

Table 11 Recommended Construction for Rectangular Medium Pressure Ducts

Dimension of Longest Side, Inches	Gage, Sheet Gage (All Four Sides)	Transverse Reinforcing*									
		Between Joints ^b		At Joints							
		Minimum Reinforcing Angle Size and Maximum Longitudinal Spacing		Inside Slip Joint	Double S Slip	Welded Flange	Standing Seam	Reinforced Standing Seam	Flanged Joint	Pocket Lock	Companion Angle Flanged Joint
		With Tie Rods	Without Tie Rods	Min. Angle Size	Min. Height, in.	Min. Height, in.	Min. Height, in.	Min. Angle Size	Min. Height, in.	Min. Height, in.	Min. Angle Size
Up thru 12	24	No tie rods required	No angle required	None required	1	1	1	None Req'd.	1	1	11X11X1
12-18	24	1 tie rod @ 48 in. intervals on center-line of duct side	1X1X18 Gage @ 48 in.	1X1X18 Gage	1	1	1	None Req'd.	1	1	11X11X1
18-24	22	1 tie rod @ 48 in. intervals on center-line of duct side	1X1X1 @ 48 in.	1X1X1	11	11	11	None Req'd.	11	11	11X11X1
24-30	22	1 tie rod @ 48 in. intervals on center-line of duct side	1X1X1 @ 32 in. or 1X1X1 @ 40 in.	1X1X1	11 with tie rod in center	11	11	None Req'd.	11	11	11X11X1
30-36	22	1 tie rod @ 48 in. intervals on center-line of duct side	1X1X1 @ 32 in. or 1X1X1 @ 40 in.	1X1X1	11 with tie rod in center	11	11	None Req'd.	11	11	11X11X1
36-42	22	1 tie rod @ 48 in. intervals on center-line of duct side	1X1X1 @ 32 in. or 1X1X1 @ 40 in.	1X1X1	11 with tie rod in center	11	11	None Req'd.	11	11	11X11X1
42-48	22	1 tie rod @ 48 in. intervals on center-line of duct side	1X1X1 @ 32 in. or 1X1X1 @ 40 in.	1X1X1	11 with tie rod in center	11	11	None Req'd.	11	11	11X11X1
48-60	20	1 tie rod @ 24 in. with tie rod in center	2X2X1 @ 24 in.	2X2X1	11 with tie rod in center	11 with tie rod in center	11	2X2X1	11 with tie rod in center	11	11X11X1
60-72	20	1 tie rod @ 24 in. with tie rod in center	2X2X1 @ 24 in.	2X2X1	11 with tie rod in center	11 with tie rod in center	11	2X2X1	11 with tie rod in center	11	11X11X1
72-84	18	1 tie rod @ 24 in. with tie rod in center	2X2X1 @ 24 in.	2X2X1	11 with tie rod in center	11 with tie rod in center	11	2X2X1	11 with tie rod in center	11	11X11X1
84-96	18	1 tie rod @ 24 in. with tie rod in center	2X2X1 @ 24 in.	2X2X1	11 with tie rod in center	11 with tie rod in center	11	2X2X1	11 with tie rod in center	11	11X11X1
96 and Over	18	1 tie rod @ 24 in. with tie rod in center	2X2X1 @ 24 in.	2X2X1	11 with tie rod in center	11 with tie rod in center	11	2X2X1	11 with tie rod in center	11	11X11X1

* — use next recommended construction.
 * Transverse reinforcing must be applied on all four sides and tied together at each corner by riveting, bolting or welding.
 * Transverse reinforcing size is determined by dimension of side to which angle is applied. Angle sizes are based on mild steel. Reinforcing made in other shapes or of other materials must be of equivalent strength and rigidity.
 * There is no restriction on the length of duct sections between joints. Ducts are normally made in sections of 4, 8, 10, or 12 ft in length. The longitudinal spacing of the transverse reinforcing between joints may necessarily be less than the spacings recommended in the table in order to conform to the selected length module.

The fan discharge connections shown in Fig. 16 are rated *good, fair, and poor*, in terms of efficiency.

Flexible connections are recommended on both the inlet and outlet to all fans. An inspection of the heater connections shown in Fig. 16 shows that uniform velocity through the heater cannot be expected in the diagram noted *poor*. When obstructions cannot be avoided, the duct area should never be decreased more than 10 percent. *Stream-lined* collars should be used around obstructions; however, round, tie

rods do not require special treatment. Larger obstructions require an increase in the duct size in order to minimize dynamic losses. In systems where the branch air quantities remain constant, the branch take-offs should be arranged to cut into the air stream in order to reduce the losses in velocity head. This type of take-off should definitely be avoided in dual-duct systems where branch flow rates vary considerably.

