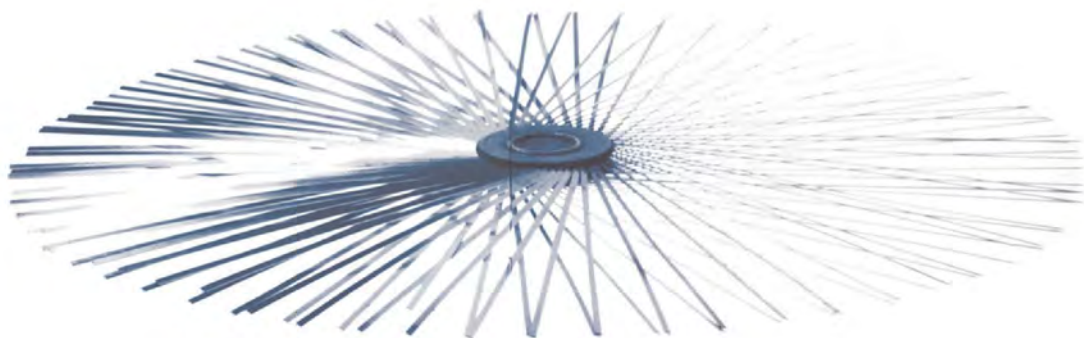


WELCOME !





Wöhler Messgeräte
Kehrgeräte GmbH

Leading manufacturer of measuring, visual inspection
and cleaning tools for sweeps

History

Sept. 2007: 75th Anniversary

Team

International Headquarters Germany: 100
employees, 220 employees worldwide

Sales

> \$25 Mill.

The Measure of Technology – more than just four words

- A passion for technology
- tailored solutions
- With our products we set the measure
- Close contact to the customer



Innovative Measuring Tools

- Flue Gas Analysis

- A 500 – Combustion analyzer
- E 3 – Combustion analyzer

- Pressure and Leakage

- DC 100 – Digital manometer
- DP 23 – Chimney Leakage test
- BC 21 – Building Leakage test



Visual Inspection

- Camera Systems
 - VIS 2xx – Videoinspectionssystem
 - Endoscopes
 - Inspection mirrors



Cleaning Tools

- The Vipers
- Rotary Viper
- Stars



A light blue world map is centered on the page. A single brown dot is located in the western United States, representing the US headquarters. A cluster of five brown dots is located in central Europe, representing other regional offices.

US Headquarters

Contact us

Wohler USA Inc.

Phone: 978 750 9876

Fax: 978 750 9799

info@wohlerusa.com

www.wohlerusa.com

„The 4 Pa Pressure Test“

Simple Testing to Confirm Combustion Air Availability

Elmar Schrader, President Wohler USA Inc.
NCSG Convention 2008, Reno, NV

CEU's T 1.25 C&S .5

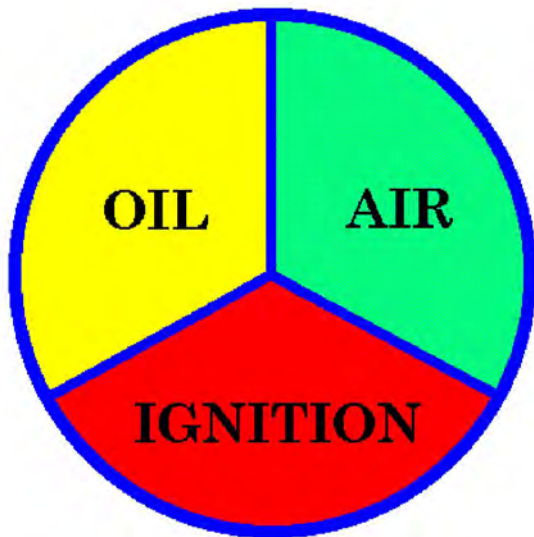
Outline

1. What is Combustion
2. Combustion Air
3. What is a Pa
4. How gets the Combustion Air to the burner
5. What can effect your Combustion Air Availability
6. What is a 4 Pa Pressure Test
7. Requirements for test equipment
8. How to perform a 4 Pa Pressure Test with the Wohler DC 100
9. Summary

What can be done to solve problems ?

