
NAVFAC IGS-02510 (MAY 2003)

Preparing Activity: LANTNAVFACENGCOM Based on 05/02 IGS-02510

ITALIAN GUIDE SPECIFICATIONS

Use for ITALIAN projects only

SECTION 02510

WATER DISTRIBUTION
05/03

NOTE: This guide specification is issued by the Atlantic Division, Naval Facilities Engineering Command for regional use in Italy.

NOTE: This guide specification covers both potable and nonpotable (raw water and sea or salt water) systems, in which the largest size pipe is 600 mm in diameter and the maximum working pressure does not exceed 1400 kPa 200 psi for pipelines 300 mm 12 inch size and smaller and 1000 kPa 150 psi for pipelines larger than 300 mm 12 inch size. This section covers exterior water distribution systems only.

1. Cathodic protection should be considered where the anticipated degree of corrosion is so great that coating systems, including polyethylene encasement, are not adequate to protect the piping for the desired life of the system.

2. When piping beneath open piers and other exposed locations is subject to freezing temperatures, include requirements for insulation and protective coverings in the project specification. Information on this subject related to open piers may be found in Technical Report R593, September 1968, "Freeze Protection for Freshwater and Sanitary Piping Under Open Piers," by the Naval Facilities Engineering Services Center, 560 Center Drive, Port Hueneme, California 93043-4328.

NOTE: The following information shall be shown on the project drawings:

1. Plan and location of all new pipelines,

including size of pipe.

2. Maximum working pressure of the system.

3. Location, size, and type of service of existing connecting, intersecting, and adjacent pipelines and other utilities.

4. Paved areas and railroads which pass over new pipelines.

5. Profile, where necessary to show unusual conditions.

6. Class or thickness of pipe, including material identification, and limits for same where class or thickness will be different for different sections of pipeline.

7. Bedding conditions.

8. Location of flanged joints, joints made with sleeve-type mechanical couplings, grooved and shouldered type joints, and insulating joints.

9. Location of valves, hydrants (showing which are traffic type hydrants), and indicator posts; and details concerning valves, where necessary.

10. Size and shape of hydrant operating nut and cap nuts if nonstandard nuts are required; dimensions of threads (major diameter, minor diameter, pitch diameter, thread form, and number of threads per inch) on hydrant hose and pumper connections if nonstandard threads are required.

11. Connection of service line to water main, if different from that specified.

12. Location or size of thrust blocks, including type; or location of and details of metal harness, when necessary (metal harness, when necessary, must be shown for PVC plastic water main pipe).

13. Design details of concrete thrust blocks.

14. Design details for fire hydrant installation.

Comments and suggestion on this specification are welcome and should be directed to the technical proponent of the specification. A listing of the technical proponents, including their organization

designation and telephone number, is on the Internet.

Use of electronic communication is encouraged.

Brackets are used in the text to indicate designer choices or locations where text must be supplied by the designer.

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 563 (1994) Carbon and Alloy Steel Nuts

ITALIAN NATIONAL INSTITUTE FOR THE UNIFICATION OF STANDARDS (UNI, UNI ISO)

UNI 810 (1975) Fire fighting equipment - Threaded bolt connections

UNI 2223 (1967) Metallic pipe flanges - Templates for drilling circular flanges

UNI ISO 3419 (1981) Non-alloy and alloy steel butt-welding fittings

UNI ISO 4179 (1985) Ductile iron pipes for pressure and non-pressure pipelines - Centrifugal cement mortar lining - General requirements

UNI 4545 (1960) Coated electrodes for arc welding - Diameters, lengths and tolerances

UNI 5745 (1986) Hot-dip zinc coating of steel pipes - Requirements and tests

UNI 7441 (1975) Rigid (unplasticized) PVC pipes under pressure - Types, dimensions and characteristics

UNI 7611 (1976) High density polyethylene pipes under pressure - Types, dimensions and requirements

UNI 7612 (1976) High density polyethylene fittings for pipes under pressure - Types, dimensions and requirements

- UNI 9164 (1994) Ductile iron pipes, fittings and accessories for pressure pipelines - Mechanical flexible joint - Coupling dimensions and joint accessories
- UNI 9485 (1989) Fire fighting equipment - Cast iron stand pipe hydrants
- UNI 9486 (1989) Fire fighting equipment - Cast iron underground hydrants

EUROPEAN COMMITTEE FOR STANDARDIZATION (CEN)

- ENV 197-1 (1992) Cement - Composition, specifications and conformity criteria - Part 1: Common cements
- EN 545 (1994) Ductile iron pipes, fittings, accessories and their joints for water pipelines - Requirements and test methods
- EN 558-1 (1995) Industrial valves - Face-to-face and centre-to-face dimensions of metal valves for use in flanged pipe systems - Part 1: PN-Designated Valves
- EN 558-2 (1995) Industrial valves - Face-to-face and centre-to-face dimensions of metal valves for use in flanged pipe systems - Part 2: Class-Designated Valves
- EN 641 (1994) Reinforced concrete pressure pipes, cylinder type, including joints and fittings
- EN 642 (1994) Prestressed concrete pressure pipes, cylinder and non-cylinder, including joints, fittings and specific requirement for prestressing steel for pipes
- EN 681/1 (1996) Elastomeric seals - Materials requirements for pipe joint seals used in water and drainage applications - Part 1: Vulcanized rubber
- EN 1057 (1996) Copper and copper alloys - Seamless, round copper tubes for water and gas in sanitary and heating applications

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

- ISO 13 (1978) Grey iron pipes, special castings

and grey iron parts for pressure main lines

- ISO 559 (1991) Steel tubes for water and sewage
- ISO 2016 (1981) Capillary solder fittings for copper tubes - Assembly dimensions and tests
- ISO 2531 (1991) Ductile iron pipes, fittings and accessories for pressure pipelines
- ISO 4422-1 (1996) Pipes and fittings made of unplasticized poly(vinyl chloride)(PVC-U) for water supply - Specifications - Part 1: General
- ISO 4422-2 (1996) Pipes and fittings made of unplasticized poly(vinyl chloride)(PVC-U) for water supply - Specifications - Part 2: Pipes (with or without integral sockets)
- ISO 4422-3 (1996) Pipes and fittings made of unplasticized poly(vinyl chloride)(PVC-U) for water supply - Specifications - Part 3: Fittings and joints
- ISO 5256 (1985) Steel pipes and fittings for buried or submerged pipelines - External and internal coating by bitumen or coal tar derived materials
- ISO 7005-1 (1992) Metallic flanges - Part 1: Steel flanges
- ISO 7483 (1991) Dimensions of gaskets for use with flanges to ISO 7005
- ISO 8992 (1986) Fasteners - General Requirements for Bolts, Screws, Studs and Nuts

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

- AASHTO H-20 (1993) Guide for Design of Pavement Structures.

ITALIAN LAWS AND NORMS

- M.O.H. Circ. n. 125 (1967) Discipline for installation of potable water polyvinyl chloride piping

AMERICAN WATER WORKS ASSOCIATION (AWWA)

- AWWA C205 (1989) Cement-Mortar Protective Lining and

	Coating for Steel Water Pipe - 4 in. and Larger - Shop Applied
AWWA C207	(1994; Erratum 1994) Steel Pipe Flanges for Waterworks Service - Sizes 4 in. Through 144 in. (100 mm Through 3,600 mm)
AWWA C502	(1994; C502a) Dry-Barrel Fire Hydrants
AWWA C503	(1997) Wet-Barrel Fire Hydrants
AWWA C550	(1990) Protective Epoxy Interior Coatings for Valves and Hydrants
AWWA M11	(1989) Steel Pipe - A Guide for Design and Installation

UNDERWRITERS LABORATORIES (UL)

UL 246	(1993; R 1994, Bul. 1994) Hydrants for Fire-Protection Service
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1.2 DESIGN REQUIREMENTS

1.2.1 Water Distribution Mains

NOTE: Provide only those pipe sizes and materials applicable to the project requirements.

[Provide water distribution mains indicated as 100 through 300 mm 4 through 12 inch diameter pipe sizes of [steel] [ductile-iron,][high-density polyethylene (HDPE)] [or] [polyvinyl chloride (PVC) plastic] pipe. Provide [ductile iron] [or] [concrete] pipe for 300 mm 12 inch diameter or larger pipe sizes. Also provide water main accessories, gate valves [and check valves] as specified and where indicated.]

1.2.2 Water Service Lines

NOTE: Provide only those pipe sizes and materials applicable to the project requirements.

NOTE: Delete the sentence allowing water main pipe to be used for water service lines except when there is water service pipe of 80 mm 3 inch size or larger included in the project. Ductile-iron piping is available in 80 mm 3 inch size, but 100 mm 4 inch size is smallest for PVC plastic water main pipe.

Provide water service lines indicated as less than 100 mm [_____]inch lines from water distribution main to building service at [a point approximately

1.5 m 5 feet from building] [the point[s] indicated]. Water service lines shall be [copper tubing] [polyvinyl chloride (PVC) plastic pipe]. Provide water service line appurtenances as specified [and where indicated].

1.3 SUBMITTALS

NOTE: Submittals must be limited to those necessary for adequate quality control. The importance of an item in the project should be one of the primary factors in determining if a submittal for the item is required.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Recommended codes for Army projects are "RE" for Resident Engineer approval, "ED" for Engineering approval, and "AE" for Architect-Engineer approval. Codes following the "G" typically are not used for Navy projects.

Submittal items not designated with a "G" are considered as being for information only for Army projects and for Contractor Quality Control approval for Navy projects.

Submit the following in accordance with Section entitled "Submittal Procedures."

SD-03 Product Data

NOTE: Delete bracketed wording in the first sentence when steel pipe is not allowed.

Water distribution main piping, fittings, joints, valves, and coupling

Water service line piping, fittings, joints, valves, and coupling

Hydrants

Indicator posts

Corporation stops

Valve boxes

Submit manufacturer's standard drawings or catalog cuts, except submit both drawings and cuts for push-on [and rubber-gasketed bell-and-spigot] joints. Include information concerning gaskets with submittal for joints and couplings.

SD-07 Certificates

Water distribution main piping, fittings, joints, valves, and coupling

Water service line piping, fittings, joints, valves, and coupling

Shop-applied lining [and coating]

Fire hydrants

Certificates shall attest that tests set forth in each applicable referenced publication have been performed, whether specified in that publication to be mandatory or otherwise and that production control tests have been performed at the intervals or frequency specified in the publication. Other tests shall have been performed within 3 years of the date of submittal of certificates on the same type, class, grade, and size of material as is being provided for the project.

SD-08 Manufacturer's Instructions

Installation procedures for water piping

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Delivery and Storage

Inspect materials delivered to site for damage. Unload and store with minimum handling. Store materials on site in enclosures or under protective covering. Store [plastic piping, jointing materials and] rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes, fittings, [valves] [and] [hydrants] free of dirt and debris.

