Beckett Online Training

Series 1: The Basics of Oil Burners

Module 4: Four-Step Burner Set-Up

May 20, 2020

Overview

This series will focus on the combustion cycle and set up of Beckett AF/AFG burners. Upon completion of this class you should be able to:

- List the components of a combustion cycle
- Apply and adjust a fuel unit / fuel pump
- Show how input rating changes directly with a change to pump pressure
- State the differences between an AF and AFG burner
- Set the electrodes and head positions using the Beckett T-501 and Z-2000 gauges
- Set the Z dimensions for:
  - F heads
  - M air tubes
- Benefits of solid-state igniters
- Understand operation and sizing of draft regulators
- Understand nozzle types
- Learn impact of oil temperature on operation
- Commission a burner using the 4-step combustion efficiency test

Pre 4-Step Burner Set-Up

Recommended Combustion Adjustment Procedure

1. Initiate a call for heat.
2. Adjust the draft or breech pressure to the appliance manufacturer's recommended level after flame has stabilized. A breech pressure that does not exceed -0.04 to -0.06"W.C. is generally acceptable.
3. Allow the appliance to heat up while checking calibration of combustion test equipment.

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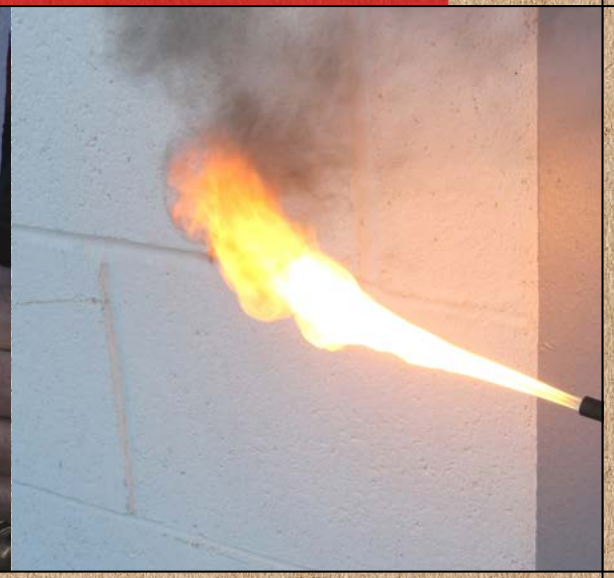
Before We Begin



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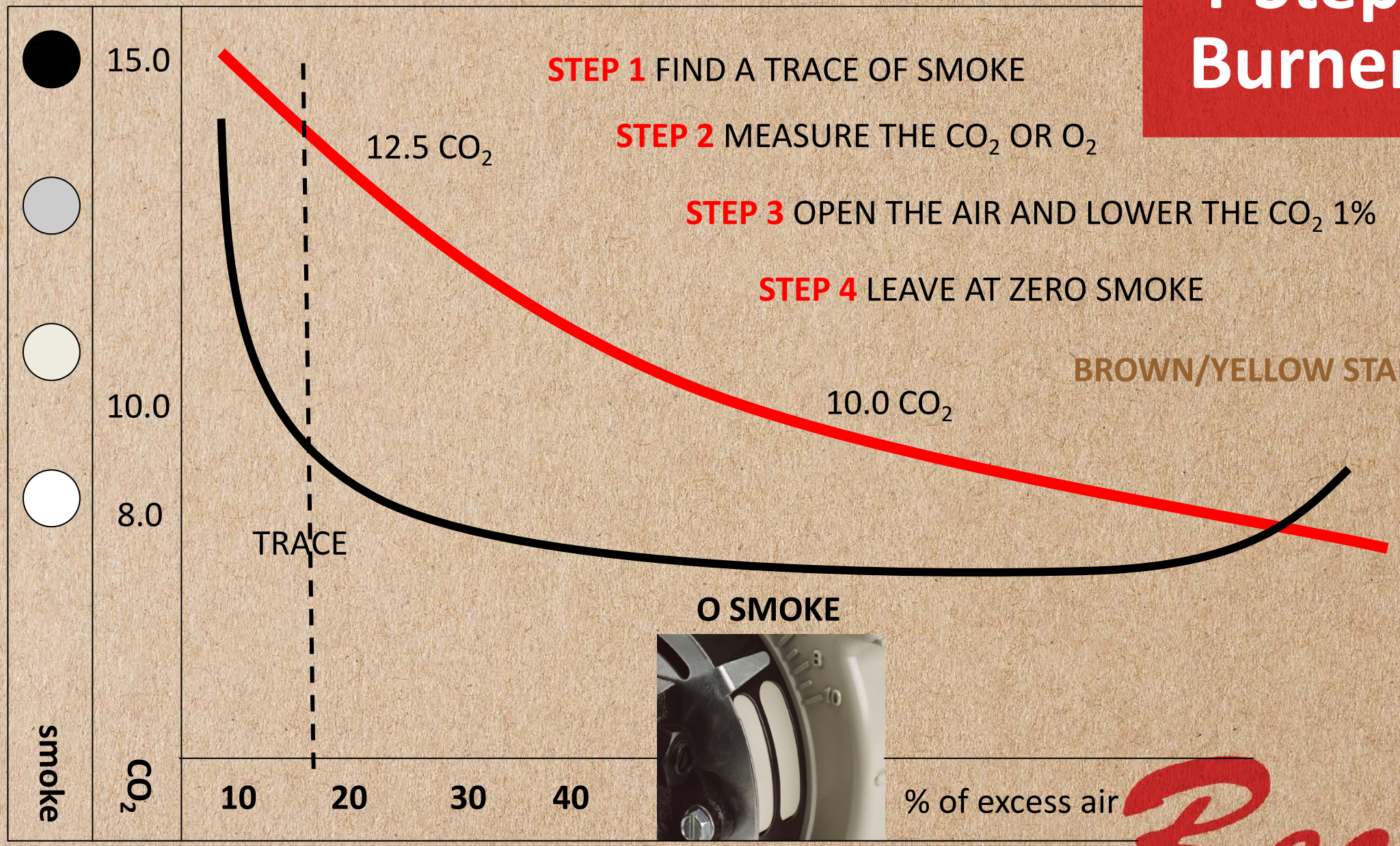
4-Step Burner Set-Up

