completed and operational in conformance with the Developer's Agreement and prior to the First occupancy. In no case shall the system be used to deliver water for human consumption without an Operating Permit from the Santa Clara County Environmental Health Services Division.

#### 1.7.7 CHANGES IN WATER PLANS AFTER "WATER SYSTEM APPROVAL"

If, during the construction of the approved water system, changes in the water system are required due to field conditions, a marked up print shall be submitted to the

1.7.7 County for written approval of the change. The County will, if the Change is approved, advise the Developer's Engineer as to whether or not the approved change is to be made on the approved plans and resubmitted to the County.

1.7.8 COMMENCEMENT OF WORK

No work will be permitted nor will inspection by the County be provided for the installation of the proposed water system until the Water System Plans have been signed by the County Surveyor and a construction permit issued. Failure to comply will result in the County's refusal to accept work and Health Division refusal to grant an Operating Permit.

1.7.9 AS CONSTRUCTED PLANS

Upon completion of construction the Developer's Engineer shall note as-built locations for all appurtenances, pipe-line location and manufacturer's name, product name, and significant identifying characteristics (flanged, 150 lb rating, epoxy coated, etc.) for all material used for construction. All as-built notes shall be signed by the Developer's Engineer and number shown. The originals of the As Constructed Plans shall be submitted to the Land Development Engineering and Surveying Division with two copies. As Constructed Plans and copies of an approved fire flow of each fire hydrant shall be submitted to Land Development Engineering and Surveying prior to Bond Reduction.

1.7.10 WATER SYSTEM EXTENSIONS

An engineered Water System Extension Plan and Report may be submitted in lieu of the Water System Package if the extension is of an existing approved system, the extension includes no additional supply, pumping or storage facilities and the extension will be owned and operated by the existing system.

Water System Extension Plans shall conform to the requirements of paragraphs 1.8.1 A "General Requirements"; 1.8.1 B(1) "Cover Sheet"; items b, c, d, i, k, l, and m of 1.8.1 B (10) "Water System Map"; 1.3.4 C "Water Plans and Profile". Additional Requirements will be set after the first review based on individual extension characteristics.

The report shall present sufficient plans and supporting evidence to show that the existing system meets current County standards including sufficient supply, storage, allowable pressures and water quality.

Water System Plans and Report are distributed for review and approval from the Land Development Engineering and

1.7.10 Surveying Division to the Fire Marshal. A copy is sent to Environmental Health Services for their records. Upon return of the Fire Marshal's review if no response has been received from the Health Division, the Fire Marshal and Land Development Division comments are summarized and returned to the applicant. Any responses from the Health Division are included when applicable.

If the existing system does not meet County standards the system shall be brought into compliance prior to approval. If the basic requirements for supply, storage, allowable pressures and water quality are met but additional work to bring the system into full compliance are not feasible, the County shall determine the extent to which the system shall be brought into compliance before the extension will be approved.

The requirements of Sections 1.8.8 through 1.8.12 shall be observed for Water System Extension packages.

1.7.11 OPERATING PERMIT

A. Permit Required

The water system may not be used to deliver water for human consumption without an Operating Permit from the Santa Clara County Environmental Health Services Division.

B. Requirements to Obtain Permit

The Environmental Health Services Division must be contacted for complete information on the requirements to obtain an Operating Permit. The following are normally required before a Permit will be issued:

- 1) Complete Laboratory Analysis for each source. The Laboratory Analysis needed for System Approval will normally be acceptable if the analysis was performed at a State approved laboratory.
- 2) Coliform Count at locations throughout the system as directed by the Health Division.
- 3) All constituents analyzed for above within acceptable limits.
- 4) Submittal of As Constructed Plans signed by a registered Civil Engineer and Environmental Health Division final approval.

1.7.12 WATER COMPANY RECORDS

In order that all information generated during the review, approval, construction, as-built and permitting procedure may be saved for later use for maintenance, expansion and



1.7.12

integration with other systems, all material required for Water System Approval, including reproducible copies of As Constructed Water System Plans, shall be gathered together and kept with other official company records.

DEFINITION  
(Section 1.8)

Approved Plans

Plans that have been signed by the County Surveyor or his authorized designee.

Backfill

That portion of the trench backfill which is above the bedding of the water main.

Bedding

That portion of the trench backfill which is under and around the water main.

City

The word "City" when used herein shall mean any of the incorporated cities or towns in the County of Santa Clara, California.

Contractor

The person or persons, co-partnership, corporation, licensed by the State of California, hired or employed by Developer for the installation of the water system for the development.

County

Land Development Engineering and Surveying Division of the Santa Clara County Environmental Management Agency. Also referred to as "the County".

County Surveyor

The County Surveyor of Santa Clara County, State of California, acting either directly or through properly authorized agents acting within the scope of the particular duties entrusted to them.

Definition of Words

Wherever, in this manual, the words directed, required, permitted, ordered, designated, or words of like importance are used, they shall be understood to mean the direction, requirement, permission, order or designation of the County. Similarly, the words approved, acceptable, satisfactory, shall mean approved by, acceptable to, or satisfactory to the County.

### Developer

Developer shall mean any individual, firm, association, syndicate, co-partnership, corporation, trust or any other legal entity effecting a development of land within the Santa Clara County but not within a City.

### Developer's Engineer

An Engineer, licensed by the State of California as a Civil Engineer, under whose direction plans, profiles and details for the work are prepared and submitted to County for review and approval. He shall also be responsible for the field staking of the water system, approval of modifications and As Constructed Plans.

### Development

Development shall mean any subdivision, tract, commercial, industrial, school, multiple residential or other use of land which requires a water system, is in Santa Clara County but not within a city.

### Domestic Water System

A generic term including any water system which furnishes or supplies domestic water to a minimum of two service connections through a maximum of 199 service connections, said water being comingled through an integrated pipe system. The legal organization includes Shared Water System, Mutual Water Company, and Private Water Company.

### Dwelling Unit

"Dwelling Unit" means one or more habitable rooms which are occupied or which are intended to be or designed to be occupied by one family with facilities for living, sleeping, cooking and eating.

### Easements

Permission, granted by Developer to Water Company by means of a recorded document, to construct and maintain water facilities within a specific area.

### Fire Protection Water System

A water system which provides only water for fire protection purposes, which has provision for ensuring no water can be used for domestic purposes nor provide opportunities for cross connections. (Abbreviated FPWS)

### Furnish or Supply

Is used in its normal and natural meaning and includes furnishing or supplying water to two or more places of human habitation where said places are connected by an integrated pipe system owned and operated by the supplier.

### Health Division

Environmental Health Services Division of the Santa Clara County Environmental Management Agency. (Abbreviated EHS)

### Health Officer

The Santa Clara County Health Officer acting either directly or through properly authorized agents acting within the scope of the particular duties entrusted them.

### Individual Residential Water System

Any water system which provides domestic water service to a single property under one ownership with not more than one dwelling unit.

### Inspector

The inspector for the County duly authorized by the County Surveyor and responsible for the particular duties delegated to him.

### Land Development Engineering and Surveying Division

Santa Clara County Environmental Management Agency, Land Development Engineering and Surveying Division. (Abbreviated LDES)

### Large Public Water System

Any Water System which supplies domestic water to 200 or more users.

### Mutual Water Company

Generally: a water company owned only by the users.  
Specifically: a California corporation organized under either the General Corporations Law (Sections 100 - 6804, Corporation Code) or the General Nonprofit Corporations Law (Sections 9000-9802, Corporations Code) and holding a valid permit to issue securities as a mutual water company pursuant to Section 25113 of the Corporate Securities Law of 1968. (Abbreviated MWS)

### Other Standard Specifications

Various standards are referred to throughout these specifications which are indexed by number (i.e., AWWA C-100 or ASTM A-276).

It is expected that the material or methods specified shall conform to the standard or specification of the designated index number current as of the date of construction. Tentative standards shall be construed as current unless otherwise noted. Where obsolete specifications have been shown as standards, they shall be superseded by the latest specification covering the same subject.

Abbreviations used for various other specifications are as follows:

AAN	- American Association of Nurserymen
AASHO	- American Association of State Highway Officials
ACI	- American Concrete Institute
ANSI	- American National Standards Institute
AREA	- American Railway Engineering Association
ASCE	- American Society of Civil Engineers
ASME	- American Society of Mechanical Engineers
ASTM	- American Society for Testing Materials
AWPA	- American Wood Preservers Association
AWS	- American Welding Society
AWWA	- American Water Works Association
Fed. Spec.	- Federal Specification
NEMA	- National Electrical Manufacturers Association

### Pipe Types

ACP	- Asbestos Cement Pipe
CIP	- Cast Iron Pipe
CMP	- Corrugated Metal Pipe
DIP	- Ductile Iron Pipe
GIP	- Galvanized Iron Pipe
PB	- Polybutylene Tubing
PVC	- Polyvinylchloride Pipe

### Plans

The plans, profiles, typical cross sections, general cross sections and working drawing, prepared by Developer's Engineer, or exact reproductions thereof, which show the location, character, dimensions and details of the work to be done.

### Public Premise Water System (Non-Residential)

Any water system which provides domestic water to the public for human consumption.

### Public Utility

A water company owned by private parties but not restricted to users and regulated by Public Utilities Commission of the State of California. (Abbreviated PU)

## Section or Sub-Section

Any reference to a section or sub-section which is not accompanied by further reference refers to a section or sub-section of these specifications.

## Service Connection

The pipeline used to convey water from the distribution main to the property line.

## Shared Water System

A "Shared Water System" means any combination of water sources, storage facilities and related appurtenances which provides domestic water service to more than one property up to a maximum of four properties where each property owner has at least a 1/4 interest in the water system and the land upon which it is situated, and all of the properties taken together have a total of no more than four dwelling units or other permitted land uses existing on them, and for which an agreement has been recorded which provides for the legal requirements of such a system. (Abbreviated SWS)

## Standard Details

The Water System Details as contained in Division E of the Environmental Management Agency Manual for Land Development for the County of Santa Clara.

## Standard Specifications

The County's Standard Specifications as contained herein and all subsequent additions, deletions, revisions or addenda.

## State

State of California

## State Health Department

State of California, Department of Health.

## State Standard Specifications

Standard Specifications of State of California, Business and Transportation Agency, Department of Transportation, (Cal Trans), as of the date of plan approval.

## Uniform Plumbing Code

The Uniform Plumbing Code adopted by Western Plumbing Officials Association, current edition as of the time of approval.

### User

Any individual, corporation or association of individuals using water for domestic purposes excepting therefrom any individual, corporation or association of individuals processing water or selling, serving, furnishing, or supplying water to the public in any manner.

### Water Company

The legal entity which owns and operates the water system.

### Water Main

Distribution pipelines located in streets, highways, public ways, or private rights of way which are used to serve the general public.

### Water Main Extension

The pipe laid or to be laid in any street, alley, or right-of-way which connects to any existing water system for the distribution and transmission of water and which will be owned and operated by the water company. It shall include any service connection.

### Water System

The water collection, treatment, storage, transportation, and delivery system designed to supply water for domestic and/or fire protection purposes.

### Water System Package

The Water System Plans, Engineer's Report, Laboratory Analysis and Legal Documents as required in the adopted Water System Manual and Standards prior to plan approval.

### Work

All the work that is or will be done subject to County inspection, in accordance with the approved Plans, Standard Specifications, Policies and Codes of the County of Santa Clara.

**SECTION II**  
**MATERIAL SPECIFICATIONS**



## GENERAL

This section provides specifications covering materials, fabrication and testing for pipeline and water system facilities in Domestic Water Systems within the County. All materials used in Domestic Water Systems shall conform hereto unless requested in writing and approved in writing by the County Surveyor. Departures from these specifications shall be noted on the approved plans.

## ASBESTOS CEMENT PRESSURE PIPE

### 2.1.0 GENERAL

This section of these specifications apply to the materials, manufacture, fabrication and testing of Asbestos Cement Pressure Pipe used within the water system. All Asbestos Cement Pressure Pipe used within the water system shall conform hereto unless otherwise indicated on the plans or directed by the County Surveyor.

### 2.1.1 FABRICATION

Asbestos Cement Pressure Pipe shall be Class 150, unless otherwise indicated on the plans, and shall conform to AWWA C-400 except as may be herein modified.

The standard length of the Asbestos Cement Pipe shall be Thirteen (13) feet. Shorter lengths of pipe used for making connections to valves, fittings, appurtenances and closures shall also comply with these specifications.

### 2.1.2 COUPLINGS

One coupling, manufactured of the same material and by the same manufacturer as the pipe, shall be furnished with each length of pipe together with two (2) rubber rings. The couplings shall be designed so as to insure a water-tight joint with the pipe.

The rubber rings shall be of the type recommended by the pipe manufacturer, shall be compatible with the pipe and coupling and shall conform to ASTM D-1869 "Rubber Rings for Asbestos Cement Pipe".

All Asbestos Cement pipe and couplings shall be designed and machined to the required tolerances of, and be interchangeable with, either the standard "Fluid-tite" or "Ring-tite" joint.

### 2.1.3 CURING

All pipe and couplings shall be cured with high pressure steam in an autoclave.

### 2.1.4 INSPECTION AND TESTING

County at its descretion may inspect the plant facilities, materials, manufacture and curing of the pipe to be furnished.

Testing of the pipe to insure compliance with these specifications shall be made in accordance with AWWA

2.1.4

C-400. Regardless of the place of manufacture, all pipe shall be tested within the continental United States when required by the County, at testing facility designated by the County.

All cost incurred by County for witnessing the manufacture of the pipe and in obtaining test results shall be borne by Contractor furnishing the pipe. When requested, the pipe shall be tested for uncombined calcium hydroxide. The maximum percentage of uncombined calcium hydroxide shall not exceed one (1) percent when tested in accordance with the Appendix of AWWA C-400.

2.1.5 AFFIDAVIT OF COMPLIANCE

County may elect to waive any of the above testing and inspection requirements, in which event the County may require the manufacturer to submit affidavits stating that all pipe has been manufactured and tested in accordance with this specification.

## CAST IRON AND DUCTILE IRON PIPE

### 2.2.0 GENERAL

This section of these specifications applies to the materials, manufacture, fabrication and testing of Cast Iron Pipe and Ductile Iron Pipe used within the water system. All Cast Iron Pipe or Ductile Iron Pipe used within the water system shall conform hereto unless otherwise indicated on the plans or directed by the County Surveyor.

### 2.2.1 FABRICATION

Cast Iron Pipe and Ductile Iron Pipe shall be Class 150, unless otherwise indicated on the plans, and shall conform to AWWA C-106-75, C-108-75, C-112-71, or C-151-71 except as modified herein.

The standard length shall be eighteen (18) feet. Shorter lengths of pipe used for making connections to valves, fittings, appurtenances and closures shall also comply with these specifications.

Joint type shall be the single rubber-gasket joint as described in ANSI A-21.11 (AWWA C-111) of latest revision.

### 2.2.2 COATINGS AND LININGS

Cast Iron and Ductile Iron Pipe shall be cement mortar lined in accordance with AWWA C-104. All Cast Iron and Ductile Iron Pipe shall be coated with a bituminous coating in conformance with the appropriate AWWA pipe specification.

### 2.2.3 INSPECTION AND TESTING

County at its discretion may inspect the plant facilities, materials and manufacture of the pipe to be furnished.

Testing of the pipe to insure compliance with these specifications shall be made in accordance with the applicable AWWA specification as required above. Regardless of place of manufacture, all pipe shall be tested within the continental United States when required by the County at a testing facility designated by the County. All Cost incurred by County for witnessing the manufacture of the pipe and in obtaining test results shall be borne by the Contractor furnishing the pipe.

### 2.2.4 AFFIDAVIT OF COMPLIANCE

County may elect to waive any of the above testing and inspection requirements, in which event County may require

2.2.4

the manufacturer to submit affidavits stating that all pipe has been manufactured and tested in conformance with this specification.

## POLYVINYL CHLORIDE PIPE

### 2.3.0 GENERAL

This section of these specifications apply to the materials, manufacture, fabrication and testing of Polyvinyl Chloride Pipe used within the water system. All Polyvinyl Chloride (PVC) pipe used within the water system shall conform unless otherwise indicated on the plans or directed by the County Surveyor.

### 2.3.1 FABRICATION

Polyvinyl Chloride Pipe sizes 4 inch through 12 inch shall be Class 150, unless otherwise indicated on the plans, and shall conform to AWWA C-900-75 except as modified herein. Polyvinyl Chloride Pipe of less than 4 inch diameter shall be equivalent to Fluid-tite PVC pipe, type 10-200psi at 73.4°F as manufactured by Certain-Teed Products.

Sizes shall be as noted on the plans and outside diameter shall conform to the outside diameter dimensions of Cast Iron Pipe.

Joint-type shall be elastomeric-gasket bell ends except when otherwise noted on the plans. When noted on the plans the joint-type shall be elastomeric-gasket coupling type.

### 2.3.3 INSPECTION AND TESTING

County at its discretion may inspect the plant facilities, materials and manufacture of the pipe to be furnished.

Testing of the pipe to insure compliance with these specifications shall be made in accordance with the applicable AWWA specification as required above. Regardless of place of manufacture all pipe shall be tested within the continental United States when required by the County at a testing facility designated by the County. All cost incurred by County for witnessing the manufacture of the pipe and in obtaining test results shall be borne by the Contractor furnishing the pipe.

### 2.3.4 AFFIDAVIT OF COMPLIANCE

County may elect to waive any of the above testing and inspection requirements, in which event County may require the manufacturer to submit affidavits

2.3.4 stating that all pipe has been manufactured and tested in conformance with this specification.

## MISCELLANEOUS PIPE

### 2.4.0 GENERAL

This section of the specifications applies to the materials, manufacture, and fabrication of the miscellaneous piping within the water system. All miscellaneous piping used within the water system shall conform hereto unless otherwise indicated on the plans or directed by the County Surveyor.

### 2.4.1 COPPER TUBING OR PIPE

Copper tubing or pipe used for service connections shall be Type "K" soft copper conforming to ASTM B-88 unless otherwise approved by the County Surveyor.

### 2.4.2 RED BRASS PIPE

Red brass pipe used for air valve connections shall conform to ASTM B-43 unless otherwise approved by the County Surveyor.

### 2.4.3 STEEL ENCASEMENT PIPE

The minimum nominal diameter and minimum metal thickness of steel encasement pipe shall be as follows unless otherwise indicated on the plans:

<u>Water Main Size (Nominal)</u>	<u>Minimum Nominal Diameter of Encasement Pipe</u>	<u>Minimum Thickness of Encasement Pipe</u>
6"	12"	3/16"
8"	14"	7/32"
12"	18"	1/4"
14"	20"	9/32"
16"	24"	11/32"
18"	24"	11/32"
20"	26"	3/8"
24"	30"	13/32"
30"	36"	15/32"
36"	42"	1/2"
42"	48"	1/2"

### 2.4.4 GALVANIZED STEEL PIPE

Galvanized steel pipe may be used only in the construction of permanent or temporary blowoff connections. Galvanized steel pipe shall conform to ASTM A-120, Schedule 40.



#### 2.4.5 BLACK STEEL PIPE

Black steel pipe shall be used for service connections or fire hydrant runs only when indicated on the plans or directed by the County Surveyor. Black steel pipe shall conform to ASTM A-120, Schedule 40, plain end. Joint shall be butt welded. Fittings, if required, may be flanged or plain end. Flanges shall be used when connecting to valves.

#### 2.4.6 PLASTIC TUBING-SERVICES ONLY

##### A. General

Plastic tubing used for service connections shall be manufactured from Polybutylene conforming to ASTM D 2666 except as may be modified hereinafter.

The tubing shall conform to the following:

Material Designation Code	: PB2100
Standard Pipe Dimension Ration (SDR)	: 13.5
Plastic Extrusion Compound	: Type II, Grade 1 (as defined in ASTM D 2581)
Pressure Rating	: 160 psi (Min.)

Plastic tubing shall be approved for use in potable water by the National Sanitation Foundation Testing Laboratories, Inc., or other accredited laboratory acceptable to the State of California Department of Public Health.

All tubing shall be clearly marked at intervals of not more than two (2) feet with the nominal size, type of material (PB 2110), Standard Dimension Ratio (SDR 13.5), pressure rating (160 psi), ASTM designation (ASTM D 2666), manufacturer's trade name and production code, and the seal of approval of an accredited testing laboratory (nSf).

All tubing, one(1) and two (2) inch nominal sizes, shall be packed and shipped in cartons, coiled in long lengths with a minimum of three hundred (300) feet of one (1) inch, one hundred (100) feet of one and one-half (1½) inch and two (2) inch tubing per carton. All cartons shall be clearly marked as to type and size of the material contained therein.

#### 2.4.7 INSPECTION

Duly authorized, County inspectors shall have access at all times to all places of production, fabrication,

2.4.7

and testing for purposes of inspection or observation. Whether or not inspection is made at the plant, pipe will be "spot inspected" upon delivery for condition, quality of workmanship, and compliance with these specifications.

## CAST IRON FITTINGS

### 2.5.0 GENERAL

This section of the specifications covers cast iron bends, tees, crosses, reducers, plugs and caps used within the water system.

### 2.5.1 FITTINGS FOR ASBESTOS CEMENT PIPE

All fittings to be used with asbestos cement pipe shall be of cast iron material specified in ANSI A 21.10 (AWWA C-110) with Class D metal thickness.

Cast iron fittings shall be classified as "Short Body Cast Iron Fittings". All cast iron fittings shall be cement mortar lined in accordance with ANSI A 21.4 (AWWA C-104).

All flanged fittings shall conform to ANSI Designation: B16.1 (Class 125 or Class 250). Unless otherwise specified or indicated on the plans, Class 125 shall be used.

The hub ends of fittings shall be designed and manufactured, for direct reception of the asbestos cement pipe, strictly in accordance with the dimensions and tolerances contained in the specifications of the manufacturer of the pipe. Closure shall be facilitated by a rubber ring retained in an internal groove inside hub. The surface of the hub in the ring area shall be cast or machined free of pits and burrs, smooth and accurate, in order to meet the requirements for water-tightness. The rubber rings shall conform to the rings specified for the pipe used.

## GATE VALVES

### 2.6.0 GENERAL

This section of the specifications cover iron-body, bronze mounted gate valves, twelve (12) inches or smaller, intended for ordinary water works service. The gate valves specified herein shall conform to AWWA Specification C-500, except as otherwise amended or altered herein.

### 2.6.1 MODIFICATIONS

Wherever these modifications conflict with the applicable AWWA specifications, the specific wording of these modifications shall govern. All parts of AWWA C-500 not modified herein shall apply in full force.

#### AWWA Section 1 - Scope

Revise: Only double disc, non-rising stem, parallel seats with a disc wedging device shall be acceptable.

Delete all reference in the AWWA Specification relating to Solid-Wedge Gate Valves.

#### AWWA Section 5 - Materials

5.5: Add: Stainless steel alloy 18-8 may be substituted for bronze at the option of the manufacturer subject to the approval of the County Surveyor.

#### AWWA Section 6 - General Design

6.2: Add: The construction of the valves shall be such that there will be no working parts that have rubbing contact of iron on iron.

#### AWWA Section 7 - Bodies and Bonnets

7.4: Add: The portion of the packing plate and bonnet in contact with the stem collar shall have a machine-smooth finish.

#### AWWA Section 9 - Valve Ends

9.1: Delete

9.2: Add: The faces of the flanges shall be machined flat over the entire face. The back of the flanges shall be smooth and parallel

2.6.1

to the front face. Flange bolt holes shall be spot faced if flange fillets interfere with bolt heads or nuts.

9.3: Delete

9.4: Add: Valve for use on asbestos cement pipe may have hub or flange by hub ends. Hub ends shall be suitable for both fluid-tite and/or ring-tight joints.

AWWA Section 16 - Stem Seal

16.2: Add: The stem collar shall be machine-smooth to true diameter and shall be concentric with the stem.

16.6: Add: Only O-Ring stem seals shall be furnished.

AWWA Section 30 - Affidavit of Compliance

When requested by County, the manufacturer and vendor shall each furnish an affidavit stating that all the valves furnished for installation within County comply with these specifications. County at its option, may select at random from the valves furnished, a valve or valves to be disassembled for inspection.

Failure to conform to these specifications after certification by the manufacturer and vendor shall justify rejection of all valves of this manufacturer in future installations for a period of not less than one (1) year. After this period, the valve may then be re-evaluated after sufficient evidence is presented to County of this manufacturer's compliance to these specifications.

## BUTTERFLY VALVES

### 2.7.0 GENERAL

This section of the specification covers rubber seated butterfly valves for use within the water system.

Rubber Seated Butterfly Valves shall be fourteen (14) inches or larger in diameter, unless otherwise approved by the County Surveyor. If smaller sizes are approved, the valves shall also conform to these specifications.

Butterfly valves shall be the product of a manufacturer who has not less than five (5) years experience in the manufacture of rubber seated butterfly valves and operators for use in municipal water distribution systems unless otherwise approved by the County Surveyor.

All valves shall be Class 150-B suitable for service in municipal water distribution system and suitable for installation in any position.

Butterfly valves shall conform to AWWA C-504 except as may be modified by these specifications. Whenever these modifications conflict with the applicable AWWA specifications, the specific wording or requirements of these modifications shall govern. All parts of AWWA C-504 not modified herein shall apply in full force.

### AWWA Section 2 - Information to be Supplied by Purchaser

2.4: Type of Valve: Delete Wafer Valves

2.8: Tests: Records of required tests shall be as indicated hereinafter under the appropriate AWWA Section.

2.9: Type of Valve Ends: Flanged

2.13: Type of Installation: All valves shall be Suitable for buried service.

2.14: Type of Operator Required: Key operators for buried service.

2.15: Direction of Opening: All valves shall have counter-clockwise opening.

2.7.0

- 2.16: All valves shall be installed with the shaft horizontal. Operators shall be fitted with a two (2) inch operating nut to which a vertical extension stem can be added.

AWWA Section 4 - Data to be Furnished by Manufacturer

Contractor shall submit to the Development Engineer for approval, four (4) prints of certified shop drawings showing the dimensions, construction details and material specifications for all parts used in the construction of the valves to be furnished. The drawings shall be in sufficient detail to enable the Developer's Engineer to check compliance with these specifications, and shall include at least the following information:

1. Outline and principal dimensions of the assembled valve with its operator attached.
2. Materials of all valve and operator components. Where applicable, ANSI, ASTM, or other standard specification numbers shall be used.
3. Details of the following:
  - (a) Disc and body seats, including provisions for clamping and adjusting if provided.
  - (b) Attachment of disc to shaft.
  - (c) Disc details at section on shaft centerline and attachment of disc to shaft.
  - (d) Main shaft bearing length and diameter.
4. Coating material to be used.
5. Any additional information requested by the Developer's Engineer.

Following approval of the shop drawings, four (4) complete sets of certified drawings, showing final "as built" information shall be furnished to the Developer's Engineer at the time the equipment is shipped.

AWWA Section 6 - Valve Bodies

- 6.1: Eliminate all reference to Wafer Valves.
- 6.3: All end flange drilling shall conform to ANSI B16.1, Class 125, Cast Iron Flanges.

2.7.0

- 6.4: Valve bodies shall be cast iron conforming either to ASTM A126, Class B, or ASTM A48, Class 40.
- 6.5: Add: Where required for valves with seats in the body, stainless steel seat retainer rings shall be furnished.

AWWA Section 7 - Valve Shafts

- 7.3: Add: When approved by the Developer's Engineer, valve shafts of hexagonal design having driving lever, valve disc, and seals conforming to the hexagonal design need not be secured to the valve disc by means of keys or pins.
- 7.5: Add: When approved by the Developer's Engineer, valve shafts of hexagonal design shall be manufactured of high-tensile steel having an average yield point of not less than 70,000 psi.

AWWA Section 9 - Valve Seats

- 9.3: Only valves that seat at 90° to the pipe axis are acceptable.
- 9.6: Delete reference made to valves that seat at an angle.

AWWA Section 12 - Operators

- 12.2: Gearing
- 12.2.3: Shop test will be required
- 12.4: Delete
- 12.5: Delete
- 12.6: Delete

AWWA Section 13 - Testing

- 13.4: Report on shop test will be required unless otherwise directed by the Developer's Engineer.



## MISCELLANEOUS VALVES

### 2.8.0 GENERAL

This section of the specification covers miscellaneous valves used within the water system.

### 2.8.1 AIR AND VACUUM AND AIR RELEASE VALVES

Air and vacuum and air release valves shall be APCO "Heavy Duty" combination air release valve, Crispin Universal, or approved equal.

### 2.8.2 PRESSURE REDUCING VALVES

Pressure reducing valves shall maintain a relatively constant downstream pressure regardless of fluctuations in demands. It shall be hydraulically operated and pilot controlled. The valve shall be provided with O-Ring seals and valve seats to provide positive pressure-tight sealing. The valve shall have an external sensing line not smaller than three-eighths (3/8) inch copper tubing. A needle valve shall be installed in the line. All strainers shall be one (1) inch minimum. The valve shall be as manufactured by Bailey Valve Company, Clayton Valve Company, or approved equal.

### 2.8.3 BACKFLOW PREVENTION DEVICES

Backflow prevention devices of both the reduced pressure principle and double check valve types shall conform to American Water Works Association Standard C506-69. If required by the County Health Officer or the County Surveyor an Affidavit of Compliance (Section 3) and Certificate of Compliance shall be provided in triplicate to the Developer's Engineer for forwarding to the requiring County departments. Unless otherwise noted all devices shall be fitted with flanged connections. Test cocks shall be provided as set forth in this standard.

### 2.8.4 CHECK VALVES

Check valves shall conform to AWWA C508-76 and shall be fitted with flanged connections unless otherwise noted.

## APPURTENANCES

### 2.9.0 GENERAL

This section of the specifications covers the appurtenances used in the water distribution system. Appurtenances include but are not limited to, fire hydrants, blowoffs, valve boxes and valve box risers, brass items, saddles, flanges, gaskets, bolts, flexible couplings and other miscellaneous items.

### 2.9.1 FIRE HYDRANTS

All hydrants shall conform to AWWA C503-75. All fire hydrants shall be approved by the Fire Marshal in coordination with the controlling fire department. In the absence of requirements to the contrary the following shall apply to all fire hydrants in the water system.

Hydrant bury shall have a ring-tite or fluid-tite hub inlet when used on asbestos cement pipe hydrant runs; a flanged inlet bury shall be used on steel pipe hydrant runs.

A break-off spool with two cast score marks or one machined score mark shall be provided between the hydrant head and the hydrant bury. The top score mark shall be located within three (3) inches of the flange which connects to the hydrant head. The maximum length of the break-off spool shall be twenty-four (24) inches. Where more than one extension riser is required between the bury and the hydrant head, the maximum length of the break-off spool immediately below the hydrant head shall be not greater than twenty-four (24) inches.

Inlet pipe shall be a minimum of 6" diameter and have a minimum of one 2½" outlet and one pumper outlet.

### 2.9.2 BLOWOFFS

Blowoffs shall be constructed of materials indicated on Standard Details.

### 2.9.3 VALVE BOXES AND VALVE BOX RISERS

Valve boxes and valve box risers are to be provided for all line valves and fire hydrant valves unless otherwise indicated on the plans or directed by the County Surveyor. The material to be used for valve box risers shall be as shown on Standard Details. The valve boxes shall be Christy G-5, or approved equal.

#### 2.9.4 BRASS ITEMS

Brass items cover corporation stops, curb stops, which include angle meter stops, coupling nuts and tail pieces.

All material used in the manufacture of this equipment shall be copper base alloy complying with the specifications of ASTM Designation B 62-63 (Industry Standard), except as follows: Upon written approval of the County Surveyor, the manufacturer may substitute for B 62-63, copper base alloys containing not more than 16% zinc, 3% aluminum, and 10% lead and meeting the mechanical properties of 30,000 psi minimum tensile strength and 20% minimum elongation in two inches under standard tension test (e.g., ASTM B 30-59, Types 1A, 1B, 2A, 3A, 4A and 12A).

#### 2.9.5 SADDLES (SERVICE CLAMPS)

Saddles or service clamps shall be used on asbestos cement or welded steel mains when indicated on the plans or directed by the County Surveyor. Saddles shall be Christy single strap Type 1011 or double strap Type 1012, Smith-Blair single strap Type 311 or double strap Type 313, or approved equal. Bronze saddles shall be Jones single strap J-975 or double strap J-979, or approved equal.

All ferrous metal saddles shall be coated with a thermal curing epoxy as specified in Sub-Section 3.5.

#### 2.9.6 STEEL FLANGES

Unless otherwise indicated on the plans or directed by the County Surveyor., all steel flanges shall be flat faced Class D conforming to AWWA C-207. The flanges shall have the same diameter and drilling as Class 125 ANSI B16.1 cast iron flanges. Where flanges are to connect to flanged appurtenance, the flange shall match the flange on the appurtenance.

#### 2.9.7 GASKETS

Gaskets shall be one-sixteenth (1/16) inch thick, full faced type, made of asbestos or rubber inserted cloth equal to Crane Cranite.

Where indicated on the plans or required by the County Surveyor, Type E Maloney insulation kit with neoprene gasket facing and one-sixteenth (1/16) inch special sleeves or approved equal shall be used.

