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USACE / NAVFAC / AFCEA / NASA UFGS-22 10 00.00 40 (June 2006)  
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Preparing Activity: NASA Superseding  
UFGS-22 10 00.00 40 (April 2006)

## UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2008

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06/06

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### SECTION 22 10 00.00 40

#### PLUMBING PIPING AND PUMPS 06/06

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NOTE: This specification covers the requirements for polyvinylchloride (PVC), polyethylene (PE), acrylonitrile-butadiene-styrene (ABS), and chlorinated polyvinylchloride (CPVC) pipe and pipe fittings for general use. Ordinary methods of installation are also included. This section does not cover the use of plastic pipe in specialized systems or processes or the installation of such systems.

Associated work specified in other sections includes identification, anchors, flashing, hangers and supports, valves and cocks, insulation, and testing.

Drawings should show:

Location where each size of pipe is installed

Provisions for expansion and contraction

Elevation of piping slope, extent of service, and location of terminations or connections to other equipment

Where piping is to be concealed or exposed, sufficient sections and details for completion of construction.

Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of [technical proponents](#), including their organization

designation and telephone number, is on the Internet.

Recommended changes to a UFGS should be submitted as  
a Criteria Change Request (CCR).

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## PART 1 GENERAL

### 1.1 REFERENCES

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NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

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

#### ASTM INTERNATIONAL (ASTM)

|             |                                                                                                                                     |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------|
| ASTM D 1527 | (1999; R 2005) Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe, Schedules 40 and 80                   |
| ASTM D 1784 | (2006a) Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds |
| ASTM D 1785 | (2006) Standard Specification for Poly(Vinyl Chloride) (PVC), Plastic Pipe, Schedules 40, 80, and 120                               |
| ASTM D 2104 | (2003) Standard Specification for Polyethylene (PE) Plastic Pipe, Schedule 40                                                       |
| ASTM D 2235 | (2004) Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings                |
| ASTM D 2239 | (2003) Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR)                                                          |

Based on Controlled Inside Diameter

|             |                                                                                                                                     |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------|
| ASTM D 2241 | (2005) Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)                                       |
| ASTM D 2447 | (2003) Standard Specification for Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter                    |
| ASTM D 2464 | (2006) Standard Specification for Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80                            |
| ASTM D 2466 | (2006) Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40                                     |
| ASTM D 2467 | (2006) Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80                                     |
| ASTM D 2564 | (2004e1) Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems                           |
| ASTM D 2609 | (2002) Standard Specification for Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe                                        |
| ASTM D 2661 | (2006) Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings                           |
| ASTM D 2680 | (2001) Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping       |
| ASTM D 2683 | (2004) Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing    |
| ASTM D 2751 | (2005) Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings                                     |
| ASTM D 2855 | (1996; R 2002) Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings               |
| ASTM D 3261 | (2003) Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing |
| ASTM F 437  | (2006) Standard Specification for Threaded                                                                                          |

|                   |                                                                                                                                   |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------|
|                   | Chlorinated Poly(Vinyl Chloride) (CPVC)<br>Plastic Pipe Fittings, Schedule 80                                                     |
| ASTM F 438        | (2004) Standard Specification for<br>Socket-Type Chlorinated Poly(Vinyl<br>Chloride) (CPVC) Plastic Pipe Fittings,<br>Schedule 40 |
| ASTM F 439        | (2006) Standard Specification for<br>Chlorinated Poly(Vinyl Chloride) (CPVC)<br>Plastic Pipe Fittings, Schedule 80                |
| ASTM F 441/F 441M | (2002) Standard Specification for<br>Chlorinated Poly(Vinyl Chloride) (CPVC)<br>Plastic Pipe, Schedules 40 and 80                 |
| ASTM F 442/F 442M | (1999; R 2005) Standard Specification for<br>Chlorinated Poly(Vinyl Chloride) (CPVC)<br>Plastic Pipe (SDR-PR)                     |

## 1.2 GENERAL REQUIREMENTS

\*\*\*\*\*  
NOTE: If Section 23 00 00.00 40 HEATING,  
VENTILATING, AND AIR-CONDITIONING is not included in  
the project specification, applicable requirements  
therefrom should be inserted and the following  
paragraph deleted.  
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Section 23 00 00.00 40 HEATING, VENTILATING, AND AIR-CONDITIONING applies  
to work specified in this section.