STEP 1 FIND A TRACE OF SMOKE

STEP 2 MEASURE THE CO_2 OR O_2

STEP 3 OPEN THE AIR AND LOWER THE CO_2 1%

STEP 4 LEAVE AT ZERO SMOKE



4-Step Burner Set-Up

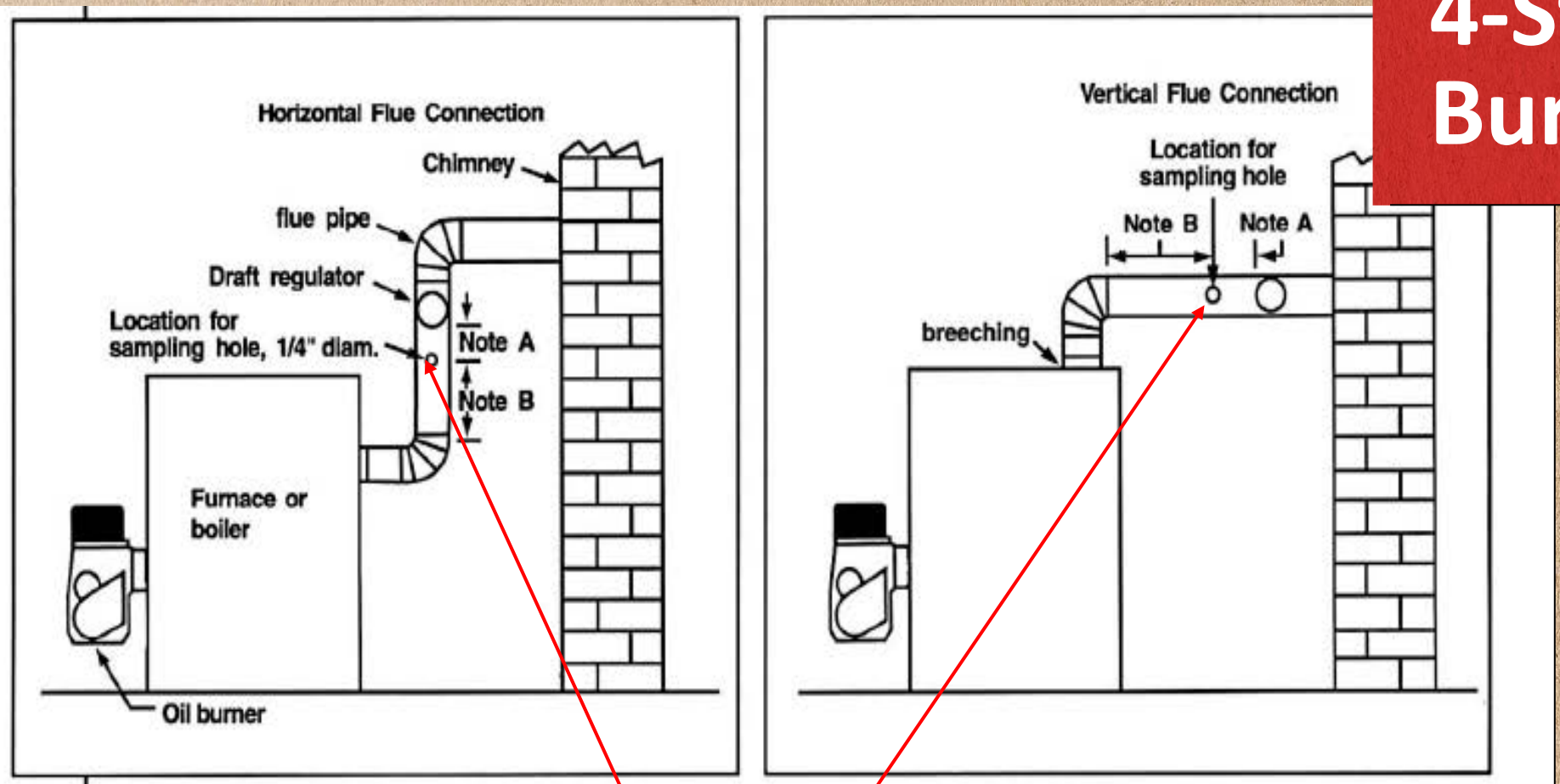


FIGURE 60 Desirable location for 1/4" flue pipe sampling hole for typical chimney connections

A. Locate hole at least one flue pipe diameter on the furnace or boiler side of the draft control.

B. Ideally, hole should be at least 2 flue pipe diameters from breeching or elbow.

Make sure the sample hole is in the right location!

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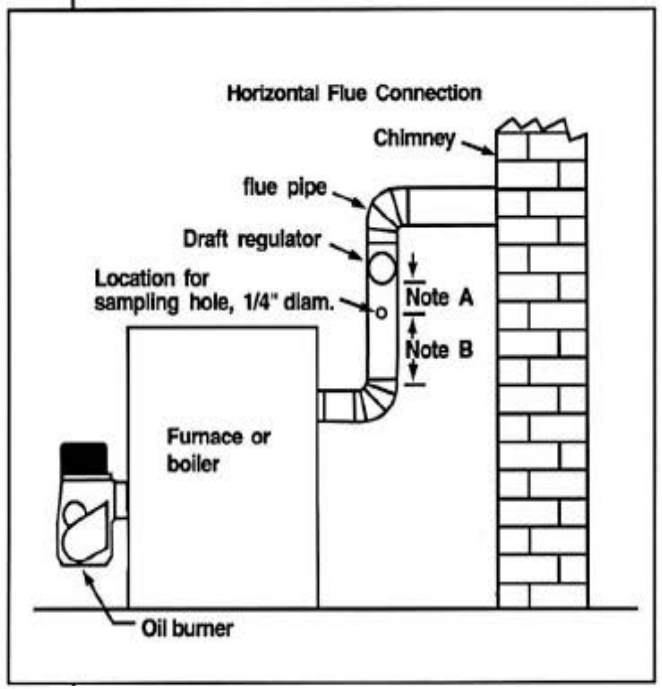
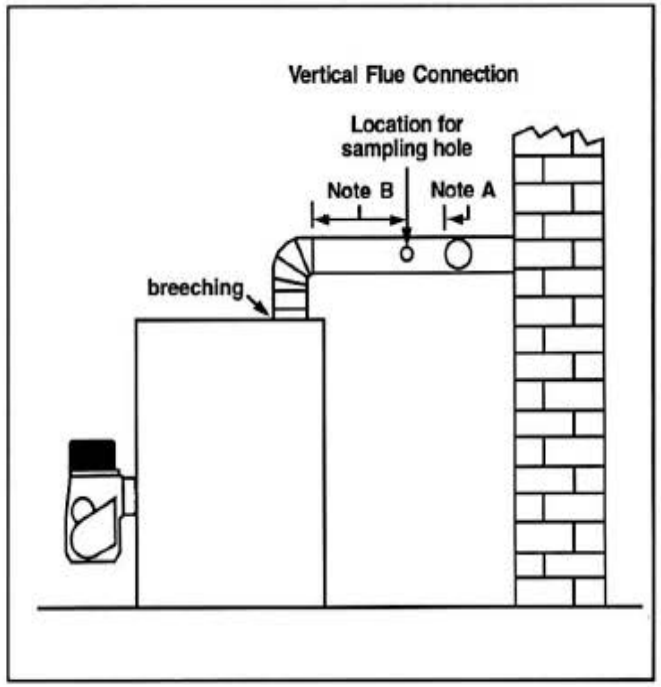
4-Step Burner Set-Up





- Check and adjust draft using the sample holes
- Make certain draft meets the requirements of the appliance.
- Adjust the draft regulator to maintain specific breech pressure.
- Make proper modifications before continuing if proper draft can not be achieved.

