

Recommended Practice

ISA RP75.06

Control Valve Manifold Designs



Sponsor
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PREFACE

This Preface is included for information purposes and is not part of RP75.06.

This Recommended Practice has been prepared as a part of the service of the Instrument Society of America toward a goal of uniformity in the field of instrumentation. To be of real value, this document should not be static, but should be subject to periodic review. Toward this end, the Society welcomes all comments and criticisms, and asks that they be addressed to the Secretary, Standards and Practices Board, Instrument Society of America, 67 Alexander Drive, P.O. Box 12277, Research Triangle Park, NC 27709, Telephone (919) 549-8411.

The ISA Standards and Practice Department is aware of the growing need for attention to the metric system of units in general, and the International System of Units (SI) in particular, in the preparation of instrumentation standards. The Department is further aware of the benefits to USA users of ISA Standards of incorporating suitable references to the SI (and the metric system) in their business and professional dealings with other countries. Towards this end this Department will endeavor to introduce SI - acceptable metric units in all new and revised standards to the greatest extent possible. The Metric Practice Guide, which has been published by the American Society for Testing and Materials as ANSI designation Z210.1 (ASTM E380-76, IEEE Std. 268-1975), and future revisions, will be the reference guide for definitions, symbols, abbreviation and conversion factors.

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From a survey initiated in 1947, Tentative Recommended Practice ISA-RP4.2, "Standard Control Valve Manifold Designs (Carbon Steel Control Valves Only)," (1956) was developed and published. It gave detailed dimensions for using ASA 300# flanged control valves 1-1/2 through 6 inch size, in 150# and 300# manifolds, 2 through 8 inch. Pressure-temperature ratings are now known as ANSI Class 150, Class 300, etc. rather than ASA 150#, 300#, etc. Dimensions have not changed since 1956 for these sizes and pressure ratings of control valves, block (gate) valves, and bypass valves (globe up through 4 inch, gate for 6 and 8 inch). Globe control valves still predominate in most industries, but other styles (flangeless, rotary, etc.) are being used and these have face-to-face or end-to-end dimensions that may be different than globe control valves (Bibliography, references 3, 4, and 5).

This document is not intended to promote the use of manifolds in piping systems nor to recommend the types shown as better than others; but if a designer has decided to install a manifold, *space estimates* may be obtained herein. Application information may be obtained in the *ISA Handbook of Control Valves*, reference 1 in the Bibliography.

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1 SCOPE

Control valves and bypass valves are sometimes manifolded in piping systems to allow manual manipulation of the flow through the systems in those situations in which (usually) the control valve is not in service. Six control valve manifold types are presented in this recommended practice with space estimates for various sizes. Each of these six types consists of a straight through globe control valve, isolating upstream and downstream block valves, and bypass piping with a manually operated valve.

2 PURPOSES OF THESE MANIFOLD DESIGNS

- 2.1 Provide space estimates for one popular pressure rating (American National Standards Institute (ANSI) Class 300) of several sizes of manifolds.
- 2.2 Suggest space estimates for other pressure ratings.
- 2.3 Suggest compact, model designs.
- 2.4 Reduce design expense.
- 2.5 Promote uniformity of practice.
- 2.6 Allow reuse of components.

3 APPLICATION

Application information and guidance may be found in the *ISA Handbook of Control Valves*, API RP550, (Bibliography, references 1 and 2), and other publications.

4 DIMENSIONS*

- 4.1 This revision of ISA-RP4.2 includes dimensions for flanged globe control valves of ANSI Class 300. (Class 600 control valves face-to-face dimensions are approximately 7 percent longer than Class 300; Class 150 are about 5 percent shorter.) Face-to-face dimensions of certain globe type valves are standardized per ISA (See Bibliography, references 3 & 4.). Dimensions for most gate valves, globe valves, and plug valves used as block and/or bypass may be obtained from Bibliography, reference 5.
- 4.2 Globe control valves have longer face-to-face dimensions than other styles. Use of flangeless valves may reduce dimension W significantly.
- 4.3 The user should verify dimensions of all components before releasing a manifold design for construction.
- 4.4 Actuator heights are not standardized; therefore the heights, for both plain and extended bonnet actuators, must be obtained from the chosen manufacturer.
- 4.5 Sizes are nominal for the control valves and both nominal and actual OD for the manifold pipe. Since space dimensions H and W are estimates, these are given to the next higher inch from a

compact design. Millimeters are converted from inches and rounded to the next higher 10 mm increment for H, W, X, and Y.

4.6 Bibliography reference 1 contains manifolds with different details and dimensions. Reference 2 also contains several different designs. Reference 6 gives layout guidance.