1.4.2 Handling

NOTE: Delete coatings not allowed for the project. See as a guide AWWA M11 in the chapter on protective coatings for information on the relative merits of cement mortar and coal-tar enamel coatings. See as

a guide foreword to AWWA C210 for information on coal-tar epoxy coating.

Handle pipe, fittings, valves, hydrants, and other accessories in a manner to ensure delivery to the trench in sound undamaged condition. Take special care to avoid injury to coatings and linings on pipe and fittings; make satisfactory repairs if coatings or linings are damaged. Carry, do not drag pipe to the trench. Store [plastic piping, jointing materials and] rubber gaskets that are not to be installed immediately, under cover out of direct sunlight. [Handle steel pipe with any coating in accordance with the recommendations of the manufacturer.]

PART 2 PRODUCTS

2.1 WATER DISTRIBUTION MAIN MATERIALS

NOTE: Allowable Piping Materials:

- 1. The project specification should allow all piping materials for water mains and for water service lines which are suitable for the project, each to be permitted as a Contractor's option.
- 2. Refer to the appropriate NAVFAC Design Manual on water supply systems for general information on piping materials suitable for use on water mains and on water service lines for water distribution systems.
- 3. Pipe materials which are known to be unsuitable for particular local conditions (i.e., corrosion, deterioration, etc.) should not be permitted for the project. However, consider use of more effective protective coatings, etc., where economically feasible.

2.1.1 Piping Materials

2.1.1.1 Ductile-Iron Piping

NOTE: Insert the necessary Pressure Class/Thickness Class to meet project conditions, as determined from EN 545 and ISO 2531.

- a. Pipe and Fittings: EN 545, ISO 2531 Pipe, [Pressure Class [____]] [Thickness Class [____]]. Fittings, fittings with push-on joint ends conforming to the same requirements as fittings with mechanical-joint ends, except that the bell design shall be modified, as approved, for push-on joint. Fittings shall have pressure rating at least equivalent to that of the pipe. Ends of

pipe and fittings shall be suitable for the specified joints.
Pipe and fittings shall have cement-mortar lining, UNI ISO 4179,
standard thickness.

b. Joints and Jointing Material:

NOTE: Push-on joint or mechanical joint may be used
except when the greater deflection afforded by the
mechanical joint (as compared to the push-on joint)
is considered necessary for all joints in the
distribution system. See AWWA C600 as a guide for
allowable deflection on each type of joint. Add
statement of maximum allowable deflection in
paragraph below. When mechanical joints, flanged
joints, mechanically coupled type joints using
sleeve-type mechanical couplings, grooved or
shouldered type joints, and insulating joints are
specified as exceptions to the basic jointing
method, their location(s) should be either indicated
on the project drawings or specified using
terminology consistent with that on the project
drawings.

NOTE: Do not locate flanged joints on buried
pipelines unless they are in valve pits or chambers.

(1) Joints: Joints for pipe and fittings shall be [push-on
joints] [or] [mechanical joints] [unless otherwise indicated].
[Provide mechanical joints where indicated.] [Provide flanged
joints where indicated.] [Provide mechanically coupled type
joints using a sleeve-type mechanical coupling where indicated.]
[Provide insulating joints where indicated.] [Joints made with
sleeve-type mechanical coupling may be used in lieu of push-on
joint, subject to the limitations specified in paragraph entitled
"Sleeve-Type Mechanical Couplings."]

(2) Push-On Joints: Shape of pipe ends and fitting ends,
gaskets, and lubricant for joint assembly, EN 681/1.

(3) Mechanical Joints: Dimensional and material requirements for
pipe ends, glands, bolts and nuts, and gaskets, UNI 9164.

(4) Flanged Joints: Bolts, nuts, and gaskets for flanged
connections as recommended EN 545, ISO 2531. Flange for
setscrewed flanges shall be of ductile iron, EN 545,
ISO 2531, and conform to the applicable requirements of UNI 2223.
Setscrews for setscrewed flanges shall be 1310 MPa tensile
strength, heat treated and zinc-coated steel. Gasket for
setscrewed flanges, in accordance with applicable requirements for
mechanical-joint gaskets specified in UNI 9164, EN 681/1, ISO 7483.

Design of setscrewed gasket shall provide for confinement and compression of gasket when joint to adjoining flange is made.

(5) Insulating Joints: Designed to effectively prevent metal-to-metal contact at the joint between adjacent sections of piping. Joint shall be of the flanged type with insulating gasket, insulating bolt sleeves, and insulating washers. Gasket shall be of the dielectric type, full face, and in other respects as recommended by EN 545, ISO 2531. Bolts and nuts, as recommended in ISO 2531.

(6) Sleeve-Type Mechanical Coupled Joints: As specified in paragraph entitled "Sleeve-Type Mechanical Couplings."

Acceptable Manufacturers

The following manufacturers generally meet the provisions of these specifications for ductile iron pipe and fittings:

a. ROMANA EDILIT PRIMA S.r.l.
Via Pier Vittorio Aldini, 41
00178 - Roma
Tel. 06/7267.0492/3

b. FERB
FIGLI di EZIO ROSSI S.p.A.
Via Cefalu' 24/6
20151 - Milano
Tel. 02/3085846

c. TUBI GHISA S.p.A.
Via Allegro, 1
16016 Cogoleto (GE)
Tel. 010/91711
Fax 010/9171401

d. MIVAL
Via Melzi d'Eril 26
20154 - Milano
Tel. 02/344242
Fax 02/341147

e. RIP
Via Reycend, 10
10148 - Torino
Tel. 011/2203444

2.1.1.2 Polyvinyl Chloride (PVC) Plastic Piping

NOTE: Use Pressure Class PN10 except when Pressure Class PN16 is necessary. See as guide Appendix A to AWWA C900. When due to external loading, pipe of greater strength than Class PN16 is required, do not

include PVC plastic water main pipe.

- a. Pipe and Fittings: Pipe, UNI 7441, Category PVC 60, PVC 100, shall be plain end or gasket bell end, Pressure Class [PN10] [PN16] with cast-iron-pipe-equivalent OD. Fittings shall be gray iron or ductile iron, ISO 2531, and have cement-mortar lining, UNI ISO 4179, standard thickness. Fittings with push-on joint ends shall conform to the same requirements as fittings with mechanical-joint ends, except that bell design shall be modified, as approved, for push-on joint suitable for use with PVC plastic pipe specified in this paragraph.
- b. Joints and Jointing Material: EN 681/1. Joints for pipe shall be push-on joints. Joints between pipe and metal fittings, valves, and other accessories shall be push-on joints, or compression-type joints/mechanical joints. Provide each joint connection with an elastomeric gasket suitable for the bell or coupling with which it is to be used. Gaskets for push-on joints for pipe. Gaskets for push-on joints and compression-type joints/mechanical joints for joint connections between pipe and metal fittings, valves, and other accessories, respectively, for push-on joints and mechanical joints. Mechanically coupled joints using a sleeve-type mechanical coupling, as specified in paragraph entitled "Sleeve-Type Mechanical Couplings," may be used as an optional jointing method in lieu of push-on joints on plain-end PVC plastic pipe, subject to the limitations specified for mechanically coupled joints using a sleeve-type mechanical coupling and to the use of internal stiffeners as specified for compression-type joints.

Acceptable Manufacturers

The following manufacturers generally meet the provisions of these specifications for PVC plastic piping and fittings:

- a. FITT S.p.A.
Via Astico 40
36030 Fara Vicentino (VI)
Tel. 0445/399111
Fax 0445/897593
- b. SOCIETA' DEL GRES
ING. SALA S.p.A.
Via Marconi, 1
24010 Petrosino (BG)
Tel. 035/579111
Fax 035/579342
- c. ROMANA EDILIT PRIMA S.r.l.
Via Pier Vittorio Aldini, 41
00178 - Roma
Tel. 06/7267.0492/3

- d. SIREA
Via Corriera 25
48010 - Ravenna
Tel. 0545/78008
Fax 0545/78790

2.1.1.3 Polyethylene (HDPE) Plastic Piping

Pipe and heat-fusion fittings shall conform to UNI 7611, UNI 7612.

Acceptable Manufacturers

The following manufacturers generally meet the provisions of these specifications for polyethylene (HDPE) piping and fittings:

- a. FITT S.p.A.
Via Astico 40
36030 Fara Vicentino (VI)
Tel. 0445/399111
Fax 0445/897593
- b. SOCIETA' DEL GRES
ING. SALA S.p.A.
Via Marconi, 1
24010 Petrosino (BG)
Tel. 035/579111
Fax 035/579342
- c. ROMANA EDILIT PRIMA S.r.l.
Via Pier Vittorio Aldini, 41
00178 - Roma
Tel. 06/7267.0492/3
- d. SIREA
Via Corriera 25
48010 - Ravenna
Tel. 0545/78008
Fax 0545/78790

2.1.1.4 Concrete Piping

NOTE: Verify pipe sizes required.

NOTE: Use 1000 kPa except when a higher pressure rating, up to 1400 kPa is necessary.

NOTE: Recommended: A minimum of 1.8 m 6 feet of earth cover for ordinary conditions. Delete this information when depth is indicated on the drawings.

- a. Piping and Fittings: [Prestressed steel cylinder [no cylinder] type reinforced concrete pipe, EN 642. Steel cylinder type

reinforced concrete pipe, not prestressed EN 641. Pretensioned steel cylinder type reinforced concrete pipe. Pipe shall be designed for the following minimum conditions:

Pressure rating - [_____] kPa

[Earth cover - [_____] mm

Water hammer - 40 percent of pressure rating

Live load - AASHTO H-20 H-20 truck loading

NOTE: In those parts of Italy where concrete pipe will be carrying sulfate-bearing waters or where concrete pipe will be buried in soils containing sulfates, specify concrete pipe manufactured using sulfate-resisting cement. Specify Type A (moderate sulfate resisting) cement when water-soluble sulfates (as SO₄) in the soil are in the range of 0.1 and 0.2 percent and, for water, are in the range of 150 to 1000 parts per million. Specify Type B (sulfate resisting) cement when soils contain in excess of 0.2 percent water-soluble sulfate and water samples contain in excess of 1000 parts per million sulfate. The availability of pipe made using Type B cement should be verified. In areas where reactive aggregates are known to occur, specify low alkali cement.

Do not order pipe until design calculations have been approved. Fittings shall conform to the same specification as that used for the pipe and shall be designed as specified for the pipe. [Cement used in the manufacture of the pipe and fittings shall be [Type A] [Type B] [low alkali cement] conforming to ENV 197-1] Identification marking for pipe and fittings shall include the pressure rating.

- b. Jointing Material: Gaskets shall be as specified in the referenced specification for the pipe.