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4-Step Burner Set-Up

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A Bad Day

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Another Bad Day

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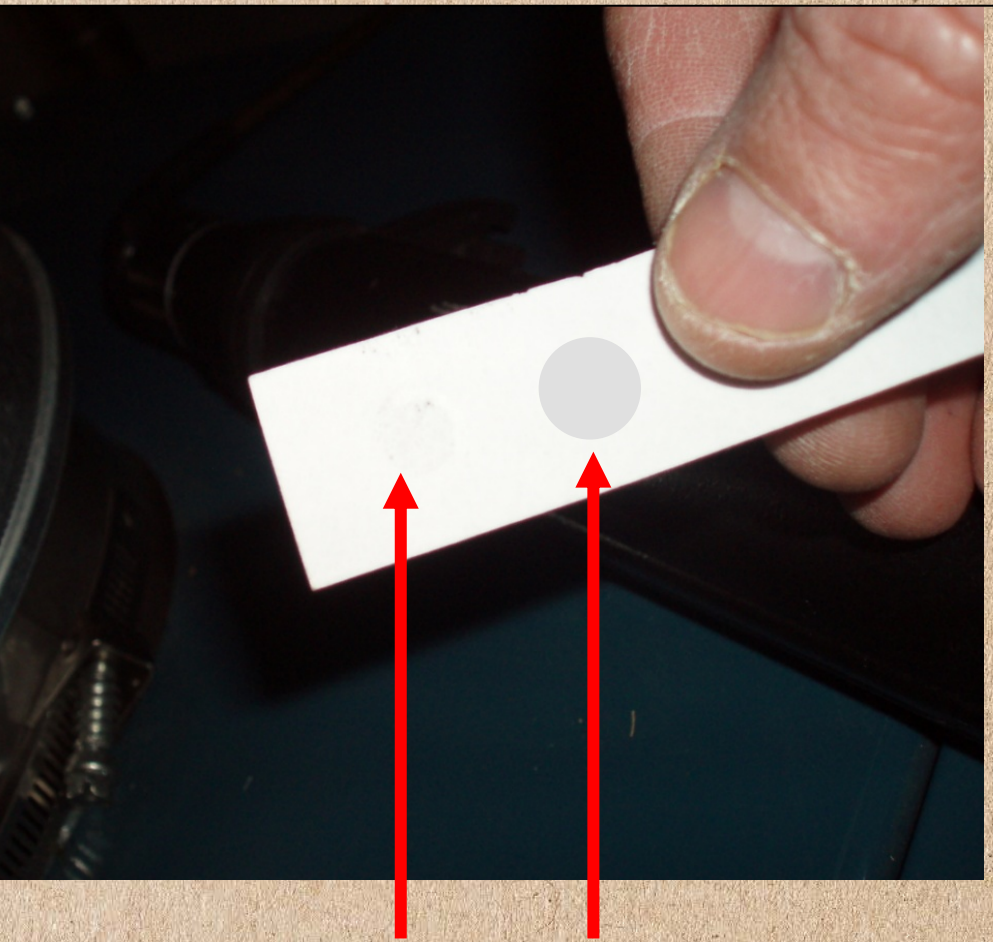
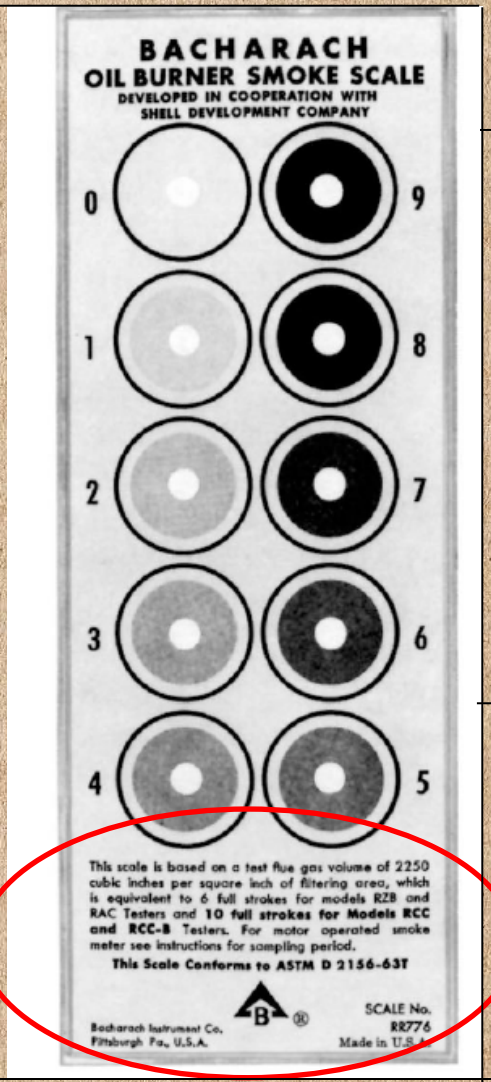
4-Step Burner Set-Up



YES NO



What is a trace of smoke?

- This scale conforms to ASTM D2156-63T

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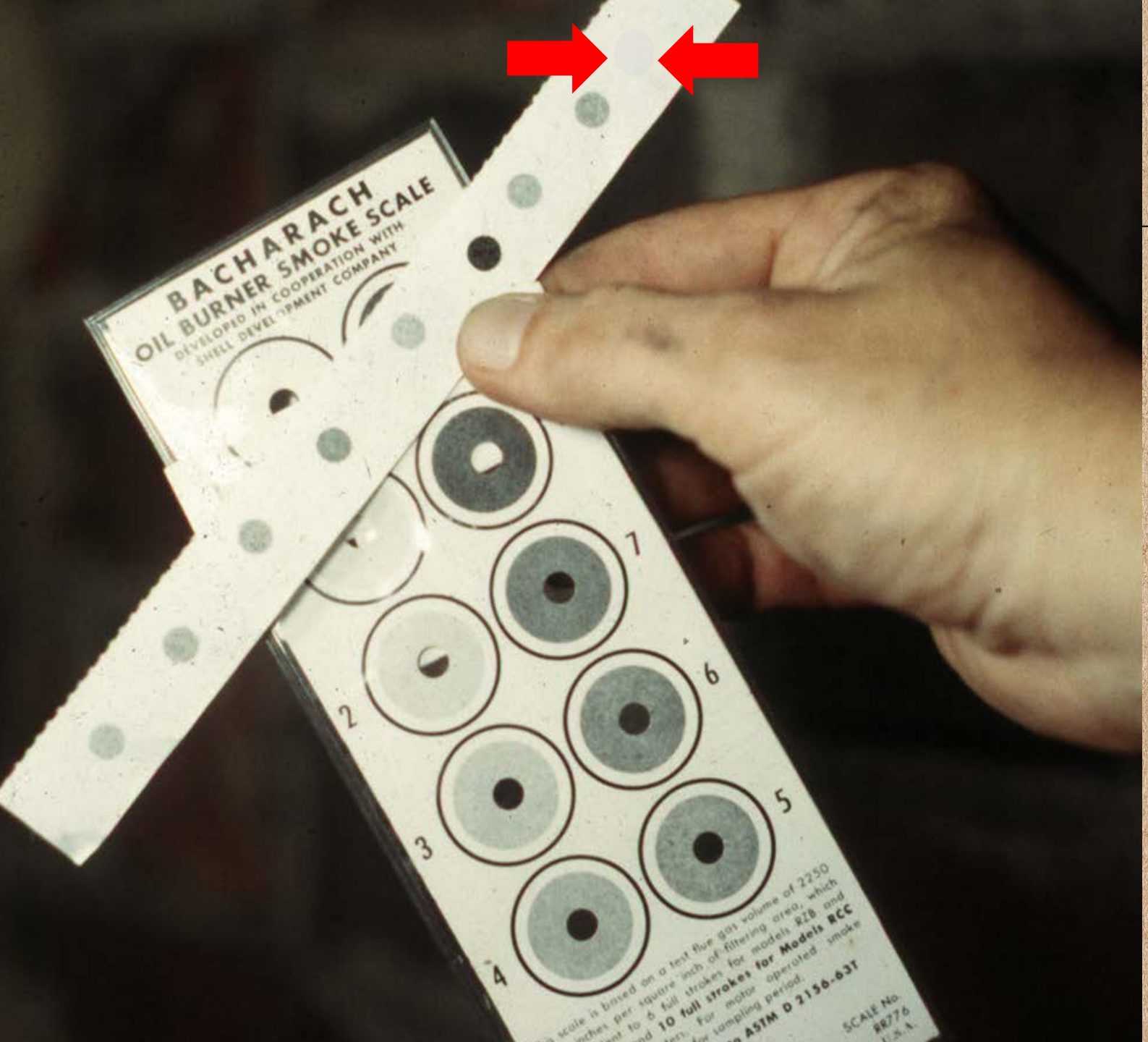

4-Step Burner Set-Up

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4-Step Burner Set-Up

Step 1:

- Find a trace of smoke

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4-Step Burner Set-Up

Step 2:

- Measure the CO_2 at a trace of smoke

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4-Step Burner Set-Up

Step 3:

- Open the air to reduce the CO_2 by 1 to 2 percentage points.