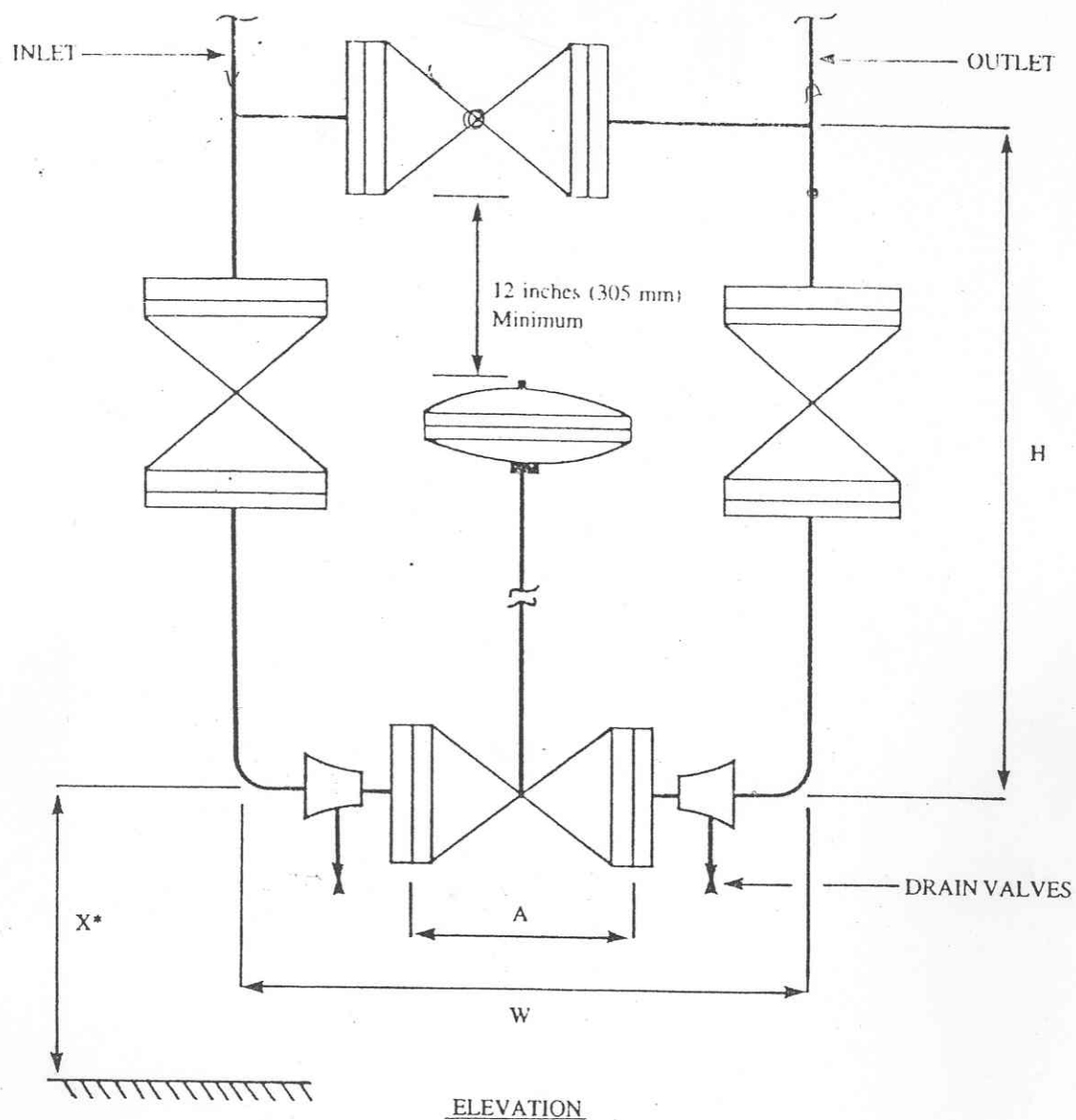
5 SIZES

- 5.1 Manifold piping nominal sizes covered by the designs are 1, 1-1/2, 2, 3, 4, 6, and 8 inches (actual piping OD is 33.4, 48.3, 60.3, 88.9, 114.3, 168.3, 219.1 mm).
- 5.2 Control valve body nominal sizes covered by the designs are 1, 1-1/2, 2, 3, 4, and 6 inch. (25, 40, 50, 80, 100, and 150 mm).

6 MANIFOLD TYPE DETAILS

- 6.1 All the piping component pieces can be fabricated using conventional weld type fittings and pipe.
- 6.2 The six manifold designs are designated Type I through Type VI. The sequence in which these designs appear has no bearing on the preference or acceptability of the designs, nor does omission of other configurations indicate less acceptability.
- 6.3 Bypass valves are usually globe valves up through 4 inch (100 mm) size. Bypass valves are often gate valves in 6 and 8 inch sizes. The dimensions shown allow enough space for manifold size bypass valves.
- 6.4 Drain and vent connections may or may not be desirable. They are shown schematically on the type drawings. Reference 6 gives more details.
- 6.5 The clearances in the manifold designs are to allow for the removal of the actuator and the control valve plug from the bonnet side (top pull) or bottom (bottom pull) of a manifold-size valve with plain bonnet. The 12 inch (305 mm) clearance between the top of the actuator and the bypass (in Types I, III, and IV) as the yoke clears the valve stem is generally quite sufficient to facilitate disassembly. Dimension X allows clearance for actuator and plug removal outside the piping.
- 6.6 It is assumed that the piping system in which these manifolds will be used has been properly sized and designed so that the variation between main line size and the control valve size is not excessive. Where the main line size is more than two sizes larger than the control valve size, it is considered economical to reduce ahead of the manifold so that the manifold pipe size and the control valve fall within the above relationship. Reducing may also be considered at the manifold inlet to provide a manifold only one size larger than the control valve if dictated by economics or where the need for flexibility for installing a larger control valve is not likely. Because of this, references have been made to manifold sizes rather than to main line sizes.

*Refer Figures for letter codes and to Figures 1-6 for dimensions.



NOTE: Dimensions shown are suggested piping dimensions and may vary depending upon actual dimensions of components being used.