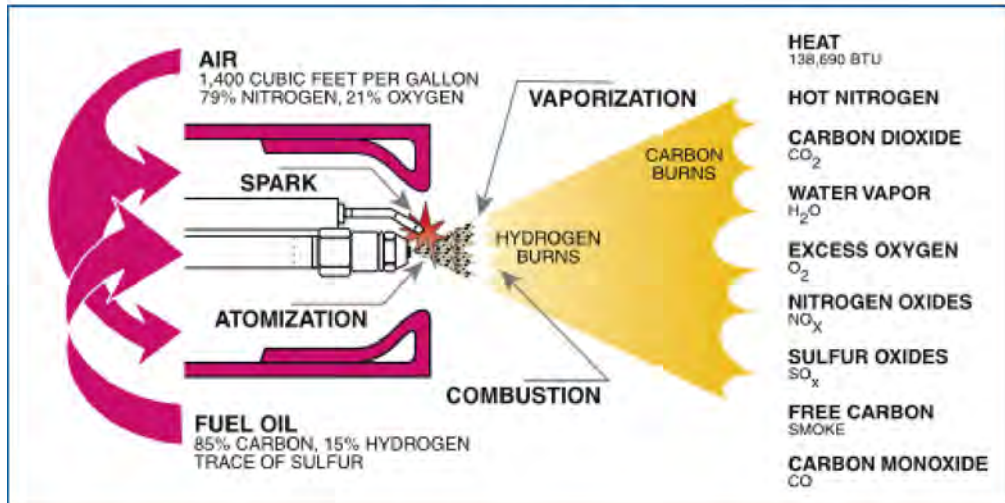
1. What is Combustion

The CIRCLE of COMBUSTION



2. Combustion Air

COMBUSTION



3. What is a Pa

Most common unit to measure draft is inch WC

$$\begin{array}{rcl} 1,000 \text{ inch WC} & = & 249 \text{ Pa} \\ 0,004 \text{ inch WC} & = & 1 \text{ Pa} \end{array}$$

1 Pa is a very low pressure!

Typical Draft in a chimney is .10 inch WC = 25 Pa

4. How gets the Combustion Air to the burner

NFPA 31: Standard for the Installation of Oil-Burning Equipment

5.3* Appliances Located in Unconfined Spaces.

5.3.1 In unconfined spaces in buildings of conventional frame, brick, or stone construction, air for combustion and ventilation shall be permitted to be supplied by normal infiltration.

5.3.2 If normal infiltration is not sufficient because of tight construction, air for combustion and ventilation shall be obtained directly from outdoors or from spaces that freely communicate with outdoors. Under these conditions, a permanent opening or openings having a total free area of not less than 1 in.² per 5000 Btu/hr (28 in.² per gal/hr) (4.4 cm²/kW), based on the total input rating of all appliances in the space, shall be provided.

4. How gets the Combustion Air to the burner

Unconfined Spaces

Any spaces whose volume is equal to or greater than 50 ft³ per 1000 Btu/hr of the aggregate input rating of all fuel-burning appliances installed therein

Example:

Input rating = 100,000 BTU/hr

$100,000 / 1,000 \times 50 \text{ ft}^3 = 5,000 \text{ ft}^3$

Roomsize for unconfined conditions = 20x25x10 ft

4. How gets the Combustion Air to the burner

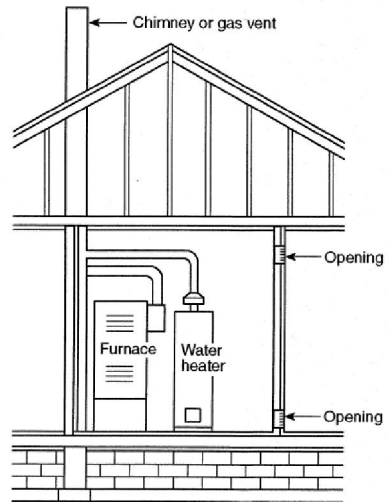
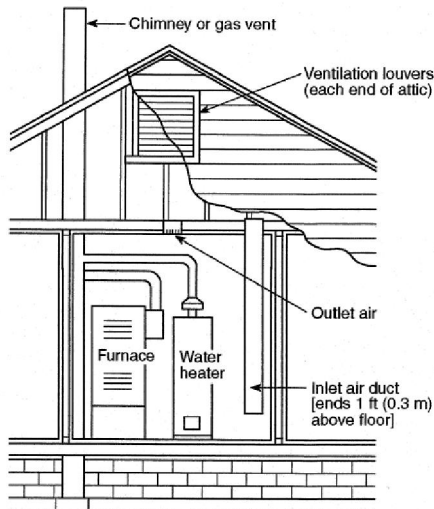
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4. How gets the Combustion Air to the burner