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4-Step Burner Set-Up

BEFORE	
CO_2	12.5%
O_2	4.0%
STACK	440
AMB	70
CO	3 PPM

TRACE POINT

AFTER	
CO_2	11.5%
O_2	5.2%
STACK	470
AMB	71
CO	0 PPM

ADJUSTED POINT

- Retest and verify the co_2 was reduced by 1 or 2 percentage points

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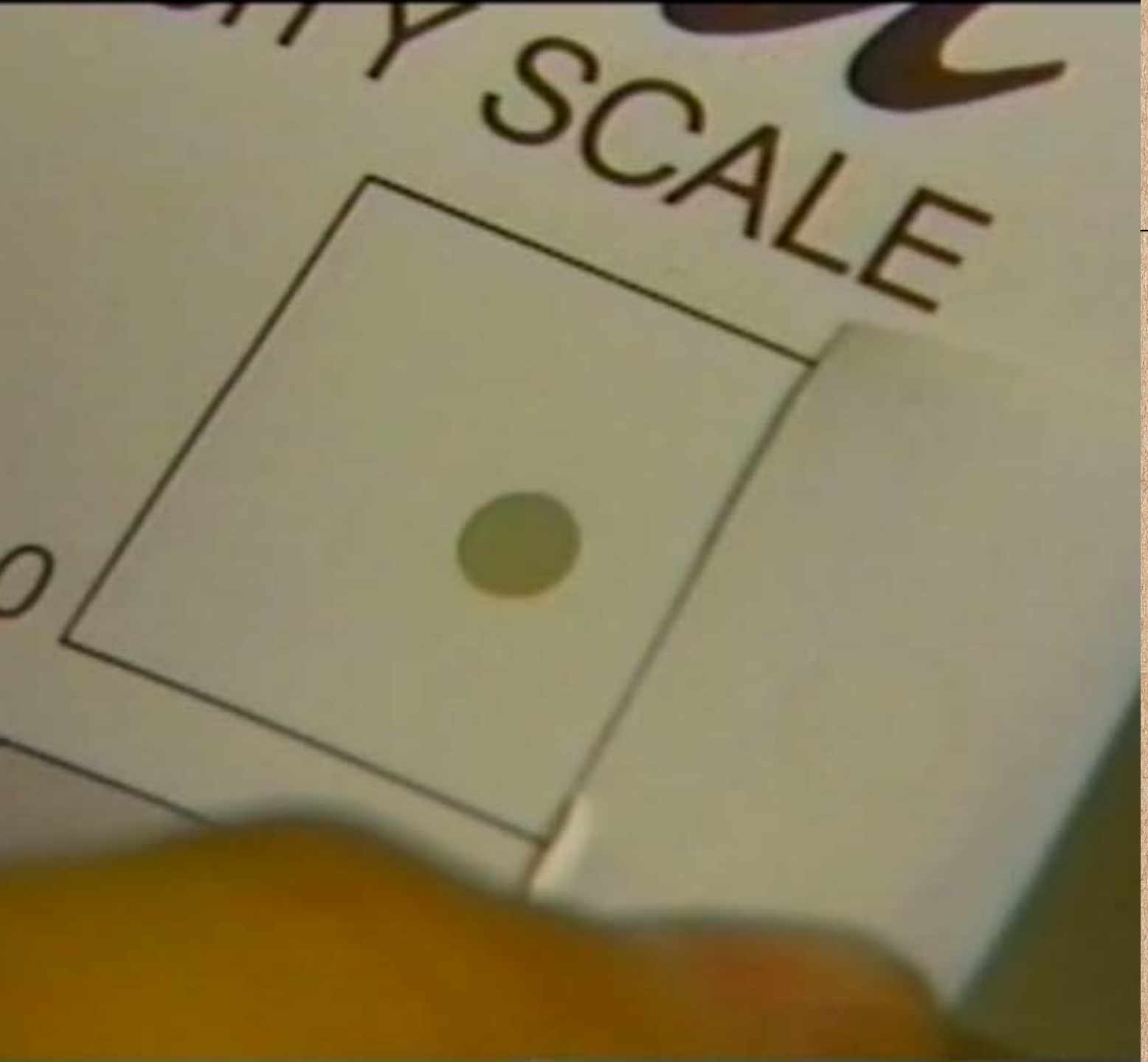

4-Step Burner Set-Up

Step 4:

- Recheck the smoke level.
- It should be zero.

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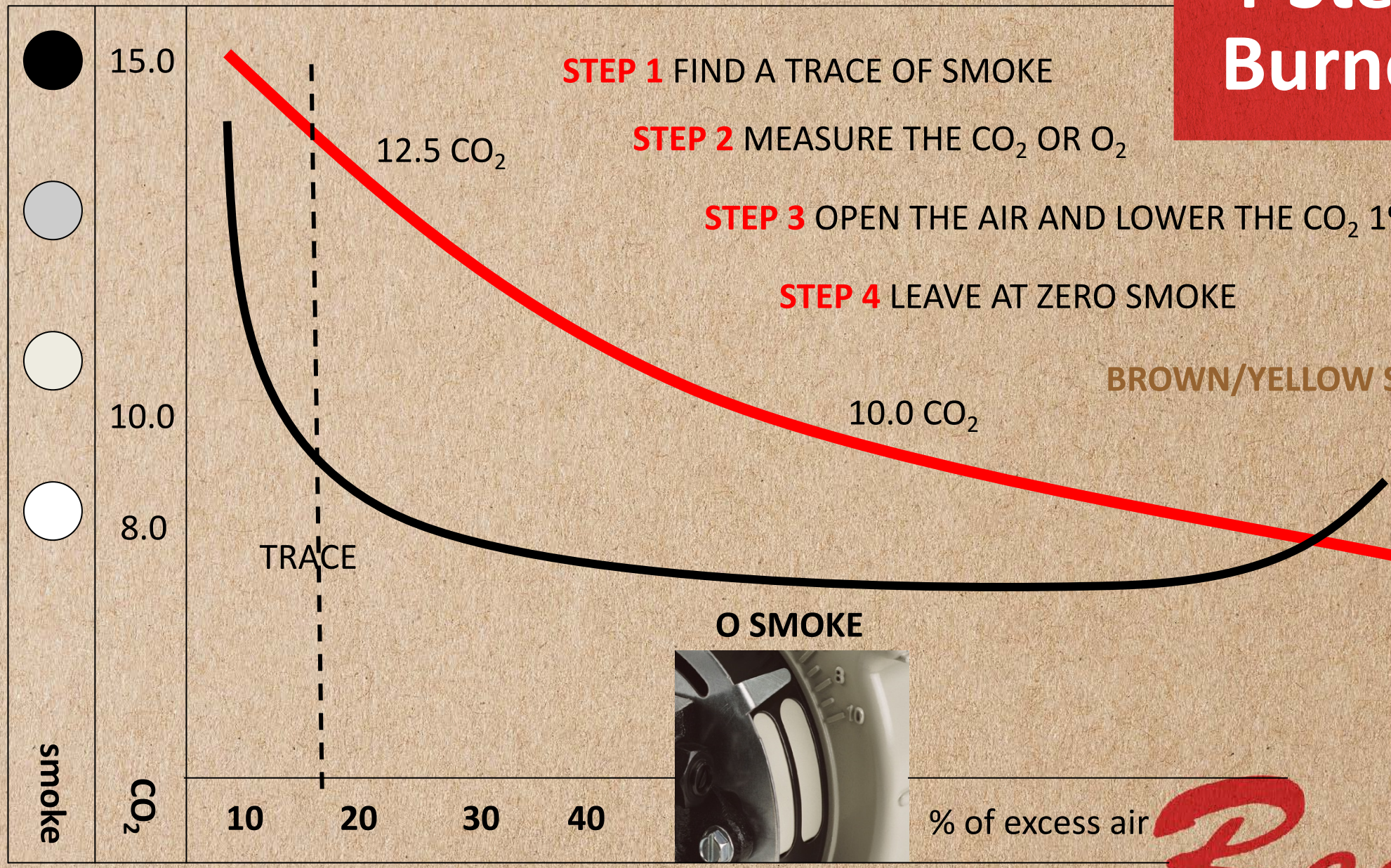
4-Step Burner Set-Up