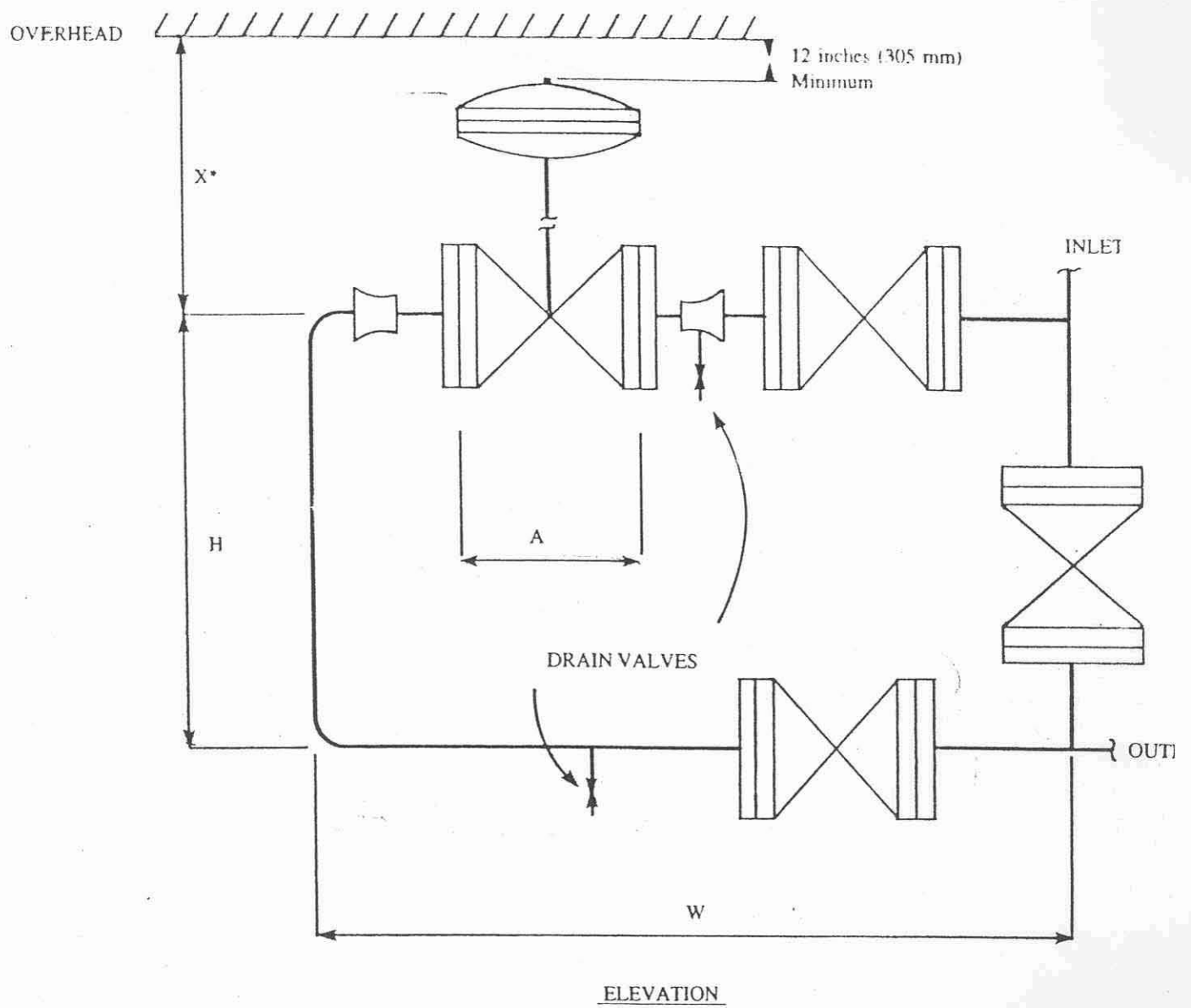
*If Plug removes in this direction

Figure 1. Type I Control Valve Manifold

TABLE 1
TYPE I CONTROL VALVE MANIFOLD DIMENSIONS FOR ANSI CLASS 300

INCHES							MILLIMETERS						
A*	W**	H**	X**	ACTUAL MANIFOLD PIPE OUTSIDE DIAMETER	NOMINAL SIZE		NOMINAL SIZE CONTROL VALVE	ACTUAL MANIFOLD PIPE OUTSIDE DIAMETER	A*	W**	H**	X**	
					MANI- FOLD PIPE	CONTROL VALVE							
7¼	27	39	23	1.315	1	1	25	33.4	197	690	990	580	
9¼	27	39	23	1.900	1½	1½	40	48.3	235	690	990	580	
7¼	27	39	23	1.900	1½	1	25	48.3	197	690	990	580	
10½	27	39	23	2.375	2	2	50	60.3	267	690	990	580	
9¼	27	39	23	2.375	2	1½	40	60.3	235	690	990	580	
7¼	27	39	23	2.375	2	1	25	60.3	197	690	990	580	
12½	30	42	27	3.500	3	3	80	88.9	317	760	1070	690	
10½	30	42	27	3.500	3	2	50	88.9	267	760	1070	690	
9¼	30	42	27	3.500	3	1½	40	88.9	235	760	1070	690	
14½	35	43	30	4.500	4	4	100	114.3	368	890	1090	760	
12½	35	43	30	4.500	4	3	80	114.3	317	890	1090	760	
10½	35	43	30	4.500	4	2	50	114.3	267	890	1090	760	
14½	45	54	39	6.625	6	4	100	168.3	368	1140	1370	990	
12½	45	54	39	6.625	6	3	80	168.3	317	1140	1370	990	
18½	55	57	46	8.625	8	6	150	219.1	473	1400	1450	1170	
14½	55	57	46	8.625	8	4	100	219.1	368	1400	1450	1170	

*Actual dimensions from reference 3.
**Suggested dimensions



NOTE: Dimensions shown are suggested piping dimensions and may vary depending upon actual dimensions of components being used.