Acceptable Manufacturers

The following manufacturers generally meet the provisions of these specifications for concrete piping and fittings:

- a. VANINI INDUSTRIA S.p.A.
Via Montello 10
00195 Roma
Tel. 06/396851
Fax 06/39685383

2.1.1.5 Steel Piping

NOTE: Verify availability of pipe sizes required.

NOTE: Delete "for underground lines" except when
aboveground water distribution mains are included in
the project.

NOTE: Delete requirements for lining of above
ground piping when above ground piping is not
included in project. When included, pipe and
fittings for above ground lines will be furnished
with lining only. Exterior protection for
aboveground piping should be specified in Section
09900, "Paints and Coatings."

- a. Pipe and Fittings: ISO 559, Type of Grade Material, Carbon Steel Fe 360 - Fe 410 - Fe 510. Pipe, dia. 150 mm and more. Fittings UNI ISO 3419. Pipe and fittings [for underground lines] shall have cement-mortar lining and [cement-mortar] [coal-tar enamel] [coal-tar epoxy] coating. [Pipe and fittings for above ground lines shall have cement-mortar lining.] Ends of pipe and fittings shall be suitable for the joints and jointing materials used.

NOTE: In the text below, use the first bracketed wording when the project designer calculates the wall thickness for steel pipe and fittings. Use the second bracketed wording when the wall thickness determination is required to be made by the manufacturer of the pipe. Wall thickness determination of steel pipe, when calculated by the project designer, should be performed in the same manner as specified when it is to be done by the manufacturer of the pipe.

NOTE: Use 1000 kPa 150 psi except when a higher pressure rating, up to 1400 kPa 200 psi is necessary.

NOTE: A minimum earth cover of 1.5 m 5 feet is recommended for ordinary conditions. Delete this information when depth is indicated on the drawings.

- b. Wall Thickness for Pipe and Fittings: [The minimum metal thickness for steel pipe wall shall be [_____] mm [_____] inch, based on steel having a yield strength of [_____] kPa [_____] psi.] [Wall thickness of steel pipe and fittings shall be determined by

the manufacturer of the pipe and calculated in the following manner. Design for the following minimum conditions:

- Pressure rating.....[_____] kPa [_____] psi
- [Earth cover.....[_____] mm ([_____] feet)]
- Water hammer.....40 percent of pressure rating
- Live load.....AASHTO H-20 H-20 truck loading
- Allowable deflection.....2 percent of nominal pipe diameter

NOTE: At the text below, see AWWA M11, Chapter 6, "External Load" for values of E'. In the calculation of wall thickness for steel water main pipe, the value of E' (modulus of solid reaction) should be based on realistic expectations of sidefill compaction rather than theoretical ones. The designer shall supply the value of E' below.

In Italy the value of the modulus of soil reaction is given by the following Table I:

TABLE I

Evaluation of Coefficient of Subgrade Reaction (Terzaghi)

Type of Soil	Subgrade Reaction Coefficient "K"	
Normally consolidated		
Coherent Rock	1 to 5	Kg/cm ³
Highly Consolidated		
Coherent Rock	15 to 25	Kg/cm ³
Highly Compacted Sand	> 15	Kg/cm ³
Compacted Sand	15 to 7.5	Kg/cm ³
Meanly Compacted Sand	7.5 to 3	Kg/cm ³
Meanly Loose Sand	3 to 1.25	Kg/cm ³
Loose Sand	1.25 to 0.4	Kg/cm ³
Very Loose Sand	< 0.4	Kg/cm ³
Compacted Gravel and Sand	10 to 30	Kg/cm ³

Calculate pipe wall thickness on the basis of an allowable fiber stress in the steel equal to 50 percent of the minimum yield strength of the steel used in the manufacture of the pipe. Design procedure shall be in accordance with the methods given in AWWA M11, Chapter 4, "Determination of Pipe Wall Thickness," Chapter 5, "Water Hammer and Pressure Surge," and Chapter 6, "External Load." The value of E', modulus of soil reaction, shall be [_____]. Do not order the pipe until calculations have been approved.] Wall thickness of fittings shall be not less than that required for the pipe. Fittings shall be designed to withstand the hydrostatic

pressure test specified herein in paragraphs entitled "Testing Procedure," and "Special Testing Requirements." When necessary to meet the pressure test requirements, fittings shall be reinforced. in accordance with methods given in AWWA M11, Chapter 13, "Supplementary Design Data and Details."

c. Joints and Jointing Materials

NOTE: At the text below, AWWA M11, Chapter 8, "Pipe Joints," contains detailed information on the various field jointing methods for steel piping.

NOTE: At the text below, delete requirements for and references to welded joints when not allowed for the project. Welded joints should not be allowed for piping less than 600 mm 24 inches in diameter.

NOTE: Under ordinary conditions, steel water pipe and fittings in the sizes included in water distribution systems covered by this specification are furnished with factory-applied cement-mortar lining. In-place cement-mortar lining for new construction is not recommended.

(1) Joints: Joints for pipe and fittings shall be rubber-gasketed bell-and-spigot joints [, welded joints,] or the mechanically coupled type using a sleeve-type mechanical coupling [, unless otherwise specified]. [Provide flanged joints where indicated.] [Provide mechanically coupled type joints using a sleeve type mechanical coupling where indicated.] [Joints shall be [grooved] [or] [shouldered] type where indicated.] [Provide insulating joints where indicated.] [[Grooved] [or] [shouldered] type joints may be used in lieu of flanged joints.]

(2) Rubber-Gasketed Bell-and-Spigot Joints: Design of joints and pipe ends shall be in accordance with the pipe manufacturer's standard for this type of joint, as approved, except that the joint shall also meet the requirements specified for rubber-gasketed joints and rubber gaskets in ISO 559.

NOTE: At the text below, delete requirements for and references to welded joints when not allowed for the project. Welded joints should not be allowed for piping less than 600 mm 24 inches in diameter.

(3) Welded Joints: Electrodes shall be of the quality specified in UNI 4545.

(4) Sleeve-Type Mechanical Coupled Joints: As specified in paragraph entitled "Sleeve-Type Mechanical Couplings."

NOTE: At the text below, use Class D flanges when maximum working pressure is 1200 kPa 175 psi or less in lines 300 mm 12 inches in diameter and smaller, or 1000 kPa 150 psi or less in lines larger than 300 mm 12 inches in diameter. For higher working pressures, use Class E flanges.

(5) Flanged Joints: ISO 7005-1. Provide pipe ends with steel flanges(Class D or Class E as per AWWA C207). Bolts and nuts for flanged connections,(as per AWWA C207). Rubber gaskets,(as per AWWA C207); asbestos gaskets will not be allowed.

(6) Insulating Joints: Design to prevent metal-to-metal contact at the joint between adjacent sections of piping. Joint shall be of the flanged type with insulating gasket, insulating bolt sleeves, and insulating washers. Gasket shall be of the dielectric type, full face, and in other respects as recommended by the manufacturer of the steel pipes. Bolts and nuts shall be as recommended by the manufacturer of the steel pipes.

d. Lining [and Coating]:

NOTE: Under ordinary conditions, steel water pipe and fittings in the sizes included in water distribution systems covered by this specification are furnished with factory-applied cement-mortar lining. In-place cement-mortar lining for new construction is not recommended.

(1) Cement-Mortar Lining: AWWA C205, shop-applied.

(2) Cement-Mortar Coating: AWWA C205, shop-applied.

NOTE: Use coal-tar enamel coating with double felt wraps instead of single layer of felt wrap where soil in which pipe is to be buried as classified as Group IV, Unusually Corrosive (as defined in AWWA M11, Chapter 10, "Principles of Corrosion and Corrosion Control") or as Class 4, Extreme (as defined in NAVFAC Design Manual on water supply systems; or where electrical resistivity of soil has been measured at less than 2,000 ohms/cc.

(3) Coal-Tar Enamel Coating: ISO 5256. Except as otherwise specified, prepare, prime, and coat piping with hot-applied coal-tar enamel and a bonded [single layer of felt wrap] [double felt wraps]. Asbestos felt shall not be used; felt material

shall be fibrous-glass mat. Shop-apply coating.

Acceptable Manufacturers

The following manufacturers generally meet the provisions of these specifications for steel pipes and fittings:

- a. DALMINE
TUBI INDUSTRIALI S.r.l.
P.zza Caduti 6 luglio 1944
24044 Dalmine (NA)
Tel. 081/8614442
- b. RIP
Via Reycend, 10
10148 - Torino
Tel. 011/2203444
- c. TUBI GHISA S.p.A.
Via Allegro, 1
16016 Cogoleto (GE)
Tel. 010/91711
Fax 010/9171401

2.1.2 Valves, Hydrants, and Other Water Main Accessories

2.1.2.1 Gate Valves [on Buried Piping]

 NOTE: For Fire Protection Service valves in systems on which pipe is pressure rated at 1000 kPa 150 psi use a working pressure of 1200 kPa 175 psi for valve sizes 300 mm 12 inches and smaller, and 1000 kPa 150 psi for valves larger than 300 mm 12 inches.

 NOTE: Delete all requirements involving gearing when no valves 400 mm 16 inch size and larger as specified in this paragraph are included in the project. Indicator should be required for geared valves where valve is in location where gate position cannot readily be seen.

 NOTE: Delete requirements for bypasses when no valves 400 mm 16 inch size and larger as specified in this paragraph are included in the project. Fill in blank with each valve size 400 mm 16 inches and larger included in the project.

 NOTE: Add the following requirement in areas where

it is known that the local water promotes galvanic corrosion in the form of dezincification or dealuminumization: "Bronze used in valves shall be Grade A, Grade D, or Grade E as specified in" (for Water Main Gate Valves) "AWWA C500 or AWWA C509"; (for Water Main Check Valves) "AWWA C508"; (for Water Service Line Gate Valves 80 mm 3 Inch Size and Larger) "AWWA C500."

Add the following requirement when a protective interior coating is considered necessary for corrosion protection: "Valves shall have a protective epoxy interior coating. conforming to AWWA C550." Insert the latest publication of AWWA C550, "Protective Epoxy Interior Coatings for Valves and Hydrants" in paragraph entitled "References." Protective coating should be required on all valves whose interiors are exposed to sea water or salt water, or where there is a serious corrosion problem other than galvanic corrosion.