STEP 1 FIND A TRACE OF SMOKE

STEP 2 MEASURE THE CO_2 OR O_2

STEP 3 OPEN THE AIR AND LOWER THE CO_2 1%

STEP 4 LEAVE AT ZERO SMOKE



O SMOKE

BROWN/YELLOW STAIN

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4-Step Burner Set-Up

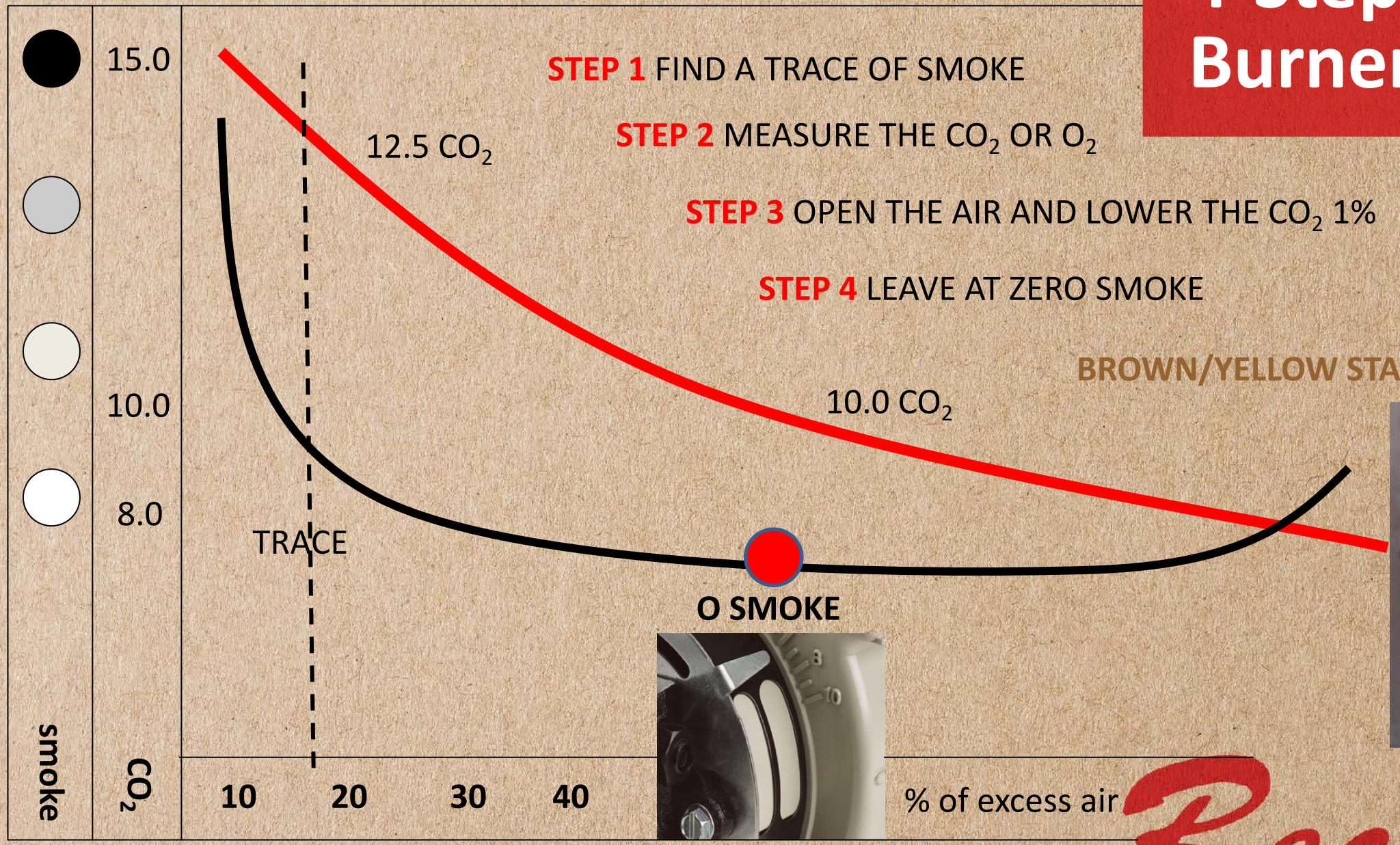
4-Step Burner Set-Up

STEP 1 FIND A TRACE OF SMOKE

STEP 2 MEASURE THE CO_2 OR O_2

STEP 3 OPEN THE AIR AND LOWER THE CO_2 1%