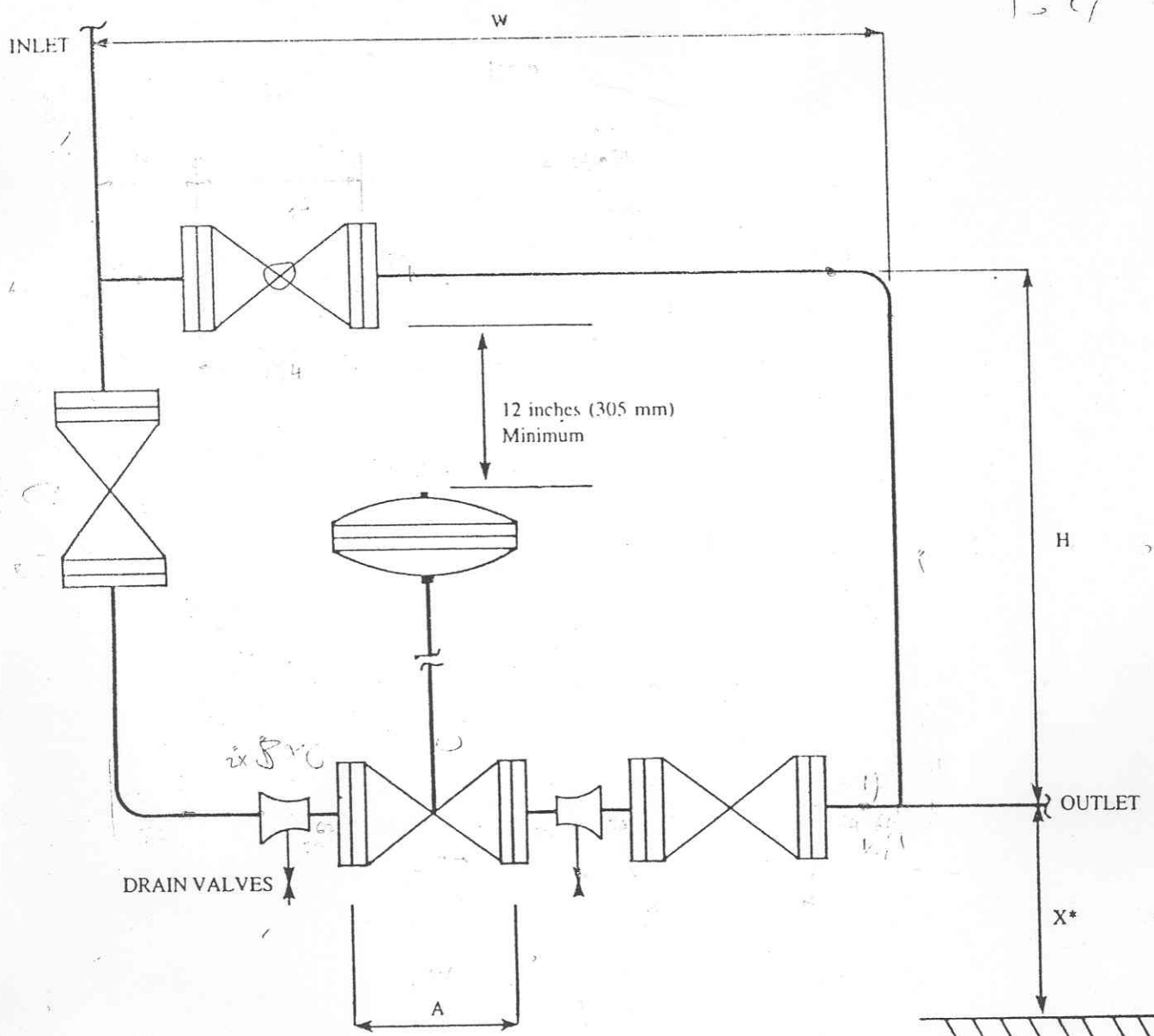
*If Plug removes in this direction

Figure 2. Type II Control Valve Manifold

TABLE 2
TYPE II CONTROL VALVE MANIFOLD DIMENSIONS FOR ANSI CLASS 300

INCHES							MILLIMETERS						
A*	W**	H**	X**	ACTUAL MANIFOLD PIPE OUTSIDE DIAMETER	NOMINAL SIZE		NOMINAL SIZE CONTROL VALVE	ACTUAL MANIFOLD PIPE OUTSIDE DIAMETER	A*	W**	H**	X**	
					MANI- FOLD PIPE	CONTROL VALVE							
7¾	44	25	37	1.315	1	1	25	33.4	197	1120	640	940	
9¼	44	25	37	1.900	1½	1½	40	48.3	235	1120	640	940	
7¾	44	25	37	1.900	1½	1	25	48.3	197	1120	640	940	
10½	44	25	37	2.375	2	2	50	60.3	267	1120	640	940	
9¼	44	25	37	2.375	2	1½	40	60.3	235	1120	640	940	
7¾	44	25	37	2.375	2	1	25	60.3	197	1120	640	940	
12½	48	29	39	3.500	3	3	80	88.9	317	1220	740	990	
10½	48	29	39	3.500	3	2	50	88.9	267	1220	740	990	
9¼	48	29	39	3.500	3	1½	40	88.9	235	1220	740	990	
14½	56	33	40	4.500	4	4	100	114.3	368	1430	840	1020	
12½	56	33	40	4.500	4	3	80	114.3	317	1430	840	1020	
10½	56	33	40	4.500	4	2	50	114.3	267	1430	840	1020	
14½	70	43	50	6.625	6	4	100	168.3	368	1780	1090	1270	
12½	70	43	50	6.625	6	3	80	168.3	317	1780	1090	1270	
18¾	78	50	52	8.625	8	6	150	219.1	473	1990	1270	1320	
14½	78	50	52	8.625	8	4	100	219.1	368	1990	1270	1320	

Actual dimensions from reference 3.
*Suggested dimensions



ELEVATION

NOTE: Dimensions shown are suggested piping dimensions and may vary depending upon actual dimensions of components being used.

