

								
PER SMACNA DUCT CONSTRUCTION STANDARDS								
TABLE 4-1 RECTANGULAR DUCT HANGERS MINIMUM SIZE								
MAXIMUM HALF OF DUCT PERIMETER	PAIR AT 10 FT SPACING		PAIR AT 8 FT SPACING		PAIR AT 5 FT SPACING		PAIR AT 4 FT SPACING	
	STRAP	WIRE/ROD	STRAP	WIRE/ROD	STRAP	WIRE/ROD	STRAP	WIRE/ROD
P/2 =30"	1" x 22 ga.	10 ga. (.135")	1" x 22 ga.	10 ga. (.135")	1" x 22 ga.	12 ga. (.106")	1" x 22 ga.	12 ga. (.106")
P/2 =72"	1" x 18 ga.	3/8"	1" x 20 ga.	1/4"	1" x 22 ga.	1/4"	1" x 22 ga.	1/4"
P/2 =96"	1" x 16 ga.	3/8"	1" x 18 ga.	3/8"	1" x 20 ga.	3/8"	1" x 22 ga.	1/4"
P/2 =120"	1 1/2" x 16 ga.	1/2"	1" x 16 ga.	3/8"	1" x 18 ga.	3/8"	1" x 20 ga.	1/4"
P/2 =168"	1 1/2" x 16 ga.	1/2"	1 1/2" x 16 ga.	1/2"	1" x 16 ga.	3/8"	1" x 18 ga.	3/8"
P/2 =192"	NOT GIVEN	1/2"	1 1/2" x 16 ga.	1/2"	1" x 16 ga.	3/8"	1" x 16 ga.	3/8"
P/2 =193" UP	SPECIAL ANALYSIS REQUIRED							
WHEN STRAPS ARE LAP JOINED USE THESE MINIMUM FASTENERS: 1"X18, 20, 22 ga. - two #10 or one 1/4" bolt 1"x16 ga. -two 1/4" dia. 1 1/2"x16 ga. - two 3/8" dia. Place fasteners in series, not side by side				SINGLE HANGER MAXIMUM ALLOWABLE LOAD				
				STRAP		WIRE OR ROD (Dia.)		
				1"x22 ga. - 260 lbs. 1"x20 ga. - 320 lbs. 1"x18 ga. - 420 lbs. 1"x16 ga. - 700 lbs. 1 1/2"x16 ga. - 1100 lbs.		0.106" - 80 lbs. 0.135" - 120 lbs. 0.162" - 160 lbs. 1/4" - 270 lbs. 3/8" - 680 lbs. 1/2" - 1250 lbs. 5/8" - 2000 lbs. 3/4" - 3000 lbs.		

Notes:

- Dimensions other than gage are in inches.
- Tables allow for duct weight, 1 lb/sf insulation weight and normal reinforcement and trapeze weight, but no external loads!
- For custom design of hangers, designers may consult SMACNA's Rectangular Industrial Duct Standards, the AISI Cold Formed Steel Design manual and the AISC Steel Construction Manual.
- Straps are galvanized steel, other materials are uncoated steel.
- Allowable loads for P/2 assume that ducts are 16 ga. Maximum, except that when maximum duct dimension (2) is over 60" then p/2 maximum is 1.25 w.
- For upper attachments see Fig. 4-2.
- For lower attachments see Fig. 4-4.
- For trapeze sizes see Table 4-3 and Fig. 4-5.
- 12, 10, or 8 ga. Wire is steel of black annealed, bright basic, or galvanized type.



PER SMACNA DUCT CONSTRUCTION STANDARDS

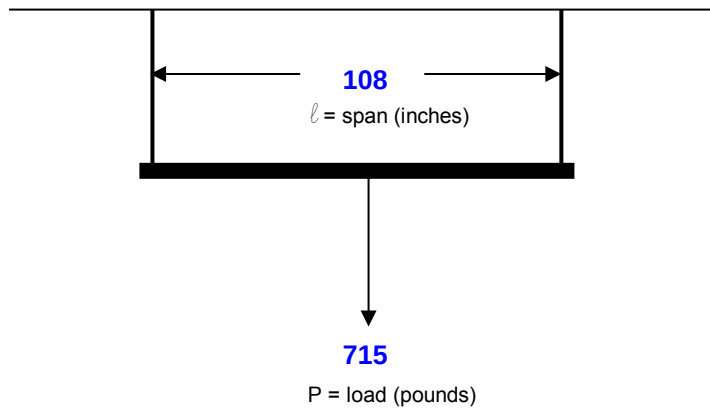
MINIMUM HANGER SIZES FOR ROUND DUCT

Diameter	Max Spacing	Wire Dia	Rod	Strap
10"	12'	One 12 ga.	1/4"	1" x 22 ga.
11-18"	12'	Two 12 ga.	1/4"	1" x 22 ga.
19-24"	12'	Two 10 ga.	1/4"	1" x 22 ga.
25-36"	12'	Two 8 ga.	3/8"	1" x 20 ga.
37-50"	12'	Two 8 ga.	Two 3/8"	Two 1" x 20 ga.
51-60"	12'	Two 8 ga.	Two 3/8"	1" x 22 ga.
61-84"	12'	Two 8 ga.	Two 3/8"	1" x 22 ga.

Notes:

1. Straps are galvanized steel; rods are uncoated or galvanized steel; wire is black annealed, bright basic or galvanized steel. All are alternates
2. See Fig. 4-4 for lower supports.
3. See Fig. 4-2 and 4-3 for upper attachments.
4. Table allows for conventional wall thickness and joint systems plus one lb/sf insulation weight. If heavier ducts are to be installed, adjust hanger sizes to be within their load limits; see allowable loads with Table 4-1. hanger spacing may be adjusted by special analysis.
5. Designers: For industrial grade supports, including saddles, single load trapeze loads, longer spans and flange joint loads, see SMACNA's Round Industrial Duct Construction Standards.
6. See Figs 3-9 and 3-10 for flexible duct supports.

PER SMACNA DUCT CONSTRUCTION STANDARDS



$$M_{\max} = \frac{P\ell}{4} = 19,305 \text{ inch} \cdot \text{pounds}$$

$$S = \frac{M_{\max}}{(1/4 (36,000 \text{ pounds/in}^2))} = 2.1450 \text{ inches}^3$$

Model	Channel / Shape	S (in ³)
B24	1 5/8" x 1 5/8" x 14 Ga.	0.2286
B26	1 5/8" x 1 5/8" x 16 Ga.	0.1925
B11	3 1/4" x 1 5/8" x 12 Ga.	0.5362

Angle	2" x 2" x 1/4"	0.247
Angle	2" x 2" x 3/8"	0.479
Angle	3" x 3" x 1/4"	0.577
Angle	3" x 3" x 3/8"	0.833
Angle	4" x 4" x 1/4"	1.050
Angle	4" x 4" x 3/8"	1.520
Angle	4" x 4" x 1/2"	1.970
Angle	4" x 4" x 3/4"	2.810

See website below for loading charts on additional sizes
<http://www.structural-drafting-net-expert.com/steel-beam.html>

VIA E-MAIL



February 27, 2015

Mark Holloway
Icon Mechanical & Engineering LCC
1616 Cleveland Blvd
Granite City, IL 62040-4401

RE: Shop Standards Verification

Dear Mr. Holloway:

Your recent application to the SMACNA Testing & Research Institute for verification of Icon Mechanical's Rectangular Duct Construction Shop Standards has been completed.

