CSA Unit 15 - Domestic Appliances

Chapter 1 Gas Ranges: Installation and Servicing

Cooking with gas has always been the choice of professional chefs and has gained a similar reputation in the home. The instant heat and immediate cool-down are features that electric units find difficult to compete with. Numerous styles of gas ranges, types of ignition systems, and temperature controls are used in today's product lineup. The gas technician/fitter must be aware of old as well as new technology that may be encountered when installing and servicing gas ranges.

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Created by Mike Kapin

Objectives

Describe Different Types of Gas Ranges

Understand the various types of gas ranges available in the market

Describe Installation Procedures

Learn proper piping and electrical connections for gas ranges

Describe Burners and Ignition Systems

Understand the different burner types and ignition mechanisms

Describe Oven Controls

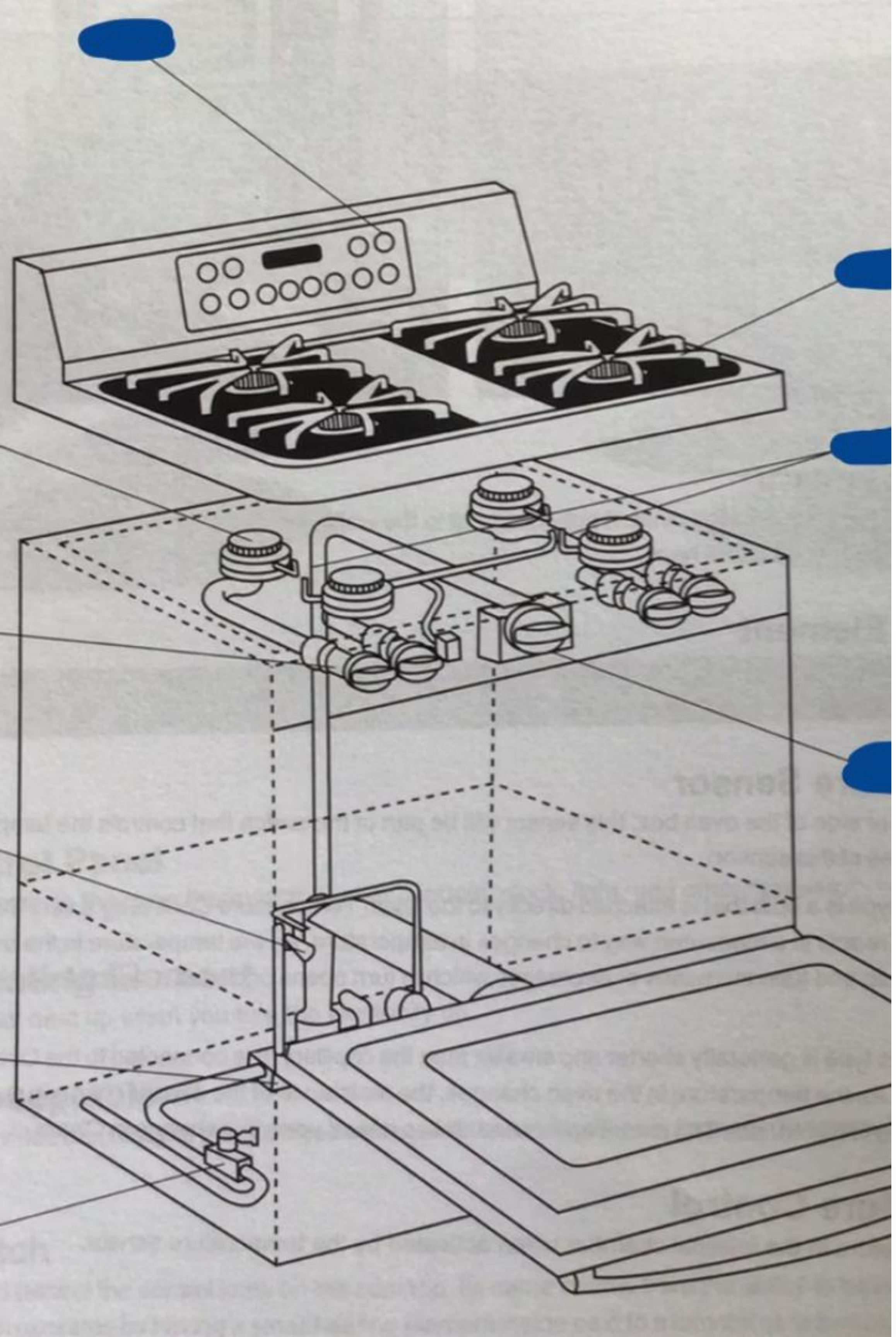
Learn about calibration and testing of oven controls

Describe Operation of Gas Ranges

Understand how gas ranges function

Describe Servicing of Gas Ranges

Learn proper maintenance and repair procedures



Key Terminology

Term	Abbreviation (Symbol)	Definition
Anti-tipping device		Device that prevents accidental tipping of a range
Appliance regulator		Used to reduce the gas supply pressure to the operating pressure of the appliance
Drill Manufacturer's Standard	DMS	
Orifice		A hole or opening used primarily to control the direction and volume of gas flow into a burner

CSA Gas Trade Unit Red Seal

Occupational Skills

- Performs safety-related functions
- Maintains and uses tools and equipment
- Plans and prepares for installation, service and maintenance

Gas Piping Preparation and Assembly

- Fits tube and tubing for gas piping systems
- Fits plastic pipe for gas piping systems
- Fits steel pipe for gas piping systems

Venting and Air Supply Systems

- Installs venting
- Installs air supply system
- Installs draft control systems

Red Seal Tasks (Continued)

Electrical Systems Controls

- Selects and installs electronic components
- Selects and installs electrical components
- Installs automation and instrumentation control systems

Installation of Systems and Equipment

- Installs gas-fired system piping and equipment
- Installs gas-fired system components
- Installs propane storage and handling systems

Testing and Commissioning

- Tests gas-fired systems
- Commissions gas-fired systems

Servicing Gas-fired Systems

- Maintains gas-fired systems
- Repairs gas-fired systems
- Decommissions gas-fired systems

Types of Gas Ranges

Free-standing Ranges

Not built-in or permanently installed. Most residential service gas-fired ranges are 24 to 30 inches wide, free-standing units with an integral oven.

Built-in Ranges

Permanently installed as part of the kitchen cabinetry. A gas-fired wall oven is a separate built-in unit installed and operated independently from the drop-in countertop cooktop unit.

Gas and Electric Combination Units

Offer gas stove top burners with electric oven options.

Dual Fuel Units

Can run on propane or natural gas. The conversion is usually accomplished by means of an adjustable orifice.

Major Features of Gas Ranges

Self-cleaning Feature

An oven equipped with a self-cleaning feature incinerates the baked-on dirt in the oven by heating it to high temperature during a cleaning cycle.

For safety, the oven door locks when the cleaning cycle is selected and remains locked until the oven cools after the cleaning cycle ends.

Continuous Cleaning Feature

In a continuous cleaning oven, the dirt is baked off the oven surfaces on a continuous basis while food is cooking.

Broiler

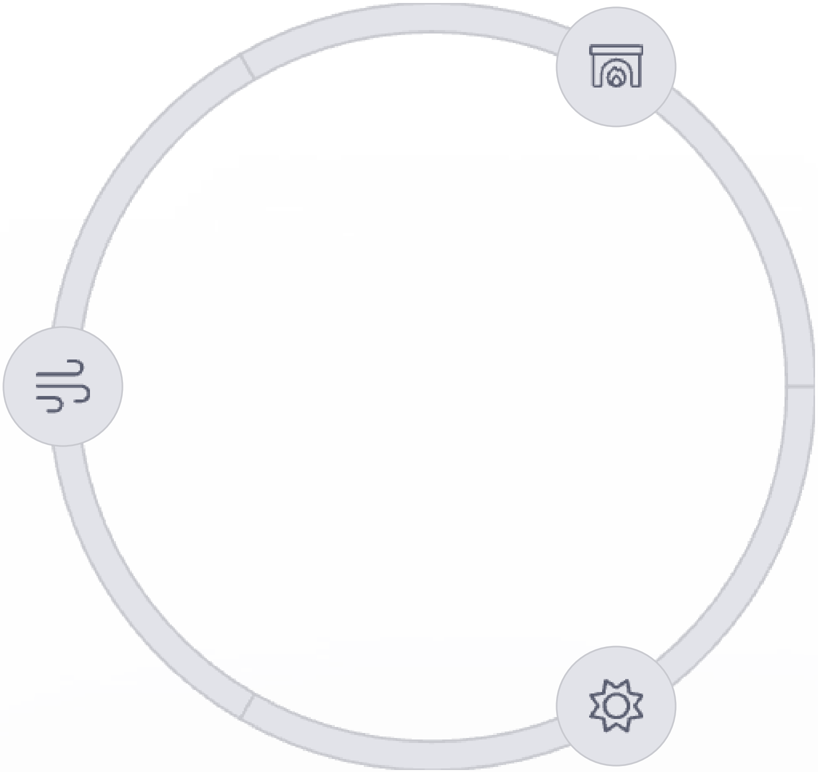
Gas stoves formerly utilized the oven burner to broil food: the lower drawer was opened to allow the same oven burner to serve as a broiler burner.

Now, gas-fired ovens come with separate broiler units. The broiler is a special burner located in the top of the oven. Heat from the burner is directed downward towards the food for broiling.

Warming Drawer

Some gas-fired ovens also have warming drawers, which maintain cooked food at the desired serving temperature.

Heat Transfer Methods



Convection

Transfer of heat by heat currents

- Natural convection: warm air rises, cool air descends
- Forced convection: fan circulates heat evenly

Conduction

Transfer of heat through direct contact

- Example: pot on range top burner heated through direct contact with flame

Radiation

Transfer of heat by means of heat rays

- Example: overhead broiler burner

Convection Methods

Natural Convection Oven

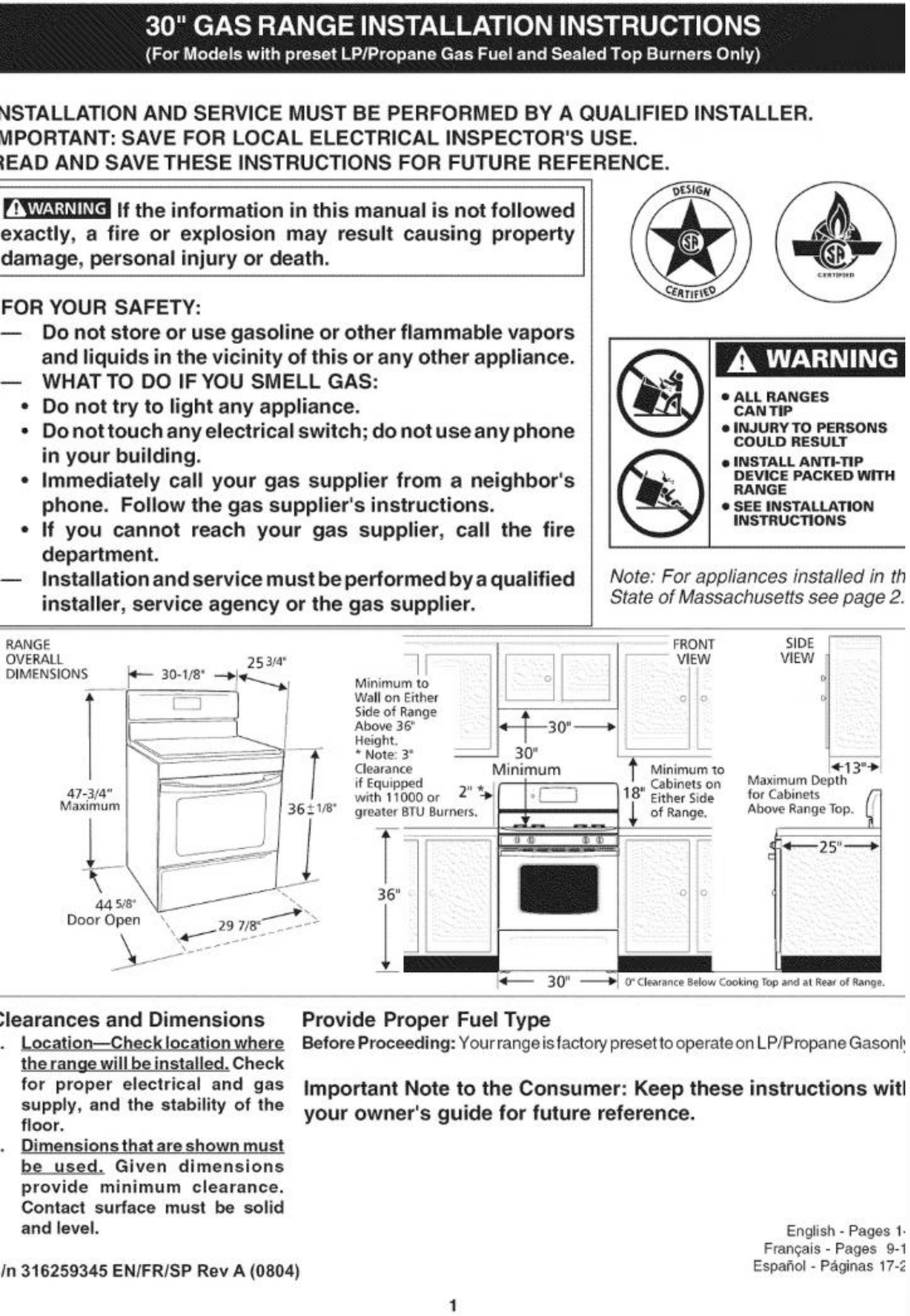
Warm air rises and cool air descends in the process of natural convection. In a standard, natural convection oven, the hottest area is at the top of the oven and the coolest is at the bottom no matter where the burner is located.

Thermostats located in the oven can control the burner on-off cycle within a certain temperature range, but the temperature may vary as much as 50°F from one area of the oven to another. This makes it difficult to cook food evenly.

Forced Convection Oven

In a forced convection oven, a fan circulates the heat from the burner evenly throughout the oven.

The circulating heat cooks food faster and more evenly than a natural convection oven.



30" GAS RANGE INSTALLATION INSTRUCTIONS
(For Models with preset LP/Propane Gas Fuel and Sealed Top Burners Only)

NSTALLATION AND SERVICE MUST BE PERFORMED BY A QUALIFIED INSTALLER.
MPORTANT: SAVE FOR LOCAL ELECTRICAL INSPECTOR'S USE.
READ AND SAVE THESE INSTRUCTIONS FOR FUTURE REFERENCE.

WARNING If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or death.

FOR YOUR SAFETY:
— Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
— WHAT TO DO IF YOU SMELL GAS:
• Do not try to light any appliance.
• Do not touch any electrical switch; do not use any phone in your building.
• Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
• If you cannot reach your gas supplier, call the fire department.
— Installation and service must be performed by a qualified installer, service agency or the gas supplier.

WARNING
• ALL RANGES CAN TIP
• INJURY TO PERSONS COULD RESULT
• INSTALL ANTI-TIP DEVICE PACKED WITH RANGE
• SEE INSTALLATION INSTRUCTIONS

Note: For appliances installed in th
State of Massachusetts see page 2.

Clearances and Dimensions
. Location—Check location where the range will be installed. Check for proper electrical and gas supply, and the stability of the floor.
. Dimensions that are shown must be used. Given dimensions provide minimum clearance. Contact surface must be solid and level.

Provide Proper Fuel Type
Before Proceeding: Your range is factory preset to operate on LP/Propane Gasonl

Important Note to the Consumer: Keep these instructions wit your owner's guide for future reference.

English - Pages 1-
Français - Pages 9-1
Español - Páginas 17-2

/n 316259345 EN/FR/SP Rev A (0804)

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Installation Requirements

Manufacturer's Specifications

Found on the model and serial number identification plate (rating plate) attached to the appliance at the factory.

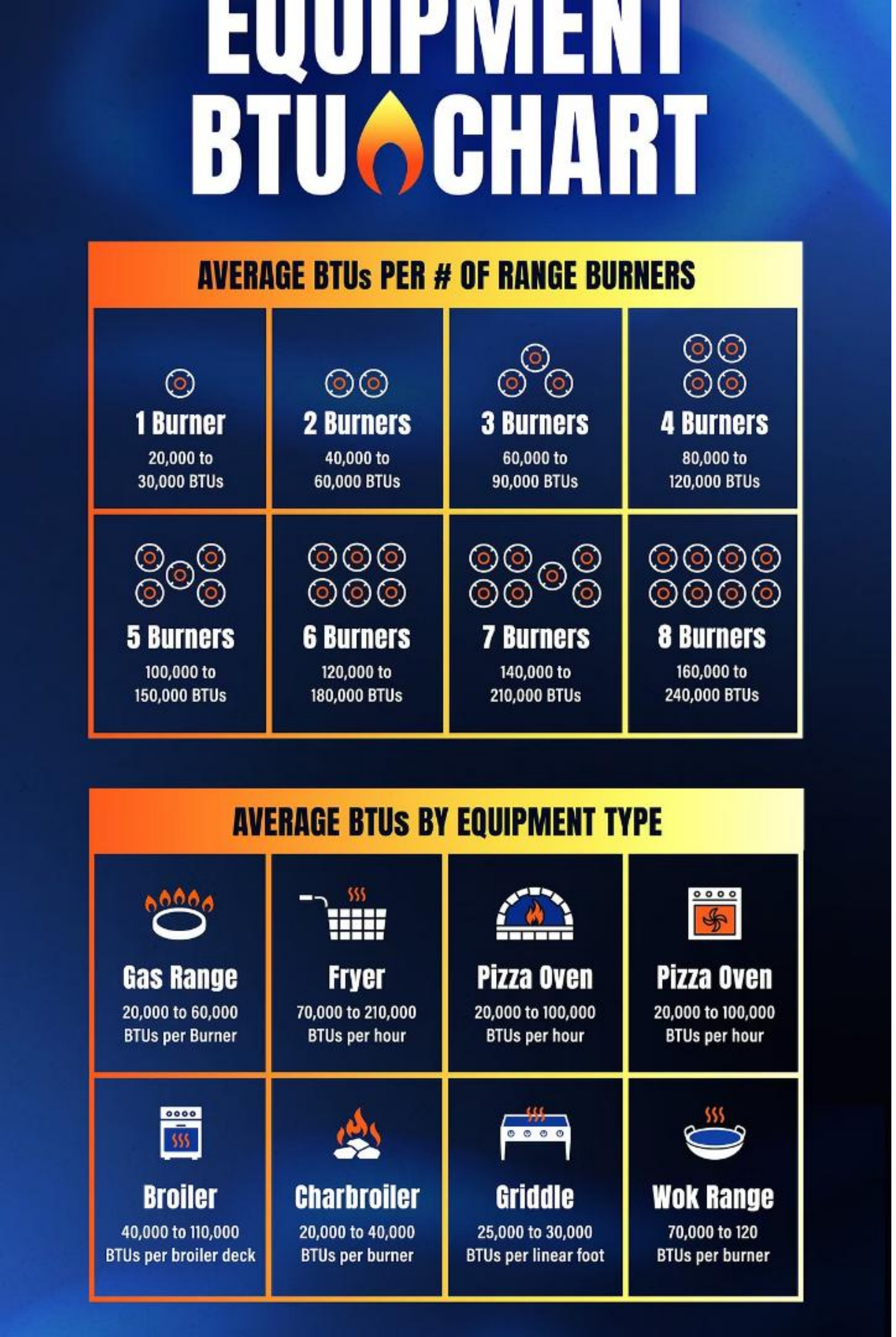
Applicable Codes

All range installations must conform to the requirements of applicable building, gas and electrical codes.

Installation Instructions

Detailed instructions provided by the manufacturer for proper installation.

Before installing a gas-fired range, review this information to ensure the installation will conform to the necessary requirements.



Manufacturer's Specifications

Btu/h (kW) Rating

Input rating of the appliance in Btu/h (or kW) is stamped on the rating plate.

Approvals

Approvals by regulating authorities and agencies.

Operating Voltage and Current

Electrical requirements for the range.

Operating Pressure

Required gas pressure for proper operation.

Input Rating and Approvals

Input Rating

The input rating of the appliance in Btu/h (or kW) is stamped on the rating plate. The rating plate specifications allow the appliance installer to determine the correct pipe or tubing size for the service and to set the burner inputs correctly.

Approvals

Gas industry and governmental regulatory agencies must approve all gas appliances before the manufacturer can sell them. Regulatory authorities recognize the service of third-party certification organizations and provide the approval by insisting that gas appliances receive certification from a recognized certification organization.

The official logo, symbol, or seal that indicates the certification of the appliance appears on the appliance's rating plate. The certification symbols that must appear on the rating plate of a gas appliance sold in Canada include those of CSA Group. Local provinces may recognize other agencies.

Operating Voltage and Pressure

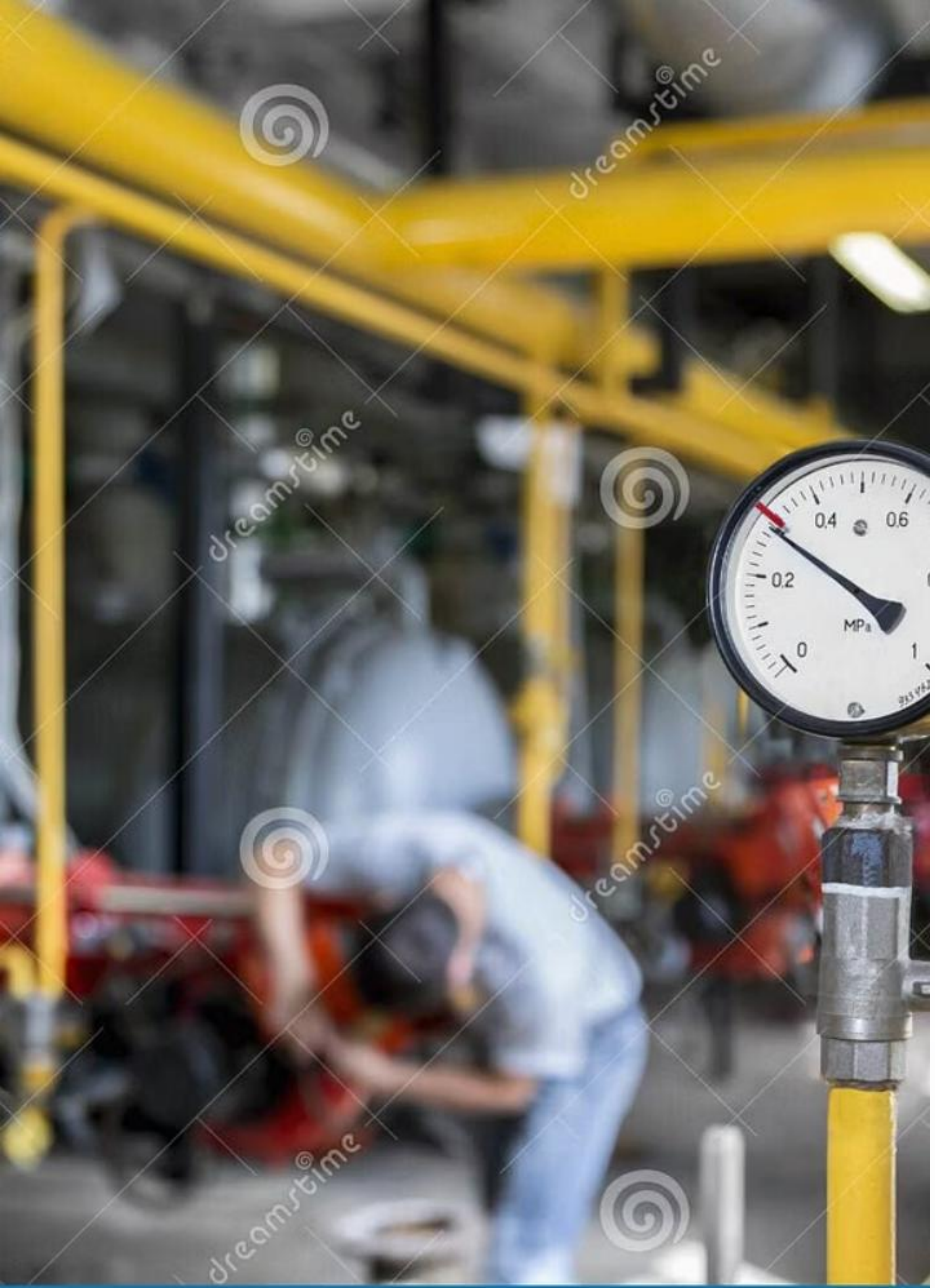
Operating Voltage and Current

The range must only be connected to an electrical circuit that conforms to the operating voltage and current rating specified on the identification plate. Although older gas stoves with few options for operation could function with just a gas supply hookup, most gas stoves require a 110 V supply outlet to power clocks, ignition sources, programmable features, and oven lighting.

Operating Pressure

Gas supply pressure is normally higher than that required for burner operation. An appliance pressure regulator is used to reduce the supply pressure to the manifold pressure required at the burner and maintain it at that level.

It is important to maintain the correct manifold pressure setting in order to avoid service problems and hazardous conditions such as delayed ignition, sooting, flashback, extinction pop, damage to components, poor operating efficiency, and limit cycling.



Gas Pressure Requirements

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Natural Gas Inlet

Typical inlet pressure in inches w.c. (1.5 kPa)

11

Propane Inlet

Typical inlet pressure in inches w.c. (2.7 kPa)

3.5-5

Natural Gas Manifold

Typical outlet pressure in inches w.c. (0.9-1.25 kPa)

10

Propane Manifold

Typical outlet pressure in inches w.c. (2.5 kPa)

The regulator is usually pre-adjusted for use with the type of gas specified on the rating plate and for a specific outlet pressure. Many ranges come with a regulator that is adjustable for use with propane or natural gas.

Code Requirements

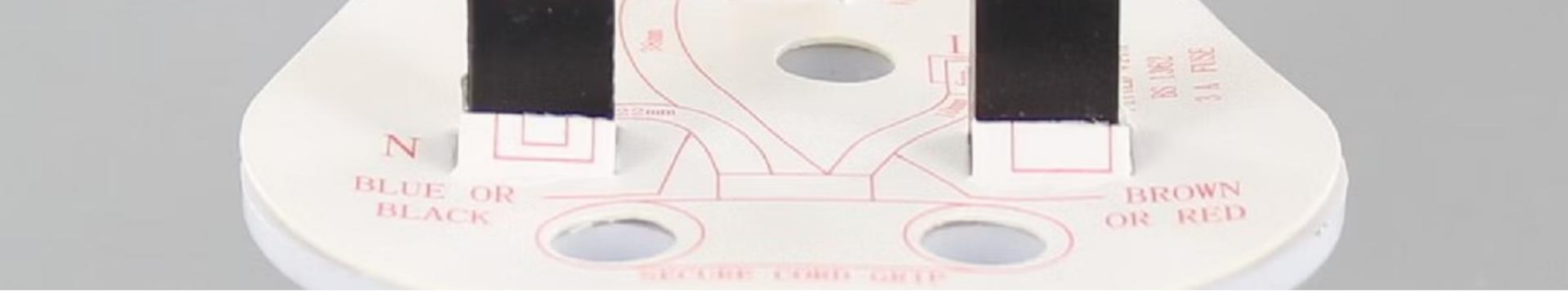
Electrical Connections

Most gas ranges require electricity to power clocks, timers, and other control devices. The electrical connection is usually 120 V 60 Hz, two-wire, with ground. The minimum size and type of wire that can be used for a 120 V, 15 A indoor appliance is No.14 AWG NMD-90.

Piping Connections

The Code requirements for gas range piping and tubing connections can be found in CSA B149.1, which will be referred to as the Code.

Rigid piping or flexible connectors may be used to connect ranges to the gas supply. Metal (flexible) connectors must be installed in accordance with Code requirements.



Electrical Connection Requirements

1 Proper Connections

All electrical connections between an appliance and the building wiring must comply with applicable electrical codes. Connection of all electrical devices associated with the appliance must follow the manufacturer's wiring diagram.

2 Power Supply Cord

A range must be connected to the electrical circuit receptacle by means of an approved power supply cord with a three-prong grounding plug. Extension cords may not be used.

3 Grounding

Under no circumstances should the grounding prong of a power supply cord be removed or replaced with a two-prong plug or adapter.

Flexible Connector Requirements

Protection

Connectors must be protected from potential damage.

No Passing Through Barriers

Connectors must not pass through walls, floors, ceiling, or partitions.

Connection Requirements

Connectors must be connected to rigid pipe or tubing in the same area as the appliance, with a shut-off valve located in the same room as the appliance.

Safety Considerations

A gas-fired appliance (range) must not be installed or operated in any location where it could create a hazard.

A gas-fired appliance (range) must not be installed in a room where corrosive vapours may damage the appliance or its venting system.

Prohibited Practices

Defective Pipe Sections

Defective sections of pipe or tubing must be replaced and not repaired.

Improper Fittings

Bushings must not be nested (installed within one another).

Fittings with both left- and right-hand threads, thread protectors, or running threads must not be used.

Concealed Piping Issues

Concealed piping runs must not contain a union or combination of fittings intended to act as a swing joint.

Field bending of piping is not permitted.

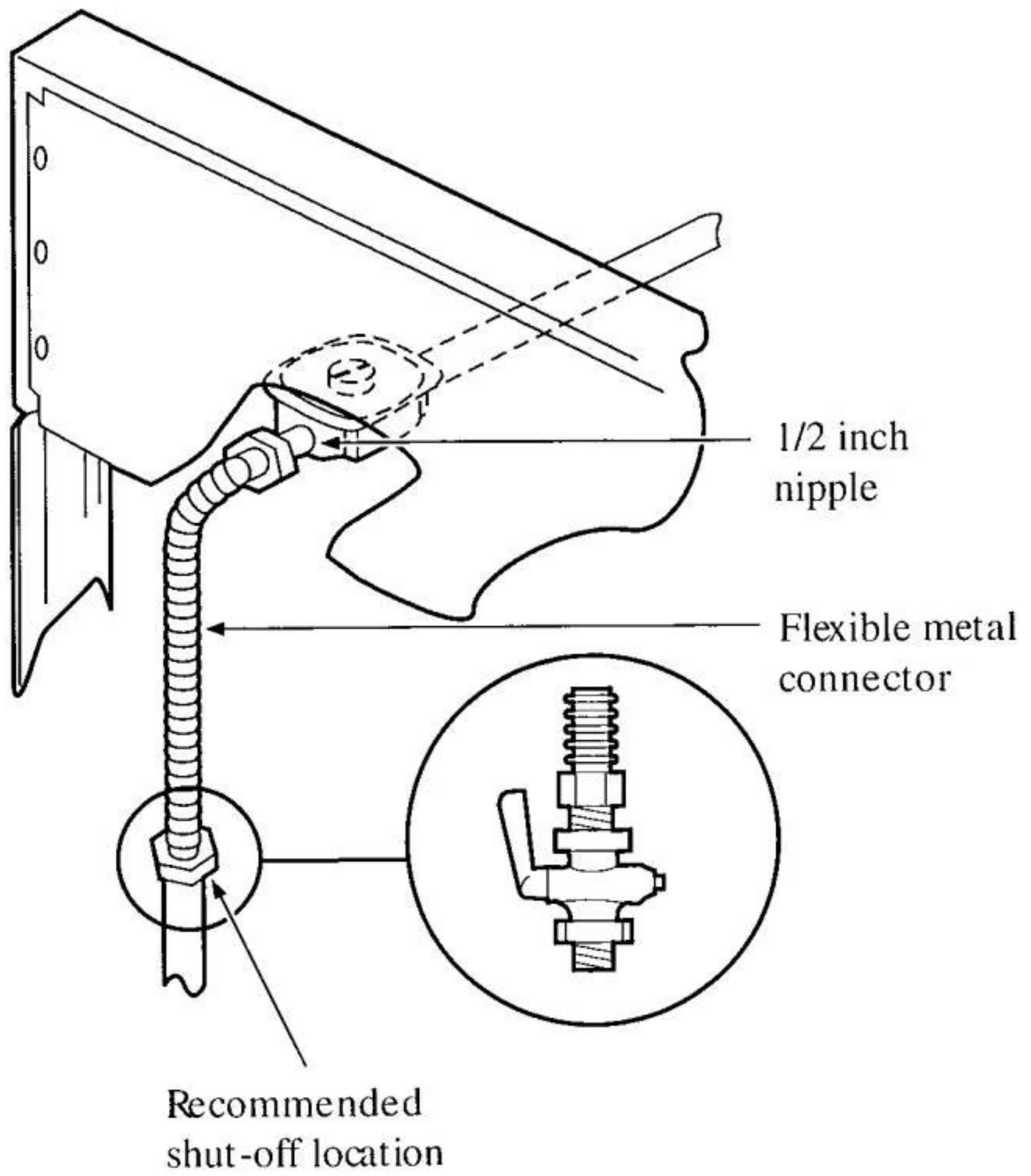
Electrical Concerns

Gas piping and tubing must not be used as an electrical ground.

