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DIVISION 1

GENERAL REQUIREMENTS

01000 GENERAL

1. **CONDITION:**
 - a. General Conditions and other contractual documents apply to each Division of the Specification.
 - b. Provisions contained in this Division apply to each Division of the Specification.

2. **WORKMEN:**
 - a. Contractor shall at all times enforce strict discipline and good order among his workmen and shall not employ on the Project any unfit person or anyone not skilled in the work assigned to him.

3. **TAXES:**
 - a. Sales, use, payroll, old age pension, and surtax applicable to this Project shall be paid by Contractor with the exception of sales or use tax on materials furnished by District.
 - b. Taxes and assessments on real property comprising the site of this Project shall be paid by Developer.

4. **MANUFACTURER'S DIRECTIONS:**
 - a. Follow Manufacturer's directions unless otherwise indicated in Contract Documents.

01010 SUMMARY OF THE WORK

1. **WORK COVERED BY CONTRACT DOCUMENTS**
 - a. Unless otherwise provided, Contractor shall provide at his expense all materials, labor, equipment, tools, transportation, and utilities including cost of connection necessary for successful completion of Project.

01040 COORDINATION

1. **CUTTING AND PATCHING**
 - a. Contractor shall coordinate all cutting, fittings, or patching of work that may be required to make the several parts of the Work come together properly and fit it to receive or to be received by other portions of his own work or that of subcontractors or others as shown or reasonably implied by Contract documents for a completed project. Also, Contractor shall make or have made proper and sufficient repair or closure as Engineer/Inspector may direct.
 - b. Contractor will not endanger any work by cutting, digging, etc., and will not cut or alter work of any Section without prior consent of Engineer/Inspector.

01060 REGULATORY REQUIREMENTS

1. **EASEMENTS, PERMITS AND REGULATIONS**
 - a. Contractor shall obtain and pay cost of all permits and licenses necessary for completion of this work.
 - b. Contractor and others working under his jurisdiction shall perform all work in compliance with laws, regulations, and ordinances of any kind required by governmental authority or other agency have

- jurisdiction over this work.
- c. If Contractor observes that Contract Documents are in variance with any laws, regulations, and ordinances, he shall notify Engineer and shall not proceed unless necessary changes required for compliance with said laws, regulation, and ordinances have been effected. Contractor shall be fully responsible for any work knowingly performed contrary to said laws, regulations, and ordinances and shall fully indemnify District against loss and bear all costs and penalties arising therefrom. Permanent easements necessary for completion of this Work shall be procured and paid for by Developer.
 - d. Contractor shall secure certificates of inspection and of acceptance that may be required by authorities having jurisdiction over the Work. He shall deliver these certificates to Engineer prior to execution of letter to District recommending acceptance.

01070 ABBREVIATIONS AND SYMBOLS

1. ORGANIZATION ABBREVIATIONS

- a. Abbreviations used in this specification for various societies, organization, or government bodies shall stand for the following:
 1. AASHTO American Association of State Highway and Transportation Officials
 2. ACIAmerican Concrete Institute
 3. ANSI American National Standards Institute
 4. ASTM American Society for Testing and Materials
 5. AISC American Institute of Steel Construction
 6. AITC American Institute of Timber Construction
 7. AISI American Iron and Steel Institute
 8. APA American Plywood Association
 9. APWA American Public Works Association
 10. ASCE American Society of Civil Engineers
 11. ASTM American Society for Testing and Materials
 12. AWA American Welding Society
 13. AWWA American Water Works Association
 14. BOCA Building Officials and Code Administration
 15. FHA Federal Housing Authority
 16. GSA General Services Administration
 17. ICBO International Conference of Building Officials
 18. ISO International Standards Organization
 19. NSF National Sanitation Foundation
 20. SMACCNA Sheet Metal and Air Conditioning Contractors National Association
 21. SSI Stainless Steel Institute
 22. UL Underwriter's Laboratory, Inc.

01200 PROJECT MEETINGS

1. PRECONSTRUCTION CONFERENCE

- a. A preconstruction conference for the Developer, Contractor, District's representative (Inspector), and District Engineer, shall be held at the District Office prior to commencement of the work for the purpose of resolving current problems, further orienting Contractor to requirements of the Contract Documents, and establishing with Contractor a general schedule of construction and inspection.

2. PROGRESS MEETINGS

- a. Periodic job site meetings will be held by District Inspector to insure all activities are being coordinated properly on project and to assist in staying on schedule. Status of submittals, changes, and other matters will be reviewed. Contractor shall attend such meetings and shall require subcontractors to attend as necessary.

01300 SUBMITTALS

1. CONSTRUCTION SCHEDULES

- a. Contractor, immediately after being awarded the Contract, shall prepare and submit for District's review an estimated progress schedule for the Work. Progress schedule shall be of sufficient detail to include, but not be limited to:
 1. Significant elements of the Work.
 2. Time frame for each element of work with a beginning and ending point.
 3. Percentage of progress of work placed or to be placed.
- b. Contractor shall notify Inspector 24 hours minimum prior to performing any work which would be covered or otherwise make it difficult to inspect. Should any of said work be covered without proper notification having been given Inspector, Contractor shall uncover that work for inspection at his own expense. Contractor shall schedule the work so that an inspection team may observe and inspect a maximum part before it is covered up.

2. PROGRESS REPORTS

- a. Contractor shall prepare daily reports of his operations and forward them to the District on at least a weekly basis. The daily report will contain at least the following information:
 1. Weather conditions,
 2. Manpower items of equipment on the job,
 3. Major items of equipment on the job,
 4. A brief summary of work accomplished that day,
 5. Materials, equipment, or District-furnished items arriving or leaving site,
 6. Significant events,
 7. any tests made and their result if known,
 8. Any oral instructions received,
 9. Visitors to the job.
- b. Contractor shall maintain a file of copies of all daily reports on the site and make it available to Inspector, Engineer, or District upon request.

3. SHOP DRAWINGS

- a. Definitions:
 1. Shop drawings are drawings, diagrams, illustrations, schedules, performance charts, brochures, and other data which are prepared by Contractor or any subcontractor, manufacturer, supplier, or distributor. Shop drawings, illustrate some portion of the work and confirm dimensions and conformance to Contract Documents.
 2. Samples are physical examples furnished by Contractor to illustrate materials, equipment, color, or workmanship and to assist in the establishment of standards by which the work will be judged.
- b. Procedure:
 1. Contractor shall review and designate (stamp) his approval and submit to District, with reasonable promptness and in orderly sequence, all shop drawings and samples required by the Contract Documents.
 2. Shop drawings and samples shall be properly identified as specified or as District may require. Contractor shall reject shop drawings not in conformance with the Contract Documents.
3. Shop drawings shall be complete and detailed. If reviewed by District, each copy of the shop drawings will be identified as having received such approval by being so stamped and dated. Contractor shall comply with notations shown. If such qualified approval is shown or if the shop drawings are not reviewed by District or if resubmission is so directed, Contractor shall make any corrections required or indicated by District at Contractor's expense.
 4. Contractor shall submit four copies of drawings and submittals to the District.
- c. Review of shop drawings by District shall not be construed as a complete check but will indicate only that the general method of construction, materials and detailing is satisfactory. Approval of such drawings will not relieve Contractor of responsibility for any error which may exist in the submittals.
- d. By approving shop drawings and samples, Contractor thereby represents that he has determined and verified all field measurements, field construction criteria, materials, catalog numbers, and similar data, or will do so, and that he has checked and coordinated each shop drawing and sample with requirements of the work and of the Contract Documents.
- e. No work requiring a shop drawing or sample submission shall be commenced until submission has been approved by District.
- f. Where specified or required, Contractor shall submit samples to District together with specification material, affidavits, and other documentation as may be required by District. It is Contractor's specific responsibility to ascertain that samples submitted have been checked and approved by him. Cost of samples, together with transportation, delivery, and any duplicate samples shall be borne by Contractor. One of each sample shall be retained in the District Office until completion of the Project. Where samples are specifically required to be submitted for approval, no work involving the sampled materials shall proceed until written approval has been obtained from the District.

01500 CONSTRUCTION FACILITIES & TEMPORARY CONTROLS

1. TEMPORARY SANITARY FACILITIES

- a. Contractor shall provide and maintain a sanitary temporary toilet.
- b. Temporary outside toilet shall be removed at completion of the job.

2. SCAFFOLDING, PLATFORMS, SHORING, ETC.
 - a. Contractor or his subcontractors shall furnish and maintain all equipment required for proper execution of the work.
 - b. All apparatus, equipment, and construction shall meet all requirements of the Labor Laws safety regulations and other State or local laws applicable thereto.
3. BRACING, SHORING AND SHEATHING
 - a. Contractor shall provide all shoring, bracing, and sheathing as required for safety and for proper execution of the work and have same removed if required when the work is completed.
4. PERSONS
 - a. Contractor shall provide installation and maintenance of necessary precautions to protect all persons on the site, including members of the general public, from injury or harm, including but not limited to:
 1. Posting of appropriate warning signs in hazardous areas.
 2. Providing guard rails, barricades of adequate heights, together with warning lights around obstructions, pits, trenches, or similar areas in on-site or adjacent streets, roads, sidewalks, or on the site. All such guard rails around openings shall be at 3'6" in height.
 3. When use or storage of explosives or other hazardous materials or equipment is necessary for the execution of the work, Contractor shall exercise the utmost care and shall carry on such activities under the supervision of properly qualified personnel.
5. WEATHER
 - a. Contractor shall at all times provide protection against weather (rain, winds, storms, frost, or heat) so as to maintain all work, materials, apparatus, and fixtures free from injury or damage. At the end of the day's work, all new work likely to be damaged shall be covered.
 - b. During cold weather, Contractor shall protect all work from damage. If low temperatures make it impossible to continue operations safely in spite of cold weather precautions, Contractor shall cease work and so notify District.
6. FIRE
 - a. Fires shall not be built on the premises without permit from Fire Department.
7. ADJACENT PROPERTY
 - a. Contractor shall provide all necessary protection for adjacent property and lateral support thereof.
8. ACCESS ROADS
 - a. It shall be the responsibility of Contractor to build and maintain all required roads to the site.
9. SURFACE WATER CONTROL
 - a. Contractor shall at all times protect the excavation, trenches, and buildings from damage from rain water, spring water, ground water, backing up of drains or sewers, and all other water, and:
 1. Provide pumps and equipment and enclosures necessary for such protection.

2. Construct and maintain necessary temporary drainage and do pumping necessary to keep site free of water.
- b. Cost of water control shall be borne by Contractor and Developer.

01600 MATERIAL AND EQUIPMENT

1. GENERAL

- a. Materials incorporated into project shall be new, except as otherwise indicated in the Specifications, of specified quality, and furnished in sufficient quantity to facilitate proper and speedy execution of the Work.
- b. Contractor shall, if required, furnish evidence of the quality of any materials.
- c. Materials not meeting requirements of the Contract Documents shall be removed from Project by Contractor without expense to District.

2. TRANSPORTATION AND HANDLING

- a. Materials shall be delivered to the site in original packaging with labels, identifications, certifications and trademarks intact, and such labels, identifications, certifications and trademarks shall remain intact until used.

3. STORAGE AND PROTECTION

- a. Contractor shall confine his apparatus, storage of materials and operations of his workmen to limits dictated by Developer, and shall arrange and maintain parking of vehicles and storage of materials in an orderly manner leaving all walks, driveways, roads, and entrances, unencumbered.
- b. All equipment on site shall be protected from physical damage and from the elements by measures satisfactory to District.

4. PRODUCT OPTIONS AND SUBSTITUTIONS

- a. When several materials are specified in the Contract Documents by name for one use, Contractor may select any of those so specified, and no other.
- b. Wherever an item or class of material is specified exclusively by trade name, name of maker, or by catalog reference, use such item only unless District's approval for a substitution is secured. Items and material not specified in the Contract Documents and installed in the Work shall be removed or replaced by specified items and material at no additional cost to District and for no additional time added to Contract.
- c. Wherever words "Approved by", "Satisfactory to", "submitted to", "inspected by", or similar phrases are used in this Specification, they shall be understood to mean that the material or item referred to shall be approved by, be satisfactory to, submitted to, or inspected by District.

01700 CONTRACT CLOSEOUT

1. CLEANING

- a. Contractor shall keep premises free from accumulations of waste material or rubbish caused by his employees, subcontractors, or others and, at completion work, shall remove all rubbish.
- b. If Contractor fails to clean up, District may do so and the cost thereof will be charged to the Contractor/Developer.

2. PREFINAL, SUBSTANTIAL COMPLETION AND FINAL INSPECTIONS

- a. Upon Contractor's request, District Inspector will make a prefinal inspection and furnish to Contractor a list of items to be corrected or completed by Contractor. Upon correction and/or completion of these items, the Contractor shall meet with the District Inspector and Engineer for a final inspection.
- b. Final Inspections will ensure that all deficiencies noted have been corrected.

3. PROJECT RECORD DOCUMENTS

- a. Contractor shall deliver to Engineer prior to substantial completion inspection:
 1. Accurate "as built" drawings and letters of the work if the work is constructed in any way at variance to that shown on construction drawings. "As built" drawings or descriptive letters for other work shall be supplied.
 2. Certificates of inspection and of occupancy that may be required by authorities having jurisdiction over the Work.

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DIVISION 2

SITWORK

02000 GENERAL

GENERAL

1. SCOPE:
 - a. Includes But Not Limited To -
 - 1) Provide labor, materials, and equipment necessary for the earthwork, surfacing, etc., as described herein or shown on the drawings to include:
 - 2) Excavation, backfill, shoring, dewatering, compaction, select backfill for bedding, and select backfill; and restoration of improved surfaces in connection with trench excavation for the sanitary sewer and culinary water extensions to the District's system.

