ASME B16.29-2017
(Revision of ASME B16.29-2012)

# Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings — DWV



AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

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AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers
Two Park Avenue • New York, NY • 10016 USA

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The American Society of Mechanical Engineers
Two Park Avenue, New York, NY 10016-5990

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# FOREWORD

Standardization of cast and wrought solder-joint fittings was initiated in Subcommittee 11 of American Standards Association (ASA) Sectional Committee A40 on Plumbing Requirements and Equipment. Development work culminated in publication of ASA A40.3-1941.

In 1949, work on these fittings was transferred to Sectional Committee B16 of ASA, which established Subcommittee 9 (now Subcommittee J). The first standard developed was approved as ASA B16.18-1950, Cast Bronze Solder-Joint Fittings. A later joint effort of the Copper and Brass Research Association and the Manufacturers Standardization Society of the Valve and Fittings Industry (MSS) culminated in a standard on wrought fittings, ultimately approved as B16.22-1951.

Concurrently, recognizing the need for drainage fitting standards, an MSS task group developed the standard later approved as ASA B16.23-1953, Cast Bronze Solder-Joint Drainage Fittings, and a standard for wrought fittings was initially published as MSS SP-64-1961. A revision of that standard was submitted to Subcommittee 9 of B16 and was eventually approved as ASA B16.29-1966.

A revision was published [after reorganization of ASA as the American National Standards Institute (ANSI)] as ANSI B16.29-1973. In this edition, shorter solder cups were specified in larger sizes, since strength to contain pressure is not a factor. In 1979, Subcommittee I (formerly 9, now J) added metric dimensional equivalents and made other minor improvements. That revision was approved by ANSI, after approval by the Committee and secretariat organizations, as ANSI B16.29-1980.

In 1982, American National Standards Committee B16 was reorganized as an ASME Committee operating under procedures accredited by ANSI. The 1986 edition of the standard removed metric equivalents (not functionally applicable in the plumbing industry), updated the referenced standards, and incorporated editorial and format revisions. The 1994 edition removed inspection tolerance requirements, established minimum laying lengths, added soil pipe adapters, and incorporated editorial revisions. Following approval by the Standards Committee and ASME, approval as an American National Standard was given by ANSI on October 10, 1994, with the designator ASME B16.29-1994.

The 2001 edition of this Standard was revised to include Nonmandatory Appendix B, Quality System Program. Editorial revisions were made for the purpose of clarification. Following approval by the B16 Main Committee and ASME Supervisory Board, the Standard was approved as an American National Standard by ANSI on October 11, 2001.

In the 2007 edition, metric units were used as a primary reference unit while maintaining U.S. Customary units in either parenthetical or separate forms. In addition, several editorial revisions were made for clarity.

In the 2012 edition, references to ASME standards were revised to no longer list specific edition years; the latest edition of ASME publications applied unless stated otherwise. Following approval by the B16 Standards Committee and the ASME Supervisory Board, and after public review, the Standard was approved as an American National Standard by ANSI on August 23, 2012.

In this 2017 edition, provisions have been made to update verbiage and readings. Following approval by the ASME B16 Standards Committee, approval as an American National Standard was given by ANSI on September 7, 2017, with the new designation ASME B16.29-2017.

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Secretary, B16 Standards Committee
The American Society of Mechanical Engineers
Two Park Avenue
New York, NY 10016-5990
http://go.asme.org/Inquiry

**Proposing Revisions.** Revisions are made periodically to the Standard to incorporate changes that appear necessary or desirable, as demonstrated by the experience gained from the application of the Standard. Approved revisions will be published periodically.

The Committee welcomes proposals for revisions to this Standard. Such proposals should be as specific as possible, citing the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent documentation.

**Interpretations.** Upon request, the B16 Standards Committee will render an interpretation of any requirement of the Standard. Interpretations can only be rendered in response to a written request sent to the Secretary of the B16 Standards Committee.

Requests for interpretation should preferably be submitted through the online Interpretation Submittal Form. The form is accessible at http://go.asme.org/InterpretationRequest. Upon submittal of the form, the Inquirer will receive an automatic e-mail confirming receipt.

If the Inquirer is unable to use the online form, he/she may e-mail the request to the Secretary of the B16 Standards Committee at SecretaryB16@asme.org, or mail it to the above address. The request for an interpretation should be clear and unambiguous. It is further recommended that the Inquirer submit his/her request in the following format:

| | |
|---|---|
| Subject: | Cite the applicable paragraph number(s) and the topic of the inquiry in one or two words. |
| Edition: | Cite the applicable edition of the Standard for which the interpretation is being requested. |
| Question: | Phrase the question as a request for an interpretation of a specific requirement suitable for general understanding and use, not as a request for an approval of a proprietary design or situation. Please provide a condensed and precise question, composed in such a way that a "yes" or "no" reply is acceptable. |
| Proposed Reply(ies): | Provide a proposed reply(ies) in the form of "Yes" or "No," with explanation as needed. If entering replies to more than one question, please number the questions and replies. |
| Background Information: | Provide the Committee with any background information that will assist the Committee in understanding the inquiry. The Inquirer may also include any plans or drawings that are necessary to explain the question; however, they should not contain proprietary names or information. |

Requests that are not in the format described above may be rewritten in the appropriate format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

Moreover, ASME does not act as a consultant for specific engineering problems or for the general application or understanding of the Standard requirements. If, based on the inquiry information submitted, it is the opinion of the Committee that the Inquirer should seek assistance, the inquiry will be returned with the recommendation that such assistance be obtained.

ASME procedures provide for reconsideration of any interpretation when or if additional information that might affect an interpretation is available. Further, persons aggrieved by an interpretation may appeal to the cognizant ASME Committee or Subcommittee. ASME does not "approve," "certify," "rate," or "endorse" any item, construction, proprietary device, or activity.

**Attending Committee Meetings.** The B16 Standards Committee regularly holds meetings and/or telephone conferences that are open to the public. Persons wishing to attend any meeting and/or telephone conference should contact the Secretary of the B16 Standards Committee.

# ASME B16.29-2017
# SUMMARY OF CHANGES

Following approval by the ASME B16 Committee and ASME, and after public review, ASME B16.29-2017 was approved by the American National Standards Institute on September 7, 2017.

ASME B16.29-2017 includes the following changes identified by a margin note, **(17)**. The Record Numbers listed below are explained in more detail in the "List of Changes in Record Number Order" following this Summary of Changes.

| *Page* | *Location* | *Change (Record Number)* |
|---|---|---|
| 7 | Table 4 | In the fourth column, fourth entry corrected by errata from "6" to "67" *(17-1720)* |
| 25 | Mandatory Appendix II | References revised *(16-1636)* |

# LIST OF CHANGES IN RECORD NUMBER ORDER

| Record Number | Change |
|---|---|
| 16-1636 | References updated in Mandatory Appendix II. |
| 17-1720 | Table 4 value corrected by errata from “6” to “67.” |

# Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings — DWV

## 1 SCOPE

This Standard for wrought copper and wrought copper alloy solder-joint drainage fittings, designed for use with copper drainage tube conforming to ASTM B306, covers the following:

*(a)* description
*(b)* pitch (slope)
*(c)* abbreviations for end connections
*(d)* sizes and method of designating openings for reducing fittings
*(e)* marking
*(f)* material
*(g)* dimensions and tolerances

## 2 GENERAL

### 2.1 Convention

For determining conformance with this Standard, the convention for fixing significant digits where limits (maximum and minimum values) are specified shall be as defined in ASTM E29. This requires that an observed or calculated value be rounded off to the nearest unit in the last right-hand digit used for expressing the limit. Decimal values and tolerances do not imply a particular method of measurement.

### 2.2 Relevant Units

This Standard states values in both SI (metric) and U.S. Customary units. These systems of units are to be regarded separately as standard. Within the text, the U.S. Customary units are shown in parentheses or in separate tables that appear in Mandatory Appendix I. The values stated in each system are not exact equivalents; therefore, it is required that each system of units be used independently of the other. Combining values from the two systems constitutes nonconformance with the Standard.

### 2.3 References

Codes, standards, and specifications, containing provisions to the extent referenced herein, constitute requirements of this Standard. These reference documents are listed in Mandatory Appendix II.