The Institute is pleased to announce that the attached shop standards (RECTANGULAR 1", 2", 3", 4", 6", and 10" wg positive and negative) have been verified to be in compliance with SMACNA's HVAC Duct Construction Standards, 3rd edition 2005.

The Institute has affixed a stamp of verification to each of your Shop Standards as certification of compliance. The Institute Board requires re-verification when either the SMACNA Standard is revised or Icon Mechanical modifies the verified shop standards.

Sincerely,

A handwritten signature in black ink, appearing to read "Eli P. Howard, III".

Eli P. Howard, III
Executive Director

Enclosure



Mechanical

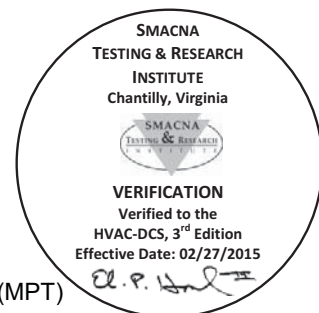
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1"	WG STATIC POS OR NEG	SHOP STANDARDS RECTANGULAR DUCT CONSTRUCTION								
DUCT DIMENSION	PANEL GA	JOINTS				JOINT TIE RODS			LONG. SEAM TYPE	REMARKS
		TYPE	SIZE	GA	SPACE	TYPE	+ SIZE	- SIZE		
		①	②		③	④	⑤	⑥	⑦	⑧
8 " dn	26	T-1/T-10/T-11	1"	26	5'- 0"	None	N/A	N/A	L-2	None
9, 10"	26	T-1/T-10/T-11	1"	26	5'- 0"	None	N/A	N/A	L-2	None
11, 12"	26	T-1/T-10/T-11	1"	26	5'- 0"	None	N/A	N/A	L-2	None
13, 14"	26	T-1/T-10/T-11	1"	26	5'- 0"	None	N/A	N/A	L-2	None
15, 16"	26	T-10/T-11	1"	22	5'- 0"	None	N/A	N/A	L-2	None
17, 18"	26	T-10/T-11	1"	22	5'- 0"	None	N/A	N/A	L-2	None
19, 20"	26	T-10/T-11	1"	22	5'- 0"	None	N/A	N/A	L-2	None
21, 22"	26	T-10/T-11	1"	22	5'- 0"	None	N/A	N/A	L-2	None
23, 24"	26	T-10/T-11	1"	22	5'- 0"	None	N/A	N/A	L-2	None
25, 26"	26	T-10/T-11	1"	22	5'- 0"	None	N/A	N/A	L-2	None
27, 28"	26	T-10/T-11	1"	22	5'- 0"	None	N/A	N/A	L-2	None
29, 30"	26	T-25	1-3/8"	26	5'- 0"	None	N/A	N/A	L-2	None
31-36"	26	T-25	1-3/8"	26	5'- 0"	None	N/A	N/A	L-2	None
37-42"	26	T-25	1-3/8"	26	5'- 0"	None	N/A	N/A	L-2	None
43-48"	24	T-25	1-3/8"	24	5'- 0"	None	N/A	N/A	L-2	None
49-54"	24	T-25	1-3/8"	24	5'- 0"	None	N/A	N/A	L-2	None
55-60"	24	T-25	1-3/8"	24	5'- 0"	None	N/A	N/A	L-2	None
61-72"	22	T-25	1-3/8"	22	5'- 0"	JTR	1/2" EMT	"See Table"	L-2	None
73-84"	20	T-25	1-3/8"	20	5'- 0"	JTR	1/2" EMT	"See Table"	L-2	None
85-96"	20	T-25	1-3/8"	20	5'- 0"	JTR	1/2" EMT	"See Table"	L-2	None
97-108"	18	T-25	1-3/8"	18	5'- 0"	JTR	1/2" EMT	"See Table"	L-1	None
109-120"	18	T-25	1-3/8"	18	5'- 0"	JTR	1/2" EMT	"See Table"	L-1	None

TR (-) Pressure EMT Size Table	
Duct Size	TR Size
to 46"	1/2"
47" - 62"	3/4"
63" - 74"	1"
75" - 102"	1 1/4"
103" - 118"	1 1/2"
119" - 120"	2"

Notes:

- ① Indicates joint type from Figure 2-1 (i.e., T-1, T-10., etc.) (T-25a/T-25b may be used).
- ② Indicates joint size.
- ③ Indicates spacing between joints.
- ④ Indicates type of tie rod used.
- ⑤ Indicates the size of tie rod for positive pressure.
- ⑥ Indicates size of tie rod for negative pressure.
- ⑦ Indicates longitudinal seam from Figure 2-2 (i.e., L-1, L-3, etc.)
- ⑧ Bolded line indicates application range limit for midpanel tie rods (MPT) in the 2005 HVAC-DCS. Indicates notes that pertain to duct range row





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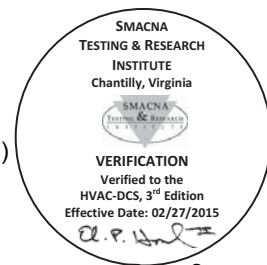
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1"	WG STATIC POS OR NEG	SHOP STANDARDS RECTANGULAR DUCT CONSTRUCTION				
DUCT DIMENSION	PANEL GA	INTERMEDIATE REINFORCEMENTS				REMARKS
		TYPE	+ SIZE	- SIZE	SPACING	
		①	②	③	④	⑤
8 " dn	26	None	N/A	N/A	N/A	None
9, 10"	26	None	N/A	N/A	N/A	None
11, 12"	26	None	N/A	N/A	N/A	None
13, 14"	26	None	N/A	N/A	N/A	None
15, 16"	26	None	N/A	N/A	N/A	None
17, 18"	26	None	N/A	N/A	N/A	None
19, 20"	26	None	N/A	N/A	N/A	None
21, 22"	26	None	N/A	N/A	N/A	None
23, 24"	26	None	N/A	N/A	N/A	None
25, 26"	26	None	N/A	N/A	N/A	None
27, 28"	26	None	N/A	N/A	N/A	None
29, 30"	26	None	N/A	N/A	N/A	None
31-36"	26	MPT	1/2" EMT	"See Table"	2'- 6"	None
37-42"	26	MPT	1/2" EMT	"See Table"	2'- 6"	None
43-48"	24	MPT	1/2" EMT	"See Table"	2'- 6"	None
49-54"	24	MPT	1/2" EMT	"See Table"	2'- 6"	None
55-60"	24	MPT	1/2" EMT	"See Table"	2'- 6"	None
61-72"	22	MPT	1/2" EMT	"See Table"	2'- 6"	None
73-84"	20	MPT	1/2" EMT	"See Table"	2'- 6"	None
85-96"	20	(2)MPT	1/2" EMT	"See Table"	2'- 6"	None
97-108"	18	HRA	2" x 2" x 3/16"	2" x 2" x 3/16"	2'- 6"	None
109-120"	18	HRA	2" x 2" x 3/16"	2" x 2" x 3/16"	2'- 6"	None

