

# **HVAC DUCT CONSTRUCTION STANDARDS METAL AND FLEXIBLE**

THIRD EDITION – 2005



**SHEET METAL AND AIR CONDITIONING CONTRACTORS'  
NATIONAL ASSOCIATION, INC.**

4201 Lafayette Center Drive  
Chantilly, VA 20151-1209  
[www.smacna.org](http://www.smacna.org)

½ in. wg Static Pos. or Neg.	No Reinforcement Required	Reinforcement Code for Duct Gage Number							
		Reinforcement Spacing Options							
10 ft		8 ft	6 ft	5 ft	4 ft	3 ft	2½ ft	2 ft	
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩
10 in. and under	26 ga.	<b>Not Required</b>							
11 – 12 in.	26 ga.								
13 – 14 in.	26 ga.								
15 – 16 in.	26 ga.								
17 – 18 in.	26 ga.								
19 – 20 in.	24 ga.	B-26	B-26	B-26	B-26	B-26	B-26	A-26	A-26
21 – 22 in.	22 ga.	B-26	B-26	B-26	B-26	B-26	B-26	B-26	A-26
23 – 24 in.	22 ga.	C-26	C-26	C-26	B-26	B-26	B-26	B-26	B-26
25 – 26 in.	20 ga.	C-26	C-26	C-26	C-26	B-26	B-26	B-26	B-26
27 – 28 in.	18 ga.	C-24	C-26	C-26	C-26	C-26	B-26	B-26	B-26
29 – 30 in.	18 ga.	C-24	C-26	C-26	C-26	C-26	B-26	B-26	B-26
31 – 36 in.	18 ga.	D-22	D-24	C-26	C-26	C-26	C-26	C-26	B-26
37 – 42 in.	16 ga.	E-20	E-24	D-24	D-26	C-26	C-26	C-26	C-26
43 – 48 in.	16 ga.	E-20	E-22	E-24	E-26	D-26	D-26	C-26	C-26
49 – 54 in.	<b>Not Designed</b>	F-18	F-20	E-22	E-26	E-26	E-26	D-26	C-26
55 – 60 in.		G-18	F-20	F-22	E-24	E-24	E-26	E-26	D-26
61 – 72 in.		H-16	H-18	F-20	F-22	F-24	E-24	E-24	E-24
73 – 84 in.		I-16G	H-18G	H-22G	G-24	F-24	F-24	F-24	
85 – 96 in.		I-16G	I-18G	H-20G	H-22G	G-22	F-22	F-22	
97 – 108 in.		I-16G	I-18G	I-18G	H-18G	H-18G	G-18	G-18	
109 – 120 in.		I-16G	I-16G	I-18G	H-18G	H-18G	H-18G		

**Table 2–1 Rectangular Duct Reinforcement**



2 in. wg Static Pos. or Neg.	No Reinforcement Required	Reinforcement Code for Duct Gage Number							
		Reinforcement Spacing Options							
		10 ft	8 ft	6 ft	5 ft	4 ft	3 ft	2½ ft	2 ft
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩
10 in. and under	26 ga.	<b>Not Required</b>							
11 – 12 in.	26 ga.								
13 – 14 in.	24 ga.		B-26	B-26	B-26	B-26	B-26	B-26	B-26
15 – 16 in.	24 ga.		C-26	C-26	C-26	C-26	C-26	B-26	B-26
17 – 18 in.	22 ga.		C-26	C-26	C-26	C-26	C-26	C-26	B-26
19 – 20 in.	20 ga.	C-22	C-24	C-26	C-26	C-26	C-26	C-26	C-26
21 – 22 in.	18 ga.	D-22	D-24	D-26	D-26	C-26	C-26	C-26	C-26
23 – 24 in.	18 ga.	E-22	E-24	D-26	D-26	D-26	C-26	C-26	C-26
25 – 26 in.	18 ga.	E-22	E-22	E-24	D-26	D-26	C-26	C-26	C-26
27 – 28 in.	18 ga.	F-20	E-20	E-22	E-24	D-26	D-26	C-26	C-26
29 – 30 in.	18 ga.	F-20	F-20	E-22	E-24	E-26	D-26	D-26	C-26
31 – 36 in.	16 ga.	G-18	G-20	F-22	F-24	E-24	E-26	D-26	D-26
37 – 42 in.	<b>Not Designed</b>	H-16	H-18	G-20	G-22	F-24	E-24	E-26	E-26
43 – 48 in.			I-18	H-20	H-22	G-22	F-24	F-24	E-24
49 – 54 in.		I-16G	I-18G	H-20G	H-20G	G-24	F-24	F-24	
55 – 60 in.			I-18G	I-20G	H-20G	G-22	G-24	F-24	
61 – 72 in.			J-16H	J-18H	I-20G	H-22G	H-22G	H-24	
73 – 84 in.				J-16H	I-20G	I-20G	I-22G	I-22G	
85 – 96 in.						J-18H	I-18H	I-20H	I-22H
97 – 108 in.						K-16I	K-18H	J-18H	I-18H
109 – 120 in.							K-16I	K-18I	J-18I