### 2.4 Quality Systems

Guidelines relating to the product manufacturer's quality system programs are described in Nonmandatory Appendix A.

## 3 DESCRIPTION

These fittings are designed for drainage and vent systems only, using the solder-joint method of connection. The fitting cups (C) are provided with stops so that the ends of the tube, when assembled, meet the stops. Sketches and designs of fittings are illustrative only. The dimensions specified herein shall govern in all cases.

## 4 PITCH (SLOPE)

All nominal 90-deg fittings shall be pitched to result in a slope of 0.20 mm/m (0.25 in./ft) (2%) of horizontal tube length with reference to a horizontal plane.

## 5 ABBREVIATIONS

The symbols shown below are used to designate the type of fitting end.

| Symbols | Definitions |
|---|---|
| C | Solder-joint fitting end (internal) made to receive copper tube diameter |
| F | Internal American National Standard taper pipe thread, NPTI |
| FTG | Solder-joint fitting end (external) made to copper tube diameter |
| M | External American National Standard taper pipe thread, NPTE |
| NPSM | American National Standard free-fitting straight mechanical pipe thread |
| SJ | End of fitting formed to receive outside diameter tube size |

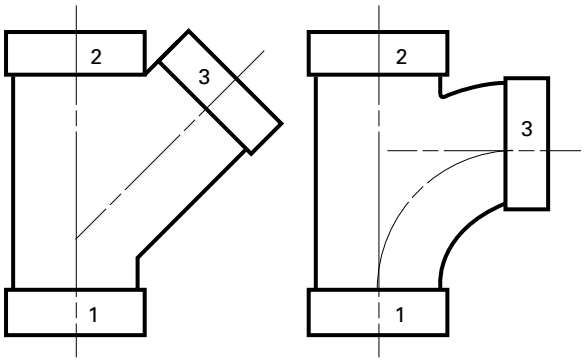
## 6 COMPONENT SIZE

### 6.1 Nominal Size

As applied in this Standard, the use of the phrase "nominal size" followed by a dimensionless number is for the purpose of fitting end connection size identification.

**6.1.1 Tube.** The size designations for the fitting end configurations defined in Table 1 (Table I-1) correspond to drainage tube sizes defined in ASTM B306.

**Figure 1 Size of Fittings**




**6.1.2 Pipe.** The size designation of threaded fitting end configurations defined in Table 2 (Table I-2) corresponds to thread sizes defined in ASME B1.20.1.

## 6.2 Identification

Fittings shall be identified by the nominal size of the openings in the sequence illustrated in Figure 1.

## 7 MARKING

Each fitting shall be marked permanently and legibly with the manufacturer's name or trademark and with DWV (to indicate drain-waste-vent).

## 8 MATERIAL

Fittings shall be made of wrought copper or wrought copper alloy material having not less than 84% of copper content.

## 9 LAYING LENGTHS

Due to widely varying manufacturing processes, laying length dimensions of fittings are not standardized. Consult the manufacturer for these dimensions. Suggested dimensions, including laying lengths, for various fitting configurations are shown in Tables 3 through 13 (Tables I-3 through I-13).

## 10 OVALITY

Maximum ovality shall not exceed 1% of the maximum diameter shown in Table 1 (Table I-1). The average of the maximum and minimum diameters must be within the dimensions shown in the table.

## 11 THREADED ENDS

### 11.1 General

Fitting threads shall be right hand, conforming to ASME B1.20.1. They shall be American National Standard taper pipe threads (NPT), except for slip-joint ends, which shall have American National Standard free-fitting straight mechanical pipe threads (NPSM).

### 11.2 Chamfer

All internal threads shall be countersunk a distance not less than one-half the pitch of the thread at an angle of approximately 45 deg with the axis of the thread. All external threads shall be chamfered at an angle of 30 deg to 45 deg from the axis. Countersinking and chamfering shall be concentric with the threads. The length of threads shall be measured to include the countersink or chamfer.

### 11.3 Threading Tolerances

**11.3.1 Internal Threads.** Variations in NPT internal threading shall be limited to one turn large or one turn small from the gaging notch when using working gages. The reference point for gaging is the starting end of the fitting, provided the chamfer does not exceed the major diameter of the internal thread. When a chamfer on the internal thread exceeds this limit, the reference point becomes the last thread scratch on the chamfer cone.

**11.3.2 External Threads.** Variations in NPT external threading shall be limited to one turn large or one turn small from the gage face of ring when using working gages. The reference point for gaging is the end of the thread, provided the chamfer is not smaller than the minor diameter of the external thread. When a chamfer on the external thread exceeds this limit, the reference point becomes the last thread scratch on the chamfer cone.

## 12 DESIGN OF THREADED ENDS

External and internal threaded ends of fittings will be furnished with a polygon to facilitate installation.

## 13 ALIGNMENT

The maximum allowable variation in the angular alignment of all openings shall be 5 mm in 1 m (0.06 in. in 1 ft) (0.5%), other than in the direction of pitch (see section 4).

## 14 GAGING

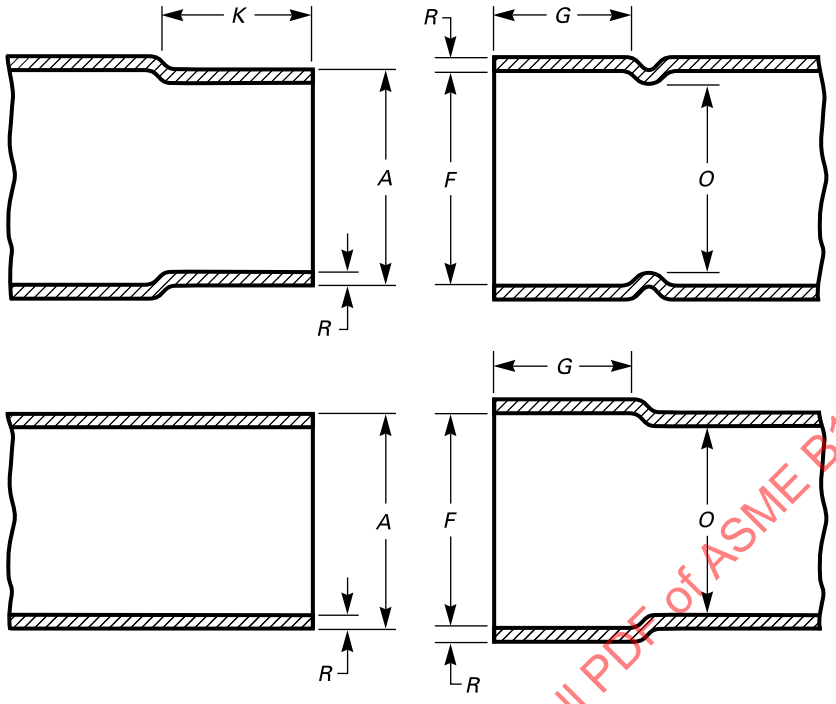
### 14.1 Standard Gaging Method of Solder-Joint Ends

The standard method of gaging the diameter tolerances for external and internal ends shall be by use of plain plug and ring gages designed to hold the product within the limits established in Table 1 (Table I-1).

### 14.2 Optional Gaging Method of Solder-Joint Ends

For gaging the diameter tolerance of external and internal ends, the manufacturer may use direct reading instruments instead of ring and plug gages as specified in para. 14.1. When gaging the diameters of external and internal ends using direct reading instruments, refer to section 10. In case of a dispute, ring/plug gages shall be used as the referee method.