## 1.3 SUBMITTALS

\*\*\*\*\*  
NOTE: Review Submittal Description (SD) definitions  
in Section 01 33 00 SUBMITTAL PROCEDURES and edit  
the following list to reflect only the submittals  
required for the project. Submittals should be kept  
to the minimum required for adequate quality control.

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.  
Codes for Army projects using the Resident  
Management System (RMS) are: "AE" for  
Architect-Engineer; "DO" for District Office  
(Engineering Division or other organization in the

District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

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Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are [for Contractor Quality Control approval.] [for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

#### SD-02 Shop Drawings

Installation Drawings for plastic piping systems shall be in accordance with paragraph entitled, "Installation," of this section.

#### SD-03 Product Data

Manufacturer's Catalog Data shall be submitted in accordance with paragraph entitled, "General Requirements," of this section.

#### SD-07 Certificates

Certificates shall be submitted for Potable Water Systems Materials in accordance with paragraph entitled, "General Requirements," of this section.

Seal of approval of [National Sanitation Foundation testing laboratory] [approved testing laboratory acceptable to public health officials] for .

### 1.4 GENERAL REQUIREMENTS

Manufacturer's Catalog Data shall be submitted for plastic pipe and fittings, for each size and type.

Certificates shall include a seal of approval from the [National Sanitation Foundation testing laboratory] [approved testing laboratory acceptable to public health officials] for Potable Water Systems Materials.

## PART 2 PRODUCTS

### 2.1 POLYVINYLCHLORIDE (PVC) PIPE

PVC pipe shall be in accordance with ASTM D 1785.

#### 2.1.1 Schedule Pipe (PVC)

\*\*\*\*\*

NOTE: Use Schedule 80 for threaded pipe.

\*\*\*\*\*

Pipe shall be Schedule [40] [80].

Material shall be PVC Class 12454-B in accordance with ASTM D 1784.

#### 2.1.1.2 SDR-PR Nonthreaded Pipe (PVC)

Nonthreaded standard dimension ratio/pressure rated (SDR-PR) pipe shall be in accordance with ASTM D 2241.

Pipe shall have SDR of [13.5] [17] [21] [26] [32.5] [41] [64].

Material shall be PVC Class 12454-B.

#### 2.1.1.3 Fittings (PVC)

##### 2.1.1.3.1 Socket-Type, Schedule 40

Material shall be PVC in accordance with ASTM D 2466.

##### 2.1.1.3.2 Socket-Type, Schedule 80

Material shall be PVC in accordance with ASTM D 2467.

##### 2.1.1.3.3 Threaded, Schedule 80

Material shall be PVC in accordance with ASTM D 2464.

#### 2.1.1.4 Cement and Lubricant

Solvent cement for pipe and fittings shall be in accordance with ASTM D 2564. Thread lubricant shall be in accordance with the pipe manufacturer's recommendations.

### 2.2 CHLORINATED POLYVINYLCHLORIDE (CPVC) PIPE

CPVC pipe shall be in accordance with ASTM F 441/F 441M.

#### 2.2.1 Schedule Pipe (CPVC)

\*\*\*\*\*  
NOTE: Use schedule 80 for threaded pipe.  
\*\*\*\*\*

Pipe shall be Schedule [40] [80].

Material shall be CPVC Class 23447-B in accordance with ASTM D 1784.

#### 2.2.2 SDR-PR Nonthreaded Pipe (CPVC)

SDR-PR nonthreaded pipe shall be in accordance with ASTM F 442/F 442M.

Pipe shall have SDR of [13.5] [17] [21] [26] [32.5].