EN 558-1, EN 558-2, DN values 40 to 600 mm, Classes NP 6-10-16-25-40-64.
Unless otherwise specified: (1) Metal-seated valves shall be nonrising stem type with double-disc gates and mechanical-joint ends or push-on joint ends as appropriate for the adjoining pipe, (2) Resilient-seated gate valves shall be nonrising stem type with mechanical-joint ends, and (3) Gate valves for Fire Protection Service shall be inside-screw type with operating nut, double-disc or split-wedge type gate, designed for a hydraulic working pressure of [_____] kPapsi, and shall have mechanical-joint ends or push-on joint ends as appropriate for the pipe to which it is joined. Materials for Fire Protection Service gatevalves shall conform to the reference standards specified for metal seated gate valves. Valves shall open by counterclockwise rotation of the valve stem. Stuffing boxes shall have o-ring stem seals [, except for those valves for which gearing is specified, in which case use conventional packing in place of o-ring seal]. Stuffing boxes shall be bolted and constructed so as to permit easy removal of parts for repair. In lieu of mechanical-joint ends and push-on joint ends, valves may have special ends for connection to [cement piping or to] sleeve-type mechanical coupling. Valve ends and gaskets for connection to [cement piping or to] sleeve-type mechanical coupling shall conform to the applicable requirements specified [respectively] for the [joint or] coupling. [Where a post indicator is shown, the valve shall have an indicator post flange; indicator post flange for metal seated gate valves shall conform to the applicable requirements of Fire Protection Service gate valves.] [Provide [_____] mm [_____] inch size valves with gearing [and indicators]. [Provide [_____] mm [_____] inch size valves with bypasses. Valves shall be of one manufacturer.

2.1.2.2 Gate Valves [in Valve Pit(s)] [and] [Above Ground Location]

NOTE: For ordinary conditions, outside-screw-and-yoke rising-stem type is preferred to nonrising stem/inside-screw type.

NOTE: For ordinary conditions, the double-disc or split-wedge type gate is preferred to the solid-wedge/solid or one-piece gate.

NOTE: For Fire Protection Service valves in system on which pipe is pressure rated at 1000 kPa, 150 psi, use a working pressure of 1200 kPa 175 psi for valve sizes 300 mm 12 inches and smaller, and 1000 kPa 150 psi for valves larger than 300 mm. 12 inches.

NOTE: Delete all requirements involving gearing when no valves 400 mm 16 inch size and larger as specified in this paragraph are included in the project. Indicator should be required for geared valves where valve is in location where gate position cannot readily be seen.

NOTE: Delete requirements for bypasses when no valves 400 mm 16 inch size and larger as specified in this paragraph are included in the project. Fill in blank with each valve size 400 mm 16 inches and larger included in the project.

NOTE: Add the following requirement in areas where it is known that the local water promotes galvanic corrosion in the form of dezincification or dealuminumization: "Bronze used in valves shall be Grade A, Grade D, or Grade E as specified in" (for Water Main Gate Valves) "AWWA C500 or AWWA C509"; (for Water Main Check Valves) "AWWA C508"; (for Water Service Line Gate Valves 80 mm 3 inch Size and Larger) "AWWA C500."

Add the following requirement when a protective interior coating is considered necessary for corrosion protection: "Valves shall have a protective epoxy interior coating conforming to AWWA C550." Insert the latest publication of AWWA C550, "Protective Epoxy Interior Coatings for Valves and Hydrants" in paragraph entitled "References." Protective coating should be required on all valves whose interiors are exposed to sea water or salt water, or where there is a serious corrosion problem

other than galvanic corrosion.

EN 558-1, EN 558-2. Unless otherwise specified: (1)Metal-seated gate valves shall be [outside-screw-and-yoke rising-stem] [nonrising stem] type with [double-disc] [solid-wedge] gates and flanged ends, (2)Resilient seated gate valves shall be [outside-screw-and-yoke rising-stem] [nonrising stem] type with flanged ends, and (3)Fire protection service gate valves shall be [outside-screw-and-yoke] [inside-screw] type, shall have [double-disc or split-wedge] [solid or one-piece] type gate and flanged ends, and shall be designed for a hydraulic working pressure of [_____] kPa. [_____] psi.. Materials for fire protection service gate valves valves shall conform to the reference standards specified for metal-seated gate valves. [Valves [_____] mm [_____] inch size] shall be nonrising stem type or inside-screw type [where indicated].] [Valves [[_____] mm [_____] inch size] shall have solid-wedge gates or solid or one-piece type gates [where indicated].] Provide valves with handwheels that open by counterclockwise rotation of the valve stem. Stuffing boxes shall be bolted and constructed so as to permit easy removal of parts for repair. In lieu of flanged ends, valves may have [grooved] [or] [shouldered] ends suitable for [grooved] [or] [shouldered] type joints, as specified in paragraph entitled "Ductile-Iron Piping." [Valves [_____] mm [_____] inch size shall have gearing [and indicator]. [Provide [_____] mm [_____] inch size valve with bypasses.] Valves shall be of one manufacturer.

2.1.2.3 Check Valves

NOTE: Add the following requirement in areas where it is known that the local water promotes galvanic corrosion in the form of dezincification or dealuminumization: "Bronze used in valves shall be Grade A, Grade D, or Grade E as specified in" (for Water Main Gate Valves) "AWWA C500 or AWWA C509"; (for Water Main Check Valves) "AWWA C508"; (for Water Service Line Gate Valves 80 mm 3 Inch Size and Larger) "AWWA C500."

Add the following requirement when a protective interior coating is considered necessary for corrosion protection: "Valves shall have a protective epoxy interior coating. conforming to AWWA C550." Insert the latest publication of AWWA C550, "Protective Epoxy Interior Coatings for Valves and Hydrants" in paragraph entitled "References." Protective coating should be required on all valves whose interiors are exposed to sea water or salt water, or where there is a serious corrosion problem other than galvanic corrosion.

EN 558-1, EN 558-2, DN values 40 to 500 mm, Classes NP 10-16-40. Swing-check type, valve or check valve for Fire Protection Services. (1)Swing check valve shall have iron or steel body and cover and flanged

ends, and (2) Check valve for fire protection services shall have cast iron or steel body and cover, flanged ends, and designed for a working pressure of [_____] kPa. psi. Materials for Check valves for Fire Protection Services shall conform to the reference standards specified for swing check valves. Valves shall have clear port opening. [Valves shall be [spring-loaded] [weight-loaded] [where indicated].] In lieu of flanged ends, valves may have [grooved] [or] [shouldered] ends suitable for [grooved] [or] [shouldered] type joints, as specified in paragraph entitled "Ductile-Iron Piping." Valves shall be of one manufacturer.

2.1.2.4 Fire Hydrants

NOTE: Standard for hydrants are Italian Vigili del Fuoco UNI System pipe threads on hose and pumper connections and operating nut and cap nuts. For the purposes of this guide specification, these threads and nuts will be defined as standard threads and nuts. Thread dimensions other than Italian Vigili del Fuoco UNI System threads and operating nut and cap nuts differing in size and shape from that described above will be defined as nonstandard threads and nuts.

In accordance with the Italian laws and decrees, the requirements for fire hydrants efficiency is established by a minimum water pressure given in bar pressure units (1 bar = 10 raised to the fifth power Pa) measured at the nozzle of the hydrant. The value of this pressure varies according to each particular type of building. For example: for civil buildings the minimum water pressure required is 1.5 bars, for garages is 2.0 bars, for theater, cinemas is 3.0 bars and so on.

Stand pipe hydrants and flush-type hydrants. [, except that flush-type hydrants shall be provided where indicated].

NOTE: For the following locations specify Italian hydrants by selecting UNI 9485 and the first set of bracketed connections:

- Capodichino Support Site
- Gaeta
- La Maddelena
- Livorno

For the following locations specify U.S. hydrants by selecting AWWA C502, AWWA C503 or UL 246 and the second set of bracketed connections:

Capodichino
Sigonella NAS I and NAS II

For projects at Aviano, select UNI 9485 and the third set of bracketed connections.

For these locations and those not listed, contact the station fire department and/or fire protection engineer to confirm the type of hydrant and connections required.

- a. [UNI 9485, except as modified herein][AWWA C502, AWWA C503 or UL 246]. Stand Pipe Frost Proof Type Fire Hydrants: Hydrant design shall have a 150 mm 6 inch inlet, [one 100 mm 4 inch pumper connection, and two 65 mm 2 1/2 inch hose connections, both pumper and hose connections shall have threads complying with UNI 810. Provide the station fire department with adaptors which allow connections of a 115 mm 4 1/2 inch pumper connection and 65 mm 2 1/2 inch hose connections, both pumper and hose adaptors shall convert to U.S. National Standard Threads (NST).][one 115 mm 4 1/2 inch pumper connection, and two 65 mm 2 1/2 inch hose connections, both pumper and hose connections shall have U.S. National Standard Threads (NST). Provide the local municipal fire department with adaptors which allow connections of a 100 mm 4 inch pumper connection and 65 mm 2 1/2 inch hose connections, both pumper and hose adaptors shall convert to threads complying with UNI 810.][one 125 mm 5 inch hydrostortz female connection with U.S. National Standard Threads (NST), one 65 mm 2 1/2 inch hose connection with (NST), and one 70 mm 2 3/4 inch hose connection with threads complying with UNI 810.] Inlet shall have [mechanical-joint or push-on joint end] [mechanical-joint end only] [, except where flanged end is indicated]; end shall conform to the applicable requirements as specified for the joint. Size and shape of operating nut, cap nuts, and threads on hose and pumper connections shall be as indicated. [Hydrants indicated as "traffic type," shall have breakable features. The traffic type hydrant shall have special couplings joining upper and lower sections of hydrant barrel [and upper and lower sections of hydrant stem] and shall be designed to have the special couplings break from a force not less than that which would be imposed by a moving vehicle; hydrant shall operate properly under normal conditions.] Fire hydrant shall have a total water flow per nozzle of 57 cubic meter/hour. Paint hydrants with at least one coat of primer and two coats of yellow enamel paint, except use red enamel paint for tops of hydrants in non-potable water systems. Stencil hydrant number and main size on the hydrant barrel using black stencil paint. Hydrant numbers shall be approved by the Contracting Officer prior to stenciling.

NOTE: Add the last bracketed sentence when a protective interior coating is considered necessary for corrosion protection. See Note H located at

rear of text for guidance.

- b. [UNI 9486, except as modified herein][AWWA C502, AWWA C503 or UL 246]. Flush-Type Fire Hydrants: Hydrants shall be of a design that will permit placement of hydrant below surface of pavement. Hydrants shall have 150 mm 6 inch inlet, 108 mm 4 1/4 inch minimum valve opening, [one 100 mm 4 inch pumper connection, and two 65 mm 2 1/2 inch hose connections, both pumper and hose connections shall have threads complying with UNI 810. Provide the station fire department with adaptors which allow connections of a 115 mm 4 1/2 inch pumper connection and 65 mm 2 1/2 inch hose connections, both pumper and hose adaptors shall convert to U.S. National Standard Threads (NST).][one 115 mm 4 1/2 inch pumper connection, and two 65 mm 2 1/2 inch hose connections, both pumper and hose connections shall have U.S. National Standard Threads (NST). Provide the local municipal fire department with adaptors which allow connections of a 100 mm 4 inch pumper connection and 65 mm 2 1/2 inch hose connections, both pumper and hose adaptors shall convert to threads complying with UNI 810][one 125 mm 5 inch hydrostortz female connection with U.S. National Standard Threads (NST), one 65 mm 2 1/2 inch hose connection with (NST), and one 70 mm 2 3/4 inch hose connection with threads complying with UNI 810.]
- Hose and pumper connections and operating nuts shall be readily accessible, and enclosed in a cast iron box with top flush with pavement and having cast-iron cover with flush lifting handle. Inlet shall have mechanical-joint or push-on joint end [, except where flanged end is indicated]. Size and shape of operating nut and cap nuts and threads on hose and pumper connections shall be as indicated.[Hydrants shall have a protective epoxy interior coating conforming to AWWA C550 on those portions continuously in contact with sea water or salt water.]