## Table 1 Dimensions of Solder-Joint Ends



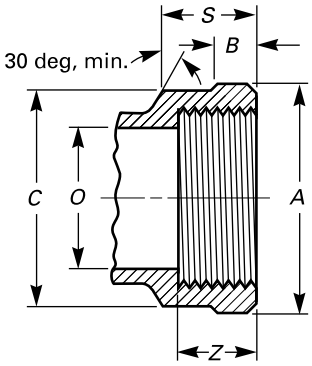

External End (FTG) | Internal End (FTG)

| Nominal Tube Size [Note (1)] | External End | | | Internal End | | | Minimum Metal Thickness, *R* [Note (4)] | Minimum Inside Diameter of Fitting, *O* [Note (5)] |
|---|---|---|---|---|---|---|---|---|
| | Outside Diameter, *A* [Note (2)] | | Minimum Length, *K* [Note (3)] | Inside Diameter, *F* [Note (2)] | | Minimum Depth, *G* [Note (3)] | | |
| | Min. | Max. | | Min. | Max. | | | |
| 1¼ | 34.85 | 34.98 | 14.22 | 35.00 | 35.10 | 12.70 | 1.02 | 32.77 |
| 1½ | 41.17 | 41.33 | 15.75 | 41.35 | 41.48 | 14.22 | 1.07 | 38.86 |
| 2 | 53.87 | 54.03 | 17.53 | 54.05 | 54.18 | 15.75 | 1.07 | 51.05 |
| 3 | 79.27 | 79.43 | 20.57 | 79.45 | 79.58 | 19.05 | 1.14 | 75.69 |
| 4 | 104.67 | 104.83 | 26.92 | 104.85 | 104.98 | 25.40 | 1.47 | 99.82 |

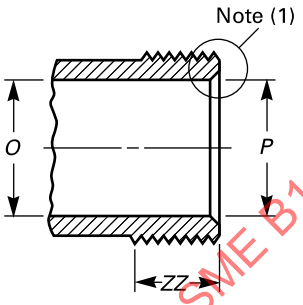
GENERAL NOTE: Dimensions are in millimeters.

NOTES:
(1) For size designation of fitting, see section 6.
(2) See section 10.
(3) *K* dimensions of 11.2 mm, 12.7 mm, and 14.2 mm and *G* dimensions of 9.7 mm, 11.2 mm, and 12.7 mm, respectively, for sizes 1¼, 1½, and 2 are sound and acceptable from an engineering standpoint. However, the cup depths specified provide greater latitude in making accurate installations.
(4) *R* dimension is based on DWV tubing, which is intended for aboveground use.
(5) Inside diameter of fitting is based on Type M copper water tube (ASTM B88).

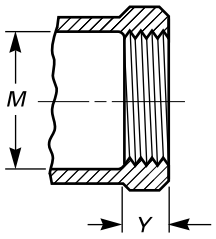
## Table 2 Dimensions of Threaded Ends — DWV




Internal Threaded End
(F)




External Threaded End
(M)

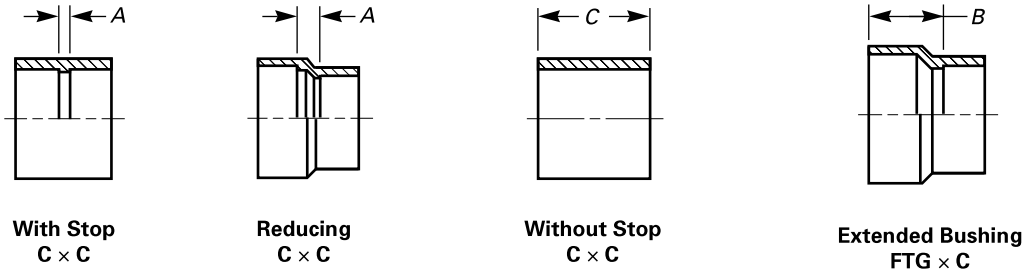



| | Internal End [Note (2)] | | | | | | | | External End [Note (3)] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Nominal Thread Size [Note (4)] | Minimum Diameter of Band or Across Flats of Polygon, *A* | Minimum Band Length, *B* | Minimum Diameter of Body Over Thread, *C* | Minimum Inside Diameter of Fitting, *O* | *M*, Min. | Minimum Length of Thread, *Y* | *S*, Min. | Minimum Depth of Bore, *Z* | Minimum Inside Diameter of Fitting, *O* | Maximum Thread End Bore, *P* | Minimum Length of Effective Thread, *ZZ* |
| 1¼ | 45.2 | 8.6 | 43.7 | 32.8 | 42.2 | 10.7 | 18.3 | 17.5 | 32.8 | 34.8 | 18.0 |
| 1½ | 52.3 | 9.7 | 50.3 | 38.9 | 48.3 | 10.7 | 18.3 | 17.5 | 38.9 | 40.9 | 18.3 |
| 2 | 64.3 | 12.7 | 63.0 | 51.1 | 60.5 | 11.2 | 20.6 | 19.1 | 51.1 | 52.6 | 19.3 |
| 3 | 94.5 | 14.2 | 93.5 | 75.7 | 88.9 | 19.6 | 32.5 | 31.0 | 75.7 | 78.2 | 30.5 |

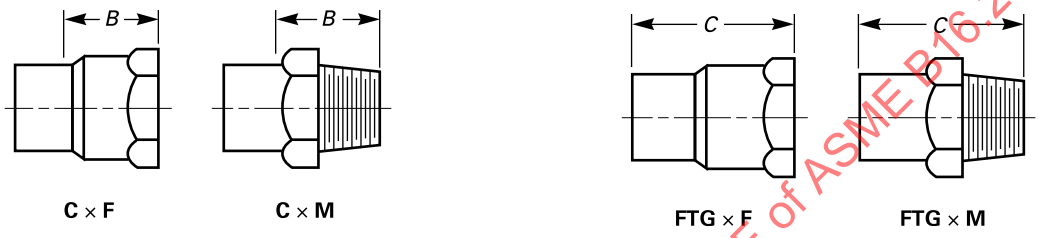
GENERAL NOTE: Dimensions are in millimeters.

NOTES:
(1) 1¼, 1½, and 2 male threaded ends may have inside chamfer for slip-nut connections.
(2) Internal threads shall be gaged ½ turn large to 1½ turn small from the gaging notch on the plug when using working gages.
(3) External threads shall be gaged ½ turn small to 1½ turn large from the face of the ring when using working gages.
(4) Thread size is as governed by ASME B1.20.1.

## Table 3 Dimensions of DWV Couplings, Extended Bushings, and Adapters




DWV Couplings



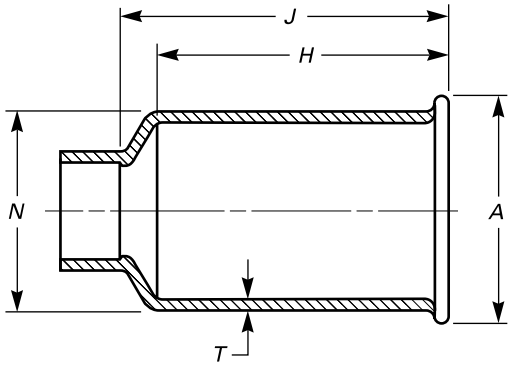

DWV Adapters

| Nominal Thread or Tube Size | Minimum Couplings C × C, *A* | Minimum Coupling Reducer C × C, *A* | Minimum Couplings Without Stop C × C, *C* | Minimum Bushing Extended FTG × C, *B* | Adapters | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Minimum C × F, *B* | Minimum C × M, *B* | Minimum FTG × F, *C* | Minimum FTG × M, *C* |
| 1¼ | 1.5 | ... | 25.4 | ... | 18.5 | 21.8 | 34.5 | ... |
| 1¼ × 1½ | ... | ... | ... | ... | ... | 31.2 | ... | ... |
| 1½ | 1.5 | ... | 28.4 | ... | 18.5 | 21.8 | 37.6 | 42.9 |
| 1½ × 1¼ | ... | 4.8 | ... | 20.6 | ... | 24.9 | ... | ... |
| 1½ × 2 | ... | ... | ... | ... | ... | 37.6 | ... | ... |
| 2 | 1.5 | ... | 31.8 | ... | 21.8 | 21.8 | 40.9 | ... |
| 2 × 1½ | ... | 6.4 | ... | 26.9 | ... | ... | ... | ... |
| 2 × 1¼ | ... | 6.4 | ... | 25.4 | ... | 23.4 | ... | ... |
| 3 | 1.5 | ... | 38.1 | ... | 33.8 | 36.8 | 55.9 | ... |
| 3 × 2 | ... | 6.4 | ... | 28.4 | ... | ... | ... | ... |
| 3 × 1½ | ... | 7.9 | ... | 28.4 | ... | ... | ... | ... |
| 3 × 1¼ | ... | 7.9 | ... | 30.2 | ... | ... | ... | ... |
| 4 | 1.5 | ... | 50.8 | ... | ... | ... | ... | ... |
| 4 × 3 | ... | 9.7 | ... | 36.6 | ... | ... | ... | ... |

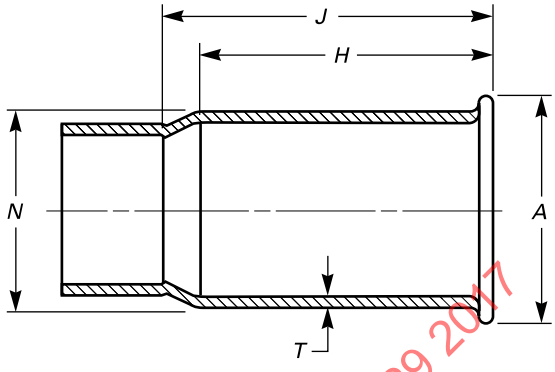
GENERAL NOTE: Dimensions are in millimeters.