Material shall be CPVC Class 23447-B in accordance with ASTM D 1784



### 2.2.3 Fittings (CPVC)

#### 2.2.3.1 Socket-Type, Schedule 40

Material shall be CPVC in accordance with ASTM F 438.

#### 2.2.3.2 Socket-Type, Schedule 80

Material shall be CPVC in accordance with ASTM F 439.

#### 2.2.3.3 Threaded Schedule 80

Material shall be CPVC in accordance with ASTM F 437.

### 2.2.4 Cement and Lubricant

Solvent cement for pipe and fittings shall be in accordance with ASTM D 2564.

Thread lubricant shall be in accordance with the pipe manufacturer's recommendations.

### 2.3 POLYETHYLENE (PE) PIPE

#### 2.3.1 Schedule Pipe (PE)

Pipe shall be Schedule 40 and shall be in accordance with ASTM D 2104.

\*\*\*\*\*

NOTE: Material designation is based on the following:

| <u>Material Designation</u><br><u>Stress (psi)</u> | <u>Hydrostatic Design</u> |
|----------------------------------------------------|---------------------------|
| PE 1404                                            | 400                       |
| PE 2305                                            | 500                       |
| PE 2306                                            | 630                       |
| PE 3306                                            | 630                       |
| PE 3406                                            | 630                       |
| <u>Material Designation</u><br><u>Stress (kPa)</u> | <u>Hydrostatic Design</u> |
| PE 1404                                            | 2800                      |
| PE 2305                                            | 3500                      |
| PE 2306                                            | 4400                      |
| PE 3306                                            | 4440                      |
| PE 3406                                            | 4440                      |

\*\*\*\*\*

Material shall be PE [1404] [2305] [2306] [3306] [3406].

### 2.3.2 Standard Inside Dimension Ratio-Pressure Rated (SIDR-PR) Pipe

SIDR-PR pipe shall be in accordance with **ASTM D 2239**.

SIDR shall be [5.3] [7] [9] [11.5] [15].

Material shall be PE [1404] [2305] [3306] [3406].

### 2.3.3 Schedule, Outside-Diameter-Controlled

Schedule pipe that is outside-diameter-controlled shall be in accordance with **ASTM D 2447**.

Pipe shall be Schedule [40] [80].

Material shall be PE [1404] [2305] [2306] [3306] [3406].

### 2.3.4 Fittings (PE)

#### 2.3.4.1 Schedule 40, Butt Fusion

Schedule 40, butt fusion fittings shall be in accordance with **ASTM D 3261**.

Pipe shall be [14333-D] [13233].

#### 2.3.4.2 Schedule 80, Butt Fusion

Schedule 80, butt fusion fittings shall be in accordance with **ASTM D 3261**.

Pipe shall be [14333-D] [13233].

#### 2.3.4.3 Insert Fittings

Insert fittings for PE pipe shall be in accordance with **ASTM D 2609**.

[Material shall be acrylonitrile-butadiene-styrene (ABS), Type [1] [2].]

[Material shall be PVC class: [12454-B] [12454-C] [11443-B] [14333-D].]

#### 2.3.4.4 Socket-Type for SDR 11.0 Pipe

Socket-type fittings for SDR 11.0 pipe shall be in accordance with **ASTM D 2683**.

Pipe shall be in accordance with [14333-D] [13233].

### 2.4 ACRYLONITRILE-BUTADIENE-STYRENE (ABS) PIPE

#### 2.4.1 Schedule Pipe (ABS)

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NOTE: ABS 1210 has a hydrostatic design stress of  
**1,000 psi 6900 kilopascal.**

ABS 2112 has a hydrostatic design stress of **1,250 psi**  
**8600 kilopascal.**

ABS 1316 has a hydrostatic design stress of **1,600 psi**

**11000 kilopascal**

\*\*\*\*\*

ABS schedule pipe shall be in accordance with [ASTM D 1527](#).

Pipe shall be Schedule 40.

Pipe shall be ABS [1210] [2112] [1316].