02200 EARTHWORK

GENERAL

1. SCOPE:
 - a. Includes But Not Limited To -
 - 1) Loosening, removing, loading, transporting, depositing, borrowing and compacting in final location, all materials wet and dry, for purposes of construction, or as required for foundation pits, pipe trenches, ditches, dikes, grading, roads, and other purposes as indicated on the drawings;
 - 2) Furnishing, placing and removing of all sheeting and bracing;
 - 3) All pumping and draining of excavations;
 - 4) Removal of existing structures and pipes as designated on the drawings;
 - 5) All backfilling around structures;
 - 6) Backfilling of all trenches and pits, and all other incidental earthwork as shown on the drawings or as specified.
 - b. Obtain any necessary excavation permits before digging in controlled areas.
 - c. Drawings show the approximate location of topographic features, buried utilities, and improvements in the area. The District will assume no responsibility for the accuracy of underground features shown on the drawings or for conclusions reached therefrom. The District will grant permission on request of the Contractor to perform investigations to determine sub-surface conditions.
2. MAXIMUM density shall be defined as the maximum density obtained in the laboratory in accordance with ASTM D 1557. In-place density of compacted backfill shall be determined in accordance with ASTM 1556 (Sand Cone) or ASTM D 2922 & D 3017 (Nuclear Methods).

PRODUCTS

1. Use equipment suitable for the work.
2. Material in excess of that required for fills, embankments, roadways, and other purposes shall be wasted. Engineer to approve material for various uses. Excess excavated material not suitable or required for backfilling, fill or embankment to be disposed of by Contractor as directed by Developer at no cost to the District.

EXECUTION

1. **BLASTING:** Any blasting required shall be as follows:
 - a. In accordance with requirements of the State Industrial Commission and local ordinances.
 - b. Carried out by skilled operators.
 - c. Precautions taken to avoid damage to adjacent property.
 - d. Engineer and Inspector duly notified and have the right to limit use of explosives and/or to order discontinuance of the use of any blasting methods which in his opinion endanger any part of existing structures or public or private property of any character. This right shall not relieve the Contractor of any responsibility for damage to property or persons of the District or others.
2. **REMOVAL OF WATER:**
 - a. Provide and maintain at all times during construction ample means and devices with which to promptly remove and dispose of all water entering excavations or other parts of the work.
 - b. No pipe or concrete footings, foundations, or floors shall be laid in water.
 - c. Water shall not be allowed to rise over concrete until it has set at least twenty-four hours.
 - d. Water shall not be allowed to rise against walls for a period of fourteen days after completion of the wall and supporting beams and crosswalks.
 - e. Any damage to pipe work or concrete work caused by water shall be repaired by the Contractor at his expense.
 - f. Water shall be disposed of from the work in a suitable manner without damage to adjacent property.
3. **CARE OF EXISTING STRUCTURES:**
 - a. Existing power and telephone lines, curb and gutter, sidewalks, trees, fences, water pipes, survey markers, sewers or other conduits, embankments and boundary structures in the vicinity of the work which are not to be removed, shall be supported and protected from injury during the construction and until the completion of the work.
 - b. Contractor shall be liable for all damage to such structures and utilities as herein provided and shall save and keep the District harmless from any liability or expense for injuries, damages or repairs to same.
4. **CARE OF SURFACE IMPROVEMENTS:**
 - a. Where construction crosses under curb and gutter, sidewalks, canals, or other surface improvements, care shall be taken not to disturb said improvements.

- b. Contractor shall be liable for all damage to said improvements and shall save and keep the District harmless from any liability or expense for injuries, damages, or repairs to same.
5. CHARACTER OF MATERIAL:
- a. Excavation will be unclassified as to materials, and shall include all materials of whatever nature that are encountered in making the required excavations.
6. DENSITY TESTING:
- a. It shall be the responsibility of the Contractor to accomplish the specified compaction for backfill, fill, and other earthwork. It shall be the responsibility of the Contractor to control his operations by confirmation tests to verify and confirm that he has complied, and is complying at all times, with the requirements of these Specifications concerning compaction, control, and testing.
 - b. The frequency of Contractor's confirmation tests shall be not less than as follows and each test location for trenches shall include tests for each layer, type, or class of backfill from bedding to finish grade.
 - 1) Trenches:
 - a) Open fields 2 every 1,000 linear feet
 - b) Along dirt or gravel roads 2 every 500 linear feet
or off traveled right-of-way
 - c) Crossing paved roads 2 locations along each crossing
 - d) Under pavement cuts or 1 location every 400 linear feet
within 2 feet of pavement edges
 - 2) Structural backfill 1 every 20 cubic yards
 - 3) Embankment or fill 1 every 200 cubic yards
 - 4) Base material 1 every 50 cubic yards
 - c. Confirmation test shall be paid by the Contractor.
 - d. Copies of the test reports shall be submitted promptly to the Engineer. The Contractor's tests shall be performed by a soils testing laboratory acceptable to the Engineer.
 - e. Material not meeting the specified gradation or density requirements shall be removed or shall receive additional compaction and retested until it meets the specification requirements.
 - f. The Contractor shall demonstrate the adequacy of compaction equipment and procedures before exceeding any of the following amounts of earthwork quantities:
 - 1) 200 linear feet of trench backfill
 - 2) 10 cubic yards of structural backfill
 - 3) 100 cubic yards of embankment work
 - 4) 50 cubic yards of base material
 - g. Until the specified degree of compaction on the previously specified amounts of earthwork is achieved, no additional earthwork of the same kind shall be performed.
7. WATER FOR USE IN EARTHWORK:
- a. Provide water as needed for placing earth at specific moisture content, compaction of certain material, dust control and other uses related to earthwork.
 - b. The District will provide a meter for use of water from fire hydrants. The Contractor will pay a deposit on the meter to be refunded when returned less the cost of the water used.

02210 GRADING

GENERAL

1. SCOPE:
 - a. Includes -
 - 1) Work required to prepare site for construction.
 - 2) Carefully examine site with Developer, Engineer and Inspector prior to beginning work to preplan procedures for removing topsoil, making cuts, placing fills, etc.

PRODUCTS

1. Use equipment suitable for the work.

EXECUTION

1. Determine areas needing fill and organize work to efficiently place fill.
2. COMPACTION OF FILLS SHALL BE AS FOLLOWS:
 - a. Place fill under slabs, walks, and asphalt paving in eight-inch deep layers. Moisten to slightly less than optimum moisture content and mechanically tamp to 95% minimum of maximum density.
 - b. Fill under footings is not allowed unless footings are designed to be placed on engineered fill.
 - c. Place other fills in 12-inch layers and mechanically tamp.
3. If soft spots, water, or other unusual excavating conditions are encountered, stop work and notify Inspector.
4. Make proper allowance for final grades of streets, lots, and planting areas.
5. Maximum variation from indicated grade shall be 1/10 of one foot.

02220 EXCAVATING, BACKFILLING & COMPACTING

02221 EXCAVATION

PRODUCTS

1. Use equipment suitable to the work.

EXECUTION

1. Locate all existing underground utilities and take all necessary precautions to avoid interference before starting construction. Notify Blue Stakes call 811 before doing any work.
2. Examine site to determine type of soil to be encountered. Discuss problems with Inspector before proceeding with work.

3. Excavate and place excavated materials where directed.
4. If existing utility lines are encountered, have local utility agencies relocate, direct relocation or protection, or protect as required at no cost to the District.

02222 TRENCHING

GENERAL

1. SCOPE:
 - a. Includes But Not Limited To -
 - 1) Pipe trenches for sewer and water lines.
2. The Contractor must satisfy himself regarding the character and amount of different materials that will be encountered and work accordingly.

PRODUCTS

1. Use equipment suitable to the work.

EXECUTION

1. Excavate to allow the pipe to be laid to the line and grade as shown on the drawing(s) or as directed by the Engineer/Inspector.
2. Excavations for trenches in areas designated as improved areas shall be shored or otherwise braced.
3. Trenches left unshored or unbraced shall have sides sloped to meet OSHA safety standards.
4. Segregate excavated material at the time of excavation into material acceptable for backfill and material unacceptable for backfill. Acceptable material shall be separately stockpiled on the work site. During backfilling operations, only acceptable material shall be used for backfill.
5. Dispose of unacceptable material and excess acceptable material as directed by Developer at no cost to the District.
6. Keep stockpiled material a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins.
7. Pile excavated material on one side of the trench only, to permit ready access to existing fire alarm boxes, fire hydrants, valves, manholes and other appurtenances.
8. Keep surface drainage of adjoining areas unobstructed.

9. Prevent surface water from flowing into excavation, and promptly remove any water accumulating therein. Under no circumstances shall water be permitted to rise in unbackfilled and tested trenches. Any pipe having its alignment or grade changed by floating in a flooded trench shall be relaid.
10. Excavation shall be by open cut, except that short sections of a trench may be bored if, in the opinion of the Engineer/Inspector, the pipe can be properly installed and backfilled.
11. The minimum clear width of the trench for pipe 4 inches in diameter and over, measured at the top of the pipe, shall be not less than the outside diameter of the pipe plus 18 inches. The maximum clear width of the trench for pipe, measured at the top of the pipe, shall not exceed the outside diameter of the pipe plus 24 inches for pipe sizes up to and including 24 inches and shall not exceed the outside diameter of the pipe plus 36 inches for pipe sizes over 24 inches.
12. DEPTH OF TRENCH:
 - a. Trench depths shall be as required for the invert grade or pipe depth shown on the plans or specified elsewhere.
 - b. In normal soils or fine gravel, excavation shall extend to a depth of at least six inches below the bottom of the pipe to provide a uniform and continuous bearing and support for the pipe on solid and undisturbed earth at every point between joints. Excavate depressions for bells. Care shall be taken not to excavate below the required depth.
 - c. Excavations for trenches in ledge rock, cobble rock, stones, mud or other material unsatisfactory for pipe foundation, shall extend to a depth of at least six inches below the bottom of the pipe.
 - d. After the trench bottom has been graded, excavation for joints shall be made to the length, depth and width required to properly make the joints.
 - e. Where unstable earth, mud, soft clays, or soft material is encountered in the excavation, a minimum of 12 inches below the bedding material shall be removed and backfilled with foundation stabilization material conforming to Section 02300 of these specifications to provide a stable subgrade.
13. BORING: Boring under highways, railways, canals, buildings, etc. will be permitted if properly encased. A District approved submittal of proposed casing and carrier pipe materials, and procedures will be required before proceeding.

02223 BACKFILLING AND COMPACTION

PRODUCTS

1. Materials shall conform to Section 02300 of these specifications.

EXECUTION

1. BEDDING MATERIAL
 - a. All pipe shall have bedding material a minimum of 6 inches below the bottom and 12 inches above the top of the pipe, compacted to a minimum of 95 percent of maximum density. This area is defined as the pipe zone.
 - 1) Water lines: Bedding material shall be sand

- 2) Sewer lines: Bedding material shall be 3/4-inch crushed rock. Crushed rock bedding material shall include layer of geotextile fabric (Mirafi or equal) covering the top of the rock prior to placement of trench backfill material
 - b. Bedding material in the bottom of the trench shall be shaped to receive the pipe and bells, and be compacted. Bedding material shall not be placed in free standing water.
 - c. Hand backfill where damage to pipe or structures might occur.
 - d. Backfill from the bottom of the trench to the centerline of the pipe shall be placed using a maximum of 3-inch thick layers and thoroughly compacted by tamping. Special care shall be taken to assure complete compaction under the haunches of the pipe. Bedding material shall be placed in the trench for its full width on each side simultaneously.
 - e. From the centerline of the pipe to a depth of one foot above the top of the pipe, bedding material shall be placed using a maximum of 6-inch thick layers and compacted by tamping.
2. Backfill above the pipe zone shall be made in continuous horizontal layers six inches thick.
3. Install materials only at optimum moisture content. Water settling will not be allowed.
4. Backfill material and compaction above the pipe zone.
 - a. Trench cuts across roadways and paved streets: From the top of the pipe zone up to the underside of pavement replacement, use untreated base course (UBC) material compacted to a minimum of 95 percent of maximum density.
 - b. Longitudinal trench cuts in roadways, paved areas, and storage areas: From the top of the pipe zone up to within 2 feet of finished grade, use select material or native material conforming to the requirements of select material compacted to 90 percent of maximum density. From 2 feet below finished grade up to finished grade or the underside of specified pavement replacement, use untreated base course (UBC) material, or select material compacted to 95 percent of maximum density.
 - c. Trench cuts in areas outside the traveled right-of-way and in open country: From the top of the pipe zone up to finished grade, use native material compacted to 90 percent of maximum density.
5. It shall be the responsibility of the Contractor to be assured that the native material, when used as previously specified, is capable of being compacted to the degree specified. If the native material cannot be compacted to the density as previously specified, it shall be the Contractor's responsibility to remove and dispose of this material whether it has been placed in the trench as backfill or not, and to utilize other backfill material from another source acceptable to the District, at no extra cost to the District.
6. Density testing shall performed in accordance with Section 02200 of these specifications.

02300 BACKFILL AND BASE MATERIALS

GENERAL

Not used.

PRODUCTS

1. SAND

- a. Sand shall be clean, coarse, natural sand which shall be nonplastic when tested in accordance with ASTM D 431B and 100 percent shall pass a 1/2-inch screen and no more than 20 percent shall pass a No. 200 screen.

2. UNTREATED (AGGREGATE) BASE MATERIAL

- a. Material shall consist of hard, durable particles or fragments of stone or gravel, screened or crushed to the required size and grading. The material shall be free from organic matter, lumps or balls of clay, alkali, adobe, or other deleterious matter, and shall conform to the following gradations when tested in accordance with AASHTO T-27 or ASTM C 136 and AASHTO T-11 or ASTM C 117.

Sieve Sizes (Square Openings)	Percentage By Weight Passing Sieve		
	Gravel Fill		(UBC)
	Type A	Type B	Aggregate Base
3-inch	100		
1-1/2-inch		100	
1-inch			100
1/2-inch			79-91
No.4	30-75	30-70	49-61
No.8	20-60	20-60	
No.16			27-35
No.30	10-40	10-40	
No.200	0-12	0-12	7-11

- b. Percentage of wear: When tested in accordance with ASTM C 131, the percentage of wear shall not exceed 40 percent after 500 revolutions.
- c. Plasticity index: When tested in accordance with AASHTO T-90 or ASTM D 431B, the plasticity index shall not be more than 5.
- d. Liquid limit: When tested in accordance with AASHTO T-89 or ASTM D 431B, the liquid limit shall not be more than 25 percent.

3. SELECT MATERIAL

- a. Select material shall be sound earthen material conforming to classification A-1-a or A-1-b, 3-inch maximum, nonplastic of AASHTO M-145.

