
APPENDIX A-6

DISTRICT STANDARD SPECIFICATIONS

A-6.1 Scope

The District Standard Specifications constitute a compilation of standards for sewer system design, development, repair and construction. The purpose of these standards is to establish quality guidelines for sewer system design and construction within the District. These standards shall apply to all sanitary sewer facilities constructed within the boundaries of the District.

The owner or their agent shall, at all times, keep themselves fully informed of, and shall observe and comply with all applicable Federal and State laws; Placer County, and special district ordinances, resolutions, rules, and regulations which in any manner effect the design construction or operation of the sanitary sewer system and its appurtenances.

All developments/projects are handled on a first come, first serve basis. There are specific administrative requirements for developments and projects that involve the installation of sewer facilities. The District has produced a "Development Guidelines" packet to assist you. The owner or their agent shall be required to submit the necessary application and associated forms to the District to facilitate this procedure. "Development Guidelines" packets may be obtained at the District office.

A-6.2 Design Standards

Design Flow: An average flow of 100 gallons per person per day shall be used for design purposes. District flow data indicates an average occupancy rate of 3.2 persons per residence. In larger sanitary sewer systems, consideration should be given to concentration of peak flows. All sewers shall be designed with sufficient capacity to handle peak flows with pipes running full but without surcharging the pipeline.

Population densities will vary, being controlled largely by the number of residential lots per acre and other land uses. All design population estimates including equivalent population for schools, commercial, and industrial uses, shall be indicated on the set of improvement plans submitted for approval.

Gradient: Sanitary sewer grades shall be designed to provide a minimum velocity of 2 feet per second when flowing full. The following table indicates the slopes, which will provide that velocity, and these shall be used as the standard for design. Minimum acceptable slopes are also shown. These minimum slopes shall be used only when topographic features preclude standard slopes and require written approval from the General Manager for their use.

SLOPE IN FEET/FOOT

<u>Diameter</u>	<u>2 feet/Second Flow</u>	<u>Minimum Acceptable</u>
4"	0.0208 (1/4" per foot)	0.0208 (1/4" per foot)
6"	0.0050	0.0035
8"	0.0035	0.0025
10"	0.0025	0.0015
12"	0.0020	0.0008
18"	0.0012	0.0006

Whenever a change in the size of the pipe, or an angle of 20 degrees or greater in alignment occurs, the flowline of the pipe flowing into manholes shall be a minimum of 0.17 feet above the flowline of the pipe flowing from the manhole, or an amount necessary to match the inside crowns of the pipe, whichever is greater.

Location and Alignment of Sanitary Sewer Facilities: All sanitary sewer facilities to be dedicated to the District shall be constructed and installed within rights-of-way dedicated for public streets or roads, or within sanitary sewer easements, unless such construction or installation is determined to be impractical by the General Manager.

Whenever it is essential that curved alignment be used for sanitary sewer pipelines, a radius of not less than 200 feet will be used, and shall be greater whenever possible. No sanitary sewer facility, including building laterals, shall be located within 50 feet of a water well. Any sanitary sewer pipeline located between 50 feet and 100 feet of a water well shall be constructed of ductile iron with rubber type ring joints.

Location of Sanitary Sewer Facilities with Respect to Water Pipelines: Sanitary sewer main pipelines running parallel to water mains must maintain at least a 10 foot horizontal separation. Sanitary sewer main pipelines crossing water mains shall maintain at least 1 foot vertical separation and shall meet Uniform Plumbing Code requirements for pipeline types, joint locations, and encasement or sleeving.

The location of building laterals with respect to water service connections running parallel in a common trench shall meet the requirements of the Uniform Plumbing Code, Section 1108 that states in part:

- The bottom of the water pipe, at all points, shall be at least 12 inches above the top of the sewer pipeline, and
- The water pipe shall be placed on a solid shelf excavated at one side of the common trench with a minimum clear horizontal distance of at least 12 inches from the sewer.

The spring line of building lateral crossing water pipes shall be at least 12 inches below the bottom of the water pipe and shall meet Uniform Plumbing Code requirements for pipeline types, joint locations, and encasement or sleeving.

Pipe Cover: The depth of any sanitary sewer main pipeline or lateral shall be adequate to obtain a minimum cover of 30 inches. Any exception to this rule must have prior approval of the General Manager.

Manhole Spacing: Normal maximum spacing for manholes shall be 400 feet. Where the location of two manholes are determined by intersecting lines, the distances between intervening manholes shall be approximately equal. Sewers on curved alignment with a radius of less than 400 feet shall have manholes spaced at a maximum of 300 feet and adjusted down to fit the individual case. Curved alignment shall not be used unless specifically permitted by the General Manager.

The maximum spacing of manholes on outfall sewer pipelines of 12 to 24 inches shall be 500 feet.

End of Line Cleanouts: An end of line cleanout may be used in lieu of a manhole for any stub pipeline with a length of 300 feet or less. Any pipeline more than 300 feet in length shall terminate with a manhole. Sewer pipelines less than 200 feet in length which are installed for future extension shall have an end of line cleanout at the end if there are any building laterals attached to it. Sewer pipelines longer than 200 feet shall terminate in a manhole with a stub for future extension. See Standard Drawings, End of Line Cleanout Assembly, Figure 5, page 147.

Sanitary Sewer Service Connections: In all new subdivision work, the sewer service lateral from the sewer main pipeline to the property line shall be installed at the time the sewer main pipeline is constructed.

Whenever a sewer main pipeline is installed which will serve existing houses or other buildings, a sanitary sewer service connection shall be constructed for each such existing house or building. Each sanitary sewer service connection shall be referenced to the plan stationing.

A plan and profile of any sanitary sewer service connection, other than for a single family or two family dwelling, shall be submitted in accordance with the District Code.

Sanitary sewer service laterals may be connected to outfall sewer pipelines at manhole locations only, and only when the depth of the outfall sewer pipeline does not exceed 12 feet from finished grade.

Wastewater Lift Stations and Force Mains: Whenever the design of a sanitary sewer system includes the necessity of a wastewater lift station and a force main, the following data shall be submitted for tentative approval prior to construction:

Pumps

- The design flows computations for the pumping system that includes either the pumps or ejectors, and the force main.
- The types, size, and model of pump to be used. Pumps shall be similar in design and manufacture to existing District equipment if possible. Pump curves shall be supplied with all design parameters and system curves marked.

Site

- A plot plan showing the dimensions of the site and its location with respect to homes or other structures. Minimum distance from a lift station to any residence shall be 50 feet except with advance approval of the General Manager for each specific case.
- Section and plan views of the wet well and all other structures to be constructed.

Electrical and Telemetry

- The design computations for electrical loads for pumps and all other equipment.
- Control equipment electrical diagrams. Control equipment shall be equal to design and manufacture of currently used control equipment in the District if possible.
- Telemetry electrical diagrams. Telemetry equipment shall be equal to design and manufacture of currently used telemetry equipment. All telemetry equipment shall be compatible with the District's most current telemetry system whether that system is in use or being implemented.
- Electrical standby system design. Electrical system shall incorporate a standby power system consisting of a safety switch and generator plug combination. Larger stations shall also include a generator and transfer switch combination depending on pumping station size, design flow, and type. Designation shall be by the General Manager

Force Main

- The size and type of pipe to be used.
- The size and type of fittings to be used.
- The tentative alignment of pipe and locations of bypass ports if required. Bypass ports shall incorporate valve and fitting types that match current District bypass port design and usage (see Standard Drawings, Bypass Port (Single), Figure 22, page 181, and Bypass Port (Double), Figure 23, page 183).
- A single bypass port shall be located at the pump station. Additional double bypass ports shall be located at accessible locations with a maximum distance between ports of 1,500 feet.

The force main shall be marked with tracer wire. Tracer wire shall consist of 10 AWG minimum with THW, THHW, TW, THWN, or other approved wet location insulation. Wire shall be attached to the top of the force main with tape at maximum 5 foot intervals. Wire shall be continuous between vaults and other access points where excess wire shall be spooled to provide connection points. Splices shall incorporate approved underground splice kits. Each run of tracer wire shall be tested for continuity following backfill.

Mobile Home and Recreational Vehicle Parks: Whenever the design of a sanitary sewer system involves mobile home and/or recreational vehicle parks, additional requirements to those in the Uniform Plumbing Code, may be necessary due to the environment (see Standard Drawings, Utility Pad Installation, Figure 11, page 159).

A-6.3 Criteria for Improvement Plans

Format of Improvement Plans: Improvement plans for sanitary sewer improvements shall be prepared on standard FAS sheets (24 x 36 inches). Scales are to be as follows except in unusually rough terrain where the scales may be variable. Horizontal 1 inch = 100 feet or 1 inch = 40 feet, Vertical 1 inch = 10 feet or 1 inch = 5 feet.

On subdivision or improvement plans exceeding three sheets in the set, a title sheet shall be prepared showing the entire subdivision or project, Assessment District, Streets Names, Section and/or grant lines and corners; and the location within the County. The owner or their agent shall provide a list of symbols and abbreviations either on the title sheet or in the specifications.

The title sheet also shall include the Engineer's name, and license number and signature; the date and scale of the drawing; and the blocks for the necessary approval of the General Manager and other officials.

Each set of improvement plans submitted to this office shall have a suitable index map showing the overall area to be developed and the sheet index referring to the construction improvement plans.

Each sheet within the set of drawings shall have an approved title block showing the sheet title, number, date, scale and the Engineer's name and license number; and the name of the Subdivision or Assessment District.

Approval blocks shall appear on the title sheet and all detail sheets that have details to be approved by the District. There shall be one block for "Approved" to be signed by the General Manager. The block shall have space to be dated.

Example:

These improvement plans have been reviewed and approved for construction of the sanitary sewer.

Approved: NORTHSTAR COMMUNITY SERVICES DISTRICT

General Manager

Date

Special notes shall be clearly indicated, and it shall be conspicuously noted on the improvement plans that all construction work and installations shall conform to the District Code and that all work is subject to the approval of the General Manager. The following phrase shall be noted on the improvement plans:

“All sewerage works to meet or exceed Northstar Community Services District Code requirements”

Plan and Profile Sheet Requirements: The improvement plans shall clearly show the existing and proposed alignments and profiles of the sanitary sewer(s) in relation to road ways, drainage ditches, storm drains or any other underground utility. The improvement plans shall show all areas of conflict and minimum clearances between sanitary sewer and water facilities. Ground surface profiles must be shown.

The stationing on plan and profile shall read from left to right. Insofar as practical the improvement plans shall be so arranged that the north arrow is either pointed toward the top or to the right edge of the sheet.

Detail Sheet Requirements: Detail sheets of all sanitary sewer facilities (manholes, cleanouts, traps, interceptors, wet wells, pump stations, etc.) shall be included in the improvement plans. Typical trench sections shall also be included in the improvement plans.

Cross Sections shall be included in the improvement plans, where determined necessary by the General Manager.

Inclusion of Datum and Legal Boundaries: The bench marks and datum shall be clearly pointed out on the improvement plans both as to location, description and elevation. The datum shall be U.S. C & G.S., 1927 North American Datum.

It is desired and encouraged that proposed improvements be tied into the California Coordinate System if monumented coordinate points are available within a reasonable distance of said improvement.

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

Topographic Features: All pertinent topographic features shall be shown such as street lines, curbs, sidewalks, shoulders, existing structures, houses, trees and other foliage drainage ditches, utility poles, fire hydrants, and all other features of the area which may affect the design requirements for the project.

Existing and proposed substructure location and size; i.e., storm and sanitary sewer pipelines; water and gas pipelines; electrical, telephone, cable T.V. conduits; and any other buried utilities which may affect the design requirements of the project, shall be noted.

A-6.4 As Built Drawings/Electronic Data

The owner or their agent shall have reproducible improvement plans (mylar sheets) prepared with all approved construction changes or final dimensions delineated on the improvement plans. All improvement plans produced on computer with the aid of computer design software shall be saved on 3 1/2 inch HD disk(s) or CD. A single set of reproducible improvement plans *and* a computer disk or CD containing the same data as the reproducible improvement plans shall be presented to the District.

The set of "as built" improvement plans shall have the words "as built" in one inch high letters on each sheet.

Dimensions and locations shall be sufficient for locating the constructed improvements. Dual swing ties are required for all stub outs and cleanout risers. Permanent objects such as property corners, power poles, water boxes, structures, etc. shall be used for swing ties. The General Manager shall approve the "as built" improvement plans prior to any District acceptance of the completed system.

A-6.5 Construction Administration

Installation of new sanitary sewer facilities or alternation to existing sewer facilities requires inspection during construction by an authorized representative of the District. Each phase of construction must be inspected and approved prior to proceeding to subsequent phases.

Any improvements constructed without inspection as provided herein or construction contrary to the orders or instructions of the authorized representative of the District will be deemed as not complying with these specifications and will not be accepted by the District.

Adequate notice shall be given the District prior to the beginning of construction operations in constructing sanitary sewer facilities so that arrangements may be made by the District to provide adequate inspection.

Conformity with Improvement Plans and Allowable Deviation: Deviations from the approved improvement plans, as may be required by field conditions during construction, shall require written approval by the General Manager.

Alteration of Improvement Plans: All authorized alterations affecting the requirements and information given on the approved improvement plans shall be in writing. No changes shall be made of any plan or drawing after the same has been approved by the District except by direction of the General Manager.

Working drawings or plans for any facility not included in the improvement plans furnished by the owner or their agent shall be approved by the District prior to commencement of any work involving such facility.

Authority of the District Inspector: The periodic inspection performed by the various inspectors employed by the District shall not constitute approval or ratification of work improperly completed by the contractor.

Final Inspection: Upon completion of any improvements which are constructed under and in conformance with this Code, and prior to requesting final inspection, the area shall be thoroughly cleaned of all rubbish, excess material and equipment; and all portions of the work shall be left in a neat and orderly condition satisfactory to the District. The final inspections may include: Ball and Flush of the pipelines, Mandrel Tests, Television Inspection, Air, Water, or Vacuum tests and/or any other tests deemed necessary by the District.

The General Manager will require copies of all Grant Deeds for easements given to the District as a part of sanitary sewer facility installation. Field verification of such easements may be required.

After receiving the request for final inspection, the District will inspect the work. The contractor and/or owner will be notified in writing as to any particular defects or deficiencies to be remedied. The contractor shall proceed to correct any such defects or deficiencies at the earliest possible date. At such time as the work has been completed, a second inspection shall be made by the District to determine if the previously mentioned defects have been repaired, altered and completed in accordance with this Code. At such time as the General Manager approves and accepts the work for the District, the contractor and/or owner may request in writing, for Board approval. The District Board of Directors will notify the owner in writing as to the date of final approval and acceptance.

A-6.6 Legal Relations and Responsibility

District Liability: Neither the District, the General Manager or any other officer or agent of the District shall be personally responsible for any liability arising under any contract between the developer and any contractor or subcontractor.

District Responsibility: The District shall not be held responsible for the care or protection of any material or parts of the work prior to final acceptance.

The District and its representatives, in establishing this Code, and in performing any services, or making any examinations, tests, or inspections hereunder, shall not be liable in any way to any person by reason of any injury, damage, costs, or expenses sustained or caused as a result thereof; nor shall any such services, examinations, tests or inspections constitute any warranty in reference thereto on the part of the District or its authorized representatives, and the relationship of the District to the contractor, or developer shall be solely that of independent contract and not joint venture, partnership, or otherwise.