#### 2.9.8 BOLTS AND NUTS

Unless otherwise indicated, bolts shall be of steel with ASNI regular unfinished square or hexagon heads, and the nuts shall be of steel with ASNI regular hexagonal dimensions, as specified in ASNI B18.2 for Wrench Head Bolts and Nuts and Wrench Openings.

All bolts and all nuts shall be threaded in accordance with ASNI B1.1 for Screw Threads, Coarse-Thread Series, Class 2A and 2B fit.

#### 2.9.9 FLEXIBLE COUPLINGS

Unless otherwise indicated on the plans or directed by the County Surveyor, flexible couplings shall be "Dresser" Type 38 or Smith-Blair No. 411 for standard connections, or "Dresser" Type 39 or Smith-Blair No. 416 for insulated connections, or approved equal. When connecting asbestos cement pipe to steel pipe the flexible coupling shall be "Dresser" Type 162 or Smith-Blair 433 transition coupling or approved equal.

Special flexible coupling shall be as indicated on the plans or as specified by the County Surveyor.

#### 2.9.10 TRACER WIRE

Tracer wire shall be solid copper wire, six-gauge, either bare or insulated. No splices between valves will be permitted.

#### 2.9.11 TRACER TAPE

Three (3) inch wide plastic coated metallic tracer tape imprinted with "Water Service Below", shall be used where indicated on the plans.

**SECTION III**  
**INSTALLATION SPECIFICATIONS**

## AUTHORITY AND RESPONSIBILITY

### 3.0.1 County Surveyor

- A. Authority: The authority to inspect the construction of water systems is vested in the County Surveyor. He may authorize a private engineer to perform the inspection work and render the necessary reports. Should the private engineer and the County Surveyor disagree concerning determination of the amount, quality and fitness of the several kinds of work and materials, the resolution shall rest with the County Surveyor and his decision shall be final and binding. All references to the County herein shall mean the County Surveyor or the private engineer authorized to inspect.
- B. Inspection: The developer or his authorized representative shall notify County Surveyor, or private engineer authorized to inspect, not less than forty-eight (48) hours in advance of the time of starting or resuming work on the water facilities so that arrangements for inspection of the work can be made.

Tanks and all appurtenances inside the tank easement lines are covered by building permit and inspected by Building Inspectors.

- C. Developer's Engineer: Developer's Engineer shall perform the necessary field staking, and any plan modifications that are required. When authorized by the County Surveyor, he shall interpret all questions relative to the plans and specifications subject to the approval of the County Surveyor. He may stop the work when necessary to prevent its improper execution.
- D. Developer and Contractor: No pipe, valve and/or appurtenance shall be backfilled until the installation of the pipe, valve and/or appurtenance has been inspected and approved. Where backfilling is made prior to inspection and approval, re-excavation and exposure of the pipe, valve and/or appurtenance for examination may be required before approval of the installation is obtained.

Materials: No valve, pipe, fitting, hydrant, valvebox, or other material shall be installed in the water system until approval has been granted by the County. The County may require the brand name and manufacturer's number to be submitted in writing with the manufacturer's drawings for each type of item mentioned above to be furnished, together with a certification from the manufacturer that the materials meet all the requirements of these specifications.

Samples and Tests: At the option of the County, the source of supply of each of the materials proposed for use on the work shall be approved before the delivery is started and before such materials are used in the work.

Representative preliminary samples of the character and quality prescribed may be required to be submitted by the Contractor or producer of the materials to be used in the work for testing or examination when requested.

The cost of securing samples, the material furnished for the sample, and the testing of the sample shall be borne by the developer or his Contractor.

Testing of materials shall be made by a testing laboratory regularly engaged in testing work.

All tests of materials furnished by Contractor shall be made in accordance with the commonly recognized standards of national technical organizations and such special methods and tests as are prescribed in these specifications. Contractor shall furnish certified copies of the test results. Samples will be obtained and tested whenever necessary to determine the quality of the material.

All instructions, rulings and decisions of the County Surveyor or his authorized representatives shall be final and binding.

## EARTHWORK

### 3.1.0 GENERAL

The provisions of this section apply to trench excavation, and trench backfilling for the installation of underground water mains and their appurtenances. The work consists of furnishing all labor, equipment, materials, transportation and services necessary for excavating and backfilling of trenches in accordance with these specifications, except that where City and/or County and/or State Special Provisions have other requirements, their requirements shall take precedence.

Contractor shall remove paving as may be required, excavate the trenches to required dimensions, place bracing and shoring to conform to the State of California Safety Code, provide for drainage of ground and surface water, provide flagmen for traffic control; restore or cause to be restored all damaged property including pipe, conduits, gas, water, other services, fences, guard rails, monuments, stakes and public or private property to the condition that existed prior to the beginning of the work; plug all open abandoned pipe, drains and sewers within the trench area with mortar or concrete; backfill and compact the trench and pits, restore the roadway surface, remove surplus excavated material, clean-up the site and perform all other work incidental thereto.

### 3.1.1 PROTECTION OF PROPERTY AND STRUCTURE

All underground utilities or structures such as drains, sewers, manholes, catch-basins, conduit, ducts, gas lines and other obstructions encountered in the progress of the work shall be adequately protected and maintained by the Contractor. Should any underground utility or structure be damaged by Contractor's operation, the owner of the utility shall be immediately notified of the damage.

Trees, shrubbery, fences, poles and all other surface structures shall be protected unless their removal is shown on the plans, authorized by the owner or authorized by the County Surveyor. When it is necessary to cut roots and tree branches, such cutting shall be done under the supervision and direction of the Developer's Engineer.

Should any surface structure or property be damaged by Contractor's operation, he shall immediately notify the proper owner or authority and arrange for immediate repair or replacement of same.



### 3.1.2 MAINTENANCE OF TRAFFIC

Where required, a schedule of operations affecting traffic shall be approved by the controlling agency in advance of the closing of a street and prior to initiation of construction. Contractor shall post suitable signs where directed by the controlling agency indicating that the street is closed and diverting the traffic to necessary detour routes.

When traffic must cross open trenches, Contractor shall provide suitable bridges. Bridges shall also be provided at street intersections, entrances to private properties, and pedestrian ways. The type of bridging used shall conform to the controlling governmental agency's specifications.

### 3.1.3 MAINTENANCE OF UTILITY CONTROLS

Hydrants under pressure, valve pots, valve boxes, meter boxes, fire and police call boxes, or other utility controls shall be maintained and accessible at all times until the work is completed, unless otherwise indicated on the plans or directed by the Developer's Engineer.

### 3.1.4 BARRICADES, GUARDS AND SAFETY PROVISIONS

Where required, adequate barricades, construction signs, flasher lights, guards, etc. shall be placed and maintained in operating order throughout the progress of the work and until it is safe for traffic to use the right of way. All material piles, equipment and pipe which are in the opinion of the Developer's Engineer, obstructions to traffic shall be similarly marked during the progress of the construction work and until it is safe for traffic to use the right of way. The spacing between flasher lights shall be not more than fifty (50) feet along the length of the trench where it is adjacent to or within the boundaries of a thoroughfare unless closer spacing is required by the controlling governmental agency. Flagmen shall be provided as required by the governing agencies for the regulation of traffic.

### 3.1.5 REMOVAL OF EXISTING PAVEMENT

Existing concrete pavement, driveways or sidewalks to be removed for the installation of a water main, shall be neatly sawed along the edges of the trench to a depth of not less than one and one-half (1½) inches with a concrete pavement saw. Bituminous pavement need not be sawed but shall be cut to clean straight lines.

### 3.1.6 REMOVAL OF WATER

Contractor shall provide and maintain at all times during construction ample means and devices with which to promptly

### 3.1.6

remove and properly dispose of all water entering the excavations. No main, valves, appurtenances, concrete foundations, or thrust blocks shall be laid in water. Water shall not be allowed to rise over concrete foundations or thrust blocks until the concrete has set not less than twenty-four (24) hours.

Contractor shall dispose of the water from the work in a suitable manner without prior consent of the Developer's Engineer.

Water shall be disposed in such a manner as not to be a menace to the public health.

### 3.1.7 EXCAVATION

#### A. General

Excavation shall comprise and include the satisfactory removal and disposal of all materials excavated, regardless of the nature of the materials encountered, and therefore shall be understood to include both rock excavation and common excavation when both classes are present.

All excavated material shall be stockpiled in a manner which will not endanger the work. Excavated material not required in other areas shall be removed from the job site.

#### B. Trench Excavation

The trench shall be excavated to the line and grade indicated on the plans.

Where the bottom of the trench is found to be unstable or to include material which, in the opinion of the Developer's Engineer is unsuitable for proper bedding of the main, Contractor shall over-excavate and remove such unsuitable material to the width and depth ordered by the Developer's Engineer. Before the main is laid, a new subgrade shall be prepared by backfilling with an approved material in layers of not more than six (6) inches in uncompacted depth. The layers shall be thoroughly tamped as directed so as to provide an adequate bearing and support for the main.

Where the bottom of the trench is found to consist of material which is unstable to such a degree that, in the opinion of the Developer's Engineer it cannot be removed and replaced with an approved material to properly support the main, Contractor shall construct a foundation for the pipe in accordance with plans prepared by the Developer's Engineer.

3.1.7.B

Where the bottom of the trench is found to consist of rock or boulders, the trench shall be over-excavated as directed by the Developer's Engineer and the subgrade shall be made by backfilling with an approved material in layers of not more than six (6) inches in uncompacted depth. The layers shall be thoroughly compacted as directed so as to provide an adequate bearing and support for the main.

Where the bottom of the trench, through the negligence of Contractor, is excavated below the grade indicated on the plans, or on the control stakes, the Developer's Engineer shall determine what effect the over-excavation shall have upon the placement of the main. When directed to do so by the Developer's Engineer, Contractor shall prepare a new subgrade by backfilling with an approved material in layers of not over six (6) inches in uncompacted depth. The layers shall be thoroughly compacted as directed so as to provide an adequate bearing and support for the main.

C. Width of Trench

The width of the trench shall be as shown on the plans or as specified hereinafter. The minimum clear trench width measured at the horizontal diameter of the main shall be eighteen (18) inches, or one (1) foot greater than the outside diameter of the barrel of the main, whichever is greater. The maximum clear width of trench at the top of the main shall be not more than the outside diameter of the barrel of the main plus two (2) feet. Greater width of trench at the top of the main shall be permitted only on approval by the Developer's Engineer.

Excessively wide and non-uniform trench excavation shall not be permitted. Trenches so constructed shall be backfilled when directed by the Developer's Engineer.

D. Normal Trench Bracing

The manner of bracing trench excavations shall conform in all respects to the Construction Safety Orders of the Division of Industrial Safety of the State of California. Failure to comply with these requirements shall result in immediate suspension of the work. Stoppage of the work shall remain in effect until full compliance with the regulations is obtained.

E. Special Trench Bracing

Where the cost of the work is in excess of \$25,000 and where the depth of the excavated trench is five (5) feet or more in depth, Contractor shall submit to Developer's Engineer, for approval in advance of the start of the excavation a detailed plan showing the design of

3.1.7.B

shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of such trench or trenches. If such plan varies from the shoring system standards established by the Construction Safety Orders, the plan shall be prepared by a registered civil or structural engineer.

Nothing in this sub-section shall be deemed to allow the use of a shoring, sloping, or protective system less effective than that required by the Construction Safety Orders of the Division of Industrial Safety.

The above requirement is set forth in Section 6422 of the Labor Code of the State of California.

3.1.8 BACKFILL

A. General

Backfilling of trenches shall be done in such a manner as not to disturb the main, valves, fittings or appurtenances. In all cases the backfill around the main and to an elevation six (6) inches over the top of the main shall be backfilled with select material as hereinafter specified. Native material shall not be permitted in the area indicated above. When native material is used, Contractor shall remove same from the trench.

Backfilling of the trench shall not begin until after the main installation has been inspected and approved by the Developer's Engineer. Backfilling of the trench prior to inspection and approval may require re-excavation of the trench, if directed by the Developer's Engineer, for the purpose of inspecting the main.

B. Trench Backfill in Existing or Proposed Future Street Right of Way to Six (6) Inches Above Top of Main

Trench backfill material shall consist of unwashed creek or bank gravel, crushed gravel, crushed rock, bank run rock, sand or a mixture of these materials. It shall be free from roots, vegetable matter or other deleterious substance, and shall be of such nature and so graded that it will bind readily when watered and compacted. Pea gravel shall not be permitted as a backfill material.

When tested in accordance with the State of California, Department of Public Works, Division of Highways Standard Specifications, the material shall conform to the following gradation requirements and shall have a sand equivalent of not less than 20 and shall have an R value of not less than 35.

BACKFILL GRADATION

Passing the 1"	sieve	100%
Passing the 3/4"	sieve	90-100%
Passing the No. 4	sieve	35-100%
Passing the No. 30	sieve	5-40%

In place of the above graded material, coarse sand or 1/4 X 6 chips may be used having a sand equivalent of not less than 20.

C. Trench Backfill in Existing or Proposed Future Street Right of Way Above Six (6) Inches Above Top of Main

Where not in conflict with City, County or State specifications, material used for trench backfill in existing or proposed future street rights of way shall be as specified hereinafter.

Trench backfill material shall consist of unwashed creek or bank gravel, crushed gravel, crushed rock, bank run rock, sand or a mixture of these materials. It shall be free from roots, vegetable matter or other deleterious substance and shall be of such nature and so graded that it will bind readily when watered and compacted.

When tested in accordance with the State of California, Department of Public Works, Division of Highways Standard Specifications, the material shall conform to the following gradation requirements and shall have a sand equivalent of not less than 30 and shall have an R value of not less than 35.

Passing the 3"	sieve	100%
Passing the 1"	sieve	90-100%
Passing the No. 4	sieve	35-100%
Passing the No. 30	sieve	5-40%

In place of the above graded material, coarse sand or 1/4 X 6 chips having a sand equivalent of less than 30 may be used.

D. Backfill in Easement or Other Areas not Within Existing or Proposed Street Right of Way

Backfill material to six (6) inches above top of pipe shall consist of the same material as specified hereinbefore for "Trench Backfill in Existing or Proposed Future Street Right of Way to six (6) inches Above Top of Main".

Backfill material above six (6) inches above top of pipe may consist of native material when not in conflict

3.1.8.D

with City, County or State specifications governing trench backfill in such areas or when approved by the County.

E. Compaction of Trench Backfill

Trench backfill shall be compacted to a minimum of 90% relative compaction as determined by California Test Method No. 216, unless otherwise specified by the Developer's Engineer or indicated on the plans or stated in the Special Conditions.

Jetting, mechanical tamping or a combination of the two may be used to obtain the required results. When backfilling, no material shall be deposited in depths greater than that which will allow a minimum of 90% relative compaction to be achieved in any portion of that lift. No subsequent lifts shall be placed until the previously compacted lift has been approved. No mechanical tamping will be allowed over the pipe without sufficient cover to avoid damage.

When required by the County or Developer's Engineer, compaction test on the trench backfill shall be made by Contractor in presence of the County or Developer's Engineer at no cost to County, Developer or Developer's Engineer.

3.1.9 CLEAN-UP OF SITE

When excavation within a street right of way or other areas frequented by the public, Contractor shall, at the end of each day's work, remove all excess excavated material and shall maintain the site in a clean and neat condition.

3.1.10 PAVEMENT REPLACEMENT

Unless otherwise shown on the plans, when trenches have been excavated in paved streets, the replacement of the base course material and pavement shall be in kind and shall meet the requirements of the controlling agency but in no case shall it consist of less than 12" of Class 2 A.B. compacted to 95% relative compaction and 4" A.C. placed in two lifts.

In replacement of other paved areas, such as shopping centers, etc., an untreated base shall be placed and compacted and have a depth equal to the existing base course material plus two (2) inches, but not less than six (6) inches. The surfacing shall be replaced in kind unless otherwise stated on the plans or directed by the County.

## INSTALLATION OF ASBESTOS CEMENT PIPE AND APPURTENANCES

### 3.2.0 GENERAL

This section covers the installation of Asbestos Cement Pipe and Appurtenances, including the handling, unloading, stringing of pipe and appurtenances along the trench, making connections to existing mains, cutting of the pipe, inspection, installation of service connections, fittings, valves, fire hydrants, blowoffs, air and vacuum and air release valves, thrust blocks, curb markings, marker posts, and all other miscellaneous work required for the installation of the water system.

All work shall comply with AWWA C-600 and C-603 except as may be modified by the approved plans, applicable Standard Details and/or these specifications.

Contractor shall notify the Developer's Engineer not less than twenty-four (24) hours in advance of the time of unloading or installation of main valves and appurtenances so that arrangements for inspection of the unloading or installation of the pipe and appurtenances may be made.

### 3.2.1 UNFIT OR REJECTED MATERIAL

All material may be inspected for defects and conformity to the specifications prior to lowering into the trench. Any pipe, valve or appurtenance whether installed or not which, in the opinion of the Developer's Engineer, does not meet the requirements of these specifications or otherwise found unfit, shall be rejected as being unfit and shall be immediately removed from the job site.

### 3.2.2 HANDLING AND UNLOADING PIPE AND APPURTENANCES

All pipe and appurtenances shall be loaded for delivery in such a manner as to avoid damage to the pipe or appurtenance.

Delivery of pipe and appurtenances to the site of the work shall not take place until immediately prior to the installation thereof.

Unless otherwise indicated on the plans or directed by the Developer's Engineer, pipe and appurtenances shall be distributed along the trench by Contractor opposite or near the place where it is to be laid.

All pipe and appurtenances shall be handled with care to avoid damage. Whether moved by hand, skidways or hoists, the pipe shall not be dropped or bumped against other pipe, accessories, or other objects.

3.2.2 Contractor shall replace any pipe section, fitting or appurtenance which has been damaged during loading, transporting, unloading, installation or as a result of faulty support while stored on the site of the work.

3.2.3 LINE, GRADE, AND PREPARATION OF TRENCH BOTTOM

All pipe and appurtenances shall be laid and maintained to the lines and grades shown on the plans.

The trench bottom shall be of even grade, prepared to receive the pipe and appurtenances; shall be free of clods, rock and excess spoil material; and shall be "crumbed" to an even stable grade, prior to the installation of the pipe and appurtenances.

3.2.4 INSTALLATION OF WATER MAIN

A. General

All water mains and appurtenances shall be carefully lowered into the trench by means of a crane, ropes or other suitable equipment consistent with safety, in such manner to prevent damage to the pipe or appurtenance. Under no circumstances shall any material be dropped or dumped into the trench.

All foreign matter or dirt shall be removed from the interior of all water mains and appurtenances before lowering into the trench. The interior of all water mains and appurtenances shall be kept clean by approved means before, during, and after laying. When directed by Developer's Engineer, the inside of the main shall be swabbed to remove all dirt prior to installation. Open ends of the mains and appurtenances within the trench shall be closed by approved means to prevent entrance of trench water, animals, or other foreign matters, when the laying operation is not in progress. Pipeline shall not be left overnight with less than 6 inches of cover or without a plug.

No main or appurtenance shall be laid in water, or when, in the opinion of the Developer's Engineer, the trench conditions or the weather are unsuitable for construction. Any water main which has floated shall be removed from the trench and be relaid in accordance with these specifications.

B. Installation of Asbestos Cement Pipe

Asbestos cement pipe shall be installed in accordance with AWWA C-603 except as may be modified herein.

Sufficient short lengths of pipe shall be provided for making connections to valves, fittings, appurtenances and closures.



#### 3.2.4.B

The trench for asbestos cement pipe shall be excavated and the trench bottom scarified a minimum of 3 inches below the grade of the bottom of the pipe in order to insure that no hard objects will bear upon the pipe after placement. All hard objects larger than 1 inch in diameter shall be removed from the area under the pipe. Alternatively, Contractor may over excavate by 3" from the grade of the bottom of the pipe and replace the overexcavation with approved select native or imported material containing no hard objects over  $\frac{1}{2}$ " in diameter.

Depressions shall be made at each coupling prior to placing the pipe in order to assure that the entire length of the pipe will have uniform bearing and the coupling will not bear against ground. Care must be taken to remove bell-hole material to a part of the trench that will not cause any portion of pipe to be "mounded".

The main shall be held to line and grade by securing select approved backfill material carefully tamped under and on each side of the main over the entire length. No deviations shall be made from the line or grade shown on the plans except with the approval of the Developer's Engineer.

The cutting of the main for inserting into the bells of valves and fittings, or for closures, shall be done in neat and workmanlike manner without damage to the main and in accordance with manufacturer's instructions.

Where it is required that the pipe be connected to another pipe, valve, or fitting of different manufacture or joint design, appropriate adaptors approved by the Developer's Engineer, shall be used to make the connection.

- 1) Minimum Cover and Clearances: The minimum depth of cover listed below shall be provided between the top of the main and the undisturbed subgrade or finished grade whichever provides the greater cover, unless indicated otherwise on the plans.

	<u>Undisturbed Subgrade</u>	<u>Finished Grade</u>
2", 4", 6" and 8" Diameter	2'0"	3'0"
10", 12" Diameter	2'6"	3'6"
14" and Larger	3'0"	4'0"

A minimum vertical clearance of twelve (12) inches shall be maintained between the water main and all foreign structures, and a minimum horizontal clearance of five (5) feet shall be maintained between utilities except sanitary sewers where at least 10'

3.2.4.B.1)

clearance shall be maintained, unless otherwise indicated on the plans or approved by the County Surveyor or County Health Officer.

If structures, pipes, manholes, etc., are encountered such that the water main must be relocated horizontally, the relocation shall be made as directed by the Developer's Engineer.

If foreign structures are encountered such that the water main must be raised, the minimum cover shall be as hereinabove indicated unless otherwise directed by the Developer's Engineer. Where required, a six (6) inch thick concrete pad, twelve (12) inches wider than the trench width, reinforced longitudinally and transversely with #4 bars at twelve (12) inch centers shall be installed over the pipe.

- 2) Joints in Asbestos Cement Pipe: Asbestos cement pipe shall be joined with an asbestos cement coupling consisting of an asbestos cement sleeve and two rubber rings. The machined ends of the pipe to be jointed, the inside of the sleeve and the two (2) rubber rings shall be wiped clean immediately prior to installation. The joint assembly shall be made in accordance with the recommendations of the pipe manufacturer.

On completion of the joint assembly, the pipe ends within the coupling shall be separated by not less than one-quarter (1/4) inch. The rubber ring location shall be checked after assembly with a suitable gage. If the location does not fall within the required limits of the manufacturer, the coupling shall be disassembled and reassembled in an acceptable manner.

Asbestos cement pipe in sizes six (6) inches through twelve (12) inches shall not be deflected more than two (2) degrees during assembly and not more than three (3) degrees when finally installed; fourteen (14) inch and sixteen (16) inch pipe shall not be deflected more than one and one-half (1½) degrees during assembly nor more than three (3) degrees after assembly. For convenience, the following chart is provided:

Angle of Deflection at Coupling	Offset per Pipe Length*		
	1 Ft.	6½ Ft.	13 Ft.
1 degree	0.2 inch	1.3 inch	2.7 inch
2 degrees	0.4 inch	2.7 inch	5.4 inch
3 degrees	0.6 inch	4.0 inch	8.1 inch

\*Approximate to tenth of an inch.

### 3.2.5 Installation of Appurtenances

#### A. General

The installation of appurtenances shall be in accordance with the following paragraphs and the applicable Standard Details referred to therein.

All ferrous metal fittings, such as tees, crosses, bends, reducers, fire hydrant buries, plugs, flanges, valve bodies, nuts, bolts, galvanized iron pipe, black iron pipe, etc., shall be coated as specified in Sub-Section 3.5.

#### B. Installation of Valves and Fittings

Valves and fittings having hub ends shall be connected to the main by means of rubber rings of the same type used to join asbestos cement pipe. Valves and fittings having flanged ends shall be connected to asbestos cement pipe by means of a flange by hub adaptor unless other means are approved by the Developer's Engineer.

If two (2) valves, fittings or valve and fitting, more than 6'6" apart, are to be connected by means of asbestos cement pipe, the connecting main shall be in two (2) or more lengths joined with one (1) or more couplings. If the distance is less than 6'6" between adjacent valves, fittings or valve and fitting, asbestos cement pipe shall not be used. Fittings shall be provided with thrust blocks as shown on the Standard Details.

Valves and fittings which are required to be bolted together to form a single unit shall be assembled and coated as specified in Sub-Section 3.5 prior to lowering into the trench.

#### C. Installation of Air and Vacuum and Air Release Valves

Air and vacuum and air release valves shall be installed where indicated on the plans or at high points in the main as directed by the Developer's Engineer.

Installation of air and vacuum and air release valves, unless otherwise indicated on the plans or directed by the Developer's Engineer, shall be in accordance with applicable Standard Details.

#### D. Installation of Pressure Reducing Valves

Pressure reducing valves shall be installed where indicated on the plans and in accordance with the details shown thereon.

### 3.2.5 E. Installation of Fire Hydrants

All fire hydrants shall be installed in accordance with applicable Standard Details at the location indicated on the plans.

If the Developer's Engineer finds that a fire hydrant is improperly installed, the hydrant shall be removed and reinstalled properly at no cost to Developer.

### F. Installation of Blowoffs

All permanent and temporary blowoffs indicated on the plans or required by the Developer's Engineer, shall be constructed in accordance with the applicable Details.

Temporary blowoffs may be used upon approval of the Developer's Engineer for disinfecting and/or pressure testing the main. Contractor shall remove the temporary blowoffs at the completion of the work.

### G. Installation of Steel, Cast Iron, or Ductile Iron Service Connections or Fire Hydrant Runs

Steel, cast iron, or ductile iron service connections or fire hydrant runs shall be installed where indicated on the plans. Steel pipe used for service connections and fire hydrant runs shall be coated as specified in Sub-Section 3.5.

### H. Installation of Valve Boxes and Valve Box Risers

Valve boxes and valve box risers shall be installed on all valves unless otherwise indicated on the plans or directed by the Developer's Engineer. Installation of valve boxes and valve box risers, unless otherwise indicated on the plans, shall be installed in accordance with applicable Standard Details.

### I. Installation of Brass Items

Brass items cover corporation stops, curb stops, angle meter stops, and coupling nuts.

Installation details for the several brass items are covered by applicable Standard Details. Contractor's attention is directed to the Standard Details covering the installation of the various items.

### J. Installation of Service Connections

Service connections shall be installed in accordance with applicable Standard Details and Section 317, Paragraph (e) of Uniform Plumbing Code, 1964 edition.

#### 3.2.5.J

Service connections shall be adjusted to proper relationship with curb and/or sidewalk and angle meter stops shall be properly located prior to meter installation.

If the Developer's Engineer finds that service connections are improperly installed, these service connections shall be abandoned at the water main and new service connections installed.

The installation of union connectors on service connections shall not be permitted under concreted areas such as driveways, sidewalks, curbs and gutters.

#### K. Installation of Saddles (Service Clamps)

Saddles shall be installed where indicated on the plans, required by the Developer's Engineer, or required by the Standard Specifications. Installation of saddles shall be in accordance with applicable Standard Details.

Ferrous metal saddles shall be coated in accordance with Sub-Section 3.5.

Saddle outlet to be concentric with tapped outlet on water main.

#### L. Testing and Chlorination of Appurtenances

All appurtenances shall be pressure tested and chlorinated concurrently with the main to which they are attached.

### 3.2.6 THRUST BLOCKS, VALVE BLOCKS AND REVERSE ANCHORS

Thrust Blocks and/or reverse anchors shall be provided for all bends, tees, crosses and where indicated on the plans or required by the Developer's Engineer. Valves and reducers shall be blocked when required as indicated by the Developer's Engineer or indicated on the plans. Thrust blocks and reverse anchors shall be constructed in accordance with the Standard Details and shall bear against undisturbed earth. If in the opinion of the Developer's Engineer, the earth against which the anchor bears is unsuitable to support the imposed load, Contractor shall provide such additional anchorages as may be required by the Developer's Engineer. Ground against which concrete is to be placed shall be moistened prior to placing so that it will not absorb excessive moisture from the fresh concrete. Forms, if required, shall be smooth, mortar tight and of sufficient strength to maintain shape during the placing of the concrete. Placing methods shall be such that the concrete will be placed in its final position without segregation. All concrete shall be spaced, placed, and rodded to insure smooth surfaces along form lines and to eliminate rock pockets. The use of

3.2.6 mechanical vibrators will not be required on reverse anchors, thrust blocks, or valve supports. Thrust and valve blocks shall be placed in such a manner that pipe and fitting joints will be accessible for repair. No concrete used for thrust blocks shall be in contact with the pipe.

3.2.7 PORTLAND CEMENT CONCRETE

Portland Cement Concrete shall consist of a mixture of Portland Cement, fine aggregate to coarse aggregate will be regulated so as to produce a plastic, workable, and cohesive mixture. The amount of fine aggregate shall be the minimum required to produce sufficient mortar to fill the voids of the coarse aggregate and leave a slight excess for finishing. Each sack of cement shall weigh ninety-four (94) pounds.

All concrete used shall be class "A" concrete and shall contain six (6) sacks of Portland cement and not more than six and one-half (6½) gallons of water per sack of cement per cubic yard of finished concrete. All material required for Portland cement concrete and the procedure for mixing shall meet the requirements set forth in Section 90, State of California, Division of Highways Standard Specifications, latest edition.

3.2.8 CURB MARKINGS

The location of all valves, blowoffs, air valves, services, etc. shall be marked on the closest curb face, if existing, in accordance with the applicable Standard Detail.

3.2.9 MARKER POSTS

A 4"x6"x6' redwood marker post conforming to applicable Standard Detail shall be installed for valves, blowoffs, air valves, etc., where there are no curbs in the immediate vicinity or as directed by the Developer's Engineer.

3.2.10 CONNECTIONS TO EXISTING MAINS

Water Company shall make all wet-tap connections to existing mains and Contractor shall make the closures thereto unless otherwise indicated on the plans or directed by the Developer's Engineer.

Where connections are to be made at an existing blowoff, Contractor shall contact the governing water company 48 hours in advance and remove the blowoff assembly and make the closure, unless otherwise indicated on the plans or directed by the Developer's Engineer.

No new mains shall be connected to existing mains, except by an approved jumper, until the bacteriological tests on the new mains have been approved by County. Jumper pipe shall conform to applicable Standard Detail.

3.2.10 Water Company shall close all valves in making a shutdown, and open all valves in restoring pressure to an existing main and initiating pressure in the new installation.

Contractor shall notify the Water Company not less than forty-eight (48) hours prior to making the closure so that valves may be closed and advance notice of the shutdown may be given to all customers affected. Contractor shall stipulate the expected duration of the shutdown. In general, shutdowns shall be kept as short as possible and shall be made at times when there will be the least interference to the customer. If, due to the nature of the demand on the system, a shutdown of the system is not possible during normal working hours, Water Company shall specify the date and time when a shutdown can be made and Contractor shall adjust his schedule accordingly.

3.2.11 TRACER WIRE OR TAPE

Tracer wire or tape shall be installed with asbestos cement pipe where called for on the plans in accordance with applicable Standard Detail.

3.2.12 TRACER TAPE

Tracer tape shall be installed with polybutlene service connections which are installed at other than 90° to the main, where called for on the plans or where directed by the Developer's Engineer. The tape shall be installed in accordance with applicable Standard Detail.

INSTALLATION OF CAST IRON, DUCTILE IRON AND  
POLYVINYL CHLORIDE PIPE AND APPURTENANCES

3.3.0 GENERAL

This section covers the installation of Cast Iron (CIP), Ductile Iron (DIP), and Polyvinyl Chloride Pipe (PVC) and Appurtenances, including the handling, unloading, stringing of pipe and appurtenances along the trench, making connections to existing mains, cutting of the pipe, inspection, installation of service connections, fittings, valves, fire hydrants, blowoffs, air and vacuum and air release valves, thrust blocks, curb markings, marker posts, and all other miscellaneous work required for the installation of the water system.

All work shall comply to Sub-Section 3.2 "Installation of Asbestos Cement Pipe and Appurtenances" except as modified herein.

Contractor shall notify the Developer's Engineer not less than twenty-four (24) hours in advance of the time of unloading or installation of main valves and appurtenances so that arrangements for inspection of the unloading or installation of the pipe and appurtenances may be made.

3.3.1 CAST IRON AND DUCTILE IRON PIPE

A. Installation of Water Main

Cast Iron Pipe and Ductile Iron Pipe shall be installed in accordance with AWWA C600-77 except as may be modified herein.

- 1) Cover and Clearance: Minimum cover and clearance shall be as required in Sub-Section 3.2.4 shall be observed except as noted below for short runs where less cover is required in order to clear obstructions.

<u>Size</u>	<u>Undisturbed Subgrade</u>	<u>Finished Grade</u>
2", 4", 6", 8"	0'-6"	1'-6"
10" and larger	1'-0"	2'-0"
All	Less than above only if technical data is provided supporting a lesser cover.	

If obstructions are encountered such that the water main must be relocated horizontally, the relocation shall be made as directed by the Developer's Engineer.