STEP 4 LEAVE AT ZERO SMOKE



BROWN/YELLOW STAIN

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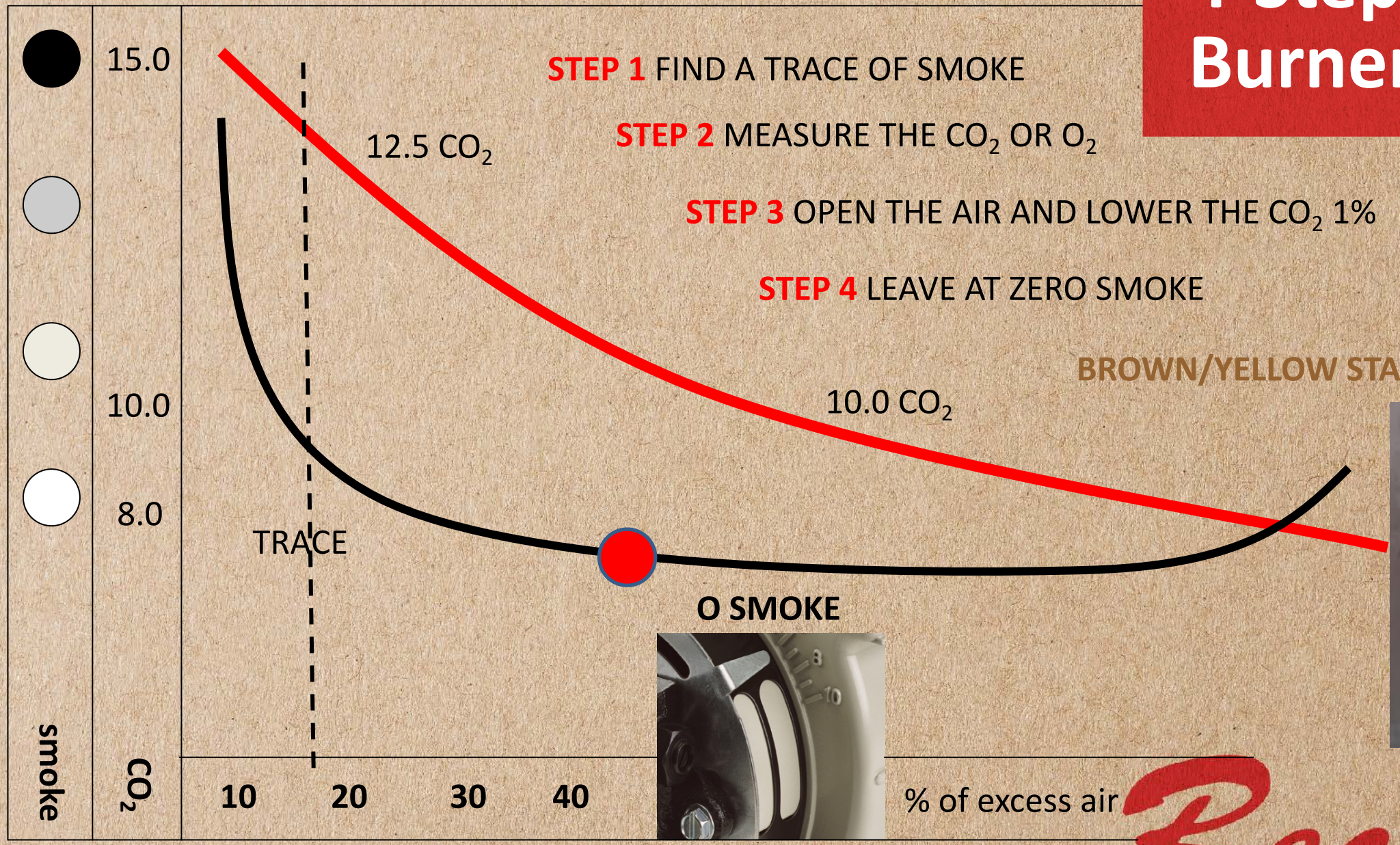
4-Step Burner Set-Up

STEP 1 FIND A TRACE OF SMOKE

STEP 2 MEASURE THE CO_2 OR O_2

STEP 3 OPEN THE AIR AND LOWER THE CO_2 1%

STEP 4 LEAVE AT ZERO SMOKE



BROWN/YELLOW STAIN

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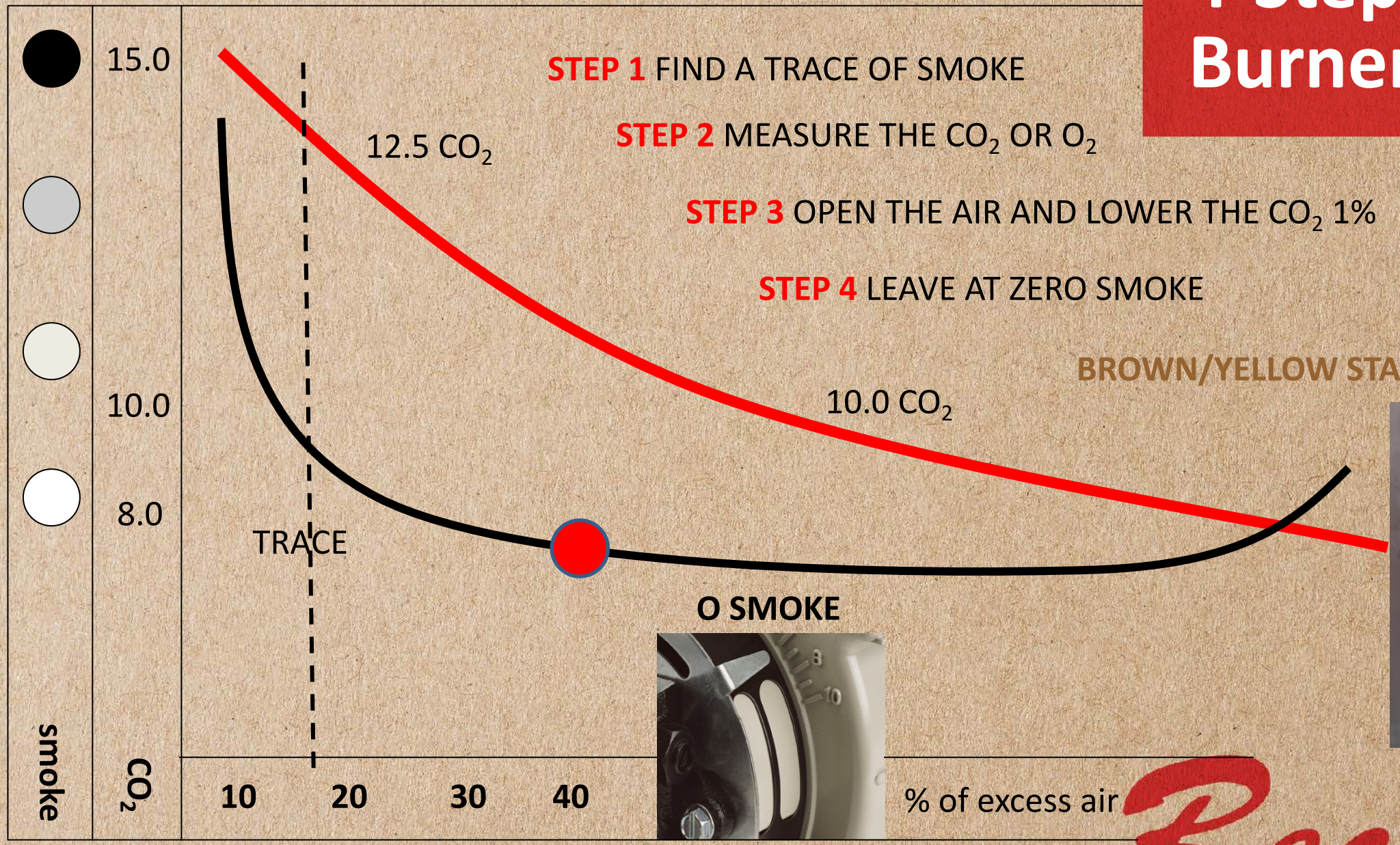
4-Step Burner Set-Up