2.4.2 SDR-PR Nonthreaded Pipe (ABS)

Nonthreaded SDR-PR pipe shall be in accordance with [ASTM D 1527](#) and [ASTM F 442/F 442M](#).

Pipe shall have SDR of [26] [21] [17] [13.5].

Pipe shall be ABS [1210] [2112] [1316].

2.4.3 Threaded Pipe

Threaded pipe shall be in accordance with [ASTM D 1527](#).

Pipe shall be ABS [1210] [2112] [1316].

2.4.4 Drain, Waste, and Vent Pipe

Drain, waste, and vent pipe shall be in accordance with [ASTM D 2661](#).

2.4.5 Sewer Pipe

Sewer pipe shall be in accordance with [ASTM D 2751](#).

2.4.6 Composite Sewer Piping

Composite sewer piping shall be in accordance with [ASTM D 2680](#).

2.4.7 Fittings (ABS)

2.4.7.1 Schedule 40, Socket-Type

Fittings shall be Type [I] [II], Grade [1] [2] [3].

2.4.7.2 Schedule 80, Socket-Type

Schedule 80, socket-type fittings shall be in accordance with [ASTM D 1527](#).

Fittings shall be Type [I] [II], Grade [1] [2] [3].

2.4.7.3 Schedule 80, Threaded

Schedule 80, threaded fittings shall be in accordance with [ASTM D 1527](#).

Fittings shall be Type [I] [II], Grade [1] [2] [3].

2.4.7.4 Drain, Waste, and Vent Fittings

Drain, waste, and vent fittings shall be in accordance with [ASTM D 2661](#).

#### 2.4.7.5 Sewer Pipe Fittings

Sewer pipe fittings shall be in accordance with ASTM D 2751.

#### 2.4.8 Cement and Lubricant

Solvent cement for pipe and fittings shall be in accordance with ASTM D 2235.

Thread lubricant shall be in accordance with the pipe manufacturer's instructions.

### PART 3 EXECUTION

#### 3.1 PIPE LAYOUT

\*\*\*\*\*  
**NOTE: Delete the second paragraph when diagonal  
piping is desired.**  
\*\*\*\*\*

Installation shall present a neat, orderly appearance. Openings or passageways shall not be blocked.

[Piping shall be parallel to exterior walls of building.]

[Piping shall be kept free from contact with structure or installed items to prevent noise transmission.]

#### 3.2 INSTALLATION

Installation drawings shall be submitted.

Plastic piping shall be installed in accordance with the manufacturer's installation instructions.

##### 3.2.1 Vertical Piping

CPVC piping shall be supported at intervals of not more than 900 millimeter 3 feet.

All other piping shall be supported at intervals of not more than 1200 millimeter 4 feet.

Piping shall be secured at sufficiently close intervals to keep pipe in alignment and to support weight of pipe and contents.

Supports shall be installed at each floor.

Piping shall be secured in position by approved stakes or braces when piping is to stand free, or when no structural element is available for providing stability during construction.

##### 3.2.2 Horizontal Piping, Suspended

All piping shall be supported at intervals in accordance with the manufacturer's instructions and in no case not more than 900 millimeter 3 feet.

Hangers shall be installed at ends of runs or branches and at each change

of direction or alignment.

### 3.2.3 Horizontal Piping, Underground

Piping shall be laid on a firm bed for the entire trench length, except where otherwise supported.

Partial backfilling and cradling shall be employed to secure piping during backfilling operations.

Piping laid on grade shall be firmly braced prior to embedment in concrete.

### 3.2.4 Cutting

Cuts shall be made square with pipe and burrs shall be removed by smoothing edges.

### 3.2.5 Joints

\*\*\*\*\*  
NOTE: Threaded joints should not be specified for  
schedule 40 or thinner wall pipe.  
\*\*\*\*\*

[Threaded joints shall be used. Joints shall be tightened by strap wrench to not more than one full turn beyond hand tight.]

[Joints shall be solvent cemented in accordance with [ASTM D 2855](#).]

Junction with other materials shall be the type of adapter and technique as recommended by the pipe manufacturer.

-- End of Section --