4. NATIVE MATERIAL
 - a. Native material shall be sound, earthen material free of debris passing the 1-inch screen. The percent of material passing the No. 200 sieve shall not exceed 30 when tested in accordance with AASHTO T-27 or ASTM C 136.

5. CRUSHED ROCK (Foundation Stabilization Material or Drain Rock)
 - a. Crushed rock shall consist of hard, durable particles of stone or gravel, crushed to the required size and grading. The material shall be free from organic matter, lumps or balls of clay, or other deleterious matter and shall conform to the following gradations when tested in accordance with AASHTO T-27 or ASTM C 136. Recycled concrete products shall not be allowed.

Percentage By Weight Passing Sieve

Sieve Sizes (Square Openings)	Foundation Stabilization Material (2-inch Crushed Drain Rock)	Drain Rock (3/4-inch Crushed)
2-inch	100	--
1-1/2 inch	95-100	--
3/4-inch	50-100	100
3/8-inch	15-55	15-55
No. 4	0-25	0-25
No. 8	0-5	0-5
No.200	0-3	0-3

- b. Coarse aggregate, retained on the No. 4 sieve, shall have a percentage of wear not greater than 40 percent when tested by the Los Angeles Test, AASHTO T-96 or ASTM C 131.

EXECUTION

Not used.

02400 RESTORATION OF ROADWAYS

GENERAL

1. INCLUDES BUT NOT LIMITED TO -
 - a. Restoration of improved surfaces including temporary gravel surface.
 - b. Restoration of gravel base for bituminous surfaces.
 - c. Restoration of bituminous surface.

2. SPECIAL REQUIREMENTS: Road restoration shall meet the standards described in latest revision of "Specifications for Excavation on State Highway Right of Way" by Utah Department of Transportation, or where the work is performed on City or County roads, the work shall meet the standards established by Salt Lake County, Salt Lake City or West Valley City, whichever has jurisdiction.

PRODUCTS

Not Used.

EXECUTION

1. **PROTECTION OF SURFACES:** In order to avoid unnecessary damage to paved surfaces, track equipment shall use rubber cleats when operating on or crossing paved surfaces, and shall follow requirements of the jurisdiction having control over the surface. The Contractor shall be responsible for damage due to construction operations occurring to improved surfaces outside the limits of surface restoration. Damaged surfaces shall be repaired or replaced by and at the expense of the Contractor in a manner satisfactory to the Engineer/Inspector.
2. **TIME:** The Contractor shall provide temporary surfaces in good condition within one (1) day after backfill over the pipe has been placed and shall complete repairs on street, sidewalk, curb, gutter, lined ditches, driveways, and other surfaces within seven (7) days from the date backfill over the pipe has been placed. Restoration of any surfaces damaged by the Contractor's operations but not within the area described in the specifications as being inside the limits of trench excavation and backfill, shall be completed within seven (7) days of surface damage.
3. **CUTTING, REMOVING:** The pavement, sidewalk, curb and gutter, driveway, etc., shall be sawcut vertically along the lines forming the trench, in such a manner as not to damage the adjoining pavement. The portion of concrete pavement to be removed shall be sawed or cut by equipment approved by the Engineer/Inspector, along straight lines designated by the Engineer/ Inspector, or shall be broken back to the nearest construction joint or sawed crack. The portion of concrete sidewalk, curb and gutter, or concrete driveway to be removed shall be broken back to the nearest construction joint or formed crack in such a manner as not to damage the adjoining concrete.
4. Street surface other than concrete shall be sawcut in straight vertical lines parallel to the trench and the portion over the trench shall be removed in a manner that will not cause damage to the paved surface outside the limits of the vertical cut lines. Bituminous material shall be removed and wasted as directed by the Engineer/Inspector.

02410 GRAVEL ROAD BASE RESTORATION

GENERAL

1. **SCOPE:**
 - a. Includes But Not Limited To -
 - 1) New base under areas where asphalt or concrete has been removed.

PRODUCTS

1. **BASE:** Untreated base material (UBC) conforming to section 02300 of these specifications.

EXECUTION

1. Gravel road base shall be restored to the thickness of the original road base or to the thickness specified under the type of surface restoration to be performed. In no case shall less than four inches under concrete sidewalk and curb and gutter, or eight inches under asphaltic pavement, be placed and compacted below the bottom of the surface course to be restored.
2. Compact to an in-place average of 96 percent of maximum density, with no single determination of density less than 92 percent of maximum density.
3. Remove or repair improperly prepared areas as directed by Engineer/Inspector.
4. Density testing shall be performed in accordance with section 02200 of these specifications. A gradation test of the material shall also be performed.

02420 TEMPORARY GRAVEL SURFACES

GENERAL

1. SCOPE:
 - a. Includes But Not Limited To -
 - 1) Where pipe trenches or foundations are excavated in paved areas, the bituminous or concrete surface shall be replaced with a temporary gravel surface. The temporary gravel surface shall extend down to the underneath face of the original surface course and shall be graded flush with the top of adjacent surfaces to provide a hard, smooth surface.

PRODUCTS

1. BASE: Untreated base material (UBC) conforming to section 02300 of these specifications.

EXECUTION

1. Maintain the temporary gravel by blading, sprinkling, rolling, adding gravel, etc. to maintain a safe uniform surface satisfactory to the Engineer/Inspector, until the final surface is to be placed.
2. Remove excess material as directed by the Engineer/Inspector.
3. Restore the temporary surface every 7 days until the final surface is placed.
4. Sprinkle the surface with water at least once each day, weekends and holidays included, unless directed otherwise by the Engineer/Inspector.
5. Upon completion of satisfactory test of the installed pipelines, laterals, service connections, and appurtenances, the Engineer/Inspector shall direct the Contractor to restore the final surface on all or any part of the work, at which time, remove the temporary gravel surface to the bottom of the surface to be restored. After removing

temporary gravel, grade and roll the gravel base course to provide a compact, smooth base for placement of final surfacing.

02430 ASPHALT SURFACE RESTORATION

GENERAL

1. SCOPE:
 - a. Includes But Not Limited To -
 - 1) New asphalt surfaces in areas where asphalt has been removed.

PRODUCTS

1. PRIME COAT: RC-70 or RC-250 complying to AASHTO M-81, applied at a rate of 0.03 to 0.08 gallons/square yard.
2. TACK COAT: MC-70 or MC-250 complying to AASHTO M-82, applied at a rate of 0.15 to 0.20 gallons/square yard.
3. AGGREGATES: Aggregates shall be of uniform density with a dry-rodded unit weight of not less than 75 pounds per cubic foot when tested in accordance with AASHTO T-19. Wear of aggregates shall not exceed 40 percent when tested in accordance with AASHTO T-96. The aggregates shall conform to the following gradations when tested in accordance with AASHTO T-30.

Percentage By Weight Passing Sieve

<u>Sieve Sizes (Square Openings)</u>	<u>3/4-inch Asphalt Mix Design</u>	<u>1/2-inch Asphalt Mix Design</u>
3/4-inch	100	--
1/2 inch	--	100
3/8-inch	75 - 91	--
No. 4	46 - 62	60 - 80
No. 16	22 - 34	28 - 42
No. 50	11 - 23	11 - 23
No. 200	7 - 11	5 - 9

Aggregates shall also have a sand equivalent of at least 40 when tested in accordance with AASHTO T-176. Fine aggregates shall be non-plastic.

4. ASPHALTIC CEMENT: Asphaltic cement shall be AC-10 viscosity graded, complying to AASHTO M-226, 4 to 8 percent by weight of mix as determined by Engineer/Inspector.

EXECUTION

1. ASPHALT CONCRETE PLACING EQUIPMENT: Use equipment for placing, spreading, shaping, and finishing asphalt concrete consisting of a self-contained power machine operating in such manner that no supplemental spreading, shaping, or finishing is required to provide surface which complies with requirements for smoothness contained herein.
 - a. In areas inaccessible to the machine, hand spreading may be permitted.
2. Asphalt surfaces shall be restored to the thickness of the original pavement or to the thickness specified under the type of surface restoration to be performed. In no case shall the restored pavement be less than three inches in total compacted thickness.
3. ASPHALT TEMPERATURE: the asphalt shall have a temperature between 270 and 320 degrees Fahrenheit at the time of placement.
4. AMBIENT AIR TEMPERATURE: the minimum ambient air temperature shall be 50 degrees Fahrenheit and rising when measured in the shade at both the site and time of placement.
5. Place asphalt concrete pavement of more than 4 inches in total compacted thickness in two or more courses. Each lift shall have a thickness of at least 2-1/2 inches.
6. Asphalt concrete pavement of more than 4 inches in total compacted thickness shall be 3/4-inch asphalt mix design. Asphalt concrete pavement 4 inches and less in total compacted thickness shall be 1/2-inch asphalt mix design.
7. Thoroughly clean all edges and surfaces. Apply prime coat to non-asphaltic base course and tack coat to sawcut asphaltic edges and between asphaltic courses.
8. PLACING AND COMPACTING ASPHALT CONCRETE: Spread asphalt in continuous strips, placing each successive strip adjacent to previously spread strip. Do not compact minimum 6 inch width of each strip adjacent to new strip until after new strip has been placed. At terminations of new surface courses, feather asphalt mixture into existing surface over such distance as may be required to produce smooth riding transition.
9. ROLLING AND COMPACTING: Perform initial or "breakdown" rolling with tandem power roller and follow spreading operation when mixture has reached temperature where it does not "pick up" on rolls. Keep rolls properly moistened but do not use surplus of water. Follow initial rolling with pneumatic roller when mixture is in proper condition and when rolling does not cause undue displacement, cracking, or shoving. Begin rolling at sides and progress gradually to center, lapping each preceding track until entire surface has been rolled. Terminate alternate trips of roller in stops at least three feet distant from any preceding stop. At any place not accessible to roller, thoroughly compact mixture with tampers and finish, if necessary, with hot iron to provide uniform layer over entire width being paved.
10. Compact asphalt to an in-place average of 96 percent of maximum density, with no single determination of density less than 92 percent of maximum density in accordance with ASTM D-1559-76 (Marshall) and ASTM D-2726-73 (Marshall Bulk Density).

11. When tested with a 10-foot straightedge laid on the surface parallel with the centerline of the road, the variation of the surface from the testing edge of the straightedge shall not be more than 1/4 inch.

DIVISION 3

CULINARY WATER SYSTEM

03000 GENERAL

1. SCOPE:
 - a. Includes But Not limited To -
 - 1) Furnish all labor, materials and equipment necessary for the culinary water extensions as described herein or shown on the drawings to include, water mains; valves; connections; fire hydrants; laterals; ductile iron pipe, polyvinyl chloride pipe, and associated couplings, fittings, and joint materials.
2. REFERENCES:
 - a. AWWA C151: American National Standard for Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lines Molds, for water or Other Liquids.
 - b. AWWA C502: AWWA Standard for Dry Barrel Fire Hydrants
 - c. AWWA C504: AWWA Standard for Rubber Seated Butterfly Valves, 3 In. Through 72 In.
 - d. AWWA C509: AWWA Standard for Resilient Seated Gate Valves for Water Supply Service
 - e. AWWA C515: AWWA Standard for Reduced Wall Resilient Seated Gate Valves for Water Supply Service
 - f. AWWA C600: AWWA Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances.
 - g. AWWA C651: AWWA Standard for Disinfecting Water Mains.
 - h. AWWA C800: AWWA Standard for Underground Service Line Valves and Fittings.
 - i. AWWA C900: AWWA Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In., for water.
 - j. ASTM D 2241: Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure Rated Pipe (SDR Series).
 - k. ASTM D 2737: Standard Specification for Polyethylene (PE) plastic Tubing
 - l. ASTM D 2855: Standard Practice for Making Solvent Cemented Joints and Poly Vinyl Chloride (PVC) Pipe and Fittings.
 - m. ASTM D 3139: Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
3. SUBMITTALS:
 - a. Manufacturer's affidavit certifying all products were manufactured, tested and supplied in accordance with applicable references in this section together with a report of the test results and the date each test was completed.
 - b. Product Data: Manufacturer's technical product data and installation instructions.
 - c. Operating and Maintenance: Include maintenance data, parts lists, Product Data, and Shop Drawings.
4. QUALITY ASSURANCE:
 - a. Reject any pipe which does not conform to Contract Documents or is cracked, chipped, crushed, dented, kinked, or otherwise unacceptable.

03100 PIPEWORKS

GENERAL

1. GENERAL PIPES AND FITTINGS:

- a. Provide piping materials and factory fabricated piping products of sized, types, pressure ratings, and capacities indicated.
- b. Where not indicated, provide proper selection as determined by District to comply with installation requirements.
- c. Provide sizes and types of equipment connections for fittings of materials which match pipe materials used in pressure piping systems. Where more than one type of material or product is indicated, selection is supplier's option.
- d. Potable water valves on transmissions pipe shall be as follows:
 - 1) 4", 6", 8", and 10" - Resilient Seated Gate Valves
 - 2) 12" and larger - Butterfly Valves
- e. All pipe works and fittings shall be domestic (manufactured in the USA) except where specifically allowed in these specifications.

PRODUCTS

1. DUCTILE IRON PIPE

- a. Flange Joints
 - 1) Flanges may be cast integrally with the pipe, in which case they shall conform to ANSI B 16.1 as to diameter, thickness, drilling, and other characteristics, or they may be screwed on the threaded ends of the pipe.
 - 2) Screwed-on flanges shall conform to ANSI B 16.1 as to material, diameter, thickness, drilling, and other characteristics, but shall have long hubs threaded specially for ductile iron pipe. Pipe shall be class 53, minimum. Screwed-on flanges shall be attached to the pipe by the pipe manufacturer, and after attachment the faces of the flanges and the ends of the pipe shall be refaced so that the end of the pipe will be even with the face of the flange and both will be perpendicular to the axis of the pipe.
 - 3) Bolt holes on the two flanges on a piece of pipe shall be in perfect alignment.
 - 4) Bolts shall conform to ANSI B 16.1 except that flanges underground, in concrete pipe valve boxes, or in water shall have Type 316 stainless steel with anti-seize.
 - 5) Where cap screws or stud bolts are required, flanges shall be provided with tapped holes for such cap screws or stud bolts.
 - 6) Gaskets shall be ring gaskets suitable for the intended application, manufactured by Garlock, Cranite, or equal.
 - 7) All flange bolts shall be cut and finished to project not more than 1/4 inch beyond outside face of nut after joint is assembled.
- b. Mechanical Joints
 - 1) Mechanical joints shall be in accordance with ANSI A 21.11 (AWWA C 111).
- c. Push-on Joints
 - 1) Push-on rubber gasket joints shall be in accordance with ANSI A 21.11 (AWWA C 111).