STEP 1 FIND A TRACE OF SMOKE

STEP 2 MEASURE THE CO_2 OR O_2

STEP 3 OPEN THE AIR AND LOWER THE CO_2 1%

STEP 4 LEAVE AT ZERO SMOKE



BROWN/YELLOW STAIN

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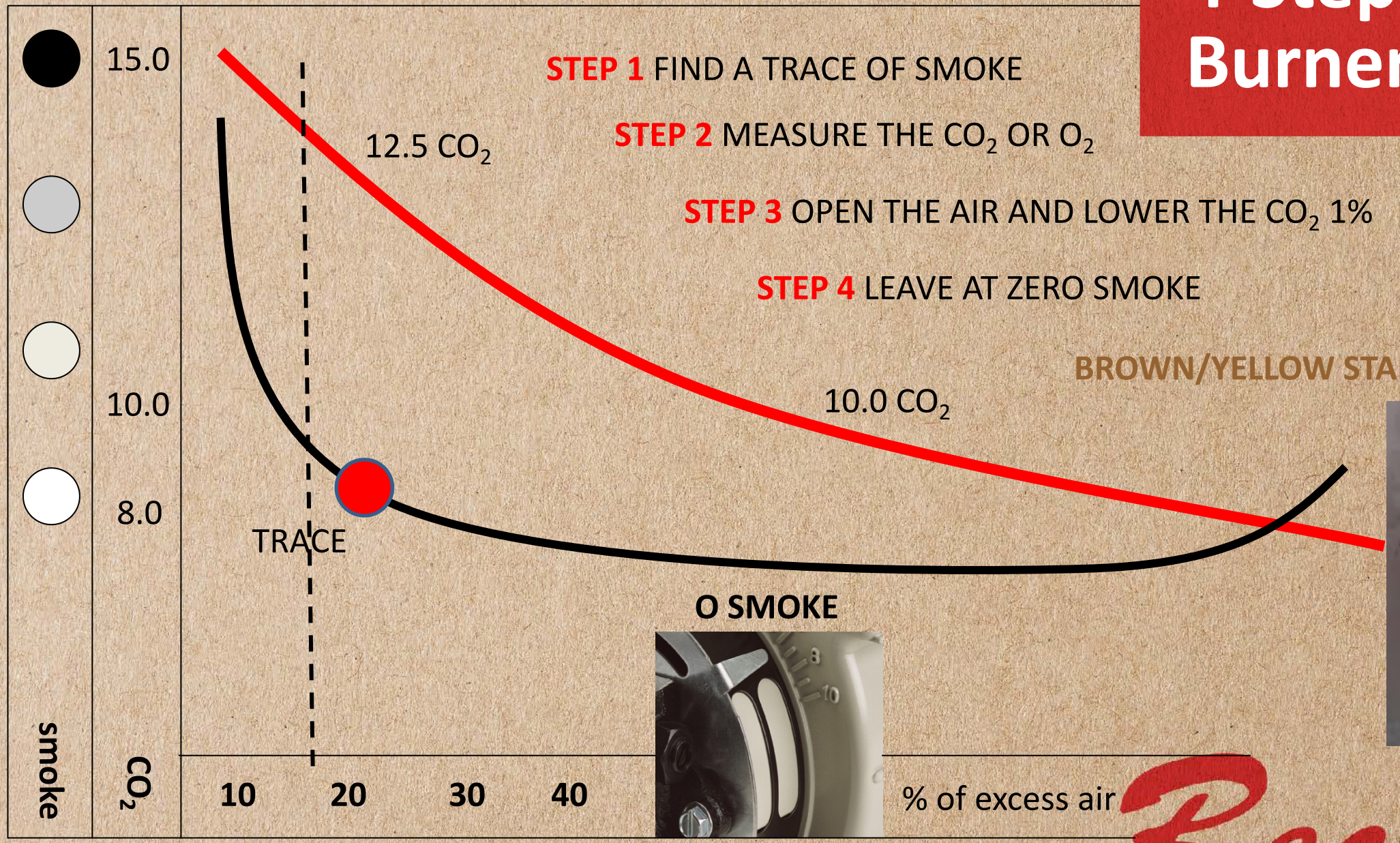
4-Step Burner Set-Up

STEP 1 FIND A TRACE OF SMOKE

STEP 2 MEASURE THE CO_2 OR O_2

STEP 3 OPEN THE AIR AND LOWER THE CO_2 1%

STEP 4 LEAVE AT ZERO SMOKE



O SMOKE

BROWN/YELLOW STAIN

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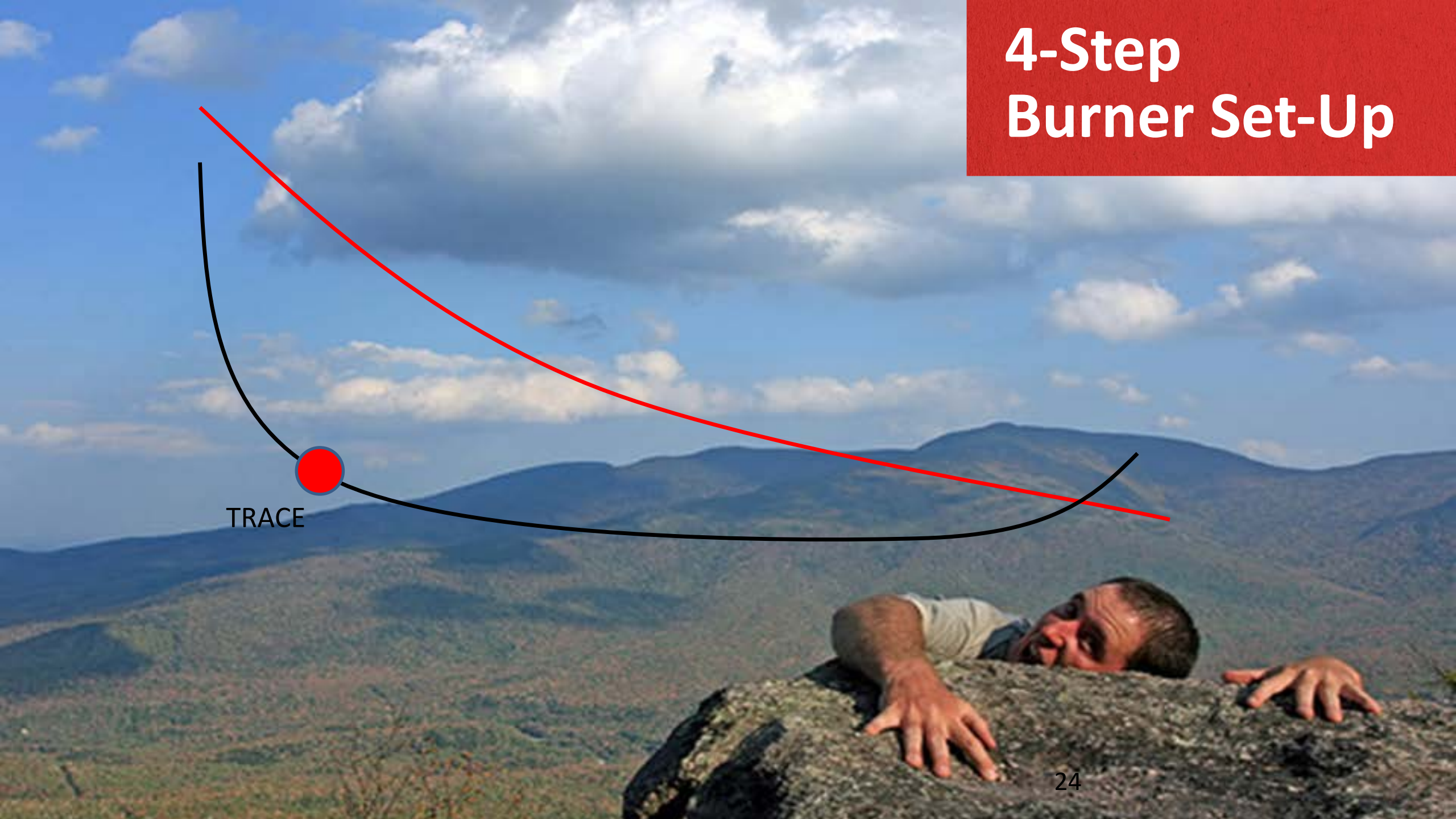
4-Step Burner Set-Up



What About Wet Kits?