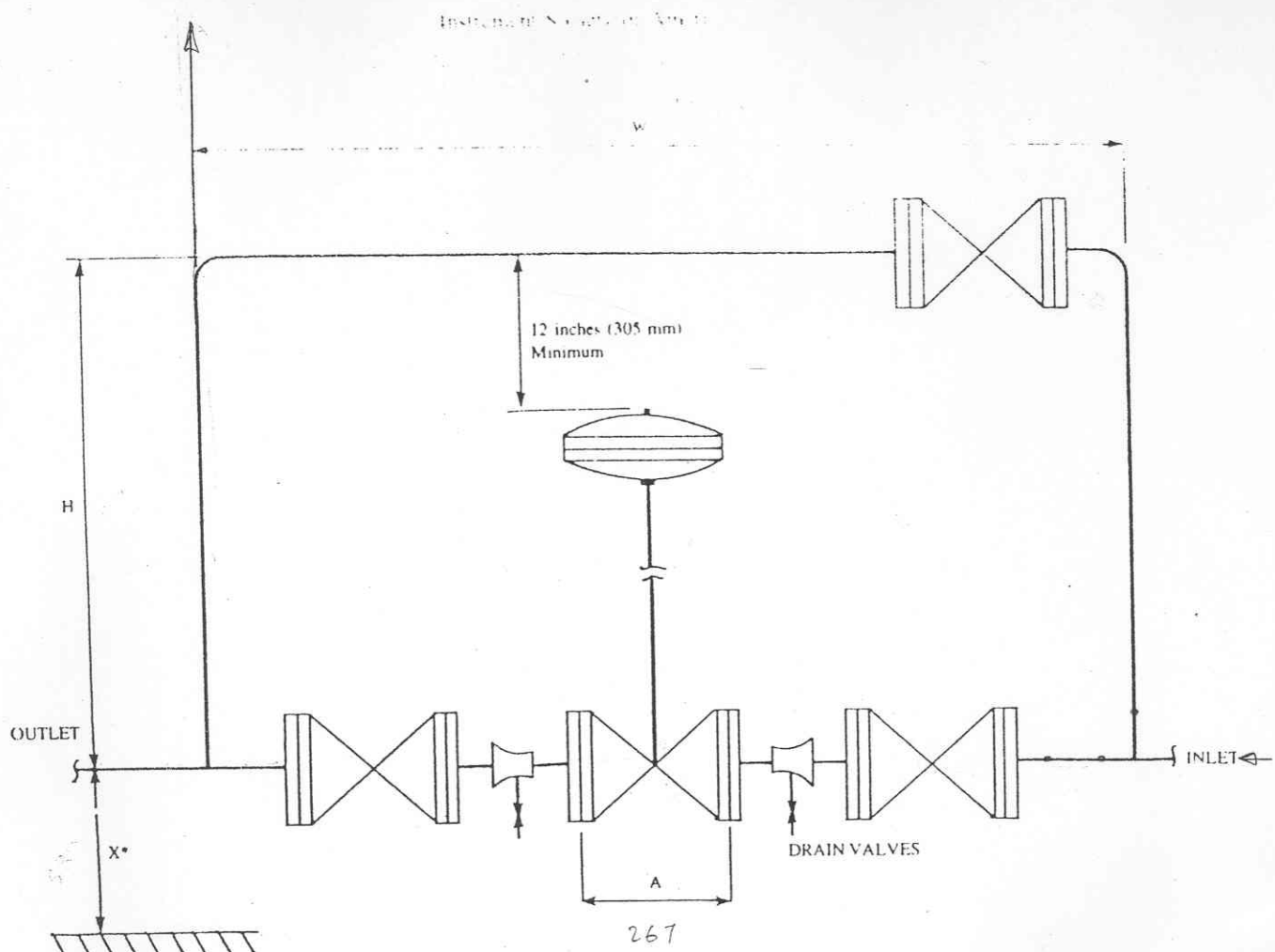
*If Plug removes in this direction

Figure 3. Type III Control Valve Manifold

TABLE 3
TYPE III CONTROL VALVE MANIFOLD DIMENSIONS FOR ANSI CLASS 300

INCHES							MILLIMETERS						
A*	W**	H**	X**	ACTUAL MANIFOLD PIPE OUTSIDE DIAMETER	NOMINAL SIZE		NOMINAL SIZE CONTROL VALVE	ACTUAL MANIFOLD PIPE OUTSIDE DIAMETER	A*	W**	H**	X**	
					MANI- FOLD PIPE	CONTROL VALVE							
7¼	44	39	23	1.315	1	1	25	33.4	197	1120	990	580	
9¼	44	39	23	1.900	1½	1½	40	48.3	235	1120	990	580	
7¼	44	39	23	1.900	1½	1	25	48.3	197	1120	990	580	
10½	44	39	23	2.375	2	2	50	60.3	267	1120	990	580	
9¼	44	39	23	2.375	2	1½	40	60.3	235	1120	990	580	
7¼	44	39	23	2.375	2	1	25	60.3	197	1120	990	580	
12½	48	42	27	3.500	3	3	80	88.9	317	1220	1070	690	