Piping and tubing must not be used in lieu of electrical wiring, except for a low voltage control circuit, ignition circuit, or flame detection device circuit incorporated into an appliance.

Flexible Metal Connectors

Figure 1-1
Flexible metal connector installation



Purpose

To provide for movement of the gas range in order to clean behind it, use a certified flexible metal gas connector as

Usage Conditions

The length of the connector must not exceed 6 feet (2 m).

Commercial Gas Connectors

Flexible connectors certified for use on commercial ranges that are moved regularly for cleaning have additional outer protective coverings of stainless-steel braided wire and antimicrobial PVC coating. They also have swivel connections to further reduce stress at the ends.

When the commercial equipment is on rollers or wheels, it requires a restraining cable 25 mm shorter than the flexible connector.

Facilitating Repairs

Flexible Connector

Install a flexible connector to allow movement of the appliance

Shut-off Valve

Install a shut-off valve upstream and as close to the appliance as practical

Quick-Disconnect Device

Attach a quick-disconnect device to the flexible connector

Restraining Cable

Install a restraining cable, which can have clips for removal that only get removed after the gas has been shutoff and the connector has been disconnected

General Installation Considerations

Installation Requirements

Follow specific installation requirements, including manufacturer's instructions

Levelling

Ensure the range is properly levelled

Anti-tipping Devices

Install anti-tipping devices as required

Restraining Device

Use restraining device for commercial cooking appliance on wheels

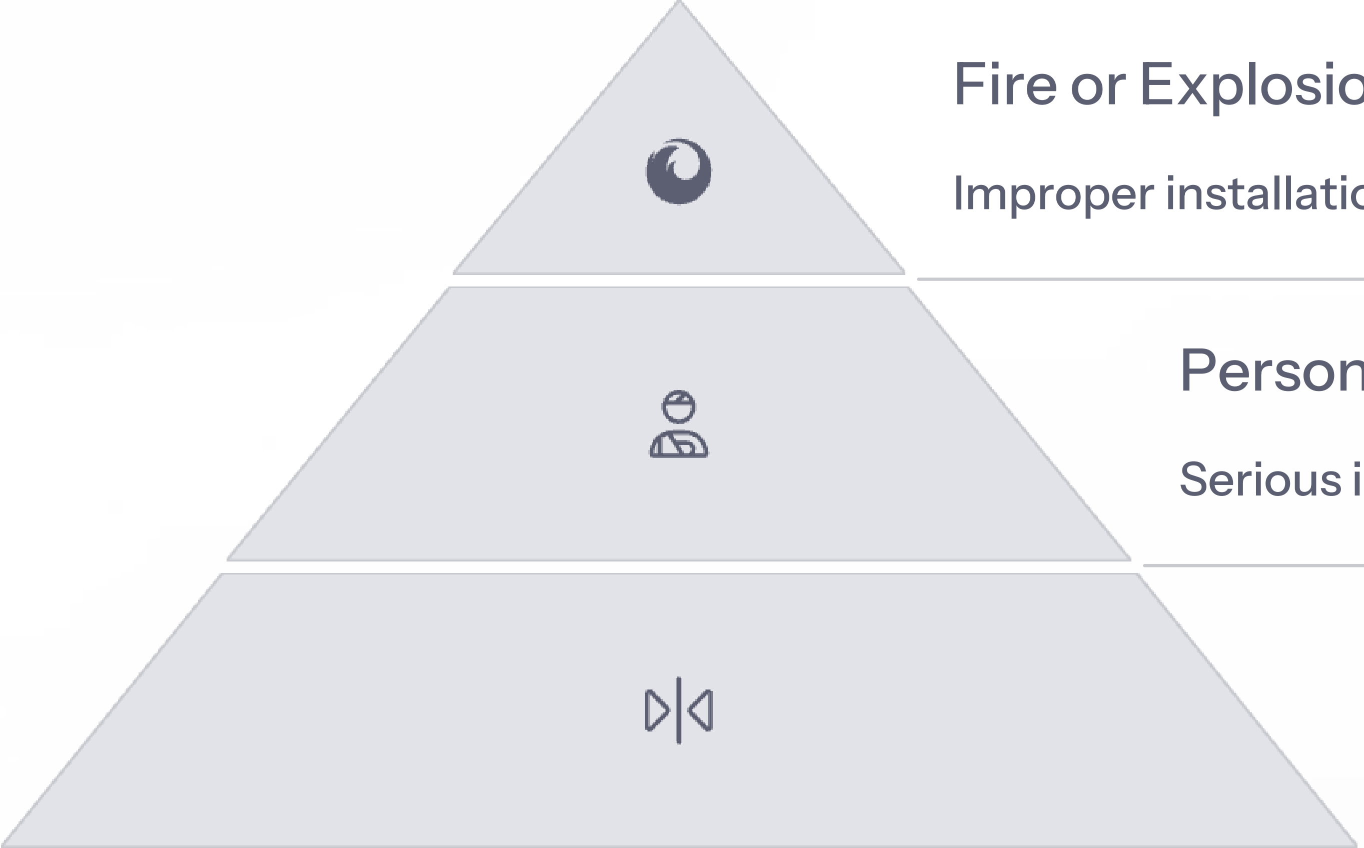
Clearance to Combustibles

Maintain proper clearance to combustible materials

Power Supply

Ensure proper power supply and polarization

Consequences of Improper Installation



Fire or Explosion Hazards

Improper installation can lead to dangerous fire or explosion risks

Personal Injury or Fatalities

Serious injuries or deaths can result from installation errors

Operating and Service Problems

Poor installation leads to ongoing operational issues

Failure to follow the manufacturer's instructions may result in these serious consequences, highlighting the importance of proper installation procedures.

Specific Installation Requirements

Proper Positioning

Compliance with clearance to combustibles requirements, in accordance with manufacturer's instructions, the rating plate, and applicable Codes

Access

Access for cleaning, repairs, and servicing

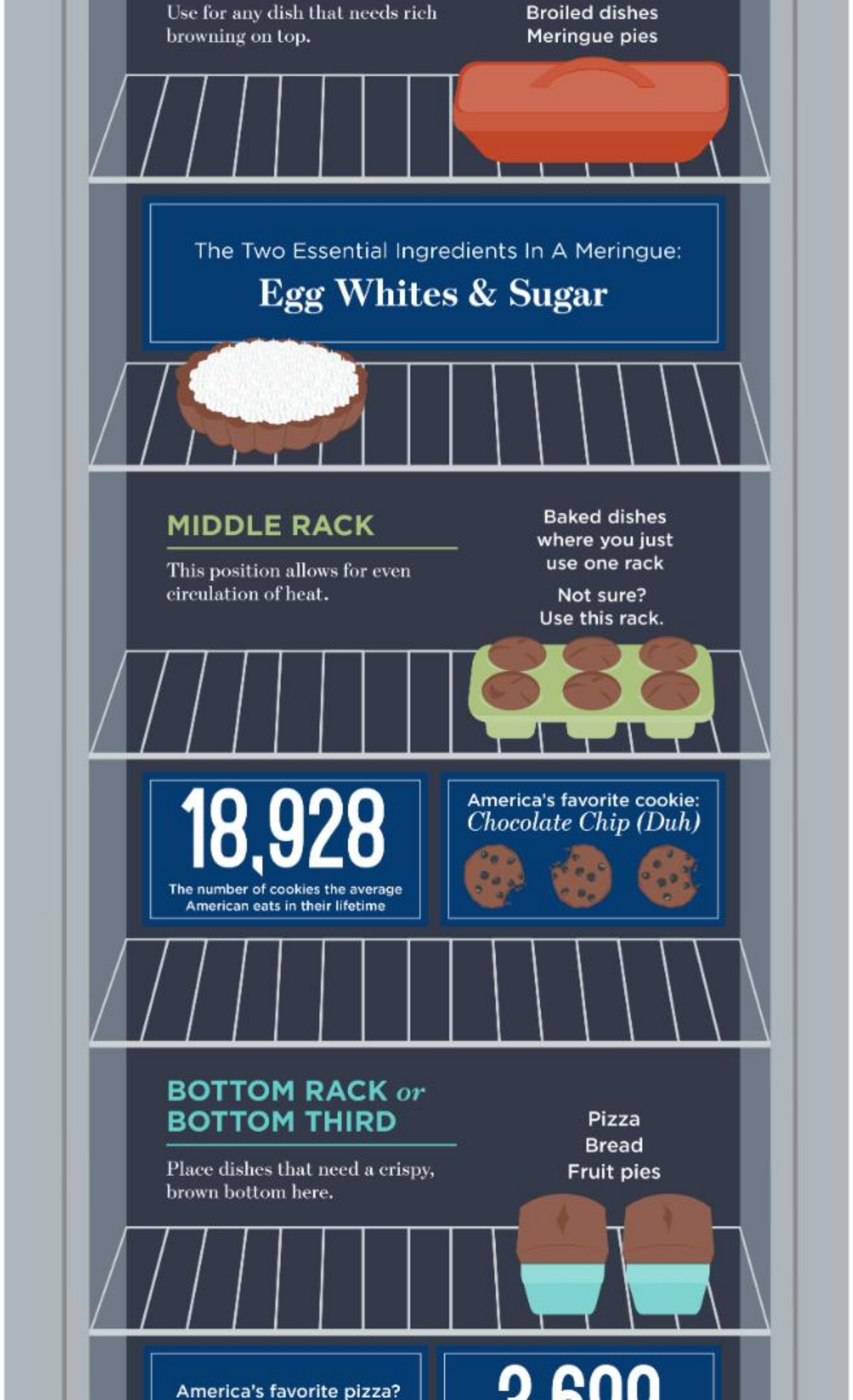
Venting

Proper distance to venting hoods, flues, or ductwork, if installed

Adjacent Fixtures

Proper positioning with respect to adjacent cabinets, countertops, and other appliances

Never install a range in a bedroom because it might produce carbon monoxide. However, you may install it in a bed-sitting room if you will not use it as a space heating appliance.



Levelling and Anti-Tipping Devices

Levelling

If a range is not levelled, fluids will not fill the cooking containers properly. This may lead to overflow and spillage that could create a fire or personal injury hazard.

Anti-Tipping Devices

Some ranges may come with anti-tipping devices. These devices, installed at the time of installation, prevent accidental tipping of the range. The devices may consist of a chain connecting the range to a wall bracket or of a rigid bracket attached to the back of the range and secured to the wall behind it.

Clearance to Combustibles

Standard Requirements

Different types of ranges have different clearance requirements. For example, storage cabinets and other combustibles must be installed at a safe distance above the cooking top of a range, while the rear and side walls of the range may be approved for zero clearance.

The manufacturer's instructions and rating plate specify the approved clearance to combustibles distance for the appliance.

Code Requirements

Where not covered in the manufacturer's instructions or on the rating plate, follow Code appliance clearance requirements. For example, if not specified by the manufacturer, a range would require a minimum of 150 mm of clearance on its back and sides from combustible surface.

Protection Requirements

Combustible cabinets or walls located next to a range cooking surface must be protected with a 28 MSG metal shield, spaced out 0.25 inch (6 mm) from the combustible surface and extending from 5 inches (125 mm) below to 30 inches (750 mm) above the cooking surface.

Zero Clearance Range Requirements

Item	Requirement
Combustibles above	There must be no combustibles within 30 inches (750 mm) of the top of the range.
Combustible surfaces reduction	Combustible surfaces protected by a shield of 0.25 inch (6 mm) millboard covered with 28 GSG (0.3 mm) sheet metal may be within 24 inches (600 mm) of the top of the range.
Space between the back of the range and a combustible surface	There must be at least a 1 inch (25 mm) space between the back of the range and a combustible surface.

Figure 1-3
Range receptacle polarity check
Used by permission of the American Gas Association

Power Supply and Polarization

Check Line to Neutral Voltage

Use a voltmeter set to measure AC volts. Check the voltage across the line and neutral conductors at the range receptacle. The meter should read 120 V, ±10%.

Check Line to Ground Voltage

Next, check the voltage across the line and ground conductors. The meter should read 120 V.

Check Neutral to Ground Voltage

Finally, check the voltage across the neutral and ground conductors. The meter should read 0 V.

Readings that differ from those above indicate that the circuit or receptacle wiring is incorrect or defective and must be corrected before the range is installed.

Fuel Conversion

Figure 1-4
Gas pressure regulators for conversions
Courtesy of Frigidaire Home Products

Reasons for Conversion

Conversion from one fuel to another may be required for a number of reasons, including the following:

- Natural gas may become available in an area previously serviced only by propane.
- A natural gas appliance may be purchased for use in an area where only propane is available.

Regulator Types

Three common types of gas pressure regulators are shown in the image. Each one has a different method for converting from one gas to another. It is important to ensure that an appliance regulator is adjusted to operate with the gas being used.

Piping Installation

Connection

The piping connection for ranges must be done so that the components are easily accessible for servicing.

Branch Piping

The size of the pipe or tubing should be large enough to provide adequate flow. See Unit 8 Introduction to piping and tubing systems and Unit 10 Piping and tubing systems for industrial and commercial applications for information on proper pipe and tubing sizing methods.

Dirt Pocket Exemption

The piping or tubing of a final drop serving a range does not require a dirt pocket. Clause 6.13.1 b) of CSA B149.1 exempts a gas stove, among other appliance types, from requiring a drip or dirt pocket at the end of the piping drop because the pocket would be inaccessible behind the stove.

Appliance Connections

Connector capacity			
Straight length capacity - BTU per hr (w)			
0.64 Sp Gr 1000 BTU per cu. Ft. gas at 0.5 in			
Water column pressure drop			
Nominal connector ID inches	2 ft	4 ft	6 ft
1/2 in	150 000	106 000	86 600
3/4 in	290 900	215 000	173 900
1 in	581 800	442 700	347 800
1 1/4 in	1 075 000	817 500	634 000

Ranges must be connected to the gas supply with piping, tubing, or other means, as discussed in the Installation requirements section. If not properly sized, flexible connectors, swivels and quick connects will cause excessive pressure loss to the gas supply. Make sure to use manufactures guidelines to properly size the connectors.

Regulators and Orifices

Regulators

An appliance regulator is used to reduce the gas supply pressure to the operating pressure of the appliance. The regulator must be adjusted for the gas being used, and the burner must have the proper orifice to ensure that:

- the appliance input is correct; and
- the proper flame characteristics are maintained.

Burner Orifices

An orifice is a hole or opening used primarily to control the direction and volume of gas flow into a burner. The size and design of an orifice depend on the following factors:

- the type of gas;
- the appliance input; and
- manifold pressure.

Types of Orifices

Table 1-1 is a partial capacity table for natural gas orifices.

Figure 1-6
Burner orifices

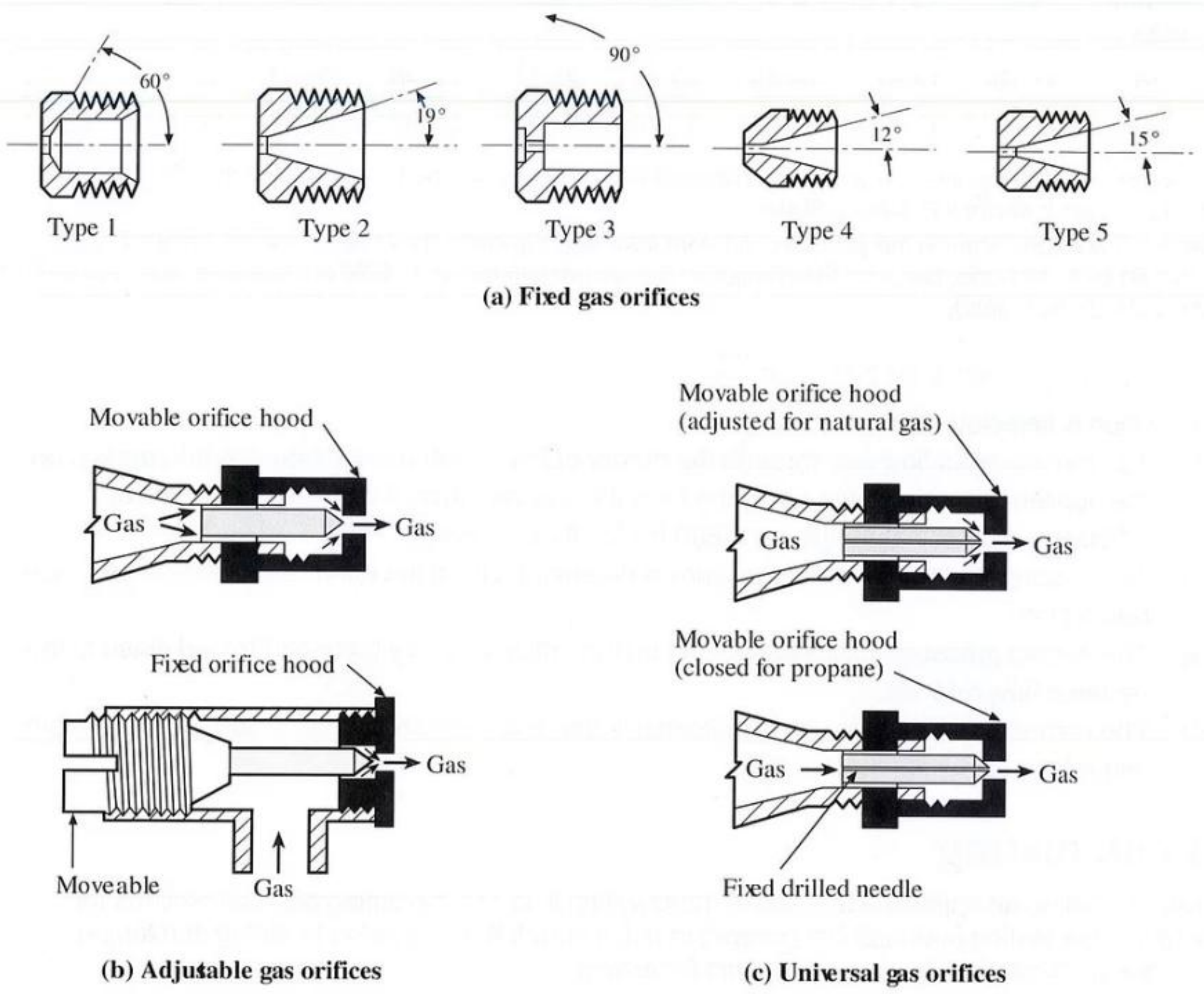


Table 1-1
Partial natural gas orifice capacity table*

Orifice Sizing

Sizing Standards

A gas orifice is sized using tables based on an orifice sizing formula. The size of an orifice is designated according to DMS drill numbers. DMS stands for Drill Manufacturer's Standard.

Sizes range from:

- No. 80 (the smallest) to No. 1; and
- A through Z (the largest).

Selection Process

An orifice is selected as follows:

1. The required gas flow rate through the burner orifice is determined from the information on the appliance's rating plate using the formula: flow rate in cu ft/h = rated input in Btu/h + 1 000 Btu/cu ft for natural gas or 2 500 Btu/cu ft for propane.
2. The required burner manifold pressure is determined from the information on the appliance's rating plate.
3. The correct pressure column is located on the orifice capacity table and traced down to the required flow rate value.
4. The correct size orifice to use is indicated in the orifice column at the far left of the flow rate value row.

Leak Testing and Removing Old Appliances

Leak Testing

After installing an appliance and before reactivating it, check the piping and connections for leaks. Leak testing methods are covered in detail in Unit 8 Introduction to piping and tubing systems, Chapter 2. Code requirements for testing.

Removing Old Appliances

Follow this procedure before either permanently removing an existing range or installing a replacement:

1. Locate and identify the gas shut-off on the branch piping that supplies the range.
2. Shut off the gas supply to the range and any other appliances attached to the same branch piping.
3. Disconnect the range from the gas supply.
4. Use thread dope and a properly fitting pipe cap to secure the gas pipe opening. If the shut-off valve is accidentally opened, an improperly capped pipe could allow gas to accumulate in the building and an explosion could result.

Operating and Supply Pressure Testing

Residential Pressure Standards

For residential and light commercial installations, natural gas manifold operating pressure at the burner, downstream of all control valves, is typically 3.5 inches w.c. (0.9 kPa). The rating plate shows the correct manifold pressure.

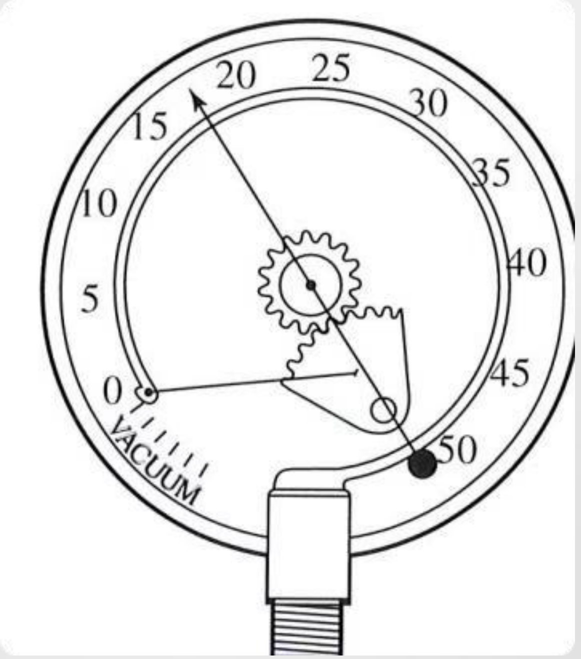
Normally, natural gas supply pressure at the outlet of the gas meter or system regulator should be 7 inches w.c. (1.75 kPa). Typical propane pressure is 11 inches w.c. (2.74 kPa) at the inlet. The rating plate shows the correct manifold pressure.

Pressure Testing Instruments

Two basic pressure measuring instruments are used in the gas industry:

- a water-filled manometer; and
- a bourdon-tube pressure gauge.

The manometer is usually more accurate since normal gas pressure, which is measured in inches of water column, is relatively low. Manometer operation is covered in detail in Unit 2 Fasteners, tools, and testing instruments, Chapter 4. Measuring tools.



Pressure Gauge Operation

Connect to Pressure Source

The gauge is connected to a pressure source.

Bourdon Tube Expansion

The pressure forces the bourdon tube in the gauge to expand.

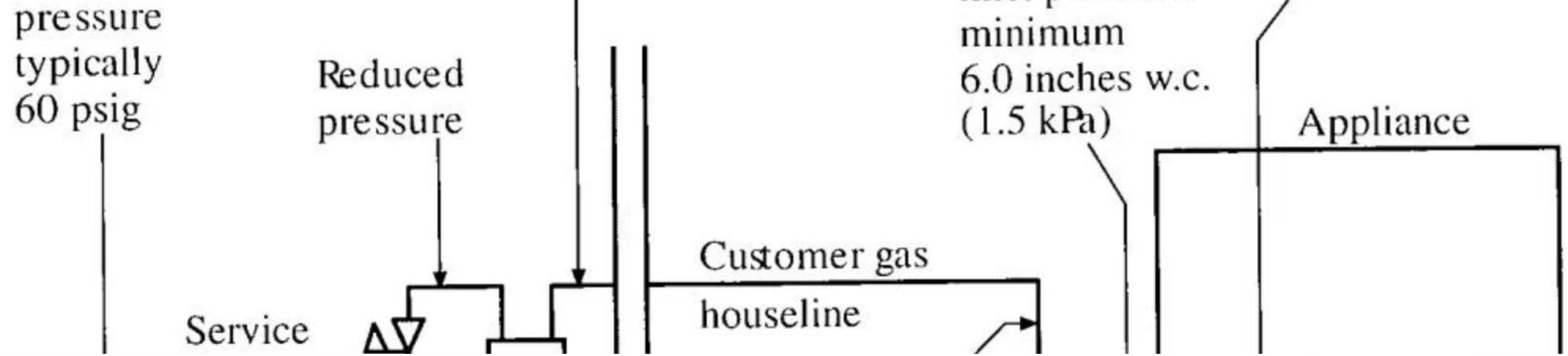
Mechanical Action

The expansion of the tube acts on a system of gears and linkages to move the indicator on the gauge dial.

Reading the Measurement

The gauge is calibrated so that the value of the pressure being measured will be indicated on the dial in inches of water column, or ounces per square inch (osi) or kPa.

A pressure gauge is more convenient to use but is not as reliable and accurate as a water manometer.



Pressure Testing Points

Gas Meter Outlet

Testing the pressure at the outlet of the gas meter

Appliance Inlet

Testing the pressure at the inlet to the appliance

Manifold Pressure

Testing the pressure at the manifold after the pressure regulator

Burner Pressure

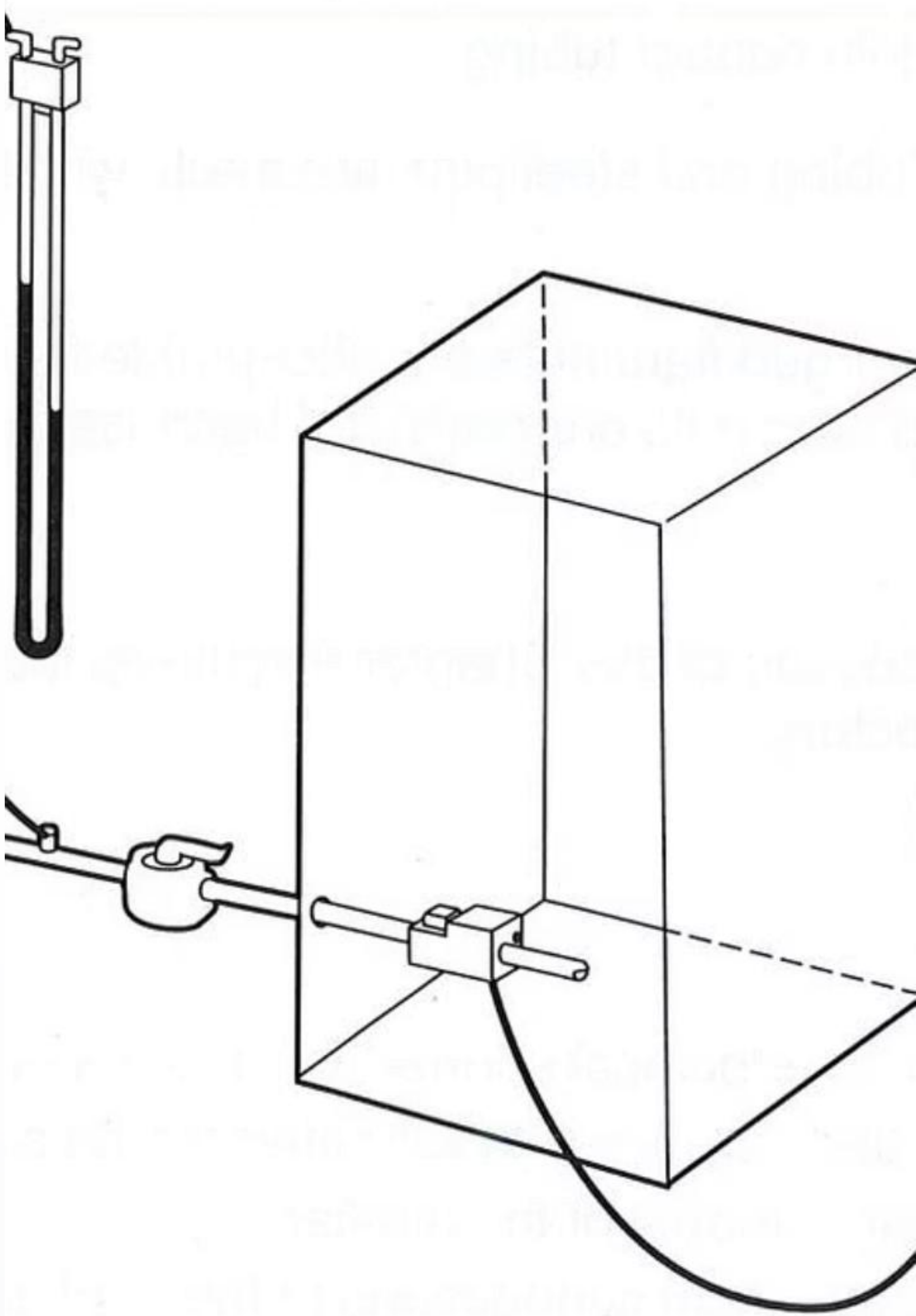
Testing the pressure at the burner

Manometers and pressure gauges can be used to test pressures at various points in a gas supply system.

Manometer Connection Methods

The image shows the manometer connection method for determining inlet pressure upstream and downstream of the combination control valve.

Digital electronic manometers are also used today to determine accurate pressure measurement in inches of water column as well as other scales.



Connecting Components

Control and Shut-off Valves

Used to stop gas flow for system repairs and servicing

Flare Fittings

Used to join copper tubing

Flex Connectors

Used for final connection to appliances

Shut-off Valves

Selection Considerations

The location and installation requirements for control and shut-off valves are specified in the Code. In addition to Code requirements, the gas technician/fitter must take the following factors into consideration when selecting the proper valve for the application:

- the location where the valve is to be installed;
- valve gas flow and pressure capacity;
- ready access for repairs and servicing; and
- ensure that the shut-off valve will be readily accessible.

Valve Connection

The size of a valve generally determines the method of its connection to the gas system:

- Medium-size valves generally have threaded connections.
- Smaller valves, used with copper tubing, are connected with flare fittings.

Flare Fittings and Flex Connectors

Flare Fittings

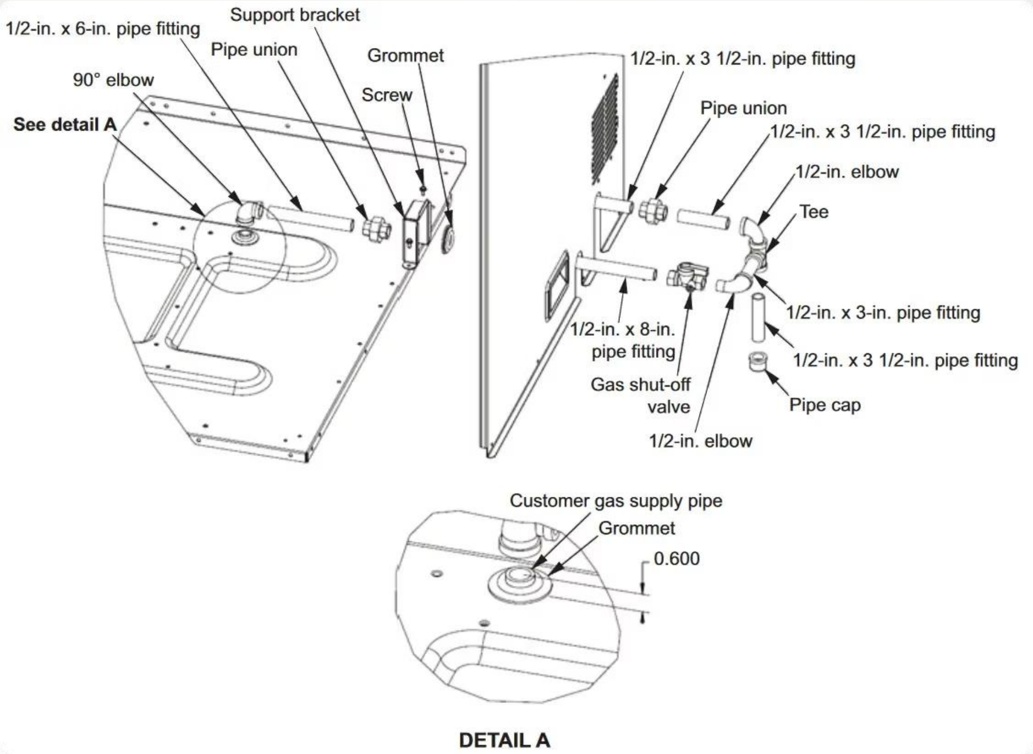
Brass flare fittings are used to join copper tubing.

Connections between copper tubing and steel pipe are made with threaded-to-tubing adapter fittings.