That the developer shall at its sole cost and expense hold the District harmless from and defend the District against all claims, charges, demands or causes of action arising out of or in any manner whatever connected with any act, activity or work made, completed or undertaken hereunder by the developer, its contractor, engineer, or agents, or employees thereof.

Nothing herein contained shall be deemed to modify, limit, or restrict the rights, duties, and obligations given or granted to said District by the laws of the State of California now in effect or hereafter from time to time adopted, including without limitations the right to amend or modify this Code at any time, and if any part of this Code be determined to be unconstitutional, such determination shall not render ineffective or invalid the remaining provisions therein contained and set forth.

Responsibility for Damage: The District, the General Manager and all officers, agents and employees of the District shall not be answerable or accountable in any manner thereof; or for any of the materials or other things used or employed in performing the work; or for injury to any person or persons either workmen or the public, for damage to property from any cause which might have been prevented by the developer or anyone employed by him against all of which injuries or damages to persons and property the developer having control over such work, must properly guard.

The developer shall be responsible for any liability imposed by law of any damage to any persons or property resulting from defects or obstructions or from any cause whatsoever during the progress of the work or at any time before its completion and final acceptance.

The developer shall indemnify and save harmless the District, the General Manager and all officers, agents and employees of the District from all suits or actions of every name, kind, description brought for or on account of any injuries or damages received or sustained by any person or persons by or from the developer, his/her agents in the construction of the work or by or in consequence of any negligence in guarding the same, any improper materials used in its construction or by or on account of any act or omission of the developer or his/her agents.

Developer's Responsibility for Work: Except as provided above, until the formal acceptance of the work by the District, the developer or his/her contractor shall have the charge and care thereof and shall bear the risk of injury or damage to any part thereof by the action of the elements or from any other cause, whether arising from the execution, or from the non execution of the work. The developer or his/her contractor shall rebuild, repair, restore, and make good all injuries or damages to any portion of the work occasioned by any of the above causes before final acceptance and shall bear the expense thereof.

All public or private facilities, including but not limited to gravel surfacing at existing canals, structures, telephone cables, roadways, curbs, gutters, parking lots, private drives, levees and embankments for creeks, ponds and reservoirs disturbed during construction of the work shall be repaired and/or replaced by the contractor to match facilities existing prior to construction. In addition, the contractor shall be responsible for any settlement damage to such facilities or adjoining areas for a period of one year after acceptance of such required facilities.

Public Convenience: It shall be the owner or their agent's responsibility to provide for the passage of public traffic through the work during construction. When work is to be performed in existing traveled streets or roads, trench spoil shall be placed so as to offer the least possible obstruction and inconvenience to public traffic. The owner or their agent shall have under construction no greater length or amount of work than can be prosecuted properly with due regard to the rights of the public.

All public traffic shall be permitted to pass through the work with as little inconvenience and delay as possible. Bridges of approved construction shall be installed and maintained across trenches at all crosswalks, intersections and such other points where, in the opinion of the General Manager, traffic conditions make it advisable.

Spillage resulting from hauling operations along or across any publicly traveled way shall be removed immediately by the owner or their agent at their expense.

Construction operations shall be conducted in such a manner as to cause as little inconvenience as possible to abutting property.

Convenient access to driveways, houses and buildings along the line of the work shall be maintained and temporary approaches to crossings or intersecting highways shall be provided and kept in good condition. When the abutting owner's access across the right-of-way line is to be eliminated, or to be replaced under the Contract by other access facilities, the existing access shall not be closed until the replacement access facilities are usable.

All fences, mailboxes, signs, etc. subject to interference shall be maintained by the owner or their agent until the work is completed, at which time they shall be restored to the condition existing prior to starting the work, or as shown on the improvement plans or specified by the General Manager.

Water or dust palliative shall be applied in accordance with Northern Sierra Air Quality Management District Rule 226.

In order to expedite the passage of public traffic through or around the work and where ordered by the District, the owner or their agent shall install signs, lights, flares, barricades, and other facilities for the sole convenience and direction of public traffic. Also, where directed by the District, the owner or their agent shall provide and station competent flagpersons whose sole duties shall consist of directing the movement of public traffic through or around the work.

Flagpersons and guards, while assigned to traffic control, shall perform their duties and shall be provided with the necessary equipment in accordance with the current "Instructions to Flagmen" of the State of California Department of Transportation. The equipment shall be furnished and kept clean and in good repair by the owner or their agent at their expense.

Safety: The owner or their agent shall be solely and completely responsible for the conditions of the job site, including safety of all persons and property during performance of the work. This requirement shall apply continuously and not be limited to normal working hours. Safety provisions shall conform to all applicable Federal, State, and local laws, ordinances, and codes, and to the rules and regulations established by the California Occupational Health and Safety Administration, and to other rules of law applicable to the work.

The services of the District in conducting construction review of the owner or their agent's performance is not intended to include review of the adequacy of the contractor's work methods, equipment, bracing or scaffolding or safety measures, in, on, or near the construction site, and shall not be construed as supervision of the actual construction nor make the District responsible for providing a safe place for the performance of work by the owner or their agent, subcontractors, or suppliers; or for access, visits, use work, travel or occupancy by any person.

The owner or their agent shall carefully instruct all personnel working in potentially hazardous work areas as to potential dangers and shall provide such necessary safety equipment and instruction as is necessary to prevent injury to personnel and damage to property. Special care shall be exercised relative to electrical work, work involving excavation and in pump sump work.

All work and materials shall be in strict accordance with all applicable State, Federal and local laws, rules, regulations, and codes.

All electrical equipment furnished shall be grounded and provided with guards and protection as required by safety codes. Where vapor-tight or explosion-proof electrical installation is required by law, this shall be provided.

Shoring and Trench Safety Plan - Attention is directed to Section 832 of the Civil Code of the State of California relating to lateral and subjacent support, and the owner or their agent shall comply with this law.

In accordance with Section 6705 of the State Labor Code, the owner or their agent shall have provisions for worker protection from caving ground. Trench safety working drawings shall show the design of shoring, bracing, sloping or other provisions to be made for worker protection from the hazard of caving ground. If such working drawings vary from the shoring system standards established by the Construction Safety Orders of the California Occupational Health and Safety Administration or the Federal safety standards of the Department of Health, Education and Welfare, improvement plans shall be prepared by a registered civil or structural engineer. In no event shall the owner or their agent use a shoring, sloping, or protective system less effective than that required by said Construction Safety Orders, or less effective than that required by said Federal Safety Standards.

Protection of Person and Property: The owner or their agent shall take whatever precautions are necessary to prevent damage to all existing improvements, including above ground and underground utilities, trees, shrubbery that is not specifically shown to be removed, fences, signs, mailboxes, survey markers and monuments, buildings, structures, the District's property, adjacent

property, and any other improvements or facilities within or adjacent to the work. If such improvements or property are injured or damaged by reason of the owner or their agent's operations, they shall be replaced or restored, at the owner or their agent's expense, to a condition at least as good as the condition they were in prior to the start of the owner or their agent's operations.

The owner or their agent shall adopt all practical means to minimize interference to traffic and public inconvenience, discomfort or damage. The owner or their agent shall protect against injury any pipes, conduits or other structures, crossing the trenching or encountered in the work and shall be responsible for any injury done to such pipes or structures, or damage to property resulting therefrom. They shall support or replace any such structures without delay and without any additional compensation to the entire satisfaction of the District. All obstructions to traffic shall be guarded by barriers illuminated at night. The owner or their agent shall be responsible for all damage to persons and property directly or indirectly caused by their operations and, under all circumstances, they must comply with the laws and regulations of the County and the State of California relative to safety of persons and property and the interruption of traffic and the convenience of the public within the respective jurisdictions.

The owner or their agent is cautioned that they must replace all improvements in rights-of-way and within the public streets to a condition that shall comply with all general paving requirements and special requirements of Nevada County, Placer County, and the State of California Department of Transportation.

Type and time of construction required at any road subject to interference by Contract work will be determined by those authorities responsible for maintenance of said road. It shall be the responsibility of the owner or their agent to determine the nature and extent of all such requirements, including provision of temporary detours as required; however, the construction right-of-way obtained by the District at affected roadways will be adequate for provision of all required detours. As required at any road crossing, the owner or their agent shall provide all necessary flagpersons, guardrails, barricades, signals, warning signs and lighting to provide for the safety of existing roads and detours. Immediately after the need for temporary detours ceases, or when directed, the owner or their agent shall remove such detours and perform all necessary cleanup work, including replacement of fences, and removal of pavement. Included shall be all necessary replacement of existing roadway appurtenances, grading work, soil stabilization and dust control measures, as required and directed. The cost of all work specified under this Section shall be borne by the owner or their agent.

If required by law, the owner or their agent shall shore up, brace, underpin, and protect as may be necessary, all foundations and other parts of all existing structures adjacent to and adjoining the site of the project, which are in any way affected by the excavations or other operations connected with the completing of the work under his/her contracts.

The owner or their agent shall examine all bridges, culverts, and other structures over which they will move their materials and equipment, and before using them, they shall properly strengthen such structures where necessary. The owner or their agent shall be responsible for any and all injury or damage to such structures caused by reason of their operations.

A-6.7 Guarantee and Delivery of Title

General Guarantee: The developer/owners shall supply the District with a 1 year guarantee for all materials and workmanship which is incorporated into the system. To assure the District this will be completed, the developer/owners shall supply this guarantee as requested by the District in either of the following two forms. Failure to provide this maintenance agreement or maintenance bond will cause the District to withhold final approval.

- Maintenance Bond - The developer/owners shall supply a maintenance bond for 10 percent of the contract amount for the sanitary sewer facilities as specified in the District Development Guidelines.
- Maintenance Agreement - The developer/owners shall supply a maintenance agreement, depositing 10 percent of the contract amount for sewer facilities, in cash securities as specified in the District Development Guidelines.

If after a period of 48 hours has elapsed after the developer/owner and/or the bonding company have received written notice by certified mail that a condition of failure exists and no correction has been made, the bonds will be called or the securities withdrawn, and the work will be performed by the District and charged against them.

The developer shall be responsible for the full expense incidental to making good any and all of the above guarantees, the performance of which shall be binding upon the developer and his/her sureties.

Delivery of Title: Upon the completion and acceptance of the installations of the sewer facilities hereunder, the same shall be transferred to the District, without cost, and the owner shall provide and deliver to the District the following:

- Duly executed warranty bill of sale transferring marketable title to the District of all such sewer works, installations and appurtenances, title thereto to be free and clear of all liens and encumbrances and;
- Duly executed easements wherein said facilities and installations are located in favor of the District; which said bill of sale and easement shall be in form acceptable to the District.

A-6.8 Materials and Equipment

All materials, hardware, equipment, fittings and other miscellaneous items to be incorporated in the District sanitary sewer system shall conform to the following specifications. No changes from the specified products shall be made without written approval from the General Manager.

Samples and Tests: The General Manager may permit the use of certain materials or assemblies prior to sampling and testing if accompanied by a Certificate of Compliance stating that the materials involved comply in all respects with the requirements of the specifications. The manufacturer of the material or the manufacturer of assembled materials shall sign the certificate. A Certificate of Compliance must be furnished with each lot of material delivered to the work and the lot so certified must be clearly identified in the certificate.

All materials used on the basis of a Certificate of Compliance may be sampled and tested at any time. The fact that material is used on the basis of a Certificate of Compliance shall not relieve the contractor of responsibility of incorporating material in the work which conforms to the requirements of the improvement plans and specifications and any such material not conforming to such requirements will be subject to rejection whether in place or not.

The District reserves the right to refuse to permit the use of material on the basis of a Certificate of Compliance.

At the option of the District the District shall approve the source of supply of each of the materials before delivery is started and before such material is used in the work. Representative preliminary samples of the character and quality prescribed shall be submitted by the contractor or producer of all materials to be used in the work for testing or examination as desired by the District.

All tests of materials furnished by the owner or their agent shall be made in accordance with commonly recognized standards of national organizations, and such special methods and tests as are prescribed in these specifications.

The owner or their agent shall furnish such samples of materials as are requested by the District, without charge. Samples will be secured and tested whenever necessary to determine the quality of material.

The owner or their agent shall deliver to the District two copies of certificates from the manufacturers of all materials and appurtenances incorporated in the District sanitary sewer system. These certificates shall certify that all goods manufactured by the manufacturer meet all applicable codes, District requirements and specifications.

The certificate shall show the type and quality of materials delivered the requirements and/or specifications that are complied with.

Should the owner or their agent fail to secure the certificates as required he shall at his/her expense have a commercial testing laboratory, approved by the General Manager, perform the

necessary testing and deliver two copies of the results to the General Manager.

The owner shall submit representative preliminary samples of the character and quality prescribed or their agent or producer of all materials to be used in the work for examination as desired by the General Manager.

No material shall be used until the General Manager has approved it.

The District reserves the right to take any additional samples or make additional tests, as they may deem necessary.

C900 Pipe: C900 PVC pipe shall conform to and meet the requirements of AWWA C900-75.

Ductile Iron Pipe: Ductile iron pipe shall conform to and meet the requirements of ANSI/AWWA C151/A21.51. It shall be the thickness class required for supporting the imposed loads. Joints shall conform to ANSI/AWWA C111/ A21.11.

Push-on gasket joints and fittings may be used except where otherwise required by the District.

Fittings shall be ductile iron and shall meet the requirements of ANSI/AWWA C110/ A21.11. An exception to this is the 4 to 12 inch pipe size whereby ductile iron compact fittings may be used provided they meet the requirements of ANSI/AWWA C153/A21.53 and have a working pressure rating of 350 pounds per square inch.

Ductile iron gravity pipe used for single family residences shall be class 51 or heavier and may use "Calder" type couplings with stainless steel clamps.

Polyvinyl Chloride Pipe: Polyvinyl chloride pipe and fittings for gravity pipelines shall be a rubber ring jointed pipe as manufactured by Johns-Manville or other approved equivalent, and shall comply with the following specifications.

Polyvinyl chloride pipe and fittings shall conform to A.S.T.M. designation D-1784 and ASTM D-3034 for rigid PVC compounds. Pipe size and dimensions shall be submitted to the General Manager for approval prior to contractor's purchase.

- Size and Dimensions - Size and dimensions shall be such that the minimum "pipe stiffness" (F/Y) at 5 percent deflection shall be as specified in ASTM D 3034-72 for all sizes when calculated in accordance with A.S.T.M. designation D-2412, External Loading Properties of Plastic Pipe by Parallel-Plate Loading.
- Flattening-The flattening test shall comply with the requirements of ASTM D 3034-72.
- Extrusion Quality-The extrusion quality shall comply with the requirements of ASTM D 3034-72.
- Impact Resistance-The resistance shall comply with the requirements of ASTM D3034.

Nominal Pipe Size-Inches	Impact Strength Ft. - Lbs.
4	150
6	210
8	210
10	220
12	220
*	

*For larger diameter pipe, see ASTM Standards

- Markings-Markings shall comply with the requirements of A.S.T.M.

Conductor Pipe: Conductor pipes shall conform to County and State requirements and these specifications.

Pipe used as a conductor pipe shall be either welded steel pipe or corrugated metal pipe. The General Manager may specify which type shall be used in any instance. The protective lining and coating, if required by the General Manager shall be as shown on the improvement plans.

- **Welded Steel Pipe** shall be manufactured of steel meeting the requirements of ASTM Designation A245, Commercial Grade. The method by which the pipe is manufactured shall comply with one or more of ASTM specifications: A134, A135, A139 or A211. The pipe shall be welded by either the electric-resistance or electric-fusion process, with either spiral seam welded joint or straight seam welded. All end joints shall be butt welded.