- d. Restrained Push-On Joints
 - 1) Restrained push-on joints shall be designed for working pressures of 350 psi for sizes 4-inch through 24-inch and 250 psi for sizes 30-inch through 54-inch. The restraining system shall be comprised of ductile iron locking segments inserted through slots in the bell face and providing positive axial lock between the bell interior surface and a retainer weldment on the spigot end of the pipe. An alternate system shall have positive restraint against joint separation by a retainer weldment through a boltless system.
 - 2) Restraint system shall be US-Pipe TR-Flex joint system.
- e. Fittings
 - 1) Except as otherwise provided, fittings for cast iron or ductile iron pipe shall be as specified in ANSI A 21.10 (AWWA 110) 2" through 36" Class 250, or A21.53 (AWWA C153), 3" through 16" Class 350, or A21.11 (AWWA C111) 18" through 24" Class 350, of the same pressure rating and same joint configuration as the pipe with which they are used.
- f. Push-On Gaskets
 - 1) Push-on rubber gasket joint fittings shall have bodies as specified above with bells dimensioned and arranged to match the push-on joints on the pipe. Mechanical joint fittings may be used with push-on joints on the pipe. Mechanical joint fittings may be used with push-on rubber gasketed joint pipe.
- g. Flexible Fittings
 - 1) Unless otherwise indicated, flexible couplings shall be solid sleeve mechanical joint, with gaskets sized for the intended pipe.
- h. Lining and Coating
 - 1) Except as otherwise specified, all cast iron and ductile iron pipe and fittings shall be smooth cement-lined in accordance with ANSI A 21.4 (AWWA C 104).
 - 2) Special attention shall be given to the lining of fittings. Lining shall be applied to bare metal. All lining shall extend to the faces of flanges, to the end of spigots, or to the shoulder of hubs, as the case may be.
 - 3) In addition, all cast iron and ductile iron pipe and fittings shall be coated inside and outside with bituminous material except that pipe which is to be painted shall not be coated on the outside.
- i. Corrosion Protection
 - 1) Ductile iron pipe underground shall be protected against external corrosion by loose 8 mil polyethylene sleeves in accordance with AWWA C 105. Cut polyethylene tubing about two feet longer than the pipe length. Gather the polyethylene tube on the spigot end of the pipe being assembled. Using shallow holes to accommodate the wrapped bell pull the gathered tubing over the bell and fix it in place with tape, band or string. Take up slack in the tubing along the top of the pipe barrel and secure in place with tape. Overlap the tubing from the next pipe length and secure in similar fashion. All holes or tears shall be repaired with an additional wrap.

2. POLYVINYL CHLORINE (PVC) PIPE:

- a. Conform to all requirements of AWWA C900, "Polyvinyl Chloride (PVC) Pressure Pipe, 4 inch Through 60-inch". Pipe shall be extruded from clean Type I Grade 1 class 12454-B PVC compound conforming to ASTM Resin Specification D-1784.
- b. Pressure Class shall be 150 or 200 psi with a minimum Dimension Ratio (DR) of 18 or 14 respectively.
- c. Pipe shall be homogeneous throughout, and free from visible cracks, holes, foreign inclusions, or other defects, and be as uniform as commercially practical in color, opacity, density and other physical

properties. Surface shall be free from nicks, scratches, gouges and other imperfections that might weaken the pipe wall or cause leakage at joints.

- d. Pipe shall bear the seal of approval of the National Sanitation Foundation for potable water service.
 - e. Dimensions and tolerances of the pipe barrel and bell ends shall conform to the applicable requirements of AWWA C900 for the pressure-class specified for cast iron outside diameter pipe.
 - f. Pipe shall be available in standard laying lengths (as distinguished from overall length) of 20 feet.
 - g. All fittings shall be cast iron fittings as specified under ductile iron pipe.
 - h. Joint requirements:
 - 1) Pipe and fittings shall be furnished with integrally thickened bell and spigot ends from joining with a solid, uniform cross-sectional elastomeric gasket as the sealing element.
 - 2) Couplings will not be permitted.
 - 3) The gasket shall be contained within the bell end, not be required to support the weight of the pipe when two sections are joined, but serve only as a seal, conform to ASTM D 3139, provide and adequate compressive force against sealing surfaces of the bell spigot to effect a positive seal under all combinations of joint tolerances and be the only elements depended upon to make the joint flexible and watertight.
 - 4) Solvent welded joints will not be permitted unless written approval as obtained from the Engineer/Inspector prior to welding the joint.
 - i. The pipe manufacturer shall perform the inspection and testing as specified in AWWA C900 or C905 on a representative sample of the manufacturer's product; and shall furnish to the District a certificate affirming that their product meets the requirements of AWWA C900 or C905, and the additional requirements of these specifications, including the drop impact test.
 - 1) Drop Impact Test: All sizes of the pipe and fittings shall withstand without failure at 73° F., the impact of a falling 12-lb. missile with a 2-inch radius nose, when tested in accordance with ASTM D 2444, at an energy level of 120 ft. lbs. There shall be no visible evidence of shattering or splitting when the energy is imposed.
 - 2) Perform leakage tests as outlined in the Execution portion of this section.
 - 3) Certification of all test will be furnished to the District and results marked to readily identify the pipe furnished. When requested, the pipe manufacturer shall certify that the pipe is recommended for direct tapping of service connections up to one-inch size.
 - j. Marking on the pipe shall include the nominal cast iron pipe size, AWWA C900 or C905 Class and dimension ratio (DR), the NSF seal of approval and the manufacturer's name or trademark at intervals not to exceed 5 feet.
 - k. Pipe shall be suitable for direct tapping of service connections up to one inch, when following the recommendations and using the equipment and materials of the manufacturer.
 - l. Unless noted otherwise, all ferrous fittings and valves shall be wrapped with 8 mil thick polyethylene file tube or sheet, held in place by 2-inch wide plastic-backed adhesive tape equal to Polyken No. 900 or Scotchrap No. 50, and adhere securely to both the pipe and polyethylene with enough film to overlap the adjoining pipe a minimum of one foot. Polyethylene wrap shall be protected from the sun and weathering prior to use, using care during backfilling of the protected areas to prevent puncturing the film.
3. POLYETHYLENE PIPE:
- a. Polyethylene pipe shall be smooth lined interior and corrugated exterior.
 - b. Polyethylene material shall conform to ASTM F405, or ASTM F667, type III Category 4 or 5, Grade

P33, Class C., or Grade P34, Class C as defined by ASTM D1248.

- c. Pipe shall be N-12 manufactured by Advanced Drainage Systems (ADS) or equal.

EXECUTION

1. Install waterlines, valves, connection, hydrants, etc. as shown on Developer's drawing(s); District Typical Details, and as dictated by the Engineer/Inspector:
 - a. Ductile Iron Pipe - C-600 "Installation of Gray and Ductile-Iron Water Mains and Appurtenances".
 - b. Per manufacturer's recommendations, this specification, and appropriate AWWA standards.
2. All pipe shall have a minimum 48-inch cover from top of the finish grade. Avoid conflicts with storm drains and other utilities. Minimum clearance shall be 18 inches between waterlines and other utility lines or structures. Clearances between culinary and sewer lines shall be a minimum of 10-foot edge to edge in accordance with Utah Division of Drinking Water Regulations.
3. Provide survey equipment of an approve type to maintain alignment and grade between critical points.
4. Prevent dirt, grease, and all other foreign matter form entering each length of piping before making connections in the field. After each section of piping is installed, clean thoroughly and remove rocks, dirt and other foreign matter by washing, sweeping, scraping, or other method that will not harm the lining of the pipe. Furnish and install plugs or bulkhead of approved type to all open ends of pipes when workmen are not on the job or in the immediate area for safety and to prevent rocks or other foreign matter from entering the pipe.
5. Make connections to existing pipelines where shown on the drawing(s) or where directed by the Engineer/Inspector as follows:
 - a. Scheduled shut downs in advance to cause the least interference with the existing system. A shut down schedule of existing mains shall be made and agreed upon by both the Contractor and District well in advance of any work being completed.
 - b. Use pipe and fittings as indicated on drawing(s) or as directed by Engineer/Inspector and otherwise conform to requirements of applicable paragraphs of this Section for the size, type and Class of the line being cut and the line connected.
 - c. Excavate to the existing main at the point it is to be served and determine all fittings require to make the connection complete and have all materials needed at the job site prior to any shut downs or cutting into the existing system.
6. Loop existing and new pipes around proposed lines or structures where shown on the drawing(s) in accordance with standard detail 26 or as directed by Engineer/Inspector.
7. TESTING: All pipe, valves in pipelines, joints, seams, couplings, fittings, flanges, welds, etc. shall be tested for leakage in the presence of Inspector/Engineer. Leakage is defined as any water passing through the surface of pipes, including joints fittings, outlets, etc. All water for testing shall be provided by the District for a maximum of two tests. The following test shall be performed.
 - a. Area to be tested shall be closed off and filled with water to a point similar to the expected volume the line will carry.
 - b. If pressure testing occurs against an existing valve, the District will inspect the condition of the valve

and determine if it needs to be replaced with a new valve at the Contractor/Developer's expense, prior to testing against the valve.

- c. No sections greater than 2000 feet in total pipe length shall be tested without special written permission by the District Engineer.
 - d. Pressure equal to 150% of the working pressure of the pipe (180 psi minimum) shall be maintained for two consecutive hours. During this period no loss of water pressure shall occur. If pressure loss does occur, leakage shall not exceed the amounts allowable by AWWA C600 DIP and C605 for PVC pipe (see reference sheets at the end of this division). If the allowable leakage is exceeded, the leak will be found and corrected and the test shall be repeated until the above requirements are met.
8. **DISINFECTING PIPES:** All pipes, valves, hydrants, etc. that convey or store culinary water shall be sterilized as follows:
- a. Flush pipes at a rate in excess of 4.0 feet per second if the pipe is under 12 inches diameter and 3.0 feet per second if the pipe is 12 inches diameter and larger.
 - b. Prepare a slurry mixture of Sodium Hypochlorite (laundry bleach) to create a 10,000 ppm concentration of chlorine (approximately one gallon of bleach to 4.25 gallons of water).
 - c. Mix slurry with water as it enters the pipe to achieve a concentration of residual chlorine of 25 ppm after 24 hours. An initial concentration of one gallon of slurry to 200 gallons of water will normally accomplish the result. If liquid chlorine or gas is used, the concentration shall be one pound of chlorine to 2,400 gallons of water. If the chlorine residual is not 25 ppm after 24 hours, the source of contamination shall be removed and the process shall be repeated until the residual requirement is met.
 - d. Bacteria testing shall be provided by the Contractor. Number of tests shall be as determined by the District. At a minimum, the Contractor shall provide the following tests:
 - One sample for every 1,000 feet of main installed
 - One sample near each connection to an existing main
 - One sample at the furthestmost point from the existing main connection
 - One sample at each dead end

9. **FLUSHING PIPES:**

- a. Flush the chlorine solution from the line by introducing culinary water from an approved source.
- b. Pipes shall be flushed from an open pipe end at a point on the main to be specified by the Inspector/Engineer. Any extra fittings, pipe or blocking required shall be supplied by the Contractor at no cost to the District.
- c. Responsibility for disposal of chlorinated water shall be at the sole responsibility of the contractor.

03200 VALVES

PRODUCTS

1. **GATE VALVES:**

- a. Valves shall be resilient seated with iron body.
- b. Valves shall have minimum working pressure rating of 200 psi.
- c. Valves shall be non-rising stem.
- d. Valves shall meet the requirements of AWWA Specifications C509 or C515, except as modified

herein.

- e. Valves shall operate driptight with full pressure on either side of the valve and no pressure on the other side.
- f. Packing and gearing shall be replaceable while the valve is in service.
- g. The flanges and drilling shall conform to dimensions of ANSI B 16.1 for Class 125 or Class 150 for cold water.
- h. Mechanical joints shall be in accordance with ANSI A 21.11 (AWWA C 111).
- i. Cast iron in the valve body and bonnet shall be close-grain gray cast iron, having minimum tensile strength of 31,000 pounds per square inch. Castings shall be uniform in thickness and free from blow holes. No brazing, welding or plugging of castings will be allowed. Valves shall be so designed that the gates and stem are clear of the full specified diameter when open.
- j. All valves shall turn clockwise to close.
- k. The operating nut shall be a 2-inch square AWWA nut.
- l. Double O-ring stem seal.
- m. Epoxy coated inside and outside conforming to AWWA C 550.

2. BUTTERFLY VALVES

- a. Butterfly valves and operators shall conform to AWWA Standard for Rubber-Seated Butterfly Valves, AWWA D 504, except as modified or supplemented herein.
- b. Butterfly valves may be short body or long body at the option of the Contractor and as determined by their location in the pipe system. Wafer Valves may not be used. Short body valves may be used only in locations where the disc will not interfere with adjacent pipe fittings, valves, or equipment.
- c. Valves and operators shall be designed for a flow through the valve corresponding to a pipeline velocity of 16 feet per second with the vane in the position of maximum coefficient of torque or for the maximum torque that may occur under the specified operating conditions of flow, pressure, valve angle, including seating, unseating, and bearing torque, with the safety factors as required in AWWA C 504 standards and as recommended in Table 2A, Appendix A, of AWWA C 504, whichever is greater.
- d. Records of tests shall be furnished as specified in AWWA C 504. Valve discs for valves on liquid service shall be stainless steel disc to 12 inches and stainless steel disc or stainless steel mating edge on ni-resist cast iron or cast iron disc above 12 inches. Method of attaching edge to disc shall be subject to approval by the Engineer.
- e. The valve shaft, keys, dowel pins, or taper pins used for attaching the valve shaft to the valve disc shall be Type 304 or Type 316 stainless steel or equivalent corrosion resistant material. All portions of the shaft bearings shall be stainless steel, bronze, nylon, or fiberglass and Teflon in accordance with AWWA C 504.
- f. All nuts and screws used with clamps and discs for rubber seats shall be securely held from loosening from vibration or cavitation effects.
- g. Valve disc shall seat in a position of 90 degrees to the pipe axis and shall rotate 90 degrees between full open and tight closed position.
- h. Valves shall be installed with valve shafts horizontal.
- i. Butterfly valves above ground shall be provided with 150 lb flanges and buried valves shall be mechanical joint of suitable pressure rating. Maximum shutoff pressure shall be 200 psi.
- j. Manual operators for valves less than 6-inch diameter shall be the hand lever type. All hand lever operators shall be provided with a locking device so that the valve can be locked in any position with

- a wing nut. The locking device shall be rigid and shall not allow any vibration or chattering of the valve. The hand lever shall be 12 inches long and shall be provided with a rubber hand grip.
- k. Valves larger than 6 inches that are buried in the ground shall be provided with a totally enclosed worm gear operator mounted on the valve. The valve shaft shall extend from the valve to the operator and shall be as specified for valve shafts. The operator shall be gasketed for watertightness.
 - l. Valves shall be epoxy coated on the interior and exterior in accordance to Section 15 of AWWA C 504.
 - M. Butterfly valves shall be Groundhog as manufactured by Henry Pratt Company or equal.

