
NAVFAC IGS-15185 (OCTOBER 2002)

Preparing Activity: LANTNAVFACENGCOM Based on UFGS-15185N

ITALIAN GUIDE SPECIFICATIONS

Use for ITALIAN projects only

SECTION 15185

LOW TEMPERATURE WATER [LTW] HEATING SYSTEM
10/02

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

NOTE: This guide specification covers the requirements for a complete low temperature water heating system including hot water piping (supply and return) and terminal units used for heating. This section does not include feedwater treatment equipment or process hot water terminal units. Piping as used in this specification includes pipe, tubes, flanges, bolting, gaskets, valves, relief devices, fittings, and pressure containing parts of other piping components, hangers and supports, and other equipment items necessary to prevent overstressing of the pressure containing parts.

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.

NOTE: The following information should be shown on the drawings:

1. Layout of heating system.

2. Location, size, and capacity of finned tube radiators, convectors, unit heaters, flow meters, pumps, and expansion tanks.

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.

ASME INTERNATIONAL (ASME)

ASME/ANSI B31.9 (1996) Building Services Piping

ITALIAN NATIONAL ASSOCIATION FOR UNIFICATION OF STANDARDS (UNI)

NOTE: A UNI Norm is a technical normative recognized as Italian Law, submitted by a private organization "Ente Nazionale Italiano di Unificazione" for Italy and is available only in the Italian language. It is the National Standard.

- UNI 1074-3 (2001) Valves for water supply - Fitness for purpose requirements and appropriate verification tests - Check valves
- UNI 1284 (1971) Piping - Pressure-temperature ratings for iron and steel pipes
- UNI 2276 (1967) Metallic pipe flanges - Circular slip-on-welding flanges - Nominal pressure 6
- UNI 2277 (1967) Metallic pipe flanges - Circular slip-on-welding flanges - Nominal pressure 10
- UNI 2278 (1967) Metallic pipe flanges - Circular slip-on-welding flanges - Nominal pressure 16
- UNI 2279 (1967) Metallic pipe flanges - Welding neck flanges - Nominal pressure 2,5
- UNI 3740-1 (1999) Steel fasteners - Technical specifications - Generalities
- UNI 5311 (1963) Gripping and holding appliances - Straps clamps, squares and bearings -

Summary of standard types

- UNI 5596 (1965) Thin square nuts - ISO metric coarse thread - Finish A
- UNI 5770 (1966) Classification and performance qualification of oxy-acetylene welders - Welders for pipes having a thickness less or equal to 7 mm of mild steel, Mn high yield point steel or alloyed steel with Mo or Cr-Mo
- UNI 6363/A199 (1984/86) Welded and seamless steel tubes for water mains
- UNI 6609 (1969) Metallic pipe flanges - Bolts - Types, materials and ratings
- UNI 6894 (1986) Flowmeters based on differential pressure transducer connected to a throttling device inserted in circular cross-section pipes
- UNI 7125/FA 109 (1972/82) Flanged gate valves for water pipelines - Technical conditions of delivery
- UNI 7151 (1972) Pipe clamps for use on board ships - Half collars, brackets and supports for flat bar clamps with expansion joint
- UNI 7177 (1973) Elastomers: Products - Sealing rubber gaskets for cooling circuits and chambers of the railway diesel locomotives and diesel railcars - Qualities, requirements and tests
- UNI 7182 (1973) Steel formed heads for welded pressure vessels and boiler drums - With centre manhole type
- UNI 7183 (1973) Steel formed heads for welded pressure vessels and boiler drums - With eccentric manhole type
- UNI 7451 (1984) Malleable iron sand castings - Deviations for dimensions without tolerance indication and machining allowances
- UNI 8364/A146 (1984/84) Heating plants - Inspection and maintenance
- UNI 8858 (1985) Copper alloy ball valves for

- heating plants - Requirements and tests
- UNI 8863/A1 (1987/89) Unalloyed steel seamless and welded tubes suitable for screwing in accordance with UNI ISO 7/1
- UNI 9157 (1988) Water supply - Back flow preventer - Characteristics and tests
- UNI 9737 (1997) Classification and qualification of welders for plastic materials - Welders by the heated tool procedure, with mechanical equipment and by electrofusion for pipes and fittings of polyethylene for the supply of gaseous fuels, water and others fluids under pressure
- UNI 9753 (1990) Technical rules for control valves of hot water heating plants
- UNI 9765 (1991) Pressure and vacuum gauges with bellows elastic element - Construction characteristics
- UNI 10269 (1995) Gate valves for water distribution - Materials and requirements for buried service

ITALIAN/EUROPEAN HARMONIZATION STANDARDS (UNI EN) (UNI ENV) (CEI EN) (UNI EN ISO)(UNI ISO)

NOTE: A UNI EN, UNI ENV, CEI EN, UNI EN ISO or UNI ISO is a European Standard with a coincident Italian National Standard or International Standard. The two standards are identical, with most (but not all) EN's available in the English language and the UNI available only in the Italian language.

- UNI ISO 7-1 (1984) Pipe threads where pressure-tight joints are made on the threads - Designation, dimensions and tolerances
- UNI EN 175 (1999) Personal protection - Equipment for eye and face protection during welding and allied processes
- UNI EN 215-1 (1990) Thermostatic radiator valves - Part 1: Requirements and test methods
- UNI EN 288-1 (1993) Specification and qualification of welding procedures for metallic materials

	- General rules for fusion welding
UNI EN 442-1	(1997) Radiators and convectors - Part 1: Technical specifications and requirements
UNI EN 593	(2001) Industrial valves - Metallic butterfly valves
UNI EN 1057	(1997) Copper and copper alloys - Seamless, round copper tubes for water and gas in sanitary and heating applications
UNI EN 1074-3	(2001) Valves for water supply - Fitness for purpose requirements and appropriate verification tests - Part 3: Check valves
UNI EN 1092-2	(1999) Flanges and their joints - Circular flanges for pipes, valves, fittings and accessories, PN designated - Part 2: Cast iron flanges
UNI EN 1151	91999) Pumps - Rotodynamic pumps - Circulation pumps having an electrical effect not exceeding 200 W for heating installations and domestic hot water installations - Requirements, testing, marking
UNI EN 1254-1	(2000) Copper and copper alloys - Plumbing fittings - Fittings with ends for capillary soldering or capillary brazing to copper tubes
UNI EN 1452-1	(2001) Plastics piping systems for water supply - Unplasticized poly(vinyl chloride)(PVC-U) - General
UNI EN ISO 1461	(1999) Hot dip galvanized coatings on fabricated iron and steel articles - Specifications and test methods
UNI EN 1514-1	(1998) Flanges and their joints - Dimensions of gaskets for PN-designated flanges - Non-metallic flat gaskets with or without inserts
UNI EN 1515-1	(2002) Flanges and their joints - Bolting - Selection of bolting
UNI EN 1564	(1999) Founding - Austempered ductile cast irons
UNI EN 1567	(2002) Building valves - Water pressure reducing valves and combination water

	pressure reducing valves - Requirements and tests
UNI EN 1982	(2000) Copper and copper alloys - Ingots and castings
UNI EN ISO 3677	(1996) Filler metal for soft soldering, brazing and braze welding - Designation
UNI EN ISO 3822-2	(1998) Acoustics - Laboratory tests on noise emission from appliances and equipment used in water supply installations - Part 2: Mounting and operating conditions for draw-off taps and mixing valves
UNI EN ISO 3822-3	(1998) Acoustics - Laboratory tests on noise emission from appliances and equipment used in water supply installations - Part 3: Mounting and operating conditions for in-line valves and appliances
UNI EN ISO 5167-1/A1	(1997/A1:2000) Measurement of fluid flow by means of pressure differential devices - Part 1: Orifice plates, nozzles and Venturi tubes inserted in circular cross-section conduits running full
UNI ISO 5781	(1990) Hydraulic fluid power - Pressure-reducing valves, sequence valves, unloading valves, throttle valves and check valves - Mounting surfaces
UNI ISO 7369	(1985) Pipework - Flexible metallic hoses - Vocabulary of general terms
UNI EN ISO 9606-3	(2001) Approval testing of welders - Fusion welding - Copper and copper alloys
UNI EN 10242/A1	(1998/00) Threaded pipe fitting in malleable cast iron
UNI EN 10253-1	(2002) Butt-welding pipe fittings - Wrought carbon steel for general use and without specific inspection requirements
UNI EN 12035	(1998) Self adhesive tapes - Flagging of adhesive tape
UNI EN 12760	(1999) Valves - Socket welding ends for steel valves
UNI EN 13133	(2002) Brazing - Brazer approval