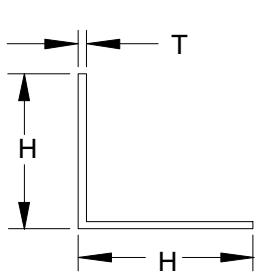
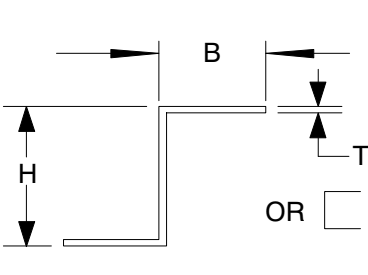
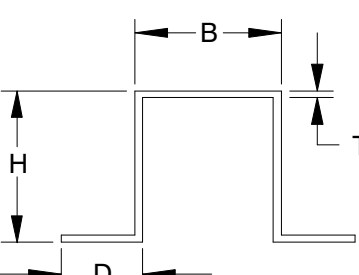
**Table 2-3 Rectangular Duct Reinforcement**



4 in. wg Static Pos. or Neg.	No Reinforcement Required	Reinforcement Code for Duct Gage Number							
		Reinforcement Spacing Options							
		10 ft	8 ft	6 ft	5 ft	4 ft	3 ft	2½ ft	2 ft
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩
8 in. and under	24 ga.	<b>Not Required</b>		B-26	B-26	B-26	B-26	B-26	B-26
9 – 10 in.	22 ga.			B-24	B-26	B-26	B-26	B-26	B-26
11 – 12 in.	22 ga.		B-24	C-24	C-26	C-26	C-26	B-26	B-26
13 – 14 in.	20 ga.		C-22	C-22	C-24	C-26	C-26	C-26	C-26
15 – 16 in.	20 ga.		D-22	D-22	C-24	C-26	C-26	C-26	C-26
17 – 18 in.	18 ga.		D-22	D-22	D-24	D-26	C-26	C-26	C-26
19 – 20 in.	18 ga.		E-20	E-22	E-24	D-24	D-26	C-26	C-26
21 – 22 in.	18 ga.		E-20	E-20	E-24	E-24	D-26	D-26	C-26
23 – 24 in.	18 ga.		F-20	F-20	E-22	E-24	E-26	D-26	D-26
25 – 26 in.	16 ga.	G-18	G-18	F-20	F-22	E-24	E-26	E-26	D-26
27 – 28 in.	16 ga.	H-18G	G-18	G-20	F-22	F-24	E-26	E-26	D-26
29 – 30 in.	16 ga.	H-18G	H-18G	G-18	G-22	F-24	E-26	E-26	E-26
31 – 36 in.	<b>Not Designed</b>	J-16H	I-16G	H-18G	H-20	G-22	F-24	F-26	E-26
37 – 42 in.			J-16H	I-16G	I-18G	H-20G	G-22	G-24	F-26
43 – 48 in.				J-16H	I-18G	I-18G	H-22G	H-24G	G-24
49 – 54 in.				J-16H	I-18H	I-18G	I-20G	H-22G	H-24G
55 – 60 in.					J-16I	I-18H	I-20G	I-22G	H-24G
61 – 72 in.						K-16H	J-18H	I-20H	I-22G
73 – 84 in.							K-16I	J-18I	I-20H
85 – 96 in.							L-16I	K-18I	J-20I
97 – 108 in.							L-16I	L-18I	L-18I
109 – 120 in.							L-16I	L-18J	L-18J