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Notes:

- ① Indicates intermediate reinforcement type (A-Angle C Channel) Z-Zee H-Hat Section TR - Tie Rod in stiffener MPT Midpanel Tie Rod. (2) Indicate the use of two MPTs.
- ② Indicates size of intermediate stiffener for positive pressure.
- ③ Indicates size of intermediate stiffener for negative pressure.
- ④ Indicates location of intermediate stiffener.
- ⑤ Bolded line indicates application range limit for midpanel tie rods (MPT) in the 2005 HVAC-DCS.





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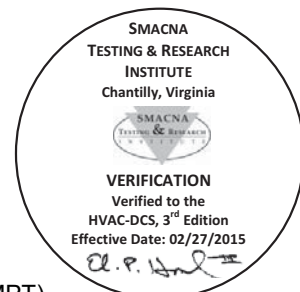
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2"		WG STATIC POS OR NEG		SHOP STANDARDS RECTANGULAR DUCT CONSTRUCTION						
DUCT DIMENSION	PANEL GA	JOINTS				JOINT TIE RODS			LONG. SEAM TYPE	REMARKS
		TYPE	SIZE	GA	SPACE	TYPE	+ SIZE	- SIZE		
		①	②		③	④	⑤	⑥	⑦	⑧
8" dn	26	T-1/T-10/T-11	1"	26	5'- 0"	None	N/A	N/A	L-2	None
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11, 12"	26	T-1/T-10/T-11	1"	26	5'- 0"	None	N/A	N/A	L-2	None
13, 14"	26	T-1/T-10/T-11	1"	26	5'- 0"	None	N/A	N/A	L-2	None
15, 16"	26	T-1/T-10/T-11	1"	22	5'- 0"	None	N/A	N/A	L-2	None
17, 18"	26	T-1/T-10/T-11	1"	22	5'- 0"	None	N/A	N/A	L-2	None
19, 20"	26	T-10/T-11	1"	22	5'- 0"	None	N/A	N/A	L-2	None
21, 22"	26	T-10/T-11	1-1/8"	20	5'- 0"	None	N/A	N/A	L-2	None
23, 24"	26	T-10/T-11	1-1/8"	20	5'- 0"	None	N/A	N/A	L-2	None
25, 26"	26	T-10/T-11	1-1/8"	20	5'- 0"	None	N/A	N/A	L-2	None
27, 28"	24	T-25	1-3/8"	24	5'- 0"	None	N/A	N/A	L-2	None
29, 30"	24	T-25	1-3/8"	24	5'- 0"	None	N/A	N/A	L-2	None
31-36"	22	T-25	1-3/8"	22	5'- 0"	None	N/A	N/A	L-2	None
37-42"	20	T-25	1-3/8"	20	5'- 0"	None	N/A	N/A	L-2	None
43-48"	22	T-25	1-3/8"	22	5'- 0"	None	N/A	N/A	L-2	None
49-54"	22	T-25	1-3/8"	22	5'- 0"	None	N/A	N/A	L-2	None
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TR (-) Pressure EMT Size Table	
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Notes:

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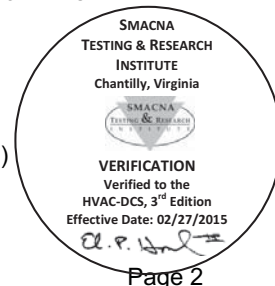
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17, 18"	26	None	N/A	N/A	N/A	None
19, 20"	26	None	N/A	N/A	N/A	None
21, 22"	26	None	N/A	N/A	N/A	None
23, 24"	26	None	N/A	N/A	N/A	None
25, 26"	26	None	N/A	N/A	N/A	None
27, 28"	24	None	N/A	N/A	N/A	None
29, 30"	24	None	N/A	N/A	N/A	None
31-36"	22	None	N/A	N/A	N/A	None
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43-48"	22	MPT	1/2" EMT	"See Table"	2'- 6"	None
49-54"	22	MPT	1/2" EMT	"See Table"	2'- 6"	None
55-60"	22	MPT	1/2" EMT	"See Table"	2'- 6"	None
61-72"	20	MPT	1/2" EMT	"See Table"	2'- 6"	None
73-84"	20	(2)MPT	1/2" EMT	"See Table"	2'- 6"	None
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- ② Indicates size of intermediate stiffener for positive pressure.
- ③ Indicates size of intermediate stiffener for negative pressure.
- ④ Indicates location of intermediate stiffener.
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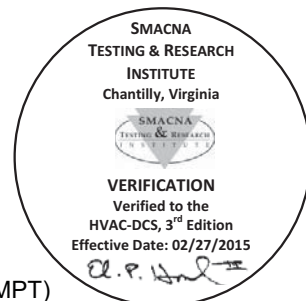
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8 " dn	26	T-25	1-3/8"	26	5'- 0"	None	N/A	N/A	L-1	None
9, 10"	26	T-25	1-3/8"	26	5'- 0"	None	N/A	N/A	L-1	None
11, 12"	26	T-25	1-3/8"	26	5'- 0"	None	N/A	N/A	L-1	None
13, 14"	24	T-25	1-3/8"	24	5'- 0"	None	N/A	N/A	L-1	None
15, 16"	24	T-25	1-3/8"	24	5'- 0"	None	N/A	N/A	L-1	None
17, 18"	24	T-25	1-3/8"	24	5'- 0"	None	N/A	N/A	L-1	None
19, 20"	24	T-25	1-3/8"	24	5'- 0"	None	N/A	N/A	L-1	None
21, 22"	24	T-25	1-3/8"	24	5'- 0"	None	N/A	N/A	L-1	None
23, 24"	24	T-25	1-3/8"	24	5'- 0"	None	N/A	N/A	L-1	None
25, 26"	24	T-25	1-3/8"	24	5'- 0"	None	N/A	N/A	L-1	None
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29, 30"	22	T-25	1-3/8"	22	5'- 0"	None	N/A	N/A	L-1	None
31-36"	20	T-25	1-3/8"	20	5'- 0"	None	N/A	N/A	L-1	None
37-42"	20	T-25	1-3/8"	20	5'- 0"	JTR	1/2" EMT	"See Table"	L-1	None
43-48"	22	T-25	1-3/8"	22	5'- 0"	JTR	1/2" EMT	"See Table"	L-1	None
49-54"	22	T-25	1-3/8"	22	5'- 0"	JTR	1/2" EMT	"See Table"	L-1	None
55-60"	20	T-25	1-3/8"	20	5'- 0"	JTR	1/2" EMT	"See Table"	L-1	None
61-72"	20	T-25	1-3/8"	20	5'- 0"	JTR	1/2" EMT	"See Table"	L-1	None
73-84"	20	T-25	1-3/8"	20	5'- 0"	JTR	1/2" EMT	"See Table"	L-1	None
85-96"	18	T-25	1-3/8"	18	5'- 0"	JTR	1/2" EMT	"See Table"	L-1	None
97-108"	18	T-25	1-3/8"	18	5'- 0"	JTR	1/2" EMT	"See Table"	L-1	None
109-120"	18	T-25	1-3/8"	18	5'- 0"	JTR	1/2" EMT	"See Table"	L-1	None

Notes:

- ① Indicates joint type from Figure 2-1 (i.e., T-1, T-10., etc.) (T-25a/T-25b may be used).
- ② Indicates joint size.
- ③ Indicates spacing between joints.
- ④ Indicates type of tie rod used.
- ⑤ Indicates the size of tie rod for positive pressure.
- ⑥ Indicates size of tie rod for negative pressure.
- ⑦ Indicates longitudinal seam from Figure 2-2 (i.e., L-1, L-3, etc.)
- ⑧ Bolded line indicates application range limit for midpanel tie rods (MPT) in the 2005 HVAC-DCS.

TR (-) Pressure EMT Size Table	
Duct Size	TR Size
to 46"	1/2"
47" - 62"	3/4"
63" - 74"	1"
75" - 102"	1 1/4"
103" - 118"	1 1/2"
119" - 120"	2"





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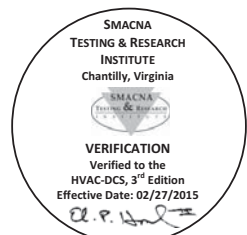
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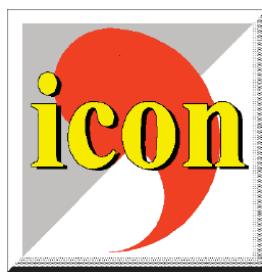
3"	WG STATIC POS OR NEG	SHOP STANDARDS RECTANGULAR DUCT CONSTRUCTION				
DUCT DIMENSION	PANEL GA	INTERMEDIATE REINFORCEMENTS				REMARKS
		TYPE	+ SIZE	- SIZE	SPACING	
		①	②	③	④	⑤
8 " dn	26	None	N/A	N/A	N/A	None
9, 10"	26	None	N/A	N/A	N/A	None
11, 12"	26	None	N/A	N/A	N/A	None
13, 14"	24	None	N/A	N/A	N/A	None
15, 16"	24	None	N/A	N/A	N/A	None
17, 18"	24	None	N/A	N/A	N/A	None
19, 20"	24	None	N/A	N/A	N/A	None
21, 22"	24	None	N/A	N/A	N/A	None
23, 24"	24	None	N/A	N/A	N/A	None
25, 26"	24	None	N/A	N/A	N/A	None
27, 28"	22	None	N/A	N/A	N/A	None
29, 30"	22	None	N/A	N/A	N/A	None
31-36"	20	None	N/A	N/A	N/A	None
37-42"	20	None	N/A	N/A	N/A	None
43-48"	22	MPT	1/2" EMT	"See Table"	2'- 6"	None
49-54"	22	MPT	1/2" EMT	"See Table"	2'- 6"	None
55-60"	20	MPT	1/2" EMT	"See Table"	2'- 6"	None
61-72"	20	(2)MPT	1/2" EMT	"See Table"	2'- 6"	None
73-84"	20	(2)MPT	1/2" EMT	"See Table"	2'- 6"	None
85-96"	18	(2)MPT	1/2" EMT	"See Table"	2'- 6"	None
97-108"	18	HRA	2 1/2" x 2 1/2" x 1/4"	2 1/2" x 2 1/2" x 1/4"	2'- 6"	None
109-120"	18	HRA	2 1/2" x 2 1/2" x 1/4"	2 1/2" x 2 1/2" x 1/4"	2'- 6"	None

TR (-) Pressure EMT Size Table	
Duct Size	TR Size
to 46"	1/2"
47" - 62"	3/4"
63" - 74"	1"
75" - 102"	1 1/4"
103" - 118"	1 1/2"
119" - 120"	2"

Notes:

- ① Indicates intermediate reinforcement type (A-Angle C Channel) Z-Zee H-Hat Section TR - Tie Rod in stiffener MPT Midpanel Tie Rod.(2) indicates use of two MPTs.
- ② Indicates size of intermediate stiffener for positive pressure.
- ③ Indicates size of intermediate stiffener for negative pressure.
- ④ Indicates location of intermediate stiffener.
- ⑤ Bolded line indicates application range limit for midpanel tie rods (MPT) in the 2005 HVAC-DCS.





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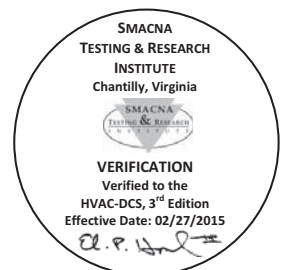
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4"	WG STATIC POS OR NEG	SHOP STANDARDS RECTANGULAR DUCT CONSTRUCTION								
DUCT DIMENSION	PANEL GA	JOINTS				JOINT TIE RODS			LONG. SEAM TYPE	REMARKS
		TYPE	SIZE	GA	SPACE	TYPE	+ SIZE	- SIZE		
		①	②		③	④	⑤	⑥	⑦	⑧
8 " dn	26	T-25	1-3/8"	26	5'- 0"	None	N/A	N/A	L-1	None
9, 10"	26	T-25	1-3/8"	26	5'- 0"	None	N/A	N/A	L-1	None
11, 12"	26	T-25	1-3/8"	26	5'- 0"	None	N/A	N/A	L-1	None
13, 14"	24	T-25	1-3/8"	24	5'- 0"	None	N/A	N/A	L-1	None
15, 16"	24	T-25	1-3/8"	24	5'- 0"	None	N/A	N/A	L-1	None
17, 18"	24	T-25	1-3/8"	24	5'- 0"	None	N/A	N/A	L-1	None
19, 20"	24	T-25	1-3/8"	24	5'- 0"	None	N/A	N/A	L-1	None
21, 22"	24	T-25	1-3/8"	24	5'- 0"	None	N/A	N/A	L-1	None
23, 24"	22	T-25	1-3/8"	22	5'- 0"	None	N/A	N/A	L-1	None
25, 26"	22	T-25	1-3/8"	22	5'- 0"	None	N/A	N/A	L-1	None
27, 28"	22	T-25	1-3/8"	22	5'- 0"	None	N/A	N/A	L-1	None
29, 30"	20	T-25	1-3/8"	20	5'- 0"	None	N/A	N/A	L-1	None
31-36"	22	T-25	1-3/8"	22	5'- 0"	None	N/A	N/A	L-1	None
37-42"	20	T-25	1-3/8"	20	5'- 0"	None	N/A	N/A	L-1	None
43-48"	20	T-25	1-3/8"	20	5'- 0"	JTR	1/2" EMT	"See Table"	L-1	None
49-54"	20	T-25	1-3/8"	20	5'- 0"	JTR	1/2" EMT	"See Table"	L-1	None
55-60"	20	T-25	1-3/8"	20	5'- 0"	JTR	1/2" EMT	"See Table"	L-1	None
61-72"	20	T-25	1-3/8"	20	5'- 0"	JTR	1/2" EMT	"See Table"	L-1	None
73-84"	18	T-25	1-3/8"	18	5'- 0"	JTR	1/2" EMT	"See Table"	L-1	None
85-96"	18	T-25	1-3/8"	18	5'- 0"	JTR	1/2" EMT	"See Table"	L-1	None
97-108"	18	T-25	1-3/8"	18	5'- 0"	JTR	1/2" EMT	"See Table"	L-1	None
109-120"	18	T-25	1-3/8"	18	5'- 0"	JTR	1/2" EMT	"See Table"	L-1	None

TR (-) Pressure EMT Size Table	
Duct Size	TR Size
to 46"	1/2"
47" - 62"	3/4"
63" - 74"	1"
75" - 102"	1 1/4"
103" - 118"	1 1/2"
119" - 120"	2"

Notes:

- ① Indicates joint type from Figure 2-1 (i.e., T-1, T-10., etc.) (T-25a/T-25b may be used).
- ② Indicates joint size.
- ③ Indicates spacing between joints.
- ④ Indicates type of tie rod used.
- ⑤ Indicates the size of tie rod for positive pressure.
- ⑥ Indicates size of tie rod for negative pressure.
- ⑦ Indicates longitudinal seam from Figure 2-2 (i.e., L-1, L-3, etc.)
- ⑧ Bolded line indicates application range limit for midpanel tie rods (MPT) in the 2005 HVAC-DCS.





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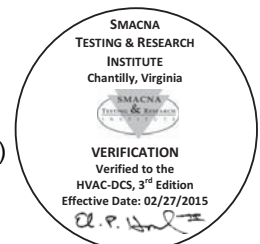
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4"		WG STATIC POS OR NEG	SHOP STANDARDS RECTANGULAR DUCT CONSTRUCTION			
DUCT DIMENSION	PANEL GA	INTERMEDIATE REINFORCEMENTS				REMARKS
		TYPE	+ SIZE	- SIZE	SPACING	
		①	②	③	④	⑤
8 " dn	26	None	N/A	N/A	N/A	None
9, 10"	26	None	N/A	N/A	N/A	None
11, 12"	26	None	N/A	N/A	N/A	None
13, 14"	24	None	N/A	N/A	N/A	None
15, 16"	24	None	N/A	N/A	N/A	None
17, 18"	24	None	N/A	N/A	N/A	None
19, 20"	24	None	N/A	N/A	N/A	None
21, 22"	24	None	N/A	N/A	N/A	None
23, 24"	22	None	N/A	N/A	N/A	None
25, 26"	22	None	N/A	N/A	N/A	None
27, 28"	22	None	N/A	N/A	N/A	None
29, 30"	20	None	N/A	N/A	N/A	None
31-36"	22	MPT	1/2" EMT	"See Table"	2'- 6"	None
37-42"	20	MPT	1/2" EMT	"See Table"	2'- 6"	None
43-48"	20	MPT	1/2" EMT	"See Table"	2'- 6"	None
49-54"	20	MPT	1/2" EMT	"See Table"	2'- 6"	None
55-60"	20	MPT	1/2" EMT	"See Table"	2'- 6"	None
61-72"	20	(2)MPT	1/2" EMT	"See Table"	2'- 6"	None
73-84"	18	(2)MPT	1/2" EMT	"See Table"	2'- 6"	None
85-96"	18	(2)MPT	1/2" EMT	"See Table"	2'- 6"	None
97-108"	18	HRA	2 1/2" x 2 1/2" x 1/4"	2 1/2" x 2 1/2" x 1/4"	2'- 6"	None
109-120"	18	HRA	2 1/2" x 2 1/2" x 1/4"	2 1/2" x 2 1/2" x 1/4"	2'- 6"	None

TR (-) Pressure EMT Size Table	
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Notes:

- ① Indicates intermediate reinforcement type (A-Angle C Channel) Z-Zee H-Hat Section TR - Tie Rod in stiffener MPT Midpanel Tie Rod.(2) indicates the use of two MPTs.
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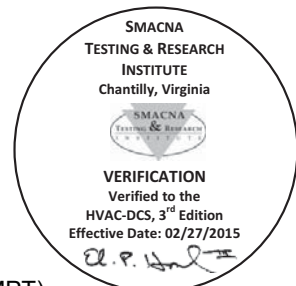
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6"	WG STATIC POS OR NEG	SHOP STANDARDS RECTANGULAR DUCT CONSTRUCTION								
DUCT DIMENSION	PANEL GA	JOINTS				JOINT TIE RODS			LONG. SEAM TYPE	REMARKS
		TYPE	SIZE	GA	SPACE	TYPE	+ SIZE	- SIZE		
		①	②		③	④	⑤	⑥	⑦	⑧
8 " dn	26	T-25	1-3/8"	26	5'- 0"	None	N/A	N/A	L-1	None
9, 10"	24	T-25	1-3/8"	24	5'- 0"	None	N/A	N/A	L-1	None
11, 12"	24	T-25	1-3/8"	24	5'- 0"	None	N/A	N/A	L-1	None
13, 14"	22	T-25	1-3/8"	22	5'- 0"	None	N/A	N/A	L-1	None
15, 16"	22	T-25	1-3/8"	22	5'- 0"	None	N/A	N/A	L-1	None
17, 18"	22	T-25	1-3/8"	22	5'- 0"	None	N/A	N/A	L-1	None
19, 20"	22	T-25	1-3/8"	22	5'- 0"	None	N/A	N/A	L-1	None
21, 22"	22	T-25	1-3/8"	22	5'- 0"	None	N/A	N/A	L-1	None
23, 24"	22	T-25	1-3/8"	22	5'- 0"	None	N/A	N/A	L-1	None
25, 26"	20	T-25	1-3/8"	20	5'- 0"	None	N/A	N/A	L-1	None
27, 28"	22	T-25	1-3/8"	22	5'- 0"	None	N/A	N/A	L-1	None
29, 30"	22	T-25	1-3/8"	22	5'- 0"	None	N/A	N/A	L-1	None
31-36"	20	T-25	1-3/8"	20	5'- 0"	None	N/A	N/A	L-1	None
37-42"	20	T-25	1-3/8"	20	5'- 0"	JTR	1/2" EMT	"See Table"	L-1	None
43-48"	20	T-25	1-3/8"	20	5'- 0"	JTR	1/2" EMT	"See Table"	L-1	None
49-54"	20	T-25	1-3/8"	20	5'- 0"	JTR	1/2" EMT	"See Table"	L-1	None
55-60"	20	T-25	1-3/8"	20	5'- 0"	JTR	1/2" EMT	"See Table"	L-1	None
61-72"	18	T-25	1-3/8"	18	5'- 0"	JTR	1/2" EMT	"See Table"	L-1	None
73-84"	18	T-25	1-3/8"	18	5'- 0"	JTR	1/2" EMT	"See Table"	L-1	None
85-96"	16	T-25	1-3/8"	16	5'- 0"	JTR	1/2" EMT	"See Table"	L-1	None
97-108"	16	T-25	1-3/8"	16	5'- 0"	JTR	1/2" EMT	"See Table"	L-1	None
109-120"	16	T-25	1-3/8"	16	5'- 0"	JTR	1/2" EMT	"See Table"	L-1	None

TR (-) Pressure EMT Size Table	
Duct Size	TR Size
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Notes:

- ① Indicates joint type from Figure 2-1 (i.e., T-1, T-10., etc.) (T-25a/T-25b may be used).
- ② Indicates joint size.
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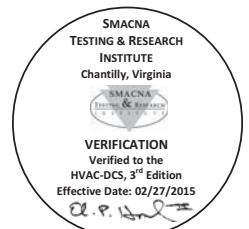
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6"	WG STATIC POS OR NEG		SHOP STANDARDS RECTANGULAR DUCT CONSTRUCTION			
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		TYPE	+ SIZE	- SIZE	SPACING	
		①	②	③	④	⑤
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9, 10"	24	None	N/A	N/A	N/A	None
11, 12"	24	None	N/A	N/A	N/A	None
13, 14"	22	None	N/A	N/A	N/A	None
15, 16"	22	None	N/A	N/A	N/A	None
17, 18"	22	None	N/A	N/A	N/A	None
19, 20"	22	None	N/A	N/A	N/A	None
21, 22"	22	None	N/A	N/A	N/A	None
23, 24"	22	None	N/A	N/A	N/A	None
25, 26"	20	None	N/A	N/A	N/A	None
27, 28"	22	MPT	1/2" EMT	"See Table"	2'- 6"	None
29, 30"	22	MPT	1/2" EMT	"See Table"	2'- 6"	None
31-36"	20	MPT	1/2" EMT	"See Table"	2'- 6"	None
37-42"	20	MPT	1/2" EMT	"See Table"	2'- 6"	None
43-48"	20	MPT	1/2" EMT	"See Table"	2'- 6"	None
49-54"	20	MPT	1/2" EMT	"See Table"	2'- 6"	None
55-60"	20	MPT	1/2" EMT	"See Table"	2'- 6"	None
61-72"	18	MPT	1/2" EMT	"See Table"	2'- 6"	None
73-84"	18	(2)MPT	1/2" EMT	"See Table"	2'- 6"	None
85-96"	16	(2)MPT	1/2" EMT	"See Table"	2'- 6"	None
97-108"	16	HRA & MPT	2" x 2" x 3/16" & 1/2" EMT	2" x 2" x 3/16" & (See Table) EMT	2'- 6"	None
109-120"	16	HRA & MPT	2-1/2" x 2-1/2" x 3/16" & 1/2" EMT	2-1/2" x 2-1/2" x 3/16"& (See Table) EMT	2'- 6"	None

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Duct Size	TR Size
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Shop Drawing Submittal Review

Transmitted To: Cannon Design

Date: September 22, 2016

Attention: stl-cac@cannondesign.com

Contact Person / WTA Field Inspector:
Patrick Garner

Project Name: Webster University-**ISB**

Reviewed by: Mark Schaefer

Project No. WT 14127.01

☐

UPS

☐

Courier

☒

Email

Copies	No.	Description
1 PDF	238800M05	(Submittal No.'s) (R&B CxSRC)
		(Cannon #238800-008) - (Paric #15051-0203) - (WES #607)
		• Ductwork Product Data

***Remarks: Please see PAGE 2 for remarks.**

c: **Kelvin Patel**
Kpatel@cannondesign.com

☐ Furnish as Submitted

☒ ***Furnish as Noted**

☐ Rejected

☐ Revise & Resubmit

☐ Reviewed

☐

Corrections or comments made on shop drawings during this review do not relieve contractor from compliance with requirements of drawings and specifications. This check is only for review of general conformance with the design concept of project and general compliance with information given in contract documents. Contractor is responsible for: confirming and correlating all quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating his work with that of all other trades; and performing his work in a safe and satisfactory manner.

Shop Drawing Submittal Review

Transmitted To: Cannon Design

Date: September 22, 2016

Attention: stl-cac@cannondesign.com

Contact Person / WTA Field Inspector:
Patrick Garner

Project Name: Webster University-**ISB**

Reviewed by: Mark Schaefer

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		• Ductwork Product Data

***Remarks: Please see PAGE 2 for remarks.**

c: **Kelvin Patel**
Kpatel@cannondesign.com

☐ Furnish as Submitted

☒ ***Furnish as Noted**

☐ Rejected

☐ Revise & Resubmit

☐ Reviewed

☐

Corrections or comments made on shop drawings during this review do not relieve contractor from compliance with requirements of drawings and specifications. This check is only for review of general conformance with the design concept of project and general compliance with information given in contract documents. Contractor is responsible for: confirming and correlating all quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating his work with that of all other trades; and performing his work in a safe and satisfactory manner.

Shop Drawing Submittal Review

Submittal Review Comments

1. Replace material list for sheet metal with the following:

Webster University ISB Job # 5768

Ductwork Specification Submittal

DUCT SYSTEM	SHAPE	MATERIAL	JOINTS	NOTES
LOW PRESSURE SUPPLY	Round	G-60	Gasketed	1,7,8
	Rectangular	G-90	Slip & Drive	
RETURN, OUTDOOR AIR, RELIEF, EXHAUST	Round	G-90	Gasketed	1,7,8
	Rectangular	G-90	Slip & Drive	
MEDIUM PRESSURE SUPPLY DUCT	Round	G-90	Gasketed	2,7,8
	Rectangular	G-90	Slip & Drive	
RANGE HOOD KITCHEN EXHAUST DUCT (CONCEALED)	Round	16 Gauge Carbon Steel	Welded and Flanged	3
	Rectangular	16 Gauge Carbon Steel	Welded and Flanged	
RANGE HOOD KITCHEN EXHAUST DUCT (EXPOSED)	Round	14 Gauge 304 Stainless Steel	Welded and Flanged	3
	Rectangular	14 Gauge 304 Stainless Steel	Welded and Flanged	
ACID RESISTANT FUME HANDLING DUCT	Round	304L Stainless Steel	Welded and Flanged	4,5,6
	Rectangular	304L Stainless Steel	Welded and Flanged	

NOTES

1. ALL RETURN, EXHAUST, OUTDOOR AIR, MAKEUP, RELIEF, AND SUPPLY DUCT WORK DOWNSTREAM FROM VAVS SHALL BE CONSTRUCTED OF GAUGES AND REINFORCEMENT TO +/- 2" W.G.
2. ALL MEDIUM PRESSURE SUPPLY DUCTWORK, UNLESS SPECIFIED OTHERWISE, SHALL BE CONSTRUCTED OF GAUGES AND REINFORCEMENT TO 4" W.G. STATIC PRESSURE.
3. RANGE HOOD KITCHEN EXHAUST DUCTS WILL COMPLY WITH NFPA PAMPHLET 96. ALL JOINTS WILL BE LIQUID TIGHT EXTERNALLY WELDED AND FLANGED. DUCT SHALL SLOPE TOWARDS HOODS AND BE INSTALLED WITHOUT FORMING DIPS OR TRAPS. ACCESS PANELS SHALL BE PROVIDED AT
4. ALL ACID RESISTANT FUME EXHAUST BRANCHES FROM THE FUME HOODS TO THE EXHAUST MAINS SHALL BE CONSTRUCTED 304 STAINLESS STEEL WITH A NO. 4 FINISH. SEAMS AND JOINTS SHALL BE LIQUID TIGHT EXTERANALLY WELDED AND FLANGED. THE MATERIAL WITH TRANSITION TO GALVANIZED STEEL AT THE HEADER.
5. ALL BRANCH AND HEADER ACID RESISTANT FUME EXHAUST DUCTWORK IN CHEMISTRY LAB CLASSROOM 472 SHALL BE CONTRUCTED OF A
6. TURNING VANES FOR ACID RESISTANT FUME EXHAUST DUCTS SHALL BE FABRICATED OF 304 STAINLESS STEEL. VOLUME DAMPERS SHALL HAVE
7. ALL MEDUIM PRESSURE ROUND DUCTS SHALL HAVE SPIRAL SEAMS.
8. ALL ROUND AND RECTANGULAR DUCT SHALL USE PROSEAL SEALANT WHERE SEALANT IS REQUIRED.

2. Radius elbows with centerline radius equal to 1.5 x diameter is preferred. Only use the 1 x diameter if space is not available for the 1.5 x diameter elbow.
3. Mitered elbows shall not be used except if necessary for space constraints and have turning vanes.
4. Abrupt reducers shall not be used.
5. Do not use straight pressed or saddle taps for medium pressure ductwork.
6. Do not use bullhead tees, unless no other configuration is available.
7. Avoid use cross style tees.

WTASHOP - Webster ISB - 23 8800-008

From: STL-CAC <STL-CAC@CANNONDESIGN.COM>
To: 'Patrick Garner' <pgarner@wmtao.com>, WTASHOP <wtashop@wmtao.com>
Date: 9/1/2016 9:33 AM
Subject: Webster ISB - 23 8800-008
Cc: "Patel, Kelvin" <kpatel@CANNONDESIGN.COM>
Attachments: 238800-008 Ductwork Product Data.pdf

Attached for review.

Melissa Pirtle
Construction Admin

CANNONDESIGN

1100 Clark Ave
St. Louis, Missouri 63102
T [314.425.8797](tel:314.425.8797) • M
cannondesign.com

SUBMITTAL IDENTIFICATION SHEET

To be completed by Contractor/CM

PROJECT NAME	
ADDRESS	
NUMBER	
OWNER	
ARCHITECT / ENGINEER	
SUBMITTED BY	
CONTRACTOR / CM SUBMITTAL NO.	CANNON DESIGN SUBMITTAL NO.
DRAWING / DETAIL REFERENCE	SPECIFICATION SECTION / PARAGRAPH
MANUFACTURER / SUPPLIER	ITEM / PRODUCT ID
REQUIRED DATE	PRIORITY
CRITICAL	☐

To be completed by Reviewer

CANNON DESIGN SUBMITTAL NUMBER
RECEIVED DATE

- ☐ **A. No Exceptions Taken**
No further review of submittal is required.
- ☐ **B. Make Corrections Noted**
Incorporate corrections in work;
resubmission is not required.
- ☐ **C. Revise and Resubmit**
Revise as noted, and resubmit for review.
- ☐ **D. Rejected**
Submittal is not in compliance with Contract Documents;
provide new submittal.
- ☐ **E. For Record / Information Only**
Submittal was reviewed for Record / Information
purposes only.
- ☐ **F. Not Required for Review**
Submittal is not required by Contract Documents
and has not been reviewed.

Review is for conformance with the design concept of this project and for general compliance with contract documents. Contractor is responsible for quantities, dimensions and compliance with contract documents and for information that pertains to fabrication processes, construction techniques and coordination of this work with all trades which will be affected thereby. This review is null and void if submittal deviates from contract documents and does not indicate or note deviations.

ITEM BEING SUBMITTED (check only one)

- ☐ Shop Drawings ☐ Certification / Qualifications ☐ Coordination Drawing
☐ Samples ☐ Record Documents ☐ Calculations
 (_____ copies) ☐ Product Data ☐ Schedules
☐ LEED Submittal ☐ O&M Manuals
☐ Other

ITEM BEING SUBMITTED FOR (check only one)

- ☐ Action ☐ Information Only ☐ Record

REMARKS OR DEVIATIONS

CONTRACTOR / CM CERTIFICATION
(SUBMITTALS NOT CERTIFIED WILL BE RETURNED WITHOUT REVIEW)



PARIC CORPORATION
SUBMITTAL STAMP

THIS SHOP DRAWING HAS BEEN REVIEWED BY PARIC CORPORATION

Subcontractor remains responsible for dimensions, quantities, coordination with other trades and compliance with contract documents.

Ry:

By:
Devin D. Gates

REVIEWED BY	DATE

A/E COMMENTS

- ☐
- See attached sheet(s) for additional comments

REVIEWED BY	DATE



77 Westport Plaza
Suite 250
St. Louis, MO 63146

TRANSMITTAL

No. 15051-0203

Paric Corporation

PROJECT: 15051-Webster University Interdisciplinary Science Building

DATE: 08/31/2016

TO: Cannon Design
1100 Clark Ave
St Louis MO 63102

RE: DuctWork Product Data

ATTN: Kelvin Patel

JOB: 15051

WE ARE SENDING:	SUBMITTED FOR:	ACTION TAKEN:
☐ Shop Drawings	☒ Approval	☐ Approved as Submitted
☐ Letter	☐ Your Use	☐ Approved as Noted
☐ Prints	☐ As Requested	☐ Returned After Loan
☐ Change Order	☐ Review and Comment	☐ Resubmit
☐ Plans		☐ Submit
☐ Samples	SENT VIA:	☐ Returned
☐ Specifications	☐ Attached	☐ Returned for Corrections
☒ Other: Product Data	☐ Separate Cover Via:	☐ Due Date:

<i>Item</i>	<i>Package</i>	<i>Code</i>	<i>Rev.</i>	<i>Copies</i>	<i>Date</i>	<i>Description</i>	<i>Status</i>
Submittal		238800-008	1		08/31/2016	DuctWork Product Data	Submitted

NOTES:

CC:

Signed: _____
Devin Gates



Mechanical

LETTER OF TRANSMITTAL

TO: Paric Corporation

77 West Port Plaza #250

St. Louis, MO 63146

ATTN: Jason Szachnieski, Devin Gates

DATE: 8/30/16

JOB #: 5768

RE: Webster ISB

We are sending you

☒

Shop drawings

☐ Attached

☐ Prints

☐ Under separate cover

☐ Plans

☐ Samples

☐ Specifications

☐ Copy of letter

☐ Change order

☐ Other

COPIES	DATE	NO.	DESCRIPTION
1	8/30/16	238800	Sheet Metal Duct Work

These are transmitted as checked below:

☐ For signature

☐ For your use

☐ As requested

☐ For bids due

☒

For review and comment

☐ Approved as submitted

☐ Approved as noted

☐ Returned for corrections

☐ Prints returned after loan to us

☐ Other

☐ Resubmit

☒

Submit

☐ Return

☐ copies for approval

☐ copies for distribution

☐ corrected prints

Remarks: Please return by 9/12/16

COPY TO: file

SIGNED:

Alex Chambers



Mechanical

Webster University ISB Webster Groves, MO

Submittal #:

238800

Submittal Description:

Sheet Metal Duct Work

Return By:

9/12/16

Please Note: To avoid scheduling delays and equipment release delays, please submit by the "Return By" date.

CHECKED BY:			
DESIGNER:		ENGINEER:	
☒	NO EXCEPTION TAKEN	☐	MAKE CORRECTIONS NOTED
☐	SUBMIT SPECIFIED ITEM	☐	REVISE AND RESUBMIT
☐	REJECTED	☐	
Checking is only for general conformance with the design concept of the project and general compliance with the information given in the contract documents. Any action shown is subject to the requirements of the plans and specifications. Equipment supplier is responsible for: dimensions which shall be confirmed and correlated at the job site; fabrication processes and techniques of construction; coordination of his work with that of all other trades; and satisfactory performance of his work.			
		Job #:	5768
		Date:	8/30/16
		By:	ARC



Webster University ISB Job # 5768

Ductwork Specification Submittal

See revised list in WTA comments.

DUCT SYSTEM	SHAPE	MATERIAL	JOINTS	NOTES
LOW PRESSURE SUPPLY, RETURN, OUTDOOR AIR, RELIEF, EXHAUST	Round	G-60	Gasketed	1,7,8
	Rectangular	G-60	Slip & Drive	
MEDIUM PRESSURE SUPPLY DUCT	Round	G-60	Gasketed	2,7,8
	Rectangular	G-60	Slip & Drive	
RANGE HOOD KITCHEN EXHAUST DUCT (CONCEALED)	Round	16 Gauge Carbon Steel	Welded and Flanged	3
	Rectangular	16 Gauge Carbon Steel	Welded and Flanged	
RANGE HOOD KITCHEN EXHAUST DUCT (EXPOSED)	Round	14 Gauge 304 Stainless Steel	Welded and Flanged	3
	Rectangular	14 Gauge 304 Stainless Steel	Welded and Flanged	
ACID RESISTANT FUME HANDLING DUCT	Round	304L Stainless Steel	Welded and Flanged	4,5,6
	Rectangular	304L Stainless Steel	Welded and Flanged	
NOTES				
1. ALL RETURN, EXHAUST, OUTDOOR AIR, MAKEUP, RELIEF, AND SUPPLY DUCT WORK DOWNSTREAM FROM VAVS SHALL BE CONSTRUCTED OF GAUGES AND REINFORCEMENT TO +/- 2" W.G.				
2. ALL MEDIUM PRESSURE SUPPLY DUCTWORK, UNLESS SPECIFIED OTHERWISE, SHALL BE CONSTRUCTED OF GAUGES AND REINFORCEMENT TO 4" W.G. STATIC PRESSURE.				
3. RANGE HOOD KITCHEN EXHAUST DUCTS WILL COMPLY WITH NFPA PAMPHLET 96. ALL JOINTS WILL BE LIQUID TIGHT EXTERNALLY WELDED AND FLANGED. DUCT SHALL SLOPE TOWARDS HOODS AND BE INSTALLED WITHOUT FORMING DIPS OR TRAPS.				
4. ALL ACID RESISTANT FUME EXHAUST BRANCHES FROM THE FUME HOODS TO THE EXHAUST MAINS SHALL BE CONSTRUCTED 304 STAINLESS STEEL WITH A NO. 4 FINISH. SEAMS AND JOINTS SHALL BE LIQUID TIGHT EXTERANALLY WELDED AND FLANGED. THE MATERIAL WITH TRANSITION TO GALVANIZED STEEL AT THE HEADER.				
5. ALL BRANCH AND HEADER ACID RESISTANT FUME EXHAUST DUCTWORK IN CHEMISTRY LAB CLASSROOM 472 SHALL BE CONSTRUCTED OF A MINIMUM 16 GAUGE THICKNESS.				
6. TURNING VANES FOR ACID RESISTANT FUME EXHAUST DUCTS SHALL BE FABRICATED OF 304 STAINLESS STEEL. VOLUME DAMPERS SHALL HAVE STAINLESS STEEL BEARINGS AND SHAFTS WITH EPOXY COATED BLADES.				
7. ALL ROUND DUCTS SHALL HAVE SPIRAL SEAMS.				
8. ALL ROUND AND RECTANGULAR DUCT SHALL USE PROSEAL SEALANT WHERE SEALANT IS REQUIRED.				