(17)

## Table 4 Dimensions of DWV Soil Pipe Adapters




Reducing Size
C × Spigot




Straight Size
C × Spigot

DWV Soil Pipe Adapters

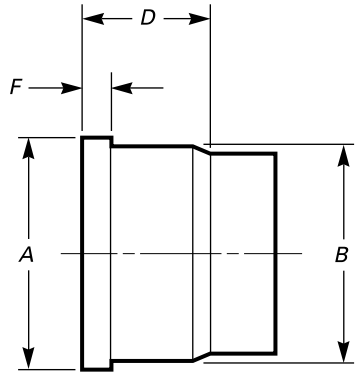
| | Dimensions | | | | | |
|---|---|---|---|---|---|---|
| Nominal Size | *A*, max. | *A*, min. | *H*, min. | *J*, min. | *N* | *T*, min. |
| 2 × 2 | 69.9 | 68.3 | 60 | 64 | 62.2 | 1.37 |
| 1½ × 2 | 69.9 | 68.3 | 81 | 87 | 62.2 | 1.37 |
| 1¼ × 2 | 69.9 | 68.3 | 81 | 87 | 62.2 | 1.37 |
| 3 × 3 | 98.6 | 96.8 | 67 | 73 | 88.6 | 1.60 |
| 2 × 3 | 98.6 | 96.8 | 86 | 95 | 88.6 | 1.60 |
| 4 × 4 | 124.0 | 122.2 | 73 | 83 | 114.0 | 1.83 |
| 3 × 4 | 124.0 | 122.2 | 92 | 103 | 114.0 | 1.83 |

GENERAL NOTES:

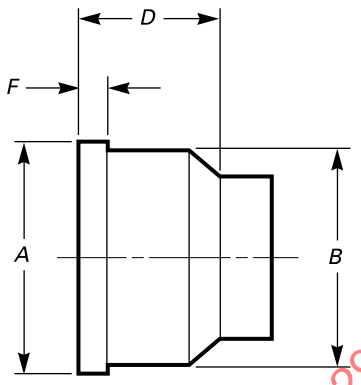
(a) Dimensions are in millimeters.

(b) Dimensions are for extra-heavy weight soil pipe (reference ASTM A74). For service weight soil pipe, *A* and *N* nominal dimensions may be from 3 mm to 8 mm smaller than dimensions shown in table.

## Table 5 Dimensions of DWV C × No-Hub Soil Pipe Adapters




Straight Size



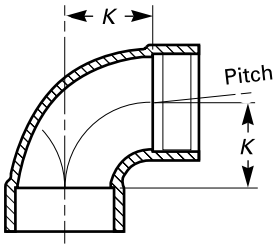

Reducing Size

**DWV Soil Pipe Adapters – C × No-Hub**
**for Use With Stainless Steel Clamp and Elastomer Gasket**

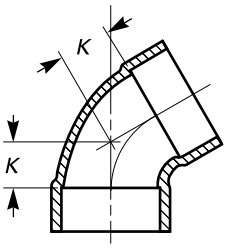
| Nominal Size | *A* ± 1.5 | *B* ± 1.5 | *D*, Min. | *F* $^{+3.3}_{-0.00}$ |
|---|---|---|---|---|
| 2 | 60.5 | 58.7 | 31.0 | 6.4 |
| 1½ × 2 | 60.5 | 58.7 | 31.8 | 6.4 |
| 1¼ × 2 | 60.5 | 58.7 | 32.5 | 6.4 |
| 3 | 86.6 | 84.8 | 31.0 | 6.4 |
| 2 × 3 | 86.6 | 84.8 | 31.8 | 6.4 |
| 1½ × 3 | 86.6 | 84.8 | 32.5 | 6.4 |
| 4 | 112.8 | 111.3 | 31.0 | 7.9 |
| 3 × 4 | 112.8 | 111.3 | 31.8 | 7.9 |

GENERAL NOTE: Dimensions are in millimeters.

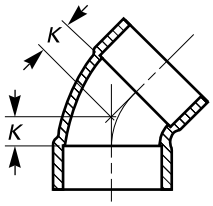
## Table 6 Dimensions of DWV Elbows



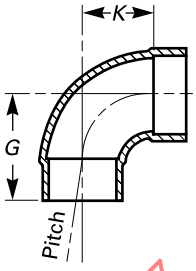

DWV 90 deg Ell
C × C



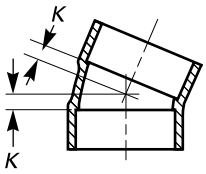

DWV 60 deg Ell
C × C



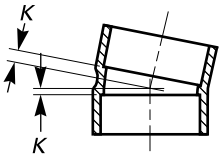

DWV 45 deg Ell
C × C



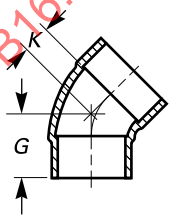

DWV 90 deg FTG Ell
FTC × C




DWV $22^{1}/_{2}$ deg Ell
C × C




DWV $11^{1}/_{4}$ deg Ell
C × C



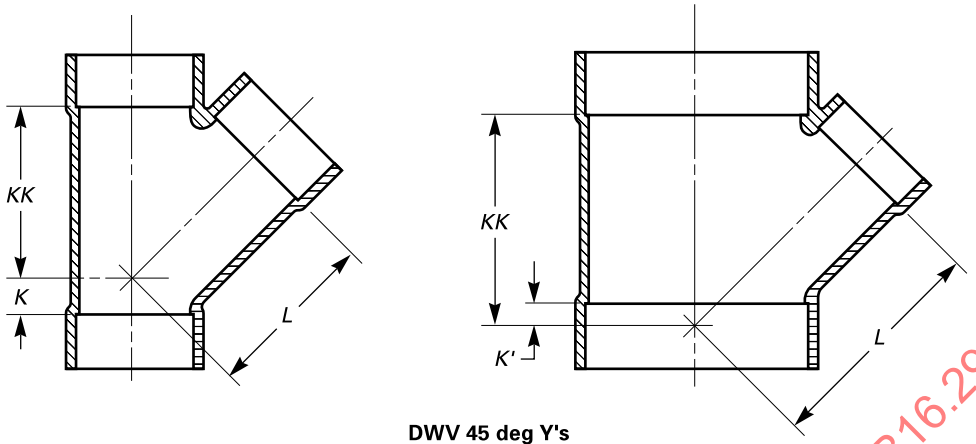

DWV 45 deg FTG Ell
FTG × C

DWV Elbows

| Nominal Tube Size, Min. | Dimensions | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | *K* for 90 deg C × C | *K* for 60 deg C × C | *K* for 45 deg C × C | *K* for $22^{1}/_{2}$ deg C × C | *K* for $11^{1}/_{4}$ deg C × C | *K* for 90 deg FTG × C | *G* for 90 deg FTG × C | *K* for 45 deg FTG × C | *G* for 45 deg FTG × C |
| $1^{1}/_{4}$ | 28.2 | 15.5 | 10.7 | 2.8 | 1.0 | 28.2 | 42.4 | 10.7 | 24.9 |
| $1^{1}/_{2}$ | 34.5 | 18.5 | 12.2 | 4.3 | 1.0 | 33.0 | 50.3 | 12.2 | 28.2 |
| 2 | 47.2 | 26.4 | 18.5 | 7.6 | 2.8 | 47.2 | 64.5 | 18.5 | 36.1 |
| 3 | 70.4 | 40.1 | 27.4 | 11.4 | 3.6 | 70.4 | 90.9 | 27.4 | 48.0 |
| 4 | 93.7 | ... | 36.6 | 15.7 | 7.9 | 93.7 | 120.9 | 36.6 | 63.5 |

GENERAL NOTE: Dimensions are in millimeters.