All materials and all fire and smoke controlling features of duct systems must satisfy the requirements of applicable local

Table 12 Recommended Construction for Rectangular High Pressure Ducts

Dimension of Longest Side, Inches	Gage, Sheet Gage (All Four Sides)	Transverse Reinforcing*									
		Between Joints ^b		At Joints							
		Minimum Reinforcing Angle Size and Maximum Longitudinal Spacing		Inside Slip Joint	Double S Slip	Welded Flange	Standing Seam	Reinforced Standing Seam	Flanged Joint	Companion Angle Flanged Joint	
		With Tie Rods	Without Tie Rods	Min. Angle Size	Min. Height, in.	Min. Height, in.	Min. Height, in.	Min. Angle Size	Min. Height, in.	Min. Height, in.	Min. Angle Size
Up thru 12	22	No tie rods required	No angle required	None required	1	1	1	None Req'd.	1	1	11X11X1
12-18	22	1 tie rod @ 40 in. intervals on center-line of duct side	1X1X16 Gage @ 40 in.	1X1X16 Gage	1	1	1	None Req'd.	1	1	11X11X1
18-24	22	1 tie rod @ 40 in. intervals on center-line of duct side	1X1X1 @ 40 in.	1X1X1	11	11	11	None Req'd.	11	11	11X11X1
24-30	22	1 tie rod @ 40 in. intervals on center-line of duct side	1X1X1 @ 32 in. or 1X1X1 @ 40 in.	1X1X1	11 with tie rod in center	11	11	None Req'd.	11	11	11X11X1
30-36	22	1 tie rod @ 40 in. intervals on center-line of duct side	1X1X1 @ 32 in. or 1X1X1 @ 40 in.	1X1X1	11 with tie rod in center	11	11	None Req'd.	11	11	11X11X1
36-42	22	1 tie rod @ 40 in. intervals on center-line of duct side	1X1X1 @ 32 in. or 1X1X1 @ 40 in.	1X1X1	11 with tie rod in center	11	11	None Req'd.	11	11	11X11X1
42-48	22	1 tie rod @ 40 in. intervals on center-line of duct side	1X1X1 @ 32 in. or 1X1X1 @ 40 in.	1X1X1	11 with tie rod in center	11	11	None Req'd.	11	11	11X11X1
48-60	20	1 tie rod @ 24 in. with tie rod in center	2X2X1 @ 24 in.	2X2X1	11 with tie rod in center	11 with tie rod in center	11	2X2X1	11 with tie rod in center	11	11X11X1
60-72	20	1 tie rod @ 24 in. with tie rod in center	2X2X1 @ 24 in.	2X2X1	11 with tie rod in center	11 with tie rod in center	11	2X2X1	11 with tie rod in center	11	11X11X1
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84-96	18	1 tie rod @ 24 in. with tie rod in center	2X2X1 @ 24 in.	2X2X1	11 with tie rod in center	11 with tie rod in center	11	2X2X1	11 with tie rod in center	11	11X11X1
96 and Over	18	1 tie rod @ 24 in. with tie rod in center	2X2X1 @ 24 in.	2X2X1	11 with tie rod in center	11 with tie rod in center	11	2X2X1	11 with tie rod in center	11	11X11X1

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 * There is no restriction on the length of duct sections between joints. Ducts are normally made in sections of 4, 8, 10, or 12 ft in length. The longitudinal spacing of the transverse reinforcing between joints may necessarily be less than the spacings recommended in the table in order to conform to the selected length module.

* — use next recommended construction.

regulations. Standard No. 90A of the National Fire Protection Association² gives recommendations for the installation of air-conditioning and ventilating systems of other than residence type. This and other NFPA standards are normally used as the basis for local building and fire regulations and for the guidance of fire insurance rating organizations.

HEAT LOSSES FROM DUCTS

In duct systems, the heat gains or losses of the ducts can be quite considerable, not only if the duct passes through unconditioned space, but also on long duct runs within conditioned space. Proper insulation will remedy this situation consider-

ably, but sometimes a redistribution of the supply air is necessary in order to compensate for the heat exchanges that occur. The heat loss from a given length of duct can be expressed by:

$$Q_u = UPI \left[\left(\frac{t_1 + t_2}{2} \right) - t_a \right] \quad (17)$$

where

Q_u = heat loss through duct walls, Btu per hour.
 U = overall coefficient of heat transfer for the duct wall, Btu per (hour) (square foot) (Fahrenheit degree).