Although short- and long-neck forged flare nuts are acceptable for natural gas or propane installations. Short-neck forged flare nuts are preferred because they are stronger.

Flex Connectors

The Installation requirements section of this Chapter discusses the Code and installation requirements for flexible connectors.



Electrical Requirements

Circuit Rating

Check that the circuit wiring and components are rated for the circuit voltage and current values and the operating requirements of the appliance

Secure Connections

Arrange for safe and secure electrical connections to the appliance

Code Compliance

Ensure that the installation conforms to applicable Canadian Electrical Code, Part 1 requirements

Electrical Code Requirements

Receptacle Placement

Each kitchen must have a sufficient number of split duplex receptacles located along the wall behind counter work surfaces and isolated work surfaces less than 12 inches (300 mm) long at the wall line so that no point along the wall line is more than 36 inches (900 mm) from a receptacle (measured horizontally along the wall line).

Appliance Access

There must be an electrical receptacle within safe and easy reach of the appliance cord -- you may not use an extension cord.

Receptacle Type

All appliance receptacles must be grounding-type receptacles, able to accommodate parallel blade attachment plugs.

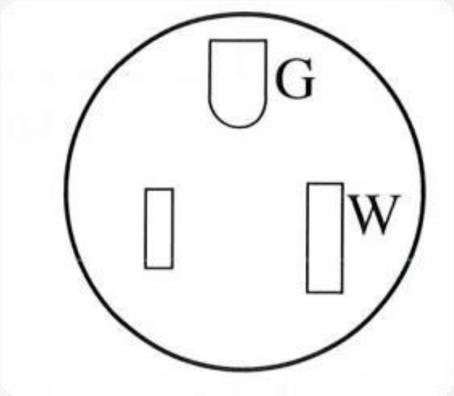
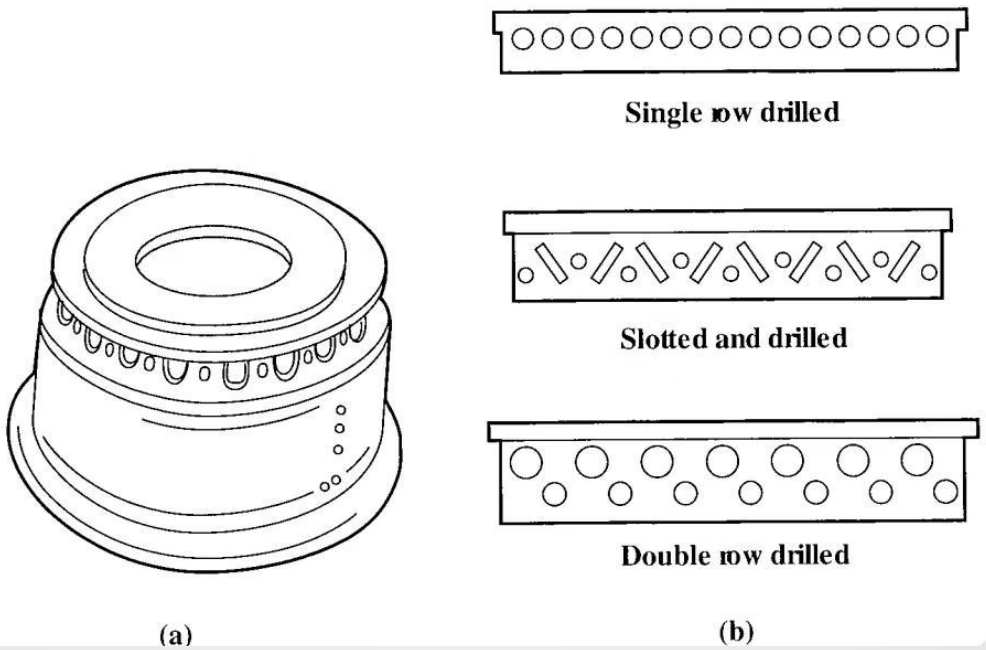


Figure 1-12
(a) Typical top burner and (b) burner port designs



Top Burners

Figure 1-12(a) shows a typical top burner for a gas-fired range. Figure 1-12(b) shows the varying burner port designs. The design chosen depends on the burner firing rate and turndown range.

Thermostatically Controlled Top Burner

Gas Flow to Tower Flame

When the control knob is turned on, gas begins to flow to a secondary pilot called the tower flame assembly.

Tower Flame Ignition

The tower flame is ignited by the constant burning pilot flame.

Main Burner Ignition

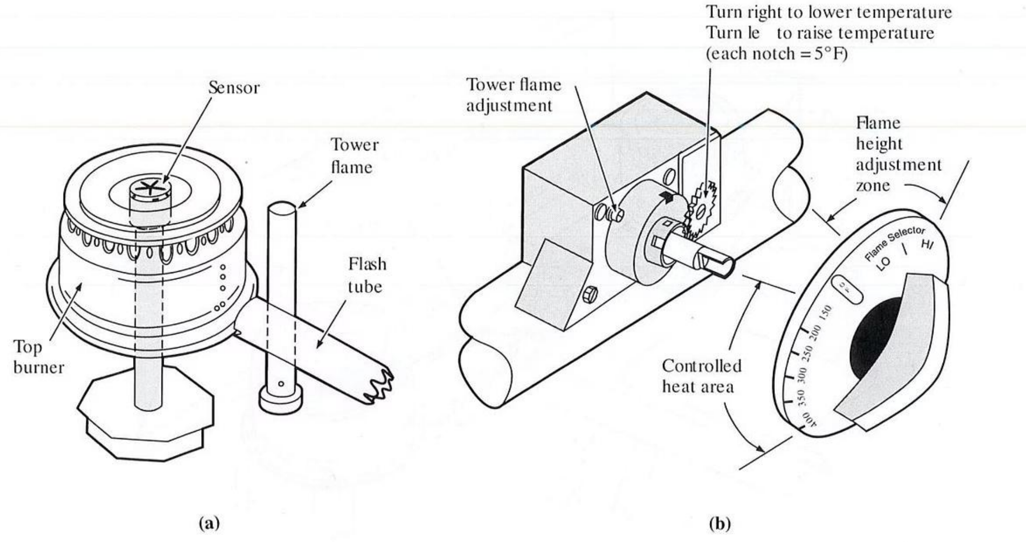
The main burner lights from the tower flame.

Temperature Control

The control system keeps the utensil contents at the desired set point temperature.

The thermostatically controlled top burner is equipped with a thermostatically controlled sensing element and valve. A spring-loaded sensing unit for the thermostat is located in the centre of the burner.

Figure 1-13
(a) Thermostatically controlled burner and (b) location of calibration screws



Top Burner Igniters

Standing Pilot

The standing pilot type of ignition system has a continuously lit pilot. A standard or HI-MED-LO push-to-turn valve controls each top burner. When a top burner control valve is turned on to allow gas flow into the burner, the pilot ignites the gas.

There are three basic designs of top burner pilot igniter systems:

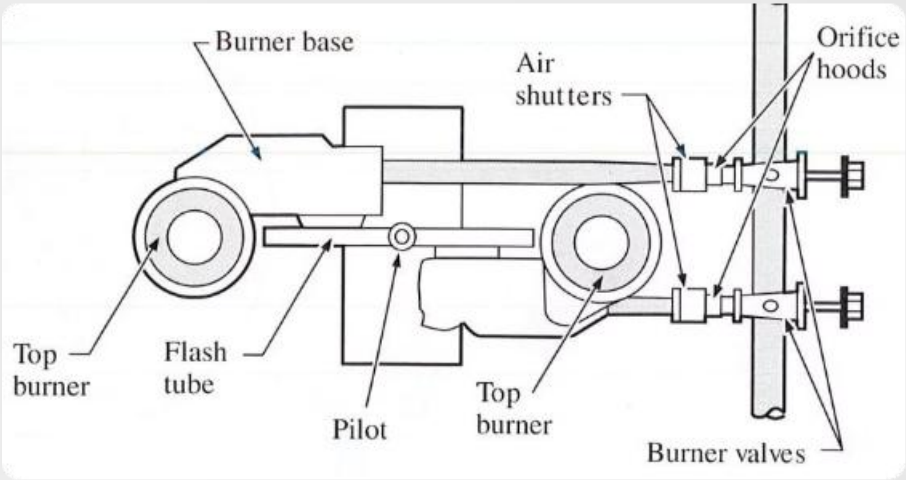
- one pilot for each burner;
- one pilot for two burners (Figure 1-14); and
- one pilot for all four burners.

When only one pilot is used for more than one burner, flash tubes are used to direct the pilot flame to each burner.

Electric Igniter

An electric ignition system consists of a spark generation device, a switch on each burner valve, and spark igniters (Figure 1-16). Typically, there are two spark igniters, one each for the left-side and right-side burners. Both sets of burners have flash tubes that run between a top burner ignition port and a central spark gap.

When a burner valve is switched on, electric current is applied to the spark generator and gas begins to flow into the burner. The gas-air mixture from the burner port flows down the flash tube, is ignited by the spark, and flashes back to ignite the top burner ports.



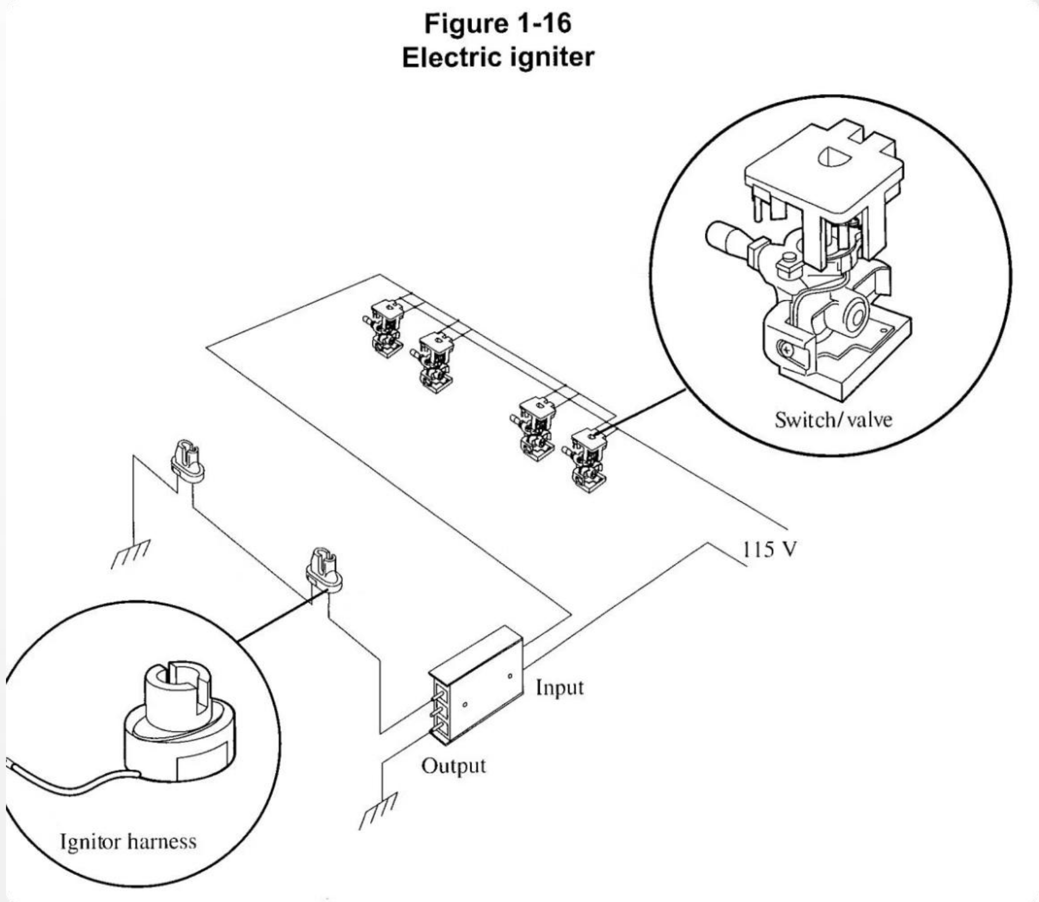
Flash Tube

The flash tube runs from the top burner ignition port to the pilot flame to provide a direct path for the ignition flame.

When the burner control valve is turned on, gas flows out of the burner ignition port and into the flash tube, drawing combustion air into the flash tube behind it. The gas and air mix as they travel down the tube toward the pilot flame where it is ignited. The resulting flame "flashes" back to the burner where it ignites the gas at all the burner ports.

Improper Ignition

If	Then
A flash tube fails to light the burner when the burner is manually lit and there is no flame at the end of the tube	There may be too much air in the mixture.
The top burner will not light off the pilot, but there is a flame at the end of the flash burner	There may be too little air in the mixture or too much gas.
The ignition at the range burner is delayed	The operator could be burned.
A range has two top pilots controlled by one adjustment and they are unequal in size.	The pilot orifices should be cleaned or replaced.



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Sealed Gas Burners

Design

A sealed gas burner is designed to prevent food or debris from dropping into the flame itself.

The sealed burner consists of an integrated drip tray, a gas burner cap. Each burner will also have its own spark igniter.

Components

Part	Use
Integrated drip tray	Can simply be wiped clean after cooking is done
Gas burner	Generates the flame
Burner cap	Can be removed and washed Deflects debris away from the flame into the drip tray

Sealed Burner Benefits and Drawbacks

Benefits

The benefit of this design is that it prevents the burner holes from getting clogged.

- Prevents food from falling into flame
- Keeps burner ports clean
- Easier surface cleaning
- More consistent flame pattern

Drawbacks

However, because the drip pan is integral to the surface of the stove, you cannot remove it to be cleaned in the sink or dishwasher.

- Limited cleaning access
- Cannot remove drip pan
- May require special cleaning products
- More complex to service

Gas Range Maintenance Overview

Inspection

Regular visual inspection of components

Cleaning

Removing debris from burners and orifices

Repair

Replacing worn or damaged components

Adjustment

Calibrating controls and flame characteristics

Burner Maintenance

1. **Inspect Flame Pattern**

   Check for proper color and height - should be steady blue flame with slight yellow tips

2. **Clean Burner Ports**

   Remove debris from ports using compressed air or fine wire

3. **Check Air Shutters**

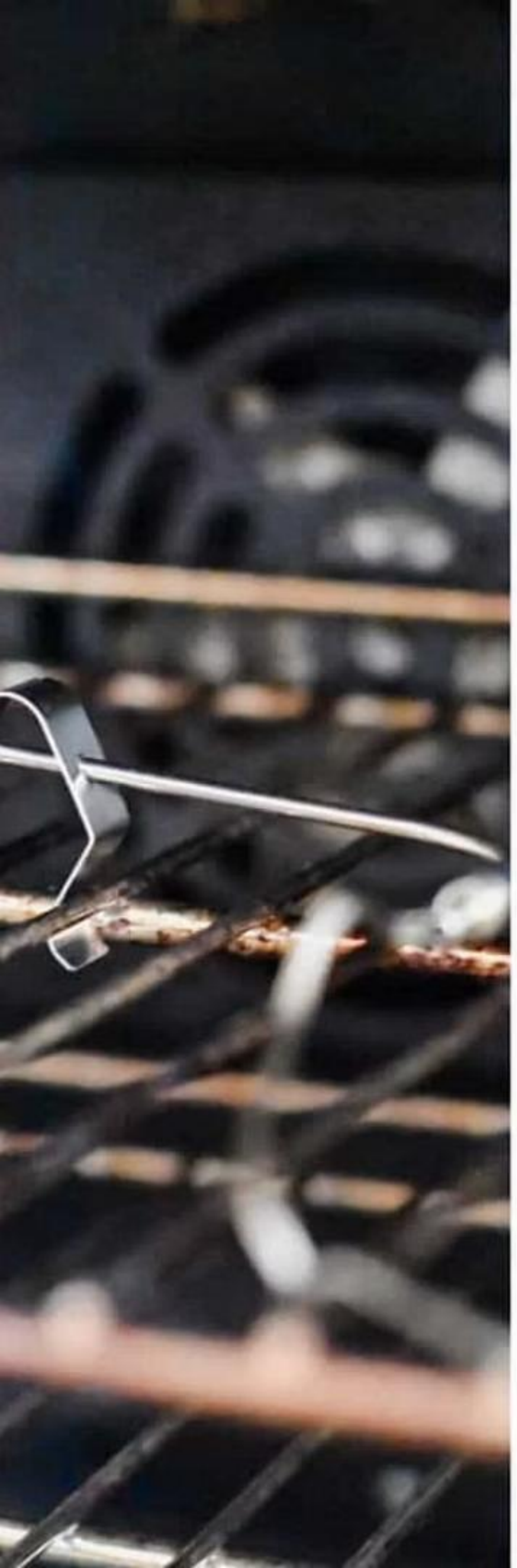
   Adjust for proper air-gas mixture if necessary

4. **Test Ignition System**

   Verify proper spark or pilot operation

5. **Inspect Gas Connections**

   Check for leaks at all connection points



Oven Control Maintenance

Verify Temperature Accuracy

Use calibrated oven thermometer to check against set temperature

Calibrate Thermostat

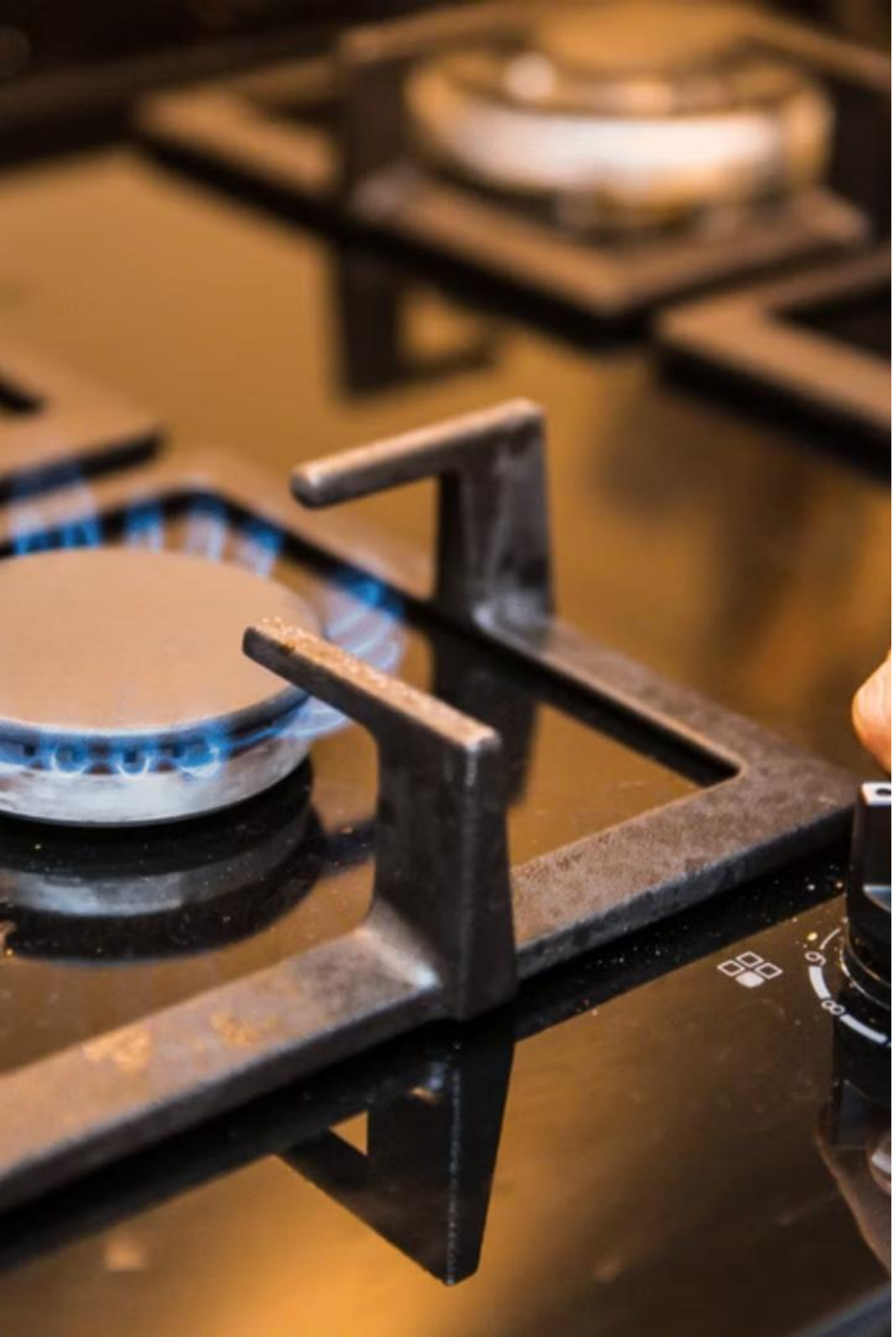
Adjust calibration screws if temperature is off by more than 25°F

Test Safety Features

Verify door locks and other safety mechanisms are functioning properly

Check Gas Valve Operation

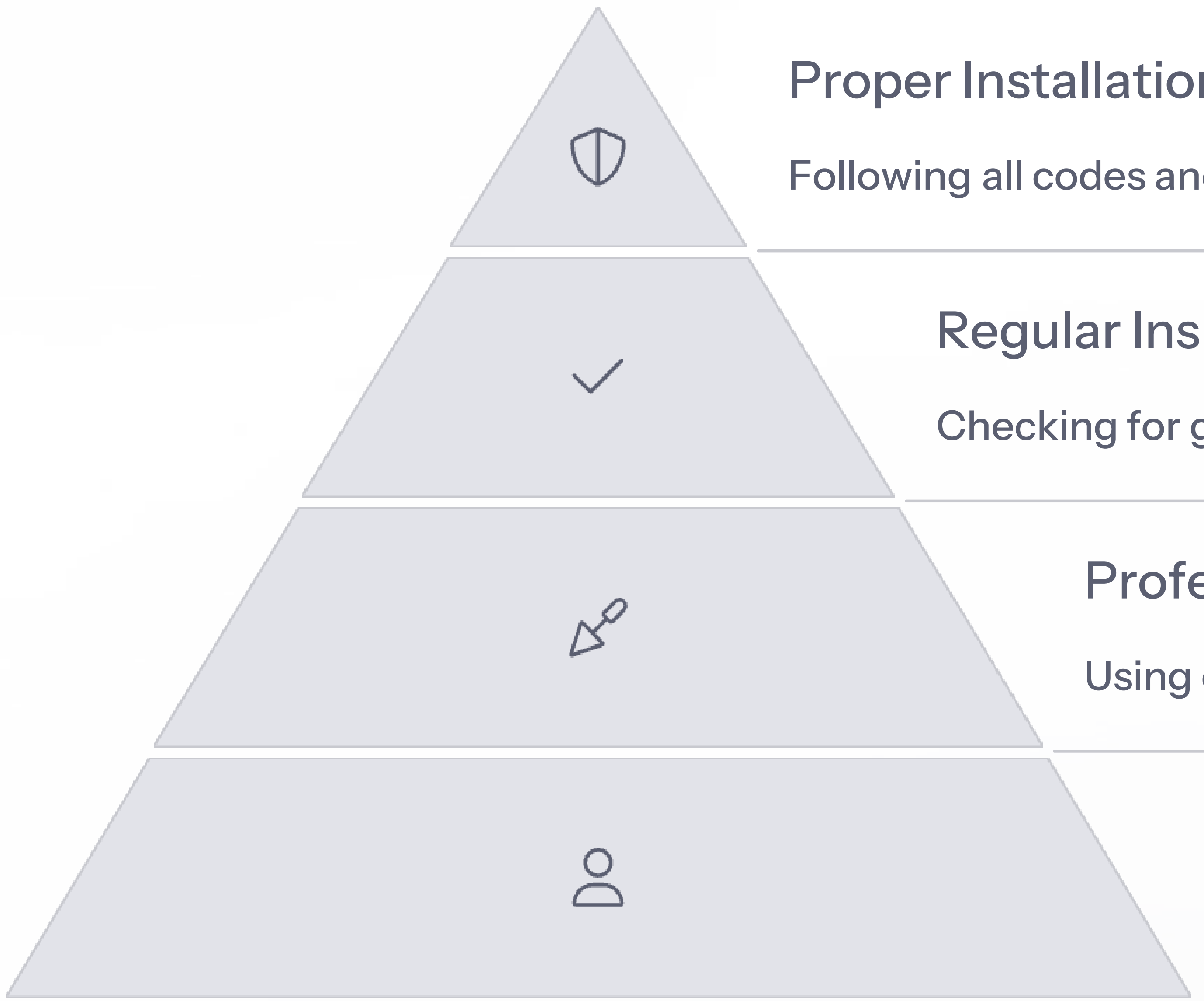
Ensure proper cycling of gas valve in response to thermostat



Troubleshooting Gas Range Issues

Problem	Possible Cause	Solution
Burner won't light	Clogged orifice or burner ports	Clean ports and orifice
Yellow flames	Improper air-gas mixture	Adjust air shutter
Uneven heating in oven	Faulty thermostat or burner	Replace or repair component
Gas odor	Gas leak	Shut off gas, check connections
Igniter clicking but no flame	Gas supply issue or faulty valve	Check gas supply and valve operation

Safety Considerations



Proper Installation

Following all codes and manufacturer specifications

Regular Inspection

Checking for gas leaks and proper operation

Professional Servicing

Using qualified technicians for repairs

User Education

Teaching proper operation and emergency procedures

Gas Range Efficiency Tips

Match Pot Size to Burner

Use appropriate sized cookware for each burner to maximize efficiency

Maintain Proper Temperature

Keep oven calibrated to avoid wasting gas from overheating

Keep Oven Door Closed

Avoid opening the oven door unnecessarily during cooking

Clean Regularly

Keep burners and orifices clean for optimal performance

Environmental Considerations

Emissions

Gas ranges produce fewer greenhouse gas emissions compared to coal-powered electric ranges in many regions, though this varies based on local electricity sources.

Indoor Air Quality

Proper ventilation is essential when using gas ranges to maintain good indoor air quality and remove combustion byproducts.

Energy Efficiency

Modern gas ranges with electronic ignition are more efficient than older models with standing pilots, reducing gas consumption during idle periods.

End-of-Life Disposal

Proper decommissioning and recycling of gas ranges is important to prevent environmental contamination from components and refrigerants.

Future of Gas Range Technology

Smart Connectivity

Integration with home automation systems and smartphone control

Improved Efficiency

Advanced burner designs that maximize heat transfer while minimizing gas usage

Enhanced Safety Features

Automatic shutoff systems and advanced leak detection technology

Hybrid Technologies

Combination of gas and induction cooking surfaces for versatility

Gas Oven Systems and Components

Oven Burners

Slotted Port Burner

The slotted port burner is often used in range ovens and broiler units. It has a series of thin slots that distribute the flame.

These burners provide even heat distribution throughout the oven cavity, making them ideal for baking applications.

Ribbon Port Burner

The ribbon port burner has a single, long slot. An assembly of thin, straight, and crimped metal strips produces a solid, continuous flame along the length of the slot.

Ribbon port burners are used in larger gas-fired ovens where consistent, high-output heating is required.

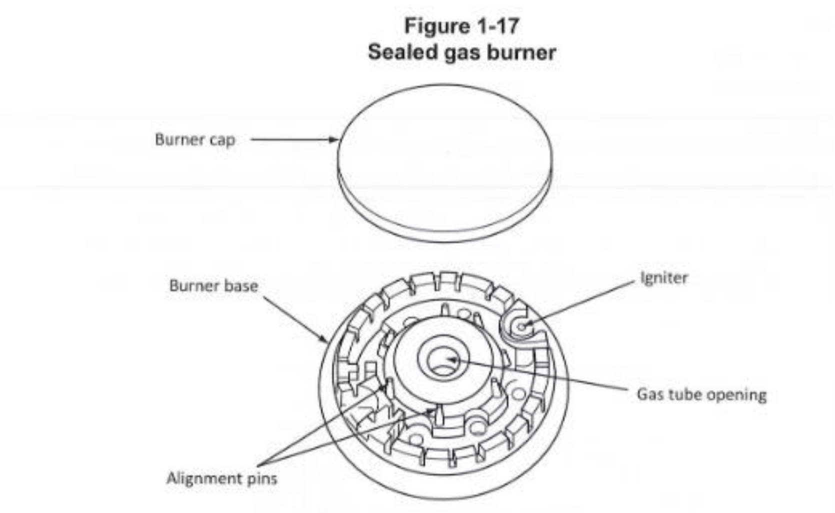


Figure 1-18: Different types of oven burners used in gas ranges

Oven Ignition Systems Overview

Match-lit

Requires manual lighting with a match; flame from main burner lights standby pilot

Constant Pilot

Continuously burning pilot flame that ignites the main burner when needed

Millivolt Pilot

Uses a thermopile heated by pilot flame to generate voltage for control circuit

Spark-ignited

Electric spark ignites the pilot or main burner directly

Hot Surface Igniter

Silicon carbide element heats up to ignite gas directly

Capillary tubes are commonly used in oven thermostats to sense the oven temperature and cycle the system on and off as needed to maintain the oven thermostat setting.

Capillary Pilot System Fundamentals

How Capillary Systems Work

Some systems have a capillary with its liquid-filled bulb placed in a pilot flame. These sensor bulbs verify the existence of a pilot flame rather than cycling the burner.

The only function of these pilot sensing elements is to stop gas flow to the burner if the bulb does not get heated by the pilot.

Operation Principle

When the liquid inside expands and exerts pressure onto the diaphragm, this movement can either open a valve or close a switch.

This safety mechanism ensures gas only flows when a pilot flame is present, preventing unburned gas from accumulating.

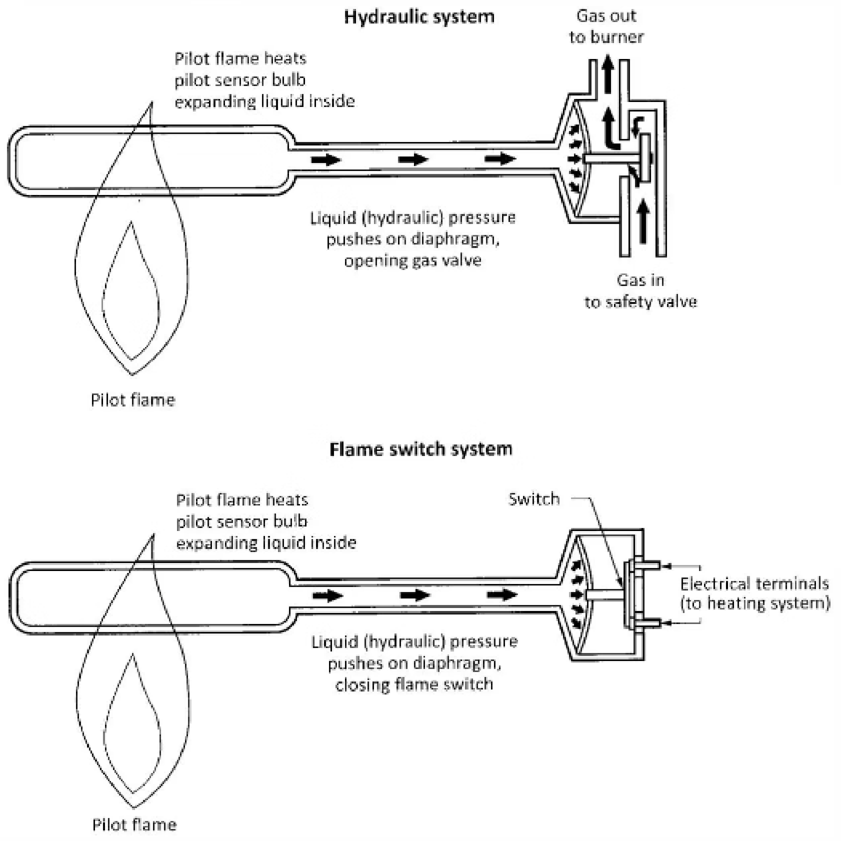


Figure 1-19: Diagram showing capillary pilot system components and operation

Match-lit Ignition System

Open Oven Door

The oven door is opened, and a lighted match is held to the end of the flash tube running between the burner ignition spud and the pilot flame.

Turn On Control Valve

The oven control valve is then turned fully on to start gas flow to the burner and standby pilot.

Ignition Occurs

The gas-air mixture ignites at the burner when it comes into contact with the match flame. The flame travels down the flash tube to ignite the standby pilot.

Set Temperature

The thermostat is turned to the desired cooking temperature setting. When the oven reaches the desired temperature, the oven burner reduces to a minimum (bypass) flame and the pilot remains lit.