## Table 7 Dimensions of DWV 45 deg Y's

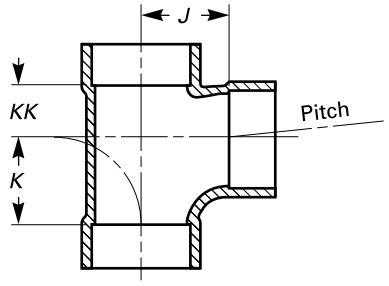



DWV 45 deg Y's
C × C × C

| Nominal Tube Size | *K* | *K′* | *KK*, Min. | *L*, Min. |
|---|---|---|---|---|
| 1¼ | 6 | ... | 49.3 | 47.2 |
| 1½ | 8 | ... | 58.7 | 56.6 |
| 1½ × 1½ × 1¼ | 4 | ... | 53.8 | 51.8 |
| 1½ × 1¼ × 1½ | 8 | ... | 60.5 | 53.6 |
| 1½ × 1¼ × 1¼ | 4 | ... | 55.6 | 50.3 |
| 2 | 12 | ... | 71.4 | 69.3 |
| 2 × 2 × 1½ | 3 | ... | 63.5 | 64.5 |
| 2 × 2 × 1¼ | 0 | ... | 58.7 | 59.9 |
| 2 × 1½ × 2 | 12 | ... | 81.0 | 69.3 |
| 2 × 1½ × 1½ | 3 | ... | 71.4 | 39.4 |
| 3 | 19 | ... | 104.6 | 101.9 |
| 3 × 3 × 2 | 0 | ... | 90.4 | 90.9 |
| 3 × 3 × 1½ | ... | 3 | 81.0 | 84.6 |
| 3 × 3 × 1¼ | ... | 5 | 71.4 | 78.2 |
| 4 | 24 | ... | 136.7 | 133.6 |

GENERAL NOTE: Dimensions are in millimeters.

## Table 8 Dimensions of DWV Tees

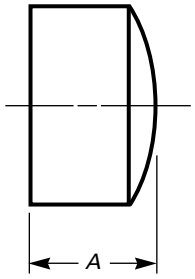



DWV Tees
C × C × C

| Nominal Tube Size | *J*, Min. | *K*, Min. | *KK*, Min. |
|---|---|---|---|
| 1¼ | 26.7 | 26.4 | 19.1 |
| 1½ | 33.0 | 33.0 | 20.6 |
| 1½ × 1½ × 1¼ | 29.7 | 26.4 | 20.6 |
| 1½ × 1¼ × 1½ | 34.5 | 34.5 | 23.9 |
| 1½ × 1¼ × 1¼ | 31.2 | 28.2 | 23.9 |
| 2 | 42.4 | 45.7 | 26.9 |
| 2 × 2 × 1½ | 37.6 | 31.2 | 22.4 |
| 2 × 2 × 1¼ | 36.1 | 26.4 | 19.1 |
| 2 × 1½ × 2 | 42.9 | 45.7 | 33.3 |
| 2 × 1½ × 1½ | 37.6 | 33.0 | 30.2 |
| 3 | 63.8 | 70.4 | 42.9 |
| 3 × 3 × 2 | 54.4 | 45.0 | 28.7 |
| 3 × 3 × 1½ | 49.5 | 32.3 | 23.9 |
| 3 × 3 × 1¼ | 48.0 | 25.7 | 20.6 |
| 4 | 95.5 | 95.5 | 52.3 |

GENERAL NOTE: Dimensions are in millimeters.

## Table 9 Dimensions of DWV Caps

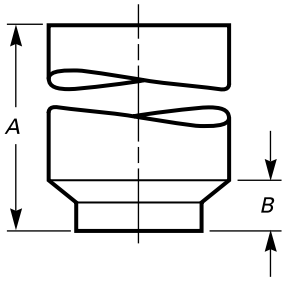



DWV Caps
C

| Nominal Tube Size | *A* |
|---|---|
| 1¼ | 18 |
| 1½ | 19 |
| 2 | 21 |

GENERAL NOTE: Dimensions are in millimeters.

## Table 10 Dimensions of DWV Vent Increasers

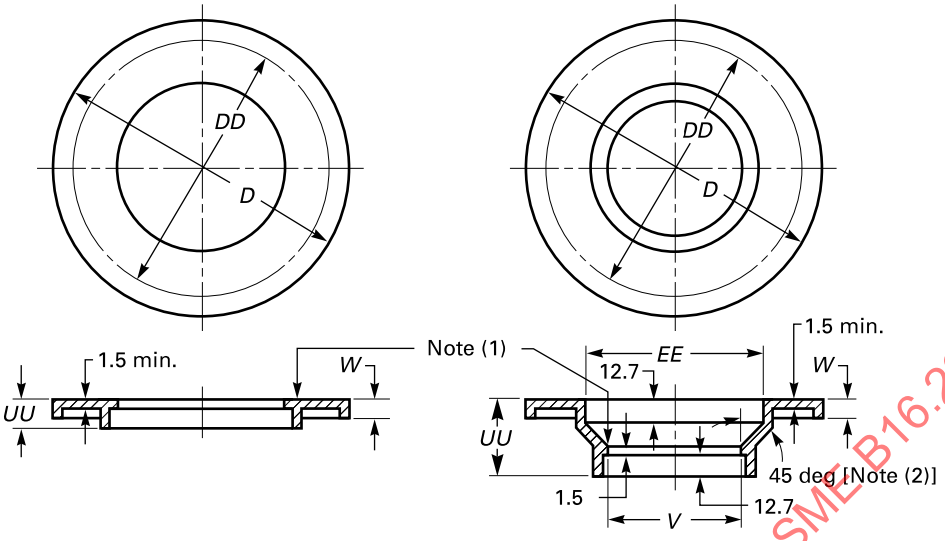



DWV Vent Increasers
C × FTG

| Nominal Tube Size | *A* | *B*, Max. |
|---|---|---|
| 3 × 4 × 18 | 457 | 76 |
| 3 × 4 × 24 | 610 | 76 |
| 3 × 4 × 30 | 762 | 76 |

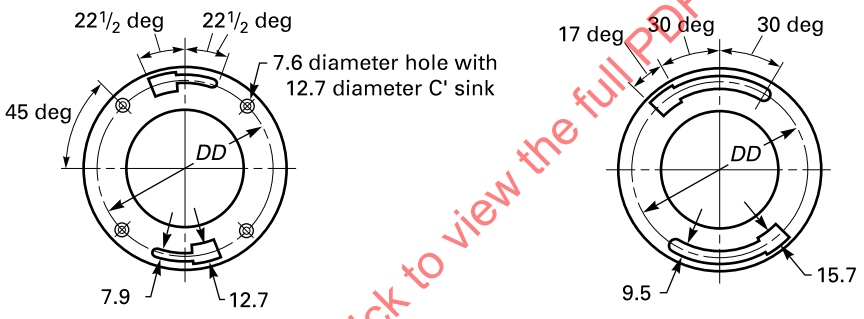
GENERAL NOTE: Dimensions are in millimeters.