03300 APPURTENANCES

PRODUCTS

- 1. VALVE BOXES:
 - a. All valves to be buried shall have cast iron valve boxes; firmly supported and painted, entered and plumb over the wrench nut of the valve.
 - b. Boxes shall be of the extension type with 34 to 60 inch extension.
 - c. Approved manufacturers:
 - 1) Tyler Pipe Industries Series 7026 or Series 664-A
 - 2) D&L M-8042
 - 3) Approved equal.
 - d. All valves to have valve system extension with 2-inch square AWWA Nut on top.
- 2. HYDRANTS:
 - a. Hydrants shall conform to requirements of AWWA C502, Dry-Barrel Fire Hydrants, as supplemented and modified herein:
 - b. Approved manufacturers
 - 1) Mueller Super Centurion
 - 2) Clow Medallion
 - c. Size shall be 5-inch valve opening.
 - d. Hydrants shall be designed for 150 psi minimum working pressure, constructed in three sections with bolted joints and the entire internal operating mechanism shall be repairable from above ground without any digging, when the hydrant is in place.
 - e. Outlet Nozzles. Hydrants shall have two 2-1/2 inch hose nozzles and a 5-1/4 inch pumper nozzle. Nozzle thread shall be National Standard. Nozzles shall be brass and replaceable.
 - f. Inlet, Inlet connections shall be flanged, or mechanical joint conforming to ANSI A 21.10, American Standard for Gray-Iron and Ductile Iron Castings.
 - g. Safety Flange. The hydrant shall have a breakable flange at ground level when installed - Flange and internal mechanism shall be designed so that, in case of accidental breaking, the hydrant sections will separate without damage to the barrel and the main valve will remain closed to prevent flooding. Safety flanges depending only on notched bolts for frangibility will not be acceptable.
 - h. Concrete Collar. Hydrants shall have a concrete collar at grade level. The concrete collar shall extend around the valve box.
 - I. Operating nut shall turn counterclockwise to open the main valve.
 - j. The drain valve inlet seals and sealings shall be all brass or bronze.

- k. Painting. Buried portions of the hydrant shall be painted with two coats of CASO coal tar enamel. Exposed portions shall be painted with two coats of Bakelite-base paint with tung oil thinner, Tropical industrial enamels or approved equal. Primer coat, ACB Primer No. 525-14. Finish coat, red, except that bonnets shall be color coded as to the size of waterline to which the hydrant is connected, as follows:

- 4 inch waterline - White Bonnet
- 6 inch waterline - Red Bonnet
- 8 inch waterline - Orange Bonnet
- 10 inch waterline - Green (Evergreen) Bonnet

3. SERVICE LATERALS

- a. All culinary water service laterals shall be blue HDPE pipe 3408 ASTM 2737 200 PSI rated with an SDR 9 CTS capable of connecting to AWWA standard water service taps and fittings.
- b. Pipe with surfaces smooth and free from bumps and irregularities, that is flexible enough to be coiled without damage to the pipe or appreciable change in cross-sectional area.
- c. Connections:
 - 1) Compression fittings with stainless steel CTS insert stiffeners as provided by Ford or Mueller.
 - 2) Locating wire shall be installed with the service lateral from the main to meter setter.
 - 3) Fittings, In accordance with AWWA C800.
- d. Mark pipe continuously to identify:
 - 1) Manufacturer's name (or trade mark) and code.
 - 2) Nominal size.
 - 3) Date of manufacture.
 - 4) Pressure rating.
 - 5) ASTM or AWWA designation number.

4. TAPPING SLEEVES:

- a. 2" and under - epoxy coated stainless steel or brass 2" wide strap tapping saddle for connections to mains. Saddle shall be specifically designed for the appropriate outside diameter of the existing main (PVC, DIP, asbestos, cement, etc.)
- b. 2.5" and over - Stainless Steel (Type 304 or 316)
- c. Hot tap connections will generally not be allowed on main line extensions (8" and larger) without prior approval from the District Engineer. Cut in tee with new valve on the existing main line run and new valve on the branch is standard.

5. TRENCH MARKING:

- a. Magnetic Tape: aluminum foil, plastic coated, stamped with terminology indicating "warning buried water line."
- b. Locating Wire: 14 gauge, 600 volt PVC jacketed wire manufactured for underground service, cad welded to all valves and fire hydrants. Wire shall be continuous without breaks. Splices shall be welded.
- c. All trench marking shall be installed a minimum of 2 feet above top of pipe.

EXECUTION

1. Make all 2" and smaller service connections at locations as determined in the field by the Engineer/Inspector as follows:
 - a. Tap water main. Use epoxy coated stainless steel or brass double strap tapping saddle for connections to all mains.
 - b. Install corporation stop of a size equal to the diameter of the service connection.
 - c. Lay or install by jetting HDPE service lateral from corporation stop to meter yoke of line. Run service line from the main to the meter box without joints. Emergency joints when approved by Inspector shall be made with compression type stainless steel double locking rings fitting.
 - d. Install copper water meter yoke with lock wing angle type curb stop and back flow preventer on residential connections only.
 - e. Install meter box with cast iron ring and cover reader lid. Locate meter box between back of curb and sidewalk.
 - f. Meter to be set by District.

2. INSTALL HYDRANTS AS FOLLOWS:
 - a. Thoroughly clean hydrant of dirt or foreign matter before setting.
 - b. Install hydrant plumb to final finished grade, having nozzles parallel with or at right angles to curb, and with pumper nozzle facing the curb.
 - 1) Nozzles shall be at least 12 inches above finished grade.
 - 2) Install concrete thrust blocks at the hydrant bowl, auxiliary gate valve, and in accordance with the District's Typical Details.
 - c. Wrap all ferrous pipe, valves, fittings and portions of the hydrant exposed to soil with 8-mil thick polyethylene film, sheet or tube.
 - d. Coat all bolts with a liberal coating of "poly" type protection grease.
 - e. With all outlet valves open, flush, test, and disinfect the hydrant, valve, and connecting piping in accordance with this section.

DIVISION 4

SANITARY SEWER SYSTEM

04000 GENERAL

1. SCOPE:

- a. Includes But Not limited To -
 - 1) Furnish all labor, materials and equipment necessary for the sanitary sewer extensions as described herein or shown on the drawings to include:
 - 2) sewer mains; manholes; connections; laterals; cleanouts; etc.

04100 PIPEWORKS

PRODUCTS

1. CONCRETE SEWER PIPE:

- a. Non-Reinforced Concrete Sewer Pipe will not be allowed.
- b. Reinforced Concrete Sewer Pipe and Fittings shall conform to ASTM C76, Reinforced Concrete Culvert, Storm Drain and Sewer Pipe, Class III, Class IV or Class V as designated on the drawings.
- c. Joints shall be bell and spigot type with O-ring rubber gaskets and conform to ASTM C443, Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets. The requirements of ASTM C443 shall govern joint design, in case of conflict, for pipe otherwise meeting requirements of ASTM C14 or ASTM C76. Gaskets shall not be used if older than one year or if they have evident defects such as porosity, blisters, pitting or other imperfections. The joint shall be designed to provide for self-centering and when assembled, to compress the gasket to form a water tight seal.
- d. Cement shall be Type V, sulfate resistant, ASTM C150, Portland Cement.
- e. All pipe, fittings and accessories shall be new, shaped true to form with smooth, surfaces free of honeycomb and as manufactured or recommended by the pipe supplier. Any deformation or irregularity which could hamper flow through the pipe shall not be acceptable. Damaged or cracked ends which would prevent making a satisfactory joint will be rejected.
- f. Each section of pipe shall be clearly marked to show the class, date of manufacture, name or trademark of the manufacturer.
- g. All fittings shall be of the same type class as the abutting pipe sections, except where otherwise shown on the drawings.
 - 1) Wyes and tees shall be factory-fabricated and tested for strength and watertightness.
- h. Factory Testing. In addition to inspection and testing otherwise required by the ASTM Standards specified herein, the following test shall be performed by the manufacturer. Test methods, procedures and equipment shall be in accordance with ASTM C-497, Methods of Testing Concrete Pipe or Tile. Test results shall meet applicable requirements of ASTM C14, ASTM C76 and ASTM C443.
 - 1) External Load Crushing Strength. The pipe shall be tested for external load crushing strength, reporting the 0.01 inch crack strength.
 - 2) Hydrostatic Test. Hydrostatic test of gasketed pipe shall be made on two sections of jointed pipe, in both straight alignment and maximum deflected position.

- 3) Concrete Compressive Strength. All pipe shall be tested for concrete compressive strength by crushing tests of cores cut from the pipe.
- 4) Certification. Pipe manufacturer shall furnish the District certificates of all test results. The certificates and pipe shall be so marked that the test results can be readily identified with the pipe supplied. The "Certificates of Test" shall be received by the District prior to the installation of any pipe covered by the certificates.

2. POLYVINYL CHLORIDE (PVC) SEWER PIPE:

- a. All PVC pipe and fittings shall be suitable for use as gravity sewer conduit, meet or exceed all of the requirements of the latest revisions of ASTM Specification D 3034 "Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings," have provisions made for contraction and expansion at each joint with a rubber ring, and be constructed with integral wall bell-and-spigot, push-on type joints.
- b. Pipe shall have a minimum SDR of 35 or better.
- c. Pipe shall show no signs of structural damage, splitting, cracking, or breaking at a minimum deflection of 30%, and as designated in the appropriate ASTM Specification.
- d. Pipe and fittings shall be homogeneous throughout and free from visible cracks, extrusion defects, holes foreign inclusions or other injurious defects, and as commercially practical be uniform in color, opacity, density, and other physical properties.
- e. Fittings: All fittings and accessories shall be as manufactured and furnished by the pipe supplier or approved equal, and shall have bell and spigot configurations compatible with that of the pipe, and be manufactured of the same materials as the pipe to which they attach. Fittings shall be the extruded type; fabricated fittings are not acceptable.
- f. Joints: The pipe and fittings shall be furnished with push-on type bell and spigot ends for joining with a solid, uniform cross-sectional rubber gasket as the sealing element. The rubber gasket shall meet the requirements of ASTM 3212. The bell shall consist of an integral wall section with the rubber gasket factory assembled and securely locked in to prevent displacement. The critical sealing dimensions of the bell, spigot and gasket shall be in accordance with the manufacturer's standard dimensions and tolerances. The gasket shall provide an adequate compressive force against the sealing surfaces of the bell and spigot so as to effect a positive seal under all combinations of the joint tolerances. The gasket shall be the only element depended upon to make the joint flexible and watertight. Solvent welded joints will not be allowed unless written approval is obtained from the Engineer prior to welding the joint.
- g. Pipe Tests: The pipe manufacturer shall furnish samples of pipe selected and conduct test that verify the pipe complies with the specified ASTM Standards. A typical joint assembly shall be subjected to a qualifying laboratory test of both internal hydrostatic pressure and internal vacuum or external pressure to confirm proper joint design and performance and is not intended to be used as a Quality Control Test for each joint.

In addition, the rubber gasket joint shall show no signs of leakage when tested as follows:

- 1) Internal Hydrostatic Pressure Test. The assembly shall also be subjected to pressure of 25 ft. hd. or 10.8 PSIG for 10 minutes without leakage.
- 2) Internal Vacuum or External Pressure Test. The assembly shall also be subjected to pressure of 25 ft. Hd. Or 10.8 PSIG for 10 minutes without leakage.
- 3) Pipe in Concentric Alignment. The assembly in concentric alignment shall be subjected to the test conditions of (1) and (2) without leakage.
- 4) Pipe in Angularly Deflected position. After completing the test in (3) the assembly shall be

deflected angularly to the maximum amount recommended by the manufacturer and subjected to the test conditions of (1) and (2) without leakage.

- 5) Pipe in Offset Deflected Position. The joint assembly shall be deflected to maximum offset deflection recommended by the manufacturer and be subjected to these conditions described in (1) and (2) without leakage.
 - h. Pipe manufacturer shall furnish District certificates of all tests. The certificates and pipe shall be so marked that the test results can readily be identified with the pipe tested. The "Certificates of Tests" shall be received by the District prior to the installation of any of the pipe covered by the certificates.
 - i. Each pipe shall be clearly marked at 5 foot intervals to show the manufacturer's name or trademark, nominal pipe size, ASTM Designation, PSM, or PSP and have the material designation "PVC". All fittings shall be marked in a similar manner.
3. DUCTILE IRON, BELL & SPIGOT:
- a. Use ductile iron pipe when minimum cover and is less than 5 feet.
 - b. Use ductile iron pipe when clearance from water line is less than minimum horizontal and/or vertical requirements.
 - c. Pipe shall be class 50.