UNI EN 13134	(2002) Brazing - Procedure approval
UNI EN 29453	(1996) Soft solder alloys - Chemical composition and forms
CEI EN 60034-1	(2000) Rotating electrical machines - Part 1: Rating and performance
CEI EN 60529/A1	(1997/00) Degrees of protection provided by enclosures (IP Code)
CEI EN 60947-4-1	(2002) Low-voltage switchgear and controlgear - Part 4: Contactors and motor-starters - Section 1: Electromechanical contactors and motor-starters

1.2 RELATED REQUIREMENTS

Section 15050, "Basic Mechanical Materials and Methods" applies to this section with additions and modifications specified herein.

1.3 SYSTEM DESCRIPTION

Except as specified otherwise, equipment and piping components shall be suitable for use in low temperature water heating system. Except as modified herein, the pressure temperature limitations shall be as specified in the referenced standards and specifications. Pressures in this specification are pressures in kilopascal (kPa) above atmospheric pressure, and temperatures are in degrees Centigrade (C).

1.3.1 Hot Water Heating System

Submit plan, elevations, dimensions, capacities, and ratings. Include the following:

- a. Unit heaters
- b. Convectors
- c. Finned tube radiators
- d. Pumps
- e. Valves
- f. Expansion tanks
- g. Flow measuring equipment
- h. Backflow preventer
- i. Air separating tank

[j. Boilers]

[k. Hot water heat exchangers]

[l. Converters]

1.4 SUBMITTALS

NOTE: For projects in Italy, Spain, and Greece, except for Aviano Air Base, Aviano, Italy, the Quality Control Manager is not authorized to approve submittals. Therefore, the EFA MED Specifications do not contain "G's". For these projects utilize special sections NFGS-E-01330, "Submittal Procedures" and NFGS-E-01450, "Quality Control."

For projects at Aviano Air Base, Aviano, Italy, the Quality Control Manager is authorized to approve submittals. On these projects, add a "G" within submittal tags for each submittal item deemed sufficiently critical, complex, or aesthetically significant to merit approval by the Government. When "G's" are used on any submittal item, utilize standard sections NFGS-01330, "Submittal Procedures" and NFGS-01450, "Quality Control."

Where a "G" follows a submittal item, it indicates that the submittal item requires Contracting Officer's approval. Submittal items not designated with a "G" will be approved by the QC organization.

Submit the following in accordance with Section 01330, "Submittal Procedures."

SD-02 Shop Drawings

Hot water heating system

SD-03 Product Data

Convectors

Finned tube radiators

Pumps

Valves

Expansion tanks

Flow measuring equipment

Backflow preventers

External air separation tanks

Hot water heating pipe

Fittings

Mechanical pipe coupling system

For valves, submit valve manufacturer's published ratings and maximum operating pressure differential. For relief valves, also submit manufacturer's published discharge capacity ratings. For pumps, include pump speed and characteristic curve for performance of impeller selected for each pump. Curves shall indicate capacity vs head, efficiency, and brake power for full range, from shut-off to free delivery. Provide family of curves for each pump volute size indicating multiple impellers and operation points. Computer generated curves indicating single operating curve characteristics are not acceptable.

SD-06 Test Reports

Hydrostatic test of piping system

Auxiliary equipment and accessory tests

Submit test reports in accordance with the paragraph entitled "Field Quality Control."

SD-07 Certificates

Backflow preventer certification

Welding procedures

Welder's qualifications

SD-10 Operation and Maintenance Data

Convectors, Data Package 3

Finned tube radiators, Data Package 3

Submit operation and maintenance data in accordance with Section 01781, "Operation and Maintenance Data." Submit a list of qualified service organizations which includes addresses and qualifications.

1.5 QUALITY ASSURANCE

1.5.1 Standard Commercial Product for Terminal Units

Terminal units provided shall comply with features called out in this specification and shall be the manufacturer's standard commercial product. Additional or better features which are not prohibited by this specification but which are a part of the manufacturer's standard commercial product, shall be included in the terminal units being furnished. A standard commercial product is a product which has been sold or is currently being offered for sale, on the commercial market through advertisements or manufacturer's catalogs, or brochures.

1.5.2 Welding

1.5.2.1 Welding Procedures

Before performing welding, submit three copies of welding procedure specification for all metals to be used in the work, together with proof of welder's qualification as outlines in UNI 5770, UNI 9737, UNI EN ISO 9606-3, and UNI EN 13133.

1.5.2.2 Welder's Qualifications

Before welder or operator performs welding, submit three copies of Welder's Performance Qualification Record in conformance with UNI 5770, UNI 9737, UNI EN ISO 9606-3, and UNI EN 13133, showing that the welder was tested under the approved procedure specification submitted by the Contractor. In addition, submit each welder's assigned number, letter, or symbol used to identify the work of the welder.

1.5.2.3 Identification of Welder's Work

Ensure that each welder's assigned number, letter or symbol is affixed immediately upon completion of the weld. To welders making defective welds after passing a qualification test, give a requalification test. Upon failing to pass the test, do not permit welder to work in this contract.

1.5.2.4 Previous Qualifications

Welding procedures, welders, and welding operators previously qualified by test may be accepted for this contract without requalification subject to the approval and provided that all the conditions specified in UNI 5770, UNI 9737, UNI EN ISO 9606-3, and UNI EN 13133 are met before a procedure can be used.

1.5.3 Brazing and Soldering

1.5.3.1 Brazing Procedure

UNI EN 13134.

1.5.3.2 Soldering, Soldering Preparation, and Procedures for Joints

UNI EN 288-1.

1.5.4 Backflow Preventer Certification

Backflow preventers shall be certified UNI 9157. Listing of a particular make, model/design, and size in the current [UNI 9157] [or] [local code] will be acceptable as the required proof.

1.6 SAFETY STANDARDS

1.6.1 Welding

Safety in welding and cutting of pipe shall conform to UNI EN 175.

1.6.2 Guards

Couplings, motor shafts, gears and other moving parts shall be guarded. Guards shall be cast iron or expanded metal. Guard parts shall be rigid and removable without disassembling the guarded unit.

PART 2 PRODUCTS

2.1 SOURCE MANUFACTURERS

2.1.1 Pipe and Fittings

The following manufacturers provide pipe and fittings, including couplings, unions, flanges, and drains, that generally comply with these specifications:

DALMINE

Piazza Caduti 6 Luglio 1944, 1
24044 Dalmine (BG) Italy
Tel: 035560.1111
Fax: 0355603827

MARCEGAGLIA S.p.A.