When the conductor pipe is to be installed by boring and jacking, the wall thickness shall be 1/4 inch for sizes up to and including 24 inches in diameter, and 5/16 inch for sizes 27 inches to 36 inches in diameter.

- **Corrugated Metal Pipe** shall conform to and meet all the requirements of "Standard Specifications for Corrugated Metal Culvert Pipe" (ASSHO Designation M36). Unless otherwise designated by the General Manager, the pipe may be fabricated of any of the base metals listed in the above specifications. Band couplers shall be of the same metal as the pipe.

When the conductor pipe is to be installed by boring and jacking the material shall be No. 10 gauge or thicker. The sections of pipe shall be especially prepared for making field joints by riveting or bolting. If the joints are bolted, the bolts shall be 3/8 inch diameter and galvanized. Rivets shall be of the same material as the base metal used for the corrugated sheets, and shall be galvanized or sherardized.

Castings: All castings for manhole rings and covers, or other purposes, shall be tough grey iron, free from cracks, holes, swells and cold sheets and be of workmanlike finish, and shall conform to the pertinent Standard Drawing. The cast iron shall meet the requirements of Specification

ASTM Designation A48, Class 40. The quality shall be such that a blow from a hammer will produce an indentation on a rectangular edge of the castings, without flaking the metal. Before leaving the foundry, all castings shall be thoroughly cleaned.

Manhole covers shall fit tightly to the seat and shall not rock. All manhole covers which do not fit neatly and bear firmly in the frame will be rejected.

Manhole frame and covers shall be used to protect end of line cleanouts located in paved areas. Manhole covers shall fit tightly to the seat and shall not rock. The frame and cover shall be set on a concrete footing ring of at least 12 inches wide by 12 inches thick.

Pre-cast Manhole Sections: The manhole sections, adjustment rings and tapered sections with tongue and groove joints shall conform to ASTM Designation C478, except that cement and aggregate shall conform to the requirements of Structural Concrete, Appendix A-6.14, page 117, of the Standard Specifications. Concrete for poured portions of manholes shall conform to Structural Concrete, Appendix A-6.14, page 117, of the Standard Specifications. Joints shall conform to Installation of Sanitary Sewer Facilities, Appendix A-6.9, page 96, of the Standard Specifications under "Manholes." Metal forms shall be used in the manufacture of the pre-cast sections so as to obtain smooth surfaces. The concrete shall be well compacted by being centrifugally-spun, vibrated, or mechanically-tamped.

Pump Stations: (For private residential submersible pump stations see Residential Pump Systems, Section 7.13, page 33). Pump stations shall have a duplex pump configuration with controls designed to alternate pumps. Controls shall include Hand-Off-Auto switches and running lights for each pump. Pump electrical supply shall be single phase for pumps rated at 5 horsepower or less where possible. Pumps shall be sized for the ultimate design flow of the area being serviced by the station and with a minimum of 4 feet per second flow velocity in the force main.

Submersible Pump Stations: Submersible pumps shall be of the explosion proof type. If circumstances require, the pump shall incorporate a grinder or cutter type blade/impeller system. Pump design shall be of the Flygt rail and discharge base mount type or approved equal. Lifting chains shall be stainless steel and rated for the lifting requirements provided by the pump manufacturer. Each pump discharge pipeline shall include a swing check valve with external lever and weight and an eccentric plug valve before the two discharge pipelines join. Valves shall be located in a separate vault outside of the wet well where possible. External valve vaults shall have a valved drain pipeline plumbed into the wet well. The drain pipeline valve shall be accessible by means of a riser pipe boxed to grade between the vault and the wet well (see Standard Drawings, Figure 19, Submersible Pump Station (Section View), page 175 and Figure 20, Submersible Pump Station (Plan View, page 177). Wet well piping and fittings shall be flanged ductile iron only. Submersible pump controllers shall be of a type equal in design and manufacture to preferred current District submersible controllers. All site related issues shall be in accordance with Pump Station Structures, Appendix A-6.15, page 125. All electrical and telemetry equipment shall be in accordance with Pump Station Electrical Work, Appendix A-6.16, page 130.

Drywell Centrifugal Wastewater Pumps: Centrifugal pumps shall be of the vertical or horizontal close-coupled, self-priming centrifugal type specifically designed for the handling of raw, unscreened sanitary domestic wastewater. Each pump shall be of heavy, cast iron construction and shall include a motor with the pump impeller mounted directly on the one-piece motor-pump shaft.

Each pump at its rated speed shall be designed to retain adequate liquid in the pump casing to insure unattended automatic repriming in a complete open system without suction of discharge check valves and with a dry suction leg. Upon completion of repriming cycle, pumps shall deliver full rated capacity at rated Total Dynamic Head (TDH) at the designed total dynamic suction lift.

The openings and passages of the pump shall be large enough to permit the passage of a sphere 3 inches in diameter and any trash or stringy material which can pass through the average 4 inch building collection system. The pump must be equipped with a removable cover plate or rotating assembly allowing complete access to pump interior to permit service and repairs without disturbing suction or discharge piping. The pump volute casing shall contain no openings of a lesser diameter than the sphere size specified. Screens or any internal devices that create a maintenance nuisance or interfere with priming and performance of the pump will not be permitted.

The pump shaft shall be sealed against leakage by a double mechanical seal installed in a bronze seal housing constructed in two sections with registered fit. Both the stationary sealing member and mated rotating member shall be of Tungsten-Titanium carbide alloy.

The impeller shall be two-vane, semi-open or enclosed type, non-clog, cast in ductile iron, and shall be balanced. The impeller shall be keyed and secured to the motor-pump shaft by a stainless steel device. The impeller shall not be screwed or pinned to the motor-pump shaft and shall be readily removable without the use of special tools. To prevent the build up of stringy materials, grit and other foreign particles around the pump shaft, all impellers less than full diameter shall be trimmed inside the impeller shroud. The shroud shall remain full diameter so that close, minimum clearance from shroud to volute is maintained.

The seal system lubricant shall be taken from the pump discharge through a 40-micron or better filter. The filter shall be readily accessible for cleaning and maintenance. The filter shall be isolated with brass valves. The seal system shall contain a brass valve connected near the top of the seal housing to permit the relief of any air trapped in the seal unit. A manually operated brass valve shall also be provided to vent the pump volute.

The pump volute shall be of heavy, cast iron construction, free from projections that might cause clogging or interfere with flow through the pump.

A heavy, cast iron base to provide maximum rigidity and balance shall support the pump. The height of a vertical pump base shall be sufficient to permit the use of an increasing suction elbow which, shall that be provided when the nominal pump size is smaller than the suction line. The suction and discharge openings shall be flanged, faced and drilled 125-pound American Standard.

Upon request, manufacturer must submit to the District for their evaluation and approval, a list of self-priming wastewater pump installations reflecting of satisfactory, automatic operations while permanently installed in an unattended wastewater lift stations.

Workmanship and materials throughout shall be of best quality per code and specifications.

Pump Motors: The motors shall be designed for continuous operation at full load with a temperature rise of not more than 40 degrees centigrade above ambient temperature. Motors shall be capable of frequent starts each hour as required to meet the flow requirements without overheating. Motors shall also be rated for the altitude at which they are to be installed.

A-6.9 Installation of Sanitary Sewer Facilities

Excavation and Bedding: Unless otherwise specified, the excavation for sewer pipe shall be an open trench, excavated to six inches below the flowline grade shown on the improvement plans, or 1 inch below the outside diameter of the bell, whichever is greater. The native soil in the trench bottom shall be compacted to 90 percent relative compaction before placement of Class 1 Backfill for pipeline bedding. Class 1 Backfill bedding material shall be compacted to a relative compaction as specified in the Standard Drawings, Typical Sewer Trench, Figures 14, 15, or 16, pages 165, 167, or 169.

Pipe trenches shall not be left open farther than 300 feet in advance of pipe laying operations or 200 feet to the rear thereof, unless otherwise permitted by the General Manager.

All trench excavation within asphalt paved areas shall be saw cut in neat parallel lines to the limits of excavation. When the existing pavement is concrete, it shall be sawed to a neat line 6 inches wider on each side than the trench width.

Whenever the bottom of the trench is soft, yielding, or unsuitable as a foundation for the pipe, sufficient crushed rock or coarse clean gravel shall be rammed into the soft material. If such treatment does not provide a proper foundation, the unsuitable material shall be removed to a depth such that when replaced with bedding material, it will provide a stable foundation.

Whenever the trench bottom is in rocky material, the trench shall be excavated to 6 inches below the flowline shown on the improvement plans or 3 inches below the outside diameter of the bell, whichever is greater, and backfilled to grade with imported bedding material thoroughly compacted into place.

Water stop impervious plugs (trench cutoff blocks) shall be installed in trenches where Class 4 Backfill is used, in all areas of ground water movement, and in all trenches containing pipeline slopes of 10 percent or greater.

The location and spacing of trench cut-off blocks for private building laterals shall be the responsibility of and shall be determined by the owner or their agent. The location and spacing of trench cut-off blocks for sanitary sewer mains shall be determined by the General Manager.

Trench cut-off blocks shall be constructed as shown in the Standard Drawings, Trench Cut-Off Block, Figure 17, page 171.

Bracing and Shoring: Sufficient bracing and shoring shall be installed in trenches to insure the safety of workers, and to protect and facilitate the work. Where practicable all such bracing and shoring shall be removed from the trench as the backfilling proceeds. All bracing and shoring shall comply with current Construction Safety Orders of the California Occupational Health and Safety Administration.

When shoring is used in the trench, the fill shall be carried to a height sufficient to prevent the surrounding ground from cracking or caving into the trench before the shoring is removed.

Pipeline Installation: A minimum of 30 inches compacted earth fill shall cover all gravity and force main pipelines. Cover less than 48 inches in vehicular traveled ways requires heavier walled pipe as listed in Appendix A-5, page 75.

The pipe shall be laid in conformity to the prescribed line and grade. The prescribed grade shall be set using the appropriate surveying tools (i.e., transit, rod, laser, etc.). In case any discrepancy exists from the prescribed alignment, the work shall be stopped and the discrepancy immediately corrected. In addition, a string line shall be used in the bottom of the trench to insure a straight alignment of pipe between manholes, unless curved alignment is shown on the improvement plans.

Pipe shall be laid continuously upgrade with the bell of the pipe uphill. Each length of pipe shall be laid on a firm bed and shall have a true bearing for the entire length between bell holes. No wedging or blocking up of the pipe will be permitted.

Both bell and spigot shall be clean before the joint is made and care shall be taken that nothing but the joint-making material enters the joints.

When for any reason, pipe laying is discontinued for an hour or more, the open end of all pipelines shall be closed with a close-fitting stopper.

The jointing of pipe with this type of joints shall be made by approved methods and recommendations of the manufacturer, care being used to prevent chipping or cracking of either end of the pipe during installation.

Pipe shall be protected during handling against impact shock and free fall. The rubber gasket joints shall be cleaned prior to the seating of the gasket. The gasket shall be wiped clean and shall be fitted snugly in the gasket seat. A thin film of lubricant shall be applied to the inside surface of the gasket which will come in contact with the plain end of the pipe, if necessary apply the same lubricant to the plain end of the pipe. Use only a lubricant recommended by the pipe manufacturer.

Boring or Jacked Casing: The work contemplated under this heading consists of placing cast iron pipe or other pipe of approved material, usually in a conductor pipe, under a paved roadway, street or railroad to a true line and grade as shown on the improvement plans, by means of boring

or jacking operations. The equipment and method of operation shall be approved by the General Manager prior to proceeding with the work.

The excavation for the boring operation shall be kept to a minimum but shall be of sufficient dimensions to satisfactorily complete the work. If so required, bracing and shoring shall be provided to adequately protect the workmen and the roadway or railroad.

The conductor pipe shall be placed closely behind and in conjunction with the boring operation. The bored hole shall be not more than 0.1 foot in diameter larger than the conductor pipe. Guide rails shall be accurately set to line and grade so as to achieve close adherence to the line and grade shown on the improvement plans.

The pipe to be placed inside the conductor pipe shall have a non-rigid joint and shall be installed by the use of suitable wood skids. Clean sand shall then be sluiced or blown into the conductor pipe to a depth of not less than half the diameter of the sewer pipe.

Where tunneling is permitted, backfill shall be made with clean damp sand, tamped and compacted to insure a non-yielding, uniform foundation for the entire length of the tunnel.

Trench Backfill Gravity Pipelines: Class 1 Backfill for sanitary sewer pipelines and related appurtenances that are constructed for the District shall have a minimum specific gravity of 2.5.

Backfill around and to at least 1 foot over pipe shall be made with Class 1 Backfill material compacted as placed. A difference in level on either side of the pipe not to exceed 4 inches shall be maintained to hold the pipe firmly in place.

Backfill from a point at least 1 foot over the top of the pipe to finish grade shall be made with Class 2 or Class 3 Backfill. When the sewer trench lies within the right-of-way of a street this backfill shall be Class 2. Class 3 Backfill may be used in areas outside the pavement of streets and highways involved.

In connection with backfill, the following tests shall be made in conformance with the requirements set forth in these Specifications:

Test Method No. California	or ASTM
<u>Tests</u>	
Relative Compaction	ASTM D1557 & D1556
Sand Equivalent	217
Resistance (R-Value)	301
Sieve Analysis	202

Backfill shall not be placed until the pipe or other facility has been inspected by an authorized District Representative and approved for backfilling. The percentage composition by weight as determined by laboratory sieves shall conform to the following requirements.

Class 1 Backfill

<u>Sieve Sizes</u>	<u>Percentage Passing Sieves</u>
3/8"	100

Sand equivalent not less than 20.
Bulk Specific Gravity of Class 1 Backfill shall be at least 2.5.

Class 2 Backfill

<u>Sieve Sizes</u>	<u>Percentage Passing Sieves</u>
1"	100
3/4"	90-100
No. 4	35-60
No. 30	10-30
No. 200	2-9

Sand equivalent not less than 20.
Bulk Specific Gravity of Class 2 Backfill shall be at least 2.6.

Class 3 Native Backfill

<u>Sieve Sizes</u>	<u>Percentage Passing Sieves</u>
3"	100

Sand equivalent not less than 20.

Class 4 Backfill

<u>Sieve Size</u>	<u>Percentage Passing Sieves</u>
1"	90-100
3/4"	70-100
1/2"	25-60
3/8"	10-40
#4	0-10
#8	0-5

Bulk Specific Gravity shall be at least 2.5

Material for Class 1, Class 2, Class 3, and Class 4 Backfill shall be placed in uniform horizontal layers not exceeding 0.67 foot in thickness before compaction, and shall be brought up uniformly on all sides of the trench. If the contractor can satisfactorily demonstrate to the General Manager an alternative method of placing the backfill so that all requirements, other than the layer thickness, are met, the General Manager will permit the contractor to use the alternative method.

Under no circumstance will the contractor use the alternative method unless the General Manager's approval is obtained in writing.

Each layer of backfill shall be compacted to a relative compaction as indicated in the Standard Drawings, Typical Sewer Trench, Figures 14, 15, or 16, pages 165, 167, or 169.

The District reserves the right to perform compaction tests, or have compaction tests performed through a licensed geotechnical testing firm, to verify compaction of the backfilled trench section. All tests by the District will be performed in such a manner as will not unnecessarily delay the work. The owner or their agent shall not be required to reimburse the District for the initial tests performed. If subsequent tests are required due to compaction failures, the owner or their agent shall pay for all subsequent compaction tests.