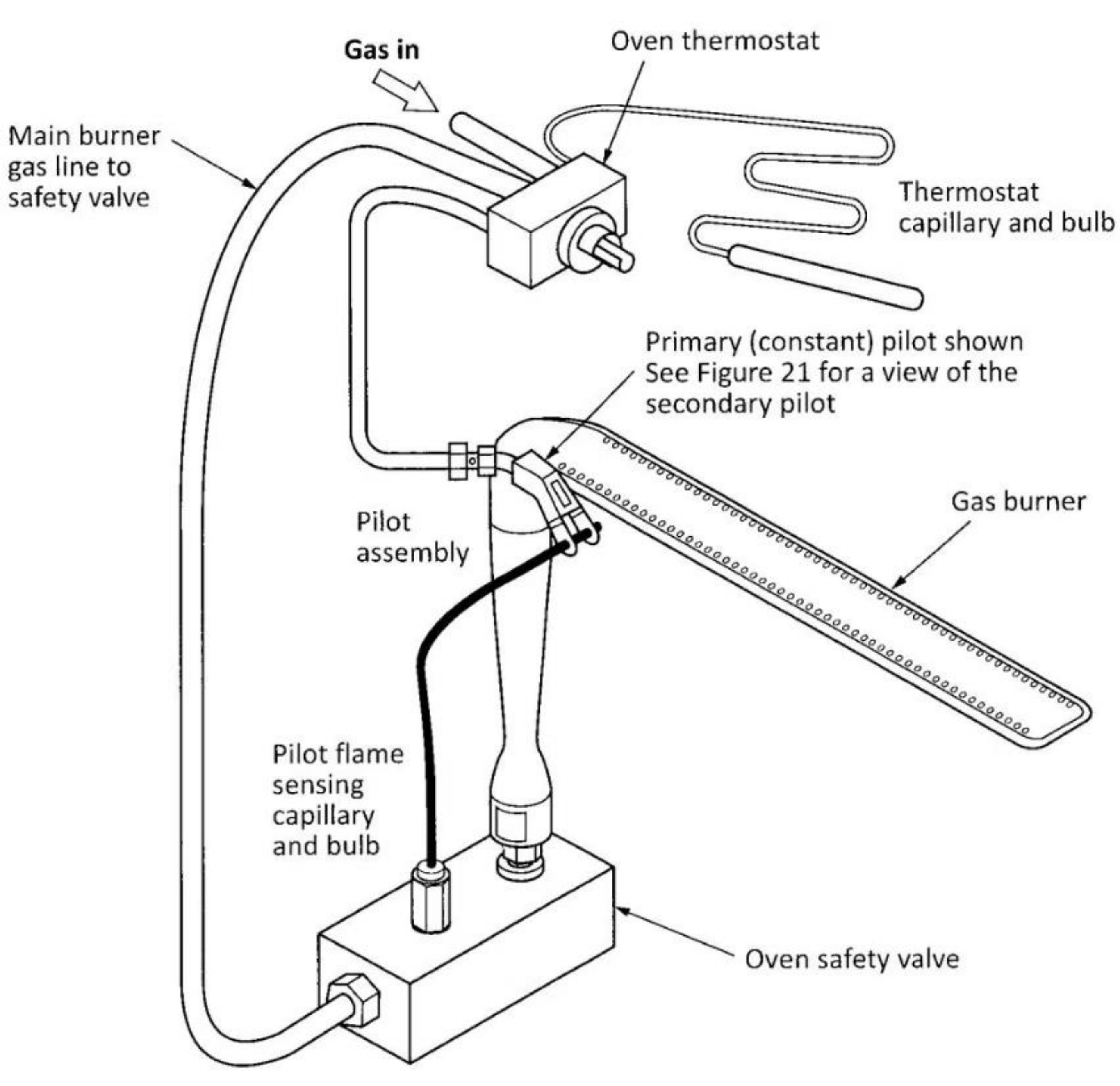
Constant Pilot Ignition System

System Components

A constant pilot ignition system consists of:

- Thermostat valve
- Safety gas valve
- Constant/heater pilot
- Mercury sensing bulb

This system is sometimes called standby pilot or expanding pilot.



Constant Pilot Operation

Thermostat Control

The thermostat valve, mounted on the manifold, controls the oven. Gas lines run to the oven burner and one line to the pilot. A small amount of gas flows continually to the oven constant pilot.

Heat Call Response

When the thermostat calls for heat, gas flows through the thermostat valve to the safety valve at the burner, and gas flow to the constant pilot increases causing a heater pilot flame.

Mercury Bulb Heating

The flame deflector spreads the heater pilot flame over a mercury-filled bulb. After this bulb is heated, it causes the safety valve to open.

Main Burner Ignition

The safety valve allows gas to flow to the oven burner. The heater pilot ignites the burner, which continues to operate until the pre-set temperature is reached.

Constant/Heater Pilot

Pilot Operation

The constant/heater pilot system uses a flame deflector to spread the heater pilot flame over a mercury-filled bulb.

When the thermostat is satisfied, the heater pilot returns to regular constant pilot flame until the thermostat again calls for heat.

Lighting Procedure

To light the constant pilot in the oven:

1. Make sure the oven is turned off
2. Remove the oven racks
3. Hold a lighted match to the opening in the top of the pilot at the rear of the oven burner

No pilot adjustments are required for this operation.

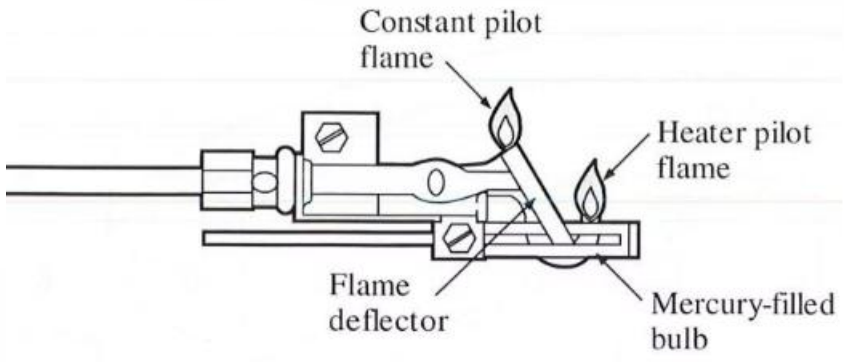
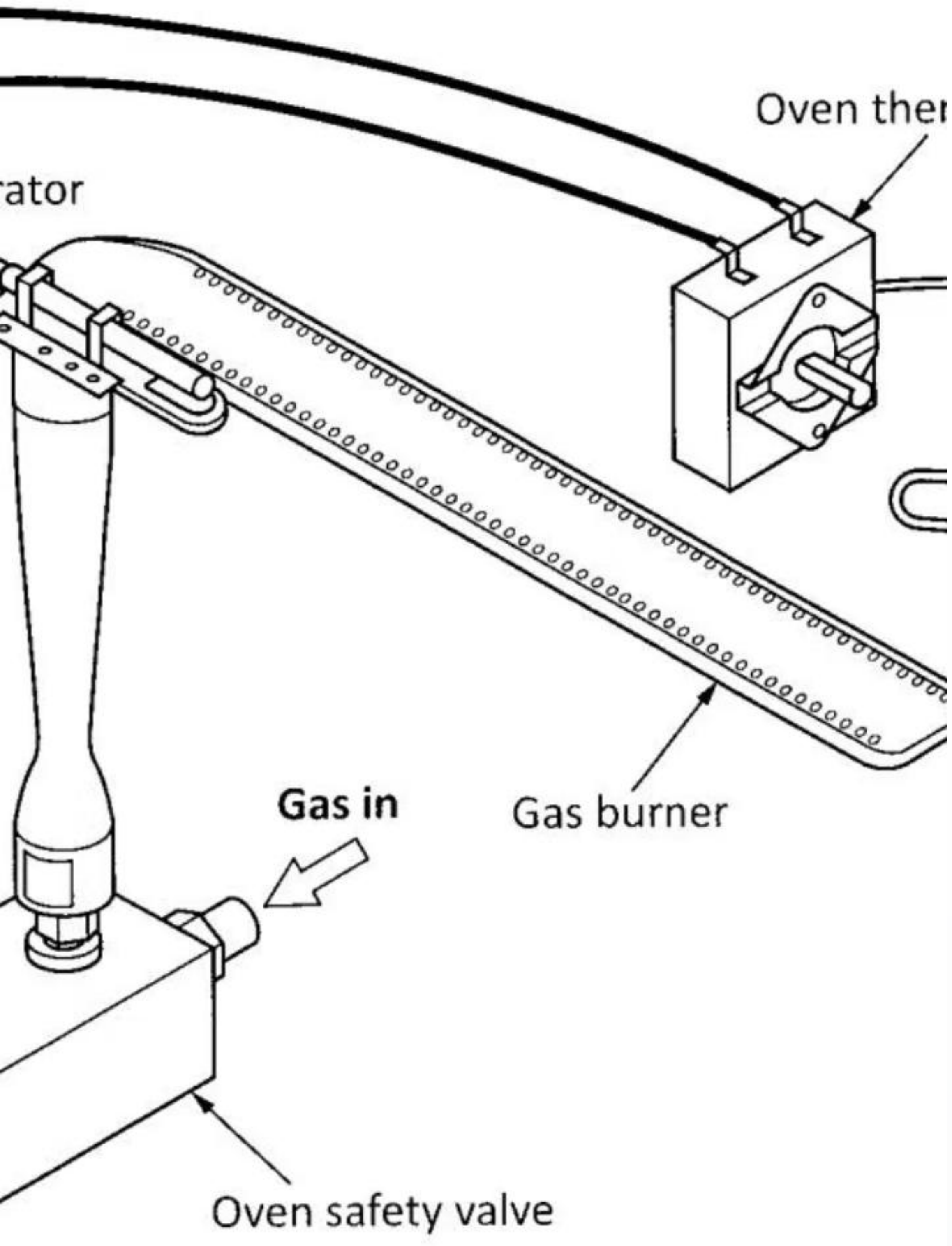


Figure 1-21: Constant/heater pilot assembly showing the flame deflector and mercury bulb

Millivolt oven ignition system



Millivolt Pilot Ignition System

System Overview

A millivolt-pilot ignition system employs a standing pilot to heat a thermopile as well as light the main burner. If the pilot generator is heated, voltage will be generated to operate the control circuit.

Operation Principle

Gas flow to the burner is turned on and off by the control valve in response to oven temperature (sensed by the thermostat capillary tube). When the thermostat is satisfied, the oven main burner shuts off, leaving only the pilot flame.

Safety Feature

If the pilot flame is extinguished, the gas flow is also shut off to the pilot burner as well, providing an important safety mechanism to prevent gas accumulation.

Two-level Pilot Spark Ignition

System Operation

The spark ignition system operates similarly to the constant pilot system, except that the pilot flame is lit by a spark and only burns while the oven control is turned on.

The flame is positioned between the spark electrode and its target. The pilot flame actually conducts electricity, so when the pilot flame is burning, electricity from the spark electrode is drained off to ground and sparking stops.

Safety Feature

If the pilot quits, sparking resumes automatically, attempting to reignite the pilot. This provides continuous monitoring of the pilot flame status.

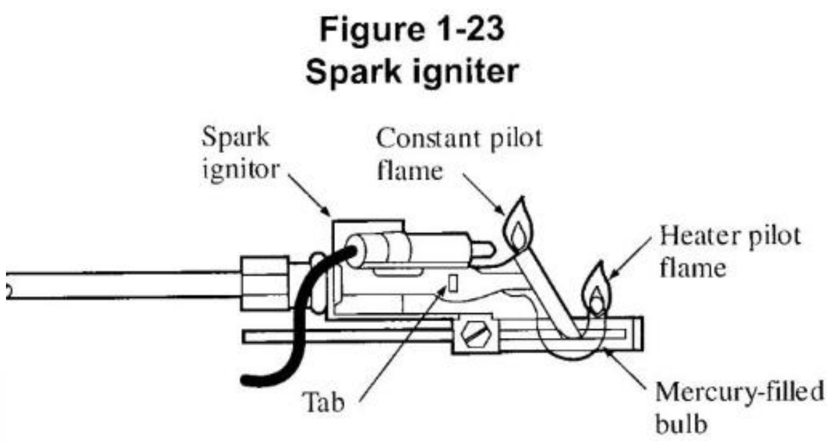


Figure 1-23: Two-level pilot spark ignition system showing the spark electrode arrangement

Spark Ignition System Operation

Oven Activation

When the oven is turned on, a switch mounted to the oven thermostat signals the spark module. Gas first flows to the low flow constant pilot.

Pilot Ignition

At the same time as gas flows to the low flow pilot, the capacitive discharge igniter produces a spark to ignite the pilot. When the igniter confirms the presence of the constant pilot, gas flows through the thermostat valve to the safety valve.

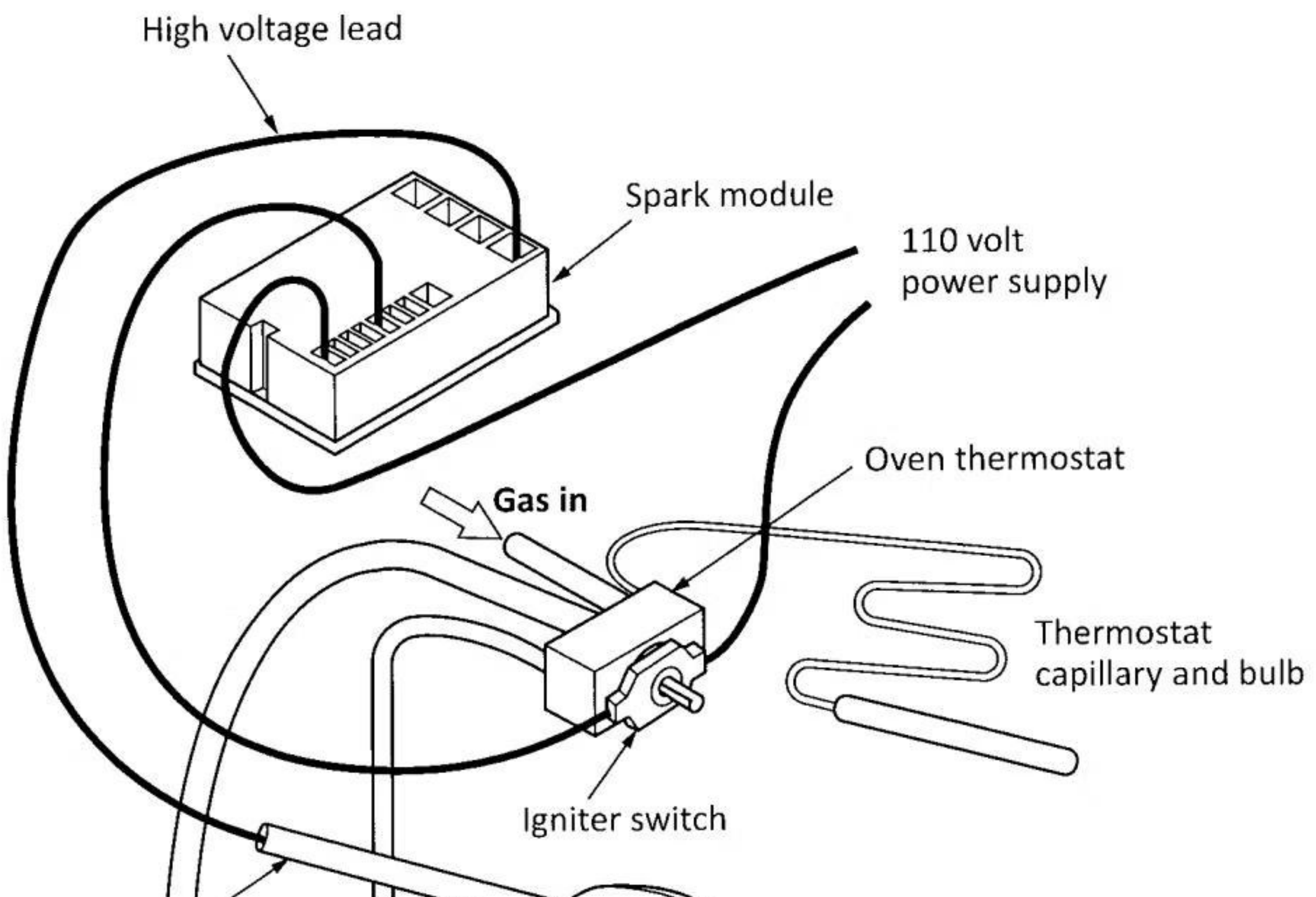
Safety Valve Operation

The gas flow to the constant pilot increases, causing a heater pilot flame. The flame deflector spreads the heater pilot flame over the mercury-filled bulb, which causes the safety valve to open.

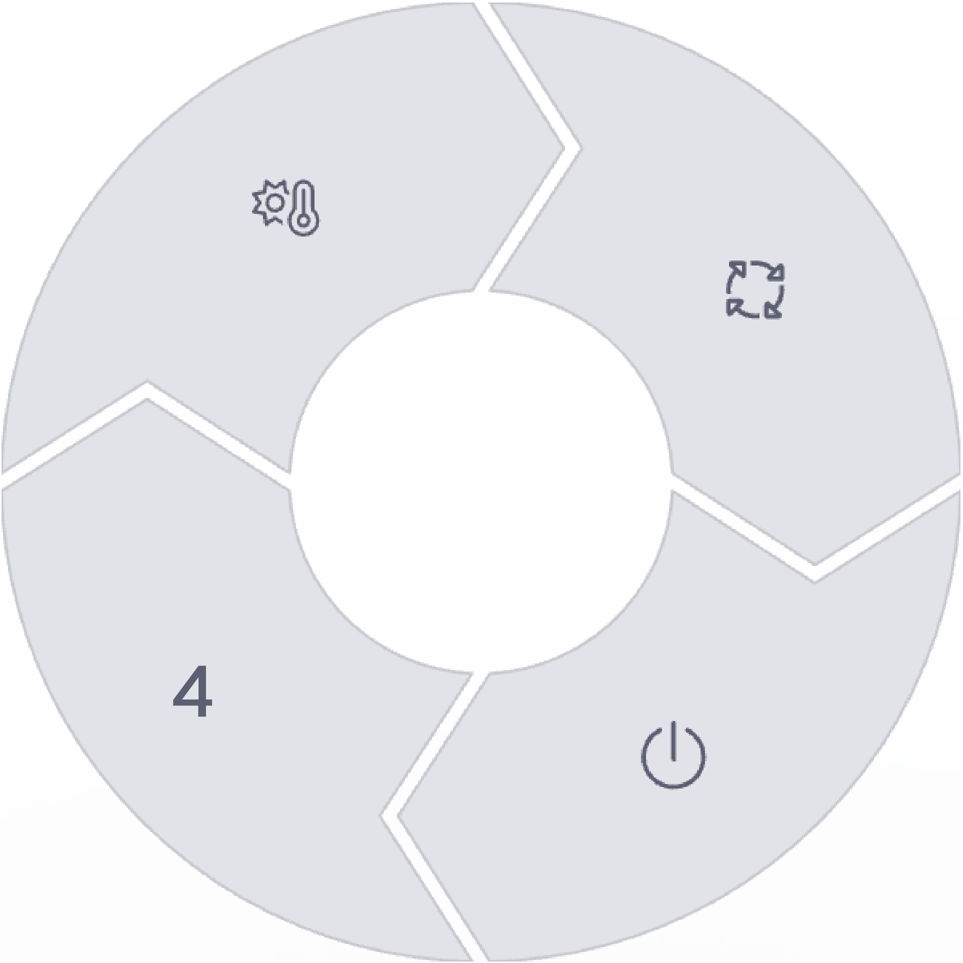
Main Burner Operation

The safety valve allows gas to flow to the oven burner. The heater pilot ignites the burner, which continues to operate until the pre-set temperature is reached.

Figure 1-24
Spark ignition system



Spark Ignition Cycling



Temperature Reached

When the oven reaches the setpoint temperature, the pilot flame reduces in size but does not go out

Ready for Next Cycle

This allows the burner to cycle on in response to a call for heat without having to re-ignite the pilot each time

System Shutdown

Once the oven control is turned to off, the main burner and pilot flame extinguish completely

Next Activation

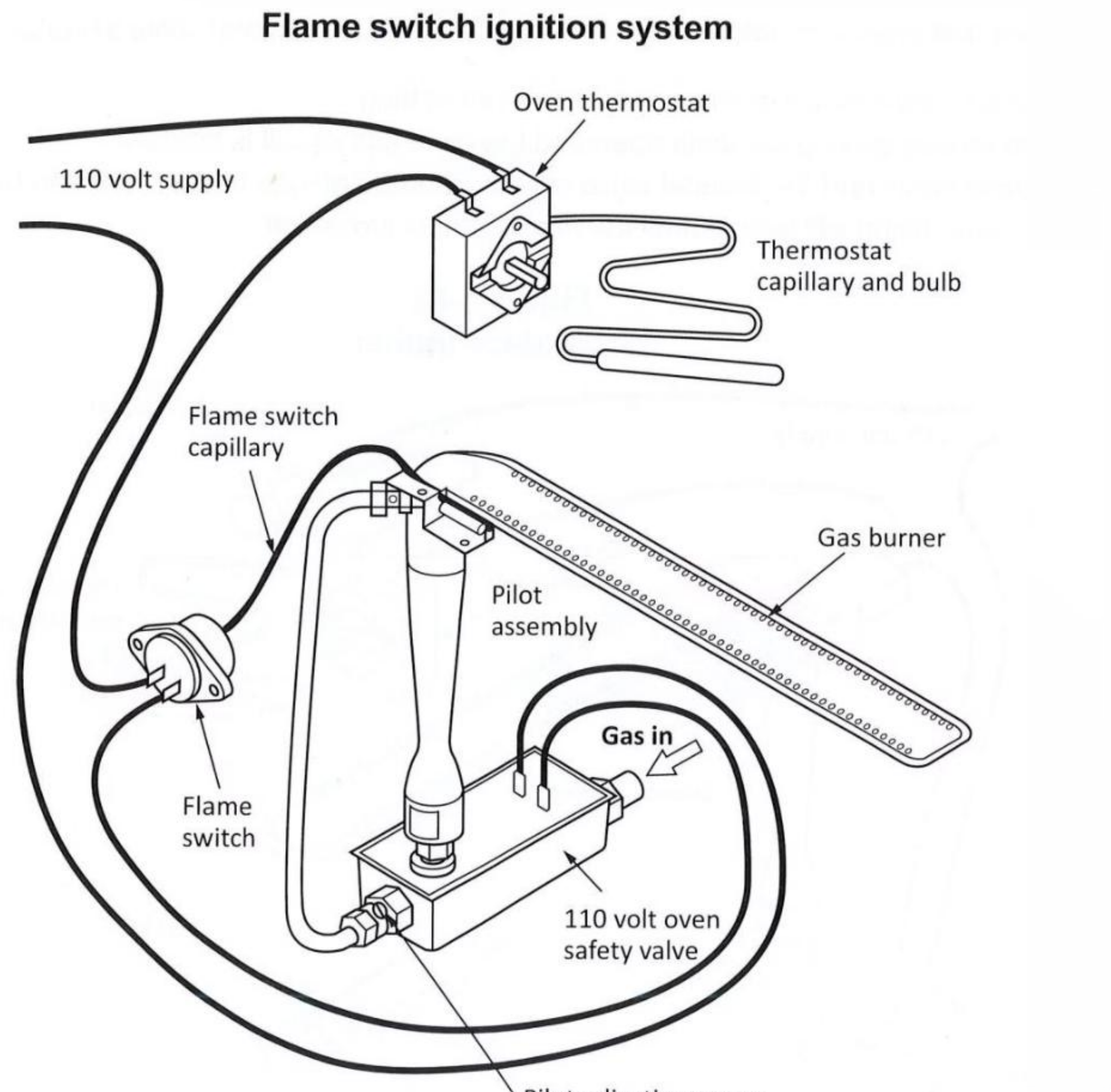
When the oven is turned on again, the entire ignition sequence restarts

Constant Pilot with Flame Switch System

System Components

Both the flame switch system and the hot surface ignition system use a 110V solenoid operated oven safety valve. The valve is normally held closed by a spring, then opened when the solenoid is energized.

The flame switch ignition system employs a pilot sensing bulb and capillary to close a switch rather than opening a valve.



Flame Switch System Operation

Pilot Lighting

The constant pilot is manually lit. The pilot flame heats the switch capillary, causing it to close its electrical contacts.

Thermostat Activation

When the thermostat temperature setting knob is turned to the desired temperature, the circuit connecting the thermostat to the flame switch and solenoid valve is completed.

Valve Operation

The energized oven safety solenoid valve opens to allow gas flow to the oven burner where the pilot flame ignites the gas instantly.

Temperature Cycling

When the oven set point temperature is reached, the circuit opens, closing the oven solenoid valve that, in turn, shuts off the gas supply to the burner. The on-off cycle continues until the thermostat is turned OFF.

Hot Surface Igniter System

System Overview

A hot surface or glow-bar ignition system eliminates the need for a pilot flame in the oven. It operates on standard household current of 120V AC and lights the oven burner electrically with a silicon carbide igniter.

Silicon carbide is very brittle so the glow bars are housed within a protective cage. There are two different types of ignitors in common use: round and flat. Their resistances are different, so the gas safety valve that each uses is different, but the operating principle is the same.

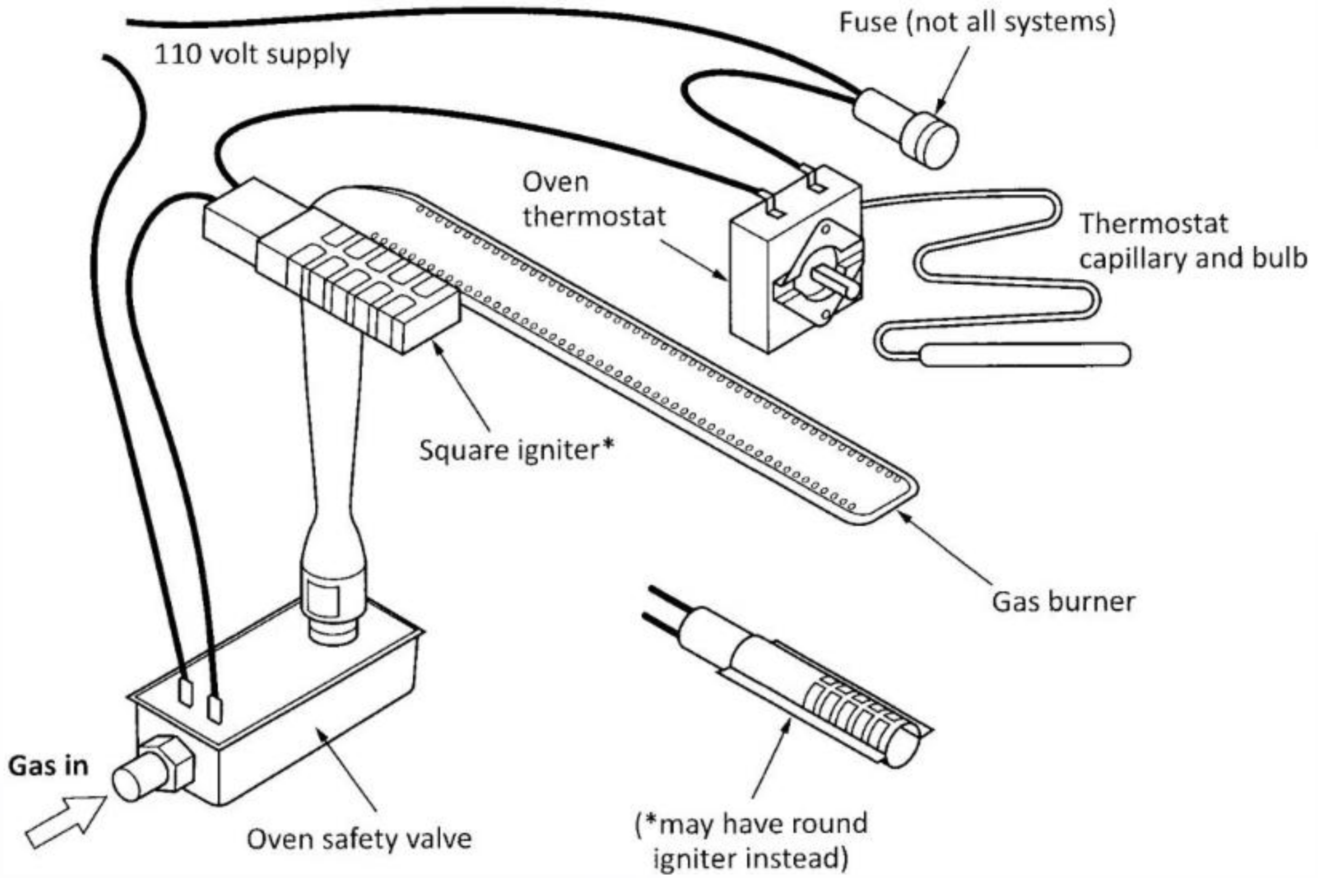


Figure 1-26: Hot surface igniter showing the silicon carbide element in its protective cage

Hot Surface Igniter Operation

Thermostat Call for Heat

When the thermostat calls for heat, the cycling contacts close, and the hot surface igniter is energized.

Igniter Heating

As current begins to flow, the igniter starts to heat and its resistance decreases. As the igniter resistance decreases, the current flow through the low resistance coil of the bimetal valve increases.

Valve Opening

The bimetal valve will not open until the igniter has reached gas ignition temperature. The gas valve opens, and ignition occurs when the amperage in the circuit has increased to the point that approximately 4V are developed across the bimetal valve's heater coil.

Cycling Operation

When the oven temperature reaches the thermostat setting, the thermostat cycling contacts open and the electrical circuit is broken. The igniter cools and the bimetal valve closes, shutting off gas flow to the main burner. This cycling action repeats until the thermostat is turned off.

Direct Spark Ignition (DSI) Systems

System Overview

In this system, there is no 'pilot'. Instead, the spark directly ignites the gas burner (hence the name), and the electronic control monitors its performance.

Operation Sequence

When the range control calls for either bake or broil, the DSI module electronically checks both gas valves' solenoids for continuity. If the checks are successful, the module will power the appropriate gas valve so it can open and initiate sparking at the burner ignitor.

Safety Features

Both the bake and broil ignitors will spark simultaneously. Once gas has ignited, the flame sensing circuitry will monitor the flame at the burner as long as it is powered to make sure that it is present. If at any point no flame is detected, the DSI module will lock out the system.

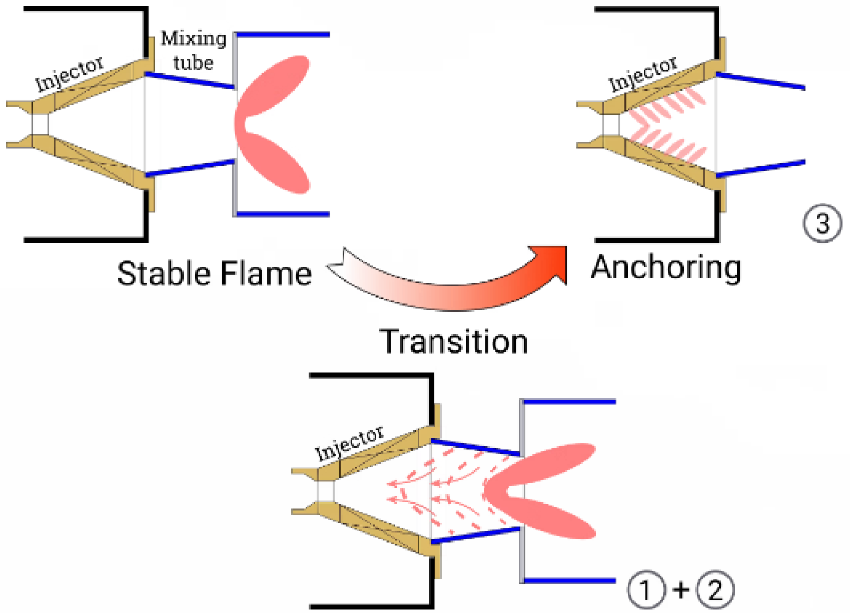
Extinction Pop

What is Extinction Pop?

Extinction pop or flashback can occur when the burner is turned off. Even after gas flow to the burner is shut off, primary air can still flow into it. When this occurs, the gas-air mixture in the burner is replaced by air only.