Via Bresciani, 16
46040 Gazaldo Ippoliti (MN)
Tel: 0376/6851
Fax: 0376/685600
www.gruppomarcegaglia.com

ARVEDI TUBI ACCIAIO

Zona Porto Canale
26100 Cremona
Tel: 0372/4091
Fax: 0372/413170
www.arvedi.it

OPPO Gesuino

Via Amerigo Vespucci, 1
09074 Ghilarza (OR)
Tel: 0785/54642
www.oppo.it

IDROSTAR S.p.a.

Via Giolitti, 94
12030 Torre San Giorgio (CN)
Tel: 0172/921023
www.idrostar.it

CAST
Strada Brandizzo 406/408
10088 Volpiano (TO)
Tel: 011/9827011
Fax: 01198270225
www.cast.it

PASOTTI EXPORT srl - AIGNEP
Via V. Montini 122
25067 Lumezzane (BS)
Tel: 030/8258526
Fax: 030/829651
www.pasotti.it

TIEMME RACCORDERIE S.p.A.
Via Cavallera 6/A
25045 Castegnato (BS)
Tel: 030/2142211
Fax: 030/2142206
www.tiemme.com

GIACOMINI S.p.A.
Via per Alzo, 39
28017 San Maurizio D'Opaglio (NO)
Tel: 0322/923111
Fax: 0322/96256
www.giacomini.com

STEEL TRADE
Loc. Cattagnina
29100 Rottofreno (PC)
Tel: 0523/780121
Fax: 0523/780123
www.steeltradeitaly.com

FBQ BARONIO srl
Via Filippo Turati
25027 Quinzano d'Oglio (BS)
Tel: 030/933035
Fax: 030/9923545
www.baronio.it

FERRARI
Via A. Grandi, 29
48100 Ravenna
Tel: 0544/452962
Fax: 0544/451801
www.ferrari-ra.it

DALMINE Resine
Ufficio Vendita Nord-Estero
24040 Levate (BG)
Tel: 035/594848
Fax: 035/594832

2.1.2 Valves

The following manufacturers provide pipe valves that generally comply with these specifications:

VALVOSTEEL srl
Via della Pace, 29
20098 San Giuliano Milanese (MI)
Tel: 02/9822981
Fax: 02/9840169
www.valvosteel.it

RASTELLI RUBINETTERIE S.p.a.
Regione Monticelli 10/14
28045 Inverio (NO)
Tel: 0322/255431
Fax: 0322/255117
www.rastelli.it

VALVOTUBI IND S.r.l.
Via M. Monti, 30/B
48100 Ravenna - Italy
Tel: (0039)544/452279
Fax: (0039)544/541148

RIMI FORNITURE INDUSTRIALI srl
Via Sandro Botticelli, 80
10154 Milano
Tel: 011/200035
Fax: 011/2425744

FAR RUBINETTERIE S.p.A.
Via Morena, 20
28024 Gozzano (NO)
Tel: 0322/94722
Fax: 0322/955332
www.far-spa.it

GREINER
Via Montesuello, 212
25065 Lumezzane S.S. (Frescia)
Tel: 030/8927511
Fax: 030/8927590

ROMETEC s.r.l.
Via Alessandro Minuziano, 89
00128 Roma (Trigoria)
Tel: 065061635

Fax: 065061542

BRANDONI S.p.A.
Via Novara, 199
28078 Romagnano Sesia (NO)
Tel: 0163/828111
Fax: 0163/834458
www.brandoni.com

CALEFFI S.p.A.
SS 229 - 28010 Fontaneto D'Agogna (No)
Tel: 0322.8491
Fax: 0322.863723
www.caleffi.com

RUBI ZETA
Via San Gerolamo, 9
25055 Pisogne (BS)
Tel: 0364/880447
Fax: 0364/875564
www.rubizeta.it

PASOTTI EXPORT srl - AIGNEP
Via V. Montini 122
25067 Lumezzane (BS)
Tel: 030/8258526
Fax: 030/829651
www.pasotti.it

WATTS CAZZANIGA S.p.A.
via Parco
20046 Biazzone (MI)
Tel: 039/49861
Fax: 039/4986222
www.wattseurope.com/italy

HYDROGOMMA S.p.A.
Via delle Industrie, 2/4
20050 Sulbiate (MI)
Tel: 039/627401
Fax: 039/6022218

MATEC INDUSTRIALE srl
Via 1 Maggio, 7
Peschiera Borromeo (MI)
Tel: 02/55301788
Fax: 02/5472158

STEEL TRADE
Loc. Cattagnina
29100 Rottofreno (PC)
Tel: 0523/780121
Fax: 0523/780123
www.steeltradeitaly.com

OPPO Gesuino
Via Amerigo Vespucci, 1
09074 Ghilarza (OR)
Tel: 0785/54642
www.oppo.it

FRA.BO S.p.A.
Via Circonvallazione, 7
26020 Bordolano (CR)
Tel: 0372/925188
Fax: 0372/95886
www.frabo.net

ZETA ESSE
Via Vicenza, 45
31050 Vedelago (TV)
Tel: 0423/400621
Fax: 0423/401177
www.zetaesse.it

T.F. PIPING
Via Anicio Paolino, 6
00178 Roma
Tel: 39-06-7809997
Fax: 39-06-7801719

CIVAS
Via Partigiani, 52
Reg. Baragiotta
28077 Prato Sesia (NO)
Tel: 39/163/851087
Fax: 39/163/851201
www.civassrl.com

CEWAL spa
Via Gramsci 48
Camponogara (VE)
Tel: 39/041/462155
Fax: 39/041/4174282

NORDIVAL srl
Via Iseo 6/a
25030 Erbusco (BS)
Tel: 030/7722055
Fax: 030/7722024
www.nordival.swagelok.com

GRINNELL SALES & DISTRIBUTION
Via San Giacomo, 260
39055 Laives (BZ)
Tel: 0471/252091
Fax: 0471/254058

2.1.3 Piping Systems Equipment

The following manufacturers provide equipment components for piping systems that generally comply with these specifications:

KSB ITALIA S.p.A.
Viale Tunisia, 46
20124 Milano
Tel: 02.6274
Fax: 02.66983272

GRUNDFOS ITALIA s.r.l.
Via Gransasso, 4
20060 Truccazzano (MI)
Tel: 02/95838112
Fax: 02/95309290

JUCKER S.p.A.
Via Verdi, 9
22050 Lomagna (LC)
Tel: 039/59181
Fax: 039/5301286

CIMM S.r.l.
via Caprera, 13
31030 Caste;;p do Gpdegp (YTV)
Tel: 0423/760009
Fax: 0423/760041
www.cimmsrl.com

CALEFFI S.p.A.
SS 229 - 28010 Fontaneto D'Agogna (No)
Tel: 0322.8491
Fax: 0322.863723
www.caleffi.com

T.F. PIPING
Via Anicio Paolino, 6
00178 Roma
Tel: 39-06-7809997
Fax: 39-06-7801719

LA POLITERMICA
Via Macello, 51
39100 Bolzano
Tel: 0471/971430
Fax: 0471/981127
www.vetribagno.com

BRANDONI S.p.A.
Via Novara, 199
28078 Romagnano Sesia (NO)
Tel: 0163/828111
Fax: 0163/834458

www.brandoni.com

2.1.4 Terminal Equipment

The following manufacturers provide radiators, convectors, heaters, and ventilating equipment items that generally comply with these specifications:

AERFERRISI

Via Vittime di Bologna, 14
10156 Torino
Tel: 011/2740283
Fax: 011/2740131
www.aerferrisi.com

AERKLIMA s.r.l.

via Per Ossona, 13/b
20010 Casorezzo (MI)
Tel: 02/90380634
Fax: 02/90380731
www.aerklima.com

JUCKER S.p.A.