## Table 11 Dimensions of DWV Closet Flanges




Size 4 Closet Flange

Size 3 Closet Flange




Quarter Slot With Holes

Half Slot

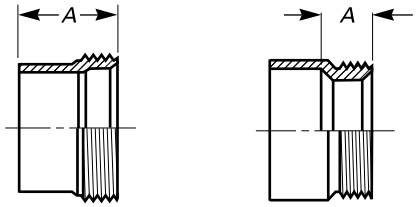
Suggested Slot Arrangements

| Nominal Size | *D*, Min. | *DD* | *EE* | *UU*, Min. | *V*, Min. [Note (3)] | *W* |
|---|---|---|---|---|---|---|
| 3 | 171.5 | 152 | 105 | 39.6 | 74.7 | 6.4 |
| 4 | 171.5 | 152 | ... | 15.7 | ... | 6.4 |

GENERAL NOTE: Dimensions are in millimeters.

NOTES:
(1) Tube stop optional.
(2) 45-deg angle may be extended to face of flange.
(3) For flange with tube stop.

## Table 12 Dimensions of DWV Trap Adapters

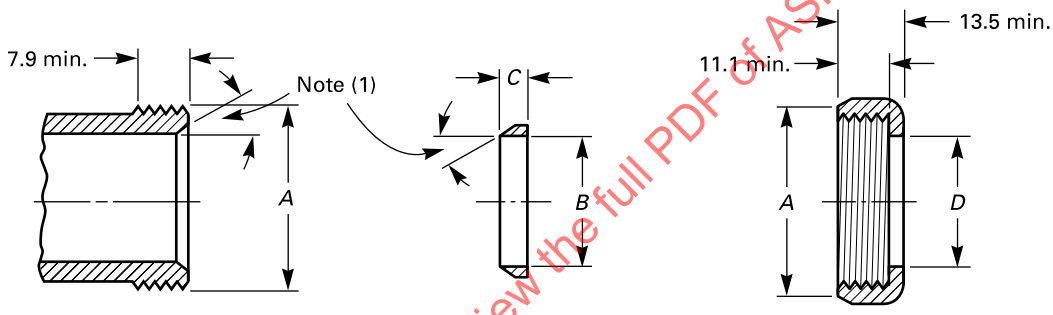



FTG × SJ C × SJ

| Nominal Size | FTG × SJ, *A* | C × SJ, *A* |
|---|---|---|
| 1¼ | 27.7 | 12.7 |
| 1½ | 29.5 | 12.7 |
| 1½ × 1¼ | 30.2 | 15.7 |

GENERAL NOTE: Dimensions are in millimeters.

## Table 13 Dimensions of DWV Slip-Joint Ends




Fitting SJ Gasket [Note (2)] Nut [Note (3)]

| | | Gasket | | Nut |
|---|---|---|---|---|
| Nominal Size | Diameter of Thread, *A* | Nominal Inside Diameter of Gasket, *B* | Minimum Length of Gasket, *C* | Nominal Nut Hole Diameter, *D* |
| 1¼ | 1¼ NPSM | 32.0 | 4.1 | 32.5 |
| 1½ | 1½ NPSM | 38.4 | 4.8 | 38.9 |

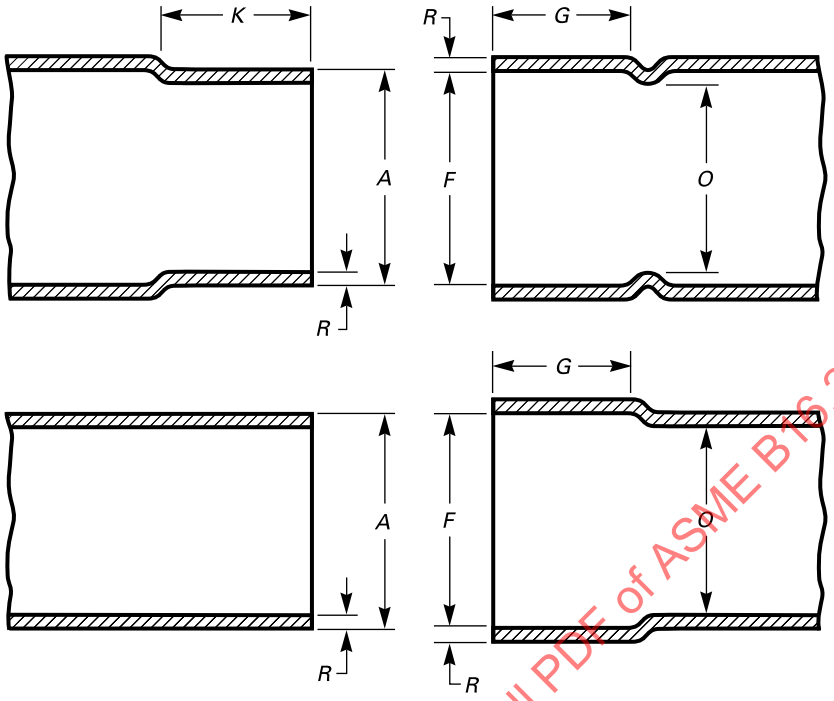
GENERAL NOTE: Dimensions are in millimeters.

NOTES:
(1) Angles must be equal.
(2) Gasket to be pliable, not subject to aging or drying out.
(3) Nut may be any material specified in section 8 or other suitable nonferrous alloy.

# MANDATORY APPENDIX I
# U.S. CUSTOMARY DIMENSIONS

This Mandatory Appendix provides tables of the standard inch dimensions for fittings (Tables I-1 through I-13).

## Table I-1 Dimensions of Solder-Joint Ends



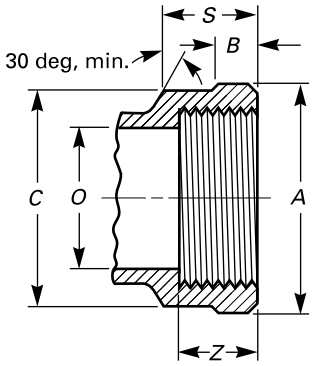

External End (FTG) | Internal End (FTG)

| Nominal Tube Size [Note (1)] | External End | | | Internal End | | | Minimum Metal Thickness, *R* [Note (4)] | Minimum Inside Diameter of Fitting, *O* [Note (5)] |
|---|---|---|---|---|---|---|---|---|
| | Outside Diameter, *A* [Note (2)] | | Minimum Length, *K* [Note (3)] | Inside Diameter, *F* [Note (2)] | | Minimum Depth, *G* [Note (3)] | | |
| | Min. | Max. | | Min. | Max. | | | |
| 1¼ | 1.372 | 1.377 | 0.56 | 1.378 | 1.382 | 0.50 | 0.040 | 1.29 |
| 1½ | 1.621 | 1.627 | 0.62 | 1.628 | 1.633 | 0.56 | 0.042 | 1.53 |
| 2 | 2.121 | 2.127 | 0.69 | 2.128 | 2.133 | 0.62 | 0.042 | 2.01 |
| 3 | 3.121 | 3.127 | 0.81 | 3.128 | 3.133 | 0.75 | 0.045 | 2.98 |
| 4 | 4.121 | 4.127 | 1.06 | 4.128 | 4.133 | 1.00 | 0.058 | 3.93 |

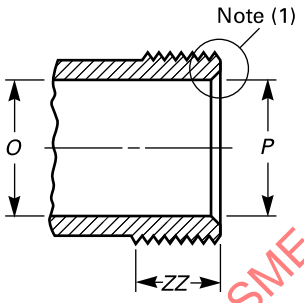
GENERAL NOTE: Dimensions are in inches.

NOTES:
(1) For size designation of fitting, see section 6.
(2) See section 10.
(3) *K* dimensions of 0.44 in., 0.50 in., and 0.56 in. and *G* dimensions of 0.38 in., 0.44 in., and 0.50 in., respectively, for sizes 1¼, 1½, and 2 are sound and acceptable from an engineering standpoint. However, the cup depths specified provide greater latitude in making accurate installations.
(4) *R* dimension is based on DWV tubing, which is intended for aboveground use.
(5) Inside diameter of fitting is based on Type M copper water tube (ASTM B88).