### 3.3.1.A

- 2) Corrosion Protection: When 100 or more feet of Cast Iron or Ductile Iron Pipe is being placed together in a development, a survey for corrosion shall be made in accordance with AWWA C-105. If ten (10) or more points are accumulated polyethelene encasement shall be placed around all cast iron or ductile iron pipe in the development in accordance with AWWA C-105. Methods of corrosion protection other than polyethelene encasement may be approved by the Developer's Engineer if requested of the Developer's Engineer together with sufficient supporting data and lead time to allow Developer's Engineer to submit for approval in writing to the County Surveyor and receive approval in writing from the County Surveyor. In no case shall any method of corrosion protection other than polyethelene encasement be used without written approval of the County Surveyor.

### B. Installation of Appurtenances

- 1) General: The installation of appurtenances shall be in accordance with Paragraph 3.2.5 "Installation of Appurtenances" except as modified herein.
- 2) Installation of Valves and Fittings: shall conform to Section 3.6 of AWWA C600-77. Fittings shall be provided with thrust blocks as shown on the plans and Standard Details. Valves and fittings which are required to be assembled and bolted together to form a single unit shall be assembled and coated as specified in Sub-Section 3.5 prior to lowering into the trench.

### 3.3.2 POLYVINYL CHLORIDE PIPE

#### A. Installation of Water Main

- 1) Polyvinyl Chloride Pipe shall be installed in accordance with Section 3.2.4 except as modified herein.
- 2) References to couplings apply to bells.
- 3) References to asbestos cement pipe apply to PVC pipe.
- 4) Minimum Cover and Clearances shall be as noted except that for short runs where less cover is required in order to clear obstructions the following minimums may be allowed:

<u>Size</u>	<u>Undisturbed Subgrade</u>	<u>Finished Grade</u>
2", 4", 6", 8"	1'-6"	2'-6"
10" or larger	2'-0"	3'-0"

3.3.2.A.4) All

Less than above only if technical data is supplied supporting a lesser cover.

5) Joints:

a) Belled joints shall be assembled and the allowable deflection shall be in accordance with AWWA C600-77 except as modified by the manufacturer.

b) Coupled joints shall be assembled and the allowable deflection shall be in accordance with Section 3.2.4, Paragraph B.2 except as modified by the manufacturer.

6) Installation of Appurtenances: Installation of appurtenances shall be in accordance with Section 3.3.1, Paragraph B.

## INSTALLATION OF ENCASEMENTS AND PIPE

### 3.4.0 GENERAL

This section of the specifications covers the installation of encasements and piping within encasements when used within the water system.

### 3.4.1 INSTALLATION OF ENCASEMENT PIPE

Encasement pipe shall be installed where indicated on the plans. Prior to the installation of the encasement, the Contractor shall explore and verify the location and elevation of all existing utilities within the limits of the encasement pipe whether or not these utilities are shown on the plans and he shall notify the Developer's Engineer immediately of any conflicts and discrepancies. The encasement pipe shall be installed accurately to the prescribed line and grade. All boring or jacking operations shall be accomplished by operators proficient in the trade. All equipment shall be of sufficient size and capacity to accurately and efficiently complete the work.

If the encasement pipe is installed prior to the excavation of a receiving pit, the Developer's Engineer may require Contractor to sufficiently expose the blind end of the encasement pipe for verification of plan line and grade. If the encasement pipe is found to deviate from plan line and grade by an amount which in the opinion of the Developer's Engineer will require changes in the alignment of the water main, such changes shall be made by Contractor at no cost to Developer.

All work involved in the installation of the encasement pipe shall be done in strict accordance with the requirement of the governmental agency or railroad issuing the permit.

### 3.4.2 INSTALLATION OF WATER MAINS WITHIN ENCASEMENT PIPE

Only cement mortar lined and coated steel pipe shall be installed in encasements. Pipe installed in encasements shall be separated from the encasement by means of insulators.

Insulators shall be installed at not more than ten (10) feet intervals with one (1) insulator located at not more than twelve (12) inches from each end of the encasement pipe. Insulators shall completely insulate the water main from the encasement pipe.

Insulators shall be P.S.I. Model A-8 for water mains up to twenty-four (24) inches through forty-four (44) inches in diameter, or approved equal, and shall have PVC liner and phenolic skids.

3.4.2

If a joint falls within the encasement, the joint shall be welded all around. Butt straps shall be required if requested by the Developer's Engineer.

The pipe may be pushed or pulled through the encasement unless the method is specifically stated on the plans or directed by the Developer's Engineer.

A. Encasement Closure

After the main has been installed, the ends of the encasement pipe shall be closed by the use of a casing end seal. The seals shall be Model S Standard Pull On, or Model w/wrap around casing seals as manufactured by P.S.I. Products Co., or approved equal.

## SPECIAL COATINGS AND CORROSION PROTECTION

### 3.5.0 GENERAL

All ferrous metal excepting cast iron fittings including but not limited to caps, plugs, flanges, nuts, bolts, galvanized pipe, black iron pipe, exposed reverse anchor rods, etc., used for buried service shall, prior to being installed in the trench or connected to the main, be coated with tape, mastic, thermo-curing dry powder epoxy or catalyst curing epoxy regardless of the manufacturer's coating unless otherwise directed by the County.

### 3.5.1 APPROVED TAPE COATINGS

Tape coatings shall be used where their application will allow the tapes to be applied without wrinkles or air pockets. If, in the opinion of the Developer's Engineer, the application of tapes will result in a finished product which will not provide an acceptable coating, Contractor shall use the type of coating recommended by the Developer's Engineer.

Tapes that have been approved for use within the water system include but are not restricted to the following:

<u>Tape</u>	<u>Primer</u>	<u>Manufacturer</u>
1. Polyken #900	Polyken #927	Kendall Corp., Polyken Div.
2. Protecto Wrap #200A	Protecto Wrap #1170	Protecto Wrap Co.
3. Royston Greenline	Roybond #747	Royston Laboratories
4. Scotchrap Tape #3	Scotchrap Pipe Primer	Minnesota Mining & Mfg. Co.

Others shall be approved prior to use.

Application of primers and tapes shall be in strict accordance with manufacturer's specifications.

After the application of the primer, the tape shall be firmly wrapped circumferentially on the pipe or appurtenance overlapping each previous wrap by not less than one half ( $\frac{1}{2}$ ) the width of the tape. Wrinkles, air pockets or loose wrap shall not be permitted. Improper wrapping shall be removed, the pipe cleaned and/or reprimed as required by manufacturer's specifications or by the Developer's Engineer, and rewrapped.

### 3.5.2 APPROVED MASTIC COATINGS

Mastic coatings shall be used where the application of a tape coating cannot be satisfactorily applied because of the surface configuration.

### 3.5.2

Mastic coatings that have been approved for use within the water system include but are not limited to the following:

<u>Mastic</u>	<u>Manufacturer</u>
Protecto Wrap CA 1200	Protecto Wrap Co.
Royston - Mastic A-51	Royston Laboratories
Koppers - Bitumastic #505	Koppers Company
Others shall be approved prior to use.	

The application of the mastic coatings shall be in strict accordance with manufacturer's specifications to a thickness of not less than forty (40) mils.

Unless otherwise approved by the Developer's Engineer, all mastic coatings shall be applied not less than twenty-four (24) hours prior to the installation of the item so coated. However, installation of coated items shall not take place until sufficient set has occurred in the coating to allow handling of the coating without damage.

Minor coating damage occurring during installation may be repaired in place or at the option of the Developer's Engineer, shall be removed from the trench and recoated.

Any improperly applied coating shall be removed, the item cleaned and recoated as required by the Developer's Engineer.

No backfill or concrete pour around any coated item shall take place until sufficient curing of the coating or coating repair has occurred.

### 3.5.3 EPOXY COATINGS

Coatings in this classification shall be either thermally cured epoxy or catalyst cured epoxy. Epoxy coatings shall be applied in strict compliance with manufacturer's specifications and shall not be field applied unless approved by the Developer's Engineer for repair to damaged sections.

#### A. Surface Preparation

Surface preparation shall be by approved abrasive blast cleaning methods and shall be finished to NACE-1 (National Association of Corrosion Engineers) standards. No coating shall be applied over a prepared surface on which oxides have formed as the result of delays in applying the coating to the prepared surface. Reblasting of such surfaces to original specifications shall be required if oxide formation is detected.

#### B. Thermal Curing Epoxy

Thermally cured epoxies shall be as manufactured by Minnesota Mining & Manufacturing, Inc., Scotchkote No. 203,

3.5.3.B

or approved equal, to a thickness of not less than twelve (12) mils dry film thickness.

Thermally cured epoxy shall be applied to all ferrous metal saddles and "U" bolt assemblies except threaded parts. All metallic parts of the saddle not coated by epoxy shall be coated by an approved mastic coating.

Thermal curing epoxy coatings shall be inspected as set forth in Paragraph C below.

Damaged thermally cured coatings may be field repaired as directed by the Developer's Engineer using an approved compatible catalyst cured epoxy. Application of the catalyst cured epoxy shall be as specified in Paragraph C below.

C. Catalyst Cured Epoxy

Catalyst cured epoxy shall be applied in strict compliance with manufacturer's specification. Catalyst cured epoxy shall be applied in a minimum of two (2) coats having a final minimum dry film thickness of not less than twenty (20) mils.

Mixing of the two part coating system shall be exactly as specified by the manufacturer. Application may be by brush or spray.

Curing time for these coatings shall be as specified by the manufacturer for the fully cured condition and no installation of an item so coated or backfilling of any coating repaired by this process shall be done until final cure of the catalyst cured epoxy system is complete.

Acceptable catalyst cured epoxies for water systems include but are not limited to the following:

<u>Epoxy Coating</u>	<u>Manufacturer</u>
1. #302 Scotchkote	Minnesota Mining & Mfg.
2. #300 - M	Koppers Company
3. Tarsel	Pittsburg Paint Company
4. Coal Tar Epoxy #43H61	Dutchboy Paint Company
Others shall be approved prior to use.	

D. Epoxy Coating Inspection

All applied epoxy coating systems shall be inspected for thickness and flaws. These inspections may be conducted by the Developer's Engineer at the point of application or at the job site. The decision of the Developer's Engineer regarding results shall be final.

## WELDING

### 3.6.0 GENERAL

Welding of longitudinal seams of steel pipe may be performed automatically by the electric arc method or by an approved resistance method. All other welding shall be done manually by the electric arc method. All electric arc welding shall be done by a process which excludes the atmosphere from the molten metal of the weld.

All field welding shall conform to AWWA C-206 unless otherwise modified herein.

### 3.6.1 PENETRATION, FUSION, SLAG INCLUSION

Penetration is defined as the complete filling of the weld groove with weld metal. Fusion is defined as the bond between beads or between the weld metal and the pipe metal. Slag inclusion is a non-metallic solid entrapped in the weld metal or between the weld metal and the pipe metal. Elongated slag inclusions are usually found at the fusion zone. Isolated slag inclusions are irregularly shaped inclusions and may be located anywhere in the weld. In order to secure adequate penetration, fusion and to prevent slag inclusion, all position welds shall be made with the parts to be joined secured against movement and with adequate clearance around the joint to allow the welder or welders space in which to work.

### 3.6.2 ROOT BEAD

The root bead, being the first or stringer bead which initially joins the two sections of pipe, a section of pipe to a fitting, or two fittings, shall be made by the uphill welding method. The joint shall be free of all foreign matter such as grease, oil, dirt and scale. The welder shall start his weld at or near the bottom and weld approximately one-half way up on each side of the pipe. The entire root bead shall be complete around the circumference before the start of the filler or finish beads. Scale and slag shall be removed from each bead, groove and the stopping point of any weld bead. Cleaning shall be thorough and may be done with chipping hammer and wire brush or power tools.

### 3.6.3 FILLER AND FINISH BEAD

The number of filler and finish beads shall be such that the completed weld shall have a substantially uniform section around the entire circumference of the pipe. At no point shall the crown surface be below the outside surface of the pipe.



3.6.3 Two beads shall not be started at the same location. The completed weld shall be brushed and cleaned.

The filler or finish welds may be run down-hand or up-hand at the option of the welder.

3.6.4 ELECTRODE

The welding electrode is generally selected which is most suitable to the welder. Standard acceptable electrodes are Fleetweld 5 and 5P and designated by the American Welding Society as E-6010. The amperage shall be that suitable to the job and the welder's technique.

3.6.5 DEFECTS

In the event of failures or defects in the weld, the defects shall be entirely removed to clean metal before repairs are made. All slag and scale shall be removed by wire brushing, prior to correcting the defect.

3.6.6 WAIVER OF PROCEDURE

It is understood that many variables exist in executing the various types of weld jobs. These procedures may be waived from time to time where they are impossible or impracticable.

Waiver of welding procedures shall be based on existing conditions of a particular job and are valid only for the duration of the condition requiring the waiver. Procedure waiver must have prior approval of the Engineer.

3.6.7 WELDING TESTS

The Engineer shall be free to perform any standard tests necessary to satisfy himself that the welded seams conform to these specifications. When tested, the weld metal shall show a strength of not less than the strength of the plate being welded. The costs incurred in performance of the test shall be borne by Contractor.

3.6.8 CERTIFICATION OF WELDER

Only certified welders shall be used.

## INSTALLATION OF METERING DEVICES

### 3.7.0 GENERAL

All metering devices and appurtenances consisting of, but not necessarily limited to, meters, detector checks, fire meters, compound meters and master meters, shall be installed by Contractor within public rights of way or easements granted to the Water Company for this purpose.

Metering devices and meter boxes shall be installed by Contractor at the location stakes provided by the Developer's Engineer and shall be considered permanent upon installation and shall not be moved. If movement of a metering device is required as the result of errors in staking or otherwise, the metering device shall be moved by Contractor at no expense to Water Company.

No metering device shall be connected to building water piping which in the opinion of the County Health Officer, Fire Marshal or County Surveyor could endanger any of the water system's facilities.

**SECTION IV**

**TESTING AND DISINFECTING WATER MAINS AND APPURTENANCES**

### GENERAL

All water mains and appurtenances shall be tested for pressure and leakage and shall be disinfected prior to acceptance by the County of Santa Clara Land Development, Engineering and Surveying Department.

Testing and disinfecting of water mains and appurtenances shall in accordance with the applicable AWWA Standards except as may be modified herein.

All testing and disinfecting of water mains and appurtenances shall in the presence of the Engineer. The Contractor shall notify the Engineer not less than forty-eight hours in advance of the actual time of testing and/or disinfecting so that the Engineer may observe the procedure.

### CONNECTING TO EXISTING WATER LINES

No permanent connection between any water main that has not passed a bacteriological test (hereinafter referred to as a unsterile main) shall be made to any existing water main or to any water main that has previously passed a bacteriological test (hereinafter referred to as a sterile main) except as may be approved by the Engineer.

Water required for initial filling, pressure testing, leakage testing, and chlorination of an unsterile main may be obtained from a sterile main by use of a jumper connection. The construction of the jumper connection proposed for use shall conform to Standard Detail unless otherwise approved by the Engineer prior to installation.

If a jumper connection is used for initial filling of the unsterile main, the jumper connection shall be vented to atmosphere or disconnected from the sterile main and remain vented or disconnected until after the pressure and leakage tests have been completed. Upon completion and acceptance of the pressure and leakage tests, the jumper connection may be used to facilitate the flushing and the introduction of chlorine into the unsterile main, after which the jumper pipe shall again be vented or disconnected.

Upon approval of the bacteriological test, a permanent connection shall be made between the two mains. The pipe used to make the connection shall be cleaned and disinfected with a swab saturated with a five (5) percent hypochlorite solution or by means approved by the Engineer.

## PRESSURE TEST

All newly laid or repaired water mains shall be pressure tested in accordance with Section 19 of AWWA C603 except as modified herein. The pressure test shall not be performed until the following conditions have been met:

### 4.2.1 UNIMPROVED AREAS

In unimproved areas, that is, in areas where no pavement surfacing of any nature is to be constructed, the pressure test shall be made only after the backfill has been placed and satisfactorily compacted and the general area has been rough graded to approximately finished grade; all angle meter stops, fire hydrants and other appurtenances have been adjusted and set to final grade and location in accordance with Standard Drawings; and until not less than seventy-two (72) hours have elapsed since the last concrete thrust block, reverse anchor or valve pad has been cast.

### 4.2.2 IMPROVED AREAS

In improved areas, that is, in areas where a pavement surfacing is to be constructed, the pressure test shall be made only after all other utilities, such as, storm sewers, sanitary sewers, P.G. & E., P.T. & T., cablevision, etc., have been installed and the sub-grade material portion of the pavement area has been constructed to proper grade, satisfactorily compacted and approved by the City, County, or State; all angle meter stops, fire hydrants and other appurtenances have been adjusted and set to final grade and location in accordance with the Standard Drawings; and until not less than seventy-two (72) hours have elapsed since the last concrete thrust block, reverse anchor or valve pad has been cast.

The pressure test shall be not less than two (2) hours duration. Contractor may at his convenience conduct a preliminary pressure test at any time prior to County pressure test. The results of the preliminary test will not be considered by County.

The amount of water main footage to be tested at one time shall be as determined by the Engineer.

Each section of water main to be tested shall be slowly filled with water from the nearest source by means of a jumper pipe as specified hereinbefore in Sub-Section 4.1. Asbestos cement pipe and cement mortar lined pipe shall be filled with water not less than twenty-four (24) hours prior to testing.

4.2 All air should be vented from all high spots in the water main before making any pressure tests.

Where temporary bulkheads are used to test isolated portions of steel mains with O-Ring joints, the joints downstream from the temporary bulkhead shall be welded.

The test pressure shall be one and one-half ( $1\frac{1}{2}$ ) times the operating pressure at the lowest elevation of the water main under test. However, notwithstanding the above, no water main shall be tested at less than one hundred fifty (150) pounds per square inch pressure.

The specified test pressure shall be measured at the point determined by the Engineer. The pressure shall be applied by means of a pump connected to the main in a manner satisfactory to the Engineer. The pump, pipe connection, bulkheads, pressure gage and all other equipment, materials and labor required for performing the pressure test shall be furnished by Contractor.

The Engineer may check the test pressure by installing a County test gage in place of Contractor's gage. In case of a difference in pressure readings between gages, County's gage reading shall govern in all cases.

### LEAKAGE TEST

A leakage test shall be made on all newly laid or repaired water mains in accordance with Section 19 of AWWA C-603 except as modified herein.

A pressure of one and one-half (1 1/2) times the operating pressure at the lowest elevation of the water main, but not less than one hundred fifty (150) pounds per square inch, shall be applied to the water main for the leakage test and shall be maintained as constant as possible for not less than thirty (30) minutes. The leakage test shall be held after the pressure test. The total elapsed time of the two (2) tests shall be not less than two and one-half (2 1/2) hours. If the leakage test is not performed immediately after the pressure test, or if the water main is empty or not completely filled with water, it shall be slowly filled with water from the nearest source by means of a jumper pipe as specified hereinbefore in Sub-Section 4.1.

Asbestos cement pipe and cement mortar lined pipe shall be filled with water not less than twenty-four (24) hours prior to leakage test.

#### 4.3.1 ALLOWABLE LEAKAGE ASBESTOS CEMENT PIPE

The measured leakage shall not exceed the ranges given in the following table:

##### ALLOWABLE LEAKAGE PER 1,000' OF MAIN

##### Test Pressure at Lowest Point in Main, psi

Pipe Diameter (Inch)	150	200	225
	Leakage - in gallons for 30 - minute test		
2	.28	.32	.33
4	0.55	0.63	0.67
6	0.83	0.95	1.01
8	1.10	1.27	1.35
10	1.38	1.59	1.68
12	1.65	1.90	2.03
14	1.92	2.23	2.36
16	2.20	2.55	2.70
18	2.48	2.86	3.03

\*It is assumed that there are 90 couplings per 1,000 feet of installed main.



#### 4.3.2 ALLOWABLE LEAKAGE - STEEL PIPE

The measured leakage for steel pipe shall not exceed the following:

##### A. O-Ring Joints

O-Ring joint steel pipe shall not exceed five (5) gallons per inch diameter per twenty-four (24) hours per mile of main.

##### B. Welded Joints

Welded joint steel pipe shall not exceed one and one-half (1½) gallons per inch diameter per twenty-four (24) hours per mile of main.

##### C. Flanged Joints

Flanged joint steel pipe shall not exceed one and one-half (1½) gallons per inch diameter per per twenty-four (24) hours per mile of main.

#### 4.3.3 ALLOWABLE LEAKAGE - OTHER PIPE TYPES

The measured leakage for other types of pipe shall be as specified in the latest AWWA Standards.

#### 4.3.4 EQUIPMENT

The pump, pipe connection, measuring devices, gages and all other equipment, materials and labor required for performing the leakage test shall be furnished by Contractor. The Engineer may, however, use County gages and measuring devices in place of Contractor's equipment. In case of a difference in the measured leakage rate between the measuring devices, County's measured leakage shall govern in all cases.

#### 4.4.3

Water used to convey the chlorine solution throughout the water main shall be obtained from the existing distribution system through a jumper pipe or any other approved source of supply. The rate of flow shall be so controlled that water will flow slowly into the unsterile main during the application of chlorine. Valves shall be manipulated so that the chlorine solution in the main being chlorinated will not flow back into the main supplying the water.

The end of the main being chlorinated shall be kept open and running during the application of chlorine and until the desired chlorine concentration is reached, after which each angle meter stop, fire hydrant, air valve line or any other connection to the water main shall be individually opened and flushed with the chlorine solution. After the water main and all connections thereto have been loaded with chlorine to the proper concentration, the water source, chlorine feeder and all other openings to the water main shall be closed.

The chlorine solution shall remain in the water main for not less than twenty-four (24) hours after which the treated water through the length of the unsterile main shall contain not less than twenty-five (25) milligrams per liter of chlorine.

The chlorine content of the water shall be tested by the Engineer and if found to be less than twenty-five (25) milligrams per liter after twenty-four (24) hours contact, the water main and appurtenances shall be rechlorinated and held again for another twenty-four (24) hour period.

Upon approval of the chlorine residual by the Engineer, the chlorine solution shall be flushed from the water main through each service, fire hydrant and blowoff. Flushing shall continue until the chlorine residual is not more than five-tenths (0.5) milligrams per liter as determined by the Engineer.

In no case shall a chlorine solution of over five-tenths (0.5) milligrams per liter be held in the main or appurtenances for more than five (5) days from the initial injection to the final flushing.

TABLE I  
NUMBER OF TABLETS REQUIRED FOR MAIN STERILIZATION

Length of Section	Diameter of Pipe					
	2"	4"	6"	8"	10"	12"
13' or less	1	1	2	2	3	5
18'	1	1	2	3	5	6
20'	1	1	2	3	5	7
30'	1	2	3	5	7	10
40'	1	2	4	6	9	14

## DISINFECTION

All newly laid water mains and appurtenances shall be disinfected in accordance with AWWA C-601 except as modified herein.

### 4.4.1 GENERAL

- A. Precautions shall be taken to prevent soiling of pipe, fittings and other materials. Pipe and fittings shall be stored so as not to accumulate mud or water and other material shall be stored in a clean, dry location.
- B. All pipe shall be clean before lowering into the trench.
- C. When the main is left unattended, even for a short time, the end shall be plugged to prevent the entrance of foreign material or small animals. At least one major waterborne epidemic was probably caused by failure to follow this instruction.
- D. Apply chlorine, using one of the methods described on the following pages.
- E. Isolate line by closing gates and allow heavily chlorinated water to stand therein for at least twenty-four hours.
- F. At the end of the contact period, flush line thoroughly. The ortho-tolidine test should show no more chlorine in the water leaving the main than in water entering the main.
- G. The Contractor's Laboratory personnel shall collect a sample for bacteriological examination and return it to the laboratory. The label shall contain the date and address for the job. The sample shall be taken from a service located near the end of the chlorinated section, or from a tap installed for sampling at the end of the main.

If tests indicate the main was not sufficiently sterilized the chlorine injection method shall be used to rechlorinate the line.

### 4.4.2 H.T.H. TABLET METHOD

Disinfection shall be done prior to pressure and leakage tests. If any work must be done to the main after disinfection which allows any foreign material into the main the main shall be rechlorinated and tested using the Chlorine Injection Method.

#### 4.4.2

This method is preferred for short jobs and for small diameter pipe of any kind. It cannot be used where trench water has entered the main. The main cannot be flushed prior to sterilization, so the method requires that the pipe be kept clean during laying.

Using Permatex No. 1 as an adhesive, fasten the required number of tablets (See Table I) to the top of each length of pipe. Tubes of Permatex may be purchased locally at most auto parts stores. The tablets may be fastened to the pipe before it is placed in the trench providing the top of the pipe is marked to avoid the possibility that the pipe may be rotated.

When installing asbestos-cement pipe, each butt end shall be treated by using an H.T.H. tablet as a piece of chalk. Fasten extra tablets to the beginning of the first length of pipe. To be sure that these tablets start to dissolve as the water enters the main, they would be placed in rows about half an inch above the bottom of the pipe. Use one tablet for each inch of diameter. For long runs, this should be repeated about every 500 feet.

When using dresser or similar couplings, an additional tablet shall be crushed and placed in the annular space between the coupling and the pipe.

Fill the pipe very slowly and proceed as outlined under General Instructions.

#### 4.4.3 CHLORINE INJECTION METHOD

Disinfection shall be done after the pressure and leakage tests have been performed and accepted.

Prior to disinfection, the water main and appurtenances shall be thoroughly flushed with water from the nearest source by means of a jumper pipe as specified in Sub-Section 4.1.

Chlorine used for disinfection may be either liquid chlorine or hypochlorites. If liquid chlorine is used, the method of application and precautions outlined in Sub-Section 6.1 of AWWA C-601 shall be followed, except as may be modified by the Engineer. Chlorine shall be applied by the continuous feed method as outlined in Sub-Section 7.1 of AWWA C-601 except as may be modified by the Engineer.

Chlorine shall be applied at the beginning of the water main to be disinfected through a corporation stop or through any other opening as may be required by the Engineer.

### BACTERIOLOGICAL TEST

Following the flushing of the chlorine solution from the water main, but not sooner than twelve (12) hours thereafter, the Contractor's Laboratory personnel shall secure samples of the water from the water main for laboratory bacteriological examination.

Taps installed in the water main shall be used for securing samples. Taps may consist of angle meter stops, piping to air valves, or risers to blowoffs. If in the opinion of the Engineer a sufficient number of the above type of taps are not available, additional temporary taps consisting of three-fourths (3/4) inch corporation stops shall be installed in the water main at the locations directed by the Engineer.

A sampling gooseneck-type pipe assembly shall be connected to each tap. The sampling pipe may be copper or galvanized steel not greater than one (1) inch diameter and shall extend at least twelve (12) inches above ground, be free of dirt, mud, or other contamination. The top of the sampling pipe shall be turned so as to project toward the street or other drainage facility.

Prior to connecting the sampling pipe to the tap, the sampling pipe shall be flushed clean and disinfected with a chlorine solution containing not less than five (5) percent hypochlorite solution. Flushing of the chlorine solution from the sampling pipe shall be done just prior to the collection of the sample.

Two (2) samples, twenty-four (24) hours apart, shall be taken from each sampling point. The sampling line may remain in place until after the second sample has been obtained, or may be removed between samplings. If the sample pipe is left in place, the end of the pipe should be covered to prevent the entrance of dust or other contamination.

The Laboratory shall notify Contractor and County of the results of the bacteriological tests. Should either the first or second day's bacteriological tests prove positive, that is, failure to pass the bacteriological test indicating that the main is still contaminated, flushing, chlorination and bacteriological sampling shall be repeated as often as necessary until satisfactory results are obtained.

After the disinfection produces satisfactory results, all temporary taps shall be securely closed and all sampling pipes removed and the water main tied into existing system if a tie in is required. In no case shall the water main be placed in service or water used therefrom until the disinfection produces satisfactory results.

4.5

If a newly laid main or portion thereof requires repair or replacement after chlorination due to accidental breakage, etc., extreme caution shall be taken not to contaminate the interior of the undamaged water main with mud, dirt, trench water, etc. If in the opinion of the Engineer the breakage has caused the water main to become contaminated, the water main or damaged portion thereof shall be rechlorinated and retested as outlined above.

## FIRE FLOW TESTS

### 4.6.0 INTRODUCTION

Fire flow tests are made on water distribution systems to determine the rate of flow available at various locations for fire fighting purposes. A certain residual pressure in the mains is specified at which the rate of flow must be available. As an example, if fire department pumpers are used to supply hose streams, a residual pressure of 20 psi is usually specified. If hose streams are used directly from hydrants, a residual pressure of 50 to 75 psi is required depending upon local structural conditions. In the case of tests for automatic sprinkler supply, the residual pressure is usually specified as 15 psi at the top line of sprinklers.

The procedure followed in the field consists of discharging water at a measured rate of flow from the system at a given location and observing the corresponding pressure drop in the mains. From the data thus obtained, it is possible to compute the rate of flow available at any residual pressure.

This sub-section has been reproduced from the American Insurance Associates pamphlet "Fire Flow Tests", 1970 reprint, (address: 465 California Street, San Francisco, California 94104).

### 4.6.1 LAYOUT OF TEST

After the location at which a test is to be run has been determined, a group of test hydrants in the vicinity is selected. One hydrant is chosen to be the residual hydrant at which the normal pressure will be observed with the other hydrants in the group closed, and the residual pressure will be observed with the other hydrants flowing. This hydrant is chosen so that the hydrants which will be flowed are between it and the larger mains which constitute the immediate sources of supply in the area.

The number of hydrants to be used in any test depends upon the strength of the distribution system in the vicinity of the test location. In order to obtain satisfactory test results, sufficient hydrants should be flowed to cause a drop in pressure at the residual hydrant of not less than 10 psi. If the mains are small and the system weak, only one or two hydrants need to be flowed. If, on the other hand, the mains are large and the system strong, it may be necessary



#### 4.6.1

to flow as many as seven or eight hydrants. For a discussion of fire flow tests for automatic sprinkler installations, see The National Board of Fire Underwriters Standard For the Installation of Sprinkler Systems, NBFU Pamphlet No. 13.

#### 4.6.2 EQUIPMENT

The equipment necessary for the field work consists of a single 200-psi bourdon pressure gage with 1-psi graduations, a number of pitot blades, 50- or 60-psi bourdon pressure gages with ½-psi graduations and scales with 1/16-inch graduations (one blade, gage and scale for each hydrant to be flowed), and a special hydrant cap tapped with a hole into which a short length of 1/4-inch brass pipe is fitted. This pipe is provided with a T connection for the 200-psi gage and a cock at the end for blowing off air.

#### 4.6.3 TEST PROCEDURE

In a typical test, the 200-psi gage is attached to one of the 2½-inch outlets of the residual hydrant using the special cap, the cock on the gage piping is opened, and the hydrant valve is opened full. As soon as the air is exhausted from the barrel, the cock is closed. A reading is taken when the needle comes to rest. At a given signal, each of the other hydrants is opened in succession with discharge taking place directly from the open hydrant butts. With all hydrants flowing, a signal is given to the men at the hydrants to read the pitot pressure of the streams simultaneously while the residual pressure is being read. The magnitude of the pressure drop can be controlled by the number of hydrants used, the number of outlets opened on each, and the extent to which the hydrant valves are opened.

After the readings have been taken, hydrants should be shut down slowly and one at a time to prevent undue surges in the system.

#### 4.6.4 DETERMINATION OF DISCHARGE

At the hydrants used for flow during the test, the discharges from the open butts are determined from measurements of the diameter of the outlets flowed and of the velocity pressures of the streams as indicated by the pitot gage reading. The formula used to compute the discharge Q, in gpm, from these measurements is:

$$Q = 29.83 \text{ Cd}^2 \sqrt{p} \quad (a)$$

#### 4.6.4

where C is a coefficient, d the diameter of the outlet in inches, and p the velocity pressure in psi. Tests have shown that coefficients ranging from 0.90 to 0.95, depending upon the design, should be used.

#### 4.6.5 PITOT READINGS

When measuring discharge from open hydrant butts, it is always preferable, from the standpoint of accuracy, to use 2½-inch outlets rather than pumper outlets. In practically all cases the 2½-inch outlets are filled across the entire cross section during flow, while with the larger outlets there is very frequently a void near the bottom. When measuring the pitot pressure of a stream of practically uniform velocity, the orifice in the pitot blade is held at the center of the stream and approximately 1-inch from the face of the hydrant outlet. The center line of the orifice should be at right angles to the plane of the face of the hydrant outlet. Readings in excess of 10 psi should be avoided wherever possible since the vibration of the needle is usually considerable making accurate observations difficult, and unnecessary damage may be done to lawns and roads by the force of the higher velocity streams. Hydrants and hydrant outlets chosen for use should be so located that no damage to surrounding property will result.

#### 4.6.6 DETERMINATION OF DISCHARGE WITHOUT A PITOT

If a pitot blade is not available for use to measure the hydrant discharge, a 50- or 60 psi gage tapped into a hydrant cap may be used. The hydrant cap with gage attached is placed on one outlet and the flow allowed to take place through the other outlet at the same elevation. The readings obtained on a gage so located and on a pitot gage held in the stream are approximately the same.

