



MAURA HEALEY
GOVERNOR

KIM DRISCOLL
LIEUTENANT GOVERNOR

ASHLEY STOLBA
INTERIM SECRETARY, EXECUTIVE
OFFICE OF ECONOMIC
DEVELOPMENT

**Commonwealth of Massachusetts
Division of Occupational Licensure
Board of Examiners of Sheet Metal Workers**

One Federal Street, Suite 600
Boston, Massachusetts 02110-2012

LAYLA R. D'EMILIA
UNDERSECRETARY, CONSUMER
AFFAIRS AND BUSINESS
REGULATION

SARAH R. WILKINSON
COMMISSIONER, DIVISION OF
OCCUPATIONAL LICENSURE

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Sheet Metal Board Code Advisory - Commercial Kitchen Grease Duct Testing

Objective: To provide instructions and requirements for commercial kitchen grease duct testing and inspection, to ensure that the system was installed liquid-tight and grease-tight in order to contain the spread of any grease duct fires, which risk the loss of life and property.

Summary: Currently, many installers and inspectors use the 100-watt light bulb test required by the International Mechanical Code (IMC) to help identify inferior welded seams. This test is not practical for testing field-welded grease ducts vertically installed in shafts where full visibility of all welded seams may not be available, or where a 100-watt light bulb cannot be pushed or pulled through a horizontal duct run.

Effective IMMEDIATELY, the Board advises that the entire grease duct system be leak tested under negative pressure equal to the duct fabrication pressure class. This test will measure and prove the tightness of the duct system without visibly inspecting each welded seam. Instructions on how the test should be performed follow below. State Sheet Metal Inspectors have found this to be effective in identifying leaks that may otherwise not have been visible with a light bulb test.

This test must be performed by a properly licensed sheet metal business or individual that specializes in Testing, Adjusting, and Air Balancing of HVAC systems.

If you have any questions, please contact the Board at 617-727-3022.



Kitchen Grease Exhaust Testing:

Testing, Adjusting and Balancing – Commercial Kitchen Exhaust.

The following testing methods and criteria shall be used when pressure testing kitchen grease exhaust ductwork to verify the following:

1. System is installed correctly and shall perform as intended or designed.
2. The overall quality and workmanship of the installation.
3. That public safety is not at risk due leakage caused by inferior welds and seams.
4. The duct does exceed allowable leakage when pressurized to the design negative duct pressure class.

Scope. The testing of new and renovated kitchen grease exhaust systems in commercial and residential buildings shall include the following:

1. Have a duct leakage pressure test performed as a part of a rough inspection prior to being covered, concealed, insulated or wrapped and prior to connecting the exhaust fan and the kitchen exhaust hood(s) or equipment. The pressure test shall be witnessed by the building inspector and the test documents signed by the permit holder or tester (*if different*) and the inspector.
2. At the completion of the project the system will be tested, adjusted and balanced. Balancing will be performed by an independent TAB contractor and a balancing report will be generated prior to final sign off of the permit.
3. All applicable systems shall be pressure tested during the initial installation. If the kitchen grease exhaust system is modified or renovated then the entire system will require testing. Testing and balancing shall be performed initially *as stated* above and additionally as needed.

Duct Pressure Test Procedure. A duct pressure test shall be performed by the permit holder or its testing agency using the criteria from this code below. Test personnel shall be a MA licensed sheet metal worker.

1. To perform the duct pressure test on a kitchen grease exhaust system you will need to know the ¹WG rating of the duct and the ²allowable leakage accepted for a duct.
2. ¹ The WG rating of the duct construction for the kitchen grease duct will determine the test pressure to test to. *The test pressure is not determined by the fan capabilities or the external pressure of the fan but the duct construction class rating in inches of WG.*
3. ² In order to determine the allowable CFM of leakage for a test you need to:

Measure the amount of surface square foot (SSF) of metal used to make the duct.

Determine what the leakage class (C_L) of the duct is to be tested.

Once you have the C_L determine the Leakage Factor (F) for the duct pressure test.

4. The allowable leakage for the duct test is determined by the calculation in Table 1.

(a) ¹For all **KGE** pressure tests the test shall be (-) negative and the leakage class shall be a $C_L 0.5$ (b) For a quick guide of leakage factors on typical duct construction classes to determine the Leakage Factor "F" for a specific test refer to Table 2.

Table 1 Allowable Leakage Formula	
Problem	$(SSF / 100) * F = \text{Allowable Leakage measured in CFM.}$
When -	
SSF =	Surface Square Foot of metal (stock) used to construct the duct to be tested.
C _L =	Leakage Class, determined by duct construction class and seal class or ¹ as specified by this code.
(P) =	Duct static pressure in inches of water column that the duct is to be tested to.
F =	Leakage Factor which is determined by: $F = C_L(P)^{.65}$