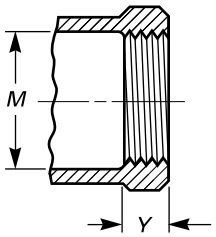
## Table I-2 Dimensions of Threaded Ends — DWV




Internal Threaded End
(F)




External Threaded End
(M)

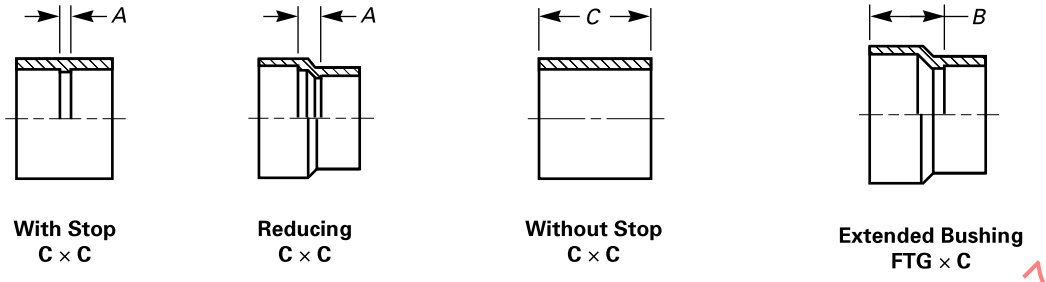



| Nominal Thread Size [Note (4)] | Internal End [Note (2)] | | | | | | | | External End [Note (3)] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Minimum Diameter of Band or Across Flats of Polygon, *A* | Minimum Band Length, *B* | Minimum Diameter of Body Over Thread, *C* | Minimum Inside Diameter of Fitting, *O* | *M*, Min. | Minimum Length of Thread, *Y* | *S*, Min. | Minimum Depth of Bore, *Z* | Minimum Inside Diameter of Fitting, *O* | Maximum Thread End Bore, *P* | Minimum Length of Effective Thread, *ZZ* |
| 1¼ | 1.78 | 0.34 | 1.72 | 1.29 | 1.66 | 0.42 | 0.72 | 0.69 | 1.29 | 1.37 | 0.71 |
| 1½ | 2.06 | 0.38 | 1.98 | 1.53 | 1.90 | 0.42 | 0.72 | 0.69 | 1.53 | 1.61 | 0.72 |
| 2 | 2.53 | 0.50 | 2.48 | 2.01 | 2.38 | 0.44 | 0.81 | 0.75 | 2.01 | 2.07 | 0.76 |
| 3 | 3.72 | 0.56 | 3.68 | 2.98 | 3.50 | 0.77 | 1.28 | 1.22 | 2.98 | 3.08 | 1.20 |

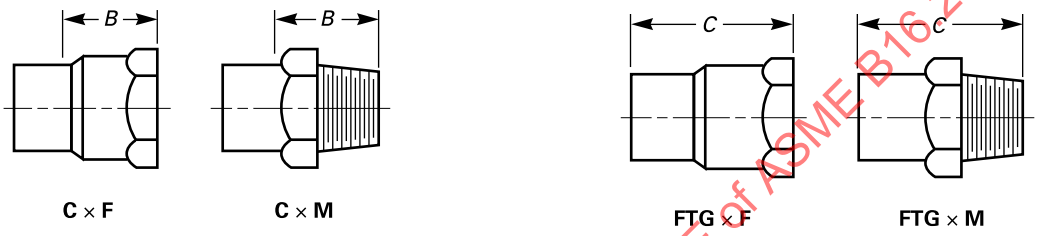
GENERAL NOTE: Dimensions are in inches.

NOTES:
(1) 1¼, 1½, and 2 male threaded ends may have inside chamfer for slip-nut connections.
(2) Internal threads shall be gaged ½ turn large to 1½ turn small from the gaging notch on the plug when using working gages.
(3) External threads shall be gaged ½ turn small to 1½ turn large from the face of the ring when using working gages.
(4) Thread size is as governed by ASME B1.20.1.

## Table I-3 Dimensions of DWV Couplings, Extended Bushings, and Adapters




DWV Couplings

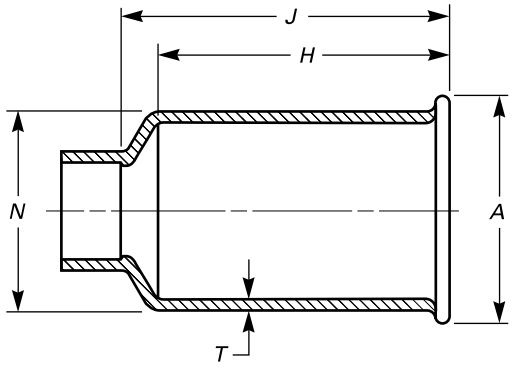



DWV Adapters

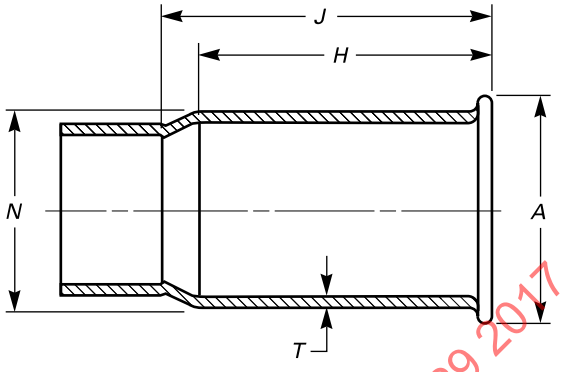
| Nominal Thread or Tube Size | Minimum Couplings C × C, *A* | Minimum Coupling Reducer C × C, *A* | Minimum Couplings Without Stop C × C, *C* | Minimum Bushing Extended FTG × C, *B* | Adapters | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Minimum C × F, *B* | Minimum C × M, *B* | Minimum FTG × F, *C* | Minimum FTG × M, *C* |
| 1¼ | 0.06 | ... | 1.00 | ... | 0.73 | 0.86 | 1.36 | ... |
| 1¼ × 1½ | ... | ... | ... | ... | ... | 1.23 | ... | ... |
| 1½ | 0.06 | ... | 1.12 | ... | 0.73 | 0.86 | 1.48 | 1.69 |
| 1½ × 1¼ | ... | 0.19 | ... | 0.81 | ... | 0.98 | ... | ... |
| 1½ × 2 | ... | ... | ... | ... | ... | 1.48 | ... | ... |
| 2 | 0.06 | ... | 1.25 | ... | 0.86 | 0.86 | 1.61 | ... |
| 2 × 1½ | ... | 0.25 | ... | 1.06 | ... | ... | ... | ... |
| 2 × 1¼ | ... | 0.25 | ... | 1.00 | ... | 0.92 | ... | ... |
| 3 | 0.06 | ... | 1.50 | ... | 1.33 | 1.45 | 2.20 | ... |
| 3 × 2 | ... | 0.25 | ... | 1.12 | ... | ... | ... | ... |
| 3 × 1½ | ... | 0.31 | ... | 1.12 | ... | ... | ... | ... |
| 3 × 1¼ | ... | 0.31 | ... | 1.19 | ... | ... | ... | ... |
| 4 | 0.06 | ... | 2.00 | ... | ... | ... | ... | ... |
| 4 × 3 | ... | 0.38 | ... | 1.44 | ... | ... | ... | ... |

GENERAL NOTE: Dimensions are in inches.

## Table I-4 Dimensions of DWV Soil Pipe Adapters




Reducing Size
C × Spigot




Straight Size
C × Spigot

DWV Soil Pipe Adapters

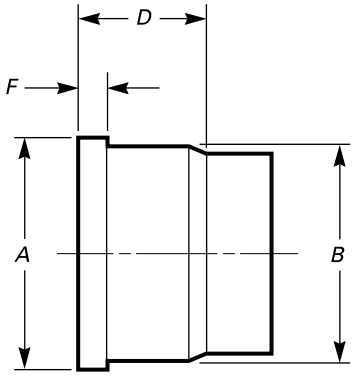
| Nominal Size | Dimensions | | | | | |
|---|---|---|---|---|---|---|
| | *A*, max. | *A*, min. | *H*, min. | *J*, min. | *N* | *T*, min. |
| 2 × 2 | 2.75 | 2.69 | 2.36 | 2.50 | 2.45 | 0.054 |
| 1½ × 2 | 2.75 | 2.69 | 3.17 | 3.44 | 2.45 | 0.054 |
| 1¼ × 2 | 2.75 | 2.69 | 3.17 | 3.44 | 2.45 | 0.054 |
| 3 × 3 | 3.88 | 3.81 | 2.64 | 2.88 | 3.49 | 0.063 |
| 2 × 3 | 3.88 | 3.81 | 3.39 | 3.75 | 3.49 | 0.063 |
| 4 × 4 | 4.88 | 4.81 | 2.88 | 3.25 | 4.49 | 0.072 |
| 3 × 4 | 4.88 | 4.81 | 3.63 | 4.06 | 4.49 | 0.072 |

GENERAL NOTES:

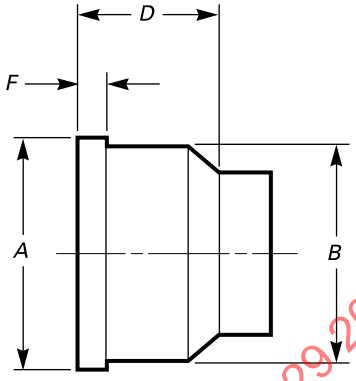
(a) Dimensions are in inches.