#### 4.6.7 CALCULATING RESULTS

The discharge in gallons per minute for each outlet flowed is obtained by the use of formula (a). If more than one outlet is used, the discharges from all are added to obtain the total discharge.

The formula which is used to compute the discharge at the specified residual pressure or for any desired pressure drop is

$$Q_R = Q_F \frac{H_R^{0.54}}{H_F^{0.54}} \quad (b)$$

#### 4.6.7

where  $Q_R$  is the computed discharge at the specified residual pressure,  $Q_F$  is the actual discharge during the test,  $H_R$  is the drop from the original pressure to the specified residual pressure, and  $H_F$  is the pressure drop during the test. In this equation any units of discharge or pressure drop may be used as long as the same units are used for each value of the same variable. In other words, if  $Q_R$  is expressed in gpm,  $Q_F$  must be in gpm, and if  $H_R$  is expressed in psi,  $H_F$  must be expressed in psi. These are the units which are normally used in applying this formula to fire flow test computations.

CONTRACTOR'S RESPONSIBILITY FOR TESTING AND DISINFECTION

Notwithstanding anything contained herein, it shall be the sole responsibility of Contractor to construct a water main capable of passing the pressure and leakage tests and to effect a disinfection of the water main. The fact that County provides inspection during the construction and testing of the water facilities and requires Laboratory testing to determine the sterility of the water mains shall not abrogate Contractor's responsibility in this regard.

It shall also be the responsibility of Contractor to prevent the consumption of water for any and all uses from unsterile mains whether by their workmen, subcontractors or any other person who may come in contact with the water from the unsterile main.

Contractor shall indemnify and save County harmless from any suits, claims, or actions brought by any person or persons for or on account of any sickness or death sustained or arising out of the consumption of water from the unsterile main.

**SECTION V**

**APPENDIX**

**RESOLUTION OF THE BOARD OF SUPERVISORS  
REGARDING LAND USES REQUIRING PUBLIC  
UTILITIES AND FACILITIES**

---

WHEREAS, the proper development of real property located within the County of Santa Clara and potentially available for residential, commercial, industrial and all other urban uses require the existence of various utilities and facilities such as water, storm and sanitary sewers, to service such property; and

WHEREAS, within the County of Santa Clara such facilities are normally furnished in whole or part by municipal corporations, local agencies or by sanitary or sanitation districts; and

WHEREAS, the granting of zone changes or use permits for such uses in those situations where such utilities and facilities are not available within the unincorporated territory leads to a duplication of the planning and zoning process in that such utilities and facilities must be sought from other political jurisdictions or local agencies after the obtaining of such land use authorization from the County of Santa Clara, thus on occasion giving rise to conflicts and disagreements; and

WHEREAS, an applicant seeking a zone change or use permit for such land use should have the burden of establishing to the satisfaction of the Planning Commission and, where appropriate, the Board of Supervisors, that such utilities and facilities are or would be available to him were the real property the subject of the application to remain in and be fully developable in such unincorporated territory, and that such applicant furnish a written statement from the appropriate political jurisdiction or local agency that such jurisdiction or agency will furnish such utilities and facilities to the real property of the applicant while such property remains in the unincorporated area of the County,

NOW, THEREFORE, BE IT RESOLVED by the Board of Supervisors of the County of Santa Clara, State of California, that it declares as a matter of policy that it hereby expresses and most strongly discourages applications for zone changes and use permits in those situations where the development of real property for residential, commercial, industrial and all other urban uses require the existence of various public utilities and facilities such as water and storm and sanitary sewers, and such facilities are not available within the unincorporated territory of the County.

BE IT FURTHER RESOLVED that in those situations where such facilities are not so available the applicant shall be expressly and most strongly urged to obtain authorization to use such lands for residential, commercial, industrial and all other urban purposes from the political jurisdiction from which such facilities are available.

BE IT FURTHER RESOLVED that this policy shall be augmented at the staff level in as many ways as possible, including the following:

(a) That a copy of this Resolution be made available to and discussed with any applicant for land use which use is subject to this Resolution; and that such availability and discussion occur prior to the time that such application for land use is filed so that the applicant fully and clearly understands the policy of this County;

(b) That such applicant furnish a written statement from the appropriate political jurisdiction or local agency that it will furnish such utilities and facilities for the development of such land while such land remains in the unincorporated territory;

(c) That the Director of the Planning Department or his representative determine whether this Resolution is applicable to a proposed land use and in the course of such determination confer with all affected departments of the County of Santa Clara, including the Health Department, the Public Works Department and the Fire Marshal, and with the political jurisdiction or local agency involved;

(d) That if the application for such land use is filed, such determination together with the facts thereof, be made available to the Planning Commission, the political jurisdiction or local agency involved and the Board of Supervisors, in the event that such application reaches such board.

BE IT FURTHER RESOLVED that a copy of this Resolution be furnished to the Planning Commission of the County of Santa Clara and to the city councils and planning commissions of each city in the County of Santa Clara.

PASSED AND ADOPTED by the Board of Supervisors of the County of Santa Clara, State of California, on November 28, 1967.

Signed/Sam P. Della Maggiore  
Chairman, Board of Supervisors

# STANDARDS FOR THE SEALING OF ABANDONED WELLS SANTA CLARA COUNTY (ABRIDGED)

## PURPOSE

The purpose of standards for the sealing of abandoned wells is to protect and preserve the groundwater supplies for future uses and to eliminate the potential physical hazard that exists from wells that are not being used. This is to be accomplished by restoring, as nearly as possible, those subsurface conditions which existed before the well was constructed. Since subsurface conditions vary from place to place, such standards must be formulated so as to conform to the groundwater geohydrologic and water quality conditions of the specific areas within the groundwater basins of Santa Clara County.

## WATER QUALITY ZONES

For well sealing purposes, the groundwater basins of Santa Clara County have been divided into three water quality zones, based on the different quality of waters present and on the local geologic conditions. Zone 1, which is the largest portion of the basin, represents the areas where the quality of water at all pumping depth intervals is generally good. Zone 2, near San Francisco Bay, is a multiaquifer area where the shallow zone (0 to 150 feet) may be contaminated or could become contaminated by seawater. In Zone 3, the Evergreen area, degraded quality water occurs below a depth of 300 feet with good quality water overlying this zone. These water quality zones are delineated on Figure 1.

## WELL SEALING PROCEDURE

All "abandoned" wells shall be destroyed in such a way that they will not produce water or act as a channel for the interchange of water, when such interchange may result in deterioration of the quality of water in any or all water-bearing formations penetrated, or present a hazard to the safety and well-being of people and animals.

### Zone 1

In Zone 1, where the quality of water is generally unimpaired, the objective of the sealing standard is to prevent contamination of the aquifer from surface sources. Here, a "general sealing standard" will apply which will entail the filling of the well with an impervious filler material (inorganic soils of low permeability, bentonite, concrete, or cement grout) from the bottom of the well to a depth of 50 feet. The upper 50

feet of the well shall be filled by the placement of cement grout, neat cement or concrete. Placement of the filler and sealing materials is to be performed in a manner that will prevent bridging, dilution or segregation of the sealing material (tremied into the well from the bottom). Placement of an annular grout seal in the upper 50 feet will be required if there is an annular opening or a gravel envelope around the well casing. Placement of the annular seal in the upper 50 feet, if necessary, shall be accomplished by either the removal of the upper casing or the perforation of the casing with the cement grout forced to pass into the annular opening or gravel pack. Typical general sealing features of a destroyed well are shown on Figure 2.

### Zone 2

In Zone 2, adjacent to San Francisco Bay where degraded quality water occurs in the shallow zone to a depth of about 150 feet with good quality water in the lower aquifers, it is the objective of the well sealing standard to prevent inter-aquifer flows from the shallow aquifer into the lower aquifers through abandoned wells. In order to accomplish this, all the provisions stated under "general sealing standard" discussed under Zone 1 shall be employed plus the placement of an annular seal opposite a clay layer at a depth of about 150 feet. The annular seal is to be placed by perforating an interval not less than 10 feet at a depth of 150 feet, then filling the casing with cement grout and forcing the cement grout to flow into and seal the annular opening between the well casing and the clay formation or into and seal the gravel pack. Typical sealing features of a destroyed well for Zone 2 are presented on Figure 3.

### Zone 3

In Zone 3, the portion of the Evergreen area where aquifers below a depth of 300 feet have yielded poor quality water, it is the objective of the well sealing standard to prevent interchange of water between the lower aquifers containing mineralized connate water and the upper unimpaired water quality aquifers. In order to accomplish this, all provisions stated under "general sealing standards" in Zone 1 shall be employed plus the placement of an annular seal opposite a

clay layer at a depth of about 300 feet. The annular seal is to be placed in a similar manner as discussed under Zone 2 and the upper 300 feet of the well shall be sealed with concrete or cement grout. Typical sealing features of a destroyed well for Zone 3 are presented on Figure 4.

## REFERENCE

Reference is made to the unabridged version of the Standards for a detailed account of the purposes, objectives, well sealing procedures, sealing materials, additional requirements in urban areas, definition of terms, bibliography, geology of the groundwater basin, water quality criteria, and other pertinent information. Said unabridged version is available for inspection in the District office.



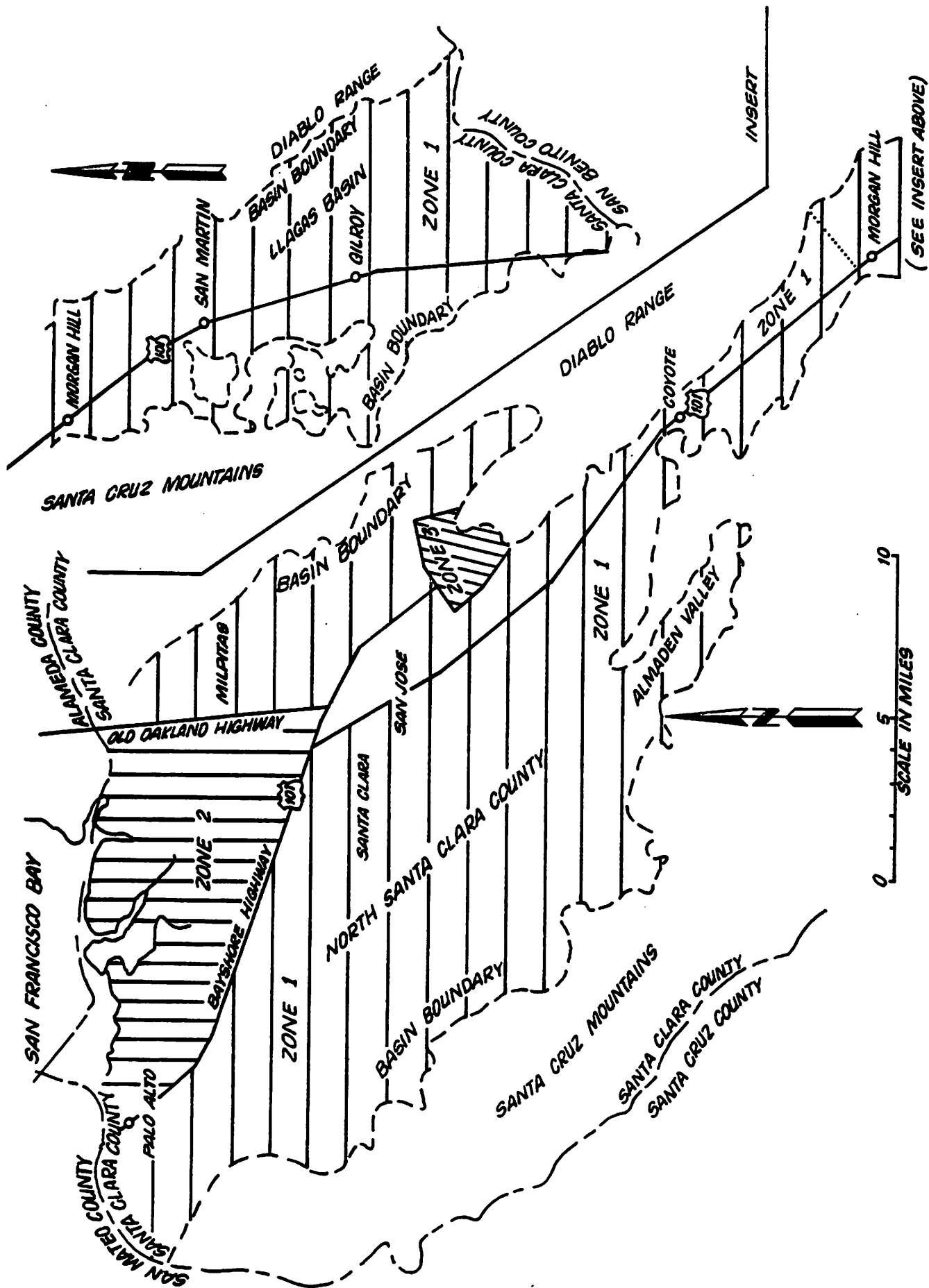


FIGURE 1

GROUNDWATER QUALITY ZONES  
SANTA CLARA COUNTY

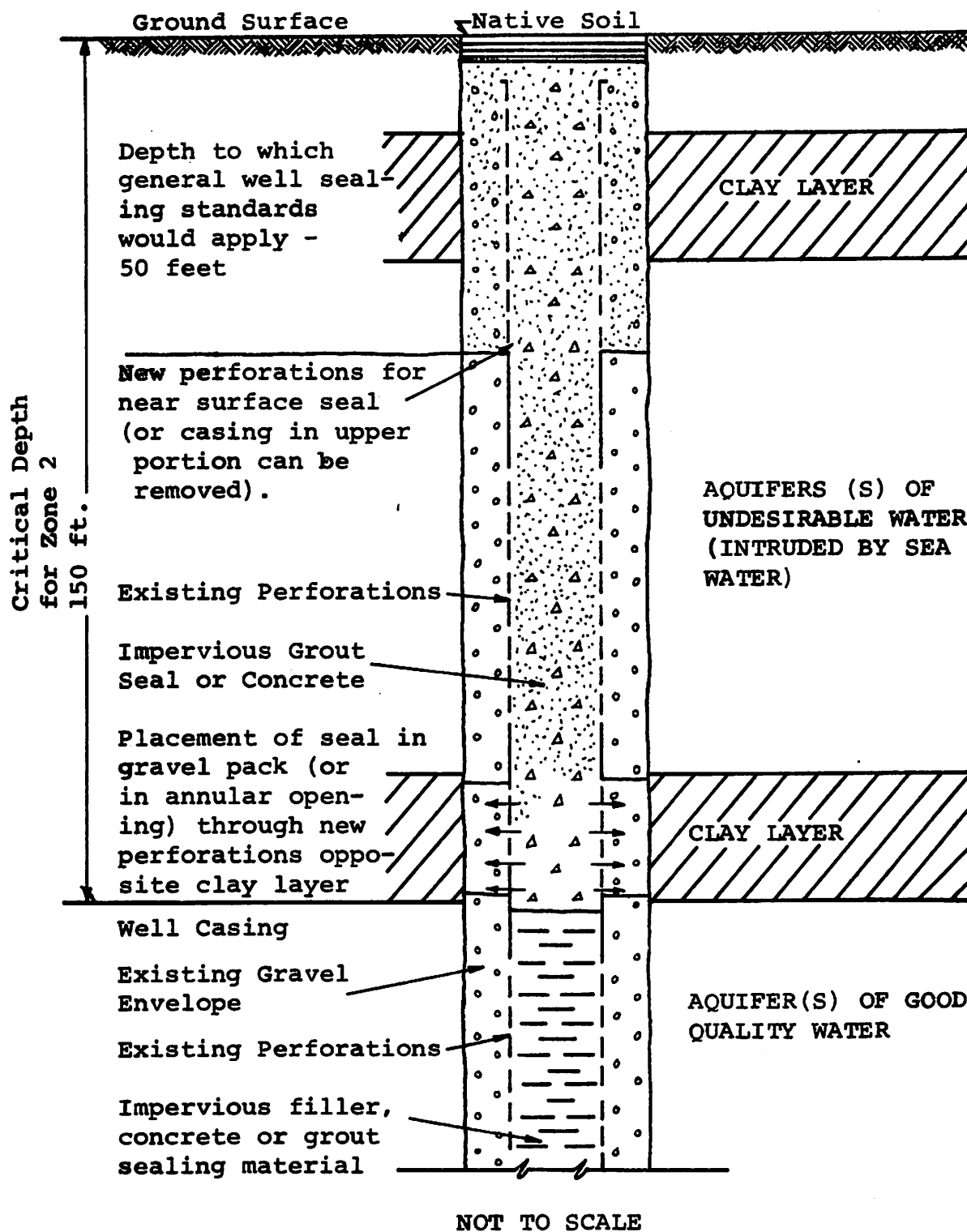


FIGURE 3. TYPICAL SEALING FEATURES OF DESTROYED WELLS FOR ZONE 2 (for gravel packed wells)

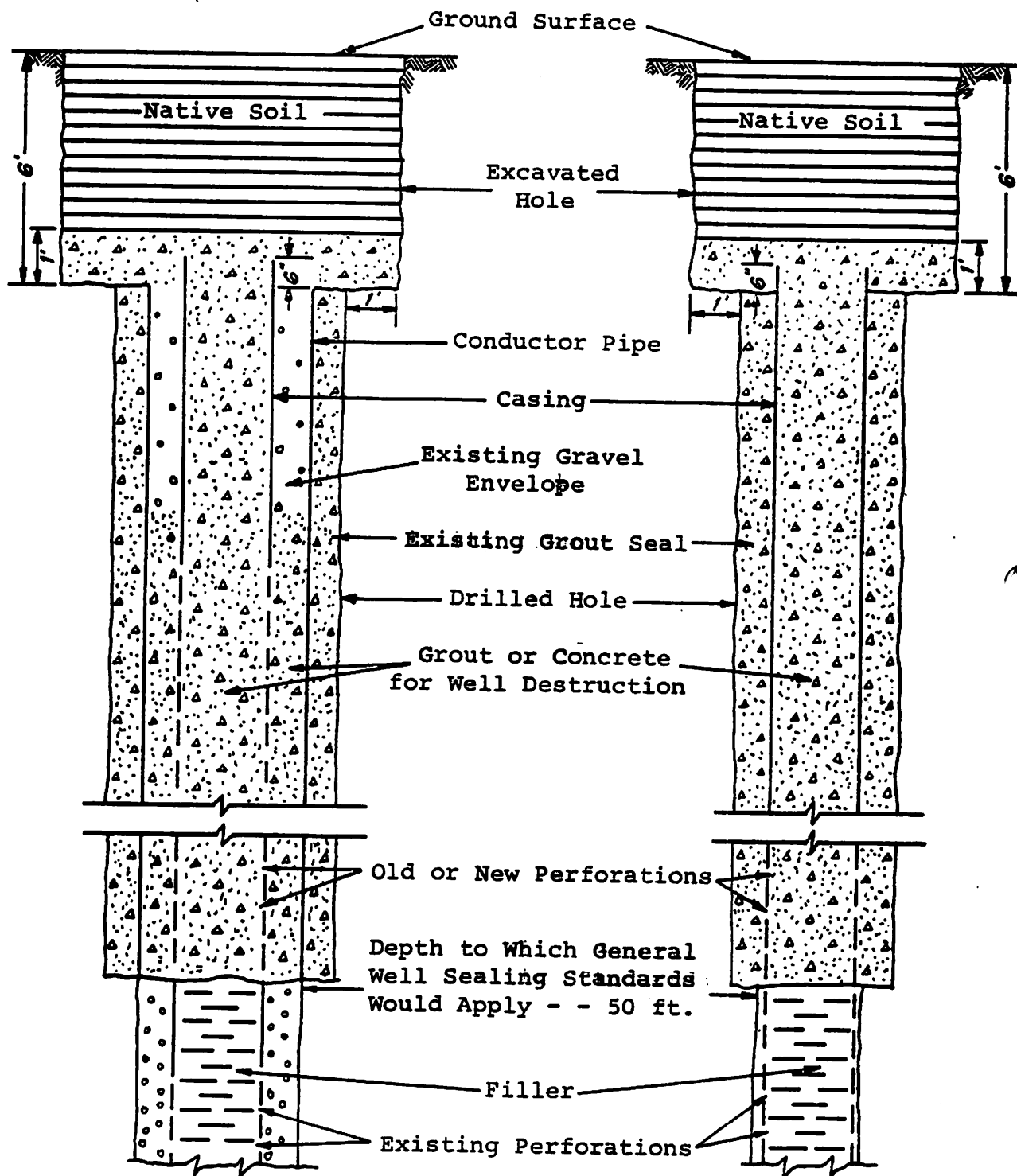


Figure 2(a) Well  
With Gravel Pack

Figure 2(b) Well  
Without Gravel Pack

NOT TO SCALE

FIGURE 2. TYPICAL SEALING FEATURES OF DESTROYED WELLS

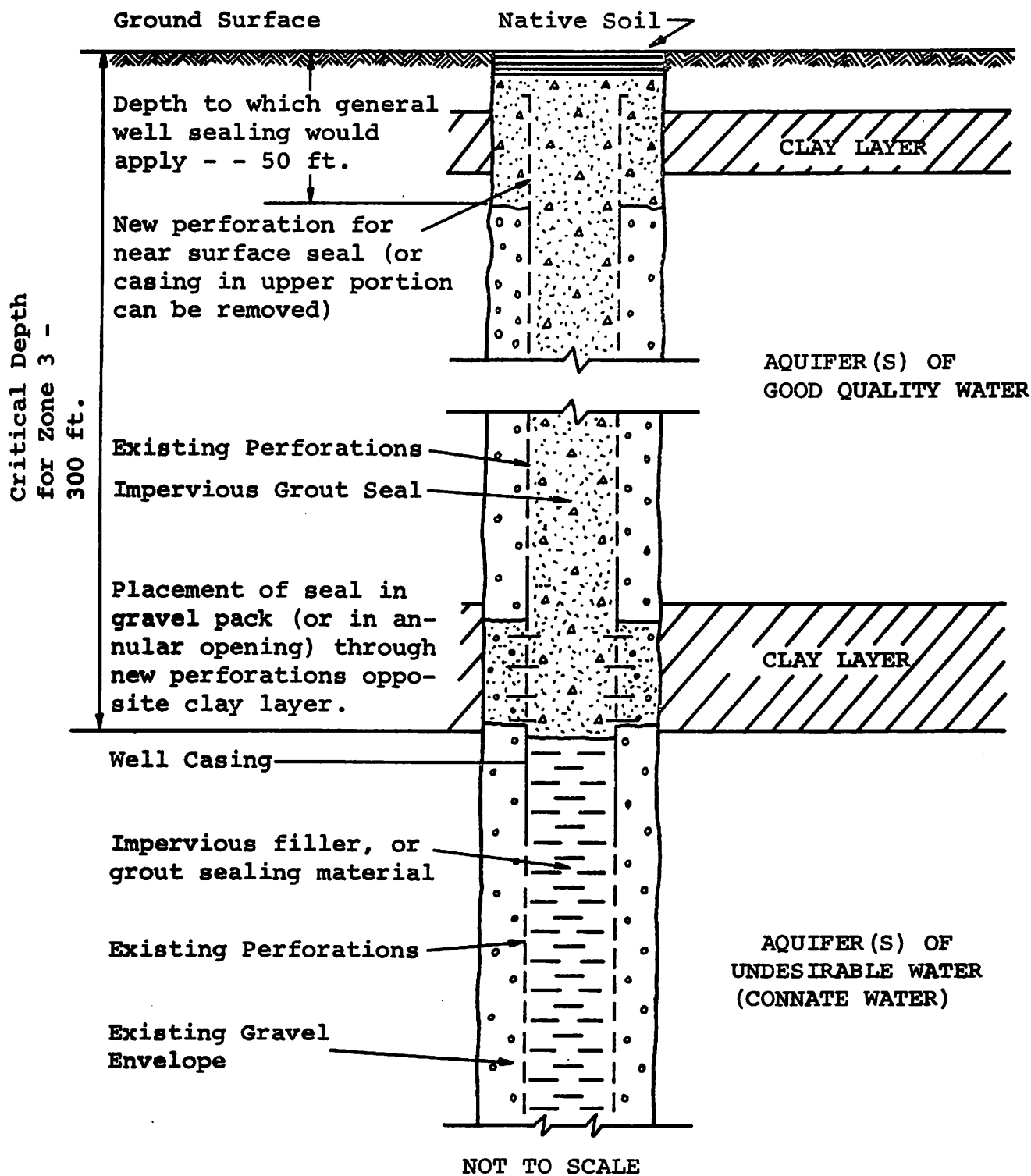


FIGURE 4. TYPICAL SEALING FEATURES  
OF DESTROYED WELLS FOR  
ZONE 3  
(for gravel packed wells)

# STANDARDS FOR THE CONSTRUCTION OF WELLS SANTA CLARA COUNTY (Abridged)

## PURPOSE

The purposes of standards for well construction are not only to provide adequate protection of water in wells but equally, if not more importantly, to protect and preserve the groundwater supply in aquifers for future uses. These purposes are to be accomplished by properly locating the well site, by requiring an annular seal in the upper portion of the well to prevent well contamination from surface sources, and by specifying construction requirements to prevent inter-aquifer transfer or mixing of degraded groundwaters with good quality waters through wells. Furthermore, wells properly constructed could be easily and adequately destroyed after their usefulness is over without having to resort to complicated and expensive procedures in order to protect the aquifers. The protection of groundwater supplies is a complex problem, and, although poor well construction may not be the principal cause of groundwater contamination, the problem of aquifer contamination must be attacked from all possible aspects.

## WATER WELL LOCATION WITH RESPECT TO CONTAMINANTS AND POLLUTANTS

All water wells shall be located an adequate horizontal distance from potential sources of contamination and pollution. Most of the factors involved in determining safe distances are usually not known. The following distances, on the basis of past experience and general knowledge, are safe where dry upper unconsolidated formations, less permeable than sand, are encountered:

Sewer	50 feet
Subsurface sewage leaching field, septic tank, or pit privy	100 feet
Cesspool or seepage pit	150 feet

No water well shall be located closer than the above distances from the specified sources of contamination. Where, in the opinion of the enforcing agency, adverse conditions exist, the usual distances shall be increased or special means of protection shall be provided.

If possible, the well shall be up the groundwater gradient (upstream) from the specified source of contamination.

## WATER QUALITY ZONES

Since subsurface conditions vary from place to place, the standards must be formulated so as to conform to the groundwater geohydrologic and water quality conditions of the specific areas within the ground water basins of Santa Clara County. For well construction and

sealing purposes, the groundwater basins of Santa Clara County have been divided into three water quality zones. Zone 1, which is the largest portion of the basins, represents the areas where the quality of water at all pumping depth intervals is generally good. Zone 2, near San Francisco Bay, is a multi-aquifer area where the shallow zone (0 to 150 feet) may be contaminated or could become contaminated by sea water. In Zone 3, the Evergreen area, degraded quality water occurs below a depth of 300 feet with good quality water overlying this zone. These water quality zones are delineated on Figure 1.

The bedrock areas outside the groundwater basins have their individual potential problems and well construction requirements for these areas are also included in these standards.

## WELL CONSTRUCTION REQUIREMENTS

All wells are to be constructed in such a way that they will not serve as a channel allowing surface waters to enter the groundwater body nor will they serve as a channel for inter-aquifer groundwater flow when such a flow may result in the deterioration of the quality in any or all water-bearing formations penetrated. The following paragraphs present examples of well construction standards that meet the protection objectives in the various water quality zones and in the bedrock areas. If the enforcing agency finds that compliance with any of the requirements prescribed herein is impractical for a particular location because of unusual conditions and would result in construction of an unsatisfactory well, the enforcing agency may prescribe alternative requirements which are equivalent to these standards in terms of protection obtained.

### Zone 1

In Zone 1, where the quality of water within the groundwater basin is generally unimpaired, the objective of the construction standards is to prevent well and aquifer contamination from surface sources. Here, a "general construction standard" will apply which entails the requirement of an effective surface seal. This is to be accomplished by the placement of a neat cement, cement grout, or concrete seal in the annular space between the well and the wall of the drilled hole to a minimum depth of 50 feet below the surface. In stratified formations the seal should terminate in a

clay or other impermeable material. Special sealing depth requirement on an individual basis will be set forth by the enforcing agency for application of wells to be constructed less than 50 feet in depth. The sealing material shall be applied from the bottom of the interval to be sealed to the top in a manner that will prevent bridging, dilution, or segregation of the sealing material (by employing either a tremie pipe or a pressure grouting method). The thickness of the seal shall be in accordance with the State of California Standards.

A concrete floor slab, or base, shall be constructed around the top of all pumping or injection wells. The top of the floor slab shall slope away from the casing and the outer edge of the slab shall be at least six inches above the ground surface.

For a pump above the surface, a concrete pedestal shall be constructed atop the floor slab on which the pump is to be placed.

Examples of acceptable sealing construction for Zone 1 for nongravel packed wells are shown on Figure 2 and for gravelpacked wells on Figure 3.

### Zone 2

In Zone 2, adjacent to San Francisco Bay, degraded quality water occurs in the shallow zone to a depth of 150 feet with good quality water in the lower aquifers. The specific objectives of the well construction standards are to prevent inter-aquifer flows from the shallow aquifer into the lower aquifers through wells and, in addition, to meet the construction objective for Zone 1. In order to accomplish these, all provisions stated under "general construction standards" discussed under Zone 1 shall be employed plus the extension of the surface seal into a clay or other impermeable layer at a minimum depth of 150 feet. An example of acceptable well construction in Zone 2 is shown on Figure 4.

If a gravel packed well were to be constructed in Zone 2, the construction of an annular seal as shown on Figure 3 would have to be extended into a clay layer at a depth of around 150 feet.

### Zone 3

In Zone 3, the portion of the Evergreen area where aquifers below a depth of 300 feet have yielded poor quality water, the specific objectives of the well construction standards are to prevent interchange of groundwater between the lower aquifers containing mineralized

connate water and the upper unimpaired water quality aquifers, and also to meet the objective for Zone 1. In order to accomplish these, all provisions stated under "general sealing standards" for Zone 1 shall be employed plus limiting the depth of wells to be constructed to a maximum of 300 feet. An exception in regards to the maximum depth can be made if the owner can prove to the enforcing agency that waters at a greater depth are of good quality. This has to be based on the results of laboratory testing of a sample obtained only from the lower zone. In order to obtain such a sample, the lower zone shall be isolated from the upper zones during sampling.

#### BEDROCK AREAS

Bedrock areas present special conditions for the safe construction of water wells in that waters in bedrock could be, in part, recharged and transmitted unfiltered through open fractures. This is in contrast to the filtering that occurs as water is recharged and transmitted through unconsolidated granular materials of the groundwater basins.

For wells constructed in bedrock, the objective is to prevent contamination from surface sources, just as for wells constructed within the groundwater basin. This is to be accomplished by selecting the well site in a manner to obtain maximum security from potential sources of contamination and requiring the construction of an annular seal in the upper portion of the well.

In the selection of a well site, the conditions listed earlier under the heading "Water Well Location with Respect to Contaminants and Pollutants" shall be observed. In places where adverse conditions exist, the minimum distances listed shall be increased or special means of protection shall be provided.

In order to construct the upper annular seal, an oversize hole must be constructed to the depth and diameter required for the seal and casing installed to retain the seal. All public water supply wells including individual domestic wells to be constructed in bedrock in subdivided lands under the jurisdiction of the County Land Development Regulations shall incorporate at least a 50-foot annular seal from the surface. Public water supply wells constructed in bedrock are also subject to Environmental Health Services approval before being placed into service. For individual domestic wells on lands not subject to Land Development Regulations shall also incorporate a 50-foot annular seal from the surface unless these wells are less than 65 feet deep. For these wells, the annular space

shall be sealed in the upper three-fourths of the depth of the well. All other requirements of the general well construction standards shall apply to wells in bedrock.

A typical example of an acceptable seal for well construction in bedrock is shown in Figure 5.

#### CATHODIC PROTECTION WELLS

Cathodic protection wells (or "deep anodes") also present hazards to groundwater quality just as a water well may in that both represent an opening from the surface through various aquifers. Just as for water wells, it is the objective of these standards to protect the quality of water in aquifers by requiring cathodic protection wells to be constructed in such a manner that they will not serve as a channel allowing surface waters to enter the groundwater body nor will they serve as a channel for interaquifer groundwater flow when such flow may result in the deterioration of the quality in any or all the aquifers penetrated. It is also the purpose of these standards to facilitate the effective sealing of these wells when their useful life has expired.

The sealing requirements for Zones 1 and 2 are similar to that of water wells constructed in these respective zones as illustrated in Figure 6, examples A and B, respectively (the latter, in Zone 2, if the well is deeper than 150 feet). In Zone 3, if the well is deeper than 300 feet, the annular seal would have to be extended to a depth of 300 feet as shown in Figure 6, example C, in order to protect the upper aquifers from rising waters from the degraded lower aquifers. If the cathodic protection well is to be less than 150 feet in depth in Zone 2 and less than 300 feet in Zone 3, general sealing requirements as for Zone 1 shall apply.

