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# 1495 Orifice Plate 1496 Flange Union 1497 Meter Section Installation & Operation Manual



**COMPLETE POINT SOLUTIONS™**

**Dieterich Standard**

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## Model 1495 Orifice Plate Model 1496 Flange Union Model 1497 Meter Section Installation and Operation Manual

### NOTICE

Read this manual before working with the product. For personal and system safety, and for optimum product performance, make sure you thoroughly understand the contents before installing, using, or maintaining this product.

Within the United States, Rosemount Inc. has two toll-free assistance numbers.

**Customer Central:** 1-800-999-9307 (7:00 a.m. to 7:00 p.m. CST)  
Technical support, quoting, and order-related questions.

**North American Response Center:** 1-800-654-7768 (24 hours a day – Includes Canada)  
Equipment service needs.

For equipment service or support needs outside the United States, contact your local Rosemount representative.

### ⚠ CAUTION

The products described in this document are NOT designed for nuclear-qualified applications.

Using non-nuclear qualified products in applications that require nuclear-qualified hardware or products may cause inaccurate readings.

For information on Rosemount nuclear-qualified products, contact your local Rosemount Sales Representative.

SNF-0004

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## IMPORTANT

Procedures and instructions in this manual may require special precautions to ensure the safety of the personnel performing the operations. **Refer to the safety messages at the beginning of each section before performing any operations.**

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# Introduction

## USING THIS MANUAL

This product manual provides installation and configuration instructions for the Model 1495 Orifice Plate, Model 1496 Flange Union and Model 1497 Meter Section.

This section contains an explanation of each section of the manual, a flowchart for using the manual, and an installation checklist.

**Section 3: Hardware Installation for Model 1495 Orifice Plate & Model 1496 Flange Union** explains initial inspection, operating limitations, and in what location and orientation to install the orifice plate and associated hardware.

**Section 3: Hardware Installation for Model 1495 Orifice Plate & Model 1496 Flange Union** explains how to install the Orifice Plate in either existing orifice flanges or with the Model 1496 Flange Union.

**Section 4: Hardware Installation for Model 1497 Meter Section** explains how to install the Meter Section assembly.

**Section 5: Specifications and Reference Data** provides specification and reference data for the Model 1495 Orifice Plate, Model 1496 Flange Union, and Model 1497 Meter Section.

**Appendix A: Recommended Straight Run Requirements** illustrates the recommended straight run to obtain highest accuracy.

**Appendix B: Standard Pipe Schedules** shows the standard pipe schedules used for the Model 1496 Flange Unions and Model 1497 Meter Sections.

**Appendix C: Standard Meter Section Lengths** gives the upstream and downstream lengths of the Model 1497 Meter Section.

**Appendix D: Orifice Plate Drawings** illustrates the Model 1495 Orifice Plate, Model 1496 Flange Union and Model 1497 Meter Section.

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## INSTALLATION CHECKLIST

The following list is a summary of the steps required to complete a Model 1495 Orifice Plate installation. If this is an entirely new installation, begin with step 1. If the mounting is already in place, verify that the orifice flange size and rating match the recommended specifications, and begin with step 5.

1. Determine where the Model 1495 Orifice Plate is to be placed within the piping system.
2. Establish the proper orientation as determined by the intended service for the orifice plate.
3. Review **Appendix A: Recommended Straight Run Requirements**.
4. Confirm the Model 1495 configuration.
5. Measure the pipe's internal diameter (ID), preferably at 1 x ID from the orifice flange (upstream or downstream).

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### NOTE

Providing the pipe internal diameter at the time of purchase is necessary to maintain published orifice plate accuracy.

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6. Install the orifice plate.
7. Check for leaks.
8. Commission the orifice plate.



## Installation, Location, and Orientation

This section describes the orientation, location and alignment limits for installing the Model 1495 Orifice Plate. Read it thoroughly before starting the installation.

### SAFETY MESSAGES

Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Please refer to the following safety messages before performing any operation in this section.

#### **WARNING**

Failure to follow these installation guidelines could result in death or serious injury:

- \* Make sure only qualified personnel perform the installation.

### RECEIVING AND INSPECTION

Model 1495 Orifice Plates are available in different models and with different options, so it is important to inspect and know which model you have before beginning installation.

Upon receipt of the shipment, check the packing list against the material received and the purchase order. All items are tagged with a model number, and serial number. Report any damage to the carrier.

### MOUNTING CONFIGURATIONS

The orifice plate electronics must be installed in the proper orientation relative to the pipe and the fluid measured. This must be specified when the order is placed. For gases, the electronics must be mounted above the pipe, and for liquid and steam the electronics must be mounted below the pipe, as shown in Figure 3-1 on page 3-1.

### STRAIGHT RUN REQUIREMENTS

To obtain published accuracy, sufficient straight run is required to produce a fully developed flow profile. Shorter lengths are possible, but accuracy will be affected. Consult the Factory for further information.

Straight run requirements are also more stringent for achieving the highest accuracy. Refer to Appendix A for recommended straight pipe lengths.

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# Hardware Installation for Model 1495 Orifice Plate & Model 1496 Flange Union

**MODEL 1495 TYPES:**  
 1495 PG  
 1495 PG  
 1495 UC  
 1495 UG

**MODEL 1496 TYPES:**  
 1496 WN  
 1496 SO  
 1496 RJ

**SAFETY MESSAGES**

This section provides hardware installation instructions for the Model 1495 Orifice Plate and Model 1496 Flange Union. Installation procedures are similar for all services. Service-specific instructions are provided where necessary. Otherwise, all instructions in this section apply to all services.

- Refer to transmitter installation instructions where applicable.

Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Please refer to the following safety messages before performing any operation in this section.

**⚠ WARNING**

Failure to follow these installation guidelines could result in death or serious injury:

\* Make sure only qualified personnel perform the installation.