Table 2 Leakage Factor "F" Quick Guide													
Leakage Class (C _L)	POSITIVE & NEGATIVE DUCT STATIC PRESSURE IN INCHES												
	0.25"	0.50"	0.75"	1.00"	1.50"	2.00"	2.50"	3.00"	4.00"	6.00"	8.00"	10.00"	12.00"
0.5	0.20	0.32	0.41	0.50	0.65	0.78	0.91	1.02	1.23	1.60	1.93	2.23	2.51
1	0.41	0.64	0.83	1.00	1.30	1.57	1.81	2.04	2.46	3.20	3.86	4.47	5.03
2	0.81	1.27	1.66	2.00	2.60	3.14	3.63	4.08	4.92	6.41	7.73	8.93	10.06
3	1.22	1.91	2.49	3.00	3.90	4.71	5.44	6.13	7.39	9.61	11.59	13.40	15.09
4	1.62	2.55	3.32	4.00	5.21	6.28	7.26	8.17	9.85	12.82	15.45	17.87	20.12
5	2.03	3.19	4.15	5.00	6.51	7.85	9.07	10.21	12.31	16.02	19.32	22.33	25.14
6	2.44	3.82	4.98	6.00	7.81	9.42	10.88	12.25	14.77	19.23	23.18	26.80	30.17
7	2.84	4.46	5.81	7.00	9.11	10.98	12.70	14.30					
8	3.25	5.10	6.64	8.00	10.41	12.55	14.51	16.34					
9	3.66	5.74	7.47	9.00	11.71	14.12	16.33	18.38					
10	4.06	6.37	8.29	10.00	13.02	15.69	18.14	20.42					
12	4.87	7.65	9.95	12.00	15.62	18.83	21.77	24.51					
24	9.75	15.29	19.91	24.00									
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Testing Equipment. The permit holder or its testing agency must provide all equipment necessary to perform the kitchen exhaust duct pressure test. As a minimum this equipment must consist of:

1. A test blower or apparatus capable of producing enough negative pressure to achieve the ducts design pressure class.

2. A calibrated orifice and tube with a certified flow chart with corresponding ΔP 's and CFM rates to calculate the CFM leakage.
3. A high range manometer for reading the test duct negative static pressure with a range of at least $\pm 0.00''$ to $\pm 12.00''$. This manometer can be liquid filled, analog or digital. Liquid filled U-Tube type and analog devices must be adjusted to zero prior to running the test fan and the digital manometer must be calibrated within one year of the test date and with no stored readings in memory.
4. A low range manometer sized for reading the test orifice ΔP . If the calculate orifice ΔP is less than $1.00''$ WG then the range of this instrument shall not be larger than $1.00''$ for this test and must be inclined if liquid filled not a U-Tube type. If analog then no larger than a $\pm 2.50''$ range on the gauge. Digital manometers must be calibrated within one year of the test date and with no stored readings in memory.
5. A speed drive, SCR or blast gate damper to control the pressure and flow from the test blower or apparatus as not to over pressurize and compromise the grease exhaust duct.
6. See Figure 1 for illustration of the test apparatus configuration below.

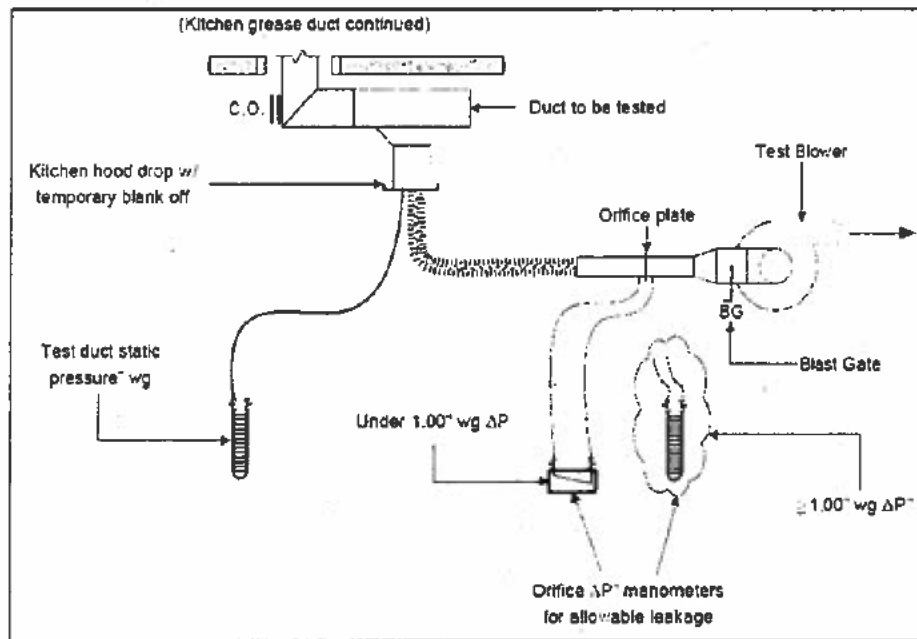


Figure 1

Documentation. It is the responsibility of the permit holder or its testing agency for providing all of the documentation and forms for the test. As a minimum the testing documentation shall contain the following:

1. Sketch of the ductwork section being tested showing **SSF** of sections, temporary testing caps and test portion end and beginning termination points.

2. Pressure Test form consisting of the following:

(a) Name of Architect, Engineer, Permit Holder and Testing Agency (if different).

(b) MA sheet metal permit #.

(c) Technician name and MA sheet metal license number and test date.

(d) Name and ID # of the System / Exhaust Fan.

(e) The Leakage Class (C_L), Static Pressure **KGE** test must be a (-) negative test.

(f) The testing fan & orifice plate manufacturer, model and serial number.

(g) Name / location of section and total SSF. (list all branches on separate lines then total).

(h) Allowable Leakage Factor & CFM.

(i) Test tube & Orifice sizes.

(j) The actual test static pressure.

(k) The actual pressure drop across the test orifice and the actual CFM leakage.

(l) Pass or fail box or section.

(m) Signature sections for the technician and inspector who witnessed the test.

(n) Section to note if this is a complete test of the system or partial test (# of #)