Cause and Effect

During this time when the gas pressure quickly decreases, the burning velocity can exceed the flow rate of the gas-air mixture and flashback results. The small flashback explosion or "extinction pop" is not a hazard but may be annoying.



This phenomenon is common in gas burners but does not represent a safety hazard.

Oven Controls Overview

Modulating Controls

Older systems were of the modulating (throttling) type and used a constant-on burner

Cycling Controls

Newer systems are cycling (on-off) types that turn the burner completely on or off

Temperature Sensing

The oven heat control system is activated by changes in temperature to control gas flow to the oven burner

Safety Features

Modern controls include multiple safety mechanisms to prevent gas accumulation

Cycling Oven Control System

System Components

A typical cycling oven heat control system consists of:

- Oven thermostat and temperature sensing probe that controls heater pilot operation
- Constant pilot that lights the heater pilot
- Heater pilot that controls safety valve operation
- Safety (cycling) valve that controls main burner operation
- The oven burner

Figure 1-27
Cycling oven control components
Courtesy of Consumers Gas

Figure 1-27: Cycling oven control system showing the relationship between components

Cycling Control Operating Sequence

Constant Pilot

The constant pilot, located at the base of the oven burner, always remains on.

Thermostat Activation

When the oven thermostat dial is turned on and adjusted to the desired temperature, the thermostat supplies gas to the heater pilot.

Safety Valve Operation

The heater pilot heats the capillary tube or bimetal element of the safety valve. Within 60 seconds, the safety valve opens to allow gas flow to the main burner.

Burner Ignition and Cycling

The pilot system ignites the main burner as soon as gas starts to flow. When the thermostat senses that the desired temperature has been reached, the pilot flame reduces back to the standby rate, shutting off the safety valve and gas flow to the burner.

Oven Thermostat

Function and Operation

The oven thermostat (gas thermostat) is the main component of the cycling control system. A gas thermostat is a hydraulic control device that responds to expansion and contraction of a liquid contained in the oven probe bulb.

A capillary tube connects the probe bulb to the thermostat. This device opens a valve in the thermostat to increase gas flow to the pilot when heat is required and closes the valve to reduce gas flow when the desired temperature is reached.

Additional Functions

The oven thermostat also provides a positive shut-off for the main burner gas supply (manual gas valve). The oven burner gas supply passes through the shut-off portion of the thermostat to ensure that no gas flows to the burner when the thermostat dial is turned to the off position.

The thermostat can be set to operate on natural gas or propane, and it can be adjusted (with the calibration screw) to increase or decrease the temperature.

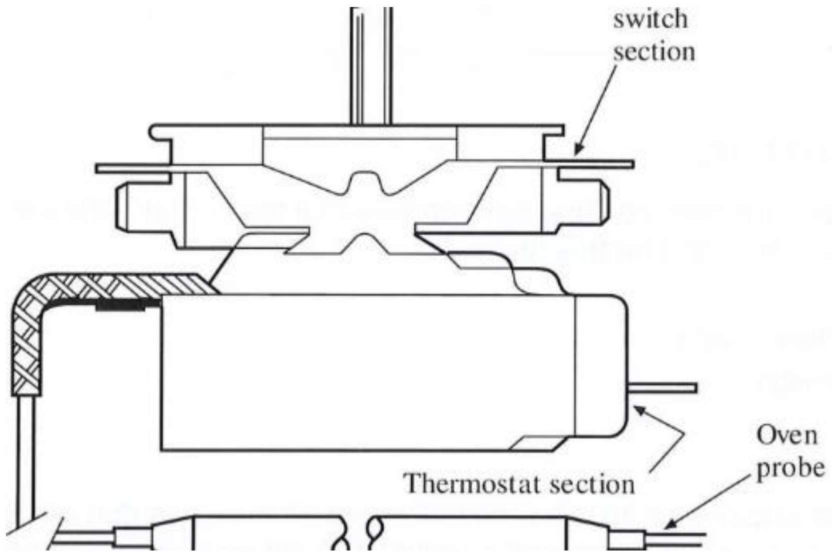


Figure 1-28: Oven thermostat selector showing the dial and internal components

Safety Valve

Function

The gas safety valve controls gas flow to the oven main burner. It is usually located in the bottom rear area of the oven, attached to the oven cabinet or to a bracket extending from the burner.

Operation

The safety valve contains a diaphragm mechanism that is controlled by the action of the pilot flame on a liquid-filled bulb. The liquid in the bulb expands or contracts in response to the amount of heat it receives from the pilot flame.

The valve diaphragm opens and closes to control gas flow to the burner, ensuring gas only flows when safe conditions exist.

Figure 1-29
Safety valve
Courtesy of Frigidaire Home Products

Figure 1-29: Safety valve showing the diaphragm mechanism and liquid-filled bulb connection

Set-back Controls

Purpose

Set-back controls reset the oven cooking temperature to a lower "hold and serve" temperature. This feature allows food to be kept warm without continuing to cook at the higher temperature.

Heat Motor Types

Bellows type: Has an electrically heated, fluid-filled bellows mechanism built into the thermostat. When the cooking cycle is finished, a pair of contacts in the oven timer close to energize the set-back control circuit.

Bimetallic Type

The bimetallic heat motor operates similarly to the bellows type, except that the bimetallic element is heated instead of the bellows. Typically, the bimetallic heat motor only reduces the temperature to 155°F (86°C) below the cooking temperature.

Additional Set-back Control Types

Mechanical Turndown

The mechanical turndown consists of a small, low-revolutions per minute (rpm) electric motor connected to the oven thermostat spindle by a series of gear wheels.

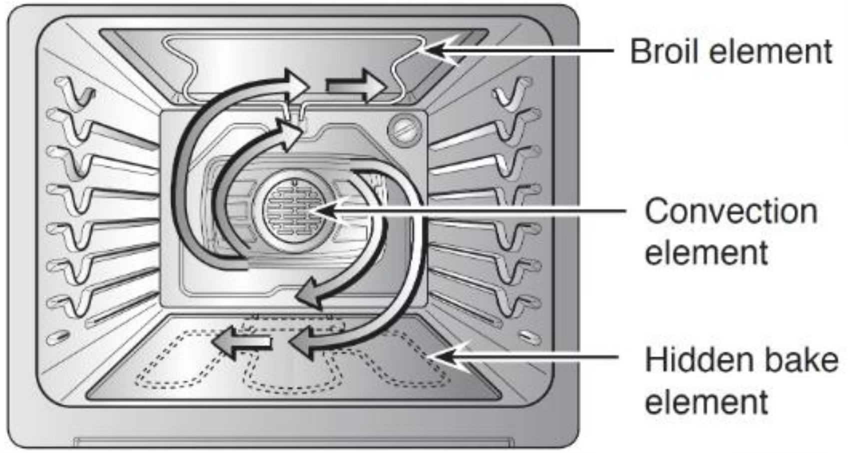
When the cooking cycle is completed, the switch mechanism of the oven timer energizes the electric motor. The motor then rotates the gear wheel mechanism, which turns the thermostat temperature control dial to 170°F (77°C).

Substitute Thermostat

This type of set-back control uses two separate thermostats:

- One thermostat is adjustable for setting cooking temperatures
- The second (substitute) thermostat is set to maintain only 170°F (77°C)

When the cooking cycle is completed, the oven timer mechanism switches over from the cooking thermostat to the substitute thermostat, which maintains the oven at 170°F (77°C).



The mechanical turndown system uses gears to physically rotate the thermostat dial to a lower setting.

Self-Cleaning Oven

Cleaning Cycle Initiation

After the clean cycle is initiated, the radiant broiler burner heats the oven to approximately 650°F (340°C). The oven door then locks automatically.

High Temperature Phase

When the cleaning temperature is reached, a disc thermostat (thermodisc) senses when the oven temperature reaches 650°F (340°C) and switches electrical power from the radiant broiler burner to the oven burner, which further heats the oven to approximately 950°F (510°C).

Cycle Completion

At the end of the cleaning cycle (typically two hours), the oven cools down and the door unlocks when the oven is at a safe temperature.

Programmable Clocks

Cook and Off

When the clock and thermostat are set to the cook and off program, the oven will operate at the set point temperature for the length of time required. When the cooking cycle is finished, the oven shuts off and cools down to room temperature.

Cook and Hold

When the clock and thermostat are set to the cook and hold program, the oven will operate at the set point temperature for the length of time required. A short time before the cooking cycle is finished, a set-back device will reduce the oven temperature to "hold and serve temperature".

Delay, Cook, and Hold

This program allows the user to pre-set the clock and thermostat so that the oven will operate automatically without the user being present. At the pre-programmed times, the cooking cycle will start, and a short time before the cooking cycle is finished, a set-back device will reduce the oven temperature to "hold and serve temperature".

Delay, Cook, and Off

This program also allows the user to pre-set the clock and thermostat for automatic operation. At the pre-programmed time, the cooking cycle will start, and when the cooking cycle is finished, the oven shuts off and cools down to room temperature.

Oven Control Calibration and Testing

Importance

Accurate calibration and testing of oven controls is a critical factor in ensuring safe and fuel-efficient range operation and satisfactory cooking results.

Safety Concerns

If an oven control is significantly out of calibration, the oven could overheat, resulting in fire, damage to the range, or personal injury to the consumer.

Calibration Types

There are three basic classes of oven calibration and testing: mechanical, electromechanical, and electronic.

Regular Maintenance

Regular calibration checks help ensure optimal performance and safety of the oven system.

Mechanical Adjustments

Types of Adjustments

Mechanical adjustments include such things as:

- Adjusting the thermostat temperature by means of its calibration screw
- Adjusting the thermostat temperature setting knob
- Standby pilot flame adjustment
- Bypass flame adjustment

Thermostat Calibration

The thermostat calibration screw is located in the centre of the thermostat shaft. The calibration screw is turned clockwise to decrease the temperature and counter-clockwise to increase the temperature.

Some thermostats are not designed to be calibrated in the field and have their calibration screw sealed in place to prevent tampering. These styles will be adjusted at the back of the temperature setting knob.

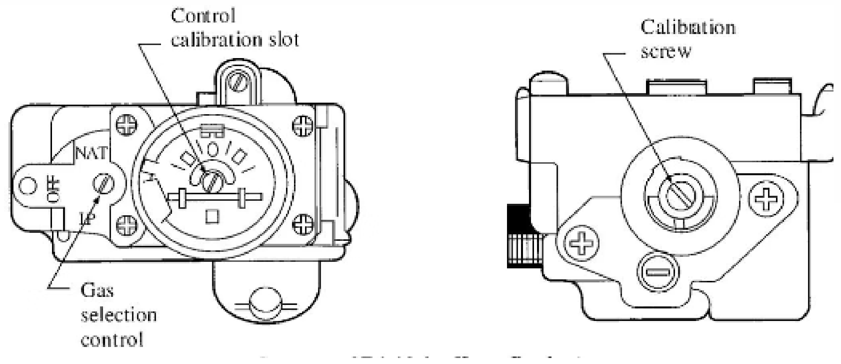


Figure 1-30: Location of thermostat calibration screw showing different thermostat designs

Temperature Setting Knob Adjustment

Adjustment Range

An oven temperature setting knob can be adjusted to increase or decrease the factory settings over a range of ±50°F (±30°C) in 10°F (5°C) increments.

Adjustment Procedure

1. Turn the knob to the OFF position, and remove it by pulling it straight off the thermostat shaft
2. Loosen both screws approximately one full turn or until the shaft rotates freely
3. Hold the knob handle in place while turning the shaft in the desired direction
4. Each notch represents a change in the setting of 10°F (5°C)
5. When the knob has been adjusted to the desired temperature, tighten both screws
6. Reinstall the knob by pushing it straight onto the thermostat shaft

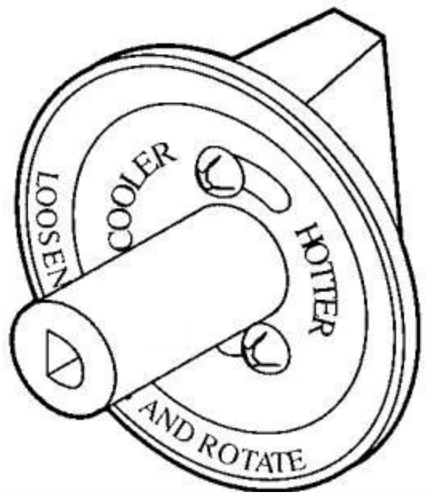


Figure 1-31: Oven temperature setting knob adjustment showing the adjustment mechanism

Standby Pilot Flame Adjustment

Purpose

Oven thermostats that control the flame of a manually lit burner come with a standby pilot. The thermostat controls the gas supply to the standby pilot, which is lit only when the oven valve is turned on.

The purpose of the standby pilot is to re-ignite the flame of the oven burner if it is extinguished for any reason.

Proper Adjustment

The proper length of the pilot flame depends on its position with respect to the oven burner flame. A pilot flame may be from 0.25 to 1 inch (6 mm to 25 mm) in length and should have only a trace of yellow at its tip.

The pilot flame should not touch any part of the burner and should ignite the oven burner within one second.

A properly adjusted pilot flame should be primarily blue with just a hint of yellow at the tip.

Bypass Flame Adjustment

Proper Flame Size

The main oven burner bypass flame should be adjusted to the minimum size at which it remains stable. For most purposes, a properly adjusted bypass flame should be the same size as the standby, with blue "beads" of flame.

Set Oven Temperature

Turn the oven temperature setting knob to 350°F (175°C). Heat the oven up to 350°F (175°C).

Check Bypass State

When the oven has reached 350°F (175°C), check the burner flame to ensure it has reduced to its bypass state. Turn the oven temperature setting knob to 250°F (120°C) to ensure that the thermostat valve is completely closed, and that the burner flame will remain in bypass mode.

Make Adjustment

Use the correct tool, in accordance with the manufacturer's instructions, to adjust the bypass flame.

Electro-mechanical Adjustments

System Components

Electromechanical adjustments and tests are sometimes required on electric gas control systems. An electric gas control system operates on 120V AC and consists of three main elements:

- The oven thermostat
- A flame switch or silicon-carbide igniter
- A solenoid valve

Thermostat Testing

To determine if the oven thermostat requires recalibration:

1. Place a temperature test probe in the centre of the oven's middle rack
2. Turn on the oven to 400°F (200°C) and allow it to heat for 15-20 minutes
3. Record the temperatures at which the burner turns on and off for several cycles
4. An average temperature within 10°F (5°C) of the set point is satisfactory

Accurate temperature measurement is essential for proper thermostat calibration.

Thermostat Recalibration

Remove Knob

Remove the temperature setting knob assembly by carefully pulling it straight off the thermostat shaft. It is important to ensure that the "D" stem does not rotate; otherwise the original thermostat setting will change.

Access Calibration Screw

Insert a screwdriver carefully into the calibration screw slot to adjust. Turn the calibration screw clockwise to reduce the temperature or counter-clockwise to increase the temperature.

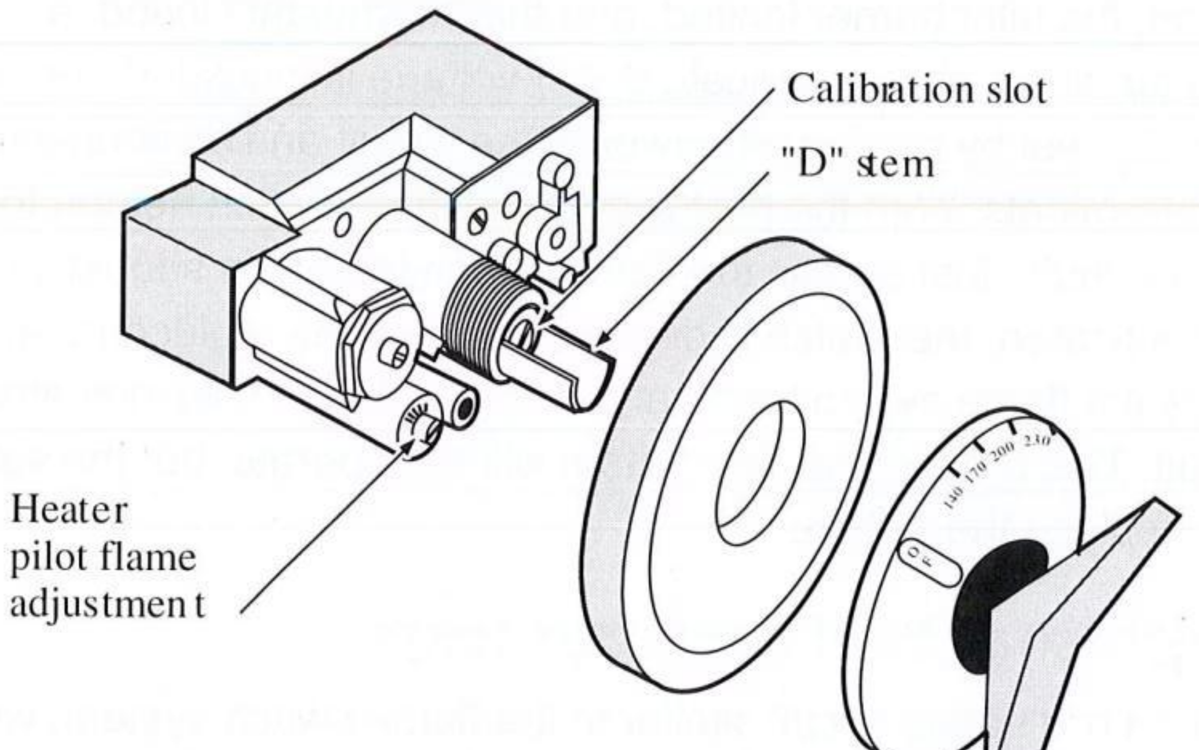
Make Adjustments

Do not move the "D" stem during these adjustments. Observe the temperature change on the test instrument and adjust the calibration screw as necessary until the desired temperature is maintained.

Complete Procedure

Make small adjustments and give the oven plenty of time before making additional adjustments. When the adjustment is completed, reinstall the temperature setting knob and turn it to the OFF position.

Figure 1-32
Calibrating electric gas control thermostat
Courtesy of Consumers Gas



Flame Switch System

System Operation

The flame switch is connected in series with the thermostat and solenoid valve, and is normally closed as long as there is a pilot flame. The solenoid valve cannot open unless the thermostat and flame switch are both closed.

Safety Function

The flame switch is a critical safety device that prevents gas flow to the main burner if the pilot flame is not present. This prevents unburned gas from accumulating in the oven cavity.

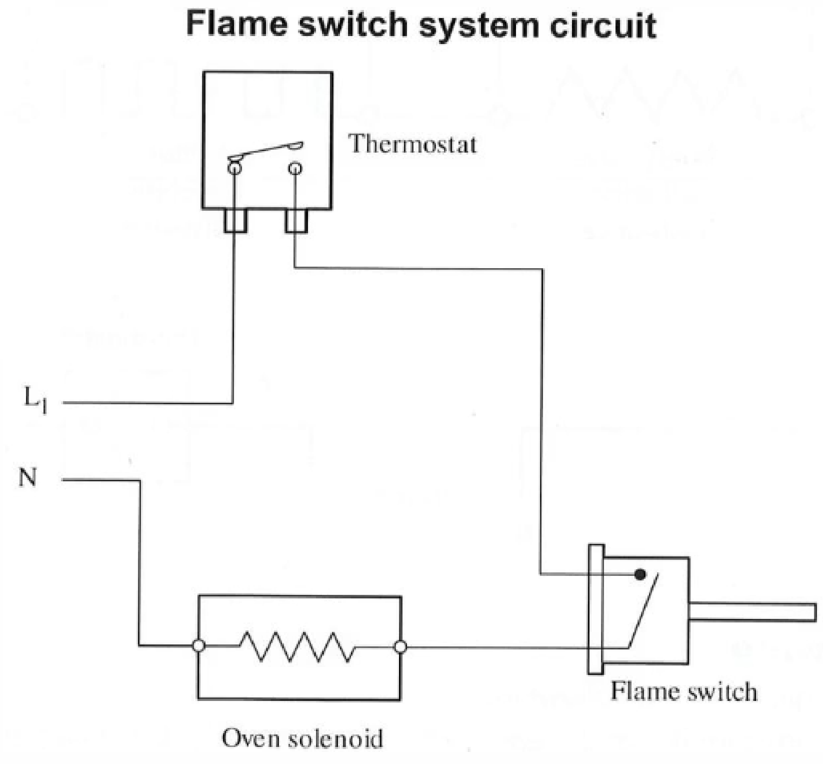


Figure 1-33: Flame switch system circuit showing the electrical connections between components

Flame Switch Testing

Voltage Test

With the power on, the pilot burner ignited, and the thermostat closed, a voltage test across the flame switch terminals should indicate 0V. If voltage is indicated, the switch is defective.

Continuity Test (Hot)

Turn off power to the circuit and disconnect one wire from the flame switch terminals. With the pilot lit and the flame switch heated to operating temperature, a continuity test across the flame switch terminals should indicate continuity.

Continuity Test (Cold)

Continuity across the flame switch terminals when the unit is cold indicates that the switch has a short circuit. This means that the system will still operate, but the safety feature will not be operational.

Replacement

The flame switch requires immediate replacement if it is defective, as it is a critical safety component.

Hot Surface Ignitor (HSI) System Tests

System Operation

The HSI control system is a series circuit similar to the flame switch system, with the glow-bar wired as the safety instead of the flame switch. Although the oven safety valve looks exactly the same as the one used for the flame switch system, it operates at a much lower voltage.

When the ignitor heats up, the resistance drops, and the safety valve gets more current. When the voltage drop across the valve reaches approximately 4V, the safety valve opens, and the ignitor is hot enough to ignite the gas.

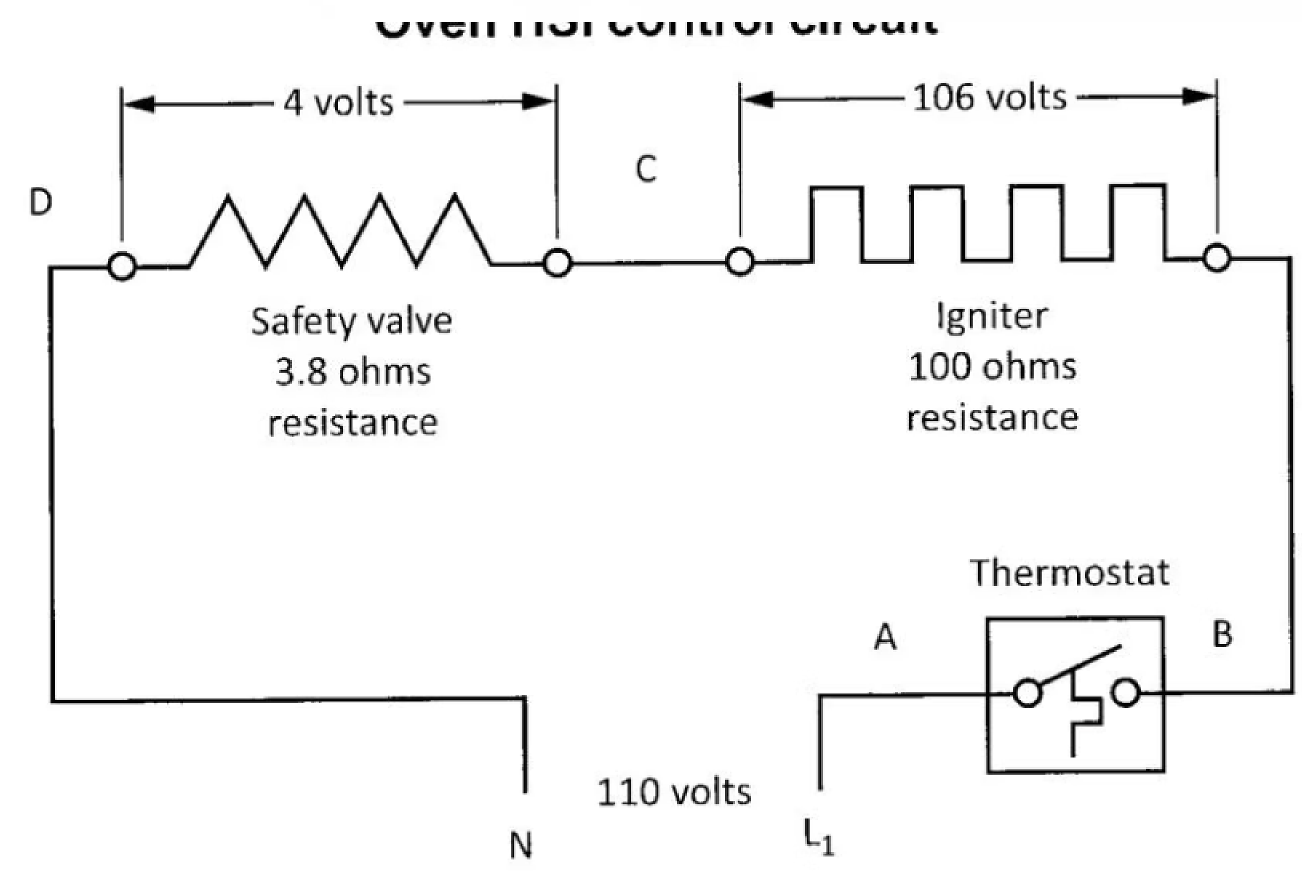


Figure 1-34: Oven HSI control circuit showing the electrical connections between components

Troubleshooting Non-Glowing Ignitor

Check Ignitor Resistance

Disconnect or remove ignitor and measure its resistance. Cold resistance should be between 50 and 150 Ohms. (The value of the resistance is not important as long as the ignitor is not open or shorted.)

Check Power Supply

Check internal fuses, switches and 120V AC power supply. If power is working, disconnect oven power and remove wires at B and D and check continuity between wire B and terminal D.

Test Safety Valve

If continuity is not present, remove wire at C and probe terminals D and C for continuity. If no continuity, replace the oven safety valve. If continuity is present at D and C, probe wires B and C. If no continuity, replace the ignitor.

Check Thermostat

If continuity is present between B and D, check the thermostat. Make sure the oven is not heated. Turn power off, disconnect wiring and turn thermostat dial to 350°F (175°C). Probe at terminals A and B. If no continuity, replace the oven thermostat.

Troubleshooting Ignitor Glowing with No Ignition

Basic Checks

First, check that gas is turned on to the range. Then check that ignitor mounting screws are tight and the ignitor is properly positioned with relationship to the main burner ports.

Amp Draw Test

Check amp draw at oven safety valve with power on and thermostat set at 350°F (175°C). Using clamp-on amp meter, test one leg for amp draw at D or C.

- Carborundum (round) Ignitor: 2.5 to 3.0 amps
- Norton (flat) ignitor: 3.2 to 3.6 amps

If amp draw not within proper range, replace the ignitor. If correct amp draw is present, replace valve.

A clamp-on ammeter is used to measure current flow through the ignitor circuit without breaking the circuit.

Solenoid Valve Test

Valve Operation

The solenoid valve, which is normally closed, opens when it is energized. To test solenoid valve operation, observe its opening and closing action while turning the power on and off.

Continuity Test

If there is no continuity across the solenoid coil, and the valve does not open when the power is turned on, the valve or its coil must be replaced.

Gas Flow Test

If any gas continues to flow through the valve when it is shut and the power is off, the valve should be replaced immediately as this represents a serious safety hazard.

Electronic Adjustments

Digital Controls

Electronic adjustments include such things as digital oven temperature controls. These microprocessor-controlled devices are operated by a push-button keypad. A digital LED or LCD window displays temperature readings, cooking times, etc.

Thermistor Operation

A thermistor is a temperature-sensitive semiconductor device that has a negative temperature coefficient, which means its resistance decreases as its temperature increases. The resistance of the thermistor varies non-linearly with temperature.

Because its resistance increases so rapidly over a very narrow temperature range, the thermistor can be used as a switching device to switch the gas valve and igniter off and on.

Figure 1-35: Electronic oven control display showing digital interface

Electronic Oven Control Calibration

Access Calibration Mode

Depress the BAKE push-button on the keypad. Turn the rotary temperature selection switch to 500°F (260°C) or higher, then immediately (within 1 second) depress the BAKE push-button and hold down for 5 seconds.

View Current Setting

The display will then indicate the factory offset setting of 00.

Adjust Temperature

Tap the arrow up or down to change the oven temperature as needed. The temperature can be increased or decreased ±35°F (±20°C) in 5°F (±2.5°C) increments. (Some clocks have a turn dial instead of arrow pads.)

Save Settings

When the desired temperature offset has been selected, depress the STOP/CLEAR pushbutton to set and store the new setting in the controller's memory. Use a tester to recheck the oven temperature.

Gas Pressure

Importance

After installing and before servicing a gas range, check the gas manifold pressure with a manometer. It must have gas flowing through in order to read and adjust its pressure setting correctly.

If it is incorrect, adjust the regulator to achieve the correct manifold pressure.

Proper Flame Characteristics

A stable flame with the correct characteristics is required for proper combustion and range operation. The characteristics of a flame depend mainly on the primary air supply.

A stable, blue flame will be produced at the burner when the proper amount of primary air is premixed with the gas before ignition.

A manometer is used to measure gas pressure in the manifold to ensure proper operation.

Primary Air Supply

Effect on Flame

Increasing or decreasing the primary air supply will change the shape and colour of the burner flame.

- Increasing primary air: The flame sharpens and the inner cone gets smaller
- Decreasing primary air: The flame gets longer and burning speed decreases because more secondary air is then required to complete combustion
- Further reduction: A yellow tip appears on the flame
- No primary air: The flame will become completely yellow

Adjustment Location

For each of the top burners and oven burners, the primary air shutter is located at the open end of the venturi tube and is locked in place.

Should the air shutter need adjusting, loosen the Phillips head screw and gradually rotate the air shutter to allow more or less air into the burner tube as needed.

The air shutter controls the amount of primary air that mixes with the gas before combustion.

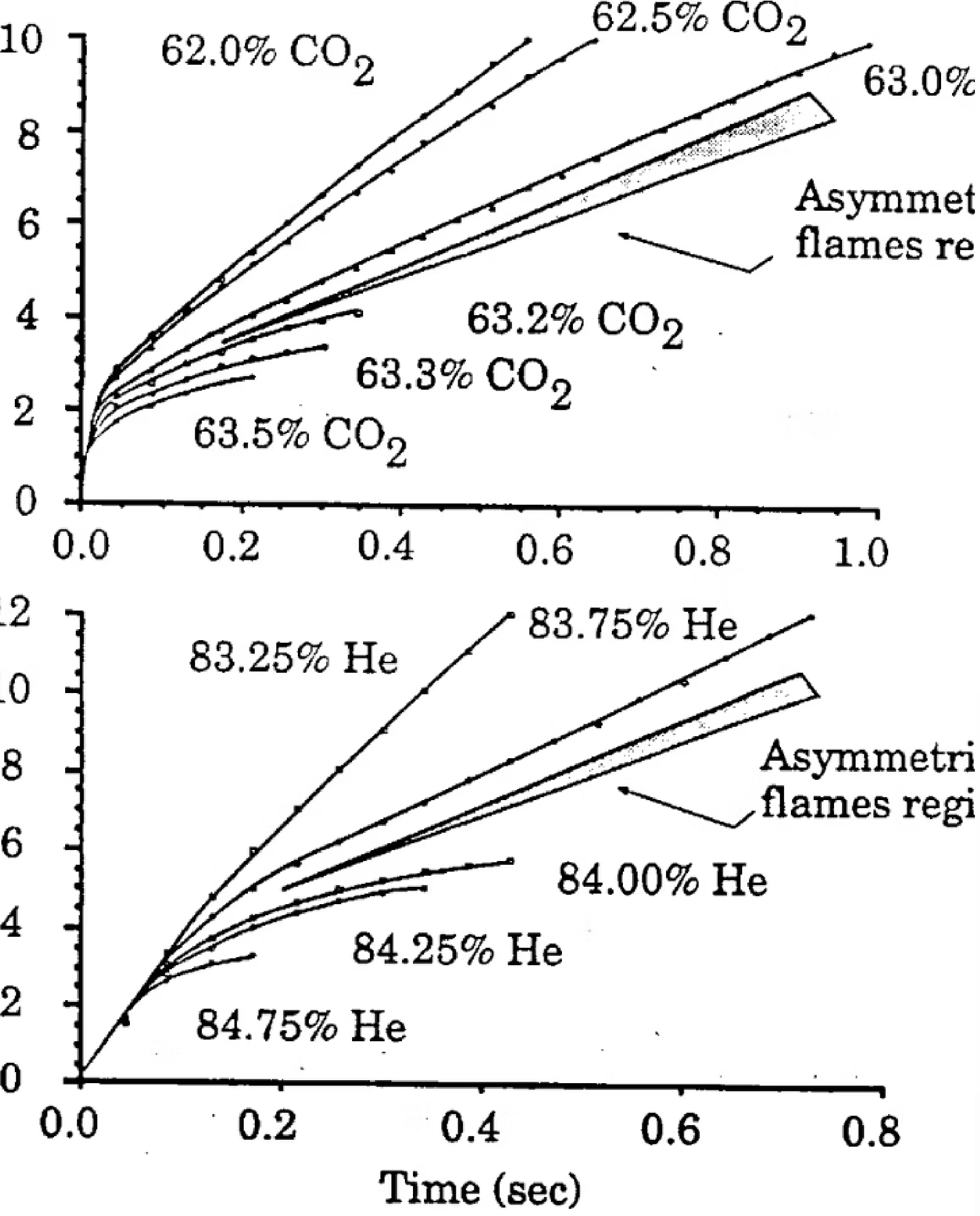


Figure 1

Proper Flame Characteristics

Flame pattern problem	Possible cause	Corrective action
Lifting flame when cooking vessel in place	Too much air; Fuel mixture velocity higher than flame speed	Reduce primary air; Reduce appliance input
Lifting flame when burner uncovered	Not a problem	No correction necessary
Flame blows out on simmer setting	Simmer set too low	Adjust simmer setting
Oven burner flame larger at back than front	Not a problem (this is common)	No correction necessary
Radiant burner makes a loud popping sound	Deteriorated radiant panel	Replace radiant panel

Proper Servicing Practice

1. ## Diagnose Customer Complaints

   Listen attentively to the customer, have them show where the equipment is, ask specific questions about symptoms, and restate the problem to ensure understanding.