Appliances Located in Confined Spaces

5. What can effect your Combustion Air Availability

- Common exhaust equipment (ie attic fan, bathroom exhaust, fireplace) can compete with the normal venting process of combustion appliances
- Negative pressure conditions in the building can create back-drafting of combustion appliances



5. What can effect your Combustion Air Availability

Problems within unconfined spaces

1. Air Tight Homes
2. Air Conditioning and Ventilation
3. Modifications (Man Room)

Problems within confined spaces

1. Openings blocked
2. Ducts damaged

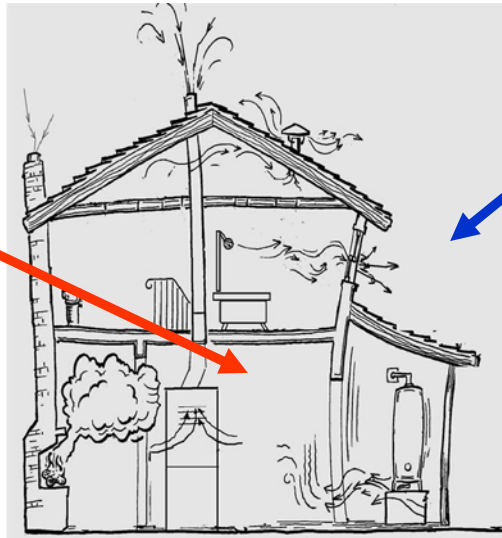
SOLUTION...

„The 4 Pa Pressure Test“

6. What is a 4 Pa Test

Pressure
inside the
building

P_i



Pressure
outside the
building

P_o

$$P_i - P_o \geq -4 \text{ Pa}$$

6. What is a 4 Pa Test

$$P_i - P_o \geq -4 \text{ Pa}$$

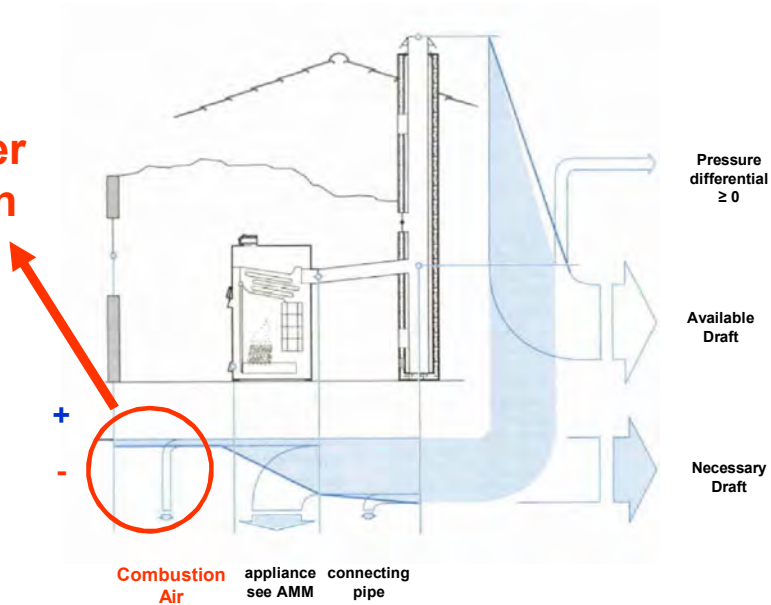
- The differential pressure between the inside and the outside of the building shall be greater or equal to -4 Pa

Why -4 Pa ?

6. What is a 4 Pa Test

defined
as -4 Pa
for proper
operation

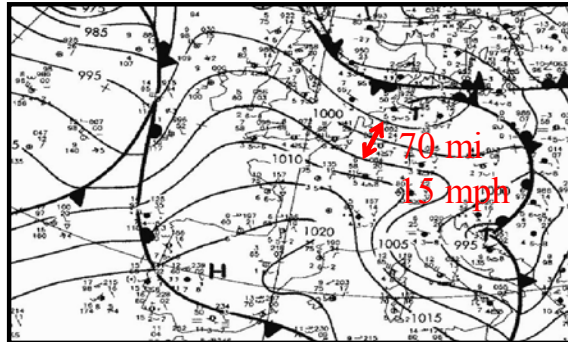
Pressure
differential



7. Requirements for test equipment

History of the test

Weather chart



Barometric pressure lines moves:

1000 Pa / 5h => 1000 Pa / 300 min about 3 Pa/min

Measuring time 3 Min: 3 min x 3Pa/min = 9 Pa

4 Pa test could not work!

7. Requirements for test equipment

- Pressure Range
 ± 50 Pa
- Resolution
 $0.1 \text{ Pa} = 0.0004 \text{ inch WC}$
- Accuracy
 $\pm 0.3 \text{ Pa}$ or 3%
- Maximum Drift
 $\pm 0.2 \text{ Pa @ } 70^\circ\text{F} \pm 5^\circ\text{F}$ ambient temperature
- Intervall
1 reading/sec
- printed report



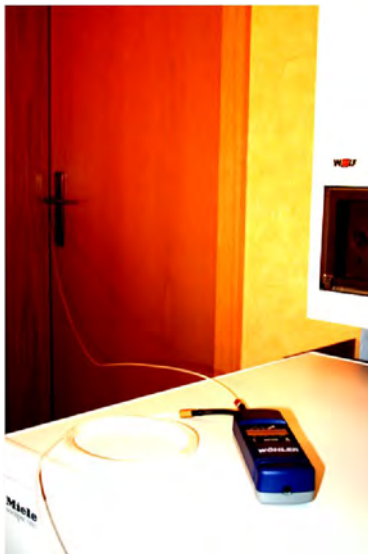
Capillary hoses for inside and outside pressure



Setup in the boiler room

one capillary hose goes
outside the room

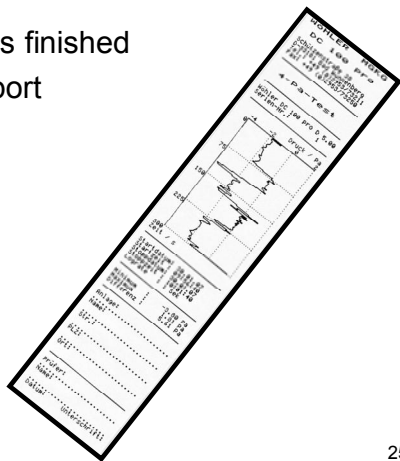
other capillary hose stays
inside



8. How to perform a 4 Pa Pressure Test

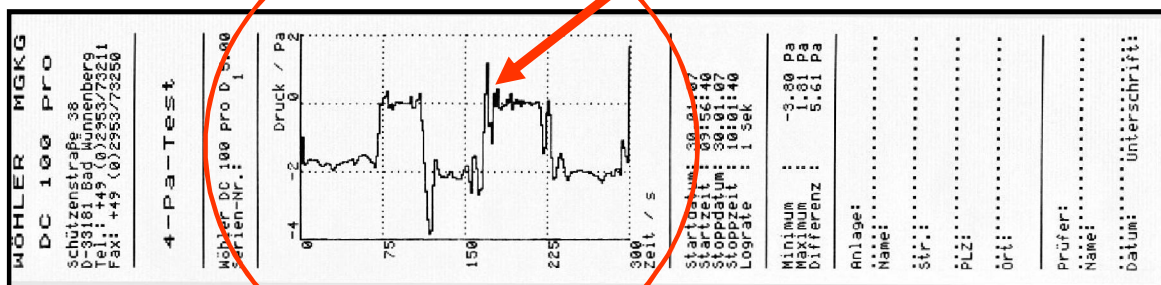
STEPS

1. Switch on appliance and all air conditioning, fan, dryer ...
2. Open a window or door to the outside and test proper operation of the appliance, ensure no backdraft conditions
3. Position outside and inside capillary tubes
4. Switch on the DC 100 and wait until selftest is finished
5. Connect inside to (-) port and outside to (+) port
6. Start 4 Pa Test
7. Window/door open for about 30 seconds
8. Window/door closed for about 30 seconds
9. Repeat 7. and 8. two times
10. Print test report



8. How to perform a 4 Pa Pressure Test

Pressure differential graph



9. Summary

- Quick and Simple test
- Reliable results
- Ensures safe operation of appliance
- Safety for the people
- Provides professional service to YOUR customers

**Without a test,
it's just a guess!**

THANK YOU



INSTITUTE OF
TECHNOLOGY