**MODEL 1495 ORIFICE PLATE AND MODEL 1496 FLANGE UNION COMPONENTS**

Figure 3-1 identifies the components of the Model 1496 Flange Union. The Model 1495 Orifice Plate is shown for hardware clarity. See the actual installation instructions for proper positioning of the orifice plate.

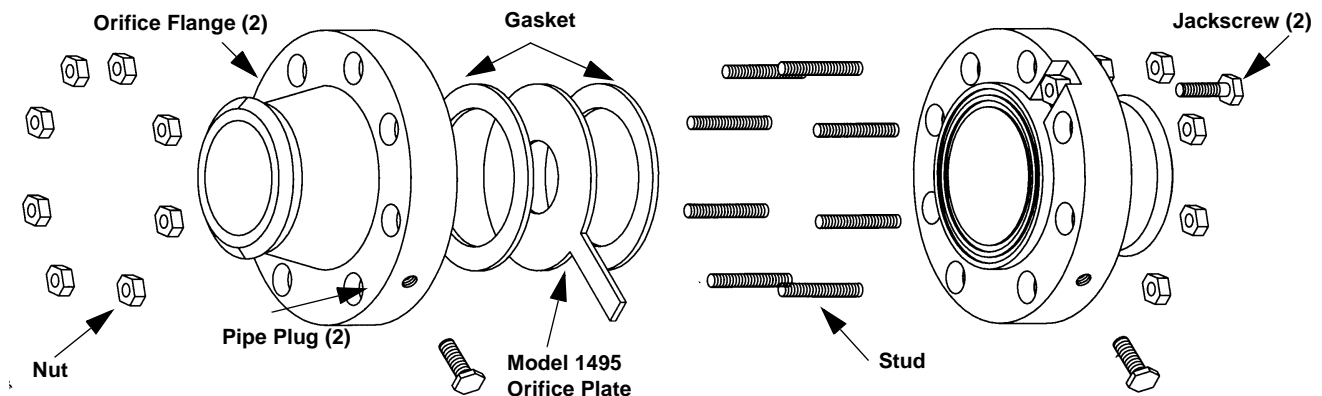


FIGURE 3-1. Model 1496 Flange Union Components

**STEP 1:  
DETERMINE THE PROPER  
ORIENTATION**

The orifice plate electronics must be installed in the proper orientation relative to the pipe and the fluid measured. For gases, the electronics must be mounted above the pipe. For liquid and steam, the electronics must be mounted below the pipe, as shown below in Figure 3-2.

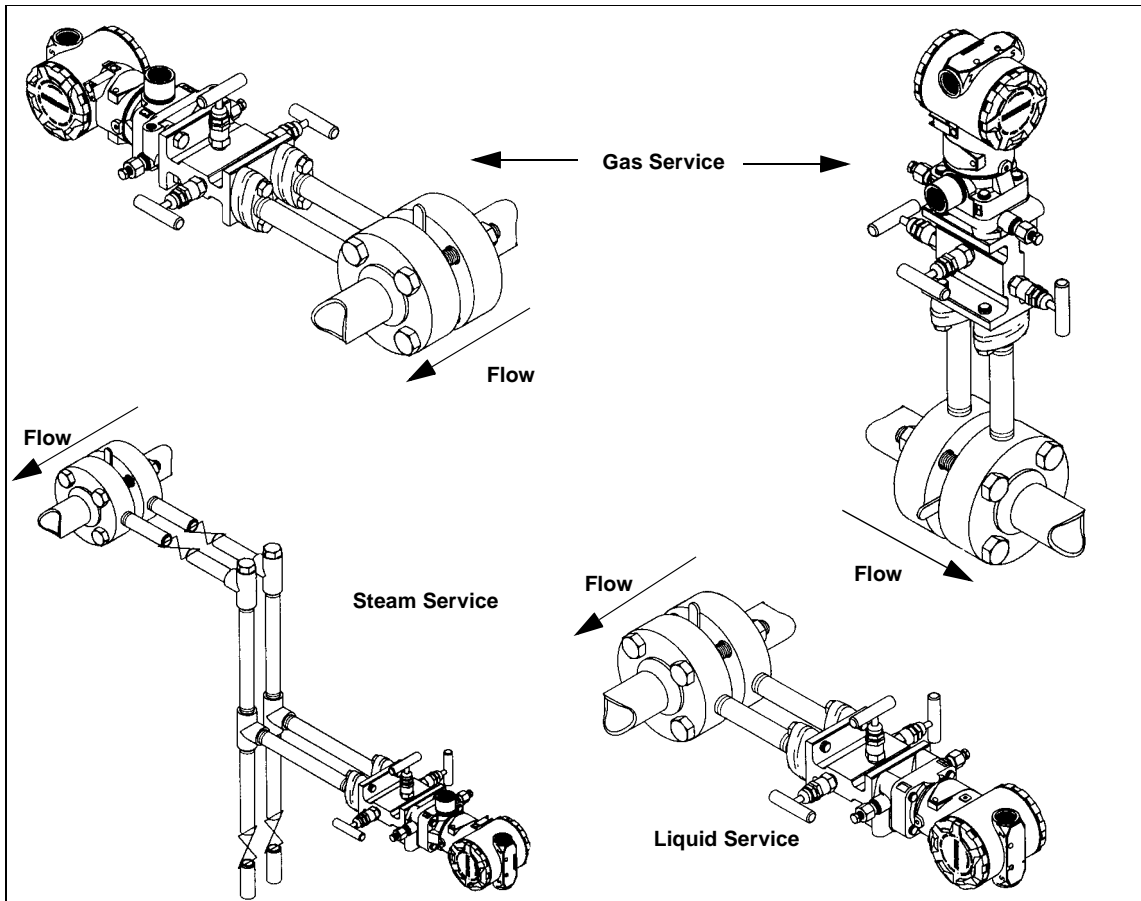


FIGURE 3-2. Mounting Configurations

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## STEP 2: WELD THE FLANGE UNION

Follow these steps to weld the orifice flanges to the pipe.