EXECUTION

1. Lay pipe in accordance with manufacturer's instructions and requirements specified elsewhere.
2. Install prefabricated wye branches in trunk line for existing and future service lines at locations designated on the drawing(s) or directed by Engineer/Inspector. Rotate 22-1/2° or 45° elbow in direction of flow at proper grade.
3. Extend service lines (laterals) from 4-inch or 6-inch wye branch placed in the trunk sewer to a location designated by the Engineer/Inspector to 15 feet into the property line to be served or at the edge of permanent easement. Laterals shall be laid at a uniform grade and alignment, free from of adverse grade and at a minimum slope of 1/4 inch per foot unless noted otherwise or approved by the Engineer/Inspector, and in no case less than 1/8 inch per foot.
4. Furnish and install a permanent marker embedded in the top of the concrete curb at the end of each service connection line. Where concrete curb is not in place when service line is laid, provide 2"X4"X10' wood temporary marker.
5. Install manholes and cleanouts where shown on drawing(s) in accordance with the District's Typical Details and as follows:
 - a. The top of concrete cone section or flat slab top shall be a maximum of 12 inches below final surface elevation, unless otherwise directed by the Engineer/Inspector.
 - b. In locations where the final surface is not in place at the time of manhole construction but surface grade has been established, locate and remove the frame and cover from the top section. Precast concrete risers or cast iron rings (not to exceed 2-6 inch rings) shall then be used to set top of manhole frame and cover flush with top of final surface.
 - c. Frames and covers of manholes which are constructed in areas where final surface is existing shall be set with top of frame and cover flush with existing surface at time of manhole construction using precast concrete

- grade rings (not to exceed (2) 6-inch grade rings).
- d. After frame and cover have been set to final grade, cement grout around grade rings from top section to trim of frame and place and finish concrete collar as detailed.
 - e. Provide flexible joint or coupling to manholes of the same size as the pipe per manufacturer's recommendations.
6. Clearance between sewer and culinary water lines shall comply to Utah's Division of Drinking Water and Division of Water Quality Standards.
 7. TESTING: Furnish all labor tools, and equipment necessary to perform one of the following tests on all pipes and manholes including laterals and/or service stubs. The methods and equipment used shall be mutually determined by Inspector/Engineer and Contractor prior to any testing. Areas between successive manholes shall be tested. If the test fails, the leak shall be repaired and retested until compliance with the testing standards is met. The testing shall be done in the presence of the Inspector/Engineer and the following criteria shall be met:
 - a. An infiltration test is required when pipeline is below the groundwater level. The amount of water leaking into the pipe shall be measured and shall not exceed the following maximums:

Type of Pipe	Allowable Infiltration - Gal./Day per Inch Diameter per Mile of Pipe
PVC	10
Concrete	100

- c. A low-pressure air test shall be performed on the pipe and manholes (by an independent testing agency of the Contractor or supplier). The section of pipe between successive manholes shall be sealed with plugs. One of the plugs shall have an orifice in order to pressurize the line. A second orifice in the plug shall be used for constantly reading the internal pressure of the pipe. This orifice shall be continuously connected to a pressure gauge with a range of 0 to 10 psi with an accuracy of + or - 0.04 psi. Pressurize the line under test to approximately 4 psi and then shut off the air supply and allow pressure to stabilize for 2 minutes. After the pressure has been stabilized, the air shall be disconnected and the timing shall begin. The time of the test in minutes is as follows:

Type of Pipe	Time of Test in Minutes
PVC	# of inches in Pipe Diameter
Concrete	# of inches in Pipe Diameter divided by two

The maximum allowable pressure drop during the specified time period shall be 1.0 psi.

8. VIDEO INSPECTION: The District shall perform a video camera inspection after the Contractor has completed flushing and testing of the main to verify it has been sufficiently cleaned and is in acceptable condition. The Contractor shall resolve any concerns or problems identified by the District during the video inspection.

04200 MANHOLES

PRECAST CONCRETE MANHOLE

Precast concrete manholes shall be constructed in accordance with the design, size, details, and at the locations indicated on the plans and specified herein. The manholes shall be constructed of precast eccentric or concentric manhole units.

Precast manholes shall conform to the size, shape, form and details indicated on the Developer's approved plans. Concrete for the precast manhole units shall be Class D concrete and shall conform to the provisions of DIVISION 5. The precast cylinder units, the precast concrete taper sections and precast eccentric flat top sections shall meet the strength requirements for ASTM C 478 "Precast Reinforced Concrete Manhole Risers and Tops." Design and manufacture shall be based on H-20 loading. The contractor shall submit shop drawings of the proposed precast manhole for the project.

All joints shall use a profile type joint design. Excavation and backfill shall be done in accordance with these Specifications. Each manhole section shall be set perfectly plumb. Sections of various heights shall be used in order to bring the top of the manhole ring and cover to the required elevation.

Manhole bases shall be constructed of Class A concrete to the dimensions indicated on the plans. Said concrete bases shall be formed and concrete placed on undisturbed soil and/or on aggregate base course compacted to 95 percent of maximum density. That portion of the base above the invert elevation of the pipe shall be formed to provide a smooth channel section as indicated on the plans. The forms shall be checked for accuracy of dimensions and relative smoothness prior to placing concrete for the base. Channels shall vary uniformly in size and shape from inlet to outlet if required. The manhole base concrete shall be placed as one monolithic unit.

Manhole frame and cover sets of the type, size, and quality as specified in the STANDARD DETAILS shall be installed at the locations indicated.

The elevations at which manhole frames and covers shall be set shall conform to the requirements set forth on the plans. Where the cover is in existing pavement or in the traveled way of the existing road shoulder, the cover shall be placed flush with the existing surface. Where the structure is outside the limits of the traveled shoulder but not in the roadside ditch, the cover shall be placed 1/10-foot or more above the existing ground surface. Where the manhole structure falls in the existing roadside ditch or right of way, the manhole cover shall be placed approximately 12 inches above the existing ground surface. Manhole frames shall be set at the required grade and shall be securely set in the place provided herein, covers shall be installed and all necessary cleaning and scraping of foreign material from the frames and covers shall be accomplished to assure proper fit.

Pipe stubs shall be furnished and installed at manholes at the locations indicated on the Plans. All stubs shall be plugged.

All pipe and fittings, including installation and manholes shall conform to the provisions of the specifications of the designated pipe and fittings.

It is the intent of the Specifications that manholes and appurtenances be as watertight and free from infiltration or exfiltration as possible. The adequacy of manholes and appurtenances as to water tightness shall be determined by filling the manhole with water. When testing of the manholes is ordered, said test may be made in connection with the hydrostatic test of the sanitary sewer. Any evidence of leakage as a result of testing shall be repaired at the sole expense of the Developer. Any leaking following backfill shall also be repaired at the sole expense of the Developer.

Pipeline connections to existing manholes shall require matching the elevation of the top of the new inlet pipe to the top of the existing inlet pipe.

Manholes shall be provided without manhole steps to limit unauthorized entry into manhole without proper safety protocols in place.

All manholes north of Parkway Boulevard (2700 South to 2820 South) or as determined by the District Engineer shall be lined with a spray applied polyurethane lining system to prevent concrete corrosion from hydrogen sulfide gas attack. System shall be SPRAYROQ Spraywall Polyurethane Manhole Rehabilitation System or approved equal.

DIVISION 5

CONCRETE

05000 GENERAL

GENERAL

1. SCOPE:

- a. Includes:
 - 1) Furnish labor, materials, and equipment necessary for completion of work unless indicated or noted otherwise.
 - 2) Installation or replacement of concrete cleanout boxes, manholes, thrust blocks, pavement, curb and gutter, sidewalks, sampling stations, meter stations, etc.

05050 CONCRETE PROCEDURES

GENERAL

Not used

PRODUCTS

Not used

EXECUTION

1. COLD WEATHER REQUIREMENTS:

- a. No frozen materials shall be used.
- b. Forms, reinforcement, and fillers shall be free from frost. Place no concrete on frozen ground.
- c. For temperatures below 40 degrees F, maintain concrete between 60 and 80 degrees F during placement, and at a minimum of 50 degrees F for five days during curing.
- d. Housing, covering, or other protection shall remain in place for 24 hours after heat is discontinued.
- e. Use of calcium chloride is forbidden.

2. HOT WEATHER REQUIREMENTS:

- a. Maximum concrete temperature allowed shall be 90 degrees F. Early morning or night placement is desirable in hot weather.
- b. Cool aggregate and subgrades by sprinkling.
- c. Avoid cement over 104 degrees F.
- d. Use cold mixing water.

05100 CONCRETE FORMWORK

GENERAL

1. SCOPE:
 - a. Includes:
 - 1) Labor, materials, and equipment necessary for complete installation of required formwork ready for placing concrete.
 - 2) Labor, materials, and equipment necessary to strip and dispose of formwork.
 - 3) Responsibility for design, construction, and safety of formwork.
2. FORMS:
 - a. Conform to shape, lines, and dimensions shown on Drawings.
 - b. Be sufficiently tight to prevent leakage.
 - c. Be properly braced and tied.

PRODUCTS

1. Wood, metal or plastic as arranged by Contractor. Forming materials shall be compatible with finish requirements for concrete to be left exposed or to receive a decorative finish.
2. Use release agents compatible with finish requirements.

EXECUTION

1. Provide for installation of inserts, templates, fastening devices, etc., to be set in concrete prior to placing.
2. Clean forms to be reused for loose concrete, etc., and repair to their proper condition.
3. Make proper form adjustments before, during, and after concreting.
4. Removal of forms can usually be accomplished in 12 to 24 hours. If temperature is below 50 degrees F or if concrete depends on forms for structural support (suspended slabs), leave forms intact for a sufficient period for concrete to reach adequate strength.

05190 GRANULAR SUB-BASE

GENERAL

1. SCOPE:
 - a. Includes:
 - 1) Gravel under slabs on grade in contact with concrete.

PRODUCTS

1. 3/4 inch crushed rock.

EXECUTION

1. Place a minimum of six inches of crushed rock over compacted sub-base, level, and compact thoroughly.

05200 CONCRETE REINFORCEMENT

GENERAL

Not used

PRODUCTS

1. Reinforcing Bars - All but #2 bars shall be of deformed type. Rebars shall have grade identification marks and conform to ASTM A 615-82 Grade 6D.

Exercise special precaution with regards to quality of reinforcing steel. Mill certificates shall be available upon request. If there is any question or doubt as to origin of steel, tests of samples taken from steel shall be made to ascertain compliance.

Fabricate reinforcing steel according to latest edition of ACI Manual of Standard Practice for Detailing Reinforced Concrete Structures.

Reinforcing steel shall be free of rust, scale, or other coating at time of delivery. Properly protect steel on site.

EXECUTION

1. Fabricate and place steel as shown on Drawings in conformance with ACI Manual of Standard Practice for Detailing Reinforced Concrete Structures.
2. Shall be free of scale or other band-reducing coatings.
3. Bend bars cold.
4. Accurately place and support with chairs, bar supports, spaces, or hangers except in slab work on grade as recommended by ACI Detailing Manual.
5. Supports for bars in slabs on grade and footings shall be on plain concrete blocks (no wood or wire).
6. Securely anchor and tie reinforcing bars.
7. Reinforcing shall have a concrete protective cover of at least the following unless otherwise noted:

- | | | |
|----|---|--------|
| a. | Concrete cast against earth | 3" |
| b. | Concrete exposed to weather or exposed to earth after curing: | |
| 1) | #6 thru #18 bars | 2" |
| 2) | #5 bar, W31 or D31 wire and smaller | 1-1/2" |
| c. | Concrete not exposed to weather or in contact with ground: | |
| 1) | Slabs, walls, and joist: | |
| a) | #14 and #18 bars | 1-1/2" |
| b) | #11 bar and smaller | 3/4" |
8. In beams, slabs, and walls, avoid splices of reinforcing bars at points of maximum stress.
9. Lap bars as follows:
- Compressions splices - 30 bar diameters minimum.
 - Tension splices - 40 bars diameters minimum.
 - No splice shall be less than 12 inches.
10. Steel reinforcing bars shall run continuously through cold joints.

05220 WELDED WIRE FABRIC

GENERAL

1. SCOPE:
- Includes:
 - Reinforcing fabric as detailed or specified.

PRODUCTS

1. Welded steel wire fabric for concrete reinforcement meeting requirements of ASTM A 185-79. Flat sheets, 6 x 6 - 10 x 10 mesh.

05251 EXPANSION AND CONTRACTION JOINTS

GENERAL

Not used

PRODUCTS

1. FIBER EXPANSION JOINTS: manufactured commercial type, meet ASTM D 1751-83, 1/2 inch thick unless indicated differently on drawings.
- Approved Manufacturers:
 - Sealtight by W.R. Meadows Inc., Elgin, Illinois.

EXECUTION

1. Install as shown on drawings and as required.
2. SIDEWALKS: 50 feet on center with marked control joints at five feet on center.
3. CURB AND GUTTER, CURBWALLS, AND MOW STRIPS: 50 feet on center with marked control joints at ten feet on center.

05253 PVC WATERSTOPS

GENERAL

1. Scope:
 - a. Includes:
 - 1) Installation in vertical joints in foundation walls and elsewhere as detailed.

PRODUCTS

1. Waterstop shall be extruded from elastomeric polyvinylchloride to meet Corp of Engineers: C-572-63.
2. APPROVED MANUFACTURERS:
 - a. Sealtight by Q.R. Meadows, Inc., Elgin, Illinois
 - b. Vinylex water stop by Vinylex Corp, Knoxville, Tennessee
 - c. Plastigrip by Progress Unlimited Inc., New York, N.Y.
 - d. Durajoint by Electrovert Inc., Construction Materials Division, New York, N.Y.
 - e. A-H PVC Waterstop by Anti-hydro Waterproofing Co., Newark, N.J.

EXECUTION

1. Install as shown on drawings and in accordance with Manufacturer's instruction.

05300 CAST-IN-PLACE CONCRETE

GENERAL

Not used

PRODUCTS

1. MATERIALS:
 - a. Portland Cement - ASTM C 150 - Type II
 - b. Coarse Aggregates:
 - 1) Aggregate for regular concrete shall meet requirements of ASTM C-33 Size #57 (one inch to #4). Nonconforming aggregate which by test or actual service produces concrete of

required strength and conforms to local Code may be used with permission of Engineer/Inspector.

- 2) Aggregate for lightweight concrete shall meet requirements of ASTM C 330.
- c. Fine aggregate shall meet requirements of ASTM C 33.
- d. Water shall be clean and potable.
- e. Storage - Store to avoid contamination or deterioration of materials.
- f. Admixtures - Except for air entraining agents specified below, use of admixtures is forbidden without written approval of District. Fly ash and related materials are forbidden unless specified. Use of calcium chloride is forbidden under all circumstances.
- g. Air Entraining Agent shall meet requirements of ASTM C 260 except that those containing chlorides may not be used.