Via Verdi, 9
22050 Lomagna (LC)
Tel: 039/59181
Fax: 039/5301286

2.2 PIPE AND FITTINGS

2.2.1 Hot Water Heating Pipe (Supply and Return)

**NOTE: Specify Schedule 40, 80, or 120 steel or Type
K or L copper as required for temperature and
pressure involved. Type M copper should only be
specified for drain piping.**

UNI 6363/A199 and UNI 8863/A1, electric resistance welded or seamless
Schedule [40] [80] [120] steel pipe [or UNI EN 1057 hard drawn copper
tubing].

2.2.2 Fittings

Provide fittings compatible with the pipe being provided and shall conform
to the following requirements.

2.2.2.1 Steel or Malleable Iron Pipe

Sizes 3 to 50 mm. UNI EN 12760 steel socket welding or screwed type or
UNI ISO 7-1 for screwed type malleable iron fittings.

2.2.2.2 Steel, Cast Iron, or Bronze

Sizes 65 mm and above. Steel fitting butt welding type UNI EN 10253-1 or UNI 2276, UNI 2277, UNI 2278, and UNI 2279 flanged type. Cast iron fittings flanged type UNI EN 1092-2. Bronze fittings up to 200 mm size flanged type UNI EN 1982.

2.2.2.3 Fittings for Copper Tubing

UNI EN 29453 cast bronze solder joint type or UNI EN 1254-1 wrought copper solder joint type. Fittings may be flared or compression joint type.

2.2.3 Mechanical Pipe Coupling System

NOTE: Mechanical couplings may be used for retrofits and other locations where welding is prohibited or where working space is extremely limited. Consideration of the aggressiveness of the water/water treatment on the seals must be considered before using the mechanical coupling system.

Couplings may be provided for water temperatures not to exceed 93 degrees C.

Couplings shall be self centering and shall engage and lock in place the grooved or shouldered ends of pipe and pipe fittings in a positive watertight couple. Couplings shall be designed to permit some angular pipe deflection, contraction, and expansion. Coupling clamp shall be ductile iron conforming to UNI EN 1564. Gasket shall be molded rubber conforming to UNI 7177, the "line call-out" number shall be suitable for a water temperature of 110 degrees C. Coupling nuts and bolts shall be steel conforming to UNI 6609. Fittings shall be grooved malleable iron conforming to UNI 7451 or ductile iron conforming to UNI EN 1564, or malleable iron conforming to UNI 7451. Mechanical couplings and fittings shall be of the same manufacturer. Before assembling couplings, coat pipe ends and outsides of gaskets with lubricant approved by the coupling manufacturer to facilitate installation.

2.2.3.1 Groove and Check Valves

Grooved end, dual disc, spring loaded, non-slam check valves with stainless steel or aluminum bronze discs and EPDM rubber seats. Maximum rated working pressure of 3447 kPa dependent on size. Tested in accordance with UNI EN 1074-3.

2.2.3.2 Butterfly Valves

Grooved end butterfly valves with ductile iron body and disc core to UNI EN 1564. Disc rubber connected with EPDM rubber. Maximum rated working pressure of 2068 kPa tested in accordance with UNI 1284.

2.2.3.3 Strainers

Include grooved end T-type strainers with steel or ductile iron bodies, stainless steel removable strainer baskets with 6 or 12 mesh screens and 57

percent open area. Maximum rated working pressure of 5170 kPa dependent on size.

2.2.4 Unions

2.2.4.1 Steel Pipe

Provide UNI EN 10242/A1, malleable iron unions, threaded connections.

2.2.4.2 Copper Tubing

Provide UNI EN 1254-1, bronze unions, solder joint end.

2.2.4.3 Dielectric Union

Provide insulated union with galvanized steel female pipe-threaded end and a copper solder joint end conforming with UNI EN 10242/A1 dimensional, strength and pressure requirements. Union shall have a water-impervious insulation barrier capable of limiting galvanic current to one percent of the short-circuit current in a corresponding bimetallic joint. When dry, insulation barrier shall be able to withstand a 600-volt breakdown test.

2.2.5 Flanges

Remove raised faces when used with flanges having a flat face.

2.2.5.1 Steel Flanges

UNI 2276, UNI 2277, UNI 2278, and UNI 2279 forged steel, welding type.

2.2.5.2 Cast Iron Screwed Flanges

UNI EN 1092-2.

2.2.5.3 Bronze Screwed Flanges

UNI EN 1982.

2.2.6 Drains and Overflows

2.2.6.1 Steel Pipe

UNI 6363/A199 and UNI 8863/A1, [Electric resistance welded] [Seamless] Schedule [40] [80], Malleable iron or forged steel fittings, screwed or welded joints.

2.2.6.2 Copper Tubing

UNI EN 1057 hard drawn, cast brass or wrought copper fittings, solder joints.

2.2.6.3 PVC Pipe

UNI EN 1452-1, Schedule 40, [and Schedule 80 for sizes 200 mm and larger,]

solvent weld joints.

2.2.7 Valves

Valves shall have rising stems and shall open when turned counterclockwise.

2.2.7.1 Gate Valves

- a. Bronze Gate Valves: UNI ISO 5781, 50 mm and smaller, wedge disc, inside screw type in accordance with UNI ISO 5781. Use solder joint ends with copper tubing.
- b. Steel Gate Valves: UNI 7125/FA 109, provide with open stem and yoke type with solid wedge or flexible wedge disc and heat and corrosion-resistant steel trim.
- c. Cast Iron Gate Valves: UNI 10269, 65 mm and larger, open stem and yoke type with bronze trim.

2.2.7.2 Globe and Angle Valves

- a. Bronze Globe and Angle Valves: UNI ISO 5781, 50 mm and smaller, with solder ends for copper tubing. Valves shall have renewable seat and discs except solder end valves which shall have integral seats.
- b. Steel Globe and Angle Valves: UNI 7125/FA 109, provide with heat and corrosion-resistant trim.
- c. Cast Iron Globe and Angle Valves: UNI EN 1092-2, 65 mm and larger, with bronze trim, tapped drains and brass plug.

2.2.7.3 Check Valves

- a. Bronze Check Valves: UNI 1074-3, 50 mm and smaller, gravity swing check type.
- b. Steel Swing Check Valves: [UNI 1074-3], [regrinding] [gravity] swing check type.
 - (1) Swing check valves shall have bolted caps.
 - (2) Steel Lift check valves 50 mm and smaller shall have bolted caps. Lift check valves 65 mm and larger shall have pressure seal caps.
- c. Cast Iron Check Valves: UNI 1074-3, 65 mm and larger, bronze trim, non-slam, eccentric disc type for centrifugal pump discharge service.

2.2.7.4 Temperature Regulating Valves

Provide valves conforming to UNI 9753, having copper alloy body with adjustable range thermostat.

2.2.7.5 Water Pressure-Reducing Valves

UNI EN 1567.

2.2.7.6 Plug Valves

Cast iron or steel, manually operated, except that a replaceable valve seat will not be required. [Lubricated, tapered plug] [Non-lubricated, lift-plug] valves.

2.2.7.7 Ball Valves

Flanged or butt-welding ends ball valve shall conform to UNI 8858, [bronze] [steel]. Threaded, socket-welding, solder joint, grooved and flared ends shall conform to UNI 8858.