1. Make sure the line is depressurized.
2. Prep the pipe ends as required.
3. Ensure that the pipe mounting flange is the correct size and rating.
4. Make certain that the flange taps are aligned and level.
5. Weld the orifice flanges to the pipe.
6. To avoid serious burns allow the orifice flanges to cool before installing the orifice plate .

### **WARNING**

**Personal hazard! To prevent injury, remove pressure and drain pipe assembly before installing or removing orifice plate.**

### **DANGER**

**If the process fluid is caustic or otherwise hazardous, the procedure outlined here must be modified as required to prevent death or serious injury to personnel.**

## STEP 3: INSTALL THE ORIFICE PLATE

General installation instructions to install (or remove) the orifice plate are as follows:

1. Make certain the pipeline is not under pressure and has been drained or purged.
2. Loosen all studs and nuts.
3. Remove the studs in one half of the flange union.
4. Spread flange union by turning jackscrews clockwise.
5. Install new plate or remove existing plate for replacement or inspection.
6. Install new gaskets when installing plate. DSI recommends installing new gaskets each time orifice flange union is separated.
7. Release the flange union by turning Jackscrews counter clockwise.
8. Replace studs.
9. Tighten studs in a star pattern.

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### **NOTE**

Refer to published standards (AGA3, ASME MFC-3M, ISO 5167 for installation guidelines if using eccentric or segmental type orifice plates.

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# Hardware Installation for Model 1497 Meter Section

**MODEL 1497 TYPES:**  
1495 WN  
1495 RJ

This section provides hardware installation instructions for the Model 1497 Meter Sections. Installation procedures are similar for all services. Service-specific instructions are provided where necessary. Otherwise, all instructions in this section apply to all services.

- Refer to transmitter installation instructions where applicable.

## SAFETY MESSAGES

Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Please refer to the following safety messages before performing any operation in this section.

### WARNING

Failure to follow these installation guidelines could result in death or serious injury:

- \* Make sure only qualified personnel perform the installation.

## MODEL 1497 METER SECTION COMPONENTS

Figure 4-1 identifies the components of the Model 1497 Meter Section. The Model 1495 Orifice Plate is shown for hardware clarity. See **Section 3: Hardware Installation for Model 1495 Orifice Plate & Model 1496 Flange Union** for proper positioning of the orifice plate.

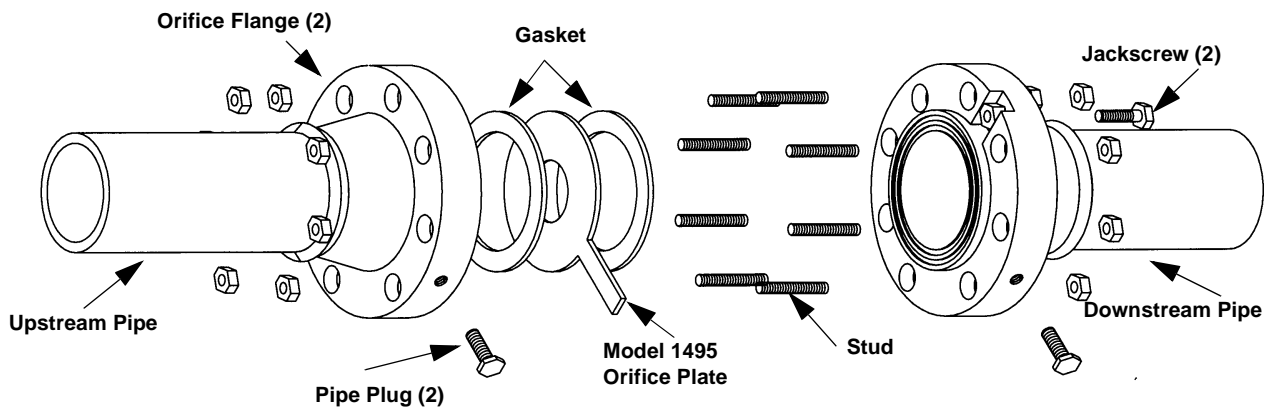


FIGURE 4-1. 1497 Meter Section Components

**STEP 1: DETERMINE THE PROPER ORIENTATION**

The orifice plate electronics must be installed in the proper orientation relative to the pipe and the fluid measured. For gases, the electronics must be mounted above the pipe. For liquid and steam, the electronics must be mounted below the pipe, as shown below in Figure 4-2.