2. ## Follow Manufacturer's Instructions

   Use appliance operating and service manuals and established troubleshooting procedures to guide service work.

3. ## Interpret Wiring Diagrams

   Each appliance has its own wiring diagram or schematic that must be understood for proper service.

4. ## Practice Safety

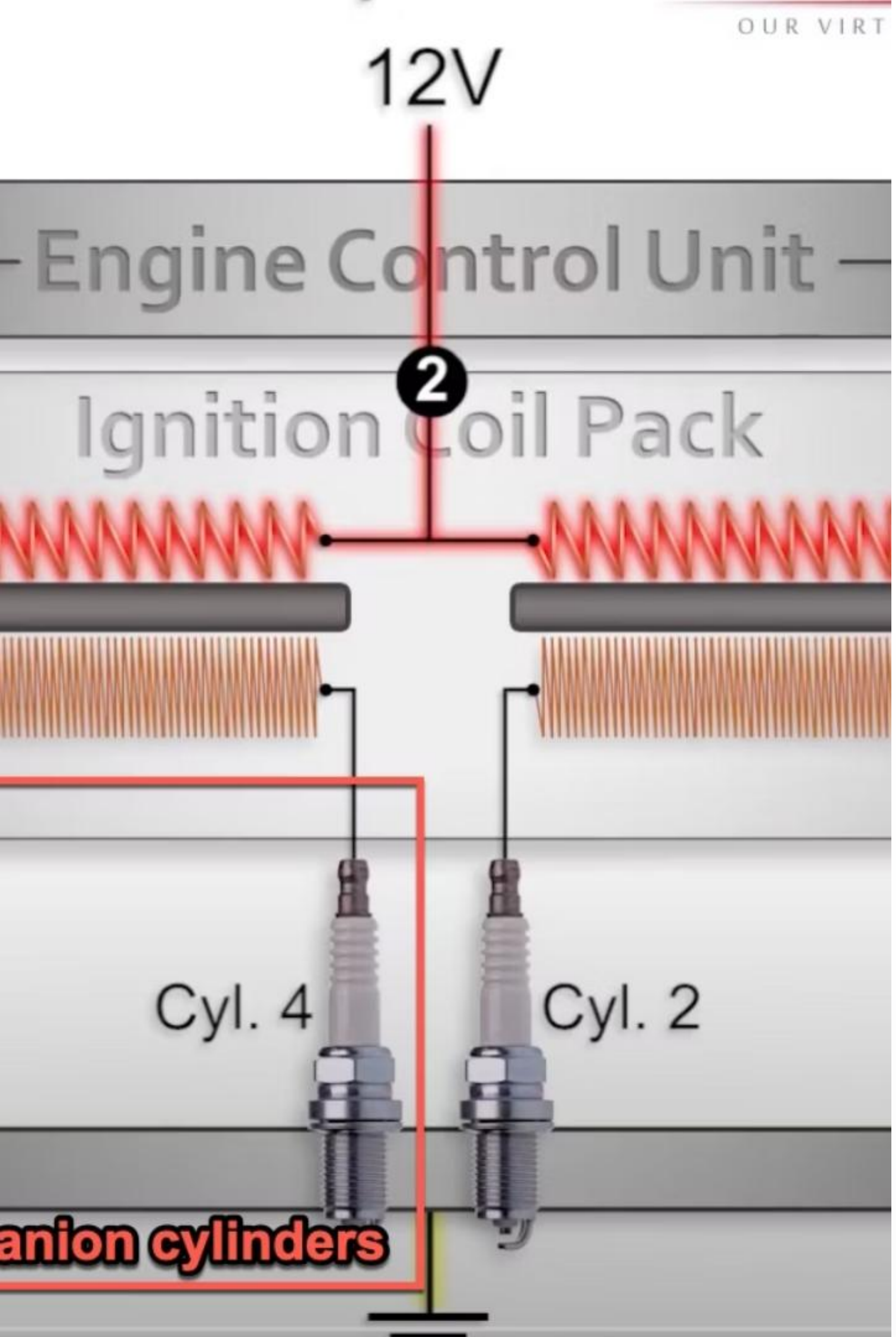
   Disconnect electrical power, shut off gas supply if necessary, and use proper safety equipment.

5. ## Replace Components Properly

   Remove faulty components and replace with correct parts according to manufacturer specifications.

6. ## Verify Operation

   Check function of all replaced components to ensure safe and efficient appliance operation.



Spark Ignition Faults

Faults	Possible causes	Corrective action
No sparking occurs for one of the top burners	Valve switch not operating	Replace valve switch
Sparking occurs at two of the top burners only	Shorted wire; Defective ignition control	Replace wire; Replace control
Intermittent sparking at burner electrode	Incorrect gap; Partial short to ground from spillover	Adjust gap; Clean spillover
No sparks at any burners	Ignition control or poor grounding; Reversed polarity	Replace control and/or ground properly; Check polarity
Constant or random sparking after the burner is lit	Improperly grounded range; Extremely low flame; Electrode issues	Check grounding; Reposition sensing element; Replace faulty components

Constant Pilot Faults

Too Much Air

Too much air going into burner, causing flame to lift and blow out. Adjust primary air shutter to reduce air flow.

Drafts

Drafts in oven can extinguish the pilot flame. Completely enclose oven cabinet to prevent drafts.

Pilot Adjustment

Pilot set too low or flame out of adjustment. Adjust pilot valve for longer flame or adjust flame length as needed.

Flame Position

Oven burner flame playing directly on pilot tip. Adjust pilot tip so it is 3/8 inch below oven burner port.

Connections

Loose connection in pilot supply line. Tighten connection to ensure proper gas flow.

Control Issues

Defective thermostat or automatic oven gas control. Replace the defective component.

Millivolt System Faults

Faults	Possible causes	Corrective action
Millivolt pilot flame goes out intermittently	Pilot size inadequate	Adjust flame length so that flame has yellow tip
Millivolt pilot flame goes out intermittently	Weak magnet on millivolt pilot system	Check millivolt dropout reading
Millivolt pilot flame goes out intermittently	Overfired or smothered main burner flame causing smothering of pilot	Check main flame input
Millivolt pilot flame goes out when reset mechanism released	Bent rod	Replace oven control
Millivolt pilot flame goes out when reset mechanism released	Defective millivolt pilot thermocouple	Replace thermocouple
Millivolt pilot flame goes out when reset mechanism released	Defective magnet	Replace magnet or valve

Top Burner Faults

Proper Flame Characteristics

A properly adjusted burner flame should extend between one and two inches above the burner ring or grate. The flame will spread out when a cooking vessel is placed on the burner.

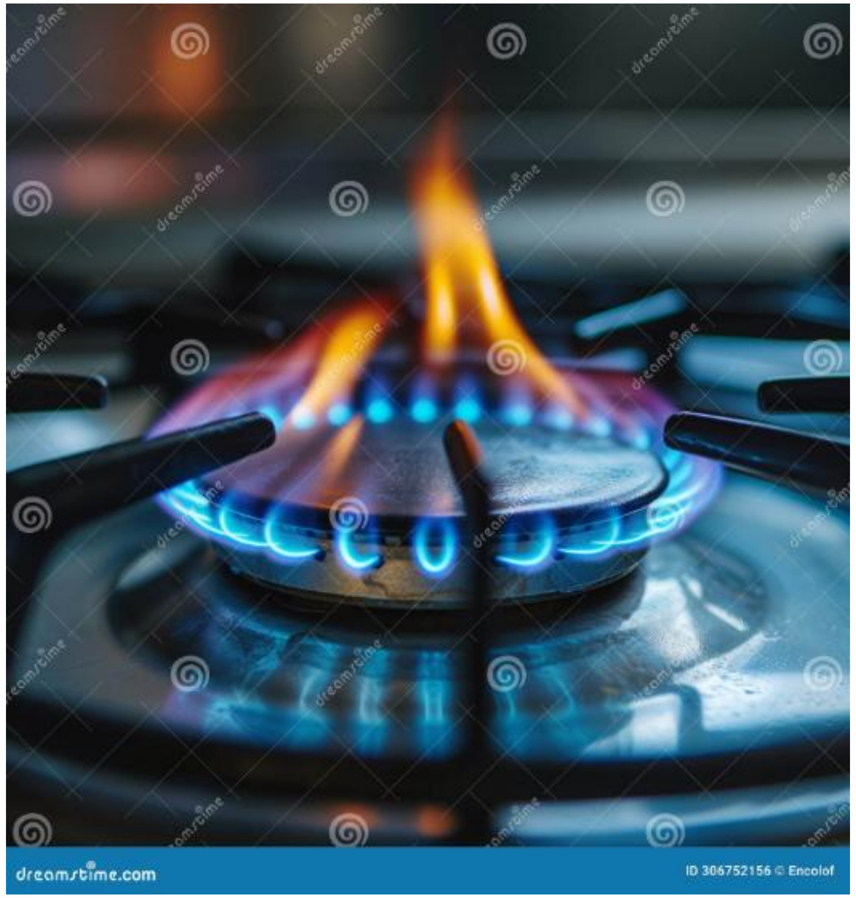
It is important to ensure that the inner blue cone of the flame is not broken by a cooking vessel on the burner. If the inner blue cone of the flame is disturbed in this way, the incomplete combustion that results can produce carbon monoxide (CO), which is a colourless, poisonous gas.

Burner Adjustments

Burner adjustments include:

- Gas input adjustment
- Air shutter adjustment to regulate primary air flow
- Burner and orifice cleaning and alignment

The correct gas input is indicated on the appliance rating plate. When the correct gas input to the range is verified, you can adjust the orifice hood of each burner to maintain the correct gas-air mixture for proper combustion.



A properly adjusted top burner flame should be steady, blue, and have a well-defined inner cone.

Oven Burner Faults - Temperature Issues

Oven Too Hot

Possible causes:

- Standby pilot set too high, preventing burner from cycling off
- Heat control sensing bulb broken or leaking
- Heat control out of calibration
- Thermostatic valve dirty

Corrective actions include adjusting the standby pilot, replacing the sensing bulb, recalibrating the heat control, or cleaning/replacing the thermostatic valve.

Baking Takes Too Long

Possible causes:

- Burner underfired, causing excessive preheat time
- Heat control out of calibration

Corrective actions include increasing the orifice size or recalibrating the heat control.

Uneven Baking

Possible cause: Burner overfired

Corrective action: Adjust burner orifice

Oven Burner Faults - Ignition Issues

Oven Will Not Turn On Manually

Possible causes:

- Pilot light out
- Dirty or defective thermostat valve
- Clock not set for manual operation
- Defective flame switch
- Defective solenoid valve
- Electric power off

Oven Burner Cannot Be Turned Off By Thermostat

Possible causes:

- Defective component or wiring
- Thermostat out of calibration

Corrective actions include disconnecting power to check if burner stays on (replace solenoid valve) or goes out (inspect wiring for shorts). If no short is evident, turn calibration screw clockwise several turns to shut off gas if thermostat is out of calibration.

Proper diagnosis of oven burner issues requires systematic testing of components.

Oven Burner Faults - Flame Issues

No Main Burner Flame

Possible causes:

- Thermostat setting lower than actual oven temperature
- Defective safety switch
- Mercury bulb does not get hot enough
- Defective thermostat

Corrective actions include recalibrating the temperature setting control knob, replacing the safety switch, checking pilot flame position and gas pressure, or replacing the thermostat.

Oven Does Not Maintain Temperature

Possible causes:

- Oven temperature sensing bulb out of position or dirty
- Thermostat not properly calibrated
- Safety switch not closing

Corrective actions include repositioning or cleaning the oven bulb, recalibrating the thermostat, or checking safety switch operation.

Temperature stability issues often relate to thermostat or sensing bulb problems.

Broiler Burner and Pilot Issues

Broiler Will Not Come On

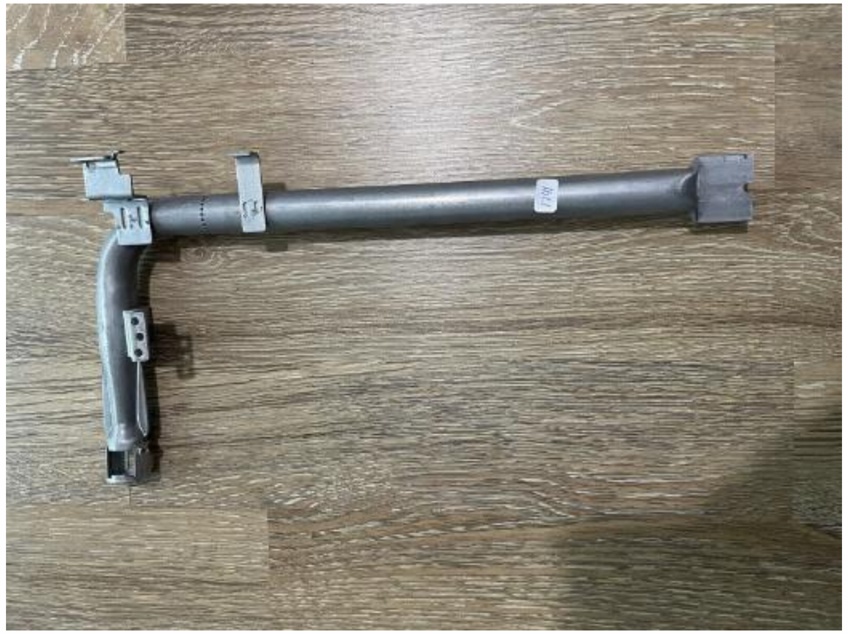
When the thermostat is set to "Broil" but the broiler burner will not come on, check the aerated pilot to ensure it:

- Is ignited
- Is hard and about 1/2 inch long
- Reaches above pilot shield
- Flows around the capillary of the flame switch

Also check the pilot adjusting screw to make sure it is open.

Other Possible Causes

- Orifice dirty or incorrectly sized - Check orifice for correct size; if correct size, clean orifice
- Air supply tube restricted - Check for foreign material, kinks, or loose fittings
- Restricted vents - Check and clear vents



The broiler burner is typically located at the top of the oven cavity and requires proper air and gas flow for operation.

Upper Oven Broiler Pilot Issues

Pilot Goes Out

If the upper oven broiler burner pilot gas goes out, check for:

- Pilot flame too small - Check whether adjusting screw is open enough to provide maximum flame
- Air supply tube blocked or out of alignment - Check air tube for restriction and proper location (approx. 1/2-5/8 inch from the oven burner box)
- Incorrect orifice size - Check pilot orifice size and replace if incorrect

Other Factors

- Oven bake burner overfired - Adjust orifice
- Vent passages blocked - Clear blocked vent passages

The broiler pilot must maintain a stable flame to ensure proper ignition of the broiler burner.

Mercury Safety System Issues

Burner Will Not Turn On

If the burner will not turn on and mercury is not glowing bright red, check for:

- Dirty pilot - Clean pilot orifice
- Defective pilot - Replace pilot
- Oven control set to LP when it should be set for natural gas

Rapid Cycling

If the burner cycles rapidly (every 1-2 seconds) after it reaches setpoint, the regulator may be failing to lock up, causing the heater pilot to surge when main burner goes out.

Corrective action: Clean or replace regulator disk and seat.

Other Issues

If the pilot does not expand when control temperature is set, the clock may not have been reset (may have been activated while cleaning). Set to manual operation.

If the pilot expands and heats mercury bright red, but burner fails to ignite, the mercury safety is defective and should be replaced.

Carbon Monoxide Safety

Potential Hazards

A gas range can produce carbon monoxide when large containers of fluid are heated over a long period of time. Carbon monoxide can form when a gas flame impinges on the cold bottom of a container.

Warning Signs

Determine if the customer is experiencing any symptoms of carbon monoxide poisoning, such as headache or nausea, while operating the range.

Prevention

Ensure proper burner adjustment and ventilation. The inner blue cone of the flame should not be disturbed by cooking vessels, as this can lead to incomplete combustion and CO production.

Installing carbon monoxide detectors near cooking areas provides an additional safety measure.

Environmental Considerations

Component Disposal

After tests prove a component to be faulty, it should be removed in accordance with the manufacturer's instructions. Potentially hazardous materials, such as mercury-filled capillary devices, must also be disposed of in accordance with applicable environmental legislation.

Replacement Parts

When installing replacement components, ensure they are correct for the application in terms of part number, type, size, and rating. Always consult the manufacturer's instructions for the component part number and other necessary specifications.

Proper disposal of components, especially those containing mercury or other hazardous materials, is essential for environmental protection.

Verification After Service

Operational Check

Verify that the appliance is in proper working order after any service work

Control Calibration

Ensure all control components are properly calibrated

Thermocouple Output

Check thermocouple output if applicable to the system

Oven Thermostat

Verify oven thermostat calibration is accurate

Gas Leak Check

Test for gas leaks at fittings or other connections

Ignition System

Confirm proper ignition system operation

Flame Characteristics

Check flame characteristics for proper combustion

Summary of Gas Oven Systems

Burner Types

Slotted port and ribbon port burners provide different flame patterns for various oven applications

Ignition Systems

From match-lit to hot surface igniters, each system has specific operation and maintenance requirements

Control Systems

Mechanical, electromechanical, and electronic controls provide temperature regulation and safety features

Service Procedures

Proper diagnosis, testing, and repair ensure safe and efficient oven operation

CSA Unit 15

Chapter 2
Gas Clothes Dryers: Installation, Operation, and Maintenance

The operation of a gas clothes dryer is somewhat different from that of other common gas appliances. The gas technician/fitter must have a full understanding of installation procedures, service, and maintenance to ensure the equipment operates safely and efficiently.

Learning Objectives

Installation Requirements

Describe the installation requirements for clothes dryers

Installation Procedures

Describe the installation procedures for gas ranges, including piping and electrical connections

Moisture Exhaust Venting

Describe the moisture exhaust venting systems

Ignition Systems

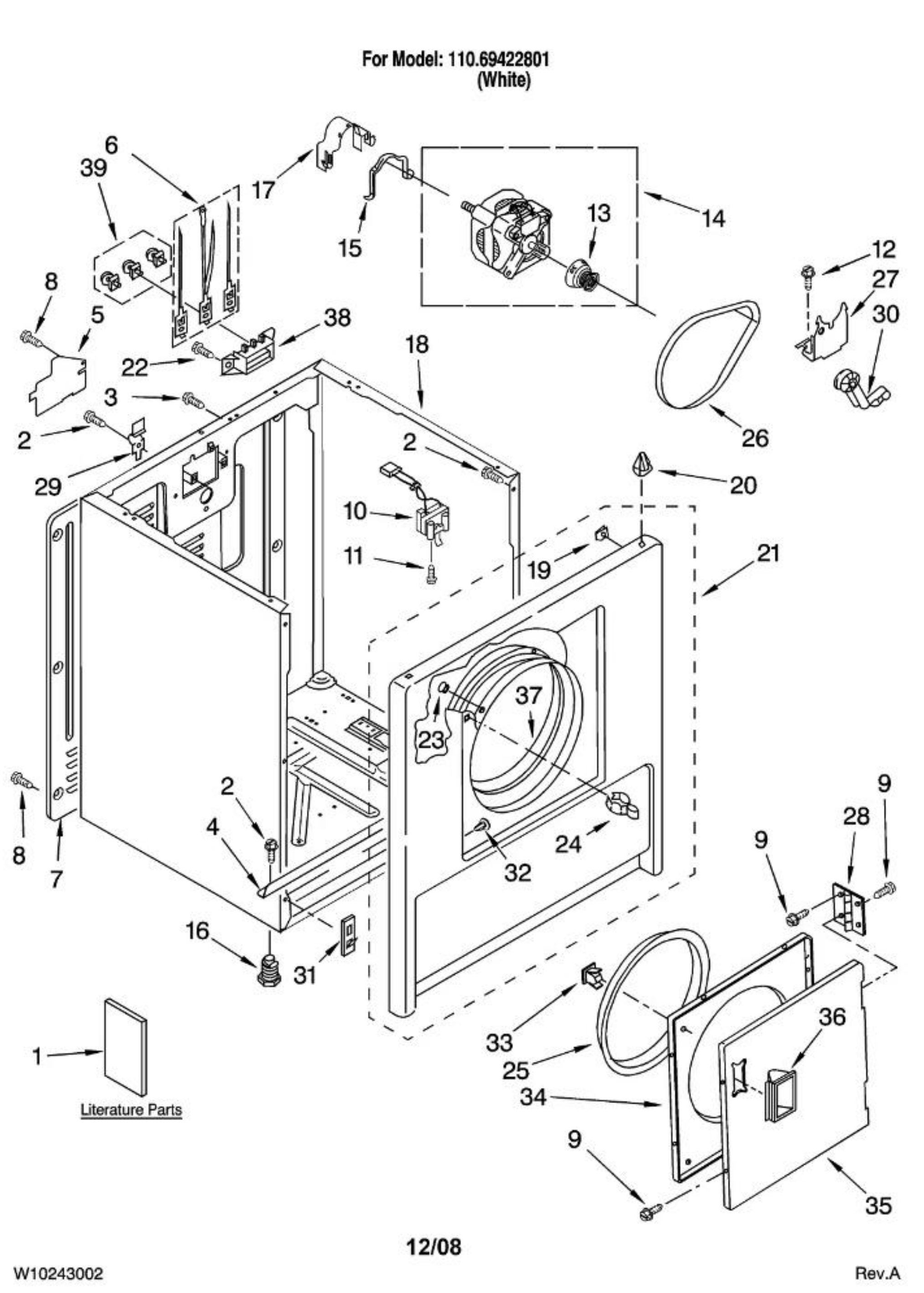
Describe burner ignition systems

Controls

Describe clothes dryer controls

Operation & Service

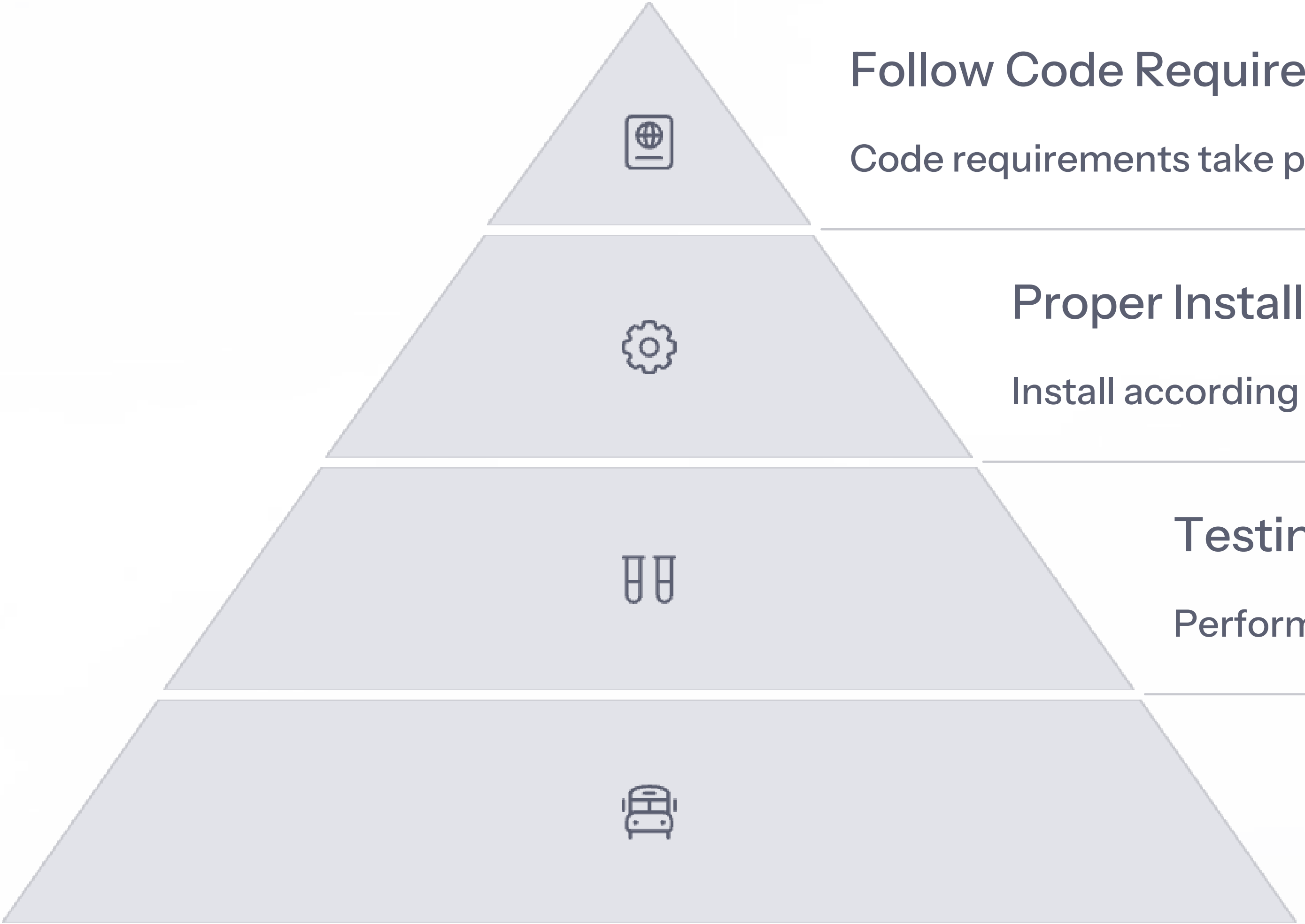
Describe the operation and servicing of clothes dryers



Key Terminology

Term	Definition
Direct ignition burner	See Spark ignition burner
Inlet pressure	Pressure of the entering gas
Pressure regulator (on a gas dryer)	Reduces the incoming gas pressure and keeps the pressure supplied to the dryer at a constant level
Radiant sensor	Detects the heat from either the igniter or the burner flame
Spark ignition burner	A burner system that lacks pilot as the gas is ignited directly by a spark
Warp switch	A safety device designed to break the circuit to the glow coil and pilot valve when certain malfunctions occur

Installer Responsibilities



Follow Code Requirements

Code requirements take precedence over manufacturer instructions

Proper Installation

Install according to certified instructions

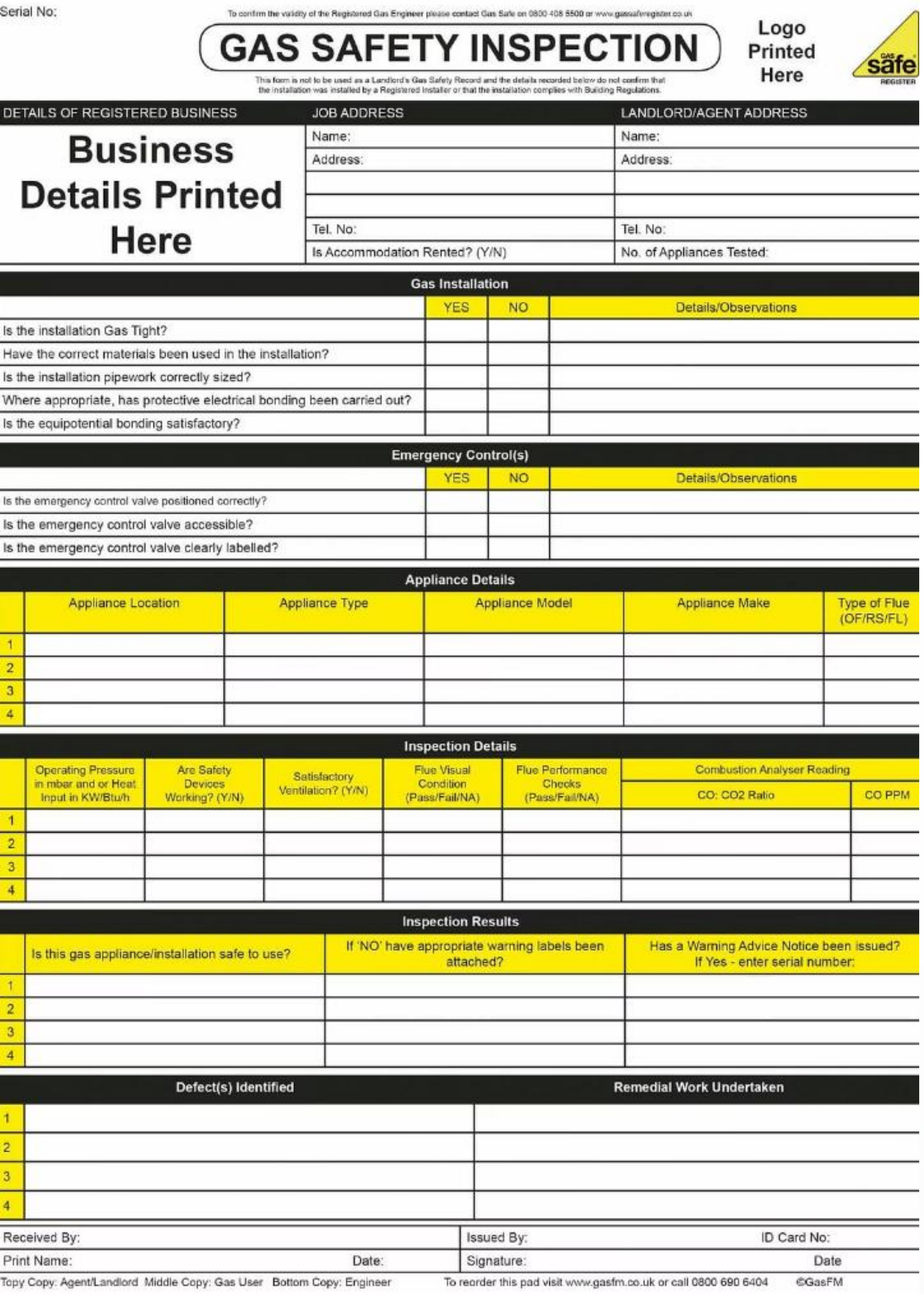
Testing

Perform safety and operation tests

User Education

Ensure user knows how to safely operate the appliance

Installation of all gas appliances must be in accordance with the manufacturer's certified instructions and the Code requirements. If there is a difference between the manufacturer's instructions and the Code requirements, follow the instructions set by the Code. Failure to read the manufacturer's instructions before installation can result in fire, explosion, personal injury or death to the operator, and service problems.


Serial No:

To confirm the validity of the Registered Gas Engineer please contact Gas Safe on 0800 408 5500 or www.gassaferegister.co.uk

GAS SAFETY INSPECTION

This form is not to be used as a Landlord's Gas Safety Record and the details recorded below do not confirm that the installation was installed by a Registered Installer or that the installation complies with Building Regulations.