10½	48	42	27	3.500	3	2	50	88.9	267	1220	1070	690	
9¼	48	42	27	3.500	3	1½	40	88.9	235	1220	1070	690	
14½	56	43	30	4.500	4	4	100	114.3	368	1430	1090	760	
12½	56	43	30	4.500	4	3	80	114.3	317	1430	1090	760	
10½	56	43	30	4.500	4	2	50	114.3	267	1430	1090	760	
14½	70	54	39	6.625	6	4	100	168.3	368	1780	1370	990	
12½	70	54	39	6.625	6	3	80	168.3	317	1780	1370	990	
18¾	78	57	46	8.625	8	6	150	219.1	473	1990	1450	1170	
14½	78	57	46	8.625	8	4	100	219.1	368	1990	1450	1170	

*Actual dimensions from reference 3.
**Suggested dimensions



NOTE: Dimensions shown are suggested piping dimensions and may vary depending upon actual dimensions of components being used.

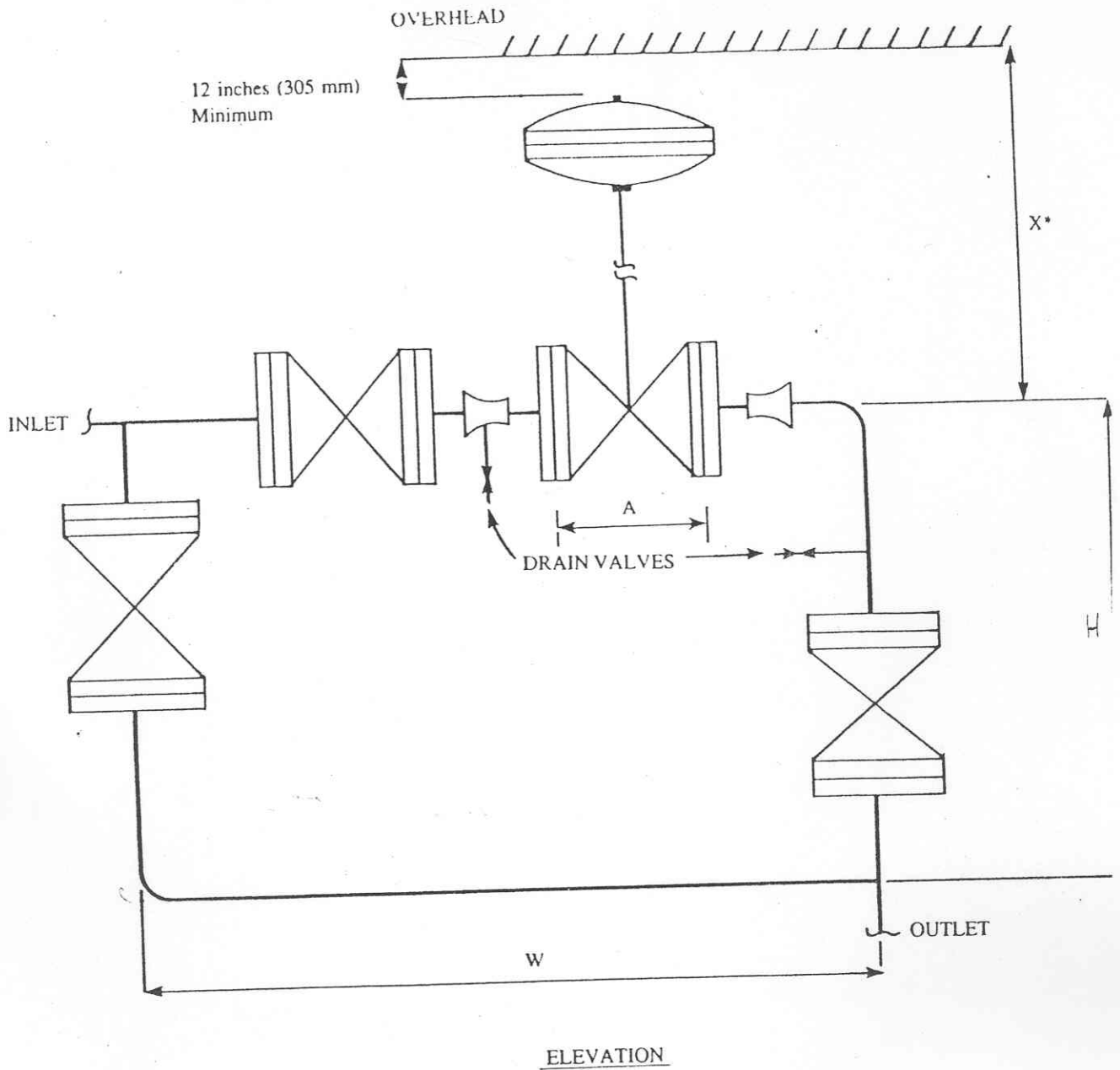
Figure 4. Type IV Control Valve Manifold