The top of the well shall be protected against the entrance of surface water draining from the surrounding land by installation of watertight caps, covers, plugs or similar devices. In drainage ways, exclusive of highways, streets, paved surfaces (such as parking lots, equipment yards, etc.), sidewalks, and the like, the top of the well shall terminate above, or otherwise be protected against, known conditions of flooding. When extended above ground surface, the vent pipe shall be terminated at the rectifier housing or other protective housing at an elevation which is above known conditions of flooding.

The diameter of the vent pipe is to be of sufficient size in order to be properly backfilled when the useful life of the anode has expired (sealing of an abandoned well).

#### DISINFECTION OF WELL

All public water supply, individual domestic, and industrial wells shall be disinfected following construction, repair, or when work is done on the pump, before the well is placed into service.

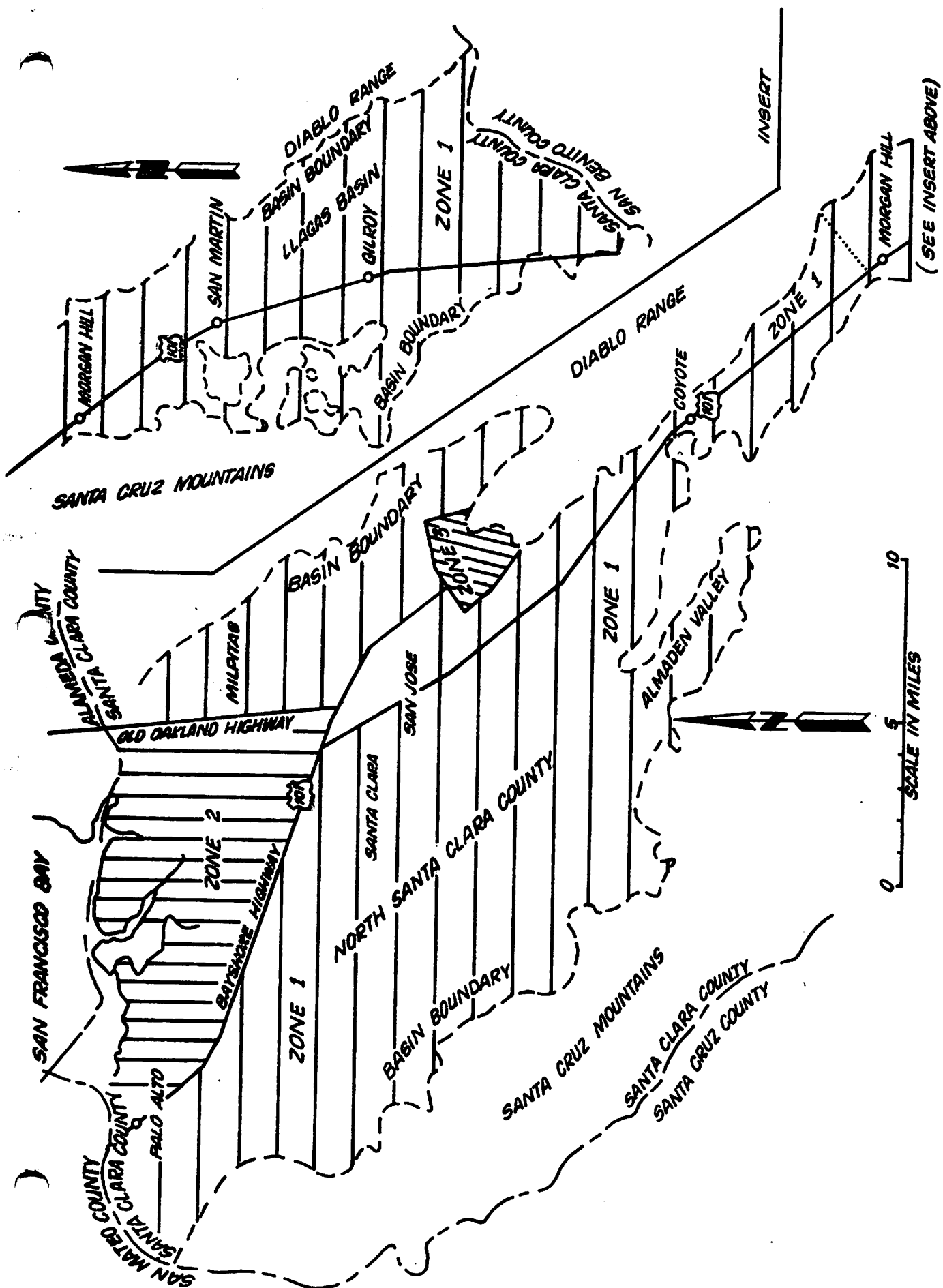
#### COMPLIANCE WITH STATE CODES

In complying with these standards, the well driller must also comply to the provisions of the various State codes relating to water well drilling. These include provisions regarding Contractor's License Law and the filing of notice of intent and well completion reports under the provisions of the Water Code.

#### REFERENCE

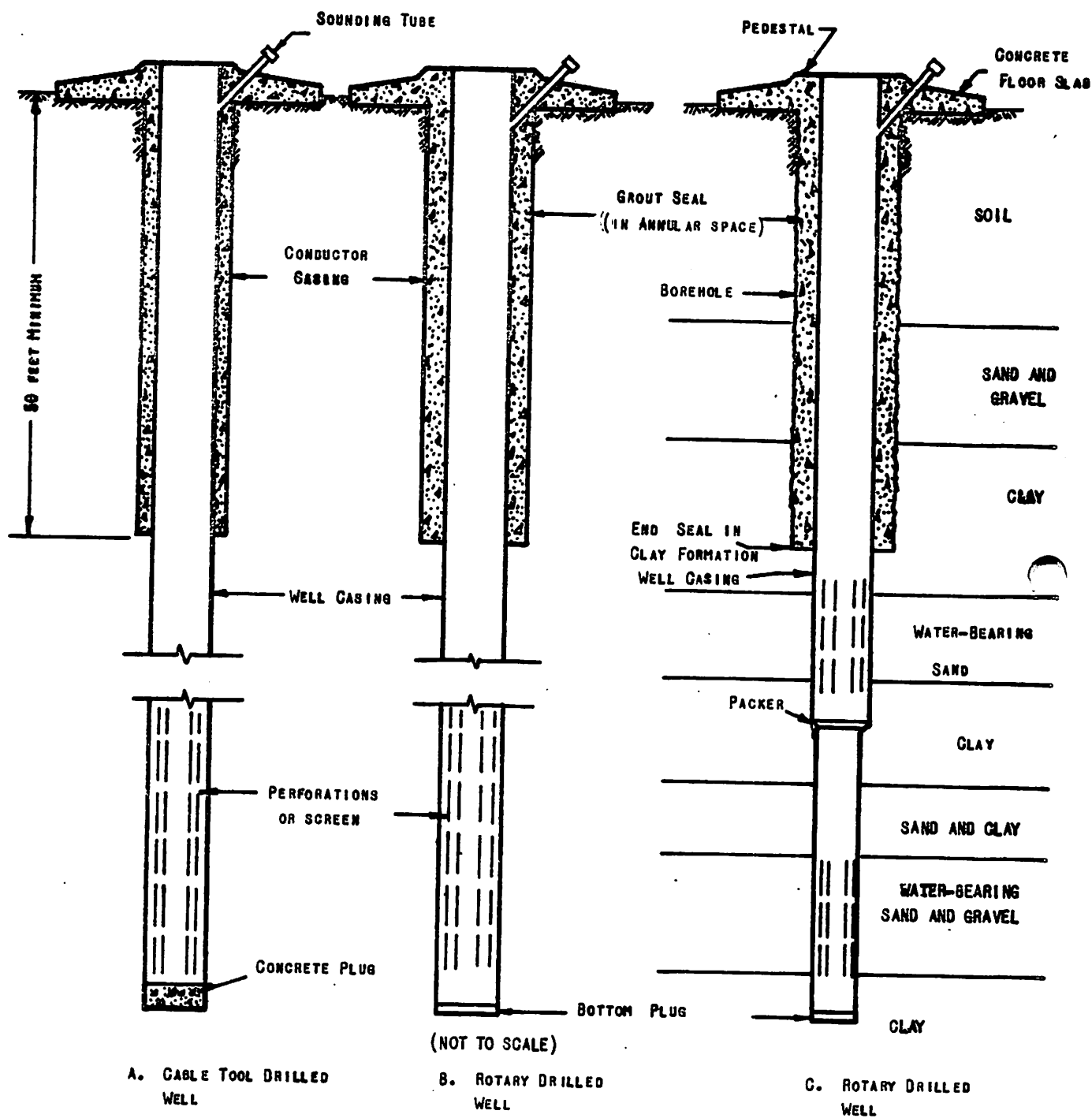
Reference is made to the unabridged version of the Well Construction Standards for a more detailed account of the purposes, objectives, and well construction requirements in addition to the bibliography and other pertinent information. The Well Construction Standards is one of two documents pertaining to water well ordinance, the companion document being "Standards for the Sealing of Abandoned Wells, Santa Clara County", October, 1972. The "Sealing Standards" also contain as Appendix A - "Geology", Appendix C - "Definition of Terms", and Appendix D - "Well Quality Criteria" which will not be repeated in the Well Construction Standards Document.

The general requirements along with specifications on procedure, materials, surface construction features, disinfection, water quality sampling, and other pertinent features conform to Chapter II of California Department of Water Resources Bulletin 74, "Water Well Standards State of California", February 1968, except where exceptions are noted in these Standards.



GROUNDWATER QUALITY ZONES  
SANTA CLARA COUNTY

FIGURE 1



WELLS DRILLED IN UNCONSOLIDATED MATERIAL, CAVING FORMATIONS

WELL PENETRATING STRATIFIED FORMATIONS

FIGURE 2. SEALING CONDITIONS FOR UPPER ANNULAR SPACE NONGRAVEL PACKED WELLS



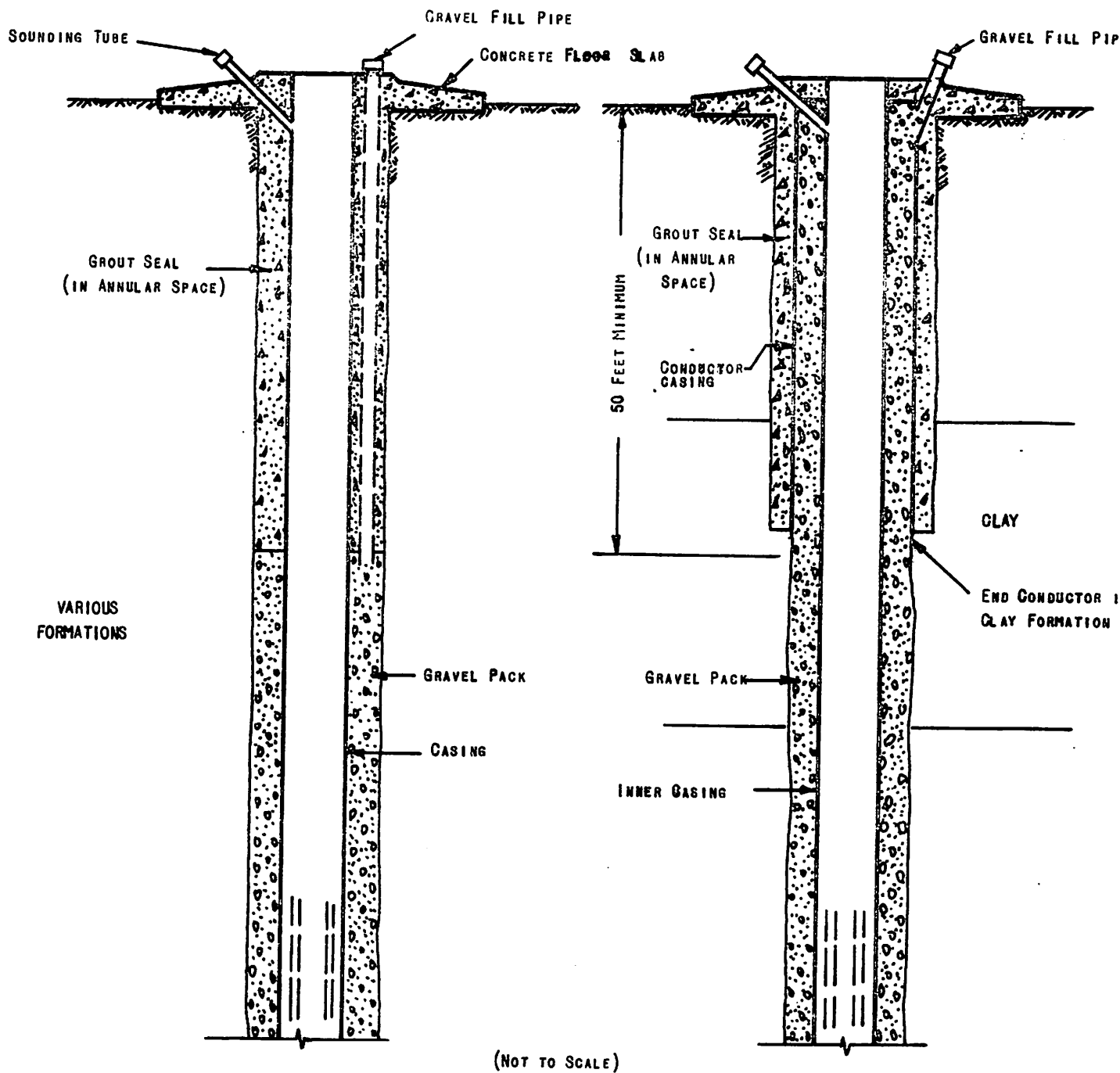


FIGURE 3. SEALING CONDITIONS FOR UPPER ANNULAR SPACE  
GRAVEL PACKED WELLS

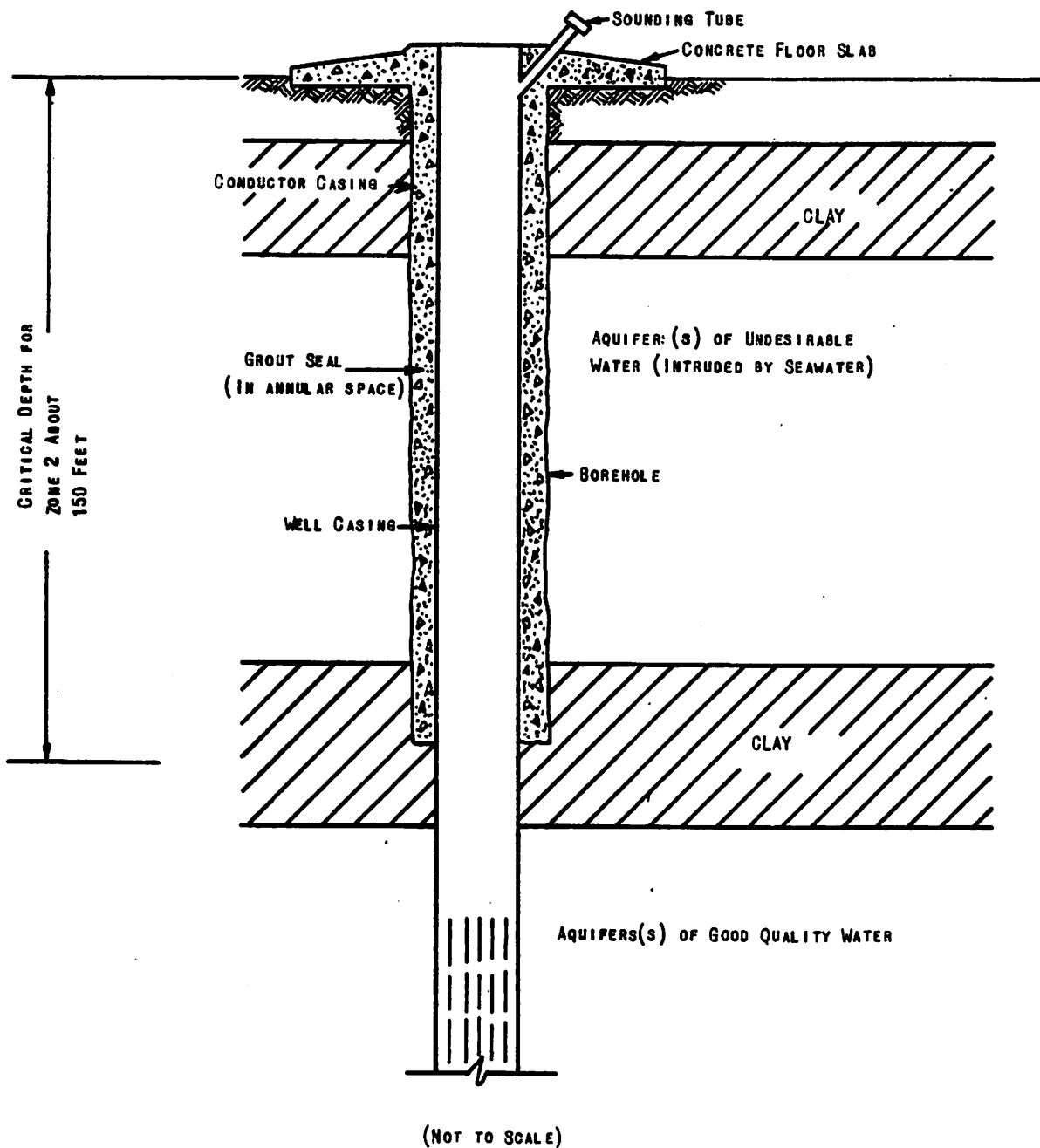
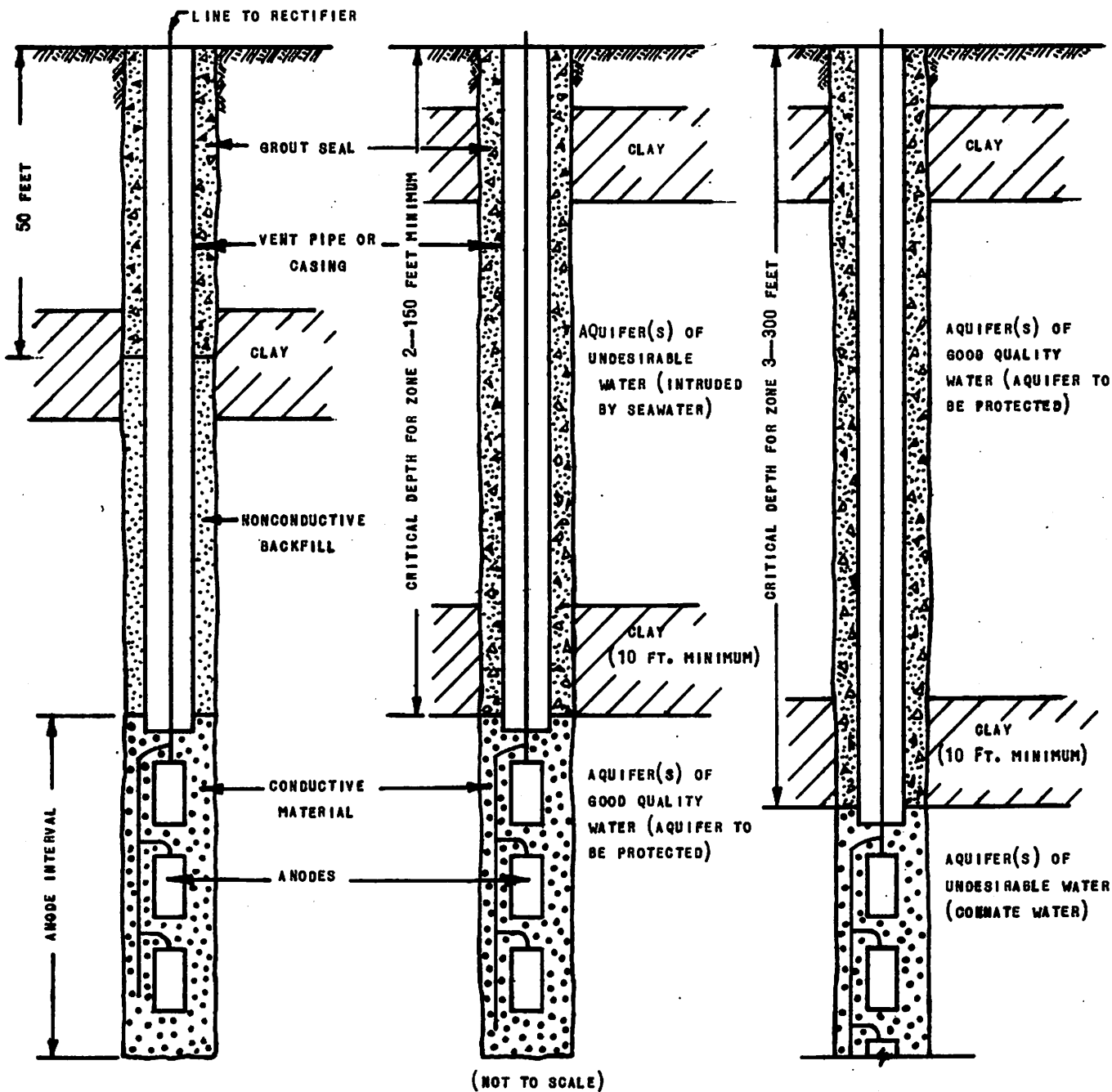


FIGURE 4. EXAMPLE OF SEALING UPPER AQUIFER ZONE  
WELL IN ZONE 2



A. GENERAL REQUIREMENT, ZONE 1.

B. SEALING REQUIREMENT FOR WELLS DEEPER THAN 150 FEET IN ZONE 2.

C. SEALING REQUIREMENT FOR WELLS DEEPER THAN 300 FEET IN ZONE 3.

FIGURE 6. EXAMPLES OF SEALING CONDITIONS CATHODIC PROTECTION WELLS

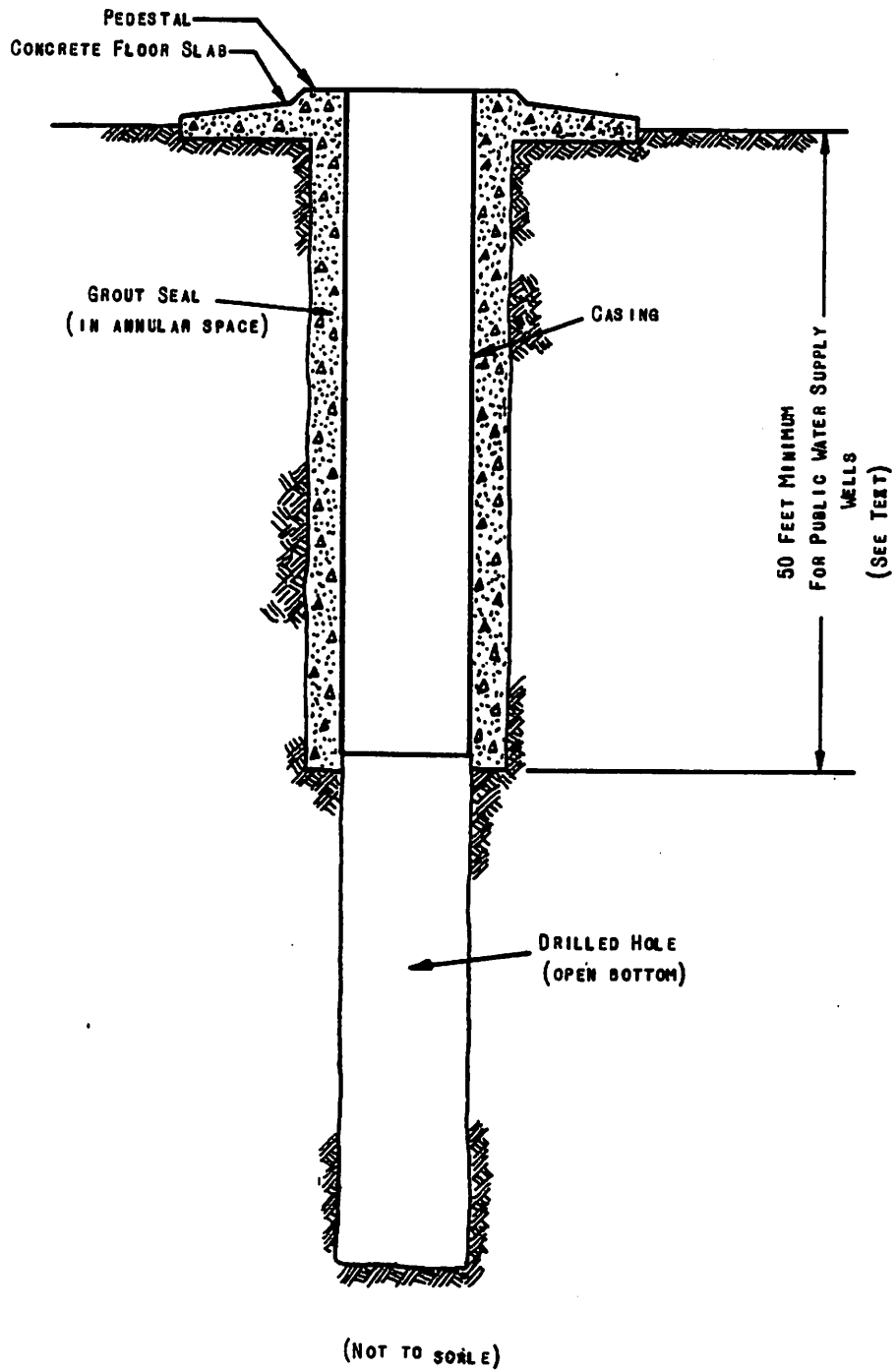
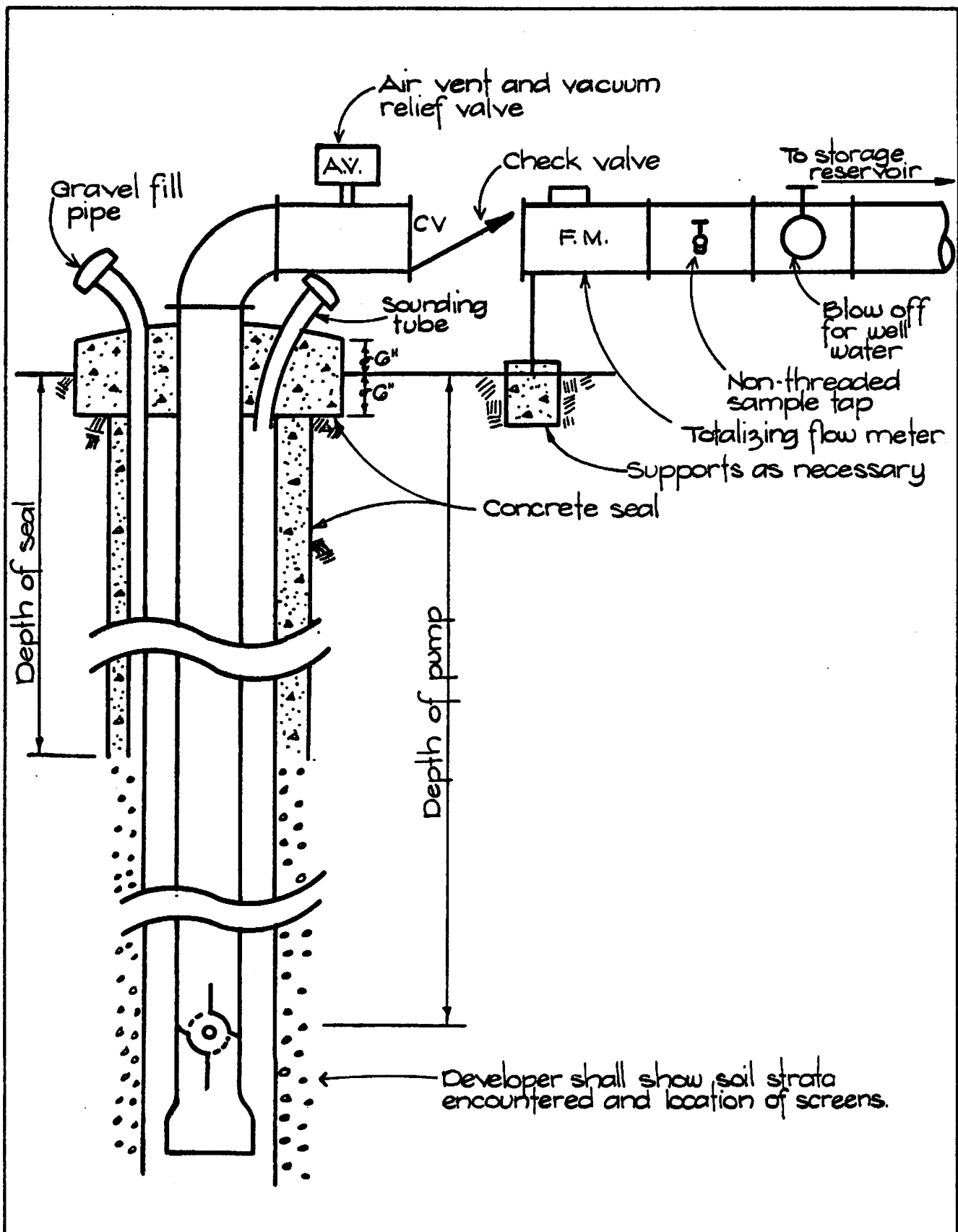


FIGURE 5. EXAMPLE OF SEALING UPPER ANNULAR SPACE  
WELL IN BEDROCK FORMATION

**SECTION VI**  
**WATER SYSTEM DETAILS**



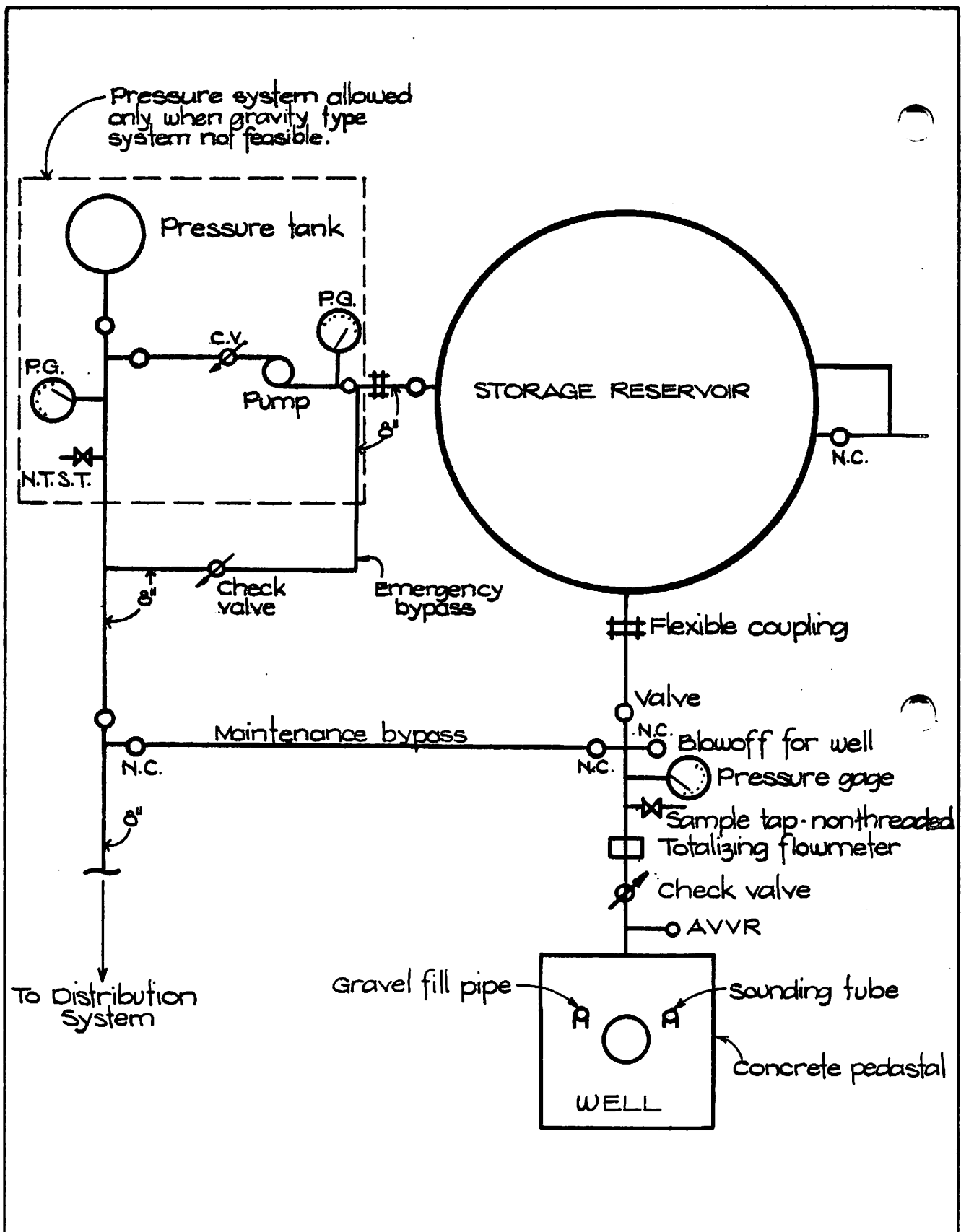
Approved: *Dan Larson*  
 Manager / County Surveyor  
 Land Dev., Engineering & Surveying