The use of backfill material other than Class 1, Class 2, and Class 3 is not permitted unless approval is granted, in writing, from the General Manager.

Class 4 Backfill material may be substituted for Class 1 Backfill, if approved by the General Manager or their designated representative in writing, under the following conditions:

- When large amounts of groundwater are encountered within the trench section, or;
- When trench depths exceed 12 feet in depth *and* placement of Class 1 Backfill material at the prescribed relative compaction is not possible.

If Class 4 Backfill material is substituted for Class 1 material, 140 NC filter fabric, or equivalent, must be placed on top of the Class 4 Backfill before proceeding with additional approved backfill.

Groundwater may be removed from the trench and placed in the existing sanitary sewer if *all* of the following conditions are met:

- The contractor requests, in writing, to place said groundwater into the existing sanitary sewer, *and* receives, in writing, from the General Manager permission to do so. This written request by the contractor and subsequent written reply from the General Manager will be only on a case-by-case basis.
- The volume of groundwater placed into the existing sanitary sewer shall not exceed a predetermined amount (in gallons per minute) as designated in writing by the General Manager.
- All pump/hose inlets shall be screened to prevent rocks or gravel from entering the existing sanitary sewer system. If high concentrations of silts are suspended in the groundwater, settling basins may be required before the water may be placed into the existing District sanitary sewer system.

Initial backfill shall be to 0.7 of the vertical outside diameter of the pipe in 8 inch maximum lifts.

Backfill material shall be "shovel sliced" on both sides of the pipe, with care to assure that the spaces under the pipe haunches have been filled.

Field repairs to P.V.C. are not acceptable unless the General Manager has given his/her prior approval for each repair.

Mechanical compactors shall not be used directly over the pipe with less than 1 foot of cover.

Paving over trenches shall not be placed until the backfill has been inspected by an authorized District representative. Trench surfacing and trench restoration in Nevada/Placer County, or State of California right-of-way shall conform to the requirements of the agency having jurisdiction.

Backfill around manholes and the pit excavated for boring operations shall be made in the same manner as above specified for trenches, except as otherwise provided under Manholes.

If at any time during the period of responsibility there shall be any settlement of the trenches, cracking of the newly applied pavement, or separation of the newly applied pavement from the existing pavement requiring repairs to be made in any street highway, or easement, or should any other defect appear in the system due to the contractor's operations, the owner or their agent shall promptly repair all defects in accordance with the requirements of the responsible agency.

Trench Backfill Force Mains: Class 1 Backfill for sanitary sewer force main pipelines and related appurtenances which are constructed for the District shall have a minimum specific gravity of 2.5. Trench backfill methods and materials for force mains, shall be as specified for sewer pipelines with the following exceptions:

- The height of backfill over the pipe before testing shall not be less than 12 inches.
- All thrust blocks shall be in place before the pipeline is hydrostatically tested.
- All joints, bends, angles, or fittings shall be left exposed until testing has been completed.

Every precaution shall be taken against floating the pipe. In case of such floating, the contractor shall replace the pipe to its proper location at his/her own expense, and replace any damaged pipe which may have resulted.

Trench Section, Paved Areas: Pipeline shall be bedded on 6 inches of Class 1 Backfill compacted to 95 percent relative compaction. Class 1 Backfill shall also extend a minimum 12 inches above top of pipe, compacted to 95 percent relative compaction as specified in the Standard Drawings, Typical Sewer Trench (Paved Areas), Figure 14, page 165. In the event that heavy groundwater is encountered in the excavated trench, Class 4 Backfill may be substituted for Class 1 Backfill as outlined above.

Class 2 Backfill shall be placed from 12 inches above top of pipe to 1 inch below bottom of existing asphalt pavement. All Class 2 Backfill shall be compacted to 95 percent relative compaction as specified in the Standard Drawings, Typical Sewer Trench (Paved Areas), Figure 14, page 165.

Trench Section, Roadway Shoulders adjacent to Paved Areas: Pipeline shall be bedded on 6 inches of Class 1 Backfill compacted to 95 percent relative compaction. Class 1 Backfill shall also extend a minimum 12 inches above top of pipe, compacted to 95 percent relative compaction as specified in the Standard Drawings, Typical Sewer Trench (Off Shoulder), Figure 15, page 167. In the event that heavy groundwater is encountered in the excavated trench, Class 4 Backfill may be substituted for Class 1 Backfill as outlined above.

Class 2 Backfill shall be placed from 12 inches above top of pipe to finished grade. Class 2 Backfill placed from 12 inches above top of pipe to 12 inches below finished grade shall be compacted to 90 percent relative compaction, with Class 2 Backfill placed from 12 inches below finished grade to finished grade compacted to 95 percent relative compaction as specified in the Standard Drawings, Typical Sewer Trench (Off Shoulder), Figure 15, page 167.

Class 3 Backfill may be substituted for Class 2 Backfill up to one foot below finished grade. Class 3 Backfill shall be compacted to 90 percent relative compaction as specified in the Standard Drawings, Typical Sewer Trench (Off Shoulder), Figure 15, page 167.

Trench Section, Unpaved Areas: Pipeline shall be bedded on 6 inches of Class 1 Backfill compacted to 95 percent relative compaction. Class 1 material shall also extend a minimum 12 inches above top of pipe, compacted to 95 percent relative compaction as specified in the Standard Drawings, Typical Sewer Trench (Non Traffic Areas), Figure 16, page 169. In the event that heavy groundwater is encountered in the excavated trench, Class 4 Backfill may be substituted for Class 1 Backfill as outlined above.

Class 2 or Class 3 Native Backfill shall be placed from 12 inches above top of pipe to finished grade. Class 2 or Class 3 Native Backfill shall be compacted to 90 percent relative compaction as specified in the Standard Drawings, Typical Sewer Trench (Non Traffic Areas), Figure 16, page 169.

Manhole Installation: Manholes shall be watertight structures constructed in accordance with the details shown on the improvement plans as specified herein and as directed by the General Manager. Pre-cast manholes shall be constructed of pre-cast reinforced pipe sections, tapered reinforced concrete sections, adjustment rings, with cast-in-place bases in accordance with the Standard Specifications and ASTM Specification C478-64T. Portland cement shall be Type II, conforming to the requirements of ASTM Designation C-150.

Pre-cast manhole bases shall be used in lieu of cast in place manhole bases whenever possible.

The ends of pipe (barrel) sections, tapered sections, adjustment rings shall be of such design and construction that when properly laid they shall have a smooth and uniform surface. Each joint shall be sealed with Kent Seal, or Ram-Nek sealant and primer to prevent infiltration or

exfiltration. Ram-Nek shall be neatly trimmed after manhole assembly. No pipe shall project more than 0.17 foot into a manhole and in no case shall the bell of a pipe be built into the wall of a manhole or structure. All work shall be cured for a period of 10 days after being placed and shall be protected from injury.

Manholes in paved areas shall have at least one, 2-inch grade ring installed on top of the cone section. The manhole frame and cover shall be placed on top of the grade ring as prescribed herein. The throat of the manholes shall be made of pre-cast concrete grade rings of the proper inside diameter and height. If fine adjustments are needed a concrete mixture fortified with "Xypex Xycrylic Admix" or equal may be used. The maximum depth permitted shall be 12 inches between the cone and frame. Adjustment using concrete mix shall not exceed 2 inches.

When adjusting an existing manhole to grade and the total depth of the throat from the top of the frame to the bottom of the throat exceeds 18 inches, the upper portion of the manhole shall be removed and the manhole shall then be reconstructed so that the final adjusted height of the throat is not greater than 12 inches. The manhole shall then be tested in accordance with Appendix A-6.10, Testing of Sanitary Sewer Facilities, page 106.

Before any work is started on adjusting or repairing a manhole, the channels in the base shall be covered. This cover shall be kept in place during all work. Upon completion of the work, the cover shall be removed from the manhole allowing no debris to fall or remain in the manhole.

The inside base of manholes shall be shaped to provide channels conforming to the size and shape of the crown of the inlets and outlets. The exact configuration of transition from branch size to mainline sizes shall be as directed by the General Manager. Cast-in-place concrete for manholes or portions of manholes shall conform to the Standard Specifications and ASTM Specification C478-64T. Portland cement shall be Type II, conforming to the requirements of ASTM Designation C-150.

The top of manhole elevations shown on the improvement plans are approximate only. In general, the finished grade of the manhole shall be set a maximum of 0.1 foot below the existing ground. Finished grade in paved areas should meet the appropriate Nevada/Placer County or State of California specifications.

Whenever the excavation for a manhole exceeds the outside diameter of the manhole by 10 inches, measured along a radius line, the backfill shall be placed in layers not to exceed 8 inches uniformly around the structure and mechanically tamped to relative compaction of not less than 95 percent for each layer.

Manhole Frame and Cover: Cast iron frames and covers as specified shall be furnished and installed by the contractor in accordance with the applicable portions of the Standard Specifications, except as herein modified. Cast iron frames and covers shall be matched and marked in pairs before delivery to the work. Manhole covers shall fit into their respective frames without rocking. Manhole frames and covers located within easements shall be the bolted down type, bolts shall be stainless steel with an anti seize compound applied to all male threads. Miscellaneous iron and steel for use in the construction of manholes shall be furnished and installed in accordance with the details shown on the improvement plans.

Internal Chimney Seals: All new construction manholes or replacement of existing manholes requires installation of an internal rubber seal as specified. A rubber seal extension to include any additional heights of chimney not covered by the seal itself shall be used as directed. The internal rubber seal and seal extensions shall be as manufactured by Cretex Specialty Products, or approved equal. The seals and extensions shall have a minimum thickness of 3/16 inches and shall be extruded from a high grade rubber compound conforming to the applicable requirements of ASTM C923. The bands used for compressing the seal and extension against the manhole shall be fabricated from 16 gauge stainless steel conforming to ASTM A240 type 304, any screws, bolts or nuts used on this band shall be stainless steel conforming to ASTM F593, type 304.

External Manhole/Vault Seals: When manholes are located within an area of high groundwater, adjacent to a lake or stream, or within an area of standing water, the exterior manhole joints and surface shall be sealed with an external concrete sealant. Exterior manhole walls shall be sealed with a liquid cold-applied waterproofing membrane system such as Sonneborn ® HLM 5000®, or equivalent. Exterior joints shall be sealed with an elastomeric based external concrete joint wrap such as Henry RUB'R-NEK®, or equivalent.

Manhole Temporary Construction Cover: Temporary covers of 3/8 inch steel plate of sufficient size to adequately cover the opening shall be placed on the cone of a manhole until paving is completed. Suitable locating ribs shall be welded to the underside of the cover to hold it in place during the grading and paving operations.

Connection to Existing Manhole: Connections to existing manhole walls shall be made by core drilling into the wall of the manhole. Pipe penetration through the manhole wall shall be sealed with a watertight seal by one of the following:

- equipping the pipe with a modular mechanical type seal (“Link-Seal”, or equivalent), consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and manhole wall opening. Links shall be loosely assembled with stainless steel bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt and nut. After the seal assembly is positioned in the sleeve, tightening of the bolts shall cause the rubber sealing elements to expand and provide a watertight seal between the pipe and the manhole wall opening.
- inserting the end of the pipe through the core drilled opening, and packing the opening around the pipe with Kent seal or Ram-Nek and primer, then covering with a stiff mix of cement mortar, thoroughly compacted. The mortar shall be composed of one part Type II Portland cement and three parts clean sand. The mortar shall be troweled smooth and flush with the interior surface of the manhole.

Connection of a pipeline to an existing manhole that has a stub-out shall be accomplished with a rigid repair coupling. No flexible rubber couplings are allowed.

The use of impact hammers to break into a manhole wall is prohibited.

Drop Manholes: When in the opinion of the General Manager the flow line grades are such as to require a drop manhole this shall be accomplished as detailed in the District Standard details. A drop inlet shall not be permitted within 5 feet of the flow line.

Utility Pad Installation: See Standard Drawings, Utility Pad Installation, Figure 11, page 159.

Cleanouts: A cleanout shall be installed in each building lateral at the property line of the premises being provided with sewer service and within 5 feet of where the lateral exits the structure foundation. Cleanouts located under the house are not accepted, rather the cleanout must be located *outside* the building foundation. Additional cleanouts shall be installed at intervals not to exceed 75 feet, and at any other point the owner or their agent may select for the purpose of keeping said sewer pipeline clean and free of obstruction. A cleanout shall also be installed on the upstream side of the fitting at all 45 degree or greater bends.

All cleanout risers must be 4 inches below finished grade and boxed to finished grade with an appropriate removable watertight plug in the end of the riser. Cleanout risers and appropriate boxes are required at the property line cleanout and at the cleanout installed nearest the building.

Cleanout boxes shall be constructed of concrete with cast iron lids for vehicular traveled areas (Christy G-5 or equivalent) or reinforced plastic with cast iron lids for non vehicular areas (Carson Industries, Inc., series 608 or 910, or equivalent). Cleanout boxes shall be set to grade and backfilled to prevent accidental displacement or removal. Lids shall have "SEWER" or equivalent imprinted on the lid. Lids with verbiage other than a sewer utility designation (i.e., Storm Drain, Water, Gas, etc.) imprinted on the lid are not permitted.

Service laterals shall be extended to property line and shall be marked with either of the following:

- A 2 x 2 inch redwood stake. The stake shall be buried at the wye and shall extend to finished grade. No stakes shall be driven into the ground or left protruding above finished grade.
- A flexible green marker made of a composite of glass-fiber reinforced polymers (Carsonite®), or equivalent. The marker shall be buried at the wye and extend to finished grade. The marker shall not be left protruding above finished grade.

Every service lateral shall be so marked before final acceptance.

A service lateral stub out to vacant land shall contain a wye (two wyes for double service) with approved removable plugs in the bell ends. The stub out shall be placed at the property line at the appropriate depth to service the parcel. The property line cleanout riser shall be extended to within 4 inches of finished grade and properly boxed per cleanout specifications. An approved marker shall be buried in front of the wye(s) and cut off flush to grade as specified in the Standard Drawings, Service Lateral Detail (Profile View), Figure 8, page 153. Dual swing ties are required for all stub outs and cleanout risers. Permanent objects such as property corners, power poles, water boxes, structures, etc. shall be used for swing ties.

Building Laterals: Building lateral pipelines connecting to the District's sanitary sewer system shall meet the requirements listed below and the criteria listed in Appendix A-5, page 75 and Appendix A-6, page 77.

- **Residential Building Laterals:** The diameter of gravity building laterals shall not be less than the pipeline diameter exiting the structure, or less than 4 inches for a single residence or two residences. Six-inch diameter pipeline or larger shall be used for more than two dwelling units.
- **Commercial Building Laterals:** The minimum pipeline diameter for commercial gravity building laterals shall not be less than 6 inches.

Appropriate fittings shall be used in connecting to the service connection provided by the District. On double sewer services, both wye's shall be uncovered prior to connection to the system for District inspection and the appropriate wye shall be used.

Joints in all building laterals shall be of a collar type as recommended by the manufacturer and shall pass the District's inspection and required tests.

A-6.10 Testing of Sanitary Sewer Facilities

The following tests will be required for all sanitary sewer facilities connected to the District's sanitary sewer system. Testing shall not be permitted until all excavation, backfilling (for other utilities), and grading (for roadway subgrade and structural section) in the immediate area of the sanitary sewer facility has been completed.