2.1.2.5 Indicator Posts

Provide for gate valves where indicated.

2.1.2.6 Valve Boxes

Provide a valve box for each gate valve [on buried piping] [, except where indicator post is shown]. Valve boxes shall be of cast iron or precast concrete of a size suitable for the valve on which it is to be used and shall be adjustable. Provide a round head. Cast the word "WATER" on the lid. The least diameter of the shaft of the box shall be 135 mm 5 1/4 inches. [as indicated]. Cast-iron box shall have a heavy coat of bituminous paint.

2.1.2.7 Sleeve-Type Mechanical Couplings

NOTE: Delete "or steel" when middle ring of cast iron only is considered necessary due to anticipated corrosion problems.

 NOTE: Minimum numbers of bolts for each pipe size
 should be as follows: 80 mm 3 inch, 3; 100 mm 4 inch,
 4; 150 mm 6 inch, 5; 200 mm 8 inch, 6; 250 mm 10 inch,
 7; 300 mm 12 inch and 350 mm 14 inch, 8; 400 mm 16
 inch, 9; 450 mm 18 inch, 10; 500 mm 20 inch, 12; 550
 mm 22 inch, 13; 600 mm 24 inch, 14.)

Couplings shall be designed to couple plain-end piping by compression of a ring gasket at each end of the adjoining pipe sections. The coupling shall consist of one middle ring flared or beveled at each end to provide a gasket seat; two follower rings; two resilient tapered rubber gaskets; and bolts and nuts to draw the follower rings toward each other to compress the gaskets. The middle ring and the follower rings shall be true circular sections free from irregularities, flat spots, and surface defects; the design shall provide for confinement and compression of the gaskets. [For [ductile iron] [and] [PVC plastic] pipe, the middle ring shall be of cast-iron [or steel; and the follower rings shall be of malleable or ductile iron]]. [For steel piping, the middle ring shall be of steel and the follower rings shall be of steel or malleable iron.] [Cast iron, ISO 13, not less than Class 25.] Malleable and ductile iron shall, conform to ISO 13 and EN 545 and ISO 2531, respectively. [Steel shall have a strength not less than that of the pipe.] Gaskets shall be designed for resistance to set after installation and shall meet the applicable requirements specified for gaskets for mechanical joint in EN 681/1. Bolts shall be track-head type, ISO 8992, with nuts, ISO 8992, ASTM A 563 or round-head square-neck type bolts, ISO 8992 with hex nuts. Bolts shall be 16 mm 5/8 inch in diameter; minimum number of bolts for each coupling shall be [_____] [for [_____] mm [_____] inch pipe [, [_____] for [_____] mm [_____] inchpipe,] [and] [_____] for [_____] mm [_____] inch pipe]. Bolt holes in follower rings shall be of a shape to hold fast the necks of the bolts used. Mechanically coupled joints using a sleeve-type mechanical coupling shall not be used as an optional method of jointing except where pipeline is adequately anchored to resist tension pull across the joint.

2.1.2.8 Acceptable Manufacturers

The following manufacturers generally meet the provisions of these specifications for valves, fire hydrants, indicator posts, valve boxes and other water main accessories:

- a. VALVOTUBI S.r.l.
 Via S. Monte 30/B
 48100 Ravenna
 Tel. 0544/452279
- b. RIP
 Via Reycend, 10
 10148 - Torino
 Tel. 011/2203444
- c. FUTURA S.r.l.

Loc. Molino, 30
61020 Belforte all'Isauro
Tel. 0722/721075-721075

d. LA POLITERMICA
S.C.A.R.L.
Via Macello, 51
39100 Bolzano
Tel. 0471/971430

e. TUBI GHISA S.p.A.
Via Allegro, 1
16016 Cogoleto (GE)
Tel. 010/91711
Fax 010/9171401

f. MIVAL
Via Melzi d'Eril 26
20154 - Milano
Tel. 02/344242
Fax 02/341147

2.1.2.9 Tracer Wire for Nonmetallic Piping

NOTE: As an option, warning tape as specified in Section 02302, "Excavation, Backfilling, and Compacting for Utilities," may be used.

Provide bare copper or aluminum wire not less than 2.5 mm 0.10 inch in diameter in sufficient length to be continuous over each separate run of nonmetallic pipe.

2.2 WATER SERVICE LINE MATERIALS

NOTE: This specification does not contemplate maximum working pressures in service lines which would require piping and valves of pressure rating exceeding 1000 kPa 150 psi. However, should the need arise for small-diameter pipelines to operate at working pressures exceeding 1000 kPa 150 psi, consult the various pipe, fitting, and valve specifications used herein to determine the proper pressure rating designation for the given material at the higher pressure, and modify the appropriate paragraphs to the extent necessary.

2.2.1 Piping Materials

2.2.1.1 Copper Pipe and Associated Fittings

Pipe, EN 1057, regular, threaded ends. Fittings shall be brass or bronze,

825 kPa 125 pound.

2.2.1.2 Copper Tubing and Associated Fittings

Tubing, EN 1057. Fittings for solder-type joint, ISO 2016; fittings for compression-type joint, flared tube type.

2.2.1.3 Acceptable Manufacturers

The following manufacturers generally meet the provisions of these specifications for copper pipe and copper tubing and associated fittings:

- a. EUROPA METALLI (SANCO)
Strada 4, Palazzo A2
20090 - Assago (MI)
Tel. 02/575531
- b. RIP
Via Reycend, 10
10148 - Torino
Tel. 011/2203444

2.2.1.4 Plastic Piping

Plastic pipe and fittings shall bear the seal of the National Sanitation Foundation for potable water service. Plastic pipe and fittings shall be supplied from the same manufacturer.

**NOTE: In the text below, delete bracketed wording
where piping is to be installed at or exposed to
temperatures below 4.5 degrees C 40 degrees F.**

- a. Polyvinyl Chloride (PVC) Plastic Piping: UNI 7441, ISO 4422-1 and ISO 4422-2 as necessary to provide 1000 kPa 150 psi minimum pressure rating. Fittings, ISO 4422-3. Pipe and fittings shall be of the same PVC plastic material. Solvent cement for jointing, in accordance with pipe manufacturer recommendations.

Acceptable Manufacturers

The following manufacturers generally meet the provisions of these specifications for PVC plastic piping and fittings:

- a. FITT S.p.A.
Via Astico 40
36030 Fara Vicentino (VI)
Tel. 0445/399111
Fax 0445/897593
- b. SOCIETA' DEL GRES
ING. SALA S.p.A.
Via Marconi, 1

24010 Petrosino (BG)
Tel. 035/579111
Fax 035/579342

2.2.1.5 Steel Pipe and Associated Fittings

**NOTE: Delete requirements for and references to
steel pipe and associated fittings for
LANTNAVFACENGCOM projects.**

Pipe ISO 559, Standard Weight, zinc-coated UNI 5745. Fittings, EN 545,
zinc coated; or EN 545 zinc coated, threaded.

Acceptable Manufacturers

The following manufacturers generally meet the provisions of these
specifications for steel piping and associated fittings:

- a. DALMINE
TUBI INDUSTRIALI S.r.l.
P.zza Caduti 6 luglio 1944
24044 Dalmine (NA)
Tel. 081/8614442

- b. RIP
Via Reycend, 10
10148 - Torino
Tel. 011/2203444

2.2.1.6 Insulating Joints

Joints between pipe of dissimilar metals shall have a rubber-gasketed or
other suitable approved type of insulating joint or dielectric coupling
which will effectively prevent metal-to-metal contact between adjacent
sections of piping.

Acceptable Manufacturers

The following manufacturers generally meet the provisions of these
specifications for insulating joints:

- a. RIP
Via Reycend, 10
10148 - Torino
Tel. 011/2203444

- b. MIVAL
Via Melzi d'Eril 26
20154 - Milano
Tel. 02/344242
Fax 02/341147

2.2.2 Water Service Line Appurtenances

2.2.2.1 Corporation Stops

NOTE: Delete the paragraph when there is no water service piping of 50 mm 2 inch diameter or less included in the project.

Ground key type; bronze, and suitable for the working pressure of the system. Ends shall be suitable for solder-joint, or flared tube compression type joint. Threaded ends for inlet and outlet of corporation stops; coupling nut for connection to flared copper tubing, ISO 2016.

2.2.2.2 Curb or Service Stops

NOTE: Delete this paragraph when there is no water service piping of 40 mm 1 1/2 inch diameter or less included in the project.

Ground key, round way, inverted key type; made of bronze, either steam, valve, composition bronze or ounce metal castings; and suitable for the working pressure of the system. Ends shall be as appropriate for connection to the service piping. Arrow shall be cast into body of the curb or service stop indicating direction of flow.

2.2.2.3 Goosenecks

Type K copper tubing. Joint ends for goosenecks shall be appropriate for connecting to corporation stop and service line. [Where multiple gooseneck connections are required for an individual service, goosenecks shall be connected to the service line through a suitable approved brass or bronze branch connection; the total clear area of the branches shall be at least equal to the clear area of the service line.] Length of goosenecks shall be in accordance with standard practice.

2.2.2.4 Acceptable Manufacturers

The following manufacturers generally meet the provisions of these specifications for corporation stop, curb or service stops and goosenecks:

- a. RIP
Via Reycend, 10
10148 - Torino
Tel. 011/2203444

- b. FUTURA S.r.l.
Loc. Molino, 30
61020 Belforte all'Isauro
Tel. 0722/721075-721075

c. MIVAL
Via Melzi d'Eril 26
20154 - Milano
Tel. 02/344242
Fax 02/341147

2.2.2.5 Gate Valves [on Buried Piping]

Add the following requirement in areas where it is known that the local water promotes galvanic corrosion in the form of dezincification or dealuminumization: "Bronze used in valves shall be Grade A, Grade D, or Grade E as specified in" (for Water Main Gate Valves) "AWWA C500 or AWWA C509"; (for Water Main Check Valves) "AWWA C508"; (for Water Service Line Gate Valves 80 mm 3 inch Size and Larger) "AWWA C500."