Date: 3/81

COUNTY OF SANTA CLARA  
 ENVIRONMENTAL MANAGEMENT /  
 GENERAL SERVICES AGENCY

No.	Revision	Date

TYPICAL  
 WELLHEAD DETAIL



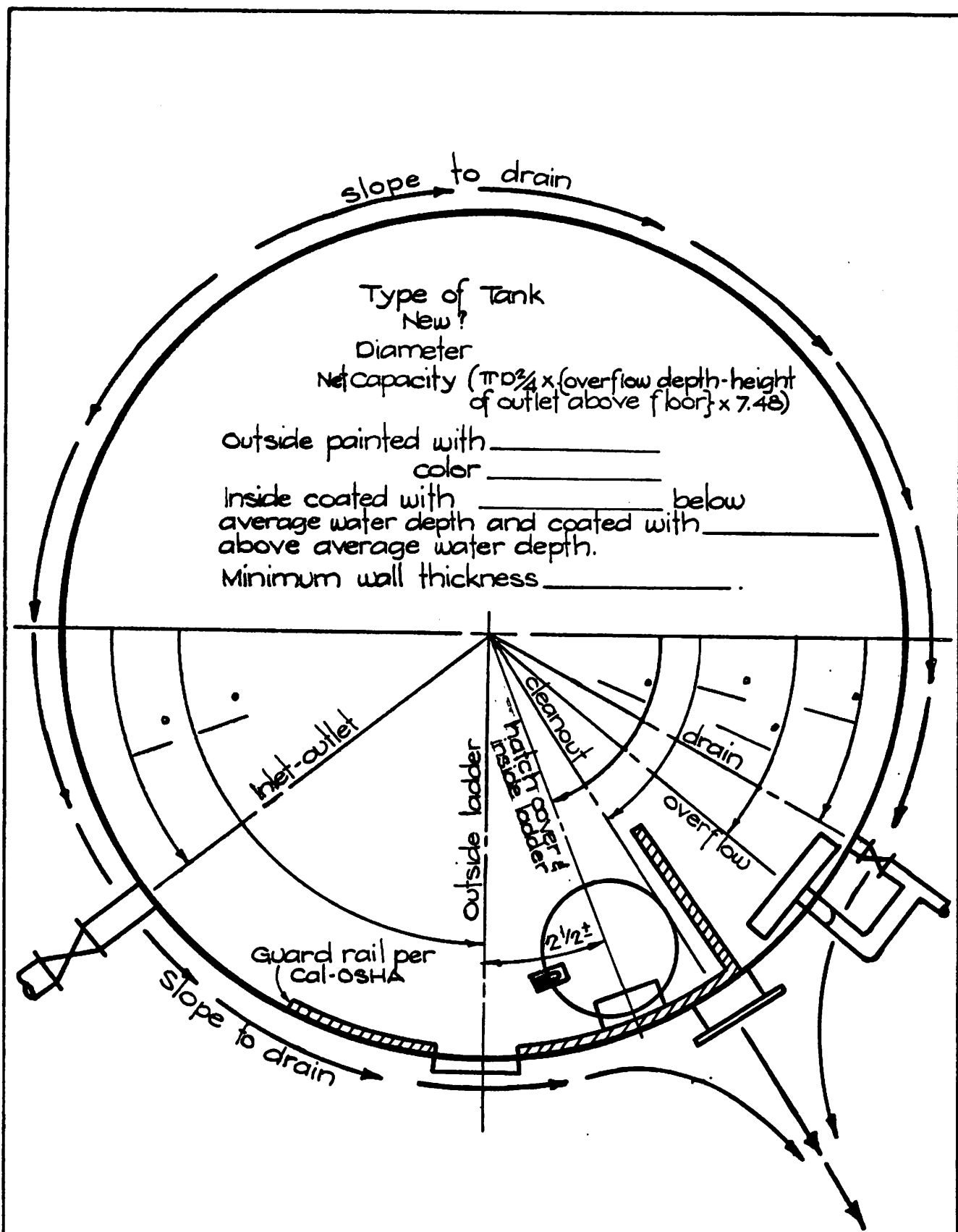
Approved: *Dean A. Larson*  
 Manager / County Surveyor  
 Land Dev., Engineering & Surveying

Date: 3/81

COUNTY OF SANTA CLARA  
 ENVIRONMENTAL MANAGEMENT /  
 GENERAL SERVICES AGENCY

No.	Revision	Date

TYPICAL SUPPLY  
 SOURCE SCHEMATIC



Approved: \_\_\_\_\_ Date: 3/81

*Dean J. Larson*  
Manager / County Surveyor

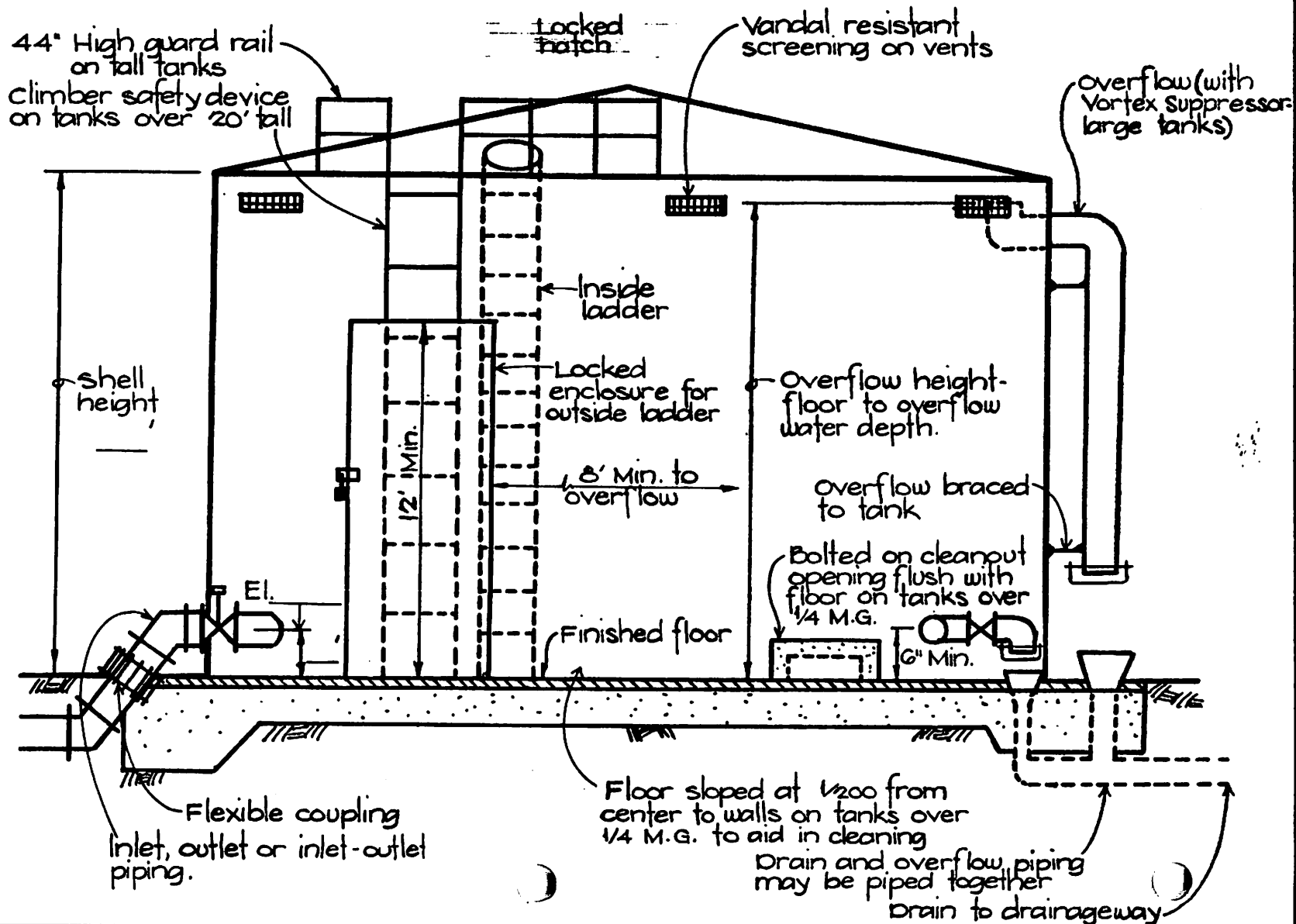
Land Dev., Engineering & Surveying

COUNTY OF SANTA CLARA  
ENVIRONMENTAL MANAGEMENT /  
GENERAL SERVICES AGENCY

No.	Revision	Date	TYPICAL WATER TANK PLAN	3

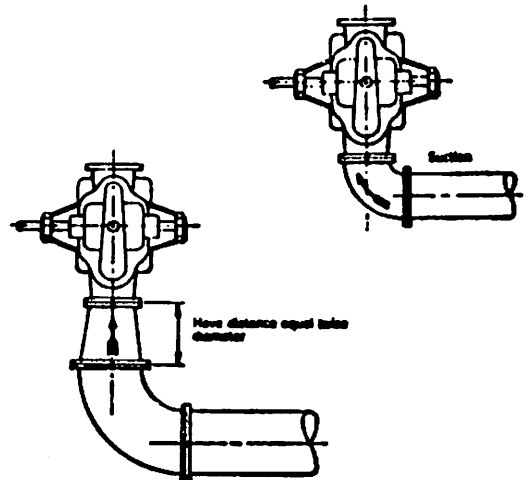
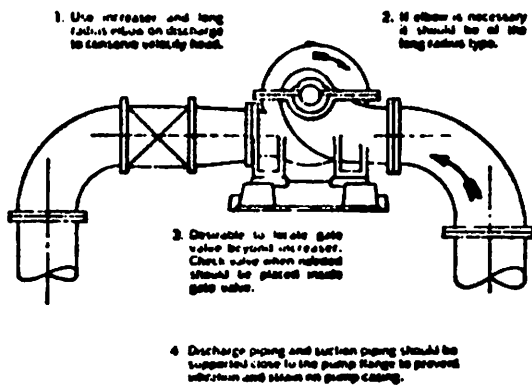
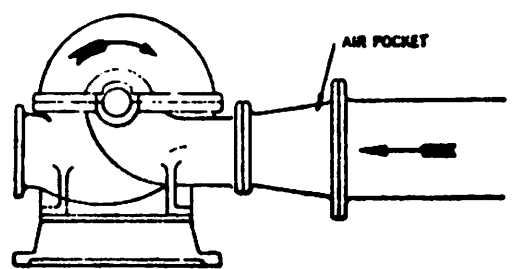
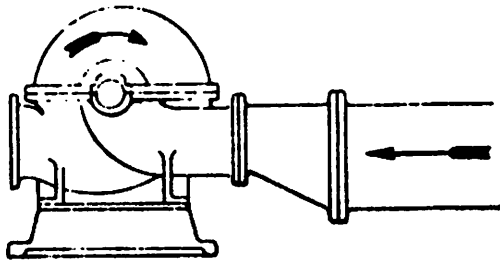
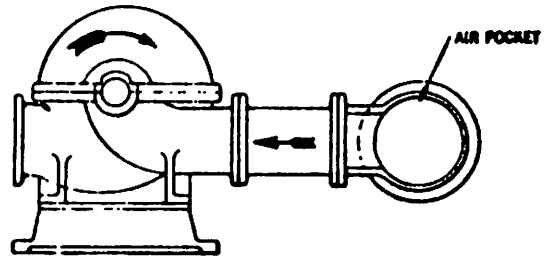
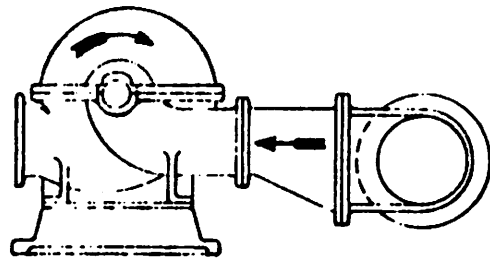


Approved: <i>Manuel P. Martinez</i> Date: 3/8/01		COUNTY OF SANTA CLARA ENVIRONMENTAL MANAGEMENT / GENERAL SERVICES AGENCY	
Manager / County Surveyor Land Dev., Engineering & Surveying			
No.	Revision	Date	
TYPICAL WATER TANK ELEVATION			
4			



**RIGHT**

**WRONG**



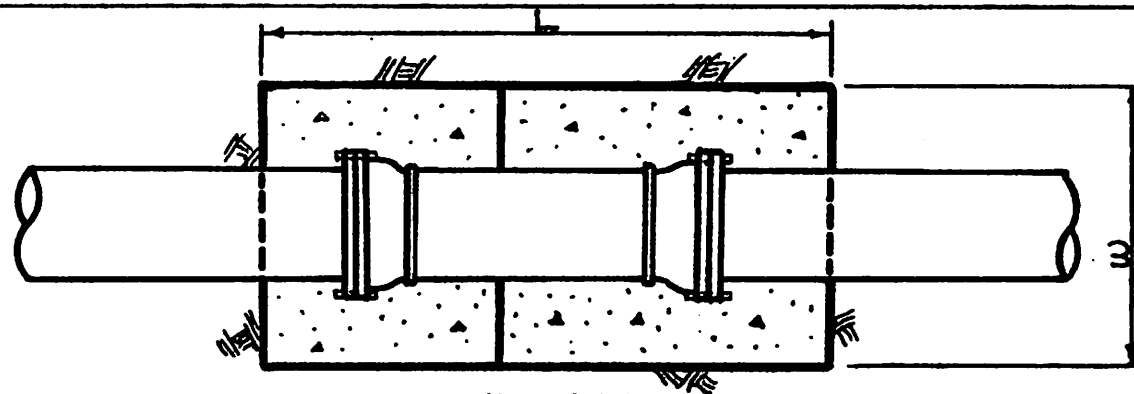
**Fig. A-3-3.4.5 Right and Wrong Pump Suctions**

Diagram reprinted from *Hydraulic Institute Standards for Centrifugal, Rotary and Reciprocating Pumps*; twelfth edition. Copyright by the Hydraulic Institute, 122 East 42nd Street, New York, N. Y. 10017.

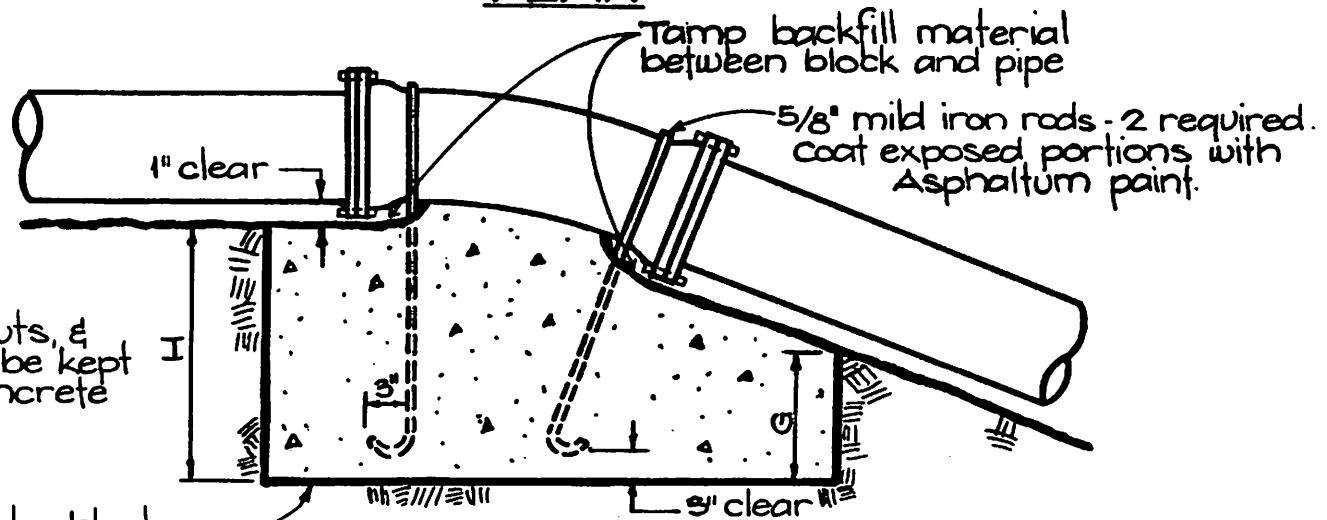
Approved: *Dean Pearson* Date: 3/81  
Manager / County Surveyor  
Land Dev., Engineering & Surveying

**COUNTY OF SANTA CLARA**  
ENVIRONMENTAL MANAGEMENT /  
GENERAL SERVICES AGENCY

No.	Revision	Date	STANDARD PUMP CONNECTION DETAILS	5



**PLAN**



**ELEVATION**

**THRUST BLOCK DIMENSIONS-UPWARD THRUST**

Pipe size	11 1/4° Bend				22 1/2° Bend				45° Bend			
	L	W	H	G	L	W	H	G	L	W	H	G
6"	2'-0"	2'-0"	1'-0"	9"	2'-0"	2'-0"	2'-0"	1'-0"	3'-0"	2'-0"	2'-0"	6"
8"	2'-0"	2'-0"	1'-0"	9"	3'-0"	2'-0"	2'-0"	1'-0"	4'-6"	2'-0"	3'-0"	6"
10"	3'-0"	2'-0"	2'-0"	1'-8"	4'-0"	2'-0"	2'-0"	1'-0"	6'-0"	2'-0"	3'-8"	8"
12"	3'-0"	2'-0"	2'-0"	1'-8"	6'-0"	2'-0"	2'-0"	1'-0"	7'-0"	2'-6"	4'-0"	6"

Approved:

Date: 3/81

*Manuel A. Aragon*  
Manager / County Surveyor  
Land Dev., Engineering & Surveying

No.

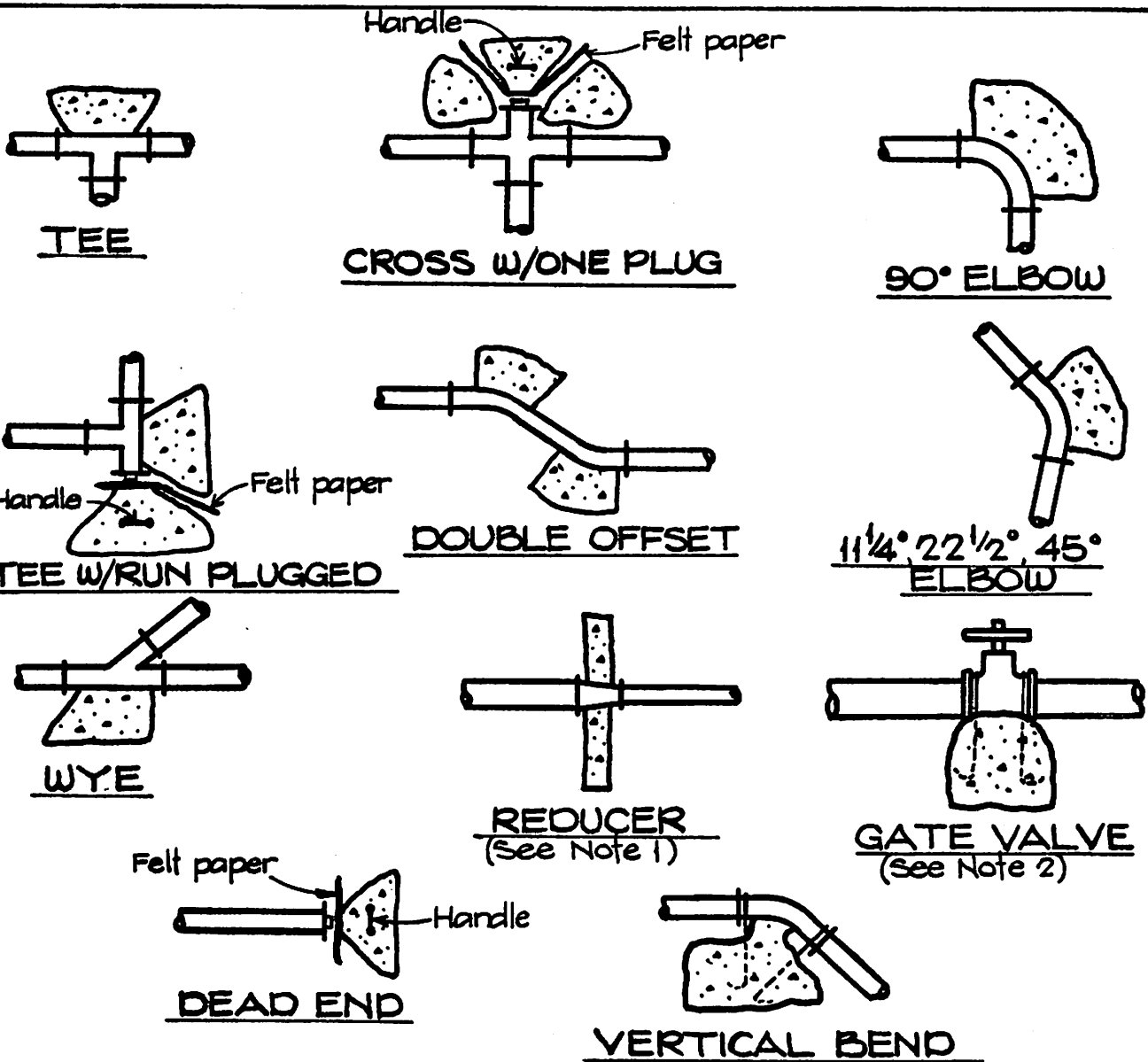
Revision

Date

**STANDARD  
ANCHOR FOR UPWARD  
THRUST**

6

COUNTY OF SANTA CLARA  
ENVIRONMENTAL MANAGEMENT /  
GENERAL SERVICES AGENCY



**Notes:**

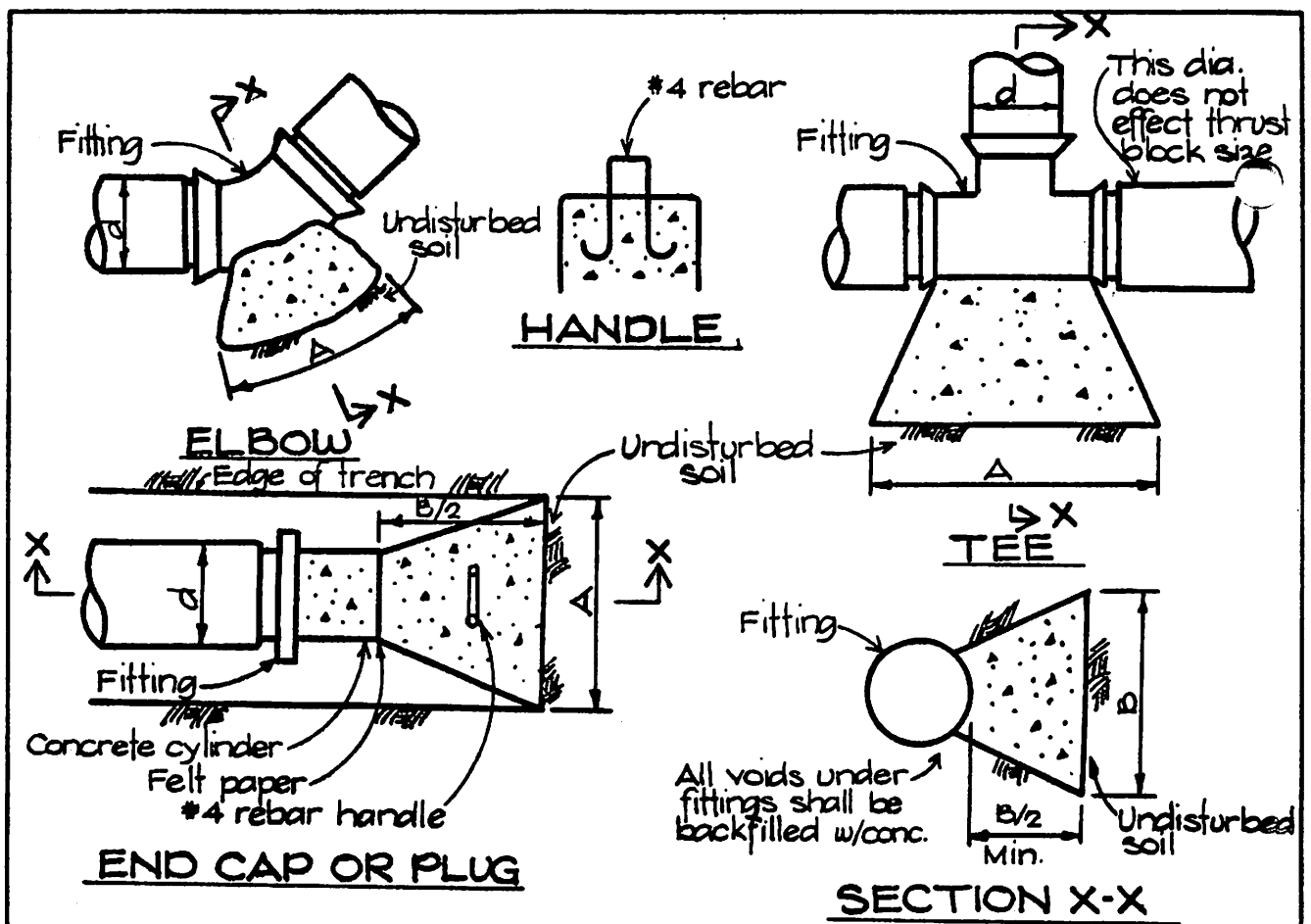
1. When reducer drops size of pipeline by more than 4", thrust problems should be investigated and blocking individually designed.
2. When pressures over 100 psi or pipelines 12" and over are used, valves should be investigated for thrust problems and blocking individually designed.

Approved: *Manuel Platon* Date: 3/81  
 Manager / County Surveyor  
 Land Dev., Engineering & Surveying

**COUNTY OF SANTA CLARA**  
 ENVIRONMENTAL MANAGEMENT /  
 GENERAL SERVICES AGENCY

No.	Revision	Date

**STANDARD THRUST  
 BLOCK LOCATIONS**



### REQUIRED BEARING AREAS & DIMENSIONS

Pipe size d	class	Tees, plugs, blowoff and end caps			90° Elbow			45° Elbow			22 1/2° Elbow			Pipe & class
		Area ft <sup>2</sup>	A ft	B ft	Area ft <sup>2</sup>	A ft	B ft	Area ft <sup>2</sup>	A ft	B ft	Area ft <sup>2</sup>	A ft	B ft	
4"	150	1.8	2	1	2.6	2.5	1	1.4	1.5	1	.7	1	1	4" 150
	200	2.4	2.5	1	3.5	2.5	1.5	1.9	2	1	.9	1	1	
6"	150	3.8	2.5	1.5	5.4	3.5	1.5	2.9	3	1	1.5	1.5	1	6" 150
	200	5.0	3.5	1.5	7.2	3.5	2	3.9	3	1.5	2.0	2	1	
8"	150	6.6	3.5	2	9.3	4.5	2	5.1	3.5	1.5	2.5	2.5	1	8" 150
	200	8.8	4.5	2	12.4	5	2.5	6.8	4.5	1.5	3.3	3.5	1	
10"	150	10.8	4.5	2.5	15.2	6	2.5	8.2	4.5	2	4.2	3	1.5	10" 150
	200	14.3	5	3	20.2	7	3	10.9	5.5	2	5.6	4	1.5	
12"	150	15.0	5.5	3	21.6	7.5	3	11.7	6.0	2	5.9	4	1.5	12" 150
	200	20.0	6	3.5	28.8	9.5	3	15.6	6.5	2.5	7.9	4	2	

Areas and dimensions based on 150 psi test pressure and 1500 psf bearing from soil. Other pressures or bearing areas may be used: New area = new Press (psi) / 150 x new bearing / 1500 x total area

Approved: *Stan Larson*  
 Manager / County Surveyor  
 Land Dev., Engineering & Surveying

Date: 3/81

COUNTY OF SANTA CLARA  
 ENVIRONMENTAL MANAGEMENT /  
 GENERAL SERVICES AGENCY

No.	Revision	Date

**STANDARD THRUST  
 BLOCK DIMENSIONS**

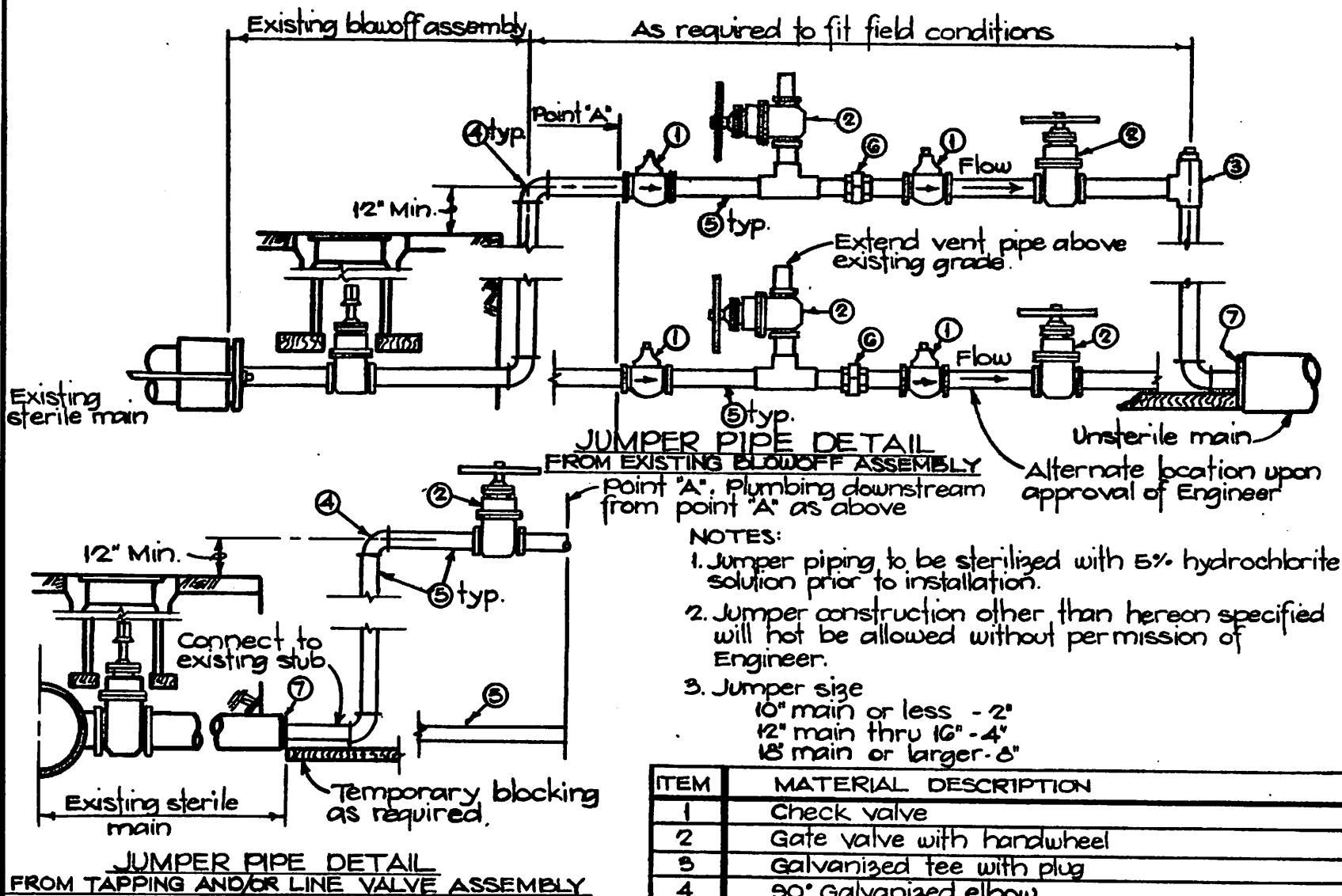
**8**

Approved: *[Signature]* Date: 3/8/81  
 Manager / County Surveyor  
 Land Dev., Engineering & Surveying

COUNTY OF SANTA CLARA  
 ENVIRONMENTAL MANAGEMENT /  
 GENERAL SERVICES AGENCY

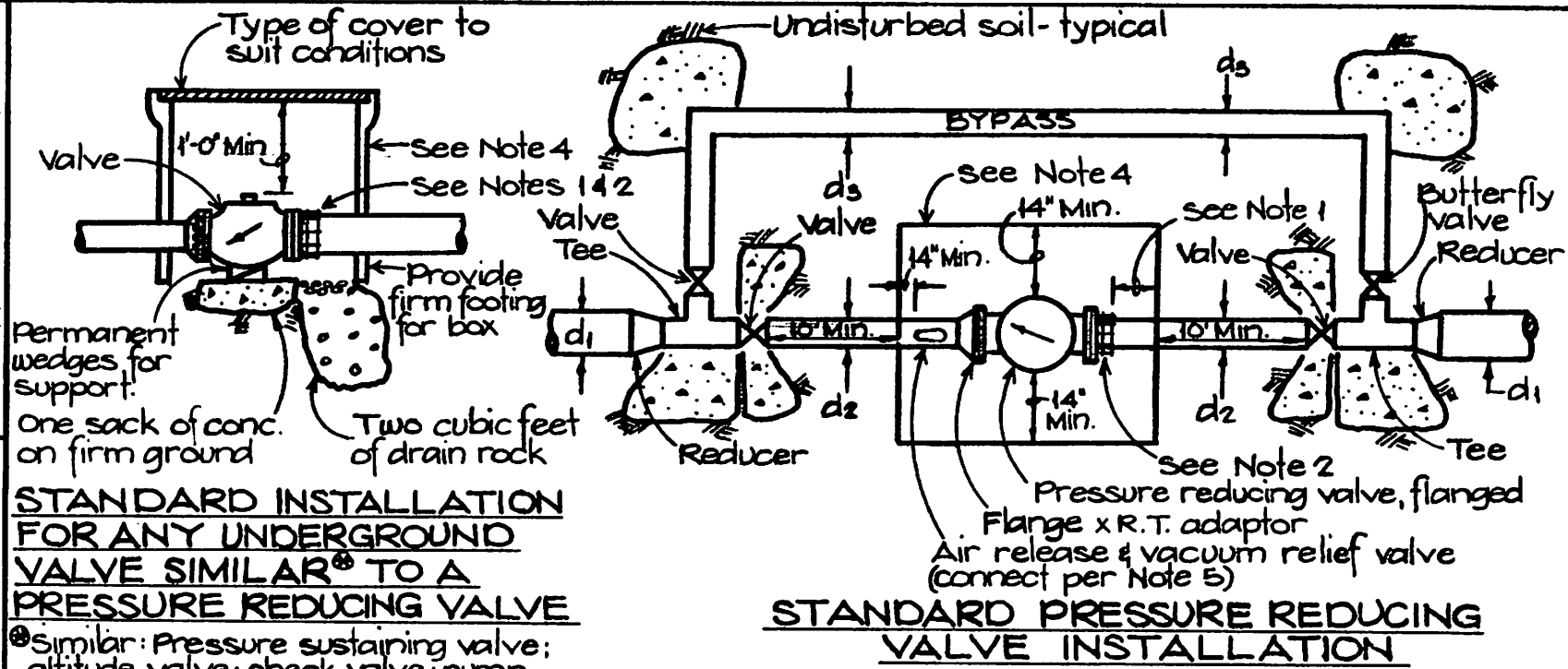
# JUMPER PIPE

9



ITEM	MATERIAL DESCRIPTION
1	Check valve
2	Gate valve with handwheel
3	Galvanized tee with plug
4	90° Galvanized elbow
5	Galvanized pipe
6	Galvanized union
7	Tapped plug

Approved: *Henry J. Adams* Date: 3/81  
 Manager / County Surveyor  
 Land Dev., Engineering & Surveying



**STANDARD INSTALLATION  
 FOR ANY UNDERGROUND  
 VALVE SIMILAR TO A  
 PRESSURE REDUCING VALVE**

① Similar: Pressure sustaining valve; altitude valve; check valve; pump control valve; etc.