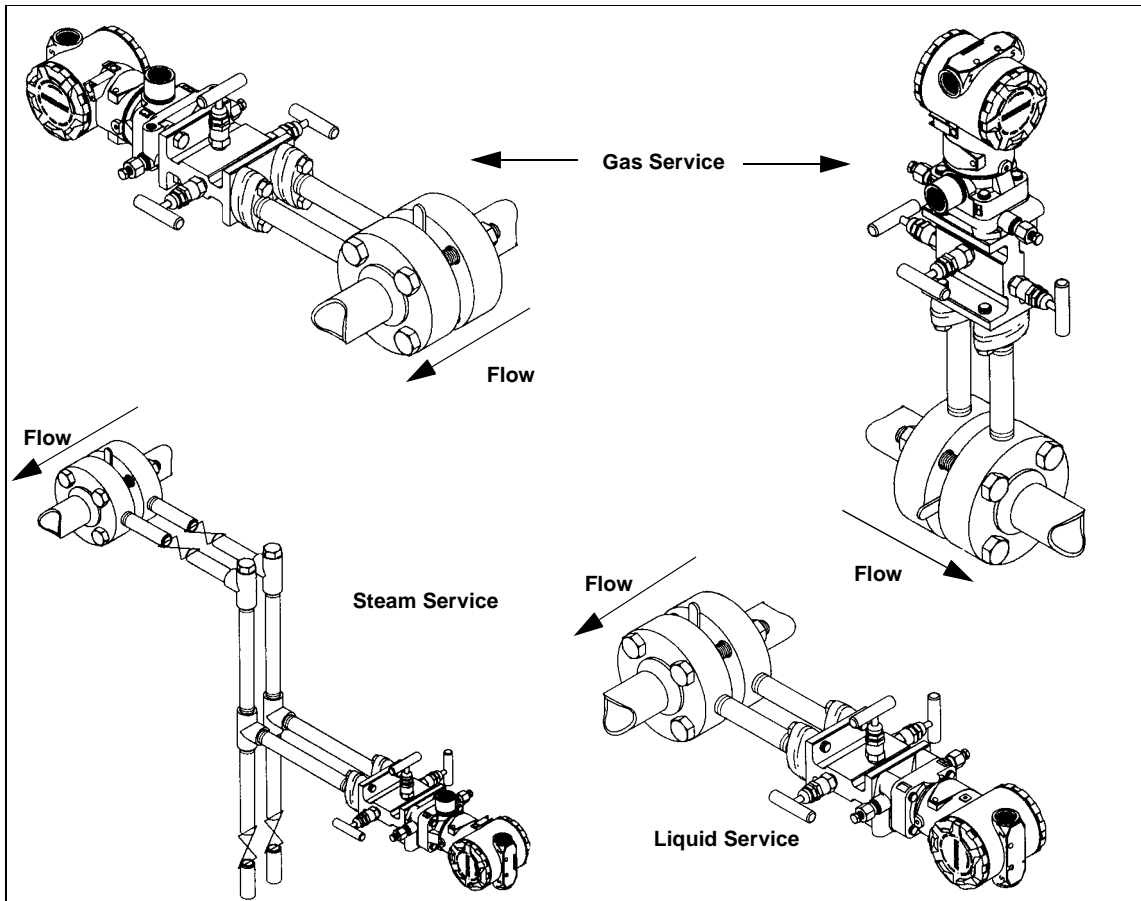


FIGURE 4-2. Mounting Configurations



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## STEP 2: INSTALL THE METER SECTION

The Model 1497 Meter Section comes pre-assembled and requires only installation into a service pipe. General installation instructions are as follows:

1. Make sure the line is depressurized.
2. Remove the section of the pipe that will be replaced by the Meter Section.

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### NOTE:

Actual piping conditions may require additional straight run. Refer to Appendix A: Recommended Straight Run Requirements.

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3. Prepare the pipe ends as required.
  - For flanged models, ensure that the pipe mounting flange is the same size or rating.
  - For threaded models, ensure that the pipe union or coupling is the same size pipe thread as the Meter Section.
4. Orient the assembly appropriately for the type of service.
5. Ensure that the ID of the Meter Section and the ID of the pipe are concentric.
6. Complete assembly to the appropriate connections.



### WARNING

Personal hazard! To prevent injury, remove pressure and drain pipe assembly before installing or removing orifice plate.



### DANGER

If the process fluid is caustic or otherwise hazardous, the procedure outlined here must be modified as required to prevent death or serious injury to personnel.

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## Specifications and Reference Data

### ORDERING INFORMATION

Ordering information is available in the *1495 Orifice Plate, 1496 Flange Union, and 1497 Meter Section* Product Data Sheet, DS-4013 (Rose-mount number 00813-0100-4792).

### FUNCTIONAL LIMITATIONS

#### Service and Flow Range

Liquid, gas or vapor turbulent flow, for pipe Reynold's Numbers greater than 10,000.

#### Orifice Plate Operating Limitations

**Temperature Limit:** -100°F to 700°F (-73°C to 370°C).  
Contact the Factory for applications above 700°F (370°C).

**Maximum Working Pressure:** Flange rating per ANSI B16.5.

### PHYSICAL SPECIFICATIONS

#### Materials of Construction

##### Orifice Plate

304/304L or 316/316L Stainless Steel, ASTM A240; Hastelloy® C-276, ASTM B575; Monel® 400, ASTM B127.

##### Flange Unions

Orifice Flanges (ANSI B16.36): Carbon Steel, ASTM A105; Stainless Steel, ASTM A182; Hastelloy ASTM B564/B575; Monel, ASTM B574/B127.

##### Flange Mounting Hardware

Studs: ASTM A193 Grade B7.  
Nuts: ASTM A194 Grade 2H.  
Jackscrews: ASTM A307.  
Gaskets: Non-asbestos ring type, Durlon® 8500 Green or equivalent.  
Pipe Plugs: ASTM A105.

##### Meter Sections

Pipe: Carbon Steel, ASTM A106 Grade B; Stainless Steel, ASTM A312; Hastelloy, ASTM B619; Monel, ASTM B165.  
Flanges (ANSI B16.5): Carbon Steel, ASTM A105; Stainless Steel, ASTM A182; Hastelloy, ASTM B564/B575; Monel, ASTM B564/B127.

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## RETURN OF MATERIALS

To expedite the return process outside the United States, contact the nearest sales representative.

Within the United States, call the Rosemount National Response Center using the 1-800-654-RSMT (7768) toll-free number. This center, available 24 hours a day, will assist you with any needed information or materials.

The center will ask for product model and serial numbers, and will provide a Return Material Authorization (RMA) number. The center will also ask for the name of the process material to which the product was last exposed.



### **CAUTION**

**People who handle products exposed to a hazardous substance can avoid injury if they are informed and understand the hazard. If the product being returned was exposed to a hazardous substance as defined by OSHA, a copy of the required Material Safety Data Sheet (MSDS) for each hazardous substance identified must be included with the returned goods.**

The Rosemount National Response Center will detail the additional information and procedures necessary to return goods exposed to hazardous substances.