Gravity Pipelines: After the sewer pipelines have been properly backfilled to a depth where additional backfilling will not disturb the position of the pipe, all sections shall be tested either *hydrostatically* or with an *air* test. In no case shall the required minimum backfill be less than 30 inches above the top of the pipe before subjecting the pipeline to the test. All necessary materials and equipment to make the test shall be provided by the owner or their agent.

Hydrostatic Test: A section of sewer pipeline shall be prepared for testing by plugging the upper side of the downstream manhole and all openings in the upstream manhole except the downstream opening. Where grades are slight, two or more sections between manholes may be tested at once. Where grades are steep, and excessive test heads would result by testing from one manhole to another, test tees the full size of the sewer main shall be installed at intermediate points so the maximum head on any section under test will not exceed 15 feet.

The allowable leakage in the test section shall not exceed 350 gallons per mile per day per inch diameter of pipe tested at the 5-foot test head.

If it is necessary or desirable to increase the test head above 5 feet, the allowable leakage will be increased at the rate of 80 gallons for each foot of increased in head.

Test sections showing leakage in excess of that allowed shall be repaired or reconstructed as necessary to reduce the leakage to that specified above and the pipeline retested.

Air Test: Air testing may be used in lieu of the hydrostatic testing. Air testing shall be as specified herein unless otherwise directed by the General Manager. Length of pipeline tested shall be limited to the length between adjacent manholes. Air test procedure shall be as follows:

Pressurize the test section to 4.0 pounds per square inch and hold above 3.5 pounds per square inch for not less than 5 minutes. Add air if necessary to keep the pressure above 3.5 pounds per square inch. At the end of this 5 minute saturation period, note the pressure (must be 3.5 pounds per square inch min.) and begin the timed period. If the pressure drops 0.5 pounds per square inch in less than the time given in the following table, the section of pipe shall not have passed the test.

If the time for the pressure to drop 0.5 pounds per square inch is 125 percent or less of the time given in the table, the pipeline shall immediately be re-pressurized to 3.0 pounds per square inch and the test repeated.

For 8 inch and smaller pipe if the pressure drops less than 0.5 pounds per square inch after the initial pressurization and air is not added, the section undergoing test shall have passed.

If the test is not passed, the leak shall be found and repaired to the satisfaction of the General Manager and the pipeline shall be retested.

House waste piping shall be considered part of the building lateral to which it is connected. No adjustment of test time shall be allowed to compensate for the smaller diameter of the house waste piping.

<u>Lateral Size</u>	<u>Minimum Time in Seconds</u>
4	122
6	184
8	245
10	306
12	367
15	460

For larger diameter pipe, use the following formula:

Minimum time in seconds = 370 x pipe diameter in feet

When the prevailing ground water is above the sewer being tested, air pressure shall be increased 0.43 pounds per square inch for each foot the water table is above the flow line of the sewer.

The pressure gauge used shall be supplied by the contractor, shall have minimum divisions of 0.10 pounds per square inch, and shall have an accuracy of 0.04 pounds per square inch. Accuracy and calibration of the gauge shall be certified by a reliable testing firm at 6 month intervals or when requested by the General Manager. In addition, the General Manager may compare the contractor's gauge with a District owned gauge at any time.

Mandrel Testing: Deflection test for Plastic Pipe and Fittings -Installed pipe shall be tested to insure that vertical deflections for plastic pipe do not exceed the maximum allowable deflection. Maximum allowable deflections shall be governed by the mandrel requirements stated herein and shall nominally be:

Nominal Pipe Size	Percentage
Up to and including 12-inch	5.0
Over 12- to and including 30-inch	4.0
Over 30-inch	3.0

The maximum average ID shall be equal to the average OD minus two times the minimum wall thicknesses per applicable ASTM Standards. Manufacturing and other tolerances shall not be considered for determining maximum allowable deflections.

Deflection tests shall be performed not sooner than 30 days after completion of placement and densification of backfill. The pipe shall be cleaned prior to testing.

For all pipes less than 24-inch ID, a mandrel shall be pulled through the pipe by hand to ensure that maximum allowable deflections have not been exceeded. If the mandrel fails to pass, the pipe will be deemed to be over deflected. Prior to use, the mandrel shall be approved by the engineer or by another entity approved by the engineer. Use of an uncertified mandrel or a mandrel altered or modified after certification will invalidate the test.

Any over deflected pipe shall be uncovered and, if not damaged, reinstalled.

Damaged pipe shall not be reinstalled, but shall be removed from the work site. Any pipe subjected to any method or process other than removal, which attempts, even successfully, to reduce or cure any over deflection, shall be uncovered, removed from the work site and replaced with new pipe.

The mandrel shall:

- Have an odd number of legs (nine legs minimum) and be a rigid, nonadjustable mandrel having an effective length not less than its nominal diameter.
- Be fabricated of steel, be fitted with pulling rings at each end, be stamped or engraved on some segment other than a runner indicating the pipe material specification, nominal size, and mandrel OD (e.g., PVC D 3034-8 inch - 7.524 inch, ABS Composite D 2680-10 inch

- 9.584 inch); and be furnished in a suitable carrying case labeled with the same data as stamped or engraved on the mandrel. For the pipe IDS nominally 24-inch and larger, deflections shall be determined by a method submitted to and approved by the engineer. If a mandrel is selected, the minimum diameter, length and other requirements shall conform to the dimensions and requirements as stated above.

All costs incurred by the contractor attributable to deflection testing including any delays, shall be borne by the contractor.

Television Tests: Each section of sewer pipeline shall be subject to inspection by use of a television (T.V.) camera. Use of the T.V. inspection shall not relieve the contractor of the responsibility for performing the tests outlined in this section nor shall it be used in lieu thereof.

Pre-inspection Preparation - T.V. inspection will not be scheduled or made until the following operations are complete:

- All sewer pipelines are installed and backfilled to finished grade, or, if pavement will be finished grade, to the final street subgrade, but prior to paving.
- All structures are in place and pipelines are accessible from structures.
- All pipelines have been balled, flushed and tested for deflection.
- All pipelines have been successfully tested.

Arrangements for Inspection - When the contractor determines that the pipeline is ready for inspection, the contractor shall notify the District and request a date for the T.V. inspection. The District shall notify the contractor of the scheduled date. If it is determined by the contractor that the job site will not be ready or accessible for the T.V. inspection on the scheduled date, as notified, the contractor shall notify the District of the necessary cancellation at least 48 hours in advance of the scheduled inspection. Rescheduling shall be accomplished in the same manner as for the initial inspection.

The developer shall bear the cost of the first T.V. inspection made for the purpose of determining acceptance. Subsequent inspections and T.V. camera assistance rendered by the District shall be charged labor, materials, equipment, and travel time.

Grounds for Refusal of Acceptance - All pipelines that have been televised will be evaluated by the District for deficiencies. If no deficiencies are noted, the sewer installation portion of the work will be considered satisfactory.

The following conditions are considered unacceptable for sewer pipelines and will result in refusal of acceptance:

- Visible standing water
- Joint separations greater than recommended by manufacturer
- Cocked joints present in straight runs or on the wrong side of pipe curve
- Chipped pipe
- Cracked pipe
- Infiltration or exfiltration
- Debris or other foreign matter
- Protrusions or excessive roughness in pipe
- Offset joint
- Out of round or diameter deflected pipe
- Improper alignment or curves not conforming to specified line
- Upset in normal hydraulic regime
- Any conditions that prevents the economical, safe or reasonable use of the sewer
- Pipeline sags in excess of 1/2-inch standing water

Video Tape - Televised sewer pipelines will be recorded onto video tape. The contractor may view video tapes within 2 working days at the District Offices by making an appointment. All video tapes produced as a result of the work shall be the sole property of the District and shall remain under its care and custody at all times.

Reinspection - If the sewer pipeline offered for acceptance fails to meet applicable specifications, the District shall have a right to reinspect after correction of defects and to charge a re-televising fee in accordance with current District rates. The T.V. testing process shall be repeated as necessary until all defects have been corrected to the satisfaction of the District.

Force Main Testing:

Pressure Class PVC Pipe - Each section of PVC pipe shall be tested in accordance with the Inspection and Testing methods outlined for pressure PVC pipe in the UniBell Handbook of PVC Pipe with the following conditions. The pipeline shall be subjected to a test pressure of not less than 150 pounds per square inch or the service pressure plus 50 pounds, whichever is greater, without exceeding the pressure rating for the pipe at the lowest end of the pipe. The pressure shall be applied for a minimum of 2 hours. All

exposed joints, bends, angles, and fittings shall be closely examined during the test. Any part of the pipeline which proves to be defective shall be replaced and the pipeline retested.

Ductile Iron Pipe - Each section of ductile iron pipe shall be tested in accordance with Hydrostatic Testing methods outlined for ductile iron water mains in the Ductile Iron Pipe Research Association Handbook with the following conditions. The pipeline shall be subjected to a test pressure of not less than 150 pounds per square inch or the service pressure plus 50 pounds, whichever is greater, without exceeding the pressure rating for the pipe at the lowest end of the pipe. The pressure shall be applied for a minimum of 2 hours. All exposed joints, bends, angles, and fittings shall be closely examined during the test. Any part of the pipeline which proves to be defective shall be replaced and the pipeline retested.

Manhole Testing: If deemed necessary by the District, any or all manholes shall be tested for leakage by one of the following procedures:

Water Test - All inlet and outlet pipes shall be plugged and the manhole filled with water to the top of the manhole frame. The water should be introduced into the test section at least 4 hours in advance of the official test period to allow the manhole and joint material to become saturated. The manhole shall then be refilled to the original water level. At the beginning of the test, the elevation of the water in the upper manhole shall be carefully measured from a point on the manhole rim. After a period of 4 hours, the water elevation shall be measured from the same point on the manhole rim and the loss of water during the test period calculated. If this calculation is difficult, enough water shall be measured into the upper manhole to restore the water to the level existing at the beginning of the test, and the amount added taken as the total leakage. For manholes, the allowable leakage shall not exceed 0.13 gallons per hour. Manholes showing leakage in excess of that allowed shall be repaired or reconstructed as necessary to reduce the leakage to that specified above and the manhole retested.

Vacuum Test - Vacuum test equipment shall be used per the manufacturer's specifications. A vacuum of 10 inch Hg should be drawn on the manhole, and the time for the vacuum to drop to 9 inch Hg shall be measured. For simplification in the field, a "rule of thumb" for this drop in vacuum shall be conservatively established at 60 seconds for a 48-inch diameter manhole; 75 seconds for a 60-inch diameter manhole; and 90 seconds for a 72-inch diameter manhole.

A-6.11 Pavement Restoration

Asphalt Concrete Pavement Restoration: The contractor shall perform asphalt concrete patching and pavement restoration work in accordance with State of California Department of Transportation Standard Specifications, Section 39, and Contract Drawings and documents.

This work shall consist of furnishing and mixing aggregate and asphalt binder at a central mixing plant, spreading and compacting the mixture as specified herein in all areas affected by trenching

and construction activities under this contract.

Asphalt concrete is designated as Type B and shall meet the requirements Section 39 of the State of California Department of Transportation Standard Specifications (July 1992) Type B Asphalt Concrete.

Asphalt concrete shall be produced in a batch mixing plant, a continuous pugmill mixing plant or a dryer-drum mixing plant. Proportioning shall be either by hot-feed control or cold-feed control.

Asphalts: Asphalt binder to be mixed with aggregate shall be Grade AR4000. The amount of asphalt binder to be mixed with the aggregate will be specified in the special provisions.

Liquid asphalt for prime coat shall conform to the provisions in "Liquid Asphalts", and shall be SC-250.

Aggregates: All aggregates shall be clean and free from decomposed materials, organic material and other deleterious substances.

Coarse aggregate is material retained on the No.4 sieve; fine aggregate is material passing the No.4 sieve; and supplemental fine aggregate is added fine material passing the No. 30 sieve, including dust from dust collectors.

Unless otherwise specified in the special provisions, the aggregate grading to the various types of asphalt concrete shall conform to the following:

<u>Type</u>	<u>Grading</u>
B, AR-4000	1/2" maximum

The combined aggregate, prior to the addition of asphalt binder, shall conform to the requirements of this section. Conformance with the grading requirements will be determined by California Test 202, modified by California Test 105 when there is a difference in specific gravity of 0.2 or more between the coarse and fine portions of the aggregate or between blends of different aggregates.

In the tables below, the symbol "X" is the gradation which the contractor proposes to furnish for the specific sieve. The proposed gradation shall meet the gradation shown in the table under "Limits of Proposed Gradation". Changes from one mix design to another shall not be made during the progress of the work unless permitted by the District Engineer. However, changes in proportions to conform to the approved mix design shall not be considered changes in mix design.

AGGREGATE GRADING REQUIREMENTS
 Type B Asphalt Concrete
 Percentage Passing

1/2" Maximum, Medium

Sieve Range	Limits of Compliance	Operating	Contract	Sizes	Gradation
3/4"		100	100		
1/2"		95-100	89-100		
3/8"		80-95	75-100		
No.4	59-66	X±5	X±8		
No.8	43-49	X±5	X±8		
No.30	22-27	X±5	X±8		
No.200		3-8	0-11		

Subgrade: Immediately prior to applying prime coat or paint binder, or immediately prior to placing the asphalt concrete when a prime coat or paint binder is not required, the subgrade to receive asphalt concrete shall conform to the compaction requirement and elevation tolerances specified for the material involved and shall be free of loose or extraneous material. If the asphalt concrete is to be placed on an existing base or pavement which was not constructed as part of the contract, the contractor shall clean the surface by sweeping, flushing or other means to remove all loose particles of paving, all dirt and all other extraneous material immediately before applying the prime coat or paint binder.

Prime Coat and Binder: Edges of existing pavement being joined and surface being overlaid shall receive a tack coat of SS1H bituminous binder or equivalent.

Prime coat shall be applied at the approximate total rate of 0.25 gallons per square yard of surface covered.

Prime coat shall be applied at a temperature conforming to the range of temperatures provided in the State of California Department of Transportation Standard Specifications, Section 93-1.03, "Mixing and Applying," for distributor application of the grade of liquid asphalt being used.

A paint binder shall be furnished and applied to all vertical surfaces of existing pavement, curbs, gutters when additional material is to be placed to a pavement to be surfaced, and to other surfaces designated by the District Engineer.

Paint binder shall be applied in one application at a rate of from 0.02 to 0.10 gallon per square yard of surface covered.

Spreading Equipment: Asphalt pavers shall be self-propelled mechanical spreading and finishing equipment, provided with a screed or strike-off assembly capable of distributing the material to not less than the full width of a traffic lane if necessary.

Compacting Equipment: A minimum of one steel-tired, two-axle tandem roller weighing not less than 8 tons or more than 10 tons shall be used for each asphalt paver to compact Open Graded asphalt concrete.

Temporary Paving: The owner or their agent shall comply with all general temporary paving requirements and special requirements of the Placer County, and the State of California Department of Transportation. Temporary paving (cold patch) shall be placed to grade over all backfilled trenches located within primary roadways until permanent paving is installed.

Temperature Requirements: Type B asphalt concrete shall be placed only when the atmospheric temperature is above 50 degrees Fahrenheit.

Asphalt concrete and asphalt concrete base shall not be placed when the underlying layer or surface is frozen, or when, in the opinion of the District Engineer, weather conditions will prevent the proper handling, finishing, or compaction of the mixtures.

Spreading: When directed by the District Engineer, paint binder shall be applied to any layer in advance of spreading the next layer.