**NOTES:**

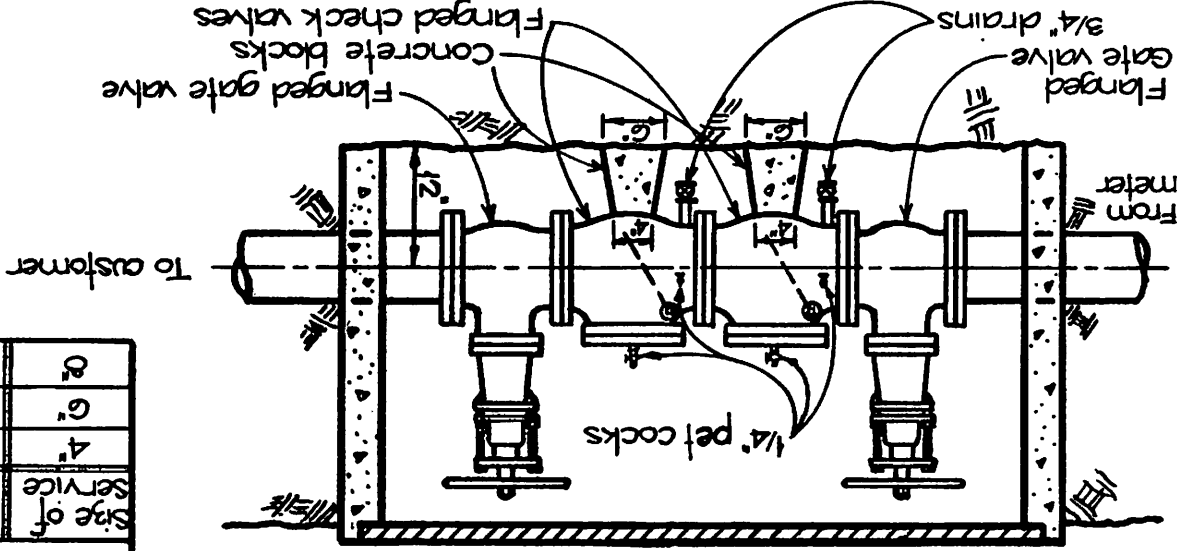
1. Clearance from installed edge of flanged coupling adaptor to inside edge of box to be at least 2 times the length of the flanged coupling adaptor to facilitate the removal of the valve for maintenance.
2. The flanged coupling adaptor is to be Smith-Blair 900 series or similar.
3. Diameter d3 may be less than d2 and both may be less than d1.
4. The box shall be large enough to contain the valve and all appurtenant piping and facilitate maintenance. Clearances shown may not always be enough.
5. See Standard Service to Main Connections detail to determine acceptable method of connection of the air release vacuum relief valve.
6. Thrust blocks shown are the minimum acceptable but other particular installations will require additional blocking; reducers, etc.

COUNTY OF SANTA CLARA  
 ENVIRONMENTAL MANAGEMENT /  
 GENERAL SERVICES AGENCY

No.	Revision	Date

STANDARD INSTALLATION  
 FOR PRESSURE REDUCING  
 AND SIMILAR VALVES 10

SIZE OF BOX				
Size of Service	Inside Length	Inside Width	Height Above of wall	Thickness
4"	5'-0"	2'-6"	1'-9"	4"
6"	6'-0"	2'-6"	2'-1"	4"
8"	7'-0"	2'-6"	2'-4"	4"



**NOTES:**

1. Some means of pressure relief should be provided by the customer so that excessive pressure from the water heater or other sources will not damage the customer's piping or fixtures.
2. Double check valve assembly shall never be by-passed.
3. Above ground installations may be required by County Health Dept. status to be determined at time of installation.
4. Double check valve assembly shall be approved by Santa Clara County Environmental Services Division prior to installation.
5. It shall be the duty of the water user to install the double check valve assembly as shown on this drawing, or in accordance with the Regulations of California Administrative Code, Title 17, Public Health.
6. Valve assembly shall be installed in a concrete box. Provide removable cover for box.

Approved: Date: 3/81

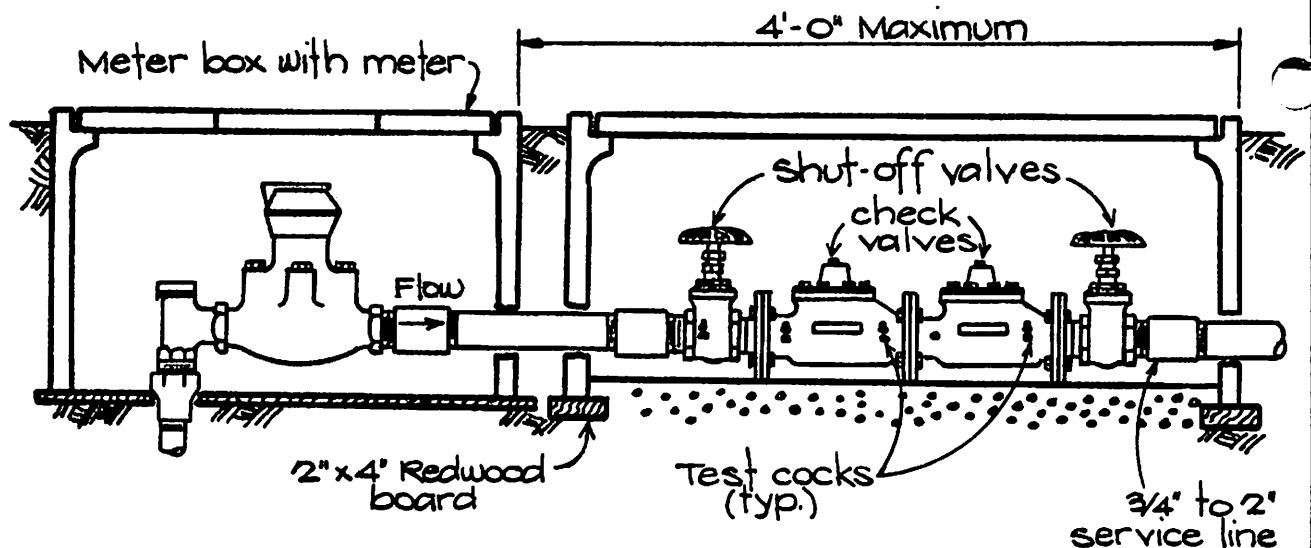
*James Pearson*  
Manager / City Surveyor  
Land Dev., Engineering & Surveying

COUNTY OF SANTA CLARA  
ENVIRONMENTAL MANAGEMENT /  
GENERAL SERVICES AGENCY

No.	Revision	Date

STD. DOUBLE CHECK VALVE  
BACKFLOW PREVENTER  
SIZES ABOVE 2" 11





### DOUBLE CHECK VALVE ASSEMBLY

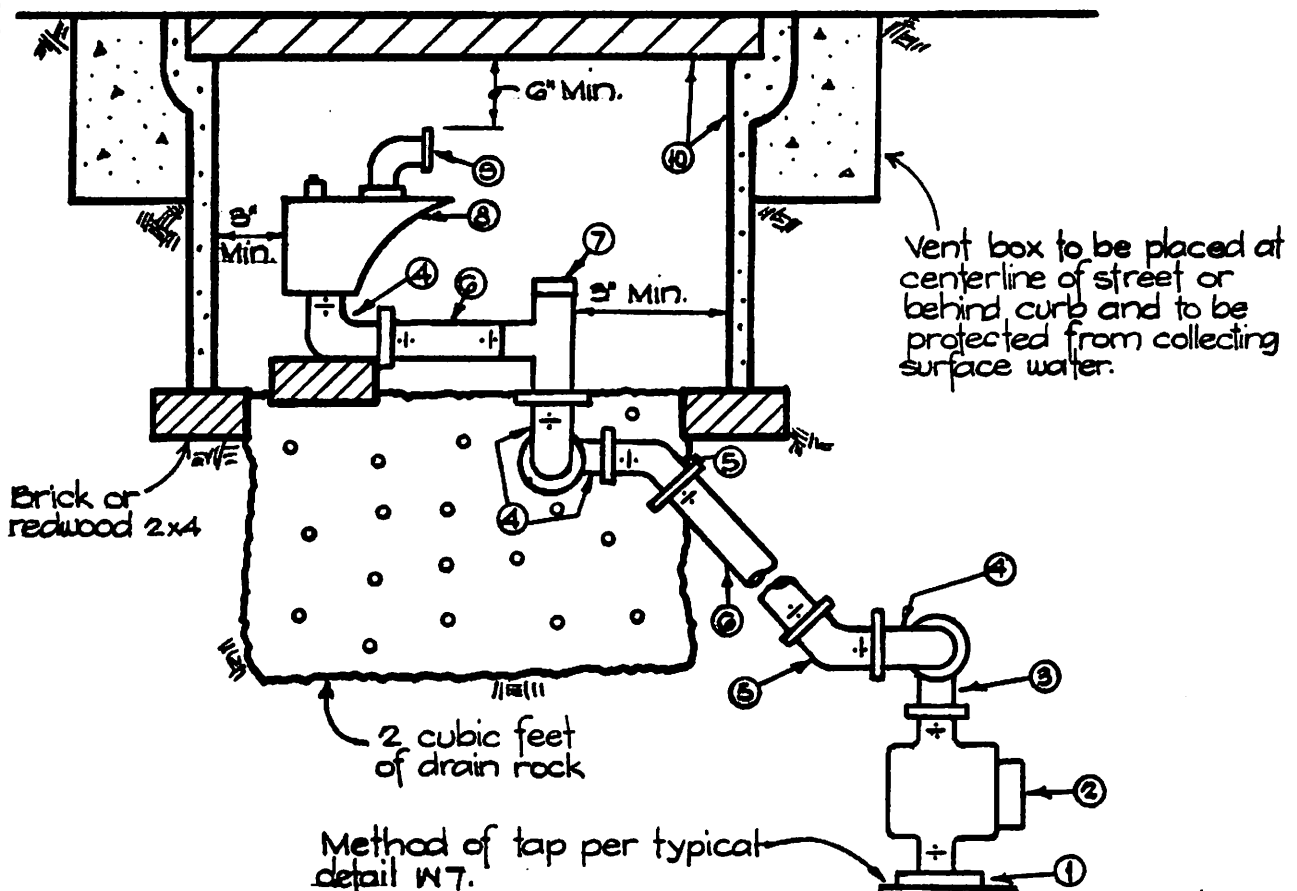
#### NOTES:

1. This drawing applicable only for double check valve backflow preventer, sizes  $\frac{3}{4}$ " to 2".
2. Double check valve assembly shall never be bypassed.
3. Size of valve and box depends upon size of service line from meter to customer.
4. It shall be the duty of the water user to install the double check valve assembly as shown on this drawing, or in accordance with the regulations of California Administrative Code, Title 17, Public Health.
5. Valve assembly shall be installed in a concrete box, provide removable cover for box.
6. Above ground installations may be required by County Health Department. Status to be determined at time of installation.
7. Some means of pressure relief should be provided by the customer so that excessive pressure from the water heater or other sources will not damage the customer's piping or fixtures.
8. Double check valve assembly shall be approved by Santa Clara County Environmental Services Division prior to installation.

Approved: *Stan Larson* Date: 3/81  
 Manager / County Surveyor  
 Land Dev., Engineering & Surveying

**COUNTY OF SANTA CLARA**  
 ENVIRONMENTAL MANAGEMENT /  
 GENERAL SERVICES AGENCY

No.	Revision	Date	SIZES $\frac{3}{4}$ " TO 2"-STANDARD DOUBLE CHECK VALVE BACKFLOW PREVENTER	1/2



ITEM	DESCRIPTION
------	-------------

- |     |  |
|-----|--|
| 1.  | Nylon bushing  |
| 2.  | 1" corporation cock  |
| 3.  | 1" 90° straight elbow (red brass)  |
| 4.  | 1" 90° street elbow (red brass)  |
| 5.  | 1" 45° street elbow (red brass)  |
| 6.  | 1" Red brass pipe  |
| 7.  | 1"x1" angle meter stop   |
| 8.  | Air & vacuum relief valve (Crispin Universal or equal)   |
| 9.  | 90° street elbow (galvanized)  |
| 10. | Meter box. If placed in street, to have traffic cover and be sufficiently strong & supported to support heavy traffic. |

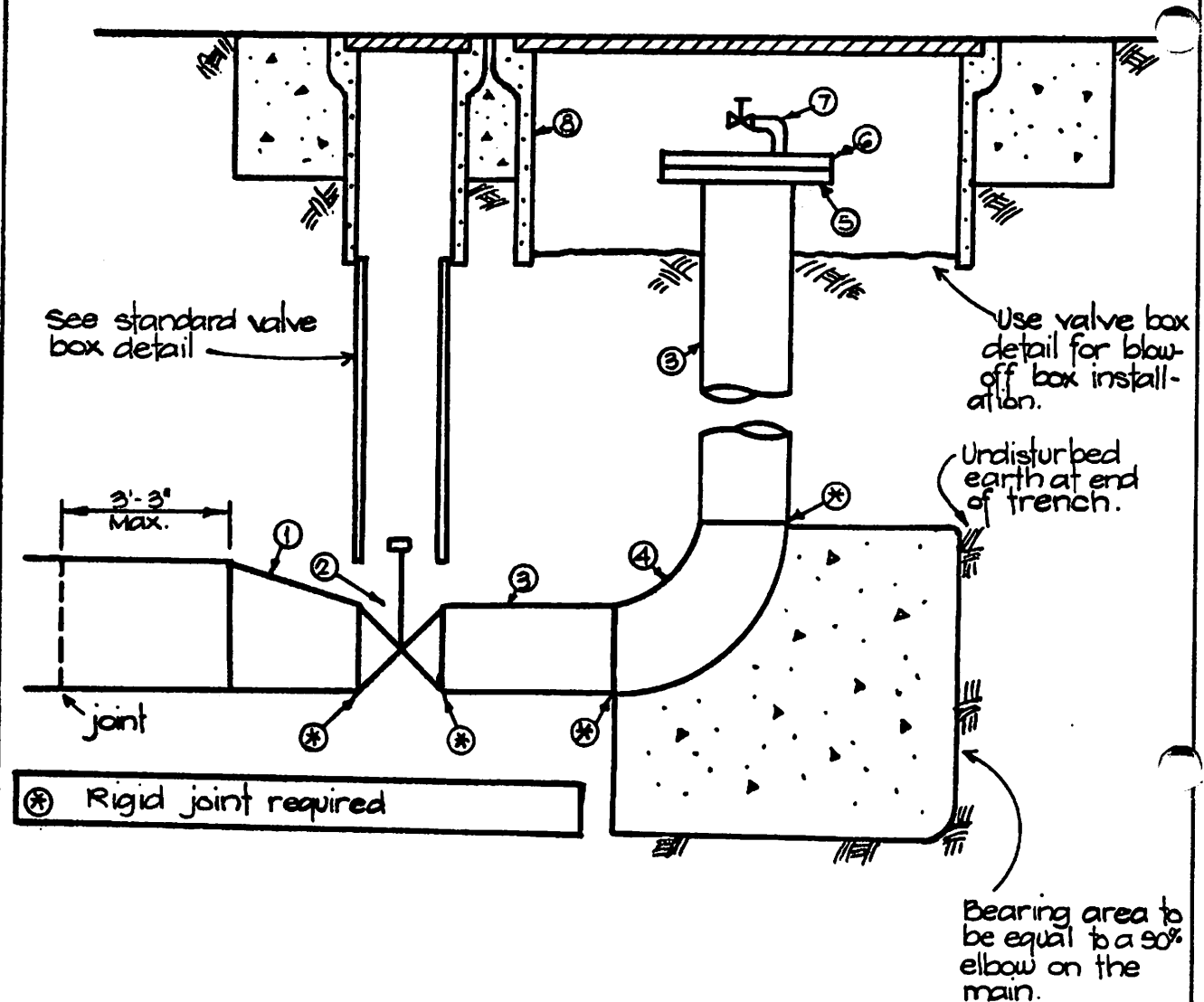
Coat air valve with 1/64" coating of CA-1180

Approved: Date: 3/81

*Dean Larson*  
Manager / County Surveyor  
Land Dev., Engineering & Surveying

COUNTY OF SANTA CLARA  
ENVIRONMENTAL MANAGEMENT /  
GENERAL SERVICES AGENCY

No.	Revision	Date	STANDARD AUTOMATIC AIR RELEASE & VACUUM RELIEF INSTALLATION	13



ITEM	DESCRIPTION
1.	Reducer
2.	4" Gate valve
3.	4" Pipe
4.	4" Elbow, 90°
5.	4" Flange
6.	4" Blind flange, tapped 3/4"
7.	3/4" Pressure bleed
8.	24" Manhole grade rings & cover (marked "water" or plain)

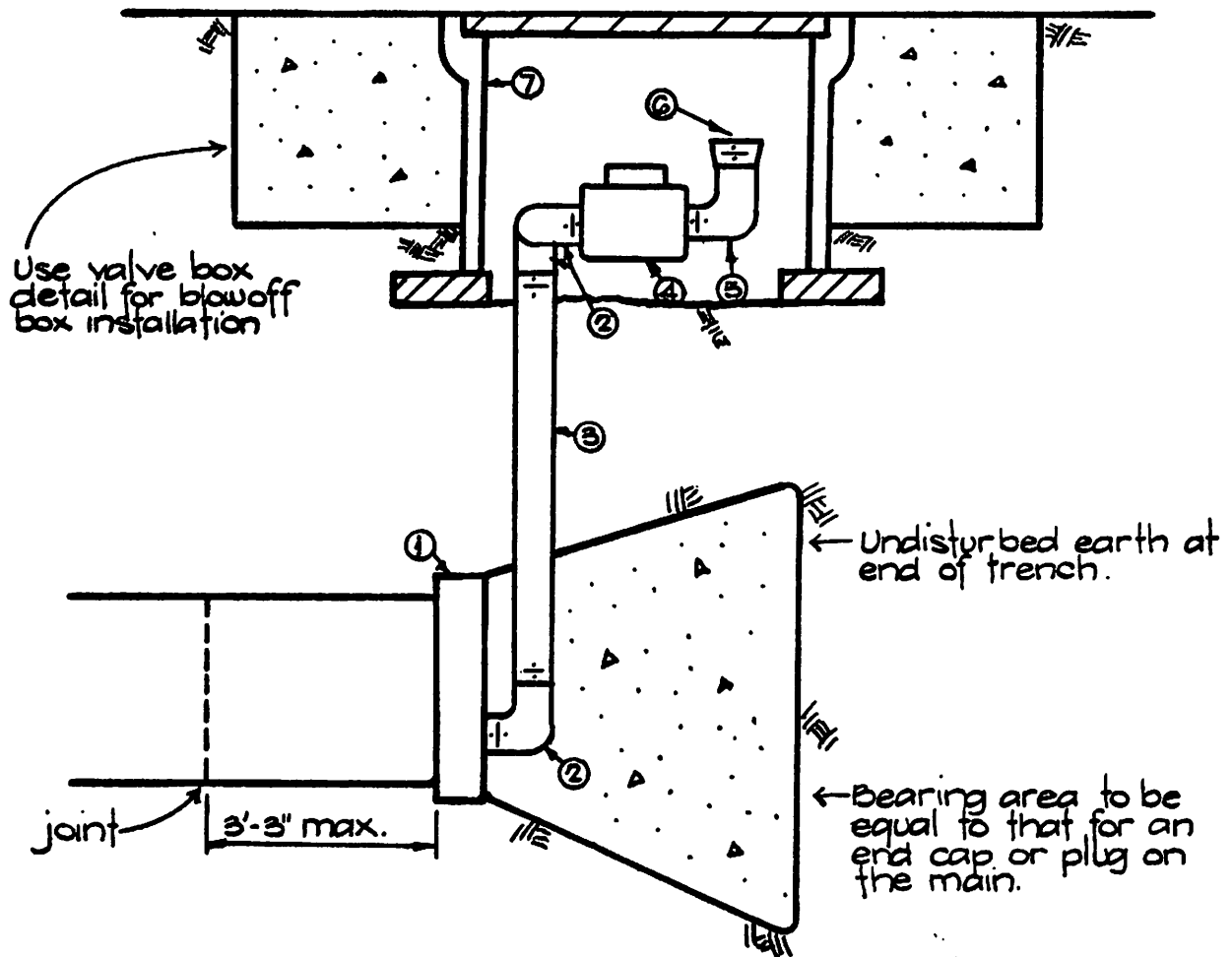
Approved: *Nuan P. Larson*  
 Manager / County Surveyor  
 Land Dev., Engineering & Surveying

Date: 3/81

COUNTY OF SANTA CLARA  
 ENVIRONMENTAL MANAGEMENT /  
 GENERAL SERVICES AGENCY

No.	Revision	Date

**STANDARD BLOWOFF:  
 DEAD END MAIN  
 8" OR LARGER**



ITEM	DESCRIPTION
1.	End cap or plug tapped 2", eccentric
2.	2" street elbow, 90°, brass.
3.	2" brass pipe, threaded both ends
4.	2" curb stop
5.	2" street elbow, 90°, galvanized
6.	2" plug, galv. - installed less than hand tight
7.	12" $\phi$ valve box with cover marked "Water"

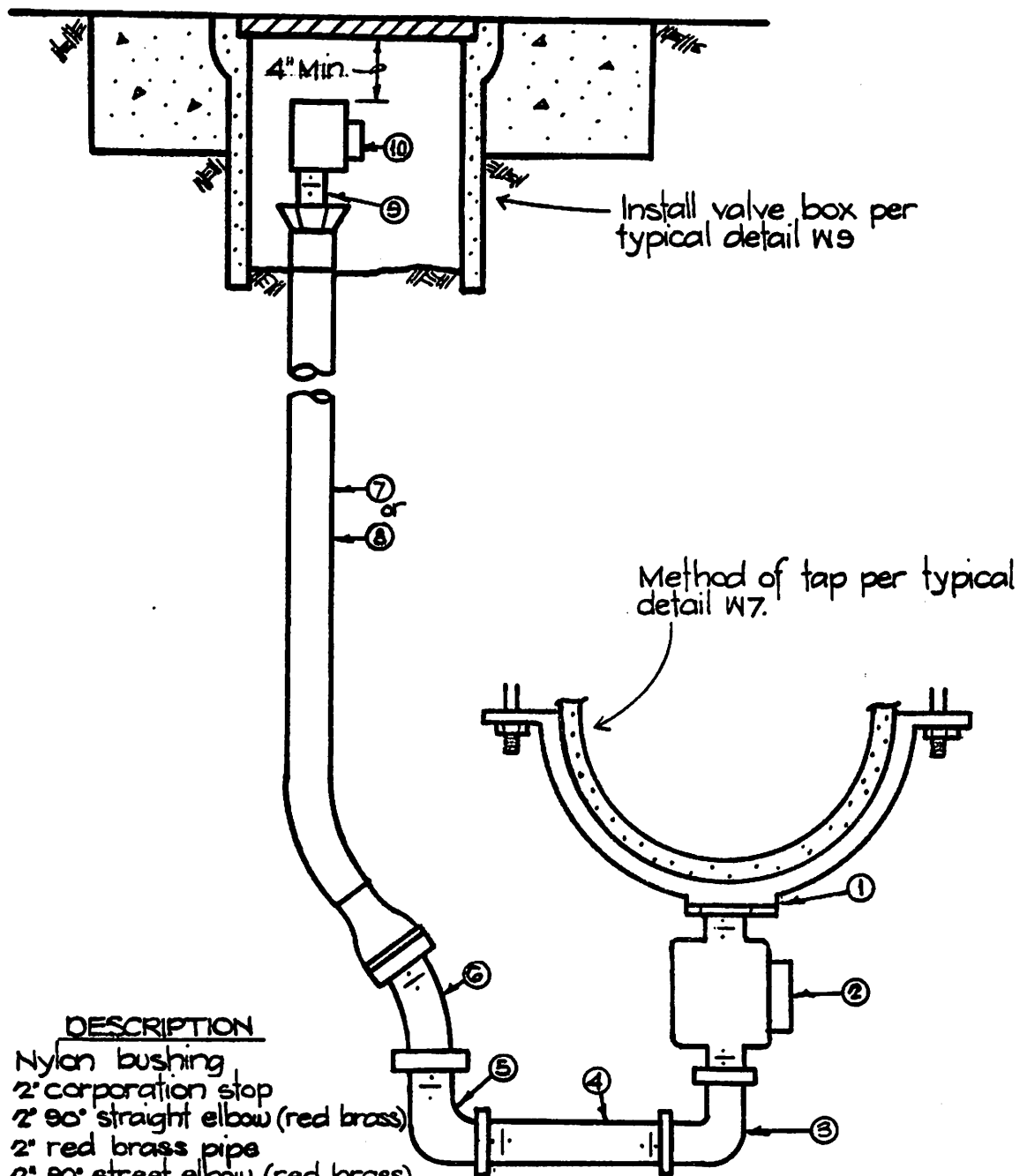
Approved: *Dan A. Larson*  
 Manager / County Surveyor  
 Land Dev., Engineering & Surveying

COUNTY OF SANTA CLARA  
 ENVIRONMENTAL MANAGEMENT /  
 GENERAL SERVICES AGENCY

No.	Revision	Date

STANDARD BLOWOFF  
 6" MAIN OR LESS

15



ITEM	DESCRIPTION
1.	Nylon bushing
2.	2" corporation stop
3.	2" 90° straight elbow (red brass)
4.	2" red brass pipe
5.	2" 90° street elbow (red brass)
6.	2" 45° street elbow (red brass)
7.	2" Polybutylene tubing
8.	2" copper tubing, type "K"
9.	2" close nipple (red brass)
10.	2" curb stop

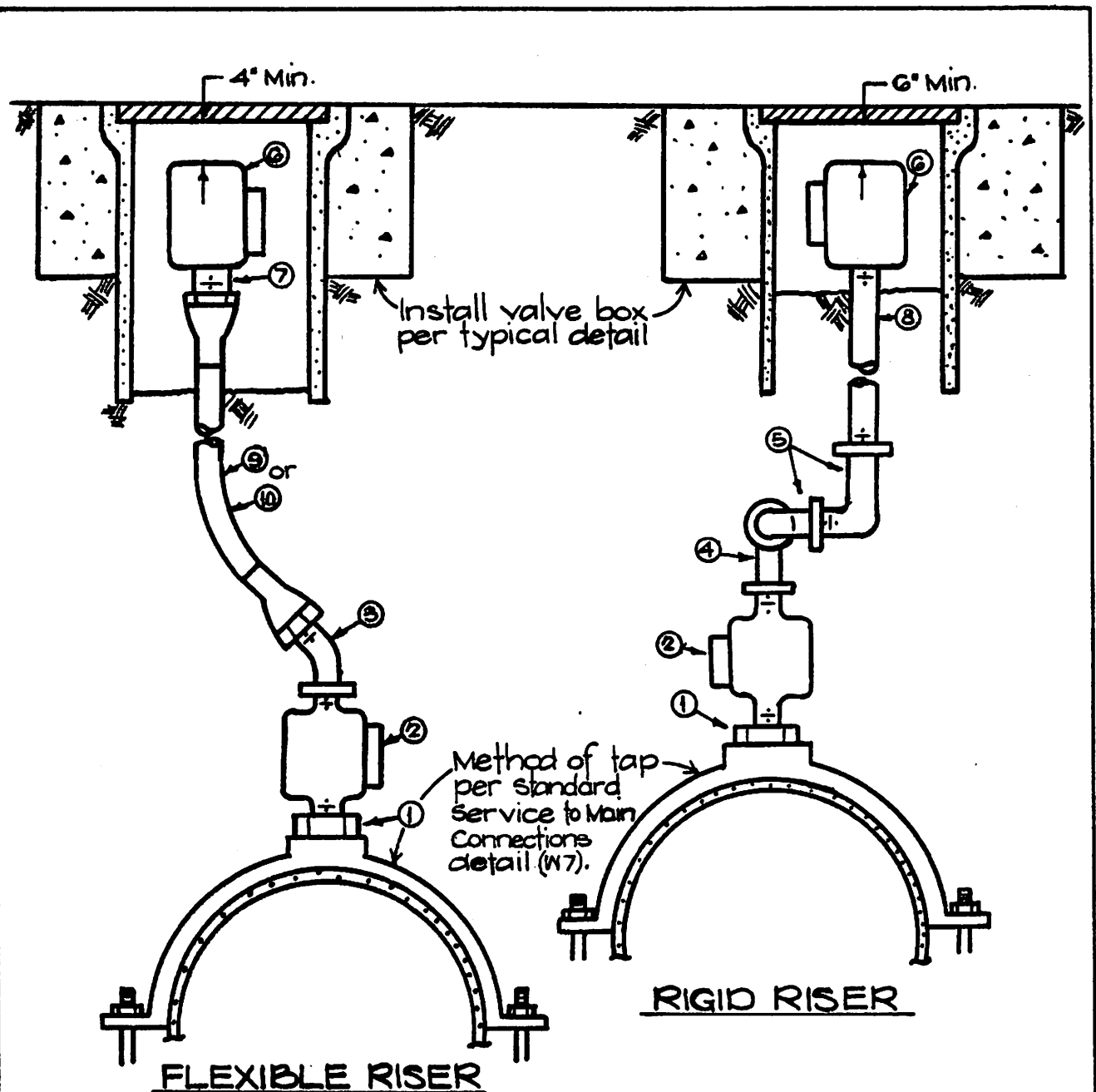
Approved: *David Larson* Date: 3/81  
 Manager / County Surveyor  
 Land Dev., Engineering & Surveying

COUNTY OF SANTA CLARA  
 ENVIRONMENTAL MANAGEMENT /  
 GENERAL SERVICES AGENCY

No.	Revision	Date

STANDARD BLOWOFF FOR  
 SAG POINT

16

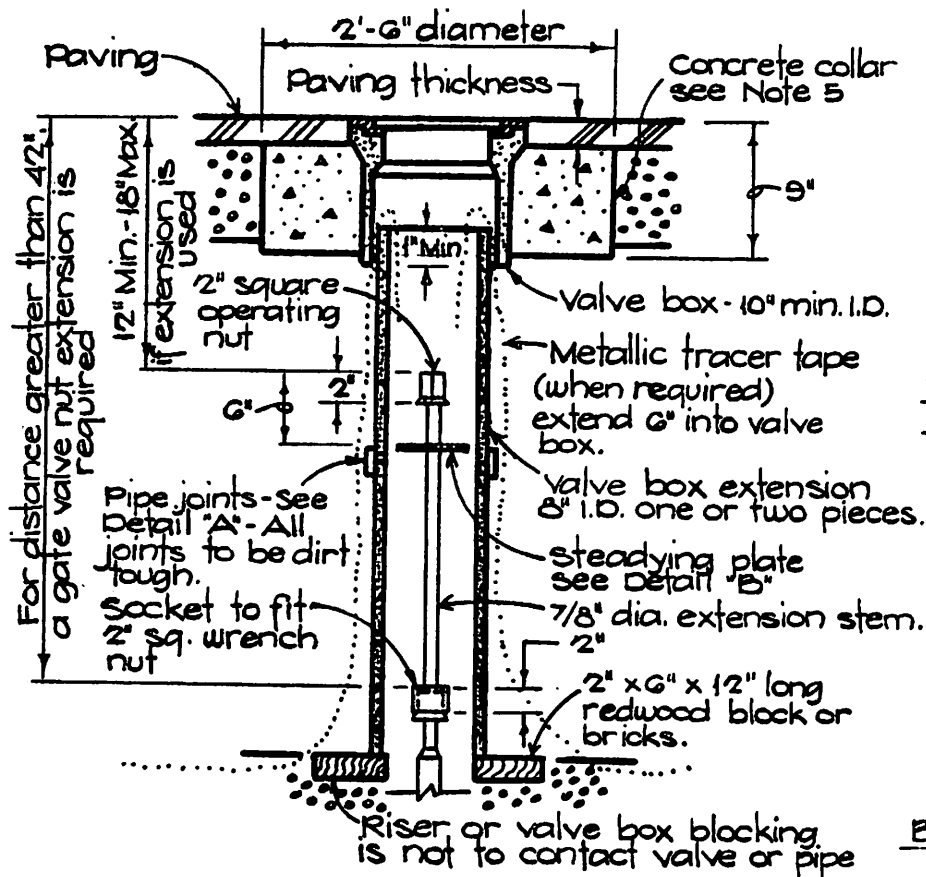


ITEM	DESCRIPTION
1.	Nylon bushing
2.	1" corporation stop
3.	1" 45° street elbow (red brass)
4.	1" 90° straight elbow (red brass)
5.	1" 90° street elbow (red brass)
6.	1" curb stop
7.	1" close nipple (red brass)
8.	1" red brass pipe
9.	1" polybutylene tubing
10.	1" copper tubing, type "K"

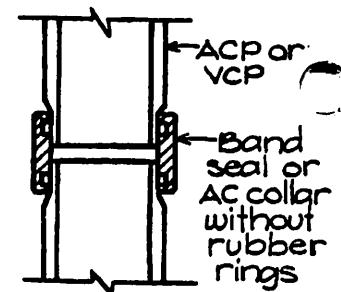
Approved: *Alan Larson* Date: 3/81  
 Manager / County Surveyor  
 Land Dev., Engineering & Surveying

COUNTY OF SANTA CLARA  
 ENVIRONMENTAL MANAGEMENT /  
 GENERAL SERVICES AGENCY

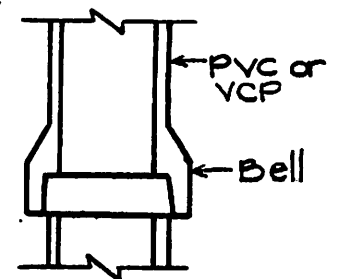
No.	Revision	Date	MANUAL AIR RELEASE INSTALLATION	17



VALVE BOX DETAIL



MILLED END WITH COLLAR

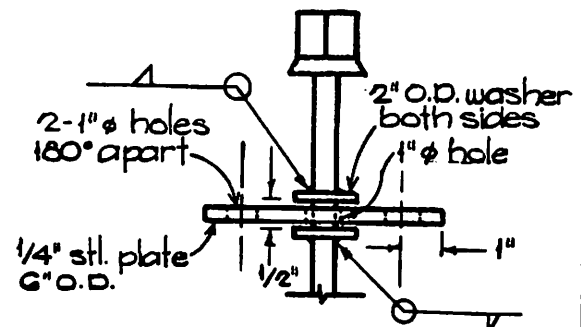


BELL & SPIGOT

DETAIL "A"

NOTES:

1. Valve box extension shall be not less than 8" diameter, A.C., P.V.C. or V.C. pipe, one or two pieces
2. Concrete shall be G sack  $\frac{3}{4}$ " max. aggregate size.
3. After paving, raise valve box to permanent grade, cast concrete collar and repair pavement.
4. Coat ferrous metal fittings as specified.
5. In green belt areas concrete collar to be installed flush with valve pot lid, and lid to be dirt tight.