Add the following requirement when a protective interior coating is considered necessary for corrosion protection: "Valves shall have a protective epoxy interior coating. conforming to AWWA C550." Insert the latest publication of AWWA C550, "Protective Epoxy Interior Coatings for Valves and Hydrants" in paragraph entitled "References." Protective coating should be required on all valves whose interiors are exposed to sea water or salt water, or where there is a serious corrosion problem other than galvanic corrosion.

EN 558-1, EN 558-2. Metal seated gate valves 80 mm 3 inch size up to 100 mm 4 inch size [on buried piping] or Fire Protection Service gate valves and of one manufacturer. Metal seated gate valves, nonrising stem type with double-disc gates. Fire Protection Service gate valves, inside-screw type with operating nut, split wedge or double disc type gate, and designed for a hydraulic working pressure of 1200 kPa. 175 psi. Materials for Fire Protection Service gate valves conforming to the reference standards specified for metal seated gate valves. Valves shall open by counterclockwise rotation of the valve stem. Stuffing boxes shall have o-ring stem seals and shall be bolted and constructed so as to permit easy removal of parts for repair. [Valves [on [_____] mm inch service lines] shall have threaded ends.] [Valves [on [_____] mm inch service lines] shall have ends suitable for joining to the pipe used; [push-on joint ends or mechanical-joint ends for joining to ductile-iron pipe] [or] [push-on joint ends or mechanical-joint ends for joining to PVC plastic water main pipe]; gaskets and pipe ends, EN 681/1].

2.2.2.6 Gate Valves [on Buried Piping]

Gate valves smaller than 80 mm 3 inch size [on Buried Piping] Class 150, solid wedge, nonrising stem. Valves shall have flanged or threaded end connections, with a union on one side of the valve. Provide handwheel

operators.

2.2.2.7 Gate Valve 80 mm 3 inch Size Up to 100 mm 4 inch Size

NOTE: Add the following requirement in areas where it is known that the local water promotes galvanic corrosion in the form of dezincification or dealuminumization: "Bronze used in valves shall be Grade A, Grade D, or Grade E as specified in" (for Water Main Gate Valves) "AWWA C500 or AWWA C509"; (for Water Main Check Valves) "AWWA C508"; (for Water Service Line Gate Valves 80 mm 3 inch Size and Larger) "AWWA C500."

Add the following requirement when a protective interior coating is considered necessary for corrosion protection: "Valves shall have a protective epoxy interior coating. Protective coating should be required on all valves whose interiors are exposed to sea water or salt water, or where there is a serious corrosion problem other than galvanic corrosion.

The three optional bracketed wordings concerning gate type (double-disc or solid-wedge/one-piece) in the second and the third sentences should be used as follows: first optional wording only, second optional wording only, or first and third optional wordings together, depending on the gate type(s) needed for the project (each third optional wording runs from "except" to end of sentence). When a gate valve is installed in an upside down position, the solid wedge type gate should be specified, since the double-disc type does not seat properly in this position.

EN 558-1, EN 558-2. Metal seated gate valves 80 mm 3 inch size up to 100 mm 4 inch size in [valve chambers] [valve pits] [and] [aboveground locations], or Fire Protection Service gate valves and of one make. (1) Metal seated gate valves shall be outside-screw-and-yoke rising-stem type with flanged ends and [double-disc] [solid-wedge] gates [, except that valves [_____] mm size] shall have solid-wedge gates [where indicated], and (2) Fire Protection Service gate valves shall be outside-screw-and-yoke type, shall be designed for a hydraulic working pressure of 1200 kPa 175 psi, and shall have flanged ends and [double-disc or split-wedge] [solid or one-piece] type gate [, except that valves [_____] mm inch size] shall have solid or one-piece type gate [where indicated]. Materials for Fire Protection Service gate valves shall conform to the reference standards specified in metal seated gate valves. Provide valves with handwheels that open by a counterclockwise rotation of the valve stem. Stuffing boxes shall be bolted and constructed so as to permit easy removal of parts for repair.

2.2.2.8 Gate Valves Smaller Than 80 mm 3 Inch Size in Valve Pits

Bronze, gate, globe, angle and check valves, DN values in millimeters, Classes NP 10-16-20, shall be solid wedge, inside screw, rising stem. Valves shall have flanged end connections, with a union on one side of the valve and a handwheel operator.

2.2.2.9 Gate Valves Smaller Than 80 mm 3 Inch Size in Valve Pits

Bronze, gate, globe, angle and check valves, DN values in inches, Classes NP 10-16-20, shall be solid wedge, inside screw, rising stem. Valves shall have threaded end connections, with a union on one side of the valve and a handwheel operator.

2.2.2.10 Curb Boxes

Provide a curb box for each curb or service stop. Curb boxes shall be of cast iron of a size suitable for the stop on which it is to be used. Provide a round head. Cast the word "WATER" on the lid. Each box shall have a heavy coat of bituminous paint.

2.2.2.11 Valve Boxes

Provide a valve box for each gate valve [on buried piping]. Valve boxes shall be of [cast iron] [or] [precast concrete] [as indicated] of a size suitable for the valve on which it is to be used and shall be adjustable. Provide a round head. Cast the word "WATER" on the lid. The least diameter of the shaft of the box shall be [135 mm] [5 1/4 inches] [as indicated]. [Cast-iron box shall have a heavy coat of bituminous paint.]

2.2.2.12 Acceptable Manufacturers

The following manufacturers generally meet the provisions of these specifications for gate valves, curb boxes and valve boxes:

- a. RIP
Via Reycend, 10
10148 - Torino
Tel. 011/2203444
- b. MIVAL
Via Melzi d'Eril 26
20154 - Milano
Tel. 02/344242
Fax 02/341147
- c. VALVOTUBI S.r.l.
Via S. Monte 30/B
48100 Ravenna
Tel. 0544/452279
- d. FUTURA S.r.l.
Loc. Molino, 30
61020 Belforte all'Isauro

PART 3 EXECUTION

3.1 INSTALLATION OF PIPELINES

3.1.1 General Requirements for Installation of Pipelines

These requirements shall apply to all pipeline installation except where specific exception is made in the "Special Requirements..." paragraphs.

3.1.1.1 Location of Water Lines

[Terminate the work covered by this section at a point approximately 1.5 m 5 feet from the building [, unless otherwise indicated]. [Do not lay water lines in the same trench with [gas lines] [fuel lines] [or] [electric wiring].]

a. Water Piping Installation Parallel With Sewer Piping

(1) Normal Conditions: Lay water piping at least 3.0 m 10 feet horizontally from a sewer line or sewer manhole whenever possible. Measure the distance edge-to-edge.

(2) Unusual Conditions: When local conditions prevent a horizontal separation of 3.0 m 10 feet, the water piping may be laid closer to a sewer or sewer manhole provided that:

(a) The bottom (invert) of the water piping shall be at least 450 mm 18 inches above the top (crown) of the sewer piping.

(b) Where this vertical separation cannot be obtained, the sewer piping shall be constructed of ductile iron water pipe and pressure tested in place without leakage prior to backfilling.

(c) The sewer manhole shall be of watertight construction and tested in place.

b. Installation of Water Piping Crossing Sewer Piping

(1) Normal Conditions: Water piping crossing above sewer piping shall be laid to provide a separation of at least 450 mm 18 inches between the bottom of the water piping and the top of the sewer piping.

(2) Unusual Conditions: When local conditions prevent a vertical separation described above, use the following construction:

(a) Sewer piping passing over or under water piping shall be constructed of ductile iron water piping, pressure tested in place without

leakage prior to backfilling.

(b) Water piping passing under sewer piping shall, in addition, be protected by providing a vertical separation of at least 450 mm 18 inches between the bottom of the sewer piping and the top of the water piping; adequate structural support for the sewer piping to prevent excessive deflection of the joints and the settling on and breaking of the water piping; and that the length, minimum 6.1 m 20 feet, of the water piping be centered at the point of the crossing so that joints shall be equidistant and as far as possible from the sewer piping.

c. Sewer Piping or Sewer Manholes: No water piping shall pass through or come in contact with any part of a sewer manhole.]

3.1.1.2 Earthwork

NOTE: Earthwork requirements for pipe trenches, including bedding, are covered in Section 02302, "Excavation, Backfilling, and Compacting for Utilities." The applicable requirements for exterior water distribution system which are set forth in Section 02315, "Excavation and Fill", must be incorporated into the project specification, whether in Section 02315, "Excavation and Fill", or in an all-inclusive earthwork section. The above referenced section number and title is subject to change. The specifier should verify the current appropriate specification and revise as necessary if different.

Perform earthwork operations in accordance with Section [_____, "_____."]

3.1.1.3 Pipe Laying and Jointing

Remove fins and burrs from pipe and fittings. Before placing in position, clean pipe, fittings, valves, and accessories, and maintain in a clean condition. Provide proper facilities for lowering sections of pipe into trenches. Do not under any circumstances drop or dump pipe, fittings, valves, or any other water line material into trenches. Cut pipe accurately to length established at the site and work into place without springing or forcing. Replace by one of the proper length any pipe or fitting that does not allow sufficient space for proper installation of jointing material. Blocking or wedging between bells and spigots will not be permitted. Lay bell-and-spigot pipe with the bell end pointing in the direction of laying. Grade the pipeline in straight lines; avoid the formation of dips and low points. Support pipe at proper elevation and grade. Secure firm, uniform support. Wood support blocking will not be permitted. Lay pipe so that the full length of each section of pipe and

each fitting will rest solidly on the pipe bedding; excavate recesses to accommodate bells, joints, and couplings. Provide anchors and supports [where indicated and] where necessary for fastening work into place. Make proper provision for expansion and contraction of pipelines. Keep trenches free of water until joints have been properly made. At the end of each work day, close open ends of pipe temporarily with wood blocks or bulkheads. Do not lay pipe when conditions of trench or weather prevent installation. [Depth of cover over top of pipe shall not be less than 760 mm 2 1/2 feet.]

3.1.1.4 Installation of Tracer Wire

Install a continuous length of tracer wire for the full length of each run of nonmetallic pipe. Attach wire to top of pipe in such manner that it will not be displaced during construction operations.

3.1.1.5 Connections to Existing Water Lines

Make connections to existing water lines after approval is obtained and with a minimum interruption of service on the existing line. Make connections to existing lines under pressure [in accordance with the recommended procedures of the manufacturer of the pipe being tapped] [as indicated].

3.1.2 Special Requirements for Installation of Water Mains

3.1.2.1 Installation of Ductile-Iron Piping

Unless otherwise specified, install pipe and fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines" for pipe installation, joint assembly, valve-and-fitting installation, and thrust restraint.