**Table 2-5 Rectangular Duct Reinforcement**



							
Reinf. Class		Angle		Channel or Zee		Hat Section	
	E1*	H x T (MIN)	WT LF	H x B x T (MIN)	WT LF	H x B x D x T (MIN)	WT LF
A	0.43	Use C		Use B		Use F	
B	1.0	Use C		$\frac{3}{4} \times \frac{1}{2} \times 20$ ga	0.24	Use F	
C	1.9	C $1 \times 16$ ga C $\frac{3}{4} \times \frac{1}{8}$	0.40 0.57	$\frac{3}{4} \times \frac{1}{2} \times 18$ ga $1 \times \frac{3}{4} \times 20$ ga	0.31	Use F	
D	2.7	H $\frac{3}{4} \times \frac{1}{8}$ C $1 \times \frac{1}{8}$	0.57 0.80	$1 \times \frac{3}{4} \times 18$ ga	0.45	Use F	
E	6.5	C $1 \frac{1}{4} \times 12$ ga H $1 \times \frac{1}{8}$	0.90	$2 \times 1 \frac{1}{8} \times 20$ ga	0.60	Use F	
F	12.8	H $1 \frac{1}{4} \times \frac{1}{8}$	1.02	$1 \frac{1}{2} \times \frac{3}{4} \times 18$ ga	0.54	$1 \frac{1}{2} \times \frac{3}{4} \times \frac{5}{8} \times 18$ ga $1 \frac{1}{2} \times 1 \frac{1}{2} \times \frac{3}{4} \times 20$ ga	0.90 0.83
G	15.8	$1 \frac{1}{2} \times \frac{1}{8}$	1.23	$1 \frac{1}{2} \times \frac{3}{4} \times 16$ ga	0.66	$1 \frac{1}{2} \times \frac{3}{4} \times \frac{5}{8} \times 18$ ga	0.80
H	26.4	$1 \frac{1}{2} \times \frac{3}{16}$ $2 \times \frac{1}{8}$	1.78 1.65	$1 \frac{1}{2} \times \frac{3}{4} \times \frac{1}{8}$	1.31	$1 \frac{1}{2} \times 1 \frac{1}{2} \times \frac{3}{4} \times 18$ ga $2 \times 1 \times \frac{3}{4} \times 20$ ga	1.08 0.90
I	69	C $2 \times \frac{3}{16}$ $2 \frac{1}{2} \times \frac{1}{8}$	2.44 2.10	$2 \times 1 \frac{1}{8} \times 12$ ga $3 \times 1 \frac{1}{8} \times 16$ ga	1.60 1.05	$2 \times 1 \times \frac{3}{4} \times 16$ ga	1.44
J	80	H $2 \times \frac{3}{16}$ C $2 \times \frac{1}{4}$ $2 \frac{1}{2} \times \frac{1}{8}$ (+)	2.44 3.20 2.10	$2 \times 1 \frac{1}{8} \times \frac{1}{8}$	1.85	$2 \times 1 \times \frac{3}{4} \times 12$ ga $2 \frac{1}{2} \times 2 \times \frac{3}{4} \times 18$ ga	2.45 1.53
K	103	$2 \frac{1}{2} \times \frac{3}{16}$	3.10	$3 \times 1 \frac{1}{8} \times 12$ ga	2.00	$2 \frac{1}{2} \times 2 \times \frac{3}{4} \times 16$ ga $3 \times 1 \frac{1}{2} \times \frac{3}{4} \times 16$ ga	1.88 2.00
L	207	H $2 \frac{1}{2} \times \frac{1}{4}$	4.10	$3 \times 1 \frac{1}{8} \times \frac{1}{8}$	2.29	$2 \frac{1}{2} \times 2 \times \frac{3}{4} \times \frac{1}{8}$ $3 \times 1 \frac{1}{2} \times \frac{3}{4} \times 12$ ga	3.70 3.40

**Table 2-29 Intermediate Reinforcement**

See Section 2.1.4. \*Effective EI is number listed times  $10^5$  before adjustment for bending moment capacity. C and H denote cold formed and hot rolled ratings; when neither is listed, either may be used. See tie rod options elsewhere.

**NOTES:**

- (+) indicates positive pressure use only.
- Hat Section Dimension "B" may be equal to 2 times Dimension "H" with the same reinforcement class rating.