Before placing the top layer adjacent to cold transverse construction joints, such joints shall be trimmed to a vertical face and to a neat line. Transverse joints shall be tested with a 12-foot straightedge and shall be cut back as required to conform to the requirements as specified in Pavement Restoration, Appendix A-6.11, Compacting, page 111. Connections to existing surfacing shall be feathered to conform to the requirements for smoothness. Longitudinal joints shall be trimmed to a vertical face and to a neat line if the edges of the previously laid surfacing are, in the opinion of the District Engineer, in such condition that the quality of the completed joint will be affected.

All layers shall be spread with an asphalt paver. Asphalt pavers shall be operated in such a manner as to insure continuous and uniform movement of the paver and shall lay a mat which will provide a lift of 2.5 inches in the compacted state and not less than 1.5 inches in the compacted state.

Compacting: A pass shall be one movement of a roller in either direction. A coverage shall be as many passes as are necessary to cover the entire width being paved. Overlap between passes during any coverage, made to insure compaction without displacement of material in accordance with good rolling practice, shall be considered to be part of the coverage being made and not part of subsequent coverage. Each coverage shall be completed before subsequent coverages are started.

Rolling shall commence at the lower edge and shall progress toward the highest portion, and shall be performed so that cracking, shoving or displacement will be avoided.

The completed surfacing shall be thoroughly compacted, smooth, and free from ruts, humps, depressions, or irregularities. Any ridges, indentations or other objectionable marks left in the surface of the asphalt concrete by blading or other equipment shall be eliminated by rolling or

other means. The use of any equipment that leaves ridges, indentations, or other objectionable marks in the asphalt concrete shall be discontinued, and acceptable equipment shall be furnished by the contractor.

When a straightedge 12 feet long is laid on the finished surface and parallel with the center line, the surface shall not vary more than 0.01 foot from the lower edge of the straightedge. The transverse slope of the finished surface shall be uniform to a degree such that no depressions greater than 0.02 foot are present when tested with a straightedge 12-foot long laid in a direction transverse to the center line and extending from edge to edge of a 12-foot traffic lane. Contractor shall furnish the 12-foot straight edge.

Manhole Adjustments: When manholes are adjusted to pavement grade, they shall be 1/2 to 3/4 inch below adjacent pavement surface. Asphalt concrete shall be neatly *tapered* from the final pavement grade to the manhole frame and cover. If the manhole is located within 2 feet of the edge of the pavement, in earth shoulders or earth flow-line areas, asphalt concrete shall be placed to a minimum 2 feet around the manhole and paved out at 45 degrees to the edge of existing pavement.

A-6.12 Clean Up

During the progress of the work, the owner or their agent shall keep the entire job site in a clean and orderly condition. Excess or unsuitable backfill material, broken pipe or other waste material shall be removed from the job site. Spillage resulting from hauling operations along or across existing streets or roads shall be removed immediately by the contractor. All gutters and roadside ditches shall be kept clean and free from obstructions. Any deviation from this practice shall have prior approval from the General Manager.

Before final acceptance of the work, the owner or their agent shall carefully clean up the work and premises, remove all temporary structures built for the work, and remove all surplus construction materials and rubbish of all kinds from the grounds which he has occupied and leave them in a neat condition.

A-6.13 Environmental Considerations

Water Pollution: The owner or their agent shall exercise every reasonable precaution to protect ditch conduits, streams, lakes and reservoirs from pollution with fuels, oils bitumens, chemicals, concrete and other harmful materials and shall conduct and schedule his/her operations so as to avoid or minimize muddying and silting of said conduits, streams, lakes and reservoirs.

Nothing in these Standards shall relieve the owner or their agent of the responsibility for compliance with Sections 5650 and 12015, California Fish and Game Code, or other applicable statutes relating to prevention or abatement of water pollution.

Erosion control features shall be constructed concurrently with other work and at the earliest practicable time. Care shall be exercised to preserve vegetation beyond the limits of construction.

When borrow material is obtained from other than commercially operated sources, erosion of the borrow site during and after completion of the work shall not result in water pollution. The material source shall be constructed, where practicable, so that water will not collect or stand therein.

The requirements of this section shall apply to all work performed within the District and to all noncommercial operated borrow or disposal sites used for work within the District. The word "stream" as hereinafter used shall be construed to mean ditch, conduit, stream, river, lake or reservoir.

The owner or their agent shall be completely responsible for compliance with all local, town, county, state, and federal regulations pertaining to water pollution and soil erosion including the payment of any fines or penalties imposed by any governmental agency as a result of work performed by or for the owner or their agent.

Stream Zones: Where working areas encroach on live streams, barriers adequate to prevent the flow of muddy water into streams shall be constructed and maintained between working areas and streams, and during the construction of such barriers, the muddying of streams shall be held to a minimum.

Prior to the removal of material from an area beneath a flowing stream, a bypass channel shall be constructed in a location which will carry the stream free from mud or silt around the material removal operation.

Should the operations of the owner or their agent require transportation of materials across live streams, such operations shall be conducted without muddying the stream. Mechanized equipment shall not be operated in the channels of such live streams except as may be necessary to construct crossings or barriers and fills at channel alterations.

When operations are completed, the flow of streams shall be returned as nearly as possible to the original meandering thread without creating the possibility of future bank erosion.

Material derived from the work shall not be deposited in a live stream channel where it could be washed away by high stream flows.

Erosion Control: This work shall consist of incorporating straw and/or mulch, fertilizing, and seeding all water pipeline excavation and backfill areas; all easements which are disturbed by pipelines, ditches or access roads shall also be seeded. Areas designated as waste or borrow areas shall be seeded after final cleanup of said areas is finished.

Seeding: Seed shall be uniformly distributed over the seedbed area. The seed mixture chosen shall be one which is suitable for dry soils at an elevation of 5,000 to 6,000 feet and meets the specifications for purity and viability as given in Chapter XI-C of the Tahoe Regional Planning Agency's Handbook of Best Management Practices.

The seeding operation shall be accomplished promptly after the cleanup of an area is

completed, in no case shall the seeding operation of an exposed or disturbed area be allowed to stand fallow through winter until the following construction season.

Fertilizer: Fertilizer shall be applied at a rate so as to provide 80 pounds of available nitrogen per acre and 100 pounds of available phosphoric acid (p2o5) per acre.

Mulch: Wood fiber mulch shall be applied to all areas at the rate of 1,500 pounds per acre. The mulch shall be applied in a slurry with the seed and fertilizer. Straw mulch shall be a cereal grain straw, not rotted and free of noxious weeds. Straw mulch shall be applied on areas as specified in the following paragraphs at the rate of 2 tons per acre. Mulching shall follow immediately after seeding.

Erosion control shall be used on all trench excavation outside of the paved Placer County, or State of California right-of-ways.

In addition, should the cross slope grade parallel with the trench be greater than 15 percent, Douglas Fir or Cedar 1 x 8 inch boards shall be placed normal to the pipe trench on 10 foot centers with 2 inches exposed above grade and extended 6 inches into original ground on each side before seeding.

A-6.14 Structural Concrete

Provide and install all cast-in-place concrete, as shown and as specified, including but not limited to the following:

- Accessories to be embedded in cast-in-place concrete, anchor bolts, etc.;
- Cutting, patching, finishing and curing of cast-in-place concrete;
- Coordination with all trades with regard to requirements for special bases, sleeves, chases, inserts, finishes, or provisions of any nature;
- Treatment of finished concrete surface.

Quality Assurance: Qualification of Workmen: All concrete work shall be completed by experienced and skilled concrete workmen working under the supervision of an experienced concrete contractor.

Reference Standards: The following references and standards are hereby made a part of this section. Nothing contained herein shall be construed as permitting work that is contrary to code requirements or governing rules and regulations.

ACI - American Concrete Institute.

- ACI 301 - "Specification for Structural Concrete for Buildings."
- ACI 304 - "Recommended practice for Measuring, Mixing and Placing Concrete."

- ACI 305 - "Recommended Practice for Hot Weather Concreting."
- ACI 306 - "Recommended Practice for Cold Weather Concreting."
- ACI 309 - "Recommendation Practice for Consolidation of Concrete."
- ACS 318 - "Building Code Requirements for Reinforced Concrete."
- ASTM - American Society for Testing and Materials.
- C 31 - "Making and Curing Concrete Test Specimens in the Field."
- C 33 - "Standard Specification for Concrete Aggregates."
- C 39 - "Standard Method of Test for Compressive Strength of Cylindrical Concrete Specimens."
- C 88 - "Standard Specification for Method of Test for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate."
- C 94 - "Standard Specification for Ready-Mixed Concrete."
- C 143 - "Standard Method of Test for Slump of Portland Cement Concrete."
- C 150 - "Standard Specification of Portland Cement."
- C 157 - "Standard Method of Test for Length Change of Hardened Mortar and Concrete."
- C 171 - "Standard Specification for Sheet Materials for Curing Concrete."
- C 172 - "Sampling Fresh Concrete."
- C 233 - "Testing Air-Entraining Admixtures for Concrete."
- C 260 - "Standard Specifications for Air-Entraining Admixtures for Concrete."
- C 309 - "Standard Specification for Liquid Membrane - Forming Compounds for Curing Concrete."
- C 494 - "Standard Specifications for Chemical Admixtures for Concrete."
- C 2419 - "Standard Specification for Method of Test for Sand - Equivalent Value of Soil and Fine Aggregate."
- E 329 - "Standard Recommended Practice for Inspection and Testing Agencies for Concrete, Steel and Bituminous Materials as Used in Construction."

UBC - Uniform Building Code, Standards.

Testing Agency: Any testing Agency utilized during the course of the project should conform to the following: All reports and certificates prepared by the Testing Agency shall be signed by a Professional Engineer registered to practice as a Civil Engineer in the State of California. Test methods shall comply with the codes and standards listed.

Source Quality Control: The Testing Agency shall perform tests and/or assemble the necessary data indicating conformance with specifications as follows:

- Mix Designs - Furnish a list of proportions for each proposed mix.
- Strength - For each mix, submit data showing that the proposed mix will attain the required strength in accordance with the requirements of these specifications.
- Aggregate - For each aggregate used, submit data showing that it complies with ASTM C33. Include gradation, deleterious materials, specific gravity and soundness. For coarse aggregates in mixes for site work, include abrasion.
- Cement - Furnish mill tests for all cement used. Submit this data to the District for review prior to delivering any concrete materials to the site. Mix designs, test, etc., required by this specification need not be made specifically for this job, provided that data submitted is current within the last 12 months and that in the judgement of the Testing laboratory the test data correctly describes the materials proposed for use.
- Provide all necessary controls during batching, mixing, and placement of concrete.

The owner will perform and report on the following:

- Review mix designs, certificates of compliance, and samples of materials proposed for use;
- Test and inspect materials, as necessary, in accordance with ACI 318, for compliance with requirements;
- Take samples as required from sources designated by contractor;
- Inspect batch plant prior to any Work to verify following:
 - 1) Plant is equipped with approved metering devices for determining moisture content of fine aggregate.
 - 2) Other plant quality controls are adequate.
- Compression Tests: During progress of Work, take not less than five identical test specimens for standard cylinder tests at job site for each 100 cubic yards or less of class "A" and "B" concrete placed per day (except 50 cubic yards or less at underpinning), in accordance with requirements of ASTM C 31 and C 172. Make standard 7 and 28 days after casting. Keep fifth cylinder as a check cylinder for further tests if required.
- Slump Tests: Make slump tests per ATM C 143 at time of making each set of cylinder specimens and for each truckload.
- Air Entrainment Tests: Make air entrainment test for each truckload.

Submittals: Submit mix designs for approval by owner prior to placement of any concrete.

Submit improvement plans and schedule concrete placement operations before commencing Work. Show all construction, contraction and expansion joints.

Product Delivery, Storage and Handling: Protect cement from moisture and rotate stock to insure fresh materials.

Protect cement from moisture and rotate stock to insure fresh materials.

Alternative Procedures: Concrete may be placed by pumping provided that pumping equipment is suitable for proposed use and provided that specific "pump mixes" are submitted with data showing that they comply with the requirements of these specifications and subject to approval of Testing Laboratory.

Concrete Mix: Class "A" - Stone aggregate concrete for use in foundations: 3/4 inch maximum size aggregate, specified minimum 28 day strength of 4,000-pounds per square inch, slump 3-inches, +/-1-inch, 4-8 percent air entrainment, maximum water/cement ratio of 0.43.

Concrete mixes shall comply with ASTM C94. Proportioning shall comply with Alternative 3, mixing and transporting shall comply with requirements for Truck-Mixed Concrete.

Materials: Portland Cement: Type II, ASTM C 150, with use of at least 2 years with proposed aggregates without detrimental reaction. Cement shall not exceed 150 degrees Fahrenheit at time of use. Use one brand of cement throughout the Work.

Standard Weight Aggregates: ASTM C 33 from approved pits. The Maximum size used in a particular location shall be consistent with the form and dimensions of the section being placed, with the location and spacing of the reinforcing steel and with the method of vibration. The aggregate sizes shall be such as will produce dense, uniform concrete, free of rock pockets, honeycombs, or other irregularities. Aggregates for stone concrete shall conform to UBC Standard No., 26-2, except as modified by this section. Any suitable individual grading of coarse aggregates may be used, provided a workable and durably sound mix is obtained. Fine and coarse aggregate for stone concrete shall be clean, hard, fine grained, ground crushed rock or washed gravel or a combination of both, free from oil, organic matter, or other deleterious substances containing not more than 2 percent by weight of shale or cherty material.

Water: Clean and free of deleterious materials such as acids, alkalis, salts, oils, or organic substances.

Admixtures: Only if acceptable by Northstar Community Services District.

- Water Reducing Admixtures: ASTM C 494, Type A; Grace Construction Materials "WRDA"; Master Builders' "Pozzolith"; Sonneborn-Contech's "Trimix" or equal.
- Air Entraining Admixtures: ASTM C 260; Protec (Autolene Lubricant Company), MB-

VR (The Master Builders' Company), or Plastiment (Sika Chemical Corp.).

Epoxy Materials:

- Epoxy Adhesive: Ceilcote No. 348, Coneresive LPL 1001, or equal.
- Epoxy Grout: Ceilcote No. 648, Grace Vibro-Foil Grout Master Builder's Masterflow No. 713 Grout, or equal.

Grout for Base Plates: Master Builder's "Embeco 636 Grout"; Conrad Sovig's "Perma Grout"; Master Builders' "Masterflow 713", or equal.

Vapor Barrier: St. Regis Paper Company's Sisal Kraft Division "Moistop", or equal, in sheets as wide as possible to avoid joints. Provide manufacturer's recommended tape for all seams, joints, and repairs.

Hardeners: Clear, Dust-on Type: Base price on application of 50 pounds per 100 square feet. Same as Conrad Sovig's "K-Natural"; Upco Company's "Hydromat"; Lambert Corp.'s "Colorhard"; or equal.

Drypack Mortar for Form Tie-Holes and Patching: Composed of one part Portland Cement and two parts of fine aggregate and water.

Cement Mortar for Sacking: 5-1/2 parts sand, 2-1/2 parts Portland Cement, 1-1/2 parts lime hydrate by volume, plus water.

Concrete Curing Requirements:

- Seven-day full water cure.
- Manufactured curing compounds may be used in addition to the 7-day full water cure upon written approval of the General Manager.

Pre-molded Joint Filler: ASTM D 1751.

Polyvinyl Waterstop: Neoprene, center bulb type, or equal.