- a. Jointing: [Make push-on joints with the gaskets and lubricant specified for this type joint.] Assemble in accordance with the joint manufacturer recommendations. [Make mechanical joints with the gaskets, glands, bolts, and nuts specified for this type joint.] Assemble in accordance with applicable recommendations of the joint manufacturer. [Make flanged joints with the gaskets, bolts, and nuts specified for this type joint. Make flanged joints up tight; avoid undue strain on flanges, fittings, valves, and other [equipment and] accessories. Align bolt holes for each flanged joint. Use full size bolts for the bolt holes; use of undersized bolts to make up for misalignment of bolt holes or for any other purpose will not be permitted. Do not allow adjoining flange faces to be out of parallel to such degree that the flanged joint cannot be made watertight without overstraining the flange. When flanged pipe or fitting has dimensions that do not allow the making of a proper flanged joint as specified, replace it by one of proper dimensions. Use setscrewed flanges to make flanged joints where conditions prevent the use of full-length flanged pipe and assemble in accordance with the recommendations of the setscrewed flange manufacturer.] [Assemble joints made with sleeve-type mechanical couplings in accordance with the

recommendations of the coupling manufacturer.] [Make insulating joints with the gaskets, sleeves, washers, bolts, and nuts previously specified for this type joint. Assemble insulating joints as specified for flanged joints, except that bolts with insulating sleeves shall be full size for the bolt holes. Ensure that there is no metal-to-metal contact between dissimilar metals after the joint has been assembled.]

NOTE: Design thrust blocks per AWWA C-600 and indicate on drawings

- b. Pipe Anchorage: Provide [concrete thrust blocks (reaction backing)] [metal harness] for pipe anchorage [, except where metal harness is indicated]. Size and positioning of thrust blocks shall be as indicated. Use concrete, having a minimum compressive strength of 15 MPa 2,500 psi at 28 days; or use concrete of a mix not leaner than one part cement, 2 1/2 parts sand, and 5 parts gravel, having the same minimum compressive strength.] [Metal harness shall be in accordance with the requirements of for thrust restraint, using tie rods and clamps as shown in, except as otherwise indicated].]

NOTE: Delete the following paragraph except when required. See the NAVFAC Design Manual on water supply systems for guidance.

- c. Exterior Protection: Completely encase buried ductile iron pipelines with polyethylene tube or sheet, using polyethylene film as recommended by the ductile iron manufacturer.

3.1.2.2 Installation of PVC Plastic Water Main Pipe

Installation of PVC Plastic Water Main Pipe and Associated Fittings: M.O.H. Circ. n. 125. Unless otherwise specified, install pipe and fittings in accordance with the M.O.H. Circ. n. 125 for laying of pipe, joining PVC pipe to fittings and accessories, and setting of hydrants, valves, and fittings.

- a. Jointing: Make push-on joints with the elastomeric gaskets specified for this type joint, using either elastomeric-gasket bell-end pipe or elastomeric-gasket couplings. For pipe-to-pipe push-on joint connections, use only pipe with push-on joint ends having factory-made bevel; for push-on joint connections to metal fittings, valves, and other accessories, cut spigot end of pipe off square and re-bevel pipe end to a bevel approximately the same as that on ductile-iron pipe used for the same type of joint. Use an approved lubricant recommended by the pipe manufacturer for push-on joints. Assemble push-on joints for pipe-to-pipe joint connections in accordance with the requirements of M.O.H. Circ. n. 125 for laying the pipe and for pipe joint assembly. Assemble push-on joints for connection to fittings, valves, and other accessories in accordance with the requirements of M.O.H. Circ. n.

125 for joining PVC pipe to fittings and accessories or joint assembly. Make compression-type joints/mechanical joints with the gaskets, glands, bolts, nuts, and internal stiffeners previously specified for this type joint; assemble in accordance with the requirements of M.O.H. Circ. n. 125 for joining PVC pipe to fittings and accessories, with the recommendation of joint manufacturer for joint assembly. Cut off spigot end of pipe for compression-type joint/mechanical-joint connections and do not re-bevel. Assemble joints made with sleeve-type mechanical couplings in accordance with the recommendations of the coupling manufacturer using internal stiffeners as previously specified for compression-type joints.

- b. Pipe Anchorage: Provide [concrete thrust blocks (reaction backing)] [metal harness] for pipe anchorage [, except where metal harness is indicated]. [Thrust blocks shall be in accordance with the requirements for reaction or thrust blocking and plugging of dead ends, except that size and positioning of thrust blocks shall be as indicated. Use concrete, having a minimum compressive strength of 15 MPa 2,500 psi at 28 days; or use concrete of a mix not leaner than one part cement, 2 1/2 parts sand, and 5 parts gravel, having the same minimum compressive strength.] [Metal harness shall be as indicated.]

3.1.2.3 Installation of Polyethylene (HDPE) Plastic Piping

HDPE pipes shall be installed in accordance with the written instructions of the HDPE pipe manufacturer.

3.1.2.4 Installation of Concrete Piping

Except as otherwise specified in the following subparagraphs, install pipe and fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines;" with the laying and joining requirements in accordance with concrete pipe manufacturer.

- a. Jointing: Make joints with the gaskets specified for concrete pipe joints, using an approved lubricant recommended by the manufacturer. Assemble joints in accordance with the joining recommendations requirements of the concrete pipe manufacturer.
- b. Pipe Anchorage: Provide [concrete thrust blocks (reaction backing).] [metal harness] for pipe anchorage [, except where metal harness is indicated]. Size and positioning of thrust blocks shall be as indicated. Use concrete, having a minimum compressive strength of 15 MPa 2,500 psi at 28 days; or use concrete of a mix not leaner than one part cement, 2 1/2 parts sand, and 5 parts gravel, having the same minimum compressive strength. [Metal harness shall be in accordance with the recommendations for tied joints in accordance with pipe manufacturer.]

3.1.2.5 Installation of Steel Piping

Unless otherwise specified, install pipe and fittings in accordance with pipe manufacturer. [Apply protective coating for above ground piping as specified in Section [_____, "_____."]]

NOTE: At the text below, delete requirements for and references to welded joints when not allowed for the project. Welded joints should not be allowed for piping less than 600 mm 24 inches in diameter, except when pipeline is to be cement-mortar lined in place after installation.

Under ordinary conditions, steel water pipe and fittings in the sizes included in water distribution systems covered by this specification are furnished with factory-applied cement-mortar lining. In-place cement-mortar lining for new construction is not recommended.

- a. Jointing: Make rubber-gasketed bell-and-spigot joints with the gaskets previously specified for this type joint, using an approved lubricant recommended by the pipe manufacturer; assemble in accordance with the recommendations of the pipe manufacturer. [Make welded joints in accordance with UNI 4545 and with the recommendations given by the manufacturer for the installation of pipe.] Assemble joints made with sleeve-type mechanical couplings in accordance with the recommendations of the coupling manufacturer. [Make flanged joints with the gaskets, bolts, and nuts specified for this type joint. Make flanged joints up tight; avoid undue strain on flanges, fittings, valves, and other [equipment and] accessories. Align bolt holes for each flanged joint. Use full-size bolts for the bolt holes; use of undersized bolts to make up for misalignment of bolt holes or for any other purpose will not be permitted. Do not allow adjoining flange faces to be out of parallel to such degree that the flanged joint cannot be made watertight without straining the flange. When flanged pipe or fitting has dimensions that do not allow the making of a proper flanged joint as specified, replace it by one of proper dimensions.] [Make insulating joints with the gaskets, sleeves, washers, bolts, and nuts specified for this type joint. Assemble insulating joints as specified for flanged joints, except that bolts with insulating sleeves shall be full size for the bolt holes. Ensure that there is no metal-to-metal contact between dissimilar metals after the joint has been assembled.] Finish joints on piping with cement-mortar lining [and on piping with cement-mortar coating] [Finish joints on piping with [coal-tar enamel] [or] [coal-tar epoxy] coating by cleaning, priming, coating, and wrapping with a cold-applied tape coating conforming to and applied in accordance with joint and fittings manufacturer.]

- b. Pipe Anchorage: Provide [concrete thrust blocks (reaction backing)] [metal harness] for pipe anchorage [, except where metal harness is indicated]. [Size and positioning of thrust blocks shall be as indicated. Use concrete, having a minimum compressive

strength of 15 MPa 2,500 psi at 28 days; or use concrete of a mix not leaner than one part cement, 2 1/2 parts sand, and 5 parts gravel, having the same minimum compressive strength.] [Metal harness shall be in accordance with the recommendations for joint harnesses [, except as otherwise indicated]. Metal harness shall be fabricated by the pipe manufacturer and furnished with the pipe.]

3.1.2.6 Installation of Valves and Hydrants

- a. Installation of Valves: Install metal-seated gate valves and fittings, in accordance with the recommendations of the valve manufacturer. Install gate valves, resilient seated gate valves and fittings, in accordance with the recommendations of the valve manufacturer.[Install gate valves on PVC water mains in accordance with the recommendations for appurtenance installation.] [Install check valves in accordance with the applicable requirements for valve-and-fitting installation [, except as otherwise indicated].] Make and assemble joints to gate valves [and check valves] as specified for making and assembling the same type joints between pipe and fittings.

- b. Installation of Hydrants: Install hydrants [, except for metal harness,] in accordance with the recommendations of the hydrant manufacturer and as indicated. Make and assemble joints as specified for making and assembling the same type joints between pipe and fittings. [Provide metal harness as specified under pipe anchorage requirements for the respective pipeline material to which hydrant is attached.] Install hydrants with the 115 mm 4 1/2 inch connections facing the adjacent paved surface. If there are two paved adjacent surfaces, contact the Contracting Officer for further instructions.

3.1.2.7 Installation Beneath Railroad Right-of-Way

Install piping passing under the right-of-way of a non-military railroad in accordance with the requirements of the railroad owner.

3.1.3 Installation of Water Service Piping

3.1.3.1 Location

Connect water service piping to the building service where the building service has been installed. Where building service has not been installed, terminate water service lines approximately 1.5 m 5 feet from the building line at [a point directed by the Contracting Officer] [the point[s] indicated]; such water service lines shall be closed with plugs or caps.

3.1.3.2 Service Line Connections to Water Mains

NOTE: Use first optional sentence for service line piping less than 80 mm 3 inches in diameter. Use third optional sentence for service line piping 80 mm

3 inches in diameter or larger. Delete references to size except when more than one size range is present.

[Connect service lines [[_____] mm [_____] inch size] to the main [by a corporation stop and gooseneck and install a service stop below the frostline] [as indicated].] [Connect service lines 50 mm 2 inch size to the main [with a rigid connection or a corporation stop and gooseneck and install a gate valve on service line below the frostline] [as indicated].]
[Connect service lines [[_____] mm [_____]inch size] to the main [with a rigid connection and install a gate valve on service line below the frostline] [as indicated].] [Connect service lines to ductile-iron water mains in accordance with the manufacturer recommendations for service taps.] [Connect service lines to PVC plastic water mains in accordance with UNI 7441, UNI 7611.][Connect service lines to concrete water mains in accordance with the recommendations of the concrete pipe manufacturer.]
[Connect service lines to steel water mains in accordance with the recommendations of the steel water main pipe manufacturer.]