2. READY MIX CONCRETE:

- a. Concrete shall conform to requirements of ASTM C 94 alternate No. 3 and these specifications.
- b. Require mix plant to furnish a completed delivery ticket for each batch of concrete upon arrival showing the following:
 - 1) Name of ready-mix batch plant
 - 2) Serial number
 - 3) Date and truck number
 - 4) Name of Contractor
 - 5) Name and location of job
 - 6) Specific class or designation of concrete in conformance with that employed in job specification
 - 7) Amount of concrete
 - 8) Time loaded
 - 9) Type, name, and amount of admixtures used (see above)
 - 10) Amount of cement
 - 11) Total water content
 - 12) Water added by receiver of concrete with his initials

Keep these delivery slips at job-site for use of District or his representatives.

3. CONCRETE PLACING:

- a. Remove water and debris from space into which concrete shall be placed.
- b. Place as soon after mixing as possible.
- c. Deposit as near as possible in final position.
- d. Do not use contaminated, deteriorated, or retempered concrete.
- e. Placing of concrete shall be continuous until a panel or section is complete.
- f. Thoroughly work in concrete around reinforcing bars.
- g. No aluminum shall be embedded in concrete.
- h. Thoroughly compact concrete in forms by vibrating and other means where required. Moving or causing concrete to flow by means of a vibrator is prohibited. Vibrate adequately between lifts.
- i. Avoid any accumulation of hardened concrete.
- j. Concrete which has not received its initial set shall be protected during remaining weather to avoid excess water in the mix.

- k. Inserts, bolts, boxes, templates, pipes, conduits, sleeves, etc, shall be installed by appropriate Section and inspected prior to concrete placement.
4. CONCRETE TOLERANCE:
- a. Variation from plumb:
 - 1) 0 to 10' - 1/4" maximum
 - 2) 20' or more - 3/8" maximum
 - b. Variation in thickness:
 - 1) 1/4" to 1/2" standard, 5 percent footings
 - c. Variation in grade:
 - 1) 1 to 10' - 1/4" standard, 1/8" floor slabs
 - 2) 10' to 20' - 3/8" standard, 1/4" floor slabs
 - 3) 40' or more - 3/4" standard, 3/8" floor slabs
 - d. Variation in plan:
 - 1) 0 to 20' - 1/2"
 - 2) 40' or more - 3/4" standard, minus 1/2" to plus 2" footings
 - e. Variation in eccentricity:
 - 1) 2 percent footings
 - f. Variation in openings:
 - 1) Size - 1/8" plus
 - 2) Location - 1/4"
5. CURING:
- a. Keep concrete moist seven days minimum.
 - b. Curing compounds where permitted shall conform to ASTM C 309-81 Type I clear and be of a type which will not interfere with adhesion of flooring.
6. GROUTING ANCHOR BOLTS AND PLATES:
- a. Grout solid, leave no voids.
7. ADDITION OF WATER TO CONCRETE:
- a. Avoid use of excessive water. If water is added on job, do not exceed specified slump and run mixer for 30 revolutions at 8 to 12 RPM.
8. If job-mixed concrete is used, contact Engineer for Mix Table and instructions.
9. FINISH:
- a. Rubbed:
 - 1) Box interiors
 - b. Rough:
 - 1) Thrust blocks
 - c. No special finish:
 - 1) Manholes, box exteriors below grade
 - d. Steel trowel finish:

- 1) Interior flatwork
- e. Broom finish:
 - 1) Exterior flatwork, curbs, and gutter. Remove edger marks.

05311 NORMAL WEIGHT STRUCTURAL CONCRETE

GENERAL

1. MIX DESIGN:

- a. Includes:
 - 1) Furnishing and placing of 3000 psi concrete in following locations:
 - a) Thrust blocks
 - 2) Furnishing and placing 4000 psi concrete in other areas to receive normal weight concrete including but not limited to the following:
 - a) Manholes
 - b) Boxes
 - c) Exterior walks and slabs
 - e) Curbs and gutters

PRODUCTS

1. PROPORTIONS:

- a. 3000 psi concrete:
 - 1) Minimum weight cement per:
 - a) Cubic yard concrete - 517 lbs. (5 bags)
 - 2) Air Entrainment (plus or minus ½ percent) - 3 percent
- b. 4000 psi concrete:
 - 1) Minimum weight cement per:
 - a) Cubic yard concrete - 611 lbs. (6 bags)
 - 2) Air Entrainment (plus-or-minus ½ percent)
 - a) Exterior Flatwork - 5 percent
 - b) all other - 3 percent

EXECUTION

1. FLATWORK:

- a. Slabs shall not vary in plane more than 1/4 inch in ten feet.

2. RUBBED FINISHES:

- a. Immediately after removing forms, remove joints, marks, bellies, projects, loose materials, and cut back metal ties from surface to be exposed.
- b. Point up voids with cement mortar 1:2 mix and rub exposed surface with Carborundum to a smooth, even surface.

05370 CONCRETE CURING

GENERAL

1. SCOPE:
 - a. Includes:
 - 1) Apply curing compound to flatwork.

PRODUCTS

1. Sodium silicate based compound providing waterproofing, curing, hardening, dustproofing, and sealing of substrate.
2. APPROVED MANUFACTURERS:
 - a. Cenco Seal 301 manufactured by Century con-Crete Chemicals, 1470 West 400 South, Orem, Utah 84057. (801) 224-7488.
 - b. Ashford Formula manufactured by Curecrete Chemical Company, 954 North Industrial Road, Orem, Utah 84057. (801) 224-7488.
 - c. Sonosil manufactured by Sonneborn Building Products, 7711 Computer Ave., Minneapolis, MN 55435
 - d. Acuricon, Type C, manufactured by Anti-Hydro Waterproofing Co., Newark, NJ 07108.
 - e. Cure-Hard manufactured by W. R. Meadows, Inc., PO Box 543, Elgin, Illinois 60120.

EXECUTION

1. Apply in accordance with Manufacturer's instructions.

05600 GROUT

GENERAL

1. Section 05000 applies to this Section.
2. SCOPE:
 - a. Includes by not limited to:
 - 1) Grout for securing anchor bolts and hardware in concrete.
 - 2) Jointing manhole sections.

PRODUCTS

1. Commercial non-shrink grout conforming to Army Corp of Engineers CE 204.01 and CRD-C588-78 and tested in accordance with ASTM C 627-78, "Test for Early Volume Change of Cementitious Mixtures", and ASTM C 157-80 "Test for Length Change of Hardened Cement Mortar and Concrete."
2. APPROVED MANUFACTURERS:

- a. Aexpandcrete by Anti-Hydro Waterproofing Company, Newark, NJ.
- b. Burke Metallic Grout by the Burke Co., an Mateo, CA.
- c. Is-Vol by Devoe & Reynolds Company, Inc., New Orleans, LA..
- d. Halco Non-Shrink Grout by Hallemite Div., Montvale, NJ.
- e. Lithochrome Metallic Grout by L.M. Scofield Co., Los Angeles, CA.
- f. Embeco pre-mixed grout, Master Builders Company Division of American Marietta Company, Cleveland, Ohio.
- g. Ferrolith G.D.S. Grout by Sonneborn Building Products Inc., Minneapolis, Minnesota.
- h. Five Star Grout by U.S. Grout Corp., Old Greenwich, Conn.

EXECUTION

1. Use in accordance with manufacturer's recommendations.

DIVISION 6

SECONDARY WATER SYSTEM

06000 GENERAL

1. SCOPE:
 - a. Includes But Not limited To -
 - 1) Furnish all labor, materials and equipment necessary for the secondary water extensions as described herein or shown on the drawings to include, water mains; valves; connections; laterals; ductile iron pipe, polyvinyl chloride pipe, polyethylene pipe and associated couplings, fittings, and joint materials.
2. DESIGN:
 - a. The system including pipe, thrust blocks, valves, fittings and appurtenances shall be designed to withstand the system pressures as outlined by the District Engineer.
 - b. The pipe network shall be designed and constructed with a minimum depth of cover as outlined herein. Any component installed shallower than the indicated depth shall be constructed to facilitate automatic draining when the system is depressurized and drained for the winter. No component shall be capable of being damaged by freezing if shallower than the indicated minimum cover. Services and laterals shall be sloped to drain and free of low spots which would be subject to freezing.
 - c. System drains will be utilized only at location authorized by the District Engineer.
3. REFERENCES:
 - a. AWWA C151: American National Standard for Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lines Molds, for water or Other Liquids.
 - b. AWWA C504: AWWA Standard for Rubber Seated Butterfly Valves, 3 In. Through 72 In.
 - c. AWWA C509: AWWA Standard for Resilient Seated Gate Valves for Water Supply Service
 - d. AWWA C515: AWWA Standard for Reduced Wall Resilient Seated Gate Valves for Water Supply Service
 - e. AWWA C600: AWWA Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances.
 - f. AWWA C651: AWWA Standard for Disinfecting Water Mains.
 - g. AWWA C800: AWWA Standard for Underground Service Line Valves and Fittings.
 - h. AWWA C900: AWWA Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 60 In., for water.
 - i. ASTM D 2241: Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure Rated Pipe (SDR Series).
 - j. ASTM D 2737: Standard Specification for Polyethylene (PE) plastic Tubing
 - k. ASTM D 2855: Standard Practice for Making Solvent Cemented Joints and Poly Vinyl Chloride (PVC) Pipe and Fittings.
 - l. ASTM D 3139: Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
4. SUBMITTALS:
 - a. Manufacturer's affidavit certifying all products were manufactured, tested and supplied in accordance with applicable references in this section together with a report of the test results and the date each test was completed.

- b. Product Data: Manufacturer's technical product data and installation instructions.
 - c. Operating and Maintenance: Include maintenance data, parts lists, Product Data, and Shop Drawings.
5. QUALITY ASSURANCE:
- a. Reject any pipe which does not conform to Contract Documents or is cracked, chipped, crushed, dented, kinked, or otherwise unacceptable.

06100 PIPEWORKS

GENERAL

1. GENERAL PIPES AND FITTINGS:
- a. Provide piping materials and factory fabricated piping products of sized, types, pressure ratings, and capacities indicated.
 - b. Where not indicated, provide proper selection as determined by District to comply with installation requirements.
 - c. Provide sizes and types of equipment connections for fittings of materials which match pipe materials used in pressure piping systems. Where more than one type of material or product is indicated, selection is supplier's option.
 - d. Secondary water valves on transmissions pipe shall be as follows:
 - 1) 4", 6", 8", and 10" - Resilient Seated Gate Valves
 - 2) 12" and larger - Butterfly Valves
 - e. All pipe works and fittings shall be domestic (manufactured in the USA) except where specifically allowed in these specifications.

PRODUCTS

1. DUCTILE IRON PIPE
- a. Flange Joints
 - 1) Flanges may be cast integrally with the pipe, in which case they shall conform to ANSI B 16.1 as to diameter, thickness, drilling, and other characteristics, or they may be screwed on the threaded ends of the pipe.
 - 2) Screwed-on flanges shall conform to ANSI B 16.1 as to material, diameter, thickness, drilling, and other characteristics, but shall have long hubs threaded specially for ductile iron pipe. Pipe shall be class 53, minimum. Screwed-on flanges shall be attached to the pipe by the pipe manufacturer, and after attachment the faces of the flanges and the ends of the pipe shall be refaced so that the end of the pipe will be even with the face of the flange and both will be perpendicular to the axis of the pipe.
 - 3) Bolt holes on the two flanges on a piece of pipe shall be in perfect alignment.
 - 4) Bolts shall conform to ANSI B 16.1 except that flanges underground, in concrete pipe valve boxes, or in water shall have Type 316 stainless steel.
 - 5) Where cap screws or stud bolts are required, flanges shall be provided with tapped holes for such cap screws or stud bolts.
 - 6) Gaskets shall be ring gaskets suitable for the intended application, manufactured by Garlock, Cranite, or equal.
 - 7) All flange bolts shall be cut and finished to project not more than 1/4 inch beyond outside face of

nut after joint is assembled.

b. Mechanical Joints

- 1) Mechanical joints shall be in accordance with ANSI A 21.11 (AWWA C 111).

c. Push-on Joints

- 1) Push-on rubber gasket joints shall be in accordance with ANSI A 21.11 (AWWA C 111).

d. Restrained Push-On Joints

- 1) Restrained push-on joints shall be designed for working pressures of 350 psi for sizes 4-inch through 24-inch and 250 psi for sizes 30-inch through 54-inch. The restraining system shall be comprised of ductile iron locking segments inserted through slots in the bell face and providing positive axial lock between the bell interior surface and a retainer weldment on the spigot end of the pipe. An alternate system shall have positive restraint against joint separation by a retainer weldment through a boltless system.
- 2) Restraint system shall be US-Pipe TR-Flex joint system.

e. Fittings

- 1) Except as otherwise provided, fittings for cast iron or ductile iron pipe shall be as specified in ANSI A 21.10 (AWWA 110) 2" through 36" Class 250, or A21.53 (AWWA C153), 3" through 16" Class 350, or A21.11 (AWWA C111) 18" through 24" Class 350, of the same pressure rating and same joint configuration as the pipe with which they are used.

f. Push-On Gaskets

- 1) Push-on rubber gasket joint fittings shall have bodies as specified above with bells dimensioned and arranged to match the push-on joints on the pipe. Mechanical joint fittings may be used with push-on joints on the pipe. Mechanical joint fittings may be used with push-on rubber gasketed joint pipe.

g. Flexible Fittings

- 1) Unless otherwise indicated, flexible couplings shall be solid sleeve mechanical joint, with gaskets sized for the intended pipe.

h. Lining and Coating

- 1) Except as otherwise specified, all cast iron and ductile iron pipe and fittings shall be smooth cement-lined in accordance with ANSI A 21.4 (AWWA C 104).
- 2) Special attention shall be given to the lining of fittings. Lining shall be applied to bare metal. All lining shall extend to the faces of flanges, to the end of spigots, or to the shoulder of hubs, as the case may be.
- 3) In addition, all cast iron and ductile iron pipe and fittings shall be coated inside and outside with bituminous material except that pipe which is to be painted shall not be coated on the outside.

i. Corrosion Protection

- 1) Ductile iron pipe underground shall be protected against external corrosion by loose 8 mil purple polyethylene sleeves in accordance with AWWA C 105. Cut polyethylene tubing about two feet longer than the pipe length. Gather the polyethylene tube on the spigot end of the pipe being assembled. Using shallow holes to accommodate the wrapped bell pull the gathered tubing over the bell and fix it in place with tape, band or string. Take up slack in the tubing along the top of the pipe barrel and secure in place with tape. Overlap the tubing from the next pipe length and secure in similar fashion. All holes or tears shall be repaired with an additional wrap.