2.2.7.8 Radiator Valves

Radiator valves shall be angle or straightway pattern, with packed or packless bonnet shutoff globe type, designed especially for hot water heating system. Valve shall be constructed of brass or bronze or copper alloy conforming to UNI EN 215-1 specifications for materials with non-metallic renewable disc and plastic wheel handle for shutoff service.

2.2.7.9 Flow Control Valves

Flow control valves shall be specially designed check valves with bronze body and trim, which shall open by the pressure developed by the pump, and close automatically. Provide means to hold the valve in the open position when the system is to be drained.

2.2.7.10 Butterfly Valves

Conform with UNI EN 593, Tight shut off valve, and [flanged] [screwed] [single flange] [flangeless] valve ends. Valve body material shall be [cast iron] [steel] [bronze] and shall be bubble tight for shutoff at 1034 kPa (gage). Flanged and flangeless type valves shall have corrosion resistant stainless steel stems and corrosion resistant or bronze discs with molded elastomer disc seals. Flow conditions shall be for the regulation from maximum flow to complete shutoff by way of throttling effect. Valves shall be provided in [closed] [open] system. Valves smaller than 200 mm shall have throttling handles. Valves 200 mm and larger shall have totally enclosed manual gear operators with adjustable balance return stops and indicators. Valves shall have a minimum of 7 locking positions and shall be suitable for water temperatures up to 93 degrees C.

2.2.7.11 Butterfly Valves 2 Millimeters and Smaller

Valves shall be one-piece and three-piece design with male or female threaded or soldered end connections and shall be bubble tight for shutoff at 1034 kPa (gage). Stem and disc assembly shall be of corrosion resistant steel. Disc seal assembly shall be of corrosion resistant steel. Disc

seal shall be suitable for the liquid being used in the system in which the valve is to be installed. Valves shall be suitable for water temperature up to 93 degrees C and shall be capable of operating at the rated pressure of [_____] kPa (gage). Valves shall be designed for throttling service use by valve lever and indicator adjustment.

2.2.7.12 Relief Valves

Bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated.

2.2.7.13 Valve Operating Mechanisms

NOTE: Show location of each floor stand, chainwheel or power operator required in the project. Delete paragraph entitled "Valve Operating Mechanisms" and its subparagraphs if these items are not required in the project.

Provide [floor stands] [chainwheels] [power operators] [and extension stems] where indicated and as specified.

NOTE: Show floor stand details including distance from centerline of valve to top of floor, floor thickness, and handwheel height.

- a. Floor Stands: Construct for bolting to the floor and include an extension stem and an operating handwheel. Design an adequately supported and guided extension stems for connection to the valve stem by a sleeve coupling or universal joint. Floor stands shall be cast iron or steel. Handwheel shall identify rotation direction for closing the valve and shall be of such diameter as to permit operation of the valve with a force of not more than 178 N.
- b. Chainwheel Operator: Shall be fabricated of cast iron or steel and shall include a wheel, endless chain and a guide to keep the chain on the wheel. Provide galvanized steel endless chain extending to within one meter of the floor.
- c. Power Operators: Shall be [electric] [pneumatic]. Power operated valves shall open and close at rates no slower than 4 mm per second for gate valves and 1.70 mm per second for globe and angle valves. Valves shall open fully or close tightly without requiring further attention when the actuating control is moved to the open or close position. A predetermined thrust exerted on the stem during operation resulting from an obstruction in the valve shall cause the motor to automatically stop. Power operators shall be complete with all gearing and controls necessary for the size of valve being provided. Power operators shall be designed

to operate on the [electric] [compressed air] power supply indicated.

- d. Extension Stem: Corrosion resisting steel designed for rising and non-rising stems. Provide in length required to connect the valve stem and the [handwheel] [operating mechanism] and of sufficient cross section to transfer the torque required to operate the valve.

2.2.7.14 Balancing Valves

Balancing valves shall be calibrated bronze body balancing valves with integral ball valve and venturi or valve orifice and valve body pressure taps for flow measurement based on differential pressure readings. Valve pressure taps and meter connections shall have seals and built-in check valves with threaded connections for a portable meter. Meter shall be provided by the same manufacturer and be capable of reading system pressures and shall meet the requirements of the paragraph entitled "Flow Measuring Equipment." Valves shall have internal seals to prevent leakage around rotating element and be suitable for full shut-off rated pressure. Valves shall have an operator with integral pointer and memory stop. Balancing valves shall be selected for the required flows as indicated on the plans.

2.2.8 End Connections

2.2.8.1 Flexible Connectors

Provide flexible pipe connectors on piping connected to equipment. Flexible section shall consist of rubber, tetrafluoroethylene resin, corrosion-resistant steel, bronze, monel, or galvanized steel. Material provided and configuration shall be suitable for [pressure,] [vacuum,] [temperature,] and circulating medium. Flexible section shall have [threaded,] [welding,] [soldering,] [flanged] [or] [socket-weld] ends and shall be suitable for service intended. Flexible section may be reinforced with metal retaining rings, with built-in braided wire reinforcement and restriction bolts or with wire braid cover suitable for service intended.

2.2.8.2 Steel Piping

Screwed or socket welded for 50 mm and smaller and flanged or butt welded for 65 mm and larger.

- a. Screwed Joints With Taper Threads: UNI ISO 7-1.
- b. Flanged Joints: Bolting and gaskets shall be as follows:
 - (1) Bolting: Bolt, nut, and stud material: UNI EN 1515-1. Bolt, stud, and nut dimensions: UNI 5596, UNI 6609, and UNI 3740-1. Bolts or bolt studs shall extend completely through the nuts and may have reduced shanks of a diameter not less than the diameter at root of threads. Carbon steel bolts shall have American Standard regular square or heavy hexagon heads and shall have American Standard heavy semifinished hexagonal nuts conforming to UNI 5596.

(2) Gaskets: UNI EN 1514-1, Nonasbestos compressed material 1 1/2 mm thickness full face or self-centering flat ring type and suitable for pressure and temperature of the piping system.

- c. Butt Weld Joints: UNI EN 10253-1. Backing rings shall conform to UNI 8364/A146. Ferrous rings shall not exceed 0.05 percent sulfur; for alloy pipe, backing rings shall be of material compatible with the chemical composition of the parts to be welded and preferably of the same composition. Provide continuous machined or split band backing rings.
- d. Socket Weld Joints: ASME/ANSI B31.9.

2.2.8.3 Joints for Copper Tubing

- a. Solder conforming to UNI EN ISO 3677 alloy. Solder and flux shall be lead free (less than 0.2 percent of lead).
- b. Copper Tube Extracted Joint: An extracted mechanical tee joint may be made in copper tube. Make joint with an appropriate tool by drilling a pilot hole and drawing out the tube surface to form a collar having a minimum height of three times the thickness of the tube wall. To prevent the branch tube from being inserted beyond the depth of the extracted joint, provide dimpled depth stops. Notch the branch tube for proper penetration into fitting to assure a free flow joint. Braze extracted joints using a copper phosphorous classification brazing filler metal. Soldered joints shall not be permitted.

2.2.9 Expansion Joints

2.2.9.1 Packless Type

Provide UNI ISO 7369, with fabricated corrosion-resistant steel bellows.

2.2.9.2 Guided Slip-Tube Type

Provide UNI 7151, internally-externally guided, injected semi-plastic type packing.

2.2.10 Instrumentation

2.2.10.1 Pressure and Vacuum Gauges

Provide UNI 9765 with restrictor.