Logo Printed Here

DETAILS OF REGISTERED BUSINESS	JOB ADDRESS	LANDLORD/AGENT ADDRESS
Business Details Printed Here	Name:	Name:
	Address:	Address:
	Tel. No:	Tel. No:
	Is Accommodation Rented? (Y/N)	No. of Appliances Tested:

Gas Installation

	YES	NO	Details/Observations
Is the installation Gas Tight?			
Have the correct materials been used in the installation?			
Is the installation pipework correctly sized?			
Where appropriate, has protective electrical bonding been carried out?			
Is the equipotential bonding satisfactory?			

Emergency Control(s)

	YES	NO	Details/Observations
Is the emergency control valve positioned correctly?			
Is the emergency control valve accessible?			
Is the emergency control valve clearly labelled?			

Appliance Details

	Appliance Location	Appliance Type	Appliance Model	Appliance Make	Type of Flue (OF/RS/FL)
1					
2					
3					
4					

Inspection Details

	Operating Pressure in mbar and or Heat Input in KW/Btu/h	Are Safety Devices Working? (Y/N)	Satisfactory Ventilation? (Y/N)	Flue Visual Condition (Pass/Fail/NA)	Flue Performance Checks (Pass/Fail/NA)	Combustion Analyser Reading	
						CO: CO2 Ratio	CO PPM
1							
2							
3							
4							

Inspection Results

	Is this gas appliance/installation safe to use?	If 'NO' have appropriate warning labels been attached?	Has a Warning Advice Notice been issued? If Yes - enter serial number:
1			
2			
3			
4			

	Defect(s) Identified	Remedial Work Undertaken
1		
2		
3		
4		

Received By:		Issued By:	ID Card No:
Print Name:	Date:	Signature:	Date

Topy Copy: Agent/Landlord Middle Copy: Gas User Bottom Copy: Engineer To reorder this pad visit www.gasfm.co.uk or call 0800 690 6404 ©GasFM

Potential Hazards of Improper Installation

Fire Hazard

Improper clearances, venting, or lint buildup can create fire hazards. Proper installation and regular maintenance are essential to prevent fires.

Explosion Risk

Gas leaks from improper connections or damaged components can lead to explosions. Always perform leak tests after installation.

Personal Injury

Improper installation can lead to burns, electrical shock, or other injuries to users. Follow all safety guidelines during installation.

Service Problems

Incorrect installation leads to ongoing performance issues, increased service calls, and shortened appliance lifespan.

Clearance Requirements

Domestic Dryers

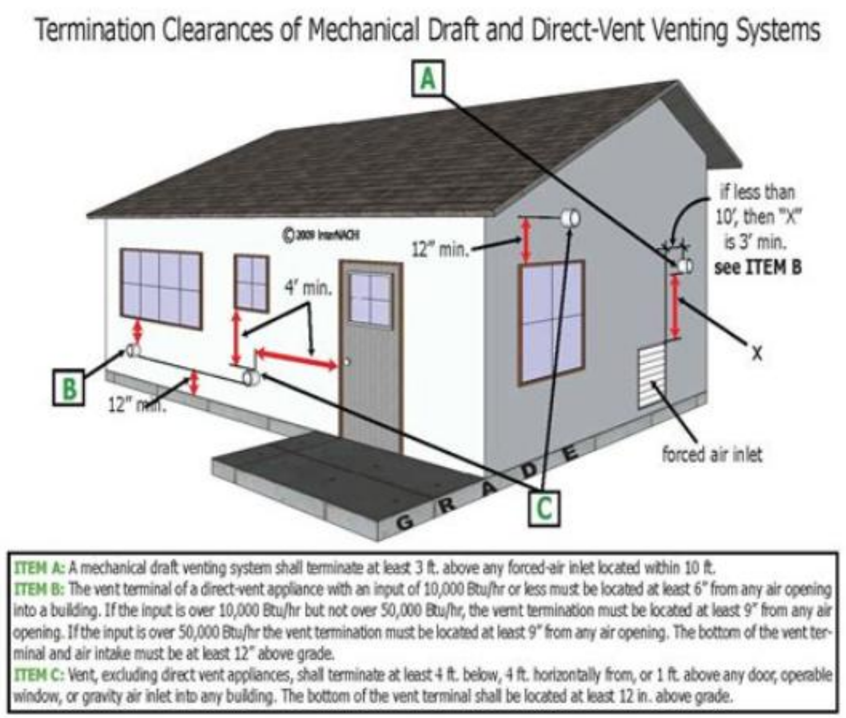
- Above: 6 inches (150 mm)
- Front: 24 inches (600 mm)
- Back and sides: 6 inches (150 mm)

Note: Manufacturer's certified clearances marked on the nameplate typically take precedence and may be reduced.

Commercial Dryers

- Above: 18 inches (450 mm)
- Front: 18 inches (450 mm)
- Back and sides: 18 inches (450 mm)

These clearances are specified in CSA B149.1 Clause 7.5.4 for domestic dryers and Clause 7.4.2 for commercial dryers.



The rating plate on the clothes dryer specifies the clearances required between a gas-fired appliance and combustible material. Check the Code for specific requirements for dryers, and consider them before installing the dryer.

Gas Supply Piping Requirements

Material

The Code states that all gas piping must be steel, copper, or plastic. Re-used piping must be cleaned, inspected, and tested to ensure it's equivalent to new.

Size

Piping must be large enough to provide the required amount of gas needed by the connected appliances. Consider future additions when sizing.

Location

The Code specifies where gas piping, tubing, connections, and fittings may or may not be placed. Protect from traffic and weather.

Joints

All pipe jointing sealants must have certification. Appliances must not place stress on piping or connections.

Manual Shut-off Valves

Required Installation

All appliances must have manual shut-off valves installed. These valves need to be readily accessible.

Proper Placement

The Code specifies the type of manual shut-off valve required, as well as where it must be placed.

Identification

If the valve for the clothes dryer is not installed in the drop to the dryer, or within a few feet of the dryer, there must be a metal tag attached to the valve or a permanent sign placed next to the valve, indicating the appliance it serves.

Flexible Connectors

Connector Types

Flexible metal connectors are the most common connection method for clothes dryers. These provide some flexibility in positioning the appliance while maintaining a secure gas connection.

Hose Restrictions

Hoses may only be used with an unvented appliance, and they are therefore not permitted to be used for connection to a dryer.

Flexible connectors must be certified for use with gas appliances and installed according to manufacturer specifications and code requirements.

Moisture Exhaust Duct Requirements

Outdoor Venting Required

The dryer must be exhausted to the outdoors to prevent lint buildup indoors, which is a fire hazard, and to prevent high moisture levels within the building.

Vent Material

The vent material must be either non-combustible or certified as meeting the requirements for Class 1 air ducts specified in ULC CAN-S110. Plastic vents are only acceptable if they have been stamped with this number.

Prohibited Connections

Do not connect a moisture exhaust duct into a vent connector, vent, or chimney. The exhaust vent must also vent clear of combustible materials.

Termination Distance

Maintain a termination distance of 1 metre (m) away from regulator vents or fresh air intakes. Commercial clothes dryer requires 3 m clearance from a fresh air intake.

Proper Vent Installation

No Sheet Metal Screws

Do not use sheet metal screws to secure a moisture exhaust duct. If screws are used, they may catch lint in the outlet, which can cause blockages and fire hazards.

Use Duct Tape

Use duct tape to connect the moisture exhaust duct to the dryer. All joints should also be sealed with suitable tape.

Provide Access

Provide an access for inspection and cleaning of the exhaust system at least once a year, including the air flow path inside the dryer.

Prevent Lint Buildup

A lint buildup can pose a serious fire hazard as there is a risk of the burner igniting this lint deposit.

Levelling the Dryer

Prepare the Floor

Check that the legs are not extended. Make sure the locknuts are tight. Slide the dryer onto cardboard or hardboard before moving it across the floor.

Position the Dryer

Move the dryer close to its permanent location. Leave enough room to connect the exhaust vent. Note the clearance requirements specified on the rating plate or as specified in the Code.

Check Levelness

Check the levelness of the dryer by placing a level on top of the dryer. Check side to side and front to back.

Adjust Legs

If the dryer is not level, loosen the locknuts and adjust the legs until the dryer is level. Keep the dryer as close to the floor as possible. All four legs must rest firmly on the floor so that the dryer does not rock when it is operating.

Secure Locknuts

After levelling the dryer, tighten the locknuts securely against the bottom of the dryer base. If the locknuts are not tightened securely, they will vibrate out of position during operation.

Electrical Supply Requirements

Power Specifications

All gas dryers have a power cord incorporating a common parallel-blade plug (three-prong plug) that will fit into a household receptacle. This receptacle must supply a nominal 120 V, 60 cycle current, and should be within 5 ft (1.5 m) of the rear of the machine.

Circuit Requirements

It is better if the receptacle used is on a separately fused (15 A) circuit. Do not use an extension cord, an adapter, or a heavily loaded circuit.

Code Compliance

All electrical service to the dryer must conform to local codes and ordinances, as well as the latest edition of the Canadian Electrical Code, Part 1.

Polarity and Grounding

Three-Prong Grounding Plug

Ensure that the dryer is supplied with a three-prong grounding plug. This is for the protection of everyone. It should be plugged directly into a properly grounded three-prong receptacle.

Caution! Never remove the grounding prong from the plug.

Proper Receptacle

If a mating wall receptacle is not available, it is the responsibility and obligation of the customer to have a suitable grounded three-prong receptacle installed by a qualified electrician.

The power cord from the dryer control housing to the wall receptacle must maintain proper polarity for safe operation.

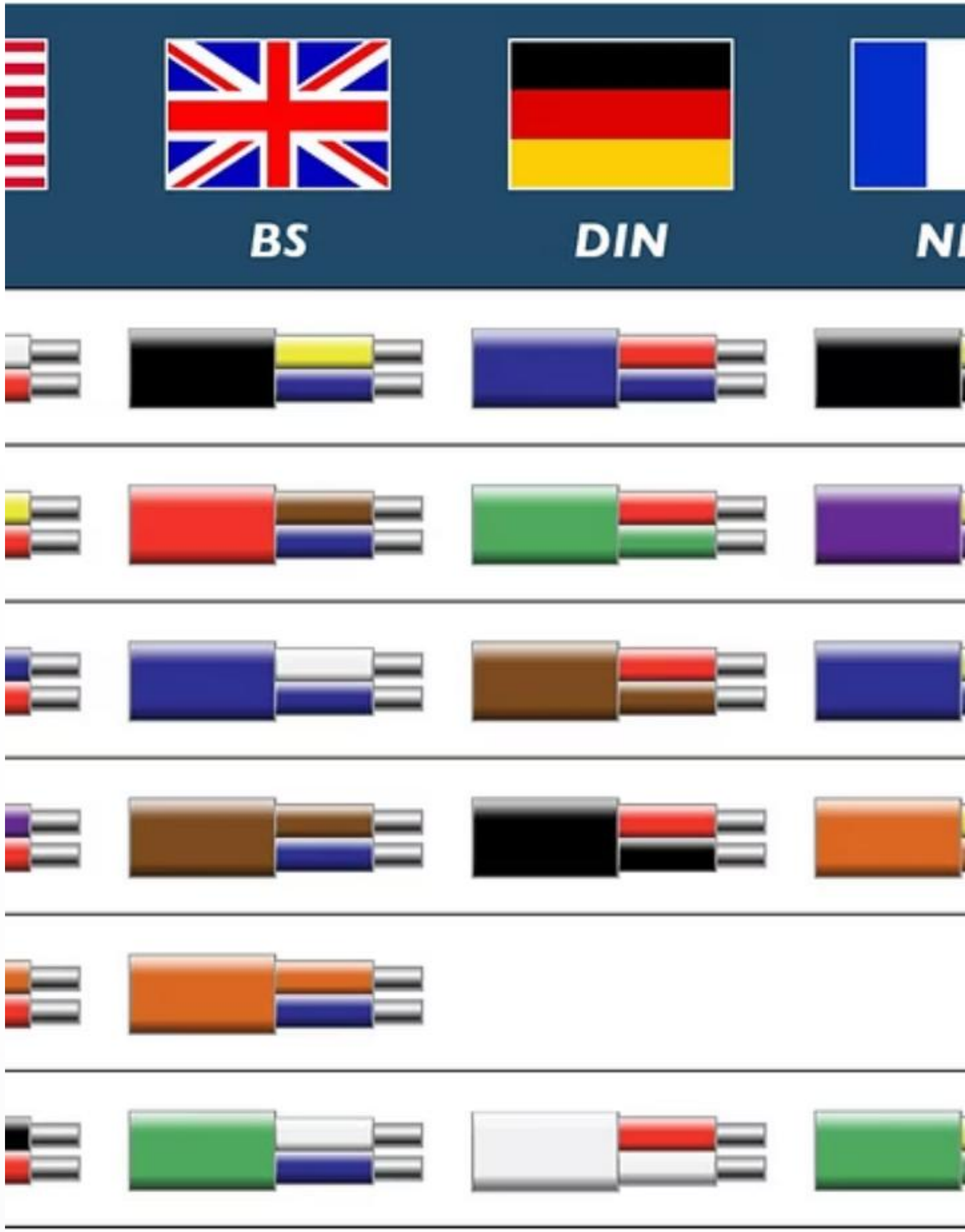
Wire Identification

Cord lead colour	Wire
Black	Hot
White	Neutral
Green	Ground

In a moulded flat cord with no wire colours except green:

Moulded flat cord	Wire
Smooth	Hot
Ribbed	Neutral
Green	Ground

Note: The ground wire is sometimes referred to as the bond wire.



Safe Electrical Installation

Turn Off Power

Before plugging the dryer's power cord into the wall receptacle, ensure that the power is turned off at the circuit breaker or fuse box.

Connect Power Cord

Plug the dryer's three-prong grounding plug into a properly grounded three-prong receptacle.

Restore Power

After plugging the dryer in, turn on the power at the circuit breaker or fuse box. This is to protect you from electrical shock if there is a problem with the electrical circuit.

Fuel Conversion

Conversion Process

Conversions of clothes dryers follow the same procedure as described for ranges. The process must be performed by a qualified technician following manufacturer guidelines and code requirements.

Inlet Pressure

The typical inlet pressure for a dryer operating on natural gas is 6 inches w.c. (1.5 kPa) and 10 inches w.c. (2.5 kPa) for an appliance operating on propane.

The inlet pressure is measured in the piping just before the appliance. It is measured while the appliance is firing at its rated input so that the pressure loss that occurs while the gas moves through the system can be taken into account.

Making the Gas Connection

Close Manual Shut-off Valve

Before the dryer is connected, close the manual shut-off valve to the piping where the dryer is being installed.

Remove Shipping Cap

Remove the shipping cap from the gas pipe at the rear of the dryer.

Check Gas Type

Check the rating plate on the dryer to see the type of gas it requires. If the dryer needs to be converted, this must be done before it is connected to the supply.

Apply Joint Compound

Apply a certified pipe-joint compound to the supply pipe and flexible connector joint.

Test for Leaks

Once the installation is complete, perform a soap test on any piping or tubing that was not previously tested.

Testing for Gas Leaks

Turn On Gas Supply

Make sure that the gas supply to the dryer is on.

Prepare Soapy Solution

Use a soapy solution such as a liquid detergent. Only use certified leak testing solution approved for use with gas.

Apply Solution

With a paintbrush, spread some of the solution around all gas joints and connections.

Check for Bubbles

If bubbles are seen, there is a leak. Turn off the gas supply and tighten the connections.

Retest

Check the connections again for leaks. Every time a dryer is serviced, use a soap test to check for leaks.

Clean Up

Always clean the soap solution away after performing a test, as over time this can be corrosive to the piping or tubing.

Pressure Regulators

Function

The pressure regulator on a dryer reduces the incoming gas pressure and keeps the pressure supplied to the dryer at a constant level.

Location

The pressure regulator is typically located in the gas flow system of the dryer, as shown in the cut-away view of the controls and gas flow system.

The balancing pressure of the regulator is typically set at 3.5 inches w.c. (0.9 kPa). Variations from this pressure will change the burner input and can cause the dryer to fire incorrectly.

Adjusting the Pressure Regulator

Factory Setting

The pressure regulator is adjusted at the factory to provide the correct operating pressure. If someone has tampered with it, it may need to be adjusted.

Access Test Port

Typically, the 1/8 inch NPT pipe plug on the side of the burner is used to give access to test the pressure.

Turn Off Gas

Turn off the main gas supply before connecting a manometer or test gauge.

Restore Gas Supply

Then turn the gas supply back on.

Adjust Pressure

Adjust the pressure on the regulator up or down as the burner is firing.

Types of Moisture Exhaust Vents

Rigid Metal Vents

Rigid metal vents are preferable as they are less likely to be crushed. They provide the most reliable and efficient exhaust path for moisture and lint.

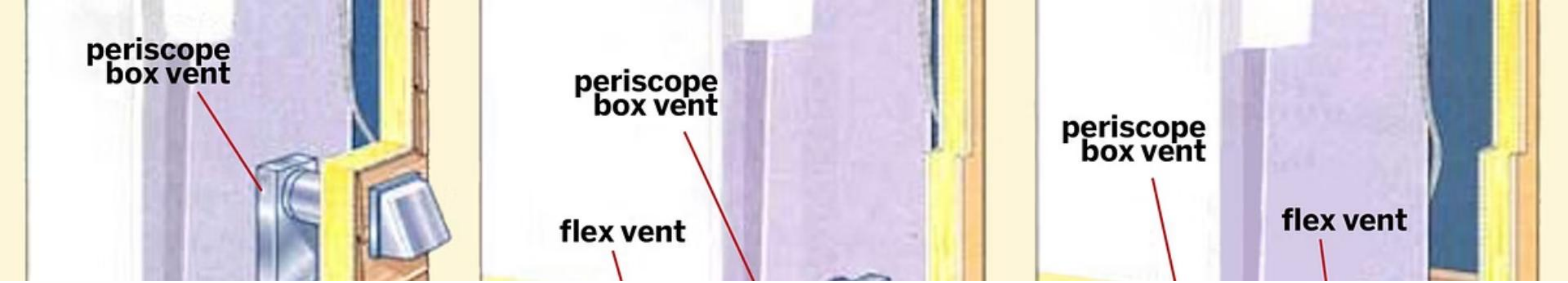
Flexible Metal Vents

If flexible metal venting is used, then it must be fully extended and supported when it is installed on the dryer. It must not be enclosed in walls, ceilings, or floors.

Prohibited Vents

Uncertified plastic and foil-covered vents are not recommended because this type of ducting can kink, sag, be punctured, reduce air flow, extend drying times, and affect dryer operation.

Note: Do not use a vent with a diameter less than 4 inches (102 mm).



Exhaust Hood Requirements

Outdoor Venting

In Canada, the exhaust system must be vented to the outdoors to prevent lint buildup indoors, which is a fire hazard, and to prevent high moisture levels within the building.

Hood Installation

The exhaust vent must fit inside the hood. The exhaust outlet hood should be at least 12 inches (300 mm) from the ground or any object that may be in the path of the exhaust.

Minimal Resistance

The termination should present minimal resistance to the exhaust air flow.

Proper Sealing

Use caulking compound to seal the exterior wall opening around the exhaust hood.

Exhaust Hood Types

Preferred Hood Types

These hood designs provide optimal airflow and prevent debris or wildlife from entering the vent system while allowing moisture to escape efficiently.

Acceptable Hood Type

This type of hood is acceptable but may not provide the same level of performance as the preferred types. It still meets code requirements for outdoor venting.

Checking Vent Flaps

Vent hoods have flaps that prevent exhaust and wildlife from entering the system. Check that the exhaust hood flapper is not stuck, missing, or damaged in any way. You can use a mirror to check that the flap is moving freely.

Vent Flap Maintenance

Regular Inspection

When the dryer is on, ensure that the flap is fully open. On an existing system, check that the exhaust hood is not clogged with lint.

Wildlife Check

Also, check that no wildlife has nested inside the hood. Birds and small animals often find dryer vents to be attractive nesting locations.

Avoid Magnetic Latches

Caution! Do not use exhaust hoods with magnetic latches. The flapper on the vent prevents the flap from swinging freely.

No Screens

Never install a screen over the outlet as it will cause lint buildup and blockages, creating a fire hazard.

Duct Length Considerations

Maximum Length Factors

The maximum length of the exhaust system depends on:

- Manufacturer's specifications
- Type of exhaust hood
- Type of material (rigid or flexible metal)
- Number of elbows

Selection Process

Choose the exhaust vent length chart that corresponds to the type of hood being used, then select the length based on the vent material and the number of elbows needed.

Risks of Excessive Length

Do not use vent runs longer than those given in the chart. Exhaust systems longer than these will:

- Accumulate lint, creating a fire hazard
- Shorten the life of the dryer
- Reduce performance of the dryer, leading to higher energy costs

Vent Length Chart

Number of 90° elbows	Maximum length of metal vent - Rigid	Maximum length of metal vent - Flexible
0	64 ft (19.5 m)	36 ft (11.0 m)
1	54 ft (16.5 m)	31 ft (9.4 m)
2	44 ft (13.4 m)	27 ft (8.2 m)
3	35 ft (10.7 m)	25 ft (7.6 m)
4	27 ft (8.2 m)	23 ft (7.0 m)

This is a typical vent length chart for a 4 inch (102 mm) hood. Always consult the manufacturer's specifications for your specific dryer model.

Ducts in Unheated Areas

Insulation Requirement

If the ductwork runs through an unheated area, it should be insulated to prevent condensation from forming inside the duct.

Proper Slope

The duct should slope downwards towards the exhaust hood so as to prevent the buildup of moisture and lint within the exhaust vent system.

Proper insulation and slope are essential to prevent moisture problems that can lead to mold growth and reduced efficiency.

Routing the Vent

Multiple Routing Options

The exhaust outlet is located at the rear of the dryer. The exhaust vent can be routed up, down, left, right, and straight out of the back of the dryer.

Wall Penetration

When routing through walls, ensure proper sealing around the vent to prevent air leakage and maintain the building's thermal envelope.

Space Considerations

Choose the routing option that minimizes the number of bends while maintaining proper clearances and accessibility for cleaning.

Tools Required for Installation

Level

For ensuring the dryer is properly leveled

Caulking Gun

For sealing around the vent hood

Safety Glasses

For eye protection during installation

Knife

For cutting materials as needed

Adjustable Wrench

For tightening connections

Screwdrivers

Flat-blade for various adjustments

Additional Installation Tools

Hex-head Socket Wrench

For various fasteners during installation

Pipe-joint Compound

For sealing gas connections

Nut Driver

For securing various components

Duct Tape

For sealing vent connections

Pipe Wrench

For gas pipe connections

Gloves

For hand protection

Metal Cutting Tools

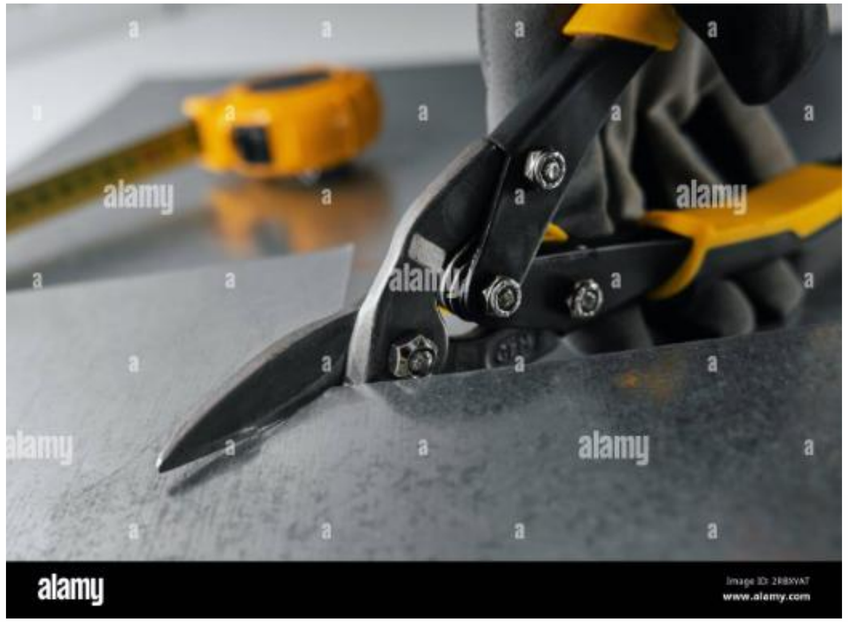
Tin Snips

Tin snips are essential for cutting the metal ducting. Make sure to include snips that cut to right and snips that cut to left for different cutting angles.

Important: Never use snips to cut wire as this blunts the blades on the snips.

Electric Drill

A heavy-duty electric drill is needed to drill through walls. When selecting a drill bit, make sure it is sharp. Also check that the bit shank and chuck jaws are clean. If they are dirty the bit may not align properly.



Proper cutting tools ensure clean edges on metal ducts, which helps prevent lint accumulation and improves airflow efficiency.

Clearance to Combustibles for Ranges

Code vs. Manufacturer Instructions

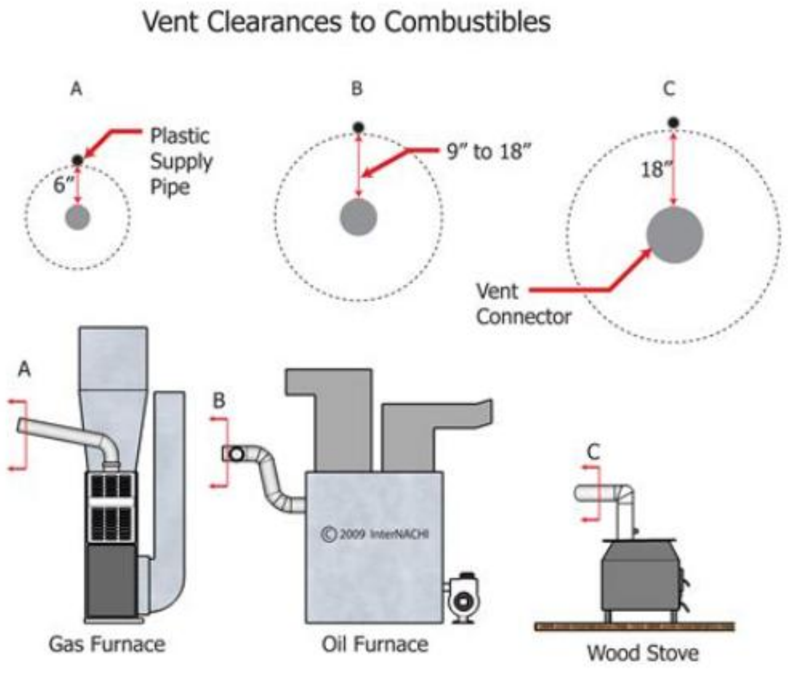
To determine the required clearance to combustibles for a range, refer to the gas code over the manufacturer's instructions or the rating plate.

This statement is **False**. The manufacturer's certified instructions take precedence over the Code requirements for clearances.

Zero Clearance Certification

The allowable clearance to combustibles for a range certified for zero clearance (without additional protection) is 600 mm above, 150 mm at the back.

This is important to understand when installing ranges in tight kitchen spaces.



Always verify the specific clearance requirements for each appliance model as they may vary based on design and certification.

Flexible Connectors and Gas Flow

Connector Length and Capacity

If you have three certified metal flexible connectors of different lengths, they will all have the same gas flow capacity.

This statement is **False.** The length of a flexible connector affects its gas flow capacity. Longer connectors have more resistance and therefore lower flow capacity.

Manifold Pressure Testing

When checking the manifold pressure, there must be gas flowing to properly read and adjust pressures.

This statement is **True**. Pressure readings must be taken while the appliance is operating to account for pressure drops during gas flow.

Proper pressure testing ensures the appliance receives the correct gas pressure for safe and efficient operation.

Sealed Gas Burner Design

Burner Port Maintenance

A sealed gas burner design maintains clean burner ports because the burner cap collects debris.

This design prevents food and liquids from entering the burner ports, which helps maintain consistent flame patterns and efficient combustion.

Burner Cap Function

The burner cap serves as both a flame spreader and a protective cover that prevents debris from entering the burner ports.

Regular cleaning of the burner cap is essential to maintain proper burner performance.

Sealed burners are easier to clean and maintain than traditional open burner designs, making them popular in modern gas ranges.

Oven Temperature Recalibration

Mechanical Style Gas Ovens

For mechanical style gas ovens that do not have adjustable thermostats, the oven temperature is recalibrated by changing the gas orifices.

This allows technicians to adjust the heat output to achieve the desired temperature range.

Calibration Timing

A gas range should operate for 15 minutes before adjusting the oven temperature calibration.

This warm-up period ensures the oven has reached a stable operating temperature for accurate calibration.

Proper calibration ensures that the oven temperature matches the setting on the control dial, which is essential for consistent cooking results.

Proper Burner Flame Adjustment

Flame Height

A properly adjusted burner flame should extend high enough so that the inner blue cone of the flame is above the burner ring or grate, and able to touch the cooking vessel.

This statement is **False.** The inner blue cone should remain below the cooking vessel for efficient heat transfer and to prevent incomplete combustion.

Correct Flame Characteristics

A properly adjusted flame should have a well-defined blue inner cone with a light blue outer mantle. The flame should be stable and not lift off the burner ports.

Correct flame adjustment is essential for efficient cooking, proper heat distribution, and safe operation of the gas range.

Gas Dryer Components Overview

Internal Components

Gas dryers contain several key components including the burner assembly, gas valve, pressure regulator, ignition system, and safety controls.

Burner Assembly

The burner assembly is where combustion occurs. It includes the burner tube, igniter, flame sensor, and related components that work together to produce heat.

Control System

The control system manages the operation of the dryer, including temperature regulation, cycle timing, and safety monitoring.

Gas Flow System in a Dryer

Gas Inlet

Gas enters the dryer through the supply line connection at the rear of the appliance.

Pressure Regulator

The gas passes through a pressure regulator that reduces the incoming pressure to the appropriate operating pressure (typically 3.5 inches w.c. or 0.9 kPa).

Gas Valve

The gas valve controls the flow of gas to the burner. It opens and closes based on signals from the control system.

Burner

Gas flows to the burner where it mixes with air and is ignited by the ignition system to produce heat.

Heat Exchange

The heat from combustion is transferred to the air circulating through the dryer drum, which dries the clothes.

Burner Ignition Systems

Spark Ignition

A burner system that lacks a pilot as the gas is ignited directly by a spark. This system is more energy-efficient than standing pilot systems as it only operates when heat is needed.

Glow Coil Ignition

Uses an electric heating element that glows red-hot to ignite the gas. The glow coil is energized before the gas valve opens to ensure reliable ignition.

Hot Surface Ignition

Similar to glow coil but uses a silicon carbide or silicon nitride igniter that heats up more quickly and has a longer service life.

Radiant Sensor

Detects the heat from either the igniter or the burner flame. This sensor is part of the safety system that ensures gas only flows when ignition is confirmed.

Dryer Safety Controls

Thermal Fuse

A one-time safety device that breaks the circuit if the dryer overheats. Once it blows, it must be replaced.

High-Limit Thermostat

Cycles the heat off if the temperature exceeds safe limits. Unlike a thermal fuse, it resets automatically when the temperature drops.

Flame Sensor

Monitors the presence of a flame. If the flame goes out, it signals the control system to shut off the gas valve.

Warp Switch

A safety device designed to break the circuit to the glow coil and pilot valve when certain malfunctions occur.

Dryer Operation Cycle

Start Cycle

User selects cycle and temperature, then starts the dryer

Air Circulation

Blower motor starts, creating airflow through the drum

Heat Generation

Ignition system activates, gas valve opens, burner ignites

Temperature Control

Thermostats cycle heat on and off to maintain selected temperature

Cycle Completion

Timer or moisture sensor determines when clothes are dry

Dryer Maintenance

Clean Lint Filter

Clean the lint filter before or after each load to maintain airflow and prevent fire hazards.

Inspect Exhaust System

Check the entire exhaust system at least once a year, including the air flow path inside the dryer.

Remove Lint Buildup

Vacuum inside the dryer cabinet and around the burner area to remove lint accumulation.

Check for Gas Leaks

Perform a soap test on gas connections whenever the dryer is serviced.

Professional Service

Have a qualified technician inspect the dryer annually for proper operation and safety.

Troubleshooting Gas Dryers

No Heat

Check gas supply, ignition system, thermal fuse, gas valve, and flame sensor. Ensure all electrical connections are secure and the gas supply valve is open.

Insufficient Heat

Inspect for restricted airflow in the exhaust system, check gas pressure, examine burner for obstructions, and verify thermostat operation.

Won't Start

Check power supply, door switch, start switch, and motor. Ensure the control board is functioning properly.