(b) Dimensions are for extra-heavy weight soil pipe (reference ASTM A74). For service weight soil pipe, *A* and *N* nominal dimensions may be from ⅛ in. to 5/16 in. smaller than dimensions shown in table.

## Table I-5 Dimensions of DWV C × No-Hub Soil Pipe Adapters




Straight Size



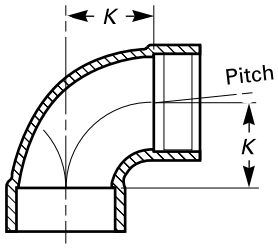

Reducing Size

**DWV Soil Pipe Adapters – C × No-Hub**
**for Use With Stainless Steel Clamp and Elastomer Gasket**

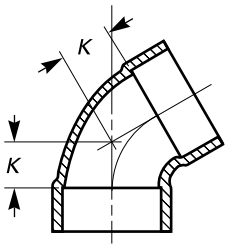
| Nominal Size | *A* ± 0.06 | *B* ± 0.06 | *D*, Min. | *F* $^{+0.13}_{-0.00}$ |
|---|---|---|---|---|
| 2 | 2.38 | 2.31 | 1.22 | 0.25 |
| 1½ × 2 | 2.38 | 2.31 | 1.25 | 0.25 |
| 1¼ × 2 | 2.38 | 2.31 | 1.28 | 0.25 |
| 3 | 3.41 | 3.34 | 1.22 | 0.25 |
| 2 × 3 | 3.41 | 3.34 | 1.25 | 0.25 |
| 1½ × 3 | 3.41 | 3.34 | 1.28 | 0.25 |
| 4 | 4.44 | 4.38 | 1.22 | 0.31 |
| 3 × 4 | 4.44 | 4.38 | 1.25 | 0.31 |

GENERAL NOTE: Dimensions are in inches.

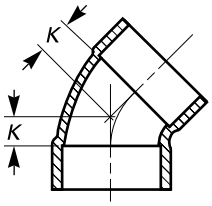
## Table I-6 Dimensions of DWV Elbows



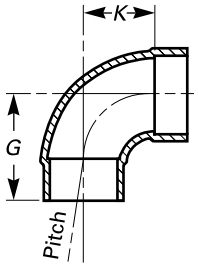

DWV 90 deg Ell
C × C



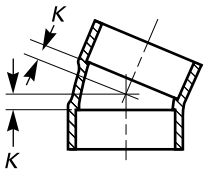

DWV 60 deg Ell
C × C



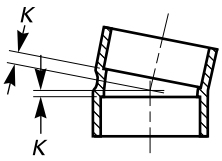

DWV 45 deg Ell
C × C



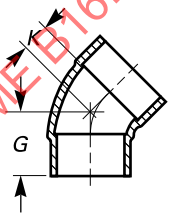

DWV 90 deg FTG Ell
FTC × C




DWV $22^{1}/_{2}$ deg Ell
C × C




DWV $11^{1}/_{4}$ deg Ell
C × C



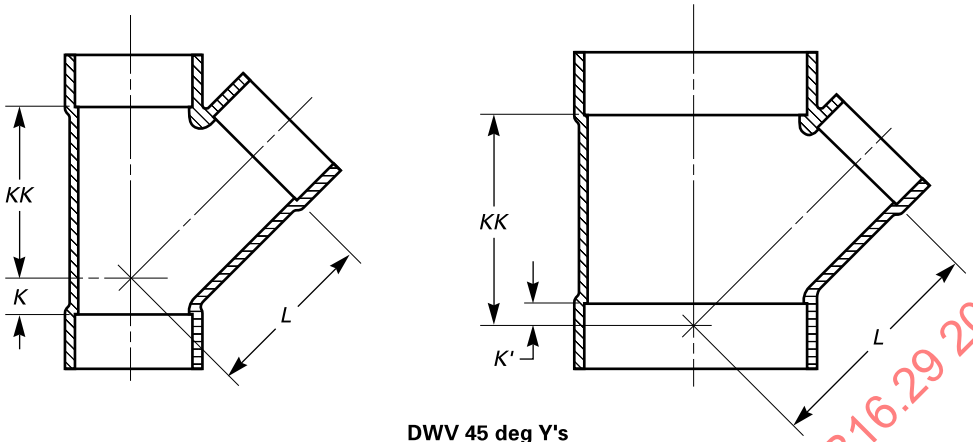

DWV 45 deg FTG Ell
FTG × C

DWV Elbows

| Nominal Tube Size, Min. | Dimensions | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | *K* for 90 deg C × C | *K* for 60 deg C × C | *K* for 45 deg C × C | *K* for $22^{1}/_{2}$ deg C × C | *K* for $11^{1}/_{4}$ deg C × C | *K* for 90 deg FTG × C | *G* for 90 deg FTG × C | *K* for 45 deg FTG × C | *G* for 45 deg FTG × C |
| $1^{1}/_{4}$ | 1.11 | 0.61 | 0.42 | 0.11 | 0.04 | 1.11 | 1.67 | 0.42 | 0.98 |
| $1^{1}/_{2}$ | 1.36 | 0.73 | 0.48 | 0.17 | 0.04 | 1.30 | 1.98 | 0.48 | 1.11 |
| 2 | 1.86 | 1.04 | 0.73 | 0.30 | 0.11 | 1.86 | 2.54 | 0.73 | 1.42 |
| 3 | 2.77 | 1.58 | 1.08 | 0.45 | 0.14 | 2.77 | 3.58 | 1.08 | 1.89 |
| 4 | 3.69 | ... | 1.44 | 0.62 | 0.31 | 3.69 | 4.76 | 1.44 | 2.50 |

GENERAL NOTE: Dimensions are in inches.

## Table I-7 Dimensions of DWV 45 deg Y's




DWV 45 deg Y's
C × C × C

| Nominal Tube Size | *K* | *K′* | *KK*, Min. | *L*, Min. |
|---|---|---|---|---|
| 1¼ | 0.23 | ... | 1.94 | 1.86 |
| 1½ | 0.30 | ... | 2.31 | 2.23 |
| 1½ × 1½ × 1¼ | 0.17 | ... | 2.12 | 2.04 |
| 1½ × 1¼ × 1½ | 0.30 | ... | 2.38 | 2.11 |
| 1½ × 1¼ × 1¼ | 0.17 | ... | 2.19 | 1.98 |
| 2 | 0.48 | ... | 2.81 | 2.73 |
| 2 × 2 × 1½ | 0.11 | ... | 2.50 | 2.54 |
| 2 × 2 × 1¼ | 0 | ... | 2.31 | 2.36 |
| 2 × 1½ × 2 | 0.48 | ... | 3.19 | 2.73 |
| 2 × 1½ × 1½ | 0.11 | ... | 2.81 | 1.55 |
| 3 | 0.73 | ... | 4.12 | 4.01 |
| 3 × 3 × 2 | 0 | ... | 3.56 | 3.58 |
| 3 × 3 × 1½ | ... | 0.13 | 3.19 | 3.33 |
| 3 × 3 × 1¼ | ... | 0.19 | 2.81 | 3.08 |
| 4 | 0.94 | ... | 5.38 | 5.26 |

GENERAL NOTE: Dimensions are in inches.