# Recommended Straight Run Requirements

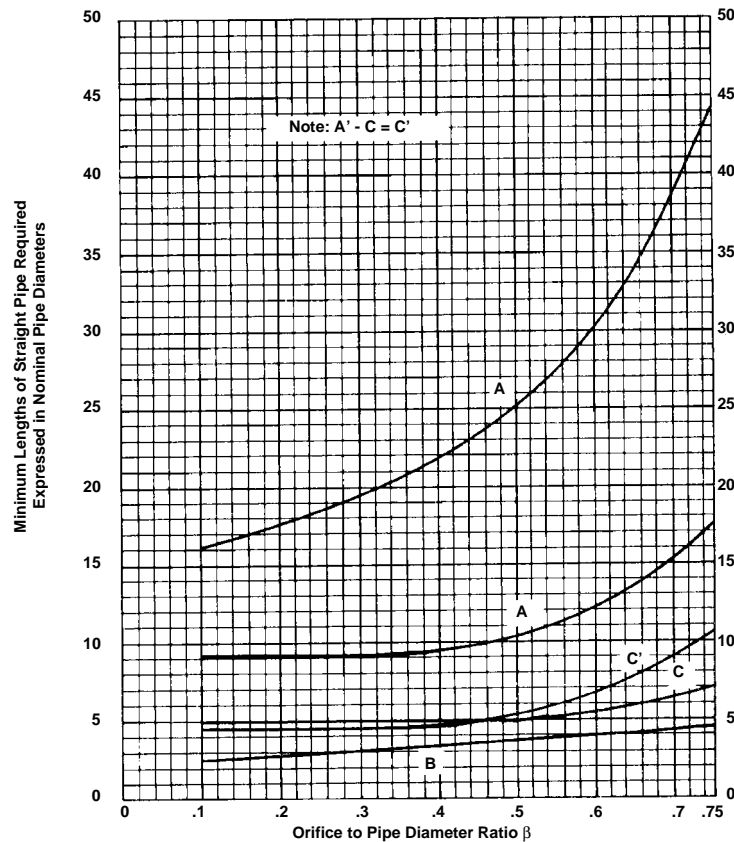
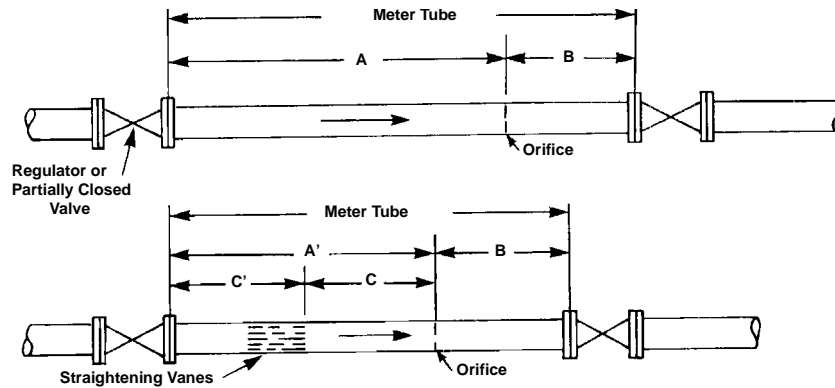


FIGURE 1. Partly Closed Valve Upstream of Meter Tube

**NOTES:**

1. When pipe taps are used, A, A', and C shall be increased by two pipe diameters and B by eight pipe diameters.
2. When the diameter of the orifice may require changing to meet different conditions, the lengths of straight pipe should be those required for the maximum orifice-to-pipe diameter ratio that may be used.

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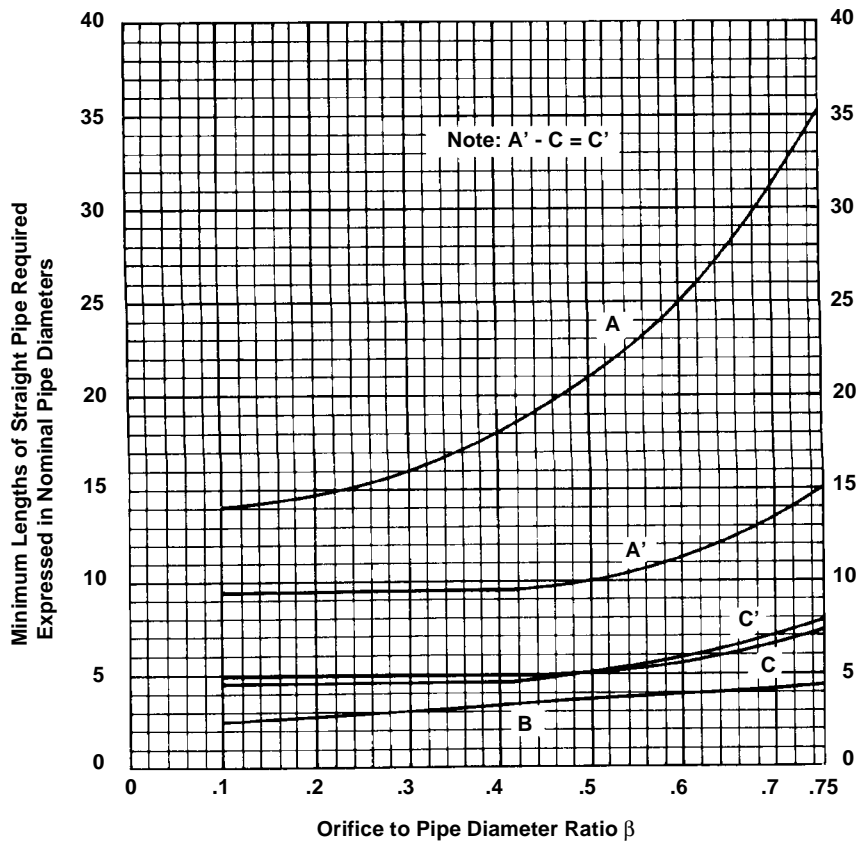
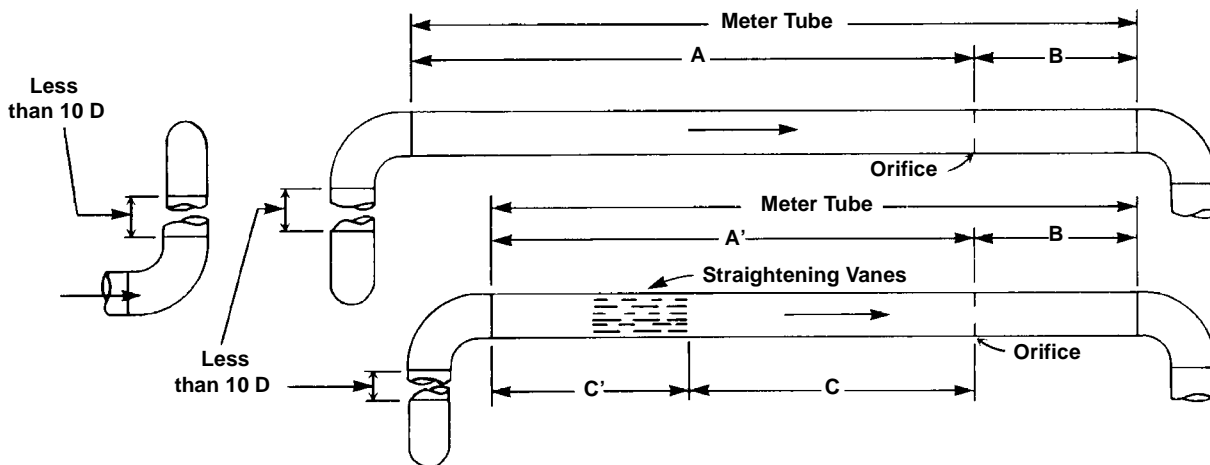