TABLE 4
TYPE IV CONTROL VALVE MANIFOLD DIMENSIONS FOR ANSI CLASS 300

INCHES							MILLIMETERS						
A*	W**	H**	X**	ACTUAL MANIFOLD PIPE OUTSIDE DIAMETER	NOMINAL SIZE		NOMINAL SIZE CONTROL VALVE	ACTUAL MANIFOLD PIPE OUTSIDE DIAMETER	A*	W**	H**	X**	
					MANI- FOLD PIPE	CONTROL VALVE							
7¼	58	39	23	1.315	1	1	25	33.4	197	1470	990	580	
9¼	58	39	23	1.900	1½	1½	40	48.3	235	1470	990	580	
7¼	58	39	23	1.900	1½	1	25	48.3	197	1470	990	580	
	58	39	23	2.375	2	2	50	60.3	267	1470	990	580	
9¼	58	39	23	2.375	2	1½	40	60.3	235	1470	990	580	
7¼	58	39	23	2.375	2	1	25	60.3	197	1470	990	580	
12½	67	42	27	3.500	3	3	80	88.9	317	1700	1070	690	
10½	67	42	27	3.500	3	2	50	88.9	267	1700	1070	690	
9¼	67	42	27	3.500	3	1½	40	88.9	235	1700	1070	690	
14½	74	43	30	4.500	4	4	100	114.3	368	1880	1090	760	
12½	74	43	30	4.500	4	3	80	114.3	317	1880	1090	760	
10½	74	43	30	4.500	4	2	50	114.3	267	1880	1090	760	
14½	97	54	39	6.625	6	4	100	168.3	368	2460	1370	990	
12½	97	54	39	6.625	6	3	80	168.3	317	2460	1370	990	
18¾	109	57	46	8.625	8	6	150	219.1	473	2770	1450	1170	
14½	109	57	46	8.625	8	4	100	219.1	368	2770	1450	1170	

*Actual dimensions from reference 3.

**Suggested dimensions



NOTE: Dimensions shown are suggested piping dimensions and may vary depending upon actual dimensions of components being used.