2.2.10.2 Indicating Thermometers

Thermometers shall be dial type with an adjustable angle suitable for the service. Provide thermowell sized for each thermometer in accordance with the thermowell specification. Fluid-filled thermometers (mercury is not acceptable) shall have a nominal scale diameter of 125 mm. Construction shall be stainless-steel case with molded glass cover, stainless-steel stem

and bulb. Stem shall be straight, length as required to fit well. Bimetal thermometers shall have a scale diameter of 90 mm. Case shall be hermetic. Case and stem shall be constructed of stainless steel. Bimetal stem shall be straight and of a length as required to fit the well.

2.2.10.3 Pressure/Temperature Test Ports

Pressure/Temperature Test Ports shall have brass body and EPDM and/or Neoprene valve seals. Ports shall be rated for service between 2 and 135 degrees C and up to 3447 kPa (gage). Ports shall be provided in lengths appropriate for the insulation thickness specified in Section 15080, "Mechanical Insulation" and installed to allow a minimum of 305 mm of access for probe insertion. Provide with screw-on cap attached with a strap or chain to prevent loss when removed. Ports shall be 8 mm DN and accept 3 mm diameter probes.

2.2.11 Miscellaneous Pipeline Components

2.2.11.1 Air Vent

Provide float type air vent in hydronic systems. Vent shall be constructed of brass or semi-steel body, copper float, and stainless steel valve and valve seat. Design air vent to suit system operating temperature and pressure. Provide isolating valve to permit service without draining the system. Pipe discharge of vent to a drain.

2.2.11.2 Strainers

Strainers for classes 125 and 250 piping in IPS 15 to 200 mm, inclusive, locate as indicated.

2.2.11.3 Hangers and Supports

Design and fabrication of pipe hangers, supports, and welding attachments shall conform to UNI 5311. Hanger types and supports for bare and covered pipe shall conform to UNI 5311 for the temperature range.

2.2.11.4 Pipe Sleeves

Sleeves in masonry and concrete walls, floors, and roof slabs shall be UNI 6363/A199 and UNI 8863/A1, Schedule 40 or Standard Weight, hot-dip galvanized steel [ductile-iron or cast-iron] pipe. Sleeves in partitions shall be zinc-coated sheet steel having a nominal weight of not less than 4.40 kilogram per square meter.

2.2.11.5 Escutcheon Plates

Provide one piece or split hinge metal plates for piping passing through floors, walls, and ceilings in exposed spaces. Provide polished stainless steel plates or chromium-plated finish on copper alloy plates in finished spaces and paint finish on metal plates in unfinished spaces.

2.3 CENTRAL MECHANICAL EQUIPMENT

[2.3.1 Boilers

Provide as specified in Section 15514 or 15515, "Low Pressure Water Heating Boilers."

][2.3.2 Hot Water Heat Exchangers

Provide as specified in Section 15184, "[High] [Medium] Temperature Water System Within Buildings."

][2.3.3 Converters

Steam to hot water converters shall have capacity as indicated for the design conditions. The converters shall be designed for support by separate pipe hangers, and [temperature regulator] [vent valve] shall be provided.

]2.4 PIPING SYSTEM EQUIPMENT

2.4.1 Pumps

Provide hot water circulating pumps, UNI EN 1151. Pump casing and flange shall be made of close-grained cast iron. Shaft shall be carbon or alloy steel with lubricated bearings and impeller shall be bronze. Select pumps so that the operating point on selected impeller-curve will lie at or to the left of shutoff side of, and not more than 5 percent below, point of maximum efficiency for impeller. Provide motors of [open] [splash proof] [totally enclosed] type conforming to CEI EN 60034-1 and suitable for electrical characteristic as indicated. Motor starters shall conform to CEI EN 60947-4-1 [manual] [across the line] [reduced-voltage-start] [part-wind] [wye-delta] type with CEI EN 60529/A1 [general purpose] [weather-resistant] [watertight] enclosure.

2.4.2 Expansion Tanks

Provide welded steel, constructed and tested hydrostatically in accordance with UNI 7182 and UNI 7183. Tank shall be equipped with all necessary fittings. The tank and fittings shall be pressure rated at least equal to the test pressure of the total system. Zinc coat the tank inside and out after fabrication by the hot dip process UNI EN ISO 1461.

2.4.3 External Air Separation Tanks

Provide tank constructed of steel, designed for not less than 517 kPa (gage), and constructed and tested in accordance with the requirements of UNI 7182 and UNI 7183. Provide tangential inlet and outlet connections, flanged for sizes 65 mm and larger. Each unit shall have an internal design suitable for creating the required vortex and subsequent air separation. Provide with automatic air release device and galvanized steel strainer. Provide a blow down connection with a gate valve and piped to nearest floor drain.

2.4.4 Backflow Preventers

NOTE: If contract specifications includes Section 15400, "Plumbing Systems" in which backflow preventers are specified, delete this paragraph entitled "Backflow Preventers."

Reduced pressure principle type. Furnish proof that each make, model/design, and size of backflow preventer being furnished for the project is UNI 9157 certified.

2.4.5 Flow Measuring Equipment

Orifice or venturi type. Flow metering equipment including pitot tubes, venturis, orifice plates, flanges, and indicating meters shall be the product of one and the same manufacturer. Provide flowmeters of [permanent type] [or] [portable type] [type indicated]. Flowmeters shall be suitable for service in which they are to be installed. Provide bronze, monel, or stainless steel materials for wetted parts of flow meters.

- a. Orifices: Square-edge type, made of corrosion and erosion resistant metal and mounted between pipe flanges having factory-made pressure taps provided with shutoff valves. Orifice flanges shall conform to UNI EN ISO 5167-1/A1.
- b. Tubular Flowmeters: Flow measuring elements consisting of venturi tubes or pitot tubes where indicated. Locations and arrangement of piping, both upstream and downstream of flow measuring elements shall conform to the manufacturer's published literature. Provide each flow measuring element with an integral tab, or a metal tag on a corrosion-resistant steel wire, extending outside pipe covering, and stamped or printed in a visible position with manufacturer's name and address; serial number of meter to which it is to be connected; name, number, or location of equipment served; specified rate of flow; and multiplier to be applied to meter reading. Provide taps with shutoff valves and quick connecting hose fittings for portable meters or double ferrule compression fittings for connection to tubing for permanently located meters or recorders. Tubes shall be calibrated in accordance with UNI 6894 recommendations.

(1) Venturi Tubes: Certified by the manufacturer for the actual piping configuration and any necessary piping changes required for certification without additional cost to the Government. Throat diameter for each venturi tube shall be designed so that at specified rate of flow the scale reading will fall between 50 percent and 80 percent of full scale value. Select venturi tube sizes from the manufacturer's latest published tables of flow versus differential pressure. Unrecovered head loss at maximum flow shall not exceed 10 percent. Provide bronze or cast iron tubes with bronze-lined throats, with flanged, threaded, or welded ends to suit piping system. Provide bodies of fabricated steel and fittings of the same class as piping in which installed. Two integral meter taps shall be provided in each venturi tube. Connections for attachment to portable flow meter hoses shall be

readily accessible and not over 1830 mm above a floor or permanent platform.