FIGURE 2. Two Ells Not in Same Plane Upstream of Meter Tube

**NOTES:**

1. When pipe taps are used, A, A', and C shall be increased by two pipe diameters and B by eight pipe diameters.
2. When the diameter of the orifice may require changing to meet different conditions, the lengths of straight pipe should be those required for the maximum orifice-to-pipe diameter ratio that may be used.
3. When the two ells shown in the above sketches are closely (less than 3D) preceded by a third, which is not in the same plane as the middle or second ell, the piping requirements shown by A should be doubled.

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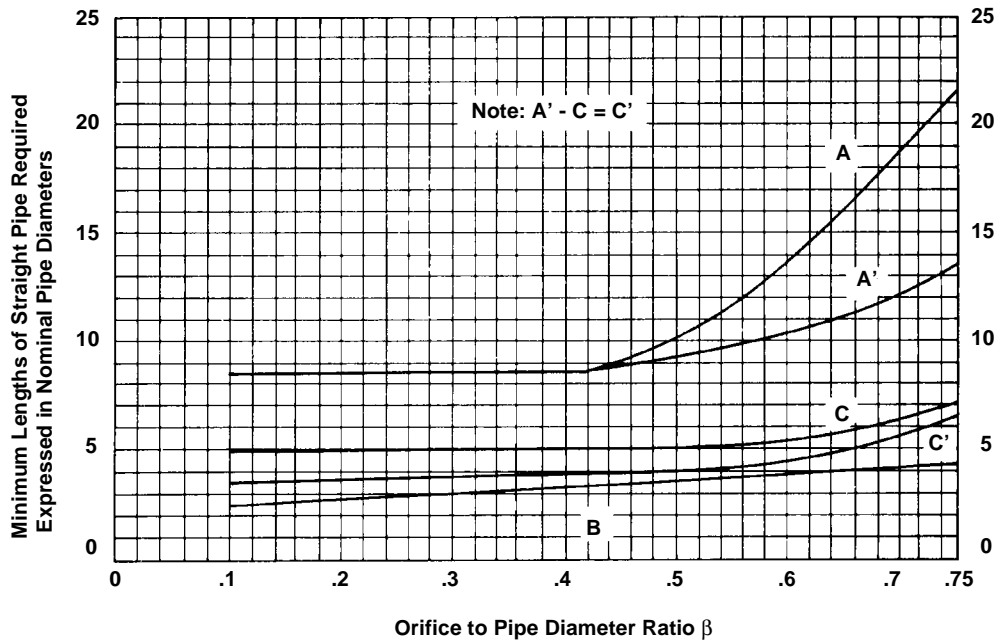
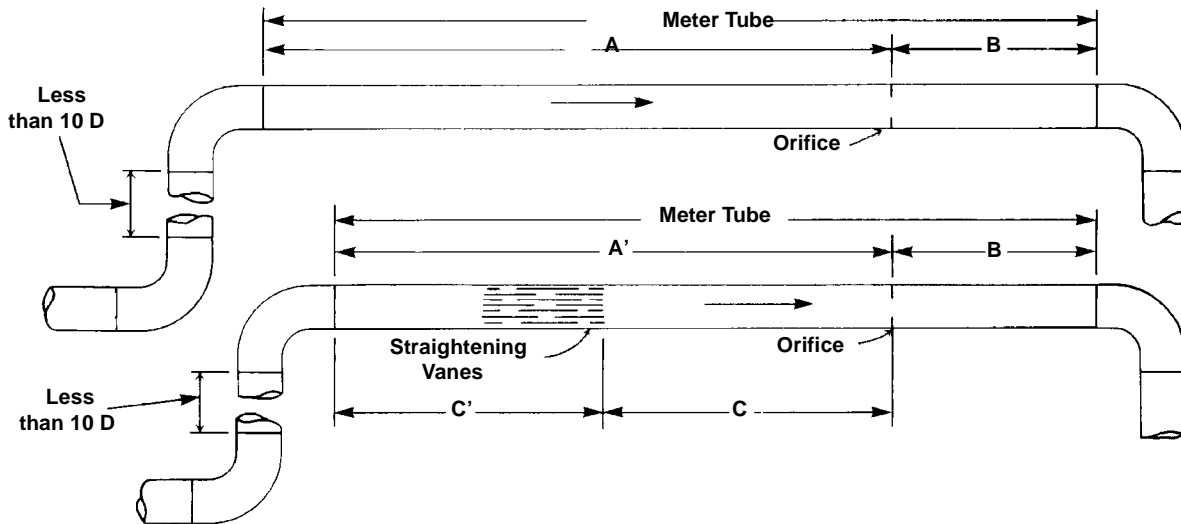


FIGURE 3. Less than Ten Pipe Diameters (D) between Two Ells in Same Plane Upstream of Meter Tube

**NOTES:**

1. When pipe taps are used, A, A, and C shall be increased by two pipe diameters and B by eight pipe diameters.
2. When the diameter of the orifice may require changing to meet different conditions, the lengths of straight pipe should be those required for the maximum orifice-to-pipe diameter ratio that may be used.