*If Plug removes in this direction

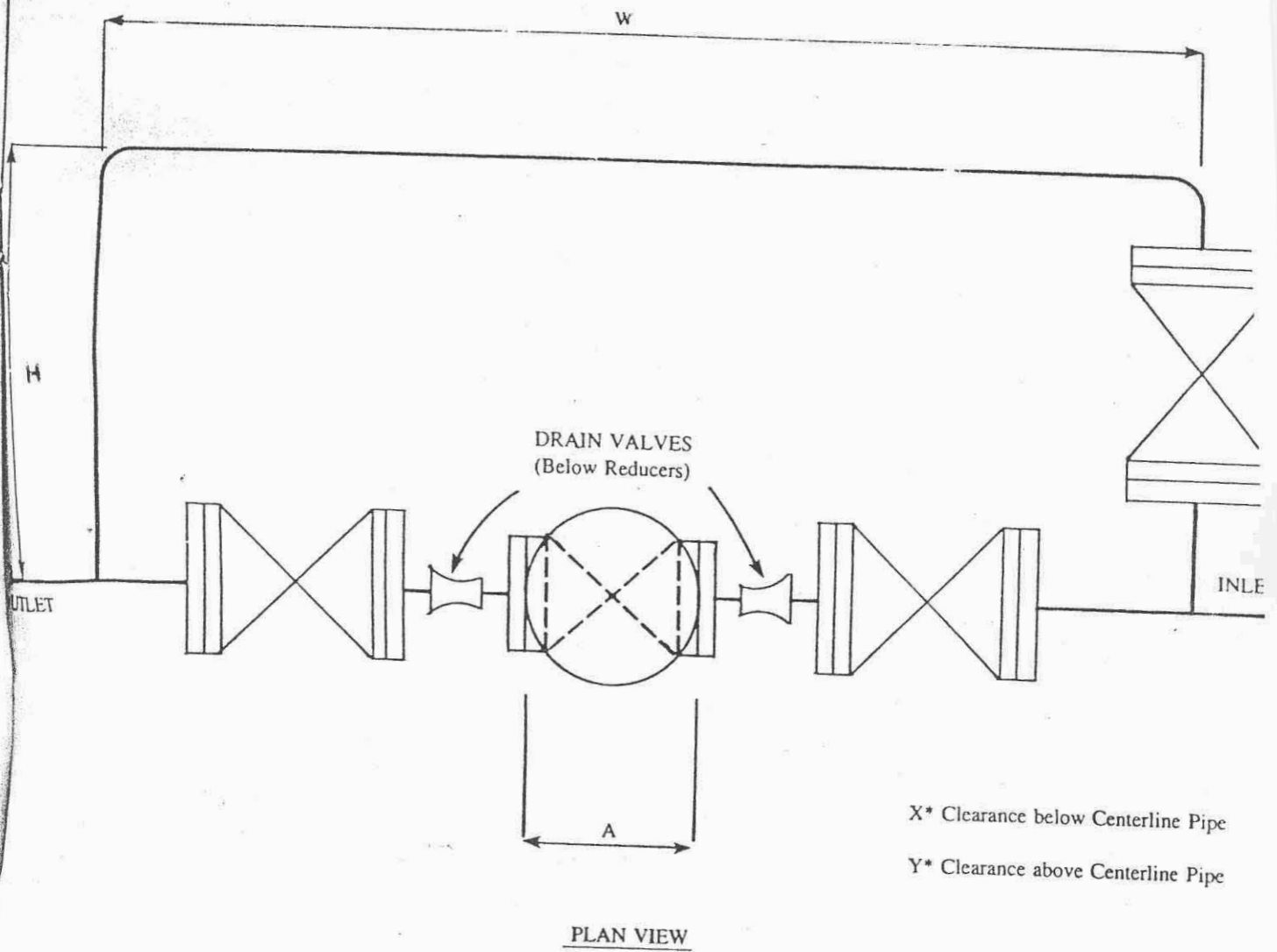
Figure 5. Type V Control Valve Manifold

TABLE 5
TYPE V CONTROL VALVE MANIFOLD DIMENSIONS FOR ANSI CLASS 300

INCHES							MILLIMETERS						
A*	W**	H**	X**	ACTUAL MANIFOLD PIPE OUTSIDE DIAMETER	NOMINAL SIZE		NOMINAL SIZE CONTROL VALVE	ACTUAL MANIFOLD PIPE OUTSIDE DIAMETER	A*	W**	H**	X**	
					MANI- FOLD PIPE	CONTROL VALVE							
7¾	44	36	37	1.315	1	1	25	33.4	197	1120	910	940	
9¼	44	36	37	1.900	1½	1½	40	48.3	235	1120	910	940	
7¾	44	36	37	1.900	1½	1	25	48.3	197	1120	910	940	
10½	44	36	37	2.375	2	2	50	60.3	267	1120	910	940	
9¼	44	36	37	2.375	2	1½	40	60.3	235	1120	910	940	
7¾	44	36	37	2.375	2	1	25	60.3	197	1120	910	940	
12½	48	39	39	3.500	3	3	80	88.9	317	1220	990	990	
10½	48	39	39	3.500	3	2	50	88.9	267	1220	990	990	
9¼	48	39	39	3.500	3	1½	40	88.9	235	1220	990	990	
14½	56	39	40	4.500	4	4	100	114.3	368	1430	990	1020	
12½	56	39	40	4.500	4	3	80	114.3	317	1430	990	1020	
10½	56	39	40	4.500	4	2	50	114.3	267	1430	990	1020	
14½	70	46	50	6.625	6	4	100	168.3	368	1780	1170	1270	
12½	70	46	50	6.625	6	3	80	168.3	317	1780	1170	1270	
18¾	78	50	52	8.625	8	6	150	219.1	473	1990	1270	1320	
14½	78	50	52	8.625	8	4	100	219.1	368	1990	1270	1320	

*Actual dimensions from reference 3.

**Suggested dimensions



NOTE: Dimensions shown are suggested piping dimensions and may vary depending upon actual dimensions of components being used.

*If Plug removes in this direction

Figure 6. Type VI Control Valve Manifold

C

TABLE 6
TYPE VI CONTROL VALVE MANIFOLD DIMENSIONS FOR ANSI CLASS 300

INCHES								MILLIMETERS						
A*	W**	H**	X**	Y**	ACTUAL MANIFOLD PIPE OUTSIDE DIAMETER	NOMINAL SIZE		NOMINAL SIZE CONTROL VALVE	ACTUAL MANIFOLD PIPE OUTSIDE DIAMETER	A*	W**	H**	X**	Y**
						MANI- FOLD PIPE	CONTROL VALVE							
7¾	58	21	23	37	1.315	1	1	25	33.4	197	1470	530	580	940
9¼	58	21	23	37	1.900	1½	1½	40	48.3	235	1470	530	580	940
7¾	58	21	23	37	1.900	1½	1	25	48.3	197	1470	530	580	940
10½	58	21	23	37	2.375	2	2	50	60.3	267	1470	530	580	940
9¼	58	21	23	37	2.375	2	1½	40	60.3	235	1470	530	580	940
7¾	58	21	23	37	2.375	2	1	25	60.3	197	1470	530	580	940
12½	67	26	27	39	3.500	3	3	80	88.9	317	1700	660	690	990
10½	67	26	27	39	3.500	3	2	50	88.9	267	1700	660	690	990
9¼	67	26	27	39	3.500	3	1½	40	88.9	235	1700	660	690	990
14½	74	29	30	40	4.500	4	4	100	114.3	368	1880	740	760	1020
12½	74	29	30	40	4.500	4	3	80	114.3	317	1880	740	760	1020
10½	74	29	30	40	4.500	4	2	50	114.3	267	1880	740	760	1020
14½	97	36	39	50	6.625	6	4	100	168.3	368	2460	910	990	1270
12½	97	36	39	50	6.625	6	3	80	168.3	317	2460	910	990	1270
18¾	109	41	46	52	8.625	8	6	150	219.1	473	2770	1040	1170	1320
14½	109	41	46	52	8.625	8	4	100	219.1	368	2770	1040	1170	1320

*Actual dimensions from reference 3.

**Suggested dimensions