Inspection: Prior to placement of concrete, contractor shall be responsible for the examination and acceptance of all conditions affecting the proper installation of his/her work and shall not proceed until all unsatisfactory conditions have been corrected including the following:

- Approval of compaction tests of fill and backfill.
- Completion of the placement of drainage fills or slab base.
- Completion of form work.

- Placement of reinforcement.
- Placement of embedded items.
- Completion of review of form work and reinforcing.

Slab on Grade and Footing: Vapor Barrier: Place completely over capillary break material subgrade. Lap joints 6 inches minimum, and continuously tape. Fit tightly to penetrations, and continuously tape. Install continuous tape at all edge conditions.

Sand Cushion: Place a 2-inch sand cushion on top of membrane immediately after placing membrane.

Clean and roughen all construction joint surfaces by removing laitance and exposing sound aggregate. Thoroughly clean and moisten contact surfaces before placing fresh concrete.

Cleaning and wetting forms and subgrade: Remove foreign matter accumulated in forms, rigidly close ports and openings left in the form work immediately prior to starting concrete placing. Wet wood forms sufficiently to tighten up cracks. Wet other materials sufficiently to reduce suction and maintain workability of the concrete mix. Thoroughly clean tools used in transporting, placing, and consolidating concrete immediately after each use. Wet subgrade surfaces, immediately prior to placing slabs on grade.

Placing Concrete: Transport concrete from batching plant to place of final deposit as rapidly as practicable. Place concrete before initial set has occurred and in no event after it has contained water for more than 90 minutes and 45 minutes when concrete temperature exceeds 85 degrees Fahrenheit. Convey concrete from mixer to forms as rapidly as possible and deposit as nearly as practicable in its final position by methods which will prevent segregation or loss of ingredients. Thoroughly vibrate and tamp concrete so that all parts of forms are filled and so that no voids remain in mass or on surface. Take special care to work concrete through and around reinforcing steel.

Deposit concrete in horizontal layers not over 8-inches deep. Use spouts, elephant trunks or other approved means as necessary to avoid segregation when dropping concrete. Free fall shall not exceed 5 feet unless approved by the District prior to placement.

Use as many vibrators and tampers as necessary to secure desired results for different parts of structure. Make extra vibrators available during placing of concrete, ready for service in case any vibrator in use fails.

For vibrating of concrete, use a mechanical internal vibrator having a frequency of not less than 4,000 impulses per minute. Place vibrating element directly in concrete and not attached to either inside or outside of forms or to reinforcing steel. Do not over vibrate concrete.

Provide runways for buggies or other approved means of conveying concrete into place to

prevent displacement of forms or reinforcement. Do not run buggies directly over reinforcing steel or on planks supported directly by reinforcing steel. Take care not to displace reinforcement, anchor bolts or other materials that are to be embedded in concrete. Where placing of concrete has been stopped for a sufficient period of time so that shrinkage or warp has separated forms and concrete, draw forms into firm contact with concrete before placing additional concrete. Prevent any shoulder or ledge being formed at a cold joint.

Bring surfaces to be finished to proper grade, strike off, finish in a workmanlike manner. Ensure smooth level surfaces.

Add no water when placing concrete.

Finishing Concrete: Sidewalks, Exterior Slabs on Grade and Curbs:

- Compact, screed, level, and tamp with a grid tamper to raise a thin mortar bed to the surface. Steel trowel and medium broom after concrete has hardened sufficiently to prevent the drawing of moisture to the surface. Do not dust with dry materials. Avoid excessive tamping and surface mortar.
- Tool mark slabs where shown. Round all edges to a 1/2-inch radius.

Curing Concrete: During initial 7 days of curing, concrete and form work shall be kept continuously moist so that a film of water remains on the concrete or form work surface. This may be accomplished through continuously fogging or spraying with water or with moisture retaining fabric coverings. Any covering must be free of any substance that would be harmful to the concrete or the curing process. New fabric coverings should be thoroughly rinsed in water prior to use.

Weather Protection:

Cold Weather Requirements:

- Provide adequate equipment for heating concrete materials and protecting concrete during freezing or near-freezing weather in accordance with ACI 306. Use no frozen materials or materials containing snow or ice.
- All reinforcement, forms, fillers, and ground with which the concrete is to come in contact shall be free from snow or ice. Whenever the temperature of the surrounding air is below 40 degrees Fahrenheit, all concrete placed in the forms shall have a temperature of 45 degrees Fahrenheit or higher after placement. Provide adequate means for maintaining this temperature for 4 days. Provide any additional time necessary to ensure proper curing of the concrete as directed. The housing, covering, or other protection used in connection with curing shall remain in place and intact at least 24 hours after the artificial heating is discontinued. No dependence shall be placed on salt or other chemicals for the prevention of freezing.

Hot-Weather Requirements:

- In hot weather, take suitable precautions to avoid drying of concrete prior to finishing operations. Provide windbreaks, sun shades, fog sprays, or other devices as directed and as required.
- Concrete deposited in hot weather shall not have a placing temperature that will cause difficulty from loss of slump, flash set, or cold joints. Concrete temperature shall be less than 90 degrees Fahrenheit, unless higher temperatures are permitted by the Architect.

Defective Work: Any concrete work not formed as shown or not true to the intended alignment or not plumb or level where so intended, or not true to the intended grades and levels or that has voids or rack pockets that have not been filled, or that has any sawdust, wood, or debris embedded in it, or does not fully conform to the Specifications will be deemed to be defective. Concrete finish which is not properly surfaced as specified, or which varies more than 1/4 inch from the required finish grade (except floors having drains), or which has any roughened top surfaces, or which does not connect properly to the adjoining work will be deemed to be defective. Defective work shall be removed and be replaced with workmanship and materials complying with the requirements of the Contract Documents at no increase in Contract Price and with no time extension allowed.

Patching and Grinding: Formed Surfaces: Patch tie holes and defective areas immediately after form removal. Bonding grout approximately one part Portland Cement to one part fine sand passing a #30 sieve, mixed to creamy consistency. Patching mortar shall be made of the same material and approximately the same proportions as used for concrete, except that coarse aggregate shall be omitted and mortar shall consist of not more than one part Portland Cement to 2-1/2 parts damp loose sand by volume. Combine white and gray Portland Cement as necessary to match color of surrounding concrete. Use no more mixing water than necessary for handling and placing. Mix patching mortar in advance and allow to stand with frequent mixing with trowel without adding water until it has reached the stiffest consistency that will permit placing. Remove honeycombed and other defective concrete down to sound concrete. Dampen area to be patched and at least 6 inches surrounding the area. After water has evaporated from surface, a coat of bonding grout shall be well brushed into the surface. When the bonding grout begins to lose water sheen, apply patching mortar, thoroughly consolidate and strike off slightly higher than surrounding surface. All patching mortar shall set undisturbed for at least 1 hour before final finishing. Do not finish patches for 7 days. Tie holes shall be cleaned, dampened, and solidly filled with patching mortar. All areas to be repaired or grouted are to be inspected by the owner and architect prior to repair.

Slabs on Grade: After entire slab is finished, shrinkage cracks may appear which shall be patched as follows:

- Where the slab is not exposed or where appearance is not important, fill cracks larger than 1/32 inch wide with cement grout and strike off level with surface.
- Where slab is exposed and appearance is important, repair all unsightly cracks in a

manner satisfactory in appearance to the Architect. If this cannot be accomplished, then the concrete shall be considered defective.

Wall Finishes:

- Sack all exposed exterior wall surfaces to fill only superficial air voids and irregularities which are larger than 1/4 inch in diameter with a cement mortar grout, remove all excess grout by sacking without use of water. Take care in application of grout and in sacking excess grout from surface in order that all voids are filled without a thickness of grout being built up on adjacent concrete surface. The resultant finish and texture of concrete shall match existing finish and texture.

Clean Up: Wash and mop clean all interior finish surfaces and sweep and hose clean exterior surfaces after removal of protective covering. Leave all finish surfaces clean and free from oil, paint, plaster, stain and foreign substances and in approved condition.

Reinforcement: Bar reinforcement shall be deformed, and shall be intermediate grade conforming to the "Billett-Steel Bars for Concrete Reinforcement" (ASTM Designation A15), and be of the shape and dimensions shown on the improvement plans. Before any reinforcing steel is delivered to the job site, two sets of prints of the shop drawings shall be submitted to the General Manager for his/her approval, showing the number, length, and a dimensioned bending diagram of all steel bars and rods. Such approval is intended only as an additional precaution against errors and the responsibility for furnishing and placing steel in accordance with the details shown on the improvement plans and as specified shall still remain with the contractor.

A-6.15 Pump Station Structures

Doors: All man doors shall be hollow metal with all steel door frame. Minimum size 3068. Doors shall be of adequate size to move interior equipment in and out for maintenance.

Clearance Requirements: Where works are to be constructed within vaults, houses, or other enclosing structures, the desired minimum horizontal clearance around, outside of, and between the extreme dimensions of appurtenances such as pipes, valves, fittings, flanges, pumps, tanks, and auxiliary equipment shall be 24 inches; the desired minimum horizontal clearance between said extreme dimensions and the vertical walls or enclosing surfaces of said structures shall be 24 inches; and the desired minimum vertical clearance under and between said extreme dimensions and the horizontal floors or bottom surfaces shall be 18 inches. Electrical equipment clearances shall be per the current National Electrical Code.

Floor Drains: The floor or bottom areas of the above mentioned structures shall be drained by means of sloping floors, catch basins with grates, and drain lines constructed to terminate at an approved location, and will not recirculate into the enclosing structure. The catch basin grates shall have a free flowing area of not less than 50 square inches, and the minimum drain line shall be 4 inch size. Where gravity discharge through a drain line is not feasible, a power driven sump pump or line pump, automatically activated by a liquid level sensing device, shall be installed. Gravity drains shall be equipped with a trap and drain to the wet well.

The enclosing structures shall be designed so that precipitation, surface water, and ground water cannot enter said structure. Floors shall be at least 6 inches above outside ground level. The Outside ground level shall have adequate storm drainage facilities not connected to the sanitary sewer system.

Materials and Workmanship: All materials used or incorporated in any works to be accepted by the District shall be new and the best market quality. All work shall be completed in the best, most thorough, substantial and workmanlike manner.

All material, labor and finished work shall be subject to the approval of the General Manager as to its quality and fitness, and shall be immediately removed if it does not meet with his/her approval.

Improvement Plans: The owner or their agent shall submit to the General Manager two prints of all structure plans for his/her review. These improvement plans shall be on 24 x 36 inch sheets.

All structures above ground shall be compatible architecturally with existing or future conditions and shall be approved as to appearance prior to final structure design.

Insulation: Insulation shall be placed if required. The owner or their agent shall submit to the General Manager insulation calculations based upon a low temperature of minus 28 degrees Fahrenheit.

Surface Treatment: The structures surface treatments shall be approved by the General Manager.

Loads: The minimum vertical snow load applicable to the design of roofs and similar surfaces including water tanks shall conform to the following schedule.

<u>Elevation of Structure</u>	<u>Normal Snow Load</u>
5500 and greater, but less than 6000	220 PSF
6000 and greater, but less than 6500	260 PSF
6500 and greater, but less than 7000	300 PSF

Wind loads shall conform to the uniform building code.

Two sets of calculations shall be sent to the General Manager.

Concrete: All concrete used in District structures shall conform to Structural Concrete, Appendix A-6.14, page 117, of this specification.

Excavation and Backfill: Excavation and backfill for buildings and structures shall be approved by the General Manager.

The owner or their agent shall, at no expense to the District, take compaction tests one for each 100 cubic yards of structure backfill by an approved commercial testing laboratory with two copies of the results sent to the General Manager.

The moisture density test shall be ASTM D1557, Method A.

The in place density shall be determined by ASTM D1556.

Access Roads and Site Work: Access roads to District sanitary sewer facilities shall be of an all weather type with a minimum width of 12 feet of traveled way. This width may be increased if length or location become a consideration to the District.

The road grades shall be a maximum of 8 percent. The structural section for access roads and parking areas shall be a minimum of 6 inches of aggregate base Class 2, and 4 inches of asphalt concrete.

There shall be adequate consideration given to roadway and site drainage.

Tops of all excavation slopes and toe of embankment slopes shall have "V" type ditches draining the runoff away from the site area.

All structure sites shall allow for a minimum of one pickup truck parking and adequate room to turn around where necessary.

The District will require free title to all structure sites and a recorded access easement on the road extending a minimum of 5 feet beyond any construction limits.

Welding: All welding shall conform to the welding handbook of the American Welding Society, and as modified herein.

Welder Qualification: All welders working on any portion of work to be incorporated in the District sanitary sewer system shall be certified as specified below and as may be required by the General Manager.

Fabrication and testing of test specimens for qualification of welding procedures and qualification of welding operators shall be completed at no cost to the District.

Test reports shall be submitted to the General Manager in triplicate and approved by him in writing prior to start of fabrication. Test reports shall become the property of the District.

The General Manager may require tested specimens to be furnished to him for review after testing. In the event that test specimens are not satisfactory, the welder will be disqualified.

The contractor shall advise the General Manager in advance of testing weld specimens and shall provide access to the test area so that testing may be witnessed by the General Manager, and bear all costs of such inspection.

Welder qualification tests will be evaluated in accordance with requirements of the AWS except that radiographic examinations will not be used in lieu of the guided bend tests. Radiographic examinations may be used as a supplement to other tests and should they indicate that a test weld is unsound, the General Manager may disqualify the welder.

In lieu of the AWS requirements, qualification tests for tack welding will be the same as the qualification tests required for butt welding material up to and including 3/4 inch thick.

All certification tests shall be performed at the owner or their agent's expense by a commercial testing laboratory approved by the General Manager.

Welding Testing: If in the opinion of the General Manager, the workmanship or the welds are of such a type or nature as to require testing, the owner or their agent shall have the necessary tests performed by a commercial testing laboratory at the owner or their agent's expense with the results delivered to the General Manager.

Pipelines and Fittings: All piping and appurtenances shall be installed in the position and to accurate lines, elevations, and grades as shown on the improvement plans or specified herein. All pipelines shall be rigidly supported and braced by approved hangers, brackets, or other devices. When temporary supports are used, they shall be sufficiently rigid to prevent any shifting or distortion of the piping or related work.

Pipe shall be cleaned of dirt and scale prior to installation and all joints swabbed clean before jointing. All fittings necessary for the satisfactory alignment and arrangement of piping and all necessary unions and cleanouts shall be adequately supported throughout and the weight thereof shall be carried independently of the pump casings or the equipment. All pipe work shall be mounted in a truly workmanlike manner with pipe work parallel with vertical and horizontal axis of reference. All sections of pipe shall be rigidly bolted or joined together after being cut accurately to length in such a manner as to relieve any and all parts of equipment of undue strain resulting from closure of flanged or other joints or connections. Equipment shall be so positioned and aligned that no strain shall be induced within the equipment during or subsequent to the installation of pipe work.

Threaded joints shall be made up with the best quality pure lead paste or approved equal, carefully and smoothly placed on the male threads only. All screwed joints shall be made tight with tongs and wrenches; caulking of any kind will not be permitted.

Use of thread cement or caulking to make joints tight is prohibited. All cut ends shall be reamed to full bore before assembly.

Flanged joints shall be made up square, with even pressure on the gaskets, and shall be watertight. Gaskets shall be heat quality rubber packing not less than 1/16 inch thick and compatible with wastewater applications. All gaskets shall be the full width of the flanges to which they are applied.

All piping within structure shall have bolted flanged joints except as authorized by the General Manager.

The owner or their agent shall, if requested by the District, demonstrate the disassembly and reassembly of the station piping.