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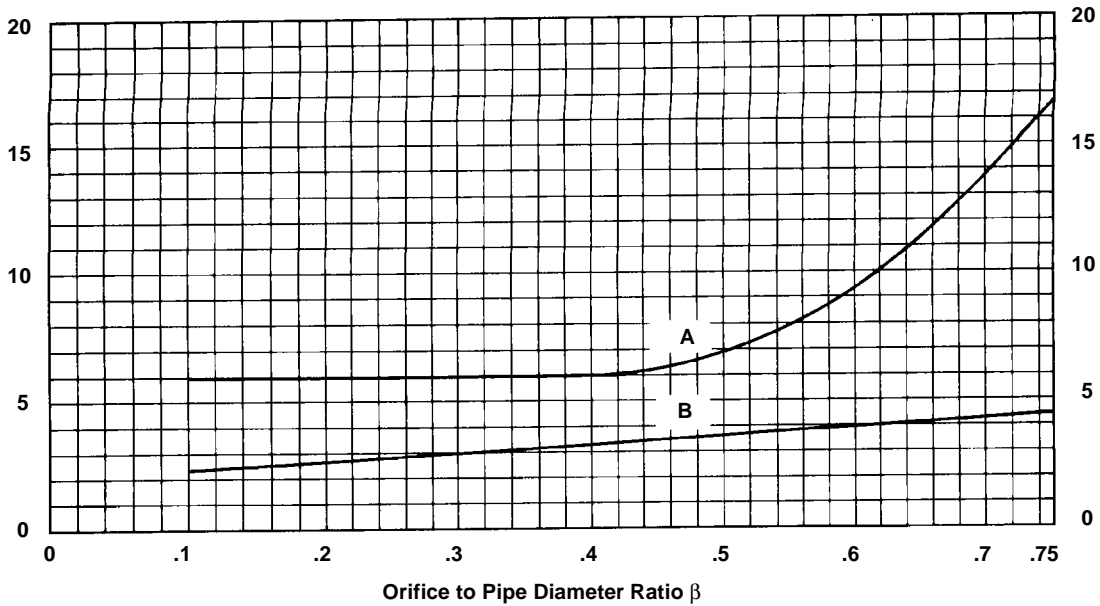
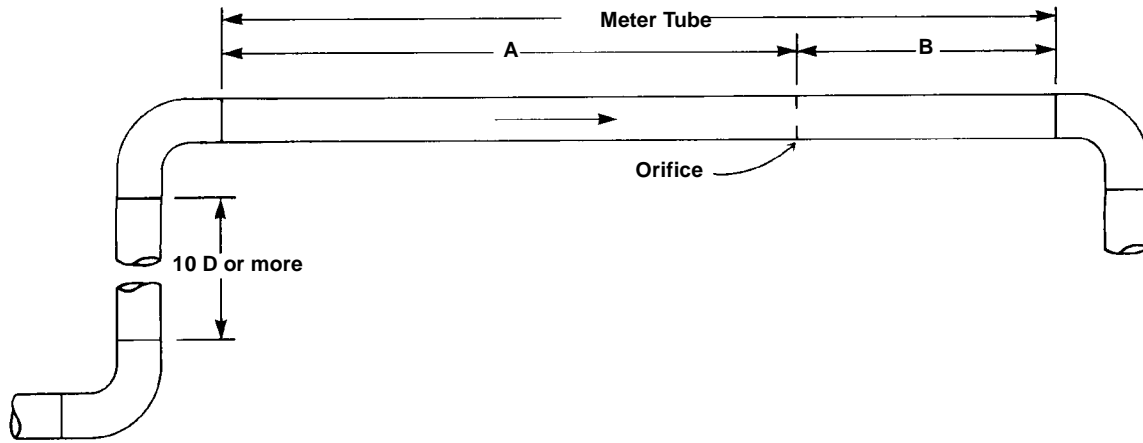


FIGURE 4. Greater than Ten Pipe Diameters (D) between Two Ells in the Same Plane Upstream of Meter Tube

**NOTES:**

1. When pipe taps are used, A, A', and C shall be increased by two pipe diameters and B by eight pipe diameters.
2. When the diameter of the orifice may require changing to meet different conditions, the lengths of straight pipe should be those required for the maximum orifice-to-pipe diameter ratio that may be used.
3. The straight run of pipe between the elbows must be at least ten diameters in length. If this length is less than the ten diameters, Figure 3, page 3, shall be applicable.