DETAIL "B"

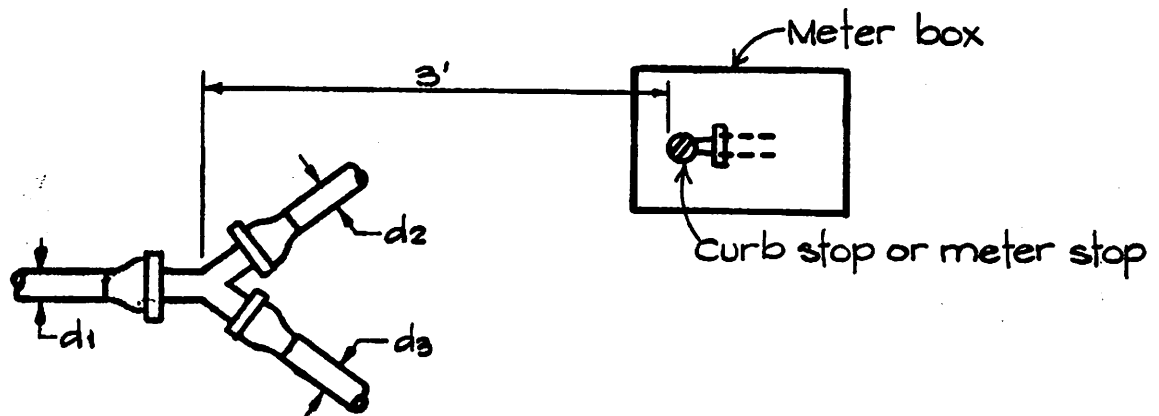
Approved: *Stan Larson*  
 Manager / County Surveyor  
 Land Dev., Engineering & Surveying

Date: 3/81

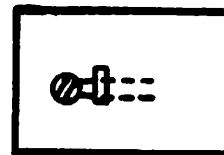
COUNTY OF SANTA CLARA  
 ENVIRONMENTAL MANAGEMENT /  
 GENERAL SERVICES AGENCY

No.	Revision	Date

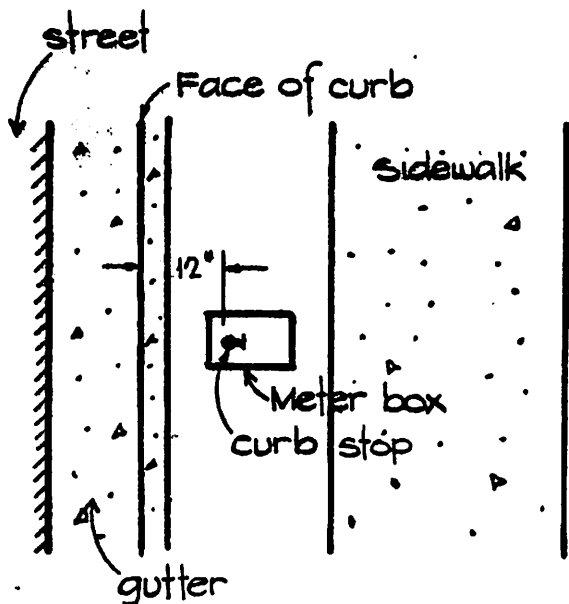
STANDARD VALVE  
 BOX INSTALLATION



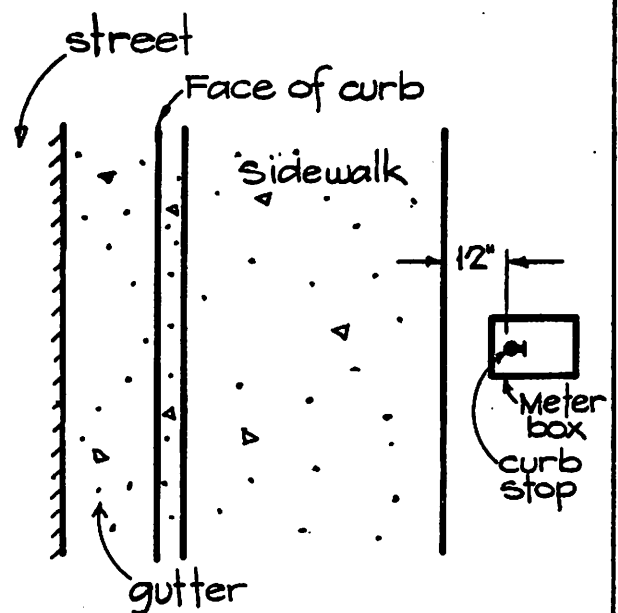
$d_1 = \sqrt{d_2^2 + d_3^2}$  as a minimum



### SPLIT SERVICE



NON-INTEGRAL OR NO S/W



INTEGRAL

### BOX LOCATION

Approved: *Stan Pearson* Date: 3/81  
 Manager / County Surveyor  
 Land Dev., Engineering & Surveying

COUNTY OF SANTA CLARA  
 ENVIRONMENTAL MANAGEMENT /  
 GENERAL SERVICES AGENCY

No.	Revision	Date

STANDARD SERVICE  
 DETAILS



**CASE I**

**CASE II**

**CASE III**

**CASE IV**

**Note:** Taps shall not be closer than 12" from another tap, on an AC pipe collar or a fitting. Taps are not allowed on MOA AC pipe.

**MAIN VS. SERVICE: TYPE OF CONNECTION TABLE**

TYPE AND DIAMETER OF MAIN	SERVICE SIZE					
	5/8"	3/4"	1"	1 1/2"	2"	More than 2"
AC Class 150 10' & up	II A	II A	II A	II B	II B	IV
	I	I	II A	II B	II B	IV
	I	I	I	II B	II B	IV
	I	I	I	II B	II B	IV
PVC Class 150 10' & up	II A	II A	II A	II B	II B	IV
	I	I	I	I	II B	IV
	I	I	I	I	I	IV
	I	I	I	I	I	IV
C.I. D.I. 10' & up	I	I	II A	II B	II B	IV
	I	I	I	I	II B	IV
	I	I	I	I	I	IV
	I	I	I	I	I	IV
std. stl. wrought iron concrete cyl. All sizes	III	III	III	III	III	IV

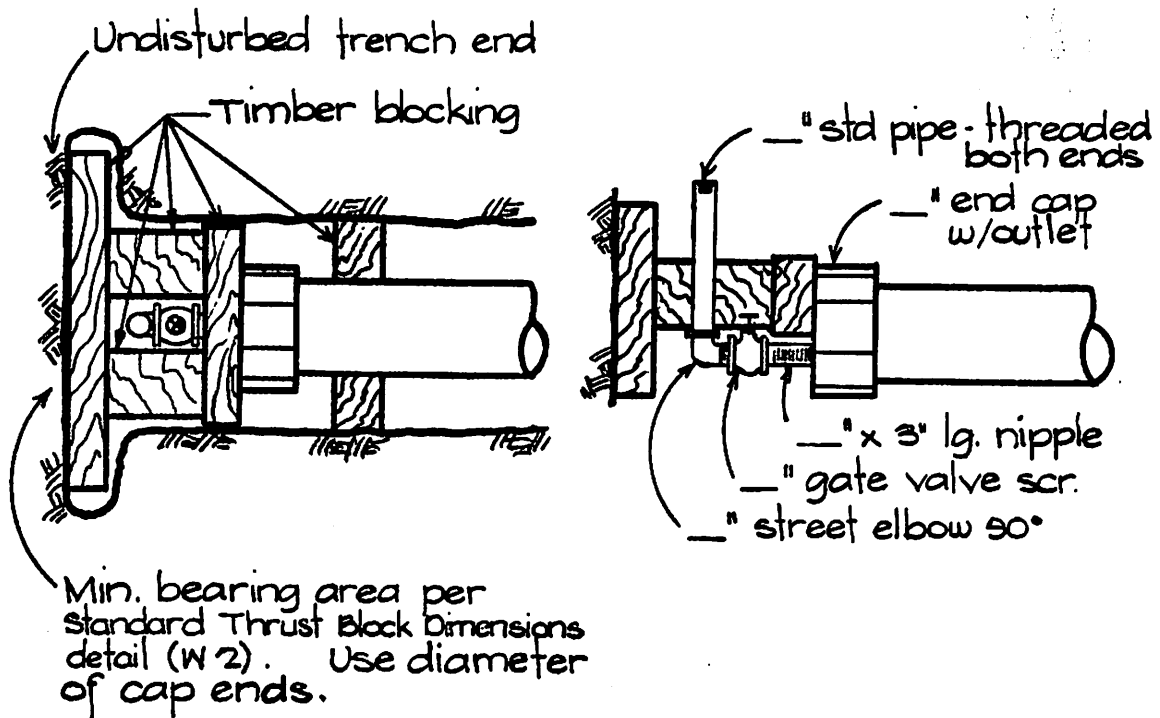
Approved: *Alan Larson* Date: 3/81  
Manager / County Surveyor  
Land Dev., Engineering & Surveying

**COUNTY OF SANTA CLARA**  
ENVIRONMENTAL MANAGEMENT /  
GENERAL SERVICES AGENCY

No.	Revision	Date

**STANDARD SERVICE TO MAIN CONNECTIONS**

20



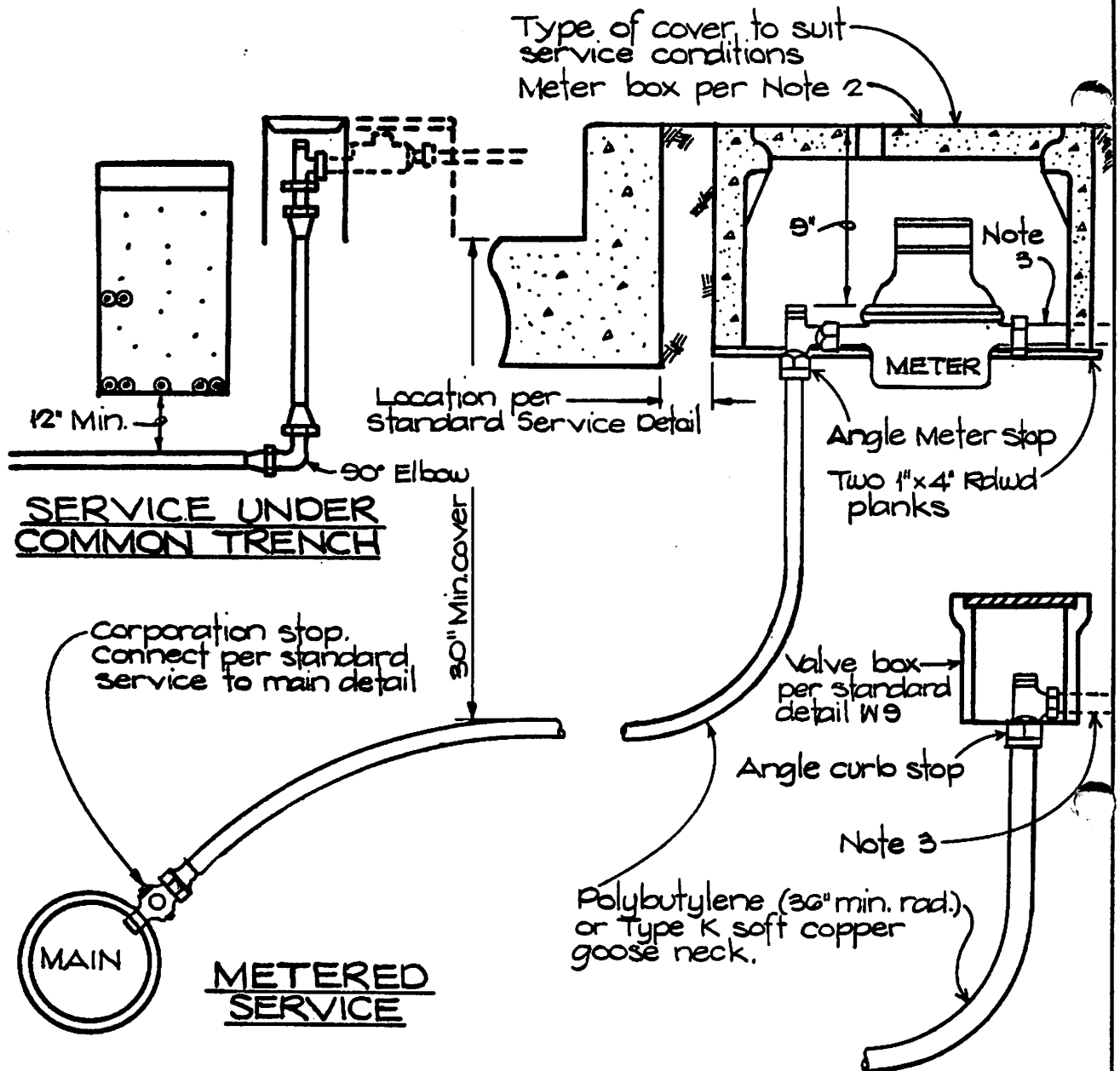
### TEMPORARY END CAP DETAIL

Approved: *Dean Larson* Date: 3/81  
 Manager / County Surveyor  
 Land Dev., Engineering & Surveying

COUNTY OF SANTA CLARA  
 ENVIRONMENTAL MANAGEMENT /  
 GENERAL SERVICES AGENCY

No.	Revision	Date

STANDARD TEMPORARY  
 END CAP 21



**NOTES:**

1. Minimum cover over service pipe to be 30".
2. Meter box: 3/4" service - Christy No. B9; 1" service - Christy No. B16, or equal
3. Hookup to meter or curb stop to be made by developer or new customer.

Approved: *David Larson*  
Manager, County Surveyor  
Land Dev., Engineering & Surveying

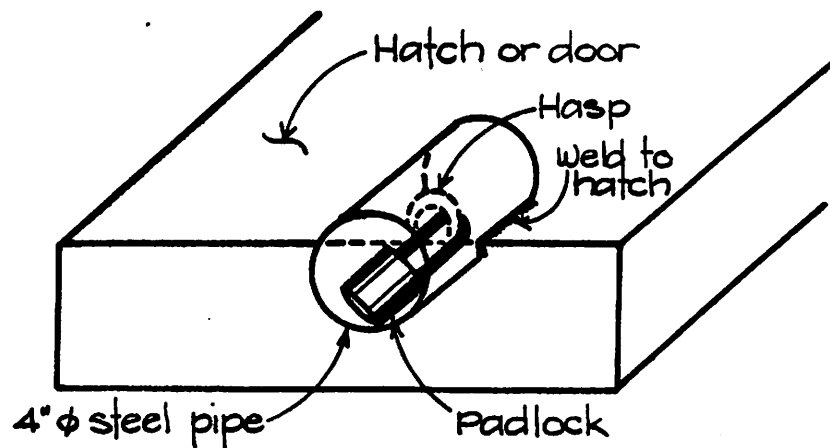
Date: 3/81

**COUNTY OF SANTA CLARA**  
ENVIRONMENTAL MANAGEMENT /  
GENERAL SERVICES AGENCY

No.	Revision	Date

**STANDARD  
SERVICE INSTALLATION**

22



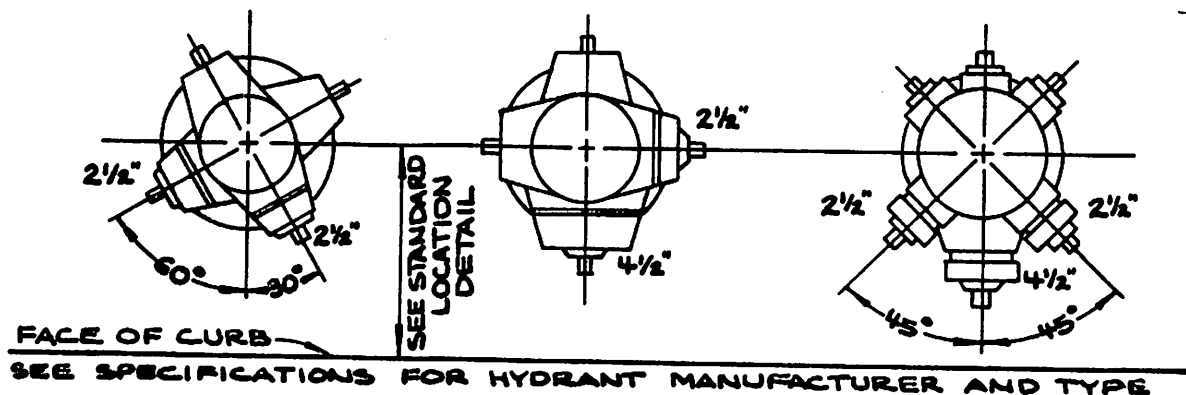
Approved: *Stan Larson*  
 Manager / County Surveyor  
 Land Dev., Engineering & Surveying

Date: 3/81

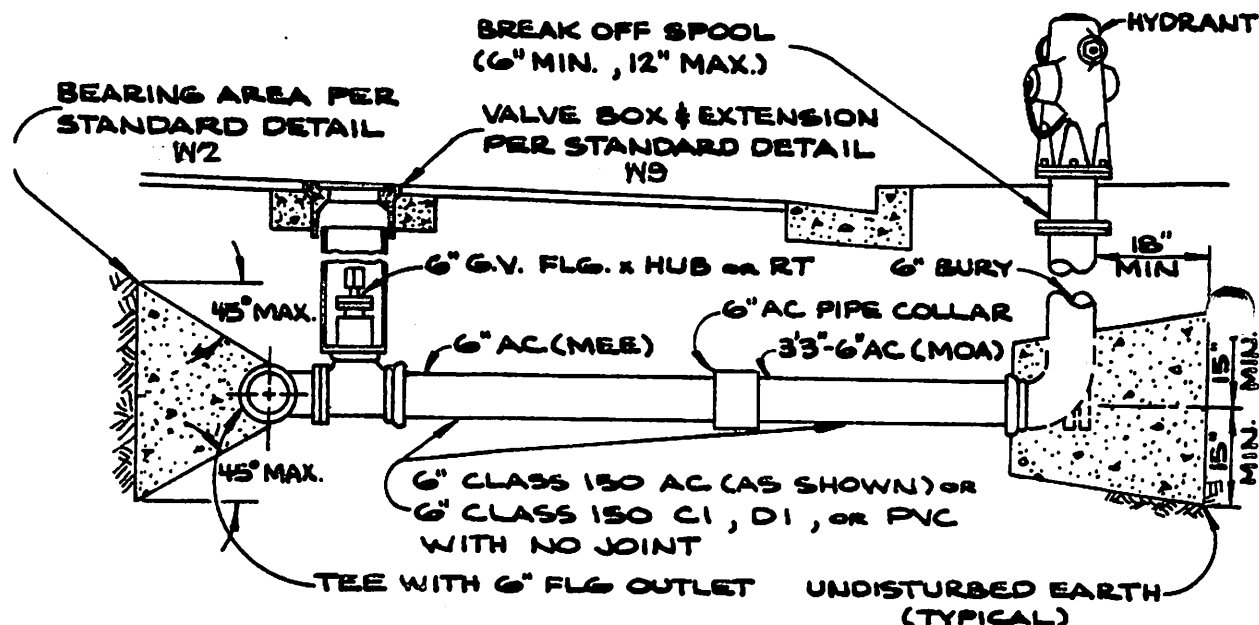
COUNTY OF SANTA CLARA  
 ENVIRONMENTAL MANAGEMENT /  
 GENERAL SERVICES AGENCY

No.	Revision	Date

VANDAL RESISTANT  
 SHIELD FOR LOCKS



## STANDARD HYDRANT POSITION ON BURY



## STANDARD HYDRANT INSTALLATION

### NOTES:

1. COAT ALL FERROUS METAL PRIOR TO PLACEMENT IN TRENCH IN ACCORDANCE WITH SPECIFICATIONS
2. PAINT HYDRANT MIRROLAC YELLOW (4-49E AS MANUFACTURED BY DEVOE & RAYNOLDS OR APPROVED EQUAL)
3. SLOTTED HYDRANT SPOOLS MAY BE REQUIRED FOR SPECIAL CONDITIONS; I.E., HYDRANTS IN CUL-DE-SACS, LONG RADIUS CURVES, ETC.
4. CAST CONCRETE AGAINST UNDISTURBED GROUND.

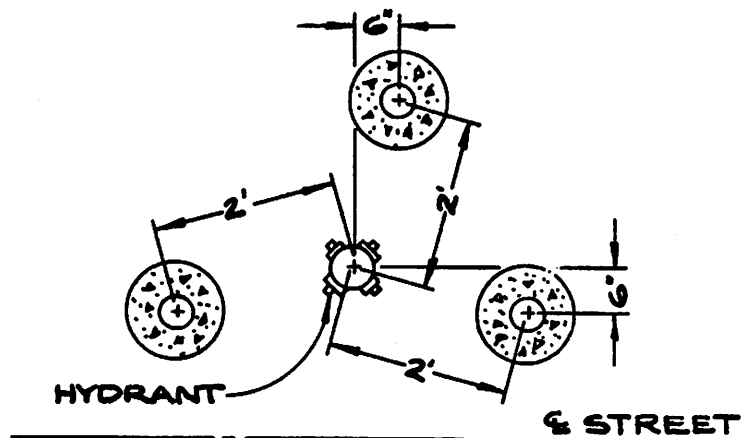
Approved: *Dean Larson*  
Manager / County Surveyor  
Land Dev., Engineering & Surveying

Date: 3/81

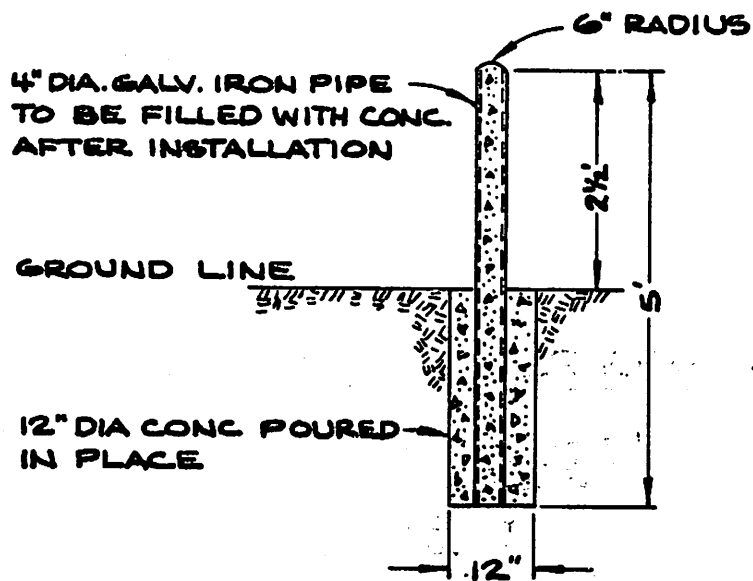
COUNTY OF SANTA CLARA  
ENVIRONMENTAL MANAGEMENT /  
GENERAL SERVICES AGENCY

No.	Revision	Date

STANDARD  
HYDRANT INSTALLATION 24



## POST LOCATIONS



THE 4" IRON PIPE SHALL BE  
COATED WITH ZINC CHROMATE  
PRIMER BEFORE INSTALLATION

Approved: *Dean Larson*  
Manager / County Surveyor  
Land Dev., Engineering & Surveying

Date: 3/81

COUNTY OF SANTA CLARA  
ENVIRONMENTAL MANAGEMENT /  
GENERAL SERVICES AGENCY

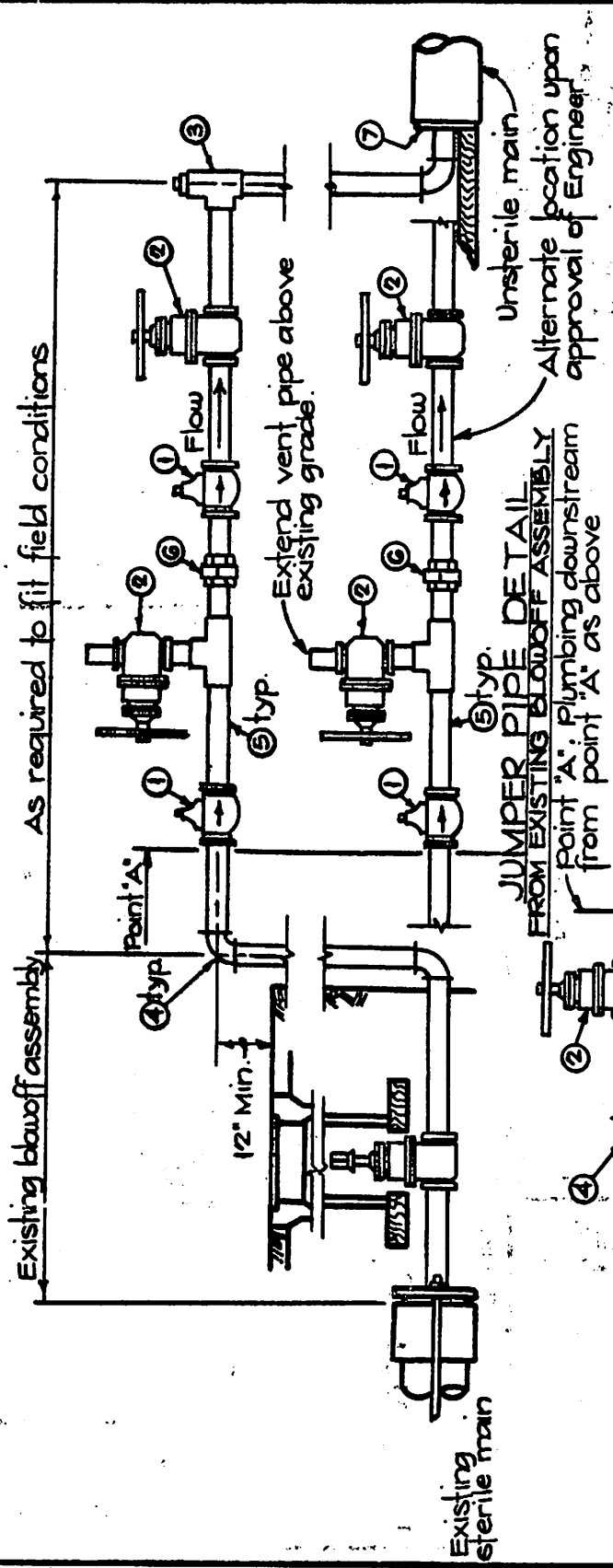
No.	Revision	Date

STANDARD  
HYDRANT GUARD POSTS

25

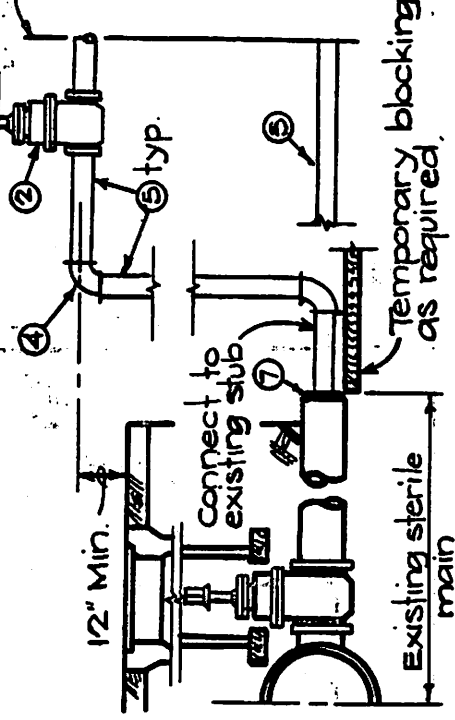


DO NOT WRITE INSIDE



- NOTES:
1. Jumper piping to be sterilized with 5% hydrochloric solution prior to installation.
  2. Jumper construction other than hereon specified will not be allowed without permission of Engineer.
  3. Jumper size:  
10" main or less - 2"  
12" main thru 16" - 4"  
18" main or larger - 6"

**JUMPER PIPE DETAIL FROM EXISTING BLOWOFF ASSEMBLY**



**JUMPER PIPE DETAIL FROM TAPPING AND/OR LINE VALVE ASSEMBLY**

ITEM	MATERIAL DESCRIPTION
1	Check valve
2	Gate valve with handwheel
3	Galvanized tee with plug
4	90° Galvanized elbow
5	Galvanized pipe
6	Galvanized union
7	Tapped plug

Approved: *Dan Larson* Date: 3/81  
 Manager / County Surveyor  
 Land Dev., Engineering & Surveying

COUNTY OF SANTA CLARA  
 ENVIRONMENTAL MANAGEMENT /  
 GENERAL SERVICES AGENCY

No.	Revision	Date

**JUMPER PIPE**



**APPENDIX VII**  
**WATER SYSTEM INDEX**

## WATER SYSTEM INDEX

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