Reinf. Class	T-22 Companion Angles		T-24 Flanged		T-24a Flanged		T-25a Flanged		T-25b Flanged		Slip-On Flange	
	EI*	H × T	WT LF	T (Nom.)	WT LF	H × T (Nom.)	WT LF	H × T (Nom.)	WT LF			
B	1.0	Use E		Use D		Use D		Use D			Consult manufacturers for ratings established by performance documented to functional criteria in Chapter 11. See text S1.18 on page 2.4.	
C	1.9	Use E		Use D		Use D		Use D				
D	2.7	Use E		26 ga	0.5	1 × 22 ga	0.4	26 ga	0.5			
E	6.5	C 1 × 1/8	1.7	24 ga	0.6	Use F		24 ga	0.6			
F	12.8	H 1 × 1/8	1.7	22 ga	0.7	1/2 × 20 ga	0.6	22 ga	0.7			
G	15.8	1/4 × 1/8	2.1	22 ga (R) 20 G	1.0	1/2 × 18 ga	0.8	22 ga (R) 20 ga	1.0			
H	26.4	C 1/2 × 1/8 (+) H 1/2 × 1/8	2.6	18 ga	1.1	<b>SEE TIE ROD TEXT</b>		18 ga	1.1			
I	69	1/2 × 1/4	3.7	20 ga (R)	1.0				20 ga (R)	1.0		
J	80	1/2 × 1/4 (+) 2 × 1/8	4.7	18 ga (R)	1.1				18 ga (R)	1.1		
K	103	2 × 3/16	5	18 ga (R)	1.1				18 ga (R)	1.1		
L	207	H 2 × 1/4	6.5	18 ga (R)	1.1				18 ga (R)	1.1		

**Table 2-32 Transverse Joint Reinforcement**

See Section 2.1.4. \*Effective EI is number listed times 10<sup>5</sup> before adjustment for bending moment capacity. For T-22, see tie rod downsize options in Tables 2-1 to 2-7; one rod for two angles. (R) means Tie Rodded. Accepted Pressure Mode for T-24a is (+) or (-) 2 in. wg maximum. See Figures 2-5 and 2-6 and tie rod text. (+) indicates positive pressure use only.

Duct Wall	26 ga		24 ga		22 ga		20 ga or Heavier	
Static Pressure	Maximum Duct Width (W) and Maximum Reinforcement Spacing (RS)							
	W	RS	W	RS	W	RS	W	RS
½ in. wg	20 in. 18 in.	10 ft N.R.	20 in.	N.R.	20 in.	N.R.	20 in.	N.R.
1 in. wg	20 in. 14 in. 12 in.	8 ft 10 ft N.R.	20 in. 14 in.	8 ft N.R.	20 in. 18 in.	10 ft N.R.	20 in.	N.R.
2 in. wg	18 in.	5 ft	18 in. 12 in.	8 ft N.R.	18 in. 14 in.	10 ft N.R.	18 in.	N.R.
3 in. wg	12 in. 10 in.	5 ft 6 ft	18 in. 10 in.	5 ft N.R.	18 in. 12 in.	5 ft N.R.	18 in. 14 in.	6 ft N.R.
4 in. wg	Not Accepted		16 in. 8 in.	5 ft N.R.	12 in. 8 in.	6 ft N.R.	12 in.	N.R.

**Table 2–48 T–1 Flat Drive Accepted as Reinforcement**

Although the flat drive slip T-1 does not satisfy the EI calculation requirements for Classes A, B or C reinforcement, tests predict its suitability for use as reinforcement within the limits of the table.

N.R. – No reinforcement is required; however, the T-1 Joint may be used.

Duct Wall	0.55 mm		0.70 mm		0.80 mm		1.00 mm or Heavier	
Static Pressure (Pa)	Maximum Duct Width (W) and Maximum Reinforcement Spacing (RS)							
	W (mm)	RS (mm)	W (mm)	RS (mm)	W (mm)	RS (mm)	W (mm)	RS (mm)
125	508 457	3 N.R.	508	N.R.	508	N.R.	508	N.R.
250	508 356 305	2.4 3 N.R.	508 356	2.4 N.R.	508 457	3 N.R.	508	N.R.
500	457	1.5	457 305	2.4 N.R.	457 356	3 N.R.	457	N.R.
750	305 254	1.5 1.8	457 254	1.5 N.R.	457 305	1.5 N.R.	457 356	1.8 N.R.
1000	Not Accepted		406 203	1.5 N.R.	305 254	1.8 N.R.	305	N.R.

**Table 2–48M T–1 Flat Drive Accepted as Reinforcement**

Although the flat drive slip T-1 does not satisfy the EI calculation requirements for Classes A, B or C reinforcement, tests predict its suitability for use as reinforcement within the limits of the table.

N.R. – No reinforcement is required; however, the T-1 Joint may be used.