- They work if you keep them up!
- Your “shaker bottle” has to have the proper scale
- Oil uses the CO_2 scale
- Use the O_2 scale for natural gas or propane
- Keep one on hand, they are handy for over-fire CO_2 testing

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Please!

- Record your test results
- Leave a copy on site
- If there are no results available, conduct an “as found” test before service
- Reference last year’s results before conducting your test
- Understand why the test results may have changed!

Please!

- What changed?
  - Building construction
  - Outdoor conditions
  - New appliances
  - Additives to the fuel
  - Chimney condition
  - Oil supply system
  - Zoning

You may not have a “Basement Problem”.

Survey the building and talk with the customer!

What are the reasons for low efficiency calculations?

Here's what to check for and additional tests


CAUTION
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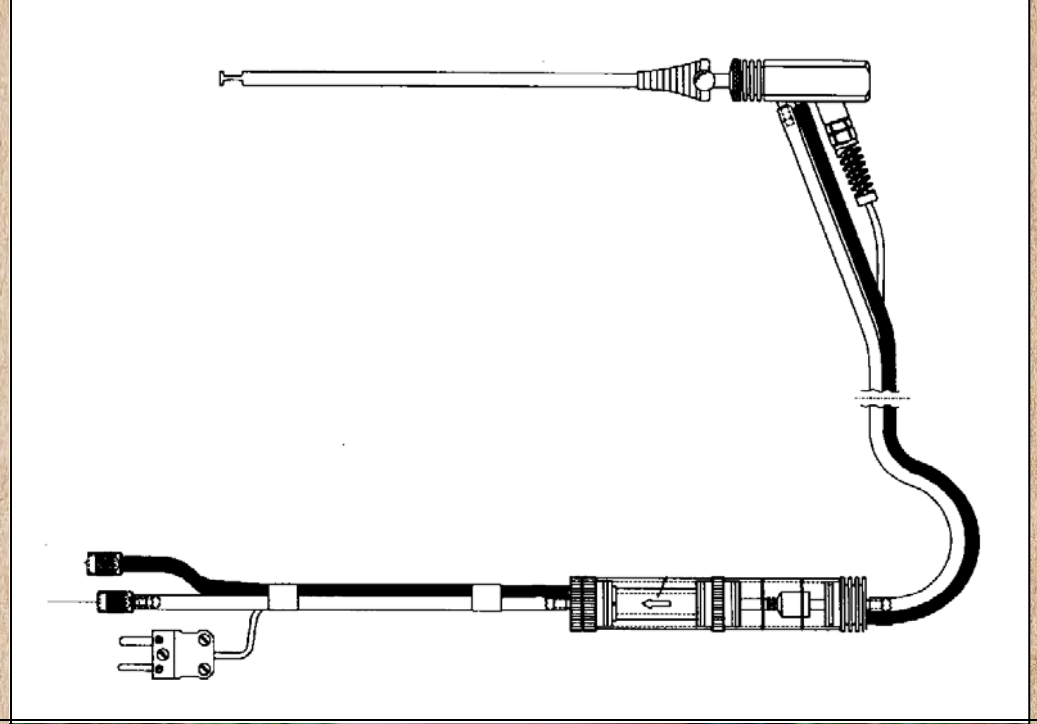

CO_2 6.6 %

==========

TIME 09:35:50 am
DATE 12/03/18

FUEL
OIL NO 2

STACK-TEMP	460°F
AMB. –TEMP	71.0°F
O_2	12.0 %
CO_2	**6.6 %**
CO	07 ppm
0% COR CO	0_2 ppm
EFFICIENCY	75.4%

COMMENTS:

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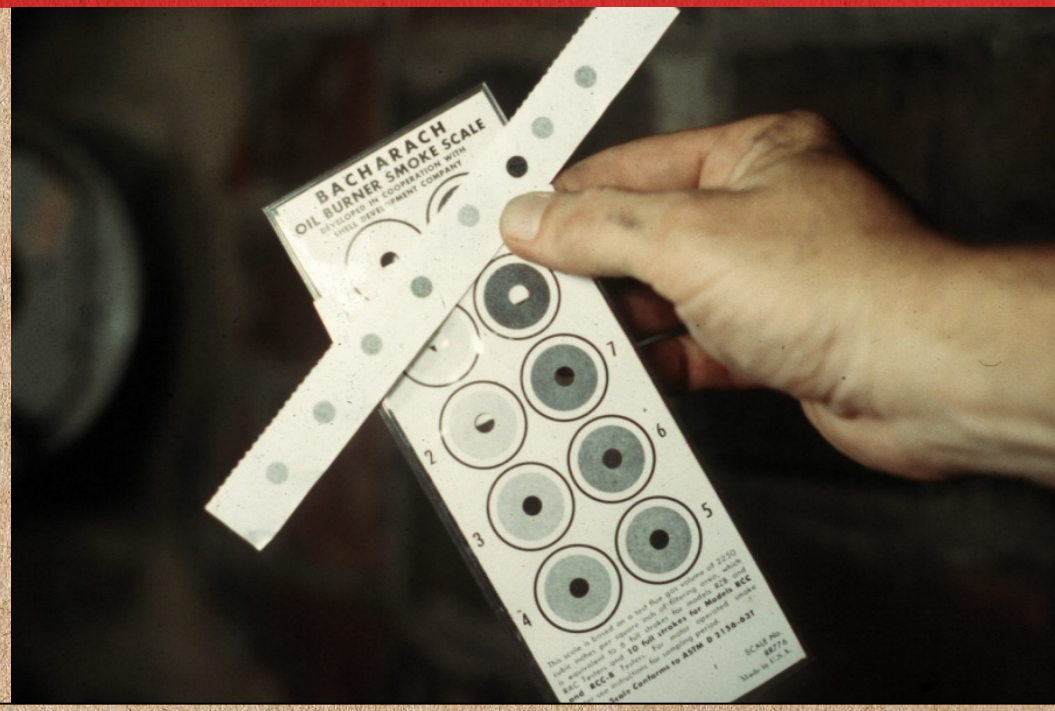
Troubleshooting Tips

Some troubleshooting tips if a trace of smoke cannot be obtained

- Partially plugged nozzle
- Not enough air provided to the burner
- Too much air provided to the burner
- Oil pressure too low
- Plugged heat exchanger
- Wrong nozzle for the application
- Vacuum too high (plugged filter or oil line restriction)
- Cold oil (larger droplets)
- Poor oil quality (water bacteria sludge)
- Z dimension incorrect
- Carbon on the retention head
- Air in the oil supply line



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It’s your turn.

What other questions do you have?

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