(2) Pitot Tube Assemblies: Provide corrosion-resistant materials. Tubes shall be capable of measuring liquid flow through tube elements providing an averaged, interpolated flow measurement from a single, fixed position. Provide self cleaning elements and impact tube designed to rotate when turned by the operator to protect pressure-sensing elements of tube when not in use. Location and total amount of pitot tubes required for system flow measurement shall be as recommended by the manufacturer and as indicated.

c. Meters: Designed for a full scale pressure differential of 12 kPa gage for tubular type or 25 kPa gage for orifice type. Dials shall have square root or linear scales with developed length of not less than 305 mm. Provide flush mounted panel meters that read directly in liters per second. Dials of portable meters shall have square root scales reading from 0 to 6 L/s for use with multiplier stamped on orifice or tubular type. Provide meters designed for not less than 1378 kPa and protected against pressure surges. Meter bodies shall have taps for venting and draining.

(1) Permanently Mounted Meters: Each meter shall be connected completely [as indicated] [and] [as specified] and provided with the following: three valve manifold equalizer lines, two block valves, two vent and drain valves, and an integral pulsation damper. Overall accuracy of meters shall be plus or minus 2 percent of full scale flow over a range from 20 to 100 percent of full scale flow.

(2) Portable Meters: Provide meter with a factory-fabricated carrying case with carrying handle. Provide case fitted to hold meter securely and to accommodate the following accessories:

(a) Two 4.60 meters lengths of connecting hose with suitable female connectors for connecting from meter to [venturi tube] [orifice flange] [pitot tube] pressure-tap nipples. Provide hose designed for a minimum service pressure of 861 kPa or 150 percent of maximum system service pressure, whichever is greater.

(b) A completely assembled three-valve manifold with two block valves and vent and drain valves, piped and mounted on a base designed for use laying flat on a stationary surface.

(c) A bound set of descriptive bulletins, installation and operating instructions, parts list, and a set of curves showing flow versus pressure differential for each orifice, venturi tube, or pitot tube with which meter is to be used.

(d) A metal instruction plate, secured inside cover, illustrating use of meter.

(e) Provide meters with overall accuracy of plus or minus 5

percent of full scale flow over a range from 20 to 100 percent of full scale flow.

2.5 TERMINAL UNITS

2.5.1 Finned Tube Radiators

Steel tube and steel fin type. [Copper tube and aluminum fin type UNI EN 442-1, [shall have an adjustable damper].]

2.5.2 Convectors

UNI EN 442-1, of design and capacity not less than that indicated.

2.5.3 Unit Heaters

NOTE: When the project specification does not have a section on unit heaters, the requirements in Section 15760, "Terminal Heating and Cooling Units" for providing unit heater components shall be included in this section.

Provide hot water unit heaters as specified in Section 15760, "Terminal Heating and Cooling Units."

2.5.4 Heating and Ventilating Units

NOTE: When the project specification does not have a section on air handling units, the requirements in Section 15720, "Air Handling Units" for associated air handling unit components shall be included in this section.

Provide fan-coil units, induction units, unit ventilators, and gravity ventilators as specified in Section 15720, "Air Handling Units."

2.6 ELECTRICAL EQUIPMENT

Provide complete with motors, motor starters, thermal overload protection, and controls. Equipment and wiring shall be in accordance with Section 16402, "Interior Distribution System."

2.7 CONTROLS

NOTE: When the project specification does not have a section on system controls, the requirements in Section 15901, "Space Temperature Control Systems" for for operating the heating system shall be included in this section.

Provide controls as specified in Section 15901, "Space Temperature Control Systems."

2.8 INSULATION

NOTE: When the project specification does not have a section on mechanical insulation, the requirements in Section 15080, "Mechanical Insulation" for shop and field applied insulation shall be included in this section.

Provide shop and field applied insulation as specified in Section 15080, "Mechanical Insulation."

2.9 ASBESTOS PROHIBITION

Asbestos and asbestos containing products are prohibited.

PART 3 EXECUTION

3.1 PREPARATION

Provide storage for equipment and material at the project site. All parts shall be readily accessible for inspection, repair, and renewal. Protect material and equipment from the weather.

3.2 INSTALLATION

Piping fabrication, assembly, welding, soldering, and brazing shall conform to UNI 8364/A146. Piping shall follow the general arrangement shown. Route piping and equipment within buildings out of the way of lighting fixtures and doors, windows, and other openings. Run overhead piping in buildings in inconspicuous positions. Provide adequate clearances from walls, ceilings, and floors to permit welding of joints and application of insulation. Make provision for expansion and contraction of pipe lines. Make changes in size of water lines with reducing fittings. Do not bury, conceal, or insulate until piping has been inspected, tested, and approved. Do not run piping concealed in walls, partitions, underground, or under the floor except as otherwise indicated. Where pipe passes through building structure, locate pipe joints and expansion joints where they may be inspected. Provide flanged joints where necessary for normal maintenance and where required to match valves and equipment. Furnish gaskets, packing, and thread compounds suitable for the service. Provide long radius ells where possible to reduce pressure drops. Pipe bends in lieu of welding fittings may be used where space permits. Pipe bends shall have a uniform radius of at least five times the pipe diameter and shall be free from appreciable flattening, wrinkling, or thinning of the pipe. Do not use mitering of pipe to form elbows, notching straight runs to form full sized tees, or any similar construction. Make branch connections over 50 mm with welding tees except approved factory made forged welding branch

outlets or nozzles having integral reinforcements may be used, provided the nominal diameter of the branch is at least one pipe size less than the nominal diameter of the run. Branch connections 50 mm and under can be threaded or welded. Run vertical piping plumb and straight and parallel to walls. Provide sleeves for lines passing through building structure. Provide a fire seal where pipes pass through fire wall, fire partitions, fire rated pipe chase walls, or floors above grade. Install piping connected to equipment with flexibility for thermal stresses and for vibration, and support and anchor so that strain from weight and thermal movement of piping is not imposed on the equipment.

3.2.1 Hangers and Supports

Unless otherwise indicated, horizontal and vertical piping attachments shall conform to UNI 5311. Band and secure insulation protection shields without damaging pipe insulation. Continuous inserts and expansion bolts may be used.

3.2.2 Grading of Pipe Lines

Unless otherwise indicated, install horizontal lines of hot water piping to grade down in the direction of flow with a pitch of not less than 25 mm in 9 meters, except in loop mains and main headers where the flow may be in either direction.

3.2.3 Pipe Sleeves

Provide sleeves where pipes and tubing pass through masonry or concrete walls, floors, roof, and partitions. Annular space between pipe, tubing, or insulation and the sleeve shall not be less than 6 mm. Hold sleeves securely in proper position and location before and during construction. Sleeves shall be of sufficient length to pass through entire thickness of walls, partitions, or slabs. Sleeves in floor slabs shall extend 50 mm above finished floor. Firmly pack space between pipe or tubing and sleeve with oakum and caulk on both ends of the sleeve with plastic waterproof cement which will dry to a firm but pliable mass, or provide a [mechanically adjustable] segmented elastomeric seal. Seal both ends of penetrations through fire walls and fire floors to maintain fire resistive integrity with fire resistant fill, void, or cavity material.

3.2.4 Flashing for Buildings

Provide flashing where pipes pass through building roofs, and make outside walls tight and waterproof.

3.2.5 Unions and Flanges

Provide unions and flanges to permit easy disconnection of piping and apparatus. Each connection having a screwed-end valve shall have a union. Place unions and flanges no farther apart than 30 meters. Install unions downstream of valves and at equipment or apparatus connections. Provide unions on piping under 50 mm in diameter, and provide flanges on piping 50 mm and over in diameter. Provide dielectric unions or flanges between ferrous and non-ferrous piping, equipment, and fittings; except that bronze

valves and fittings may be used without dielectric couplings for ferrous-to-ferrous or non-ferrous-to-non-ferrous connections.

3.2.6 Connections for Future Equipment

Locate capped or plugged outlets for connections to future equipment as indicated.