3.1.4 Special Requirements for Installation of Water Service Piping

3.1.4.1 Installation of Metallic Piping

Install pipe and fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines" and with the applicable requirements of pipe manufacturer for pipe installation, unless otherwise specified.

a. Jointing:

(1) Screwed Joints: Make screwed joints up tight with a stiff mixture of graphite and oil, inert filler and oil, or graphite compound; apply to male threads only. Threads shall be full cut; do not leave more than three threads on the pipe exposed after assembling the joint.

(2) Joints for Copper Tubing: Cut copper tubing with square ends; remove fins and burrs. Handle tubing carefully; replace dented, gouged, or otherwise damaged tubing with undamaged tubing. Make solder joints using 95-5 tin-antimony or solder. Solder and flux shall contain not more than 0.2 percent lead. Before making joint, clean ends of tubing and inside of fitting or coupling with wire brush or abrasive. Apply a rosin flux to the tubing end and on recess inside of fitting or coupling. Insert tubing end into fitting or coupling for the full depth of the recess and solder. For compression joints on flared tubing, insert tubing through the coupling nut and flare tubing.

(3) Flanged Joints: Make flanged joints up tight, taking care to avoid undue strain on flanges, valves, fittings, and accessories.

NOTE: At the text below, use coal-tar enamel coating with double felt wraps instead of single

layer of felt wrap where soil in which pipe is to be buried is classified as Group IV, Unusually Corrosive (as defined in AWWA M11, Chapter 10, "Principles of Corrosion and Corrosion Control") or as Class 4, Extreme (as defined in NAVFAC Design Manual on water supply systems); or where electrical resistivity of soil has been measured at less than 2,000 ohms/cc.

- b. Protection of Buried Steel Service Line Piping: [Unless otherwise specified,] prepare, prime, and coat exterior surface of zinc-coated steel pipe and associated fittings to be buried with hot-applied coal-tar enamel with a bonded [single layer of felt wrap in accordance with ISO 5256] [double felt wraps]. For the felt wrap material, use fibrous-glass mat; use of asbestos felt will not be permitted. Use solvent wash only to remove oil, grease, and other extraneous matter from zinc-coated pipe and fittings.

3.1.4.2 Installation of Plastic Piping

Install pipe and fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines" and with the applicable requirements of M.O.H. Circ. n. 125, ISO 4422-1, ISO 4422-2 and ISO 4422-3 unless otherwise specified. Handle solvent cements used to join plastic piping in accordance with the plastic piping manufacturer.

- a. Jointing: Make solvent-cemented joints for PVC plastic piping using the solvent cement previously specified for this material; assemble joints in accordance with ISO 4422-1 and ISO 4422-2. Make plastic pipe joints to other pipe materials in accordance with the recommendations of the plastic pipe manufacturer.
- b. Plastic Pipe Connections to Appurtenances: Connect plastic pipe service lines to corporation stops and gate valves in accordance with the recommendations of the plastic pipe manufacturer.

3.1.5 Disinfection

Before acceptance for domestic use each unit of completed water line and distribution system shall be flushed and disinfected with sterilizing material before acceptance for domestic operation. One of the following materials shall be used for disinfecting the Water System by chlorinating:

3.1.5.1 Liquid Chlorine

Liquid chlorine shall be 99.5 percent pure by volume as obtained from vaporized liquid chlorine and suitable for use in water pipe sterilization. A certificate from the manufacturer shall be furnished to indicate the results of tests to determine the percent of chlorine.

3.1.5.2 Hypochlorite

3.1.5.2.1 Chlorinated Lime

For decontamination use shall conform to the requirements listed in Table I.

TABLE I

	<u>Chlorinated Lime</u>
Available chlorine, min. %	30
Moisture, max %	3
Practicable size:	
Retained on 100-mesh, min. %	0
Through 30-mesh, min. %	60
Through 14-mesh, min. %	98
Loss of available chlorine on heat, max. %	25
Total mixed oxides of heavy metal, plus AL ₂ O ₃ , max. %	50
Iron, max. %	25
Calcium hydrozide, min. %	15
Calcium hydrozide, max. %	35
Bulk density, min. grams/cm ³	0.80

A certificate from the manufacturer shall be furnished to indicate the results of tests to determine the conformance with Table I above.

3.1.5.3 Sodium Hypochlorite

May be used for decontamination in place of chlorinated lime. The material shall be clear greenish-yellow liquid free from sediment or suspended matter. Available chlorine in the solution shall be not less than 10 percent and free alkali shall be not more than 1.5 percent by weight, calculated as NaOH. A certificate from the manufacturer shall be furnished to indicate the results of tests to determine the percent of available chlorine and of free alkali.

3.1.5.4 Disinfection Method

Disinfection shall be accomplished as described below. After pressure tests have been completed and approved, the piping system to be disinfected shall be thoroughly flushed with water until all entrained dirt and mud have been removed before introducing the chlorinating material. The amount of chlorine applied shall be such as to provide a dosage of not less than 50 parts per million. The chlorinating material shall be introduced to the water lines and distribution system in a manner approved by the Contracting Officer. If possible to do so, the lines shall be thoroughly flushed before introducing of the chlorinating materials. After a contact period of not less than 24 hours, the system shall be flushed with clean water until the residual chlorine content is not greater than 1.0 part per million. All valves in the lines being disinfected shall be opened and closed several times during the contact period. From several points in the system, testing laboratory shall take at least three (3) samples of water utilizing sterilized containers for bacterial examination/analysis. The local Italian testing laboratory utilized to perform the test must be duly certified by

the Italian state to perform such services. The disinfection procedure shall be repeated as many times as is necessary until test indicates compliance to the above specified requirements and the absence of bacterial pollutants for at least two (2) full days (48 hour period). The units will not be accepted until satisfactory bacteriological test results have been attained and a certified test result forwarded in writing to the Contracting Officer.

3.2 FIELD QUALITY CONTROL

3.2.1 Field Tests and Inspections

The Contracting Officer will conduct field inspections and witness field tests specified in this section. The Contractor shall perform field tests, and provide labor, equipment, and incidentals required for testing [, except that water and electric power needed for field tests will be furnished as set forth in Section [02315, "Excavation and Fill"]]. The Contractor shall produce evidence, when required, that any item of work has been constructed in accordance with the drawings and specifications. [Do not begin testing on any section of a pipeline where concrete thrust blocks have been provided until at least 5 days after placing of the concrete.]

3.2.2 Pressure and Leakage Tests

NOTE: Delete references to water service lines of these materials except when there is water service pipe of 80 mm 3 inch size or larger included in the project. Ductile-iron piping is available in [80 mm] [3 inch] size, but 100 mm 4 inch size is smallest for PVC plastic water main pipe.

Test water mains and water service lines in accordance with the following testing procedures and applicable specified requirements. On those distribution systems utilized for fire hydrants, sprinkler systems or other fire protection purposes, hydrostatic pressure for pressure test shall be 345 kPa in excess of the maximum working pressure of the system, but shall be not less than 1380 kPa and shall be held for a period of not less than two hours. On those water lines not utilized for fire protection purposes, the hydrostatic pressure for the pressure test shall be 345 kPa in excess of the maximum working pressure of the system. The hydrostatic pressure for the pressure test shall not be less than 1030 kPa and shall be held for a period of not less than two hours. Prior to the pressure test, that portion of the water line being treated shall be filled with water for a period of not less than 24 hours. Hydrostatic pressure for leakage test for all systems shall be the maximum working pressure of the system. Leakage test may be performed at the same time and at the same test pressure as the pressure test. Pipe, joints, valves and fittings in the test section shall be examined. Equipment shall be tested in operation to demonstrate compliance with specification requirements. Each hydrant and all control valves shall be fully opened and closed under water pressure. The duration of each leakage test shall be two hours, and during the test, the pipe shall be subjected to the normal working pressure for the section of line being tested. These pressures will be based upon the lowest point of the

section of line being tested.

3.2.3 Special Testing Requirements

For pressure test, use a hydrostatic pressure 375 kPa 50 psi greater than the maximum working pressure of the system, except that for those portions of the system having pipe size larger than 50 mm 2 inches in diameter, hydrostatic test pressure shall be not less than 1400 kPa 200 psi. Hold this pressure for not less than 2 hours. Prior to the pressure test, fill that portion of the pipeline being tested with water for a soaking period of not less than 24 hours. For leakage test, use a hydrostatic pressure not less than the maximum working pressure of the system. Leakage test may be performed at the same time and at the same test pressure as the pressure test.

3.2.4 Testing Procedure

Test water mains and water service piping in accordance with the following requirements:

3.2.4.1 Water Distribution Main Piping

- a. Ductile-Iron: For pressure and leakage tests, except no leakage will be allowed for flanged joints.
- b. PVC: For pressure and leakage tests except no leakage will be allowed at joints made with sleeve-type mechanical coupling.
- c. Concrete Pipes: For pressure and leakage tests except that the amount of leakage on concrete pipelines shall not exceed 1.8 liters per 24 hours per millimeter of pipe diameter per 1600 m of pipeline.
- d. Steel Pipes: For pressure and leakage tests except that the amount of leakage on steel pipelines with rubber-gasketed bell-and-spigot joints shall not exceed 1.8 liters per 24 hours per millimeter of pipe diameter per 1600 m of pipeline; no leakage will be allowed at joints made by any other method. Repair of welded joints to stop leakage shall be done by welding only.

3.2.4.2 Water Service Line Piping

- a. Copper Tubing, Copper Piping, and PVC: For hydrostatic testing. No leakage shall be allowed.

3.2.5 Allowable Leakage

No pipe installation will be accepted until the leakage is less than the number of liters per hour as determined by the following formula:

$$L = \frac{ND \text{ times the square root of } P}{7400}$$

in which L equals the allowable leakage, in liters per hour, N is the

number of field joints in the length of pipeline tested, D is the nominal diameter of the pipe, in millimeters, and P is the average test pressure during the leakage test, in kilograms/square centimeter gauge.

3.2.6 Repair

Should any test on pipe laid disclose leakage greater than specified above, the Contractor shall, at his own expense, locate and repair the line until the leakage is within the specified allowance.

NOTE: Suggestions for improvement of this specification will be welcomed using the Navy "Change Request Forms" subdirectory located in SPECSINTACT in Jobs or Masters under "Forms/Documents" directory or DD Form 1426. Suggestions should be forwarded to:

LANTNAVFACENGCOM
Code 406
1510 Gilbert Street
Norfolk, VA 23511-2699

FAX: (757) 322-4415 or DSN 262-4415

-- End of Section --