Noisy Operation

Inspect drum support rollers, idler pulley, blower wheel, and motor bearings. Ensure the dryer is properly leveled.

Common Dryer Problems

Long Drying Times

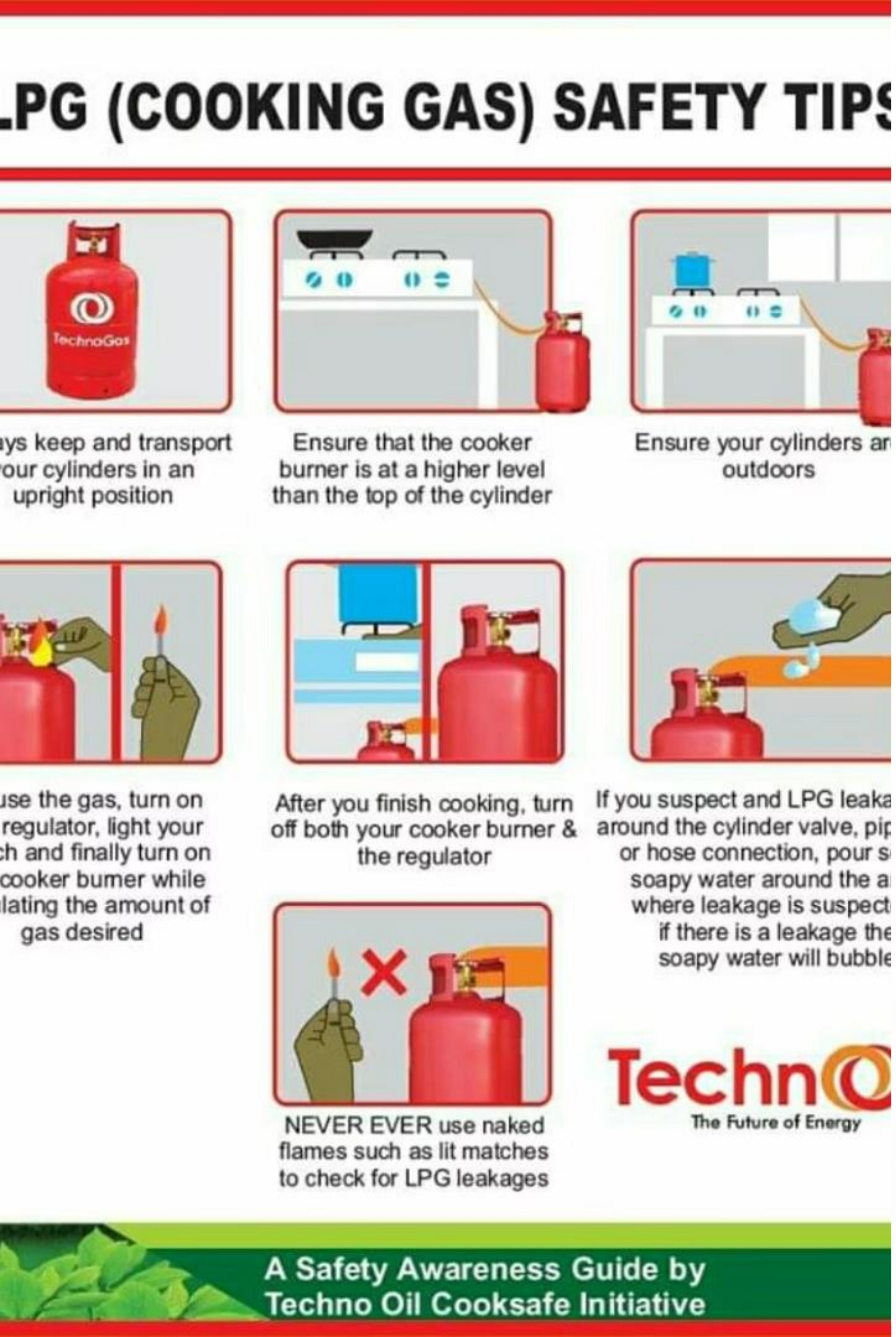
- Restricted exhaust vent
- Clogged lint filter
- Overloaded drum
- Insufficient gas pressure
- Defective heating element

Overheating

- Restricted airflow
- Faulty cycling thermostat
- Defective high-limit thermostat
- Blocked exhaust vent
- Malfunctioning control board

Drum Not Turning

- Broken belt
- Worn drum rollers
- Faulty motor
- Defective idler pulley
- Malfunctioning start switch



Gas Dryer Safety Precautions

Gas Supply

Always turn off the gas supply before servicing a gas dryer. Use a properly calibrated gas detector to check for leaks after service.

Electrical Safety

Disconnect the power before servicing. Never bypass safety devices or operate with panels removed.

3

Proper Ventilation

Ensure the area around the dryer is well-ventilated. Never operate a gas dryer in an enclosed space without adequate ventilation.

Qualified Service

Only qualified technicians should service gas appliances. Improper service can create serious safety hazards.

Replacing a Gas Dryer

Assess Compatibility

If replacing an appliance, check to ensure that the new appliance or replaced parts are compatible with and suitable for the current system.

Energy Type Change

If the new appliance uses a different type of energy to the old one -- such as a different type of gas, or electricity - check that the old energy supply is safely shut off and sealed.

Testing

When an appliance is installed, perform tests to see that it is working safely and correctly. Included in these tests are pressure tests.

User Education

Ensure that the user of the appliance knows how to safely operate the gas-fired clothes dryer.

Prohibited Practices

Improper Venting

Never connect a moisture exhaust duct into a vent connector, vent, or chimney. This can cause dangerous backdrafting of combustion products.

Unsafe Connections

Do not use sheet metal screws to secure a moisture exhaust duct as they may catch lint in the outlet, which can cause blockages and fire hazards.

Inadequate Clearances

Never install a dryer without maintaining the required clearances to combustible materials as specified in the Code or on the appliance rating plate.

Improper Materials

Do not use uncertified plastic or foil-covered vents for dryer exhaust. Only use materials that are specifically approved for this application.

Dryer Installation Checklist

Location

Verify that the installation location meets all clearance requirements and is on a solid, level floor.

Gas Connection

Ensure proper gas type, pressure, and leak-free connections. Verify that a readily accessible manual shut-off valve is installed.

Electrical Connection

Confirm proper voltage, grounding, and polarity. Ensure the outlet is on a dedicated circuit.

Venting

Verify that the exhaust system is properly installed, using approved materials, and vented to the outdoors with minimal restrictions.

Leveling

Ensure the dryer is level and all four legs are firmly on the floor with locknuts tightened.

Testing

Perform operational tests to verify proper functioning of all components and systems.

Dryer Efficiency Considerations

Proper Venting

An efficient exhaust system with minimal restrictions allows the dryer to operate at peak efficiency. Longer or more complex vent runs reduce efficiency and increase drying times.

Regular Maintenance

Keeping the lint filter and exhaust system clean ensures optimal airflow, which is essential for efficient operation. A clogged system forces the dryer to work harder and use more energy.

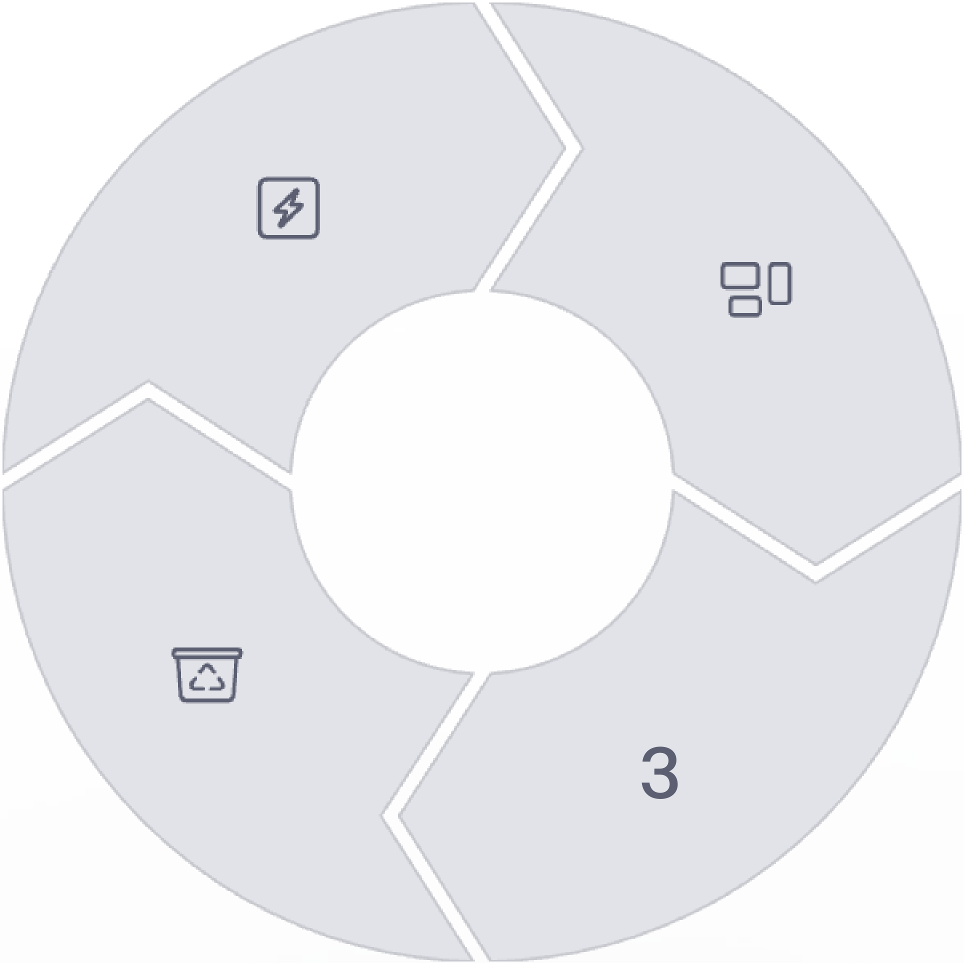
Proper Loading

Overloading the dryer restricts airflow around the clothes, increasing drying time and energy consumption. Underloading wastes energy by heating more air than necessary.

Environmental Considerations

Energy Consumption

Gas dryers typically use less electricity than electric models but consume natural gas or propane



Emissions

Combustion produces carbon dioxide and other gases that contribute to air pollution

Disposal

Proper recycling of old appliances prevents harmful materials from entering landfills

Efficiency Improvements

Modern designs and proper maintenance minimize environmental impact

Dryer Technology Advancements

Moisture Sensing

Advanced sensors detect when clothes are dry, preventing over-drying and saving energy

Improved Efficiency

Modern gas dryers use less gas while maintaining effective drying performance

Smart Features

Wi-Fi connectivity allows remote monitoring and control of the dryer

Enhanced Safety

Multiple safety systems prevent overheating and gas-related hazards

Commercial vs. Residential Dryers

Residential Gas Dryers

- Typically 27-29 inches wide
- Capacity of 7-9 cubic feet
- 120V electrical supply
- Standard 1/2" gas connection
- Clearances: 6" above, 24" front, 6" sides/back

Commercial Gas Dryers

- Larger dimensions for higher capacity
- Capacity of 10-30+ cubic feet
- May require 208/240V electrical supply
- Larger gas connection (often 3/4")
- Clearances: 18" above, 18" front, 18" sides/back

Key Differences

- Commercial units built for continuous use
- Higher BTU output in commercial models
- More robust components for durability
- Different code requirements for installation
- Commercial units often coin-operated

Dryer Certification and Standards

CSA B149.1

The Canadian Natural Gas and Propane Installation Code that contains requirements for installing gas appliances, including clothes dryers.

Canadian Electrical Code

Governs the electrical aspects of dryer installation, including proper grounding, circuit requirements, and wiring methods.

ULC CAN-S110

Standard for Class 1 air ducts, which applies to certain types of dryer vent materials.

Certification Marks

Look for certification marks from recognized testing laboratories such as CSA, ULC, or other approved agencies on appliances and components.

Dryer Installation in Multi-Unit Buildings

Special Considerations

Installing gas dryers in multi-unit buildings presents unique challenges related to venting, gas supply, and safety requirements.

Venting Requirements

Each dryer must have its own dedicated vent to the outdoors. Common venting systems are not permitted for multiple dryers due to the risk of lint fires and backdrafting.

Gas Distribution

Gas supply systems in multi-unit buildings must be properly sized to accommodate all appliances. Individual shut-off valves must be accessible to each unit.

Code Compliance

Additional code requirements may apply to multi-unit installations, including fire separation, access for maintenance, and ventilation considerations.

Dryer Installation in Confined Spaces

Ventilation Requirements

Gas dryers installed in closets or other confined spaces require adequate ventilation to ensure proper combustion and prevent the buildup of combustion products.

Door Requirements

Closet doors must have ventilation openings at the top and bottom to allow for proper air circulation. The minimum opening sizes are specified in the installation instructions and applicable codes.

Clearance Considerations

Even in confined spaces, all clearance requirements must be maintained. This includes clearances to combustible materials and service clearances for maintenance access.

Dryer Conversion Between Gas Types

Manufacturer's Kit

Use only the conversion kit specified by the manufacturer for the particular dryer model. Improper conversion can create serious safety hazards.

Qualified Technician

Conversion must be performed by a qualified technician with the appropriate training and certification.

Component Replacement

Conversion typically involves replacing the pressure regulator spring, gas orifices, and sometimes the burner assembly to accommodate the different gas properties.

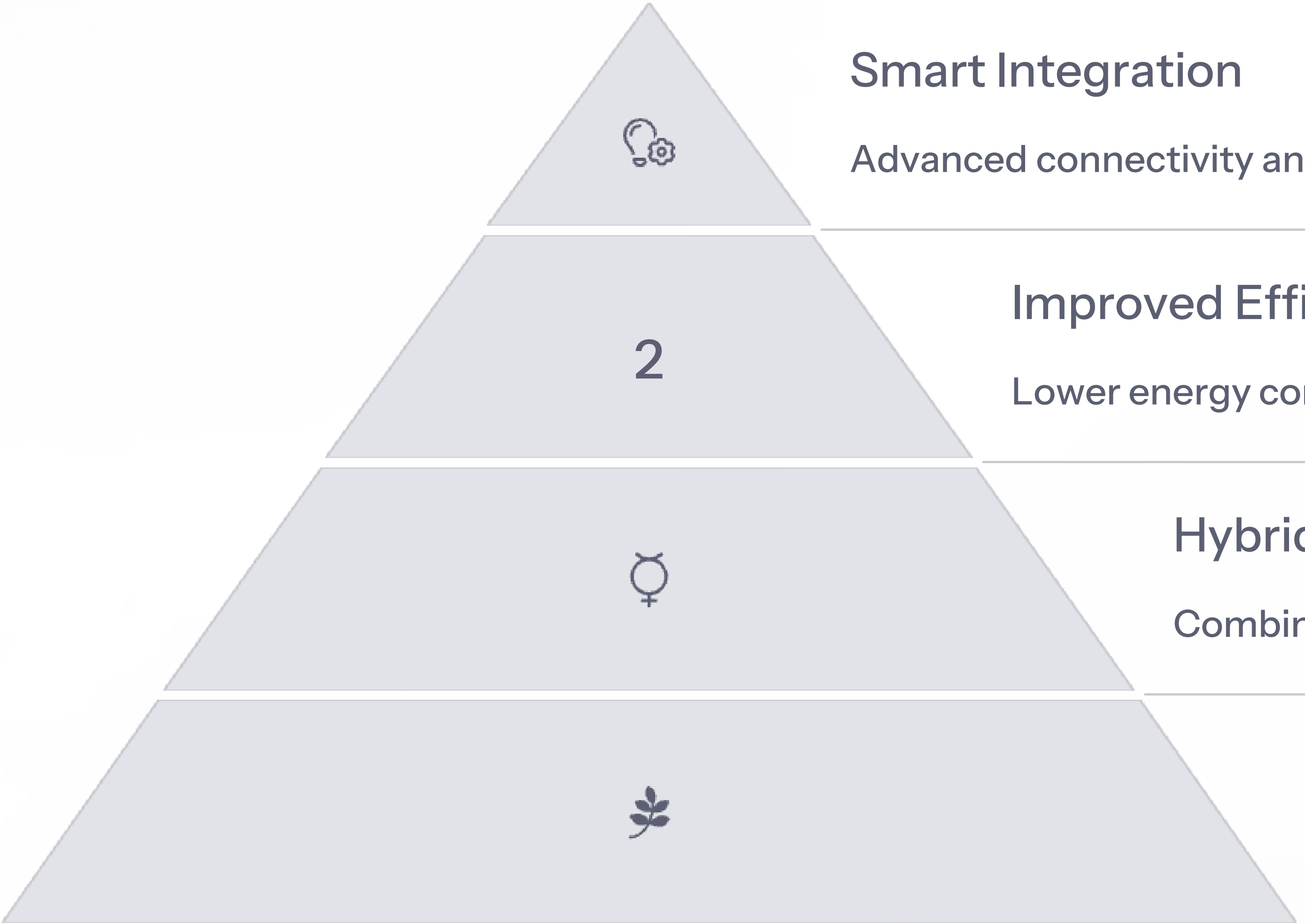
Testing and Adjustment

After conversion, the appliance must be tested for proper operation, including checking gas pressure, burner flame characteristics, and safety controls.

Documentation

The conversion must be documented with appropriate labels on the appliance indicating the new gas type and date of conversion.

Future Trends in Gas Dryer Technology



Smart Integration

Advanced connectivity and automation

Improved Efficiency

Lower energy consumption and faster drying

Hybrid Technologies

Combining gas and heat pump technologies

Eco-Friendly Design

Reduced emissions and water vapor recovery

The future of gas dryers is moving toward greater integration with smart home systems, allowing for remote monitoring and control. Efficiency improvements will continue to reduce energy consumption while maintaining or improving performance. Hybrid technologies may combine the best aspects of gas and electric heat pump dryers. Environmental considerations are driving development of more eco-friendly designs with lower emissions and features like water vapor recovery systems.

Professional Development for Gas Technicians

Basic Certification

Initial training and licensing for gas technicians

2

Practical Experience

Hands-on work with various gas appliances

3

Specialized Training

Advanced courses in specific appliance types

4

Continuing Education

Ongoing learning to stay current with codes and technology

Summary: Gas Clothes Dryer Installation and Maintenance

Proper Installation

Follow code requirements and manufacturer instructions for clearances, gas connections, electrical supply, and venting to ensure safe operation.

Effective Venting

Use appropriate materials, maintain proper duct length and configuration, and ensure outdoor termination to prevent fire hazards and maintain efficiency.

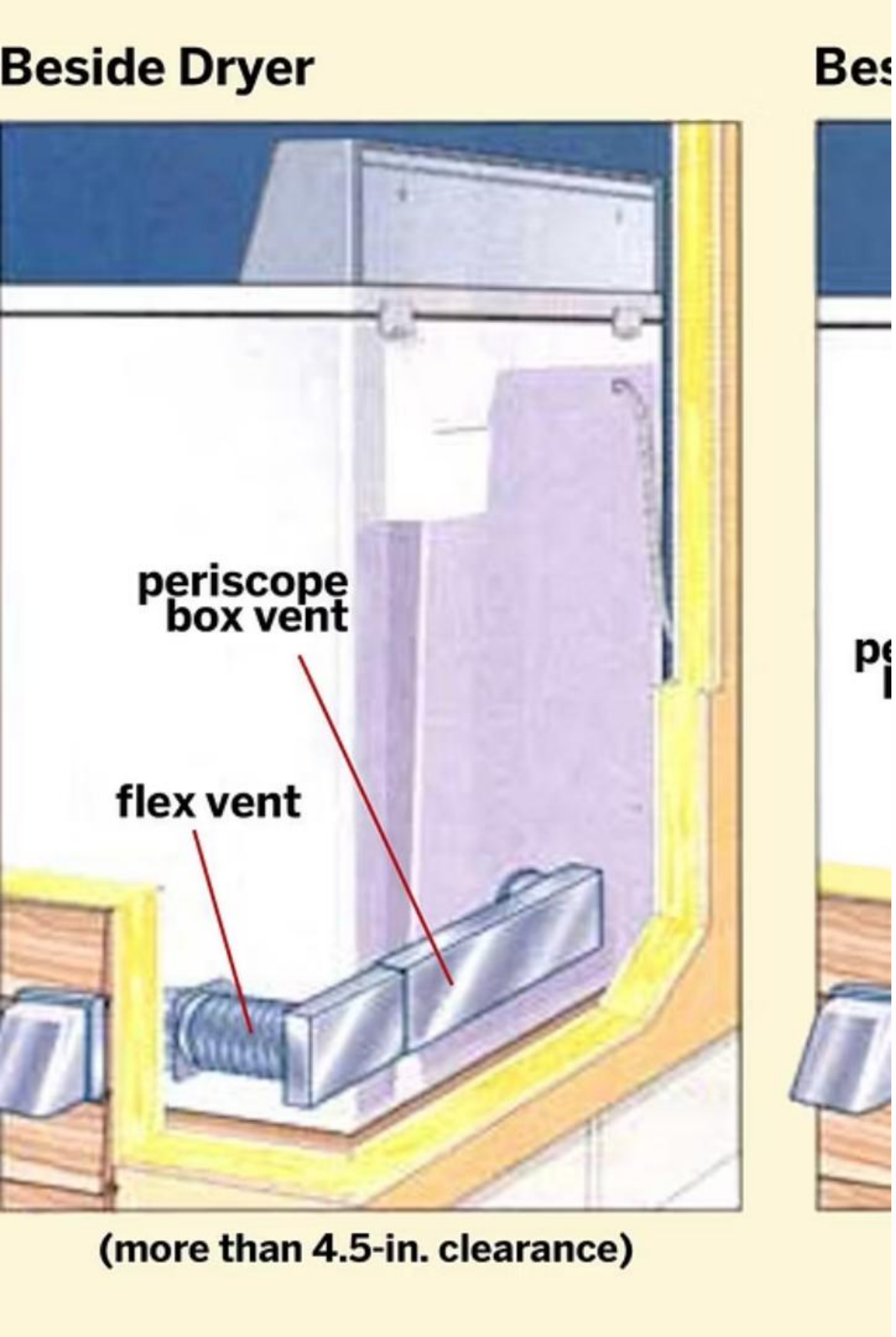
Regular Maintenance

Clean lint filters and exhaust systems, check for gas leaks, and inspect components to ensure continued safe and efficient operation.

Safety First

Always prioritize safety in installation, operation, and servicing. Only qualified technicians should work on gas appliances.

Gas Dryer Installation and Operation Guide



Wall Preparation for Venting

Standard Walls

To cut a hole through the walls that the venting must pass through, use a 4.125 inch (100 mm) high-speed hole cutter.

Masonry Walls

For brick or concrete walls, use a masonry bit or coring machine.

Proper venting is critical for gas dryer operation. The vent hole must be precisely sized to ensure adequate airflow while maintaining a proper seal around the vent pipe.

Burner Ignition Systems Overview

Constant Pilot

Sometimes referred to as a match-lit, capillary pilot, or standing pilot burner. This older technology requires manual lighting and maintains a continuous flame.

Glow Coil

Uses a resistance wire mounted on a ceramic block that heats up to ignite the gas when power is applied.

Spark Ignition

Also called direct ignition, this system ignites gas directly with a spark without using a pilot light.

Glo-sil

Provides a hotter igniter with faster combustion response, using silicon carbide elements that heat to high temperatures.

Constant Pilot Burner System

Manual Lighting Required

The constant pilot is an outdated technology found on older dryers. It must be manually lit and remains on continuously once lit.

Mercury-Filled Capillary Tube

The standing pilot heats a mercury-filled capillary tube bulb; the pressure is transmitted through the capillary to keep the spring-loaded shut-off valve open.

Safety Mechanism

If the pilot goes out, the mercury cools and the bellows release the spring-loaded valve to shut off the flow of gas to the pilot and burner.

This ignition type represents an outdated burner technology and is found on older dryers. A gas technician/fitter is less likely to encounter this style of ignition as electronic ignition now dominates the dryer marketplace.

Lighting the Constant Pilot

Push Down Start Lever

This lever lifts the pilot valve and latching cap and seals the tube to the main burner. The gas flows into two different tubes: to the zip tube and the pilot.

Light the Air-Gas Mixture

Light the mixture above the zip tube. The gas lights along the full length of the tube and lights the pilot.

Wait for Heating

Wait while the pilot heats up one end of the mercury-filled capillary tube. As the mercury heats up, it expands and pushes on the diaphragm attached to the other end of the tube, operating a latching pin.

Release the Start Lever

After about one minute, the pin moves forward into the latched position, holding the pilot gas valve open. You can now release the start lever.

If the pilot goes out, the latching pin pulls back, shutting the pilot valve and stopping all gas flow.

Main Burner Ignition Sequence

1. **Timer Setting**

   When the timer dial is set to a heat setting, the circuit through the timer is closed.

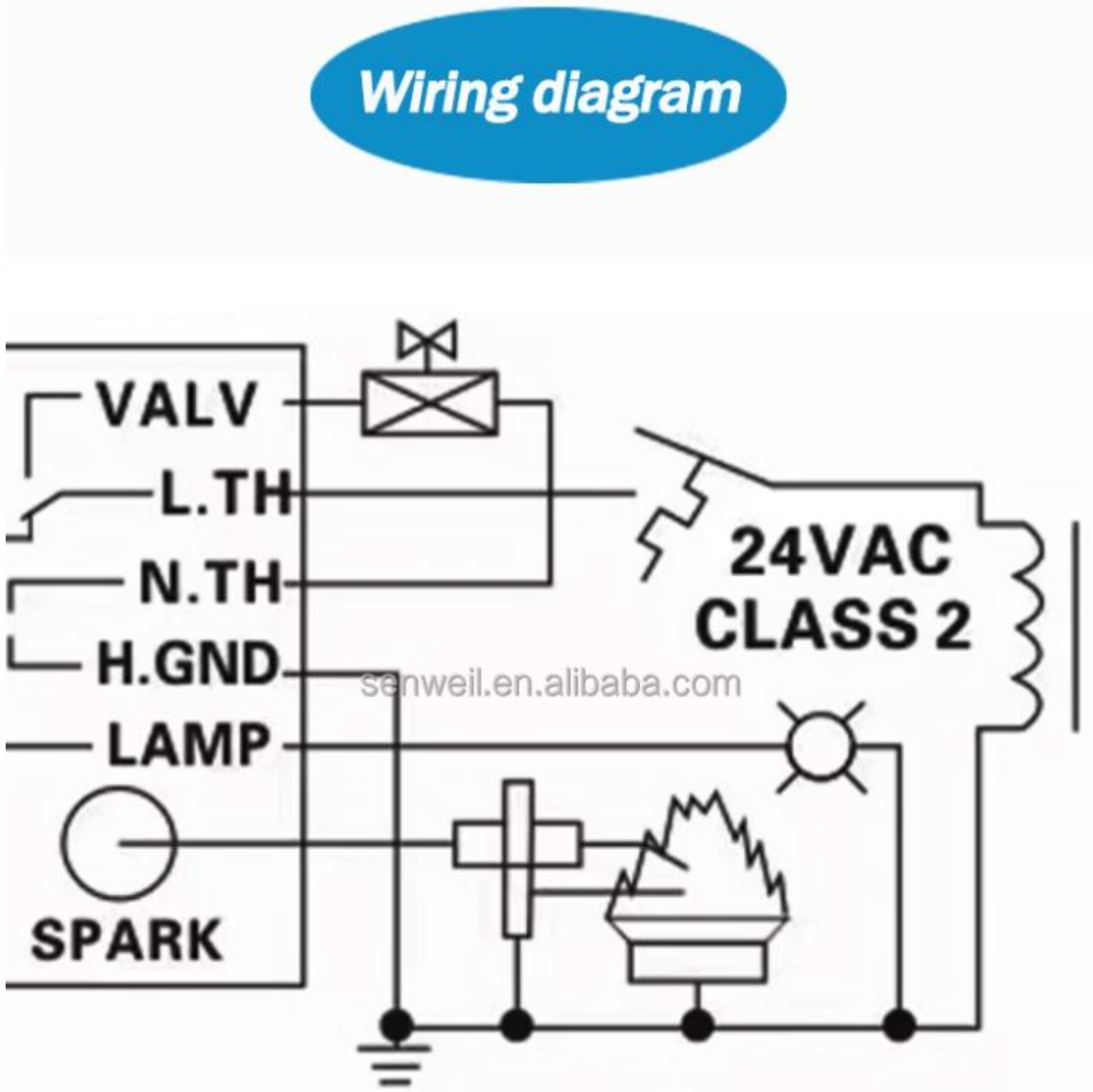
2. **Thermostat Circuit**

   This completes a circuit through the thermostat to the main gas solenoid.

3. **Gas Flow and Ignition**

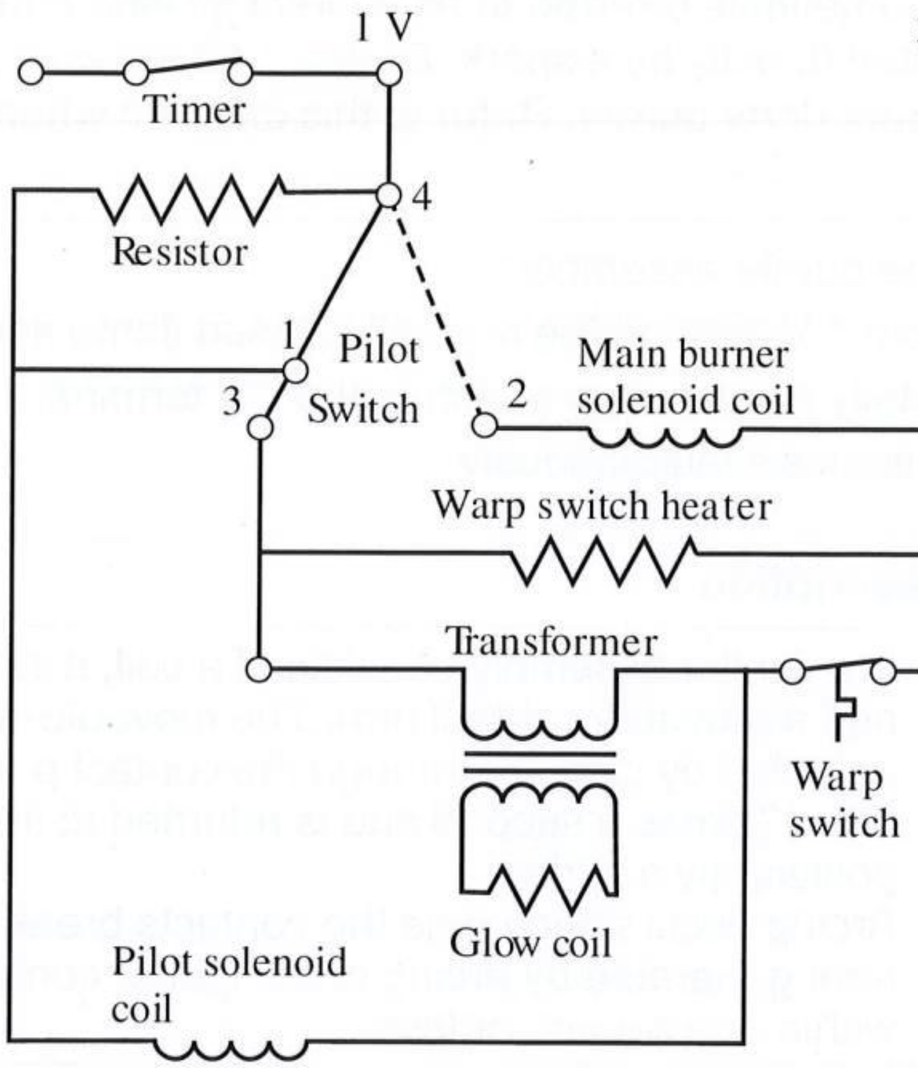
   Gas can now flow to the burner and be ignited by the pilot.

This sequence ensures that gas only flows to the main burner when both the timer is set to a heat setting and the thermostat is calling for heat, with the pilot flame ready to ignite the gas.



Glow Coil Ignition System

Figure 2-11
Wiring diagram of glow-coil ignition system



System Components

The glow coil is a resistance wire mounted on a ceramic block. It is connected to a step-down transformer that is mounted on the valve body. When power is applied to the coil, it glows, producing enough heat to light the gas.

Operation Sequence

As soon as the dryer timer is turned to one of the heat settings, the pilot valve is energized. Power enters through the 1 V circuit, and the pilot switch is closed at three points simultaