



Technical Resources Bulletin

To: SMACNA Members
SMACNA Chapter Executives

From: Technical Resources Department

Subject: **SMACNA Grease Duct Construction Reinforcement Standards**

Attached please find the *SMACNA Grease Duct Construction Reinforcement Standards, First Edition, 2022*.



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GREASE DUCT CONSTRUCTION REINFORCEMENT STANDARDS

FIRST EDITION – 2022



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

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FOREWORD

This First Edition of the SMACNA grease duct construction reinforcement standards was written as an aide to designers of grease duct to easily choose stiffeners as reinforcement.

SMACNA expresses appreciation to the many who have offered suggestions for this manual. Suggestions for future improvement are welcome. Special thanks is given to those who volunteered their time, gave special knowledge and struggled with development of this manual that reflects the needs for a diversified industry. Although standardization intrinsically involves selection, no intention of discrimination against the use of any product or method that would serve a designer's need equally or better exists.

SHEET METAL AND AIR CONDITIONING CONTRACTORS'
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Purpose of This Manual

Rectangular grease duct is commonly constructed of 16 ga carbon steel (including hot rolled steel, cold rolled steel, galvanized steel and aluminized steel.) Typical ranges of static pressure class required are 2.5 in. wg to 10 in wg. positive or negative static pressure. 11 in. wg is also included for 0 – 12 inch widths. At the request of its members, SMACNA saw a need to create gage/reinforcement tables to make the selection process of grease ducts for reinforcement less tedious. This manual has gage/reinforcements requirements for grease duct for operating temperatures up to 500°F (galvanized steel is not recommended over 400°F) and maximum static pressures capacity of 2.5 in. wg, 3 in. wg, 4 in. wg, 6 in. wg, 8 in. wg and 10 in. wg., positive and negative pressures. The tables include an allowance of 5.2 lbs/ft² (which is equivalent to 1.0 in. wg) for duct wrap and other loads.

Gage/Reinforcements for grease duct can also be determined from other SMACNA manuals including the Rectangular Industrial Duct Construction Standards, I-P Second Edition – August, 2004.

Reinforcements

Table 1 gives the maximum static pressure capacity of 16 gage grease duct for operating temperatures up to 500°F (400°F for galvanized steel). The maximum static pressure capacity is given for widths up to 96 inches and reinforcement spacing requirements of “use unreinforced”, 2 ft, 2.5 ft, 3 ft, 4 ft, 5 ft and 6 ft reinforcement spacings.

Tables 2 through 7 list the type of reinforcement and spacing for each of the maximum static pressure classes 2.5 in. wg, 3 in. wg, 4 in. wg, 6 in. wg, 8 in. wg and 10 in wg. The reinforcement types are defined in Table 8.



Duct Dimension	Reinforcement Spacing Options (ft.)						
	Unreinforced	2	2.5	3	4	5	6
0 - 12 in.	11	Use Unreinforced					
13 - 18 in.	4	10	8	6	Use Unreinforced		
19 - 24 in.	1	10	8	6	4	3	2.5
25 - 30 in.		10	8	6	4	3	2.5
31 - 36 in.		10	8	6	4	3	2.5
37 - 42 in.		10	8	6	4	3	2.5
43 - 48 in.		10	8	6	4	3	2.5
49 - 54 in.		10	8	6	4	3	2.5
55 - 60 in.		10	8	6	4	3	2.5
61 - 66 in.		10	8	6	4	3	2.5
67 - 72 in.		10	8	6	4	3	2.5
73 - 78 in.		10	8	6	4	3	2.5
79 - 84 in.		10	8	6	4	3	2.5
85 - 90 in.		10	8	6	4	3	2.5
91 - 96 in.		10	8	6	4	3	2.5

Table 1. Maximum Static Pressure Capacity, in. wg, for Carbon Steel Grease Ducts for Operating Temperatures to 500°F (400°F For Galvanized Duct)

Notes:

1. Maximum static pressure capacities include an allowance of 5.2 lbs/ft² to account for the weight of duct wrap and other loading.
2. Each side can be independently reinforced. It is NOT required to wrap angle on all four sides or for reinforcements to coincide
3. Table 1 is for carbon steel (including hot rolled steel, cold rolled steel, galvanized to 400°F and aluminized steel)
4. Pressure capacities are for positive and negative grease duct

Example 1: 16 gage carbon steel duct, 12 in. x 12 in., 10 in. wg

Solution: Use **Table 1. Maximum Static Pressure Capacity, in. wg, for Carbon Steel Grease Ducts for Operating Temperatures to 500°F (400°F For Galvanized Duct)**. Maximum Pressure capacity, in. wg, for Carbon Steel Grease Ducts for Operating Temperatures to 500°F (400°F For Galvanized Duct). This size can be used up to 11 in. wg without any reinforcement.

Example 2: 16 gage carbon steel duct, 48 in. x 12 in., - 4 in. wg

Solution: From **Table 1. Maximum Static Pressure Capacity, in. wg, for Carbon Steel Grease Ducts for Operating Temperatures to 500°F (400°F For Galvanized Duct)**, the 12 in. side can be used up to 11 in. wg without any reinforcement Also from Table 1., 16 gage duct, 48 inches wide can be used up to 4 in. w.g. with reinforcements at 4 ft. max spacing. From **Table 4. Reinforcement Code for 16 gage carbon steel with a 4 in. wg Maximum Static Pressure Capacity**, there are two solutions that should be considered for the 48 in. side; either an R4 stiffener at 4 ft spacing or an R3 stiffener at 3 ft spacing.



A R3 stiffener at 2.5 ft or 2 ft could also be used but since the R3 stiffener at 3 ft spacing meets the reinforcement requirement, it would generally be selected or more stiffeners than necessary would be used. Once the reinforcement type is selected for the stiffener, **Table 8. Stiffener Data for Structural GR CS-36ksi** is used to get the stiffener dimension and other data. There are several options for both the type R3 stiffener and for the type R4 stiffener. For the R3 stiffener, an 1 ½ x 1 ½ x ¼ inch angle is selected and would need to be fastened to the grease duct every 3 ft. An alternative would be for the R4 stiffener of a 2 x 2 x 3/16 inch angle fastened to the grease duct every 4 ft.

Example 3: 16 gage carbon steel duct, 48 in. x 48 in., - 6 in. wg

Solution: From **Table 1. Maximum Static Pressure Capacity, in. wg, for Carbon Steel Grease Ducts for Operating Temperatures to 500°F (400°F For Galvanized Duct)**, 16 gage duct, each 48 inches wide can be used up to 6 in. wg. with reinforcements at 3 ft. max spacing so reinforcements are required on all four sides. From **Table 5. Reinforcement Code for 16 gage carbon steel with a 6 in. wg Maximum Static Pressure Capacity** there are two solutions that should be considered for the 48 in. sides; either an R4 stiffener at 3 ft spacing or an R3 stiffener at 2 ft spacing.

Once the reinforcement type is selected for the stiffener, **Table 8. Stiffener Data for Structural GR CS- 36ksi** is used to get the stiffener dimension and other data. There are several options for both the type R3 stiffener and for the type R4 stiffener. For the R3, an 1 ½ x 1 ½ x ¼ inch angle is selected and would need to be fastened to the grease duct every 2 ft. An alternative for the R4 would be a 2 x 2 x 3/16 inch angle fastened to the grease duct every 3 ft.

Reinforcement Code for 16 Gage Carbon Steel Maximum Static Pressure Capacity Tables

Tables 2 through Table 7 are organized by maximum static pressure capacity and provide the type of reinforcement stiffener required for 16 ga carbon steel based on static pressure and spacing. Table 8 provides the stiffener data.

Attaching Reinforcement Stiffeners

Figure 2 through 4 shows how the reinforcement stiffeners should be attached. Use 2-inch welds with 8-inch spacing on alternating heel – toe.

Flange Joints

See Figure 5 for flanged joints with a maximum height (H) of ½ inch and an alternative to make welding easier.



2.5 in. wg Static Pos. or Neg.	Reinforcement Code for 16 gage carbon steel						
Duct Dimension	Reinforcement Spacing						
	Unreinforced	6 ft	5 ft	4 ft	3 ft	2.5 ft	2 ft
0 - 12 in.	OK	Use Unreinforced					
13 - 18 in.	OK	Use Unreinforced					
19 - 24 in.	Not Designed	R1	R1	R1	R1	R1	R1
25 - 30 in.		R2	R2	R2	R1	R1	R1
31 - 36 in.		R3	R3	R2	R2	R2	R2
37 - 42 in.		R3	R3	R3	R2	R2	R2
43 - 48 in.		R4	R4	R3	R3	R3	R2
49 - 54 in.		R4	R4	R4	R3	R3	R3
55 - 60 in.		R5	R5	R4	R4	R4	R3
61 - 66 in.		R6	R5	R5	R4	R4	R4
67 - 72 in.		R6	R6	R5	R5	R4	R4
73 - 78 in.		R7	R6	R6	R5	R5	R4
79 - 84 in.		R7	R7	R6	R6	R5	R5
85 - 90 in.		R8	R7	R7	R6	R6	R5
91 - 96 in.	R8	R8	R7	R6	R6	R6	

Table 2. Reinforcement Code for 16 Gage Carbon Steel with a 2.5 in. wg Maximum Static Pressure Capacity

Notes:

1. *Maximum static pressure capacities include an allowance of 5.2 lbs/ft² to account for the weight of duct wrap and other loading.*
2. *Each side can be independently reinforced. It is NOT required to wrap angle on all four sides or for reinforcements to coincide*
3. *Table 2 is for carbon steel (including hot rolled steel, cold rolled steel, galvanized to 400°F and aluminized steel.)*
4. *See Table 8 for Stiffener Data.*



3 in. wg Static Pos. or Neg.	Reinforcement Code for 16 gage carbon steel						
	Duct Dimension	Reinforcement Spacing					
		Unreinforced	6 ft	5 ft	4 ft	3 ft	2.5 ft
0 - 12 in.	OK	Use Unreinforced					
13 - 18 in.	OK	Use Unreinforced					
19 - 24 in.	Not Designed		R1	R1	R1	R1	R1
25 - 30 in.		R2	R2	R2	R1	R1	
31 - 36 in.		R3	R2	R2	R2	R2	
37 - 42 in.		R3	R3	R3	R2	R2	
43 - 48 in.		R4	R3	R3	R3	R3	
49 - 54 in.		R4	R4	R4	R3	R3	
55 - 60 in.		R5	R4	R4	R4	R3	
61 - 66 in.		R6	R5	R4	R4	R4	
67 - 72 in.		R6	R6	R5	R5	R4	
73 - 78 in.		R7	R6	R6	R5	R5	
79 - 84 in.		R7	R6	R6	R6	R5	
85 - 90 in.		R8	R7	R6	R6	R6	
91 - 96 in.		R8	R8	R7	R6	R6	

Table 3. Reinforcement Code for 16 Gage Carbon Steel with a 3 in. wg Maximum Static Pressure Capacity

Notes:

1. Maximum static pressure capacities include an allowance of 5.2 lbs/ft² to account for the weight of duct wrap and other loading.
2. Each side can be independently reinforced. It is NOT required to wrap angle on all four sides or for reinforcements to coincide
3. Table 3 is for carbon steel (including hot rolled steel, cold rolled steel, galvanized to 400°F and aluminized steel.)
4. See Table 8 for Stiffener Data.



4 in. wg Static Pos. or Neg.	Reinforcement Code for 16 gage carbon steel						
Duct Dimension	Reinforcement Spacing						
	Unreinforced	6 ft	5 ft	4 ft	3 ft	2.5 ft	2 ft
0 - 12 in.	OK	Use Unreinforced					
13 - 18 in.	OK	Use Unreinforced					
19 - 24 in.	Not Designed		R1	R1	R1	R1	R1
25 - 30 in.			R2	R2	R2	R2	R1
31 - 36 in.			R3	R2	R2	R2	R2
37 - 42 in.			R3	R3	R3	R3	R2
43 - 48 in.			R4	R3	R3	R3	R3
49 - 54 in.			R4	R4	R4	R4	R3
55 - 60 in.			R5	R4	R4	R4	R4
61 - 66 in.			R6	R5	R4	R4	R4
67 - 72 in.			R6	R5	R5	R5	R5
73 - 78 in.			R7	R6	R6	R6	R5
79 - 84 in.			R7	R6	R6	R6	R6
85 - 90 in.			R8	R7	R6	R6	R6
91 - 96 in.			R8	R7	R7	R7	R6

Table 4. Reinforcement Code for 16 Gage Carbon Steel with a 4 in. wg Maximum Static Pressure Capacity

Notes:

1. *Maximum static pressure capacities include an allowance of 5.2 lbs/ft² to account for the weight of duct wrap and other loading.*
2. *Each side can be independently reinforced. It is NOT required to wrap angle on all four sides or for reinforcements to coincide*
3. *Table 4 is for carbon steel (including hot rolled steel, cold rolled steel, galvanized to 400°F and aluminized steel.)*
4. *See Table 8 for Stiffener Data.*



6 in. wg Static Pos. or Neg.	Reinforcement Code for 16 gage carbon steel						
	Duct Dimension	Reinforcement Spacing					
		Unreinforced	6 ft	5 ft	4 ft	3 ft	2.5 ft
0 - 12 in.	OK	Use Unreinforced					
13 - 18 in.	Not Designed				R1	R1	R1
19 - 24 in.					R1	R1	R1
25 - 30 in.					R2	R2	R2
31 - 36 in.					R3	R3	R2
37 - 42 in.					R3	R3	R3
43 - 48 in.					R4	R4	R3
49 - 54 in.					R4	R4	R4
55 - 60 in.					R5	R5	R4
61 - 66 in.					R6	R5	R5
67 - 72 in.					R6	R6	R5
73 - 78 in.					R7	R6	R6
79 - 84 in.					R7	R7	R6
85 - 90 in.					R8	R7	R7
91 - 96 in.					R8	R8	R7

Table 5. Reinforcement Code for 16 Gage Carbon Steel with a 6 in. wg Maximum Static Pressure Capacity

Notes:

1. *Maximum static pressure capacities include an allowance of 5.2 lbs/ft² to account for the weight of duct wrap and other loading.*
2. *Each side can be independently reinforced. It is NOT required to wrap angle on all four sides or for reinforcements to coincide*
3. *Table 5 is for carbon steel (including hot rolled steel, cold rolled steel, galvanized to 400°F and aluminized steel.)*
4. *See Table 8 for Stiffener Data.*



8 in. wg Static Pos. or Neg.	Reinforcement Code for 16 gage carbon steel						
Duct Dimension	Reinforcement Spacing						
	Unreinforced	6 ft	5 ft	4 ft	3 ft	2.5 ft	2 ft
0 - 12 in.	OK	Use Unreinforced					
13 – 18 in.	Not Designed					R1	R1
19 – 24 in.						R2	R1
25 - 30 in.						R2	R2
31 – 36 in.						R3	R3
37 – 42 in.						R3	R3
43 – 48 in.						R4	R4
49 – 54 in.						R4	R4
55 – 60 in.						R5	R5
61 – 66 in.						R6	R5
67 – 72 in.						R6	R6
73 – 78 in.						R7	R6
79 – 84 in.						R8	R7
85 – 90 in.						R8	R7
91 – 96 in.						R8	R8

Table 6. Reinforcement Code for 16 Gage Carbon Steel with a 8 in. wg Maximum Static Pressure Capacity

Notes:

1. *Maximum static pressure capacities include an allowance of 5.2 lbs/ft² to account for the weight of duct wrap and other loading.*
2. *Each side can be independently reinforced. It is NOT required to wrap angle on all four sides or for reinforcements to coincide*
3. *Table 6 is for carbon steel (including hot rolled steel, cold rolled steel, galvanized to 400°F and aluminized steel.)*
4. *See Table 8 for Stiffener Data.*



10 in. wg Static Pos. or Neg.	Reinforcement Code for 16 gage carbon steel						
	Duct Dimension	Reinforcement Spacing					
		Unreinforced	6 ft	5 ft	4 ft	3 ft	2.5 ft
0 - 12 in.	OK	Use Unreinforced					
13 – 18 in.	Not Designed						R1
19 – 24 in.							R2
25 - 30 in.							R2
31 – 36 in.							R3
37 – 42 in.							R3
43 – 48 in.							R4
49 – 54 in.							R4
55 – 60 in.							R5
61 – 66 in.							R6
67 – 72 in.							R6
73 – 78 in.							R7
79 – 84 in.							R7
85 – 90 in.							R8
91 – 96 in.							R8

Table 7. Reinforcement Code for 16 Gage Carbon Steel with a 10 in. wg Maximum Static Pressure Capacity

Notes:

1. Maximum static pressure capacities include an allowance of 5.2 lbs/ft² to account for the weight of duct wrap and other loading.
2. Each side can be independently reinforced. It is NOT required to wrap angle on all four sides or for reinforcements to coincide
3. Table 7 is for carbon steel (including hot rolled steel, cold rolled steel, galvanized to 400°F and aluminized steel.)
4. See Table 8 for Stiffener Data.



STRUCTURAL GR CS – 36 ksi
Table 6-D – Stiffener Data

Stiffener Type	S (Min)	I (Min)	Stiffener Size	Stiffener Description	Weight, lb/ft	S, in. ³	I, in. ⁴
R-1	0.031	0.022	1 × 1 × 1/8	Angle	0.80	0.031	0.022
			1 × 1 × 3/16	Angle	1.16	0.044	0.030
			1 × 1 × 1/4	Angle	1.49	0.056	0.037
			1 × 3/8 × 1/8	Channel	0.68	0.048	0.024
			1 × 1/2 × 1/8	Channel	0.82	0.063	0.031
			1 × 1/4	Bar	0.85	0.042	0.021
			1 × 5/16	Bar	1.06	0.052	0.026
			1 × 3/8	Bar	1.28	0.062	0.031
R-2	0.072	0.060	1 1/2 × 1 1/2 × 1/8	Angle	1.23	0.072	0.078
			1 3/4 × 1 3/4 × 1/8	Angle	1.44	0.099	0.126
			1 1/2 × 1 1/2 × 3/16	Angle	1.80	0.104	0.110
			1 1/4 × 1 1/2 × 1/8	Channel	1.01	0.096	0.060
R-3	0.131	0.139	1 1/2 × 1 1/2 × 1/4	Angle	2.34	0.134	0.139
			2 × 2 × 3/8	Angle	1.65	0.131	0.190
			2 × 1/4	Bar	1.70	0.167	0.167
R-4	0.190	0.272	2 × 2 × 3/8	Angle	2.44	0.190	0.272
			2 × 2 × 1/4	Angle	3.19	0.247	0.348
R-5	0.300	0.416	2 × 2 × 5/8	Angle	3.92	0.300	0.416
			2 × 2 × 3/8	Angle	4.70	0.351	0.479
			2 1/2 × 2 1/2 × 3/8	Angle	3.07	0.303	0.547
			3 × 1/4	Bar	2.55	0.375	0.563
R-6	0.394	0.703	2 1/2 × 2 1/2 × 5/8	Angle	5.00	0.482	0.849
			2 1/2 × 2 1/2 × 1/4	Angle	4.10	0.394	0.703
			3 × 3 × 3/8	Angle	3.71	0.441	0.962
			3 × 3/8	Bar	3.19	0.469	0.703
			3 × 3/8	Bar	3.83	0.563	0.844
R-7	0.566	0.984	2 1/2 × 2 1/2 × 1/2	Angle	7.70	0.724	1.230
			2 1/2 × 2 1/2 × 3/4	Angle	5.90	0.566	0.984
			3 × 3 × 1/4	Angle	4.90	0.577	1.240
			3 × 3 × 5/8	Angle	6.10	0.707	1.510
			4 × 1/4	Bar	3.40	0.667	1.330
R-8	0.755	1.530	3 × 2 × 3/8	Angle	5.90	0.781	1.530
			3 × 2 1/2 × 3/8	Angle	6.60	0.810	1.660
			3 1/2 × 2 1/2 × 1/4	Angle	4.90	0.755	1.800
			3 1/2 × 2 1/2 × 5/8	Angle	6.10	0.927	2.190
			3 1/2 × 3 × 1/4	Angle	5.40	0.776	1.910
			3 1/2 × 3 × 3/8	Angle	6.60	0.954	2.330
			4 × 3 × 1/4	Angle	5.80	1.000	2.770
			4 × 3 1/2 × 1/4	Angle	6.20	1.030	2.910
			3 × 3 × 3/4	Angle	7.20	0.833	1.760
			3 1/2 × 3 1/2 × 1/4	Angle	5.80	0.794	2.010
			3 1/2 × 3 1/2 × 5/8	Angle	7.20	0.976	2.430
			4 × 3/8	Bar	5.10	1.060	2.000
			R-9	1.050	2.220	4 × 4 × 1/4	Angle
3 × 3 × 1/2	Angle	9.40				1.070	2.220
3 1/2 × 2 1/2 × 3/8	Angle	7.20				1.090	2.560
3 1/2 × 3 × 3/8	Angle	7.90				1.130	2.720
3 1/2 × 3 1/2 × 3/8	Angle	8.50				1.150	2.870
4 × 3 × 5/8	Angle	7.20				1.230	3.380
4 × 3 1/2 × 5/8	Angle	7.70				1.260	3.560
4 × 1/2	Bar	6.80				1.334	2.667

Table 8. Stiffener Data for Structural GR CS-36ksi



Reinforcement Stiffeners are attached using a 2-inch weld on 8-inch alternating heel – toe

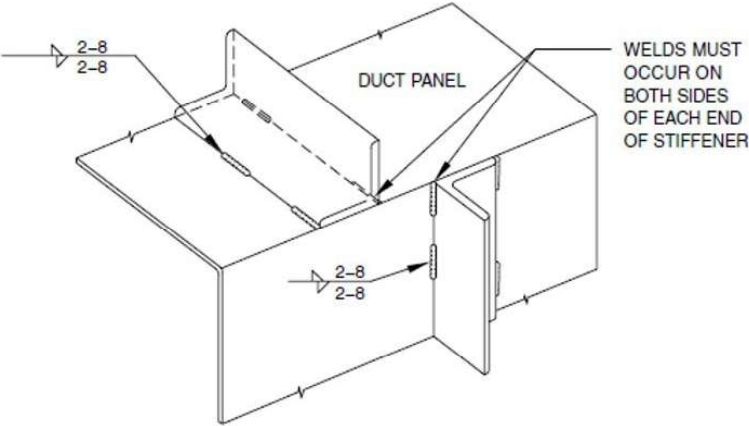


Figure 1 Unfixed Reinforcement Stiffeners (Heel Down)

Reinforcement Stiffeners are attached using a 2-inch weld on 8-inch alternating heel – toe

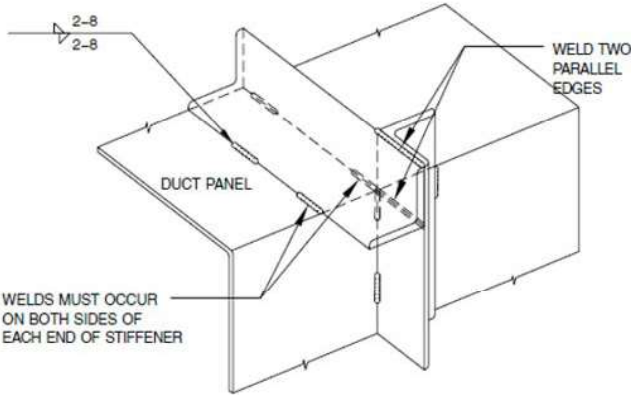


Figure 2 Fixed Reinforcement Stiffeners (Back to Back - Heel Down)



Reinforcement Stiffeners are attached using a 2-inch weld on 8-inch alternating heel – toe

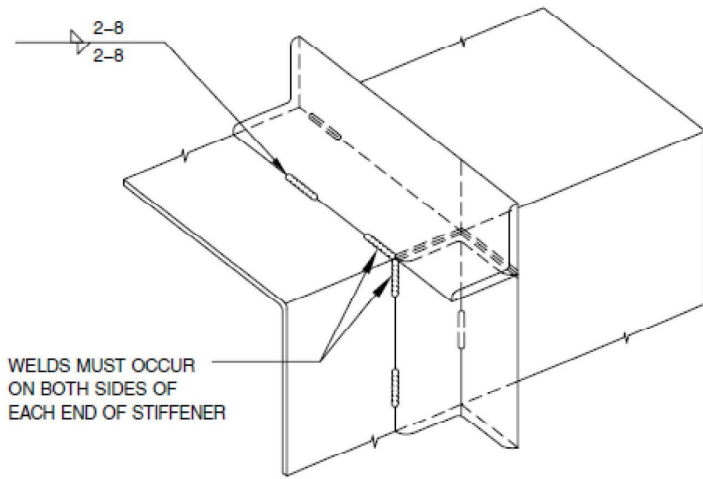


Figure 3 Fixed Reinforcement Stiffeners (Framed - Heel Down)

Reinforcement Stiffeners are attached using a 2-inch weld on 8-inch alternating heel – toe

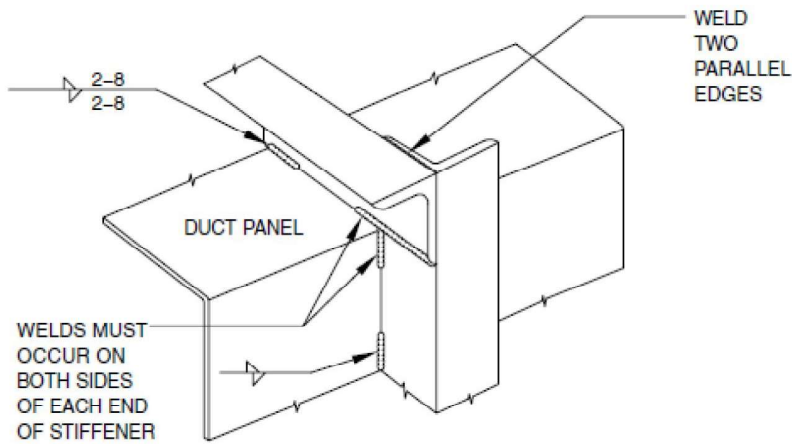


Figure 4 Fixed Reinforcement Stiffeners (Back to Back - Heel Down)



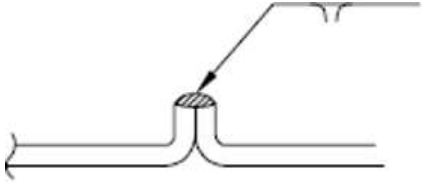


Figure 5a Even Flange Joint Maximum Height ($H = \frac{1}{2}$ inch)

Also permitted:

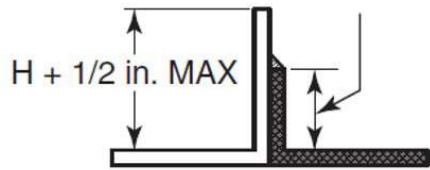


Figure 5b Uneven Flange Joint (H Defined By Shorter Flange)

