

Standard for Safety

1400 Degree Fahrenheit Factory-Built Chimneys

Overview of Test Installations

1. Temperature Measurement

Equivalent nominal diameter of chimney		Column 1		Column 2	
		Temperature test – 1400°F (760°C) flue gases		Temperature test – 1800°F (982°C) flue gases	
Inches	(mm)	BTU/Hr x 1,000	(kW)	BTU/Hr x 1,000	(kW)
6	(150)	59.2	(17.4)		
7	(180)	80.5	(23.6)		
8	(200)	106	(31.1)		
9	(230)	133	(39.0)		
10	(250)	165	(48.4)	281.1	(82)
12	(300)	238	(69.8)	413.4	(121)
14	(360)	323	(94.7)		
16	(410)	421	(123)	727.5	(213)
18	(460)	533	(156)	930.1	(273)
20	(510)	658	(193)	1136.8	(333)
22	(560)	796	(233)	1653.6	(485)
24	(610)	947	(278)	1653.6	(485)
26	(660)	1,111	(326)		
28	(710)	1,289	(378)		
30	(760)	1,480	(434)	2583.7	(757)
36	(900)	2,131	(625)	3720.6	(1091)

2. Temperature Test

Material	Maximum rise above room temperature	
	°F	°C
1. Aluminum alloys –		
11100 (2S)	330	183
3003 (3S)	430	239
2014, 2017, 2024, 2052 ^a	530	294
2. Aluminum-coated steel, heat-resistant type ^b	1030	572
3. Carbon steel-coated with Type A19 ceramic	1030	572
4. Galvanized steel ^c	480	267
5. Low-carbon steel, cast iron ^d	830	461
6. Stainless steel –		
Types 302, 303, 304, 321, 347	1235	686
Type 316	1200	667
Type 309S	1560	867
Types 310, 310B	1610	894
Type 430	1310	728
Type 446	1730	961

^a These and other alloys containing more than 1.0 percent magnesium shall not be used when the reflectivity of the material is utilized to reduce the risk of fire.

^b When the reflectivity of aluminum-coated steel is utilized to reduce the risk of fire, the maximum allowable temperature rise shall be 830°F (461°C).

^c The specified maximum temperature rise shall apply when the galvanizing is required as a protective coating or the reflectivity of the surface is utilized to reduce the risk of fire.

^d The specified maximum temperature rises apply to parts whose malfunction results in the product being incapable of further use.

3. Positive Pressure Applications Test

- a. Chimney should be assembled incorporating a minimum ratio of 50 inches of seal per cubic foot of sealed sample.
- b. Chimney is to be pressurized to a 60 inch water column or the manufacturer’s rated pressure.
- c. The chimney is then to be subjected to the flue gas temperatures listed in the temperature test and conducted for 4 hours.
- d. Following the exposure of temperature, the chimney is again to be pressurized to a 60 inch water column or manufacturer’s rated pressure.

4. Vertical Support Test

- a. Chimney section is to be placed on the support, and is to be loaded by means of weights or machine. Max load should be 4 times the load imposed by the heaviest chimney that the support is required to sustain in service and applied for 60 minutes.

5. Impact Test

- a. A sand bag is to be swung on a pendulum at 3 different impact points and chimney should not become damaged in any way.

6. Longitudinal force test

- a. A force of 100 pounds is to be applied first to the flue-gas-conveying conduit, then to the outer jacket or casing.

7. Load test for chimney elbows

- a. A vertical load equal to 4 times the weight of the longest supported section of the chimney is to be attached to the longest supported section of the elbow and applied through the center of gravity of the section and sustained for 5 minutes.

8. Chimney joint load test

- a. A vertical load equal to four times the weight of the length of the chimney between supports should be applied to the inclined length of flue-pipe between supports. The load is to be sustained for 5 minutes.

9. Wind Load Test

- a. 30 pounds per square foot of wind pressure is to be applied to the surface of the assembly in a horizontal direction for roof assemblies.
- b. For lateral supports; two lateral supports should be spaced at max distance specified by manufacturer. 30 pounds per square foot of wind pressure should be applied.

10. Rain Test

- a. Rain test apparatus is to consist of three spray heads mounted in water-supply pipe rack.
- b. Water pressure for all tests should be maintained at 5psig at each spray head.
- c. Should be directed at top of roof assembly.
- d. Water collected should not exceed the value obtained by application of formula:

$$Q < \text{ or } = 0.02 \times R \times A$$

Where:

Q = Volume of water actually collected, cubic inches per hour;

R = Rainfall, inches per hour; and

A = Area of conduit or passageway, square inches.