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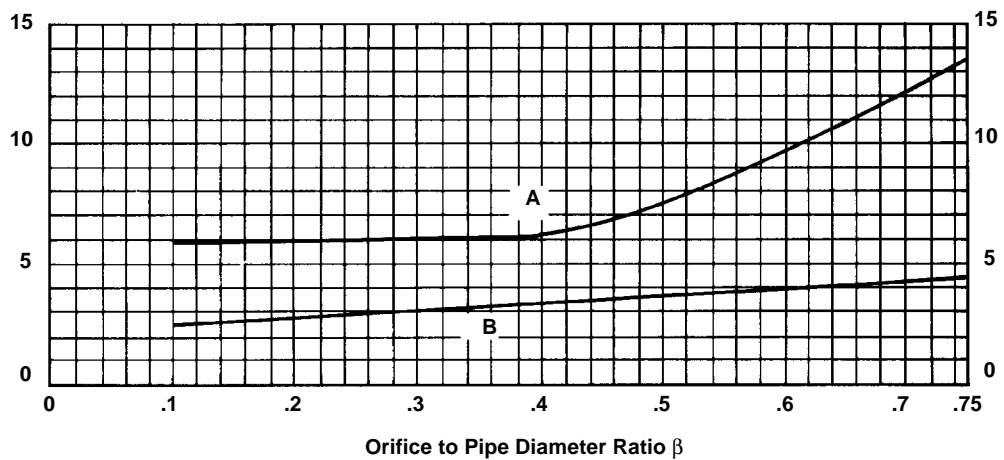
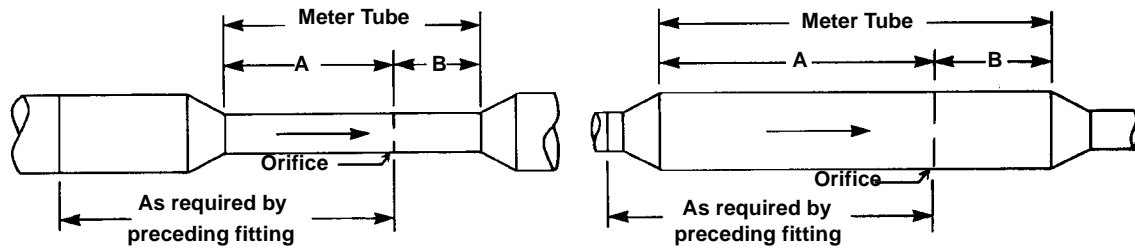


FIGURE 5. Reducer or Expander Upstream of Meter Tube

**NOTES:**

1. When pipe taps are used, A, A', and C shall be increased by two pipe diameters and B by eight pipe diameters.
2. When the diameter of the orifice may require changing to meet different conditions, the lengths of straight pipe should be those required for the maximum orifice-to-pipe diameter ratio that may be used.
3. Straightening vanes will not reduce required lengths of straight pipe A. Straightening vanes are not required because of the reducers. They may be required because of other fittings, which precede the reducer. Length A is to be increased by an amount equal to the length of the straightening vanes whenever they are used.
4. If the flowing fluid may be partially condensed, the expander type installation as well as any other configuration that might create two-phase flow in the meter tube is to be avoided.

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# Standard Pipe Schedules

Line Size	ANSI Class 300			ANSI Class 600		ANSI Class 900		ANSI Class 1500		ANSI Class 2500	
	WN	SO	RTJ	WN	RTJ	WN	RTJ	WN	RTJ	WN	RTJ
2" (50.8 mm)	STD	STD	STD	STD	STD	STD	STD	XH	XH	160	160
2-1/2" (63.5 mm)	STD	STD	STD	STD	STD	STD	STD	XH	XH	160	160
3" (76.2 mm)	STD	STD	STD	STD	STD	STD	STD	XH	XH	160	160
4" (101.6 mm)	STD	STD	STD	STD	STD	STD	STD	XH	XH	160	160
5" (127 mm)	STD	STD	STD	STD	STD	STD	STD	XH	XH	160	160
6" (152.4 mm)	STD	STD	STD	STD	STD	STD	STD	XH	XH	160	160
8" (203.2 mm)	STD	STD	STD	STD	STD	STD	STD	XH	XH	160	160
10" (254 mm)	STD	STD	STD	STD	STD	STD	STD	XH	XH	160	160
12" (304.8 mm)	STD	STD	STD	STD	STD	STD	STD	XH	XH	160	160
14" (355.6 mm)	STD	STD	STD	STD	STD	STD	STD	XH	XH	-	-
16" (406.4 mm)	STD	STD	STD	STD	STD	STD	STD	XH	XH	-	-
18" (457.2 mm)	STD	STD	STD	STD	STD	STD	STD	XH	XH	-	-
20" (508 mm)	STD	STD	STD	STD	STD	STD	STD	XH	XH	-	-
24" (609.6 mm)	STD	STD	STD	STD	STD	STD	STD	XH	XH	-	-

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## Standard Meter Section Lengths

Line Size	Upstream Length	Downstream Length	I.D. inches)
2" (50.8 mm)	1.7 ft (.52 m)	0.9 ft (.27 m)	2.067" ( 52.5 mm)
2-1/2" (63.5 mm)	2.1 ft (.64 m)	1.0 ft (.30 m)	2.469" (68.3 mm)
3" (76.2 mm)	2.6 ft (.79 m)	1.3 ft (.40 m)	3.068" (77.9 mm)
4" (101.6 mm)	3.4 ft (1.0 m)	1.7 ft (.52 m)	4.026" (102.3 mm)
5" (127 mm)	4.2 ft (1.3 m)	2.1 ft (.64 m)	5.047" (128.2 mm)
6" (152.4 mm)	5.1 ft (1.6 m)	2.5 ft (.76 m)	6.065" (154.1 mm)
8" (203.2 mm)	6.7 ft (2.0 m)	3.3 ft (1.0 m)	7.981" (202.7 mm)
10" (254 mm)	8.4 ft (2.6 m)	4.2 ft (1.3 m)	10.020" (254.5 mm)
12" (304.8 mm)	10.0 ft (3.0 m)	5.0 ft (1.5 m)	12.000" (304.8 mm)
14" (355.6 mm)	11.0 ft (3.4 m)	5.5 ft (1.7 m)	13.250" (336.6 mm)
16" (406.4 mm)	12.7 ft (3.9 m)	6.4 ft (1.9 m)	15.250" (393.7 mm)
18" (457.2 mm)	14.4 ft (4.4 m)	7.2 ft (2.2 m)	17.250" (438.1 mm)
20" (508 mm)	16.0 ft (4.9 m)	8.0 ft (2.4 m)	19.250" (488.9 mm)
24" (609.6 mm)	19.4 ft (5.9 m)	9.7 ft (3.0 m)	23.250" (590.5 mm)



**Orifice Plate Drawings**











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