Bolts and nuts for flanged joints shall be made of the best quality of defined iron or mild steel and shall have sound, well fitting threads. Bolts shall be provided with hexagonal chamfered heads and nuts. The underside of all bolt heads and nuts shall have true surfaces at right angles to the axis of the bolts. The lengths of the bolts shall be such that after joints are made up, the bolts shall protrude through the nuts, but in no case shall they protrude more than 1/2 inch. All bolts shall have an anti seize compound applied to all male threads.

Dehumidifiers, Heating, Ventilation, and Air Conditioning: Where necessary these types of equipment shall be installed such that the control of the environment within wastewater lift stations and/or other District structures may be controlled.

Heaters shall be required in structures where cold sensitive equipment is located. Cabinets containing cold sensitive equipment shall be equipped with heat strips or heat ventilation. Piping located above ground or in such a manner that exposure to extreme cold would be evident if the heating system failed shall be avoided.

Dehumidifiers where required shall conform to the following. The moisture removing capability of the dehumidifier shall vary with the temperature and relative humidity. The minimum capacity rating at 80 degrees Fahrenheit shall be 15.5 pints per day at 60 percent relative humidity. The maximum capacity at 80 degrees Fahrenheit shall be 25 pints per day at 90 percent humidity. The dehumidifier shall be controlled automatically by an adjustable humidistat and low air temperature cut out with contacts of adequate capacity for the dehumidifier motor.

Ventilation shall be accomplished by using a ventilating blower with sufficient capacity in cubic feet per minute to ventilate the enclosing structure. Minimum guidelines for air changes per hour shall be taken from the current publication of NFPA 820, *Standard for Fire Protection in Wastewater Treatment and Collection Facilities*. A gas detection system shall be installed to check for levels of oxygen, hydrogen sulfide, and explosive gases. The indicators on the gas detection system shall be located such that personnel entering the building will receive notification of hazards. Telemetry equipment shall be connected to the gas detection system to remotely notify District personnel in the event there is a detection of dangerous levels of explosive gases.

Air conditioning shall be installed if the horsepower requirements of the pump motors are such that overheating will be a consideration. Air-conditioning type and size shall be approved by the General Manager.

Calculations for environmental conditions within the lift station shall be submitted with lift station improvement plans.

A-6.16 Pump Station Electrical Work

These Standards cover in general the Districts requirements. The developer shall have his/her engineers specify in additional detail all necessary items of electrical work not mentioned herein.

Materials: All materials shall be new, of the quality herein specified, free from defects and approved by the Underwriters' Laboratories for the purpose for which they are used. Materials shall be of uniform type and make throughout.

Equipment Identification: All panelboards, remote control switches, push buttons, terminal boxes, etc., shall be properly identified with a descriptive nameplate. Nameplate shall be made of 1/16-inch laminated plastic with black background and white letters. Size of letters shall be 1/8 inch high for equipment in device box or boxes and 1/4 inch high for panelboard, terminal can, or larger items. Letters shall be machine engraved. Punched strip tape type nameplates and cardholders in any form are not acceptable.

Working Space: Provide adequate working space around electrical equipment in compliance with the National Electrical Code. In general, provide 6-1/2 foot of headroom and 42-inch minimum clear work space in front of panelboards and controls.

Wire: Installed in conduit and control panels shall be stranded copper with 600 volt type "THHN" or "THWN" insulation. Direct burial cable shall not be allowed.

All other wires shall be stranded type copper wire of not less than 98 percent conductivity. Wires shall bear the Underwriters' label, be color coded and be marked with gauge, type, and manufacturer's name on 24 inch centers.

Wire splices and joints are allowed only in readily accessible junction boxes. #10 AWG or smaller shall be twisted together electrically and mechanically secured and insulated with approved type insulated electrical spring connectors Scotchlok or Ideal. Threaded type wire nut, porcelain or bakelite are not acceptable. Joints and connections for #8 AWG, or larger, shall be made with Burndy, T & B or approved equal, solderless tool applied pressure lugs and connectors. Un-insulated lugs and wire ends shall be insulated with layers of plastic tape equal to insulation of wire and all irregular surfaces properly padded with "Scotchfill" putty prior to application of tape. Tape shall be equal to Scotch #33, General Electric #AW-1 or H.K. Porter #107.

Lace or wire tie conductors together in a neat and workmanlike manner in panelboards, wireways, raceways pull boxes, and similar locations. Plastic wiring ducts are preferred as an alternate to lace or wire ties.

#12 AWG wire shall be the minimum size wire used for lighting and power circuits. Wires run in conduit shall conform to code regulations as to number of wires and conduit size. All wire ends shall be identified with Thomas & Betts WM-A-Z and/or WM-0-45 or approved equal. Identification shall be as shown on the electrical drawings.

Outlet Boxes: Shall be galvanized or sherardized, one-piece pressed steel type. Boxes for fixtures shall be not less than 4 inches and be equipped with fixture stud. Boxes shall be at least 1-1/2 inches deep. Boxes must be accurately placed for finish, independently and securely supported by adequate wood backing or by manufactured adjustable channel type heavy duty box hangers. Boxes in unfinished areas, installed exposed, shall be cast type "condulet" for switches and convenience outlets. Exposed boxes mounted below 6 feet from finished floor shall be cast type.

Codes, Rules, Regulations: All work shall be in full accordance with the latest edition of the National Electrical Code, California Electrical Code, and all state, federal, local, and other laws including the requirements of the serving utility company. However, when these specifications call for materials or construction of a better quality or larger sizes than required by the above mentioned rules and regulations, the provisions of the specifications shall take precedence.

Pilot Lights: Shall be of the oil-tight type and shall have push-to-test feature. Color of lens shall be red unless noted otherwise on drawings.

Switchboard Motor Controls: Shall generally consist of the following components: main circuit breaker; combination drawout circuit breakers and full voltage or soft-start motor starters; dry transformers; 120-volt panelboards; and all appurtenances.

The switchboard/motor controls shall consist of vertical sections to accommodate the circuit breakers, motor starters and control devices. The control structures shall be free-standing, designed and tested in accordance with the latest NEMA ICS 1970 standards, and shall be metal enclosed indoor type, completely interwired in accordance with steel with NEMA Class I Type B standards. Fabrication shall be of code gauge steel with 1-1/2 x 1-1/2 inch welded structural steel angles at the top and bottom of the frames. Control cabinets shall be designed for multiple alignment with continuous main horizontal bus and multiple sections riveted together.

Doors and blank cover plates shall be code gauge steel with gaskets around each door except panelboard. Doors shall use semi-concealed piano type hinges and be secured with slotted head, one-quarter turn captive speed fasteners or approved equal.

All bus bars shall be rectangular and formed of alcan tin-plated copper supported on fiberglass insulators and be properly braced to withstand mechanical stresses of not less than 22,000 amperes. Each combination starting unit shall be mounted on a chassis, having a height as required by the particular size of the combination starter and circuit breaker unit. The chassis shall be so housed and constructed as to isolate the components from adjoining circuits. All motor starters shall be of the magnetic type for across-the-line starting with ambient compensated thermal and adjustable overload protection in each phase. Overload heaters shall be sized for the load they are protecting. Motor starters and circuit breakers shall be I.T.E., Square D, or approved equal. Each combination starter shall be protected by a molded case circuit breaker having an interrupting capacity of not less than 14,000 amperes (symmetrical) and/or as called for on the drawings. Adjustable time delay relays shall be provided, where shown on drawings, to start motors in sequence to limit starting demand on commercial power. Ammeters shall be used as necessary.

Time delay relays, control power transformers and auxiliary relays as necessary shall be provided in each cubicle and each internal and external component shall be clearly identified.

Components shall be mounted on removable back panels, drilled and tapped from the front. They shall not protrude into or restrict wireways. Push buttons, selector switches, meters and pilot lights shall be visible and operable externally, through gasketed, die-cut openings in the unit door. Thermal overload protective devices in combination starters and branch circuit protective devices shall have an external operating device. The circuit breaker shall be interlocked with the door so that the circuit must be de-energized before the door can be opened. A semi-concealed interlock "defeater" arrangement shall be provided. Provisions shall be made for padlocking the breakers with a minimum of three padlocks in the "on or off" position.

All plug-in equipment not mounted horizontally shall have readily removable physical restraining devices to prevent their vibrating loose and falling out.

A wiring diagram specifically detailed for each cubicle shall be furnished and installed inside each cubicle in a door mounted holder.

A continuous ground bus shall extend through all motor control centers. Provide space heaters and thermostats with a calibrated dial adjustment in each section.

All motor control centers and switchboards shall be mounted on 1-1/2 inch concrete slab raised above normal floor level. Grouting will not be accepted. Provide anchor bolts. At locations shown on improvement plans, maintain a minimum of 2 inch air space between rear of switchboards and concrete or metal walls. The 1-1/2 inch concrete pads shall be provided under this section of the specifications to fit the exact size and shape of the switchboards.

Identification of electrical interior controls shall be of a plastic coated material, or other permanent type of marking, as approved by the General Manager. Dymo tape is not accepted. The permanently attached marking shall be attached to each of the following, but not necessarily limited to such: relays, timers, terminal blocks, starters, control transformers, etc. Identification of each item shall correspond to wiring diagram of final shop drawings.

A qualified representative of each manufactured item shall make final adjustments of equipment.

Lighting Fixtures and Lamps: Shall be as shown in the Fixture Schedule complete with lamps listed therein, and shall be U.L. approved, listed and labeled for use as installed. All fixtures of a kind shall be of identical manufacture, appearance and finish. Fixtures shall be located where shown on improvement plans. Where structural conditions require slight deviations, resulting layout shall be symmetrical and as approved by the General Manager.

Bussing: All bussing shall be of copper with sizes based on current code requirements or a current carrying capacity of not over 1,000 amperes per square inch of cross-section. Bars shall be 1/4 inch thickness minimum. All contact surfaces shall be cleaned bright and silver-plated by submergence in an electrolytic bath. Busses shall be rigidly supported and thoroughly braced to match short circuit values of the main circuit breaker.

Circuit Breakers: The main and distribution circuit breakers shall be molded case type with trip ratings as called for in the schedule on the drawing.

Each circuit breaker shall be identified with an engraved laminated phenolic plate showing the load served or the function of the breaker. The nameplate shall be attached with oval head machine screws tapped into the front of the board, or some other equally effective means.

Grounding: Ground fittings shall be of approved manufactured type, installed and connected to conform with Code requirements. The neutral conductors and noncurrent-carrying parts of equipment at each installation shall be grounded in accordance with the applicable Code. Ground conductor shall be copper having a current capacity per N.E.C., but not smaller than No. 6 AWG. Exercise every precaution to obtain good contact at all panelboards, outlets, etc. Where it is not possible to obtain good contact, the conduits shall be bonded around the boxes with an insulated conductor, No. 6 AWG or larger, connected to the conduits by means of approved clamps.

All equipment cases, motor frames, etc., shall be completely grounded to satisfy the requirements of the N.E.C. and the Electrical Safety Orders.

Conduits: Rigid Steel Conduit shall be standard weight, mild steel pipe, zinc coated on the outside by a hot dipping, sherardizing, or metalizing process. The inside and outside of the conduit shall be finished with a protective coating.

Fittings, such as couplings, elbows, bends, etc., shall be subject to the same requirements as for rigid steel conduit. All couplings and unions shall be the threaded type assembled with red leaded joints made absolutely tight to exclude water. Unions shall be Crouse Hinds UNY or UNF or approved equal.

Electrical Metallic Tubing (E.M.T.) shall be cold rolled steel tubing with zinc coating on the outside and a protective enamel coating on the inside.

Fittings shall meet the same requirements for finish and material as E.M.T. They shall be the watertight compression type requiring the tightening of a nut. Indenters will not be allowed.

A flexible conduit shall be liquid tight except where used with a recessed light fixture. Conduit shall be galvanized with extruded polyvinyl covering and with watertight connectors. Minimum size shall be 1/2 inch except where supplied as part of approved manufactured assemblies.

All conduits shall be rigid, except that E.M.T. may be used at the following locations:

- In dry locations in furred spaces.
- In partitions other than concrete or solid masonry.
- For exposed work indoor above 6 feet.

Conduits installed in contact with the ground, in sand or gravel-fill shall be rigid steel with two protective coverings of Koppers' Bitumastic #50 or equal, applied after couplings and fittings are in place, each coat not less than 1/32 inch thick when dry. Conduit shall be run concealed in areas having finished ceilings and in furred walls. Conduit may be run exposed where so permitted by the General Manager. Exposed conduit below 6 feet shall be rigid type. Conduit run exposed shall be neatly installed parallel and at right angles to the structural members.

Conduit shall be fastened to the structure with pipe clamps. Conduits up to and including 1-1/2 inch trade size shall be supported at 5 foot intervals or less.

Cap conduit during construction by means of manufactured seals; swab out conduits before wires are pulled in.

Make water-tight conduits projecting through roof by proper flashing.

Wet Well Electrical Equipment: The electrical equipment used in the wet well must meet the National Electrical Code (NEC) requirements for Class I, Division I, groups C and D hazardous atmospheres. The electrical control cabinet shall also be isolated from the wet well to meet the above hazardous atmospheres. If sensors or other electrical equipment is used that does not meet the NEC requirements for hazardous atmospheres, they shall be electrically isolated with approved intrinsically safe barriers.

Telemetry: Will be required where wet wells, pump stations and other types of mechanical facilities are to be incorporated into the District sanitary sewer system. The owner or their agent shall include a complete telemetry system which shall conform with the existing District telemetry plans and system. The proposed system shall be approved by the General Manager.

Tests: Upon completion of construction and adjustment of all equipment, all systems shall be tested under the direction of the General Manager to demonstrate that all equipment furnished and installed and/or connected under the provisions of these standards shall function electrically in the manner required.

All systems shall test free from short circuits and grounds, shall be free from mechanical and electrical defects, and shall show an insulation resistance between phase conductors and between phase conductors and ground not less than the requirements of the National Electrical Code. All circuits shall be tested for proper neutral connections.

As Built Drawings and Operating Manuals: Shall be furnished in three bound sets, covering the following items:

- "As Built" drawings of contract electrical documents showing clearly exact locations of all underground conduits as installed. All deviations from contract drawings shall be shown. This information shall be presented by the contractor on revised transparent ozalid prints of original tracings. As built drawings shall be presented at completion of project and before final payment is due.
- "As Built" drawings of all switchboards, panelboards, wiring diagrams and control equipment.
- Detailed control wiring diagrams, both schematic and construction wiring for all switchboards, motor starters, transformers. Included herein shall be copies of individual cubicle wiring diagrams posted inside motor starter cubicles as noted under switchboard specifications. All wires, connections, terminals, etc. shall have an individual identification code.
- Complete instruction, maintenance and overhaul manuals, clearly showing and explaining operation and overhaul of all starters, circuit breakers, controls and all electrical equipment.
- Renewal parts lists for all equipment requiring maintenance, adjustment or repairs.
- Complete step-by-step sequential explanation of relay contact and device operation for all controls. The written explanation shall be clearly coordinated to device symbols and numbers on the elementary wiring diagrams.
- Complete step-by-step sequential instructions and precautions for system start-up as well as system shut down.
- All material called for in c. to f. above shall be bound and indexed in stiff back, loose leaf, plastic covered binder.

Guarantee: The owner or their agent shall leave the entire electrical system in proper working order and shall, at their own expense, replace any work, material, or equipment furnished by him which develops defects within 1 year from the date of acceptance.