2. POLYVINYL CHLORINE (PVC) PIPE:

- a. Conform to all requirements of AWWA C900, "Polyvinyl Chloride (PVC) Pressure Pipe, 4 inch Through 60-inch, for Water". Pipe shall be extruded from clean Type I Grade 1 class 12454-B PVC compound conforming to ASTM Resin Specification D-1784.

- b. Pressure Class shall be 150 or 200 psi with a minimum Dimension Ratio (DR) of 18 or 14 respectively.
- c. Pipe shall be homogeneous throughout, and free from visible cracks, holes, foreign inclusions, or other defects, and be as uniform as commercially practical in color, opacity, density and other physical properties. Surface shall be free from nicks, scratches, gouges and other imperfections that might weaken the pipe wall or cause leakage at joints.
- d. Pipe shall be purple in color.
- e. Dimensions and tolerances of the pipe barrel and bell ends shall conform to the applicable requirements of AWWA C900 or C909 for the pressure-class specified for cast iron outside diameter pipe.
- f. Pipe shall be available in standard laying lengths (as distinguished from overall length) of 20 feet.
- g. All fittings shall be cast iron fittings as specified under ductile iron pipe.
- h. Joint requirements:
 - 1) Pipe and fittings shall be furnished with integrally thickened bell and spigot ends from joining with a solid, uniform cross-sectional elastomeric gasket as the sealing element.
 - 2) Couplings will not be permitted.
 - 3) The gasket shall be contained within the bell end, not be required to support the weight of the pipe when two sections are joined, but serve only as a seal, conform to ASTM D 3139, provide and adequate compressive force against sealing surfaces of the bell spigot to effect a positive seal under all combinations of joint tolerances and be the only elements depended upon to make the joint flexible and watertight.
 - 4) Solvent welded joints will not be permitted unless written approval as obtained from the Engineer/Inspector prior to welding the joint.
- i. The pipe manufacturer shall perform the inspection and testing as specified in AWWA C900, C905, C909 on a representative sample of the manufacturer's product; and shall furnish to the District a certificate affirming that their product meets the requirements of AWWA C900, C905, or C909, and the additional requirements of these specifications, including the drop impact test.
 - 1) Drop Impact Test: All sizes of the pipe and fittings shall withstand without failure at 73° F., the impact of a falling 12-lb. missile with a 2-inch radius nose, when tested in accordance with ASTM D 2444, at an energy level of 120 ft. lbs. There shall be no visible evidence of shattering or splitting when the energy is imposed.
 - 2) Perform leakage tests as outlined in the Execution portion of this section.
 - 3) Certification of all test will be furnished to the District and results marked to readily identify the pipe furnished. When requested, the pipe manufacturer shall certify that the pipe is recommended for direct tapping of service connections up to one-inch size.
- j. Marking on the pipe shall include the nominal cast iron pipe size, AWWA C900, C905, or C909, Class and dimension ratio (DR), and the manufacturer's name or trademark at intervals not to exceed 5 feet.
- k. Pipe shall be suitable for direct tapping of service connections up to one inch, when following the recommendations and using the equipment and materials of the manufacturer.
- l. Unless noted otherwise, all ferrous fittings and valves shall be wrapped with 8 mil thick polyethylene file tube or sheet, held in place by 2-inch wide plastic-backed adhesive tape equal to Polyken No. 900 or Scotthrap No. 50, and adhere securely to both the pipe and polyethylene with enough film to overlap the adjoining pipe a minimum of one foot. Polyethylene wrap shall be protected from the sun and weathering prior to use, using care during backfilling of the protected areas to prevent puncturing the film.

EXECUTION

1. Install waterlines, valves, connection, hydrants, etc. as shown on Developer's drawing(s); District Typical Details, and as dictated by the Engineer/Inspector:
 - a. Ductile Iron Pipe - C-600 "Installation of Gray and Ductile-Iron Water Mains and Appurtenances".
 - b. Per manufacturer's recommendations, this specification, and appropriate AWWA standards.
2. All pipe shall have a minimum 30-inch cover from top of the finish grade. Avoid conflicts with storm drains and other utilities. Minimum clearance shall be 24 inches edge to edge between waterlines and other utility lines or structures.
3. Provide survey equipment of an approve type to maintain alignment and grade between critical points.
4. Prevent dirt, grease, and all other foreign matter form entering each length of piping before making connections in the field. After each section of piping is installed, clean thoroughly and remove rocks, dirt and other foreign matter by washing, sweeping, scraping, or other method that will not harm the lining of the pipe. Furnish and install plugs or bulkhead of approved type to all open ends of pipes when workmen are not on the job or in the immediate area for safety and to prevent rocks or other foreign matter from entering the pipe.
5. Make connections to existing pipelines where shown on the drawing(s) or where directed by the Engineer/Inspector as follows:
 - a. Scheduled shut downs in advance to cause the least interference with the existing system. A shut down schedule of existing mains shall be made and agreed upon by both the Contractor and District well in advance of any work being completed.
 - b. Use pipe and fittings as indicated on drawing(s) or as directed by Engineer/Inspector and otherwise conform to requirements of applicable paragraphs of this Section for the size, type and Class of the line being cut and the line connected.
 - c. Excavate to the existing main at the point it is to be served and determine all fittings require to make the connection complete and have all materials needed at the job site prior to any shut downs or cutting into the existing system.
6. Loop existing and new pipes around proposed lines or structures where shown on the drawing(s) in accordance with standard detail 26 or as directed by Engineer/Inspector.
7. TESTING: All pipe, valves in pipelines, joints, seams, couplings, fittings, flanges, welds, etc. shall be tested for leakage in the presence of Inspector/Engineer. Leakage is defined as any water passing through the surface of pipes, including joints fittings, outlets, etc. All water for testing shall be provided by the District for a maximum of two tests. The following test shall be performed.
 - a. Area to be tested shall be closed off and filled with water to a point similar to the expected volume the line will carry.
 - b. If pressure testing occurs against an existing valve, the District will inspect the condition of the valve and determine if it needs to be replaced with a new valve at the Contractor/Developer's expense, prior to testing against the valve.
 - c. No sections greater than 2000 feet in total pipe length shall be tested without special written permission by the District Engineer.
 - d. Pressure equal to 150% of the working pressure of the pipe shall be maintained for two consecutive hours. During this period no loss of water pressure shall occur. If pressure loss does occur, leakage

shall not exceed the amounts allowable by AWWA C600 DIP and C605 for PVC pipe (see reference sheets at the end of this division).

7. CLEANING PIPES: All pipes, valves, hydrants, etc. that convey or store secondary water shall be cleaned as follows:
 - a. Flush pipes at a rate in excess of 4.0 feet per second if the pipe is under 12 inches diameter and 3.0 feet per second if the pipe is 12 inches diameter and larger.
 - b. Pipes shall be flushed from an open pipe end at a point on the main to be specified by the Inspector/Engineer. Any extra fittings, pipe or blocking required shall be supplied by the Contractor at no cost to the District.

06200 VALVES

PRODUCTS

1. GATE VALVES:
 - a. Valves shall be resilient seated with iron body.
 - b. Valves shall have minimum working pressure rating of 200 psi.
 - c. Valves shall be non-rising stem.
 - d. Valves shall meet the requirements of AWWA Specifications C509 or C515, except as modified herein.
 - e. Valves shall operate driptight with full pressure on either side of the valve and no pressure on the other side.
 - f. Packing and gearing shall be replaceable while the valve is in service.
 - g. The flanges and drilling shall conform to dimensions of ANSI B 16.1 for Class 125 or Class 150 for cold water.
 - h. Mechanical joints shall be in accordance with ANSI A 21.11 (AWWA C 111).
 - i. Cast iron in the valve body and bonnet shall be close-grain gray cast iron, having minimum tensile strength of 31,000 pounds per square inch. Castings shall be uniform in thickness and free from blow holes. No brazing, welding or plugging of castings will be allowed. Valves shall be so designed that the gates and stem are clear of the full specified diameter when open.
 - j. All valves shall turn clockwise to close.
 - k. The operating nut shall be a 2-inch square AWWA nut.
 - l. Double O-ring stem seal.
 - m. Epoxy coated inside and outside conforming to AWWA C 550.
2. BUTTERFLY VALVES
 - a. Butterfly valves and operators shall conform to AWWA Standard for Rubber-Seated Butterfly Valves, AWWA D 504, except as modified or supplemented herein.
 - b. Butterfly valves may be short body or long body at the option of the Contractor and as determined by their location in the pipe system. Wafer Valves may not be used. Short body valves may be used only in locations where the disc will not interfere with adjacent pipe fittings, valves, or equipment.
 - c. Valves and operators shall be designed for a flow through the valve corresponding to a pipeline velocity of 16 feet per second with the vane in the position of maximum coefficient of torque or for the maximum torque that may occur under the specified operating conditions of flow, pressure, valve angle, including seating, unseating, and bearing torque, with the safety factors as required in AWWA C 504 standards and as recommended in Table 2A, Appendix A, of AWWA C 504, whichever is

- greater.
- d. Records of tests shall be furnished as specified in AWWA C 504. Valve discs for valves on liquid service shall be stainless steel disc to 12 inches and stainless steel disc or stainless steel mating edge on ni-resist cast iron or cast iron disc above 12 inches. Method of attaching edge to disc shall be subject to approval by the Engineer.
 - e. The valve shaft, keys, dowel pins, or taper pins used for attaching the valve shaft to the valve disc shall be Type 304 or Type 316 stainless steel or equivalent corrosion resistant material. All portions of the shaft bearings shall be stainless steel, bronze, nylon, or fiberglass and Teflon in accordance with AWWA C 504.
 - f. All nuts and screws used with clamps and discs for rubber seats shall be securely held from loosening from vibration or cavitation effects.
 - g. Valve disc shall seat in a position of 90 degrees to the pipe axis and shall rotate 90 degrees between full open and tight closed position.
 - h. Valves shall be installed with valve shafts horizontal.
 - i. Butterfly valves above ground shall be provided with 150 lb flanges and buried valves shall be mechanical joint of suitable pressure rating. Minimum shutoff pressure shall be 200 psi.
 - j. Manual operators for valves less than 6-inch diameter shall be the hand lever type. All hand lever operators shall be provided with a locking device so that the valve can be locked in any position with a wing nut. The locking device shall be rigid and shall not allow any vibration or chattering of the valve. The hand lever shall be 12 inches long and shall be provided with a rubber hand grip.
 - k. Valves larger than 6 inches that are buried in the ground shall be provided with a totally enclosed worm gear operator mounted on the valve. The valve shaft shall extend from the valve to the operator and shall be as specified for valve shafts. The operator shall be gasketed for watertightness.
 - l. Valves shall be epoxy coated on the interior and exterior in accordance to Section 15 of AWWA C 504.
 - m. Butterfly valves shall be Groundhog as manufactured by Henry Pratt Company or equal.

06300 APPURTENANCES

PRODUCTS

1. VALVE BOXES:
 - a. All valves to be buried shall have cast iron valve boxes; firmly supported and painted, entered and plumb over the wrench nut of the valve.
 - b. Boxes shall be of the extension type with 34 to 60 inch extension.
 - c. Approved manufacturers:
 - 1) Tyler Pipe Industries Series 7026 or 664-A
 - 2) D&L M-8042
 - 2) Approved equal.
 - d. All valves to have valve system extension with 2-inch square AWWA Nut on top.
2. SERVICE LATERALS
 - a. Tubing shall be flexible polyethylene tubing, colored purple. Polyethylene pipe shall be SDR-9-PE 3408 in accordance with ASTM D-2737. The outer, purple layer shall contain pigments and ultraviolet stabilizers to meet the cell classification of 345444E per ASTM D 3350. Tubing shall be rated for a minimum pressure of 200 psi.
 - b. Pipe with surfaces smooth and free from bumps and irregularities, that is flexible enough to be coiled

without damage to the pipe or appreciable change in cross-sectional area.

- c. Connections:
 - 1) Compression fittings with stainless steel CTS insert stiffeners as provided by Ford or Mueller.
 - 2) Locating wire shall be installed with the service lateral from the main to meter setter.
 - 3) Fittings, In accordance with AWWA C800.
- d. Mark pipe continuously to identify:
 - 1) Manufacturer's name (or trade mark) and code.
 - 2) Nominal size.
 - 3) Date of manufacture.
 - 4) Pressure rating.
 - 5) ASTM or AWWA designation number.

3. TAPPING SLEEVES:

- a. 2" and under - epoxy coated stainless steel or brass double strap tapping saddle for connections to mains. Saddle shall be specifically designed for the appropriate outside diameter of the existing main (PVC, DIP, asbestos, cement, etc.)
- b. 2.5" and over - Stainless Steel (Type 304 or 316)
- c. Hot tap connections will generally not be allowed on main line extensions (8" and larger) without prior approval from the District Engineer. Cut in tee with new valve on the existing main line run and new valve on the branch is standard.

5. TRENCH MARKING:

- a. Magnetic Tape: aluminum foil, plastic coated, stamped with terminology indicating "warning buried water line."
- b. Locating Wire: 14 gauge, 600 volt PVC jacketed wire manufactured for underground service, cad welded to all valves and fire hydrants. Wire shall be continuous without breaks. Splices shall be welded.
- c. All trench marking shall be installed a minimum of 2 feet above top of pipe.

EXECUTION

- 1. Make all 2" and smaller service connections at locations as determined in the field by the Engineer/Inspector as follows:
 - a. Tap water main. Use epoxy coated stainless steel or brass double strap tapping saddle for connections to PVC mains.
 - b. Lay or install by jetting polyethylene tubing from main line to meter valve box. Run service line from the main to the valve or valve to valve without joints. Emergency joints when approved by Inspector shall be made with compression type stainless steel double locking rings fitting.
 - c. Install stop and waste box with locking cap in concrete slab as not to inhibit the operation of the cap.