3.2.7 Changes in Pipe Size

Provide reducing fittings for changes in pipe size; reducing bushings are not permitted. In horizontal lines, provide eccentric reducing fittings to maintain the top of the lines in the same plane.

3.2.8 Cleaning of Pipe

Thoroughly clean each section of pipe, fittings, and valves free of foreign matter before erection. Prior to erection, hold each piece of pipe in an inclined position and tap along its full length to loosen sand, mill scale and other foreign matter. For pipe 50 mm and larger, draw wire brush, of a diameter larger than that of the inside of the pipe, several times through the entire length of pipe. Before making final connections to apparatus, wash out interior of piping thoroughly with water. Plug or cap open ends of mains during shutdown periods. Do not leave lines open where foreign matter might enter the pipe.

3.2.9 Valves

Install valves in conformance with UNI 8364/A146. Provide gate valves unless otherwise directed. Install valves with stems horizontal or above. Locate or equip stop valves to permit operation from floor level, or provide with safe access in the form of walkways or ladders. Install valves in positions accessible for operation and repair.

3.2.9.1 Globe Valves

Install globe valves so that the pressure is below the disk and the stem horizontal.

3.2.9.2 Radiators Valves

Provide radiator valves on water inlet and balancing valves on water outlet of terminal heating units such as radiation, unit heaters, and fan coil unit.

3.2.9.3 Relief Valves

Provide valves on pressure tanks, low pressure side of reducing valves, heat exchangers, and expansion tanks. Select system relief valve so that capacity is greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment. Pipe relief valve outlet to the nearest floor drain.

3.2.10 Pressure Gage

Provide a shut-off valve or pet cock between pressure gages and the line.

3.2.11 Thermometers

Provide thermometers and thermal sensing elements of control valves with a separable socket. Install separable sockets in pipe lines in such a manner to sense the temperature of flowing the fluid and minimize obstruction to flow.

3.2.12 Strainers

Provide strainers, with meshes suitable for the services, where indicated, or where dirt might interfere with the proper operation of valve parts, orifices, or moving parts of equipment.

3.2.13 Pumps

Select pumps for specified fluid temperatures, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve. Support piping adjacent to pump such that no weight is carried on pump casings. Install close coupled and base mounted pumps on concrete base, with anchor bolts, set and level, and grout in place and provide supports under elbows on pump suction and discharge line sizes 100 mm and over. Lubricate pump before start-up.

3.2.14 Equipment Foundations

**NOTE: When the project specification does not have
a section on concrete work, the requirements in
Section 03300, "Cast-In-Place-Concrete" for
foundation work shall be included in this section.**

Locate equipment foundations as shown on the drawings. Size, weight, and design shall preclude shifting of equipment under operating conditions. Foundations shall meet the requirements of the equipment manufacturer. Concrete shall conform to Section 03300, "Cast-In-Place-Concrete," and grout shall be approved non-shrinking.

3.2.15 Equipment Installation

Install equipment in accordance with installation instructions of the manufacturers. Grout equipment mounted on concrete foundations before installing piping. Install piping in such a manner as not to place a strain on the equipment. Do not bolt flanged joints tight unless they match. Grade, anchor, guide, and support piping without low pockets.

3.2.16 Cleaning of Systems

As installation of the various system components is completed, fill, start, and vent prior to cleaning. Place terminal control valves in open position. Add cleaner to closed system at concentration as recommended by

manufacturer. Apply heat while circulating, slowly raising temperature to 71 degrees C and maintain for 12 hours minimum. Remove heat and circulate to 38 degrees C or less; drain systems as quickly as possible and refill with clean water. Circulate for 6 hours at design temperatures, then drain. Refill with clean water and repeat until system cleaner is removed.

Use neutralizer agents on recommendation of system cleaner supplier and approval of Contracting Officer. Remove, clean, and replace strainer screens. Inspect, remove sludge, and flush low points with clean water after cleaning process is completed. Include disassembly of components as required. Preliminary or final tests are not permitted until cleaning is approved.

3.2.17 Painting of Piping and Equipment

NOTE: When the project specification does not have a section on field painting, the requirements in Section 09900, "Paints and Coatings" for cleaning and painting of pipe and equipment, and for painting and stencilling of piping shall be included in this section.

Provide in accordance with Section 09900, "Paints and Coatings."

3.2.18 Identification of Piping

NOTE: When the project specification does not have a section on field painting, the requirements in Section 09900 for cleaning and painting of pipe and equipment, and for painting and stencilling of piping shall be included in this section.

Identify piping in accordance with UNI 8364/A146, except that labels or tapes may be used in lieu of painting or stencilling. Spacing of identification marking on runs shall not exceed 15 meters. Materials for labels and tapes shall conform to UNI EN 12035, and shall be general purpose type and color class. Painting and stencilling shall conform to Section 09900, "Paints and Coatings."

3.3 FIELD QUALITY CONTROL

Perform inspections and tests as specified herein to demonstrate that piping and equipment, as installed, is in compliance with contract requirements. Start up and operate the system. During this time, periodically clean the various strainers until no further accumulation of foreign material occurs. Exercise care so that minimum loss of water occurs when strainers are cleaned. Adjust safety and automatic control instruments to place them in proper operation and sequence.

3.3.1 Hydrostatic Test of Piping System

NOTE: Test piping systems at one and one-half times system pressure or 345 kPa (gage) whichever is greater.

Test piping system hydrostatically using water not exceeding 38 degrees C. Conduct tests as follows. Test piping system after all lines have been cleaned and before applying insulation covering. Remove or valve off from the system, gages, and other apparatus which may be damaged by the test before the tests are made. Install calibrated test pressure gage in the system to observe any loss in pressure. Maintain test pressure for a sufficient length of time to enable an inspection of each joint and connection. Perform tests after installation and prior to acceptance. Notify the Contracting Officer in writing [_____] days prior to the time scheduled for the tests.

3.3.2 Auxiliary Equipment and Accessory Tests

Observe and check pumps, accessories, and equipment during operational and capacity tests for leakage, malfunctions, defects, noncompliance with referenced standards, or overloading.

3.3.2.1 Backflow Preventers

Backflow preventers shall be tested by locally approved and certified backflow assembly testers. A copy of the test report shall be provided to the Contracting Officer prior to placing the domestic water system into operation, or no later than 5 days after the test.

3.4 TESTING, ADJUSTING, AND BALANCING

NOTE: Use the first sentence for simple hydronic systems and where Section 15950, "HVAC Testing/Adjusting/Balancing" is not included in the specifications. Use the second sentence for all specifications with Section .

3.4.1 Markings of Settings

Following final acceptance of the balancing report, the settings of all valves, splitters, dampers, and other adjustment devices shall be permanently marked so that adjustment can be restored if disturbed at anytime.

3.4.2 Sound Level Tests

Upon completion of testing and balancing of hydronic systems, conduct sound level tests of conditioned spaces. Use sound level meter required by UNI EN ISO 3822-2 and UNI EN ISO 3822-3 calibrated in accordance with NBS standards and guidelines, and accompanied by a certificate of calibration. Record sound levels in dBA with heating systems off and with heating

systems operating. Record the following data for each room and system:

- a. Background sound level (systems off);
- b. Total sound level corrected for background; and
- c. Sound power rating by manufacturer of the respective outlet.

Test Locations: Take sound level reading at location 2 meters from face of each outlet on a line at 0.785 rad with face of outlet. Remedial Action: If sound level at any observation point exceeds [20] [45] [_____] dBA, take remedial action as directed.

-- End of Section --