

Engineering Report

ORIFLOW Engineering
2112 Sunnydale Blvd. Suite J
Clearwater, Florida 33765

Strength of Spiral Seam Elbows – Collapse Testing

Client: Jinwwong Technology Ltd.
Date: January 27, 2012

Summary:

Five galvanized steel, spiral seam, elbows were tested for strength by applying a vacuum (negative pressure) to see what pressure would cause each elbow to collapse. The elbows were fabricated by Jinwwong Technology Ltd., a Korean manufacturer of the equipment that fabricates spiral seam elbows. Three of the five elbows did not collapse while the other two elbows collapsed, but at extremely high negative pressures.

Test Specimens:

The five elbows tested had diameters of 3.6 in. (92 mm), 5.7 in. (145 mm), 9.6 in. (245 mm), 15.6 in. (395 mm), and 19.3 in. (490 mm). All five elbows were fabricated from galvanized steel that was 0.020 inches (0.51 mm) thick.

Test Method:

Elbows were tested per the following:

- ANSI/ASHRAE Standard 126-2008, *Method of Testing HVAC Air Ducts and Fittings*.

See *Figure 1* for a picture of the typical test setup.



Figure 1
Typical Test Setup, 15.6 in. (395 mm) Elbow Shown

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Test Method (continued):

The equipment used for testing is shown in greater detail in *Figure 2* and *Figure 3*. In *Figure 2*, a picture is shown of the vacuum pump used to evacuate air from each elbow. In *Figure 3*, a picture is shown of the digital pressure gauge used to measure negative pressure.



Figure 2
Vacuum Pump used to Evacuate Air from Each Elbow



Figure 3
Pressure Gauge used to Measure Negative Pressure

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Test Results:

Test results are shown in *Table 1a* and *Table 1b*. For pictures of each elbow after collapsing, see *Figures 4* through *7*.

Table 1a – Collapse Pressures (in.wg.)

Elbow Size (inches)	Collapse Pressure (in.wg.)
3.6	Did not collapse at - 396
5.7	Did not collapse at - 356
9.6	Did not collapse at - 384
15.6	- 214
19.3	- 131

Table 1b – Collapse Pressures (Pa)

Elbow Size (mm)	Collapse Pressure (kPa)
92	Did not collapse at - 98.6
145	Did not collapse at - 88.6
245	Did not collapse at - 95.6
395	- 53.3
490	- 32.6



Figure 4

Picture of 15.6-inch (395 mm) Elbow after Collapsing

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Test Results (continued):



Figure 5

Picture of 15.6-inch (395 mm) Elbow after Collapsing



Figure 6

Picture of 19.3-inch (490 mm) Elbow after Collapsing

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Test Results (continued):



Figure 7

Picture of 19.3-inch (490 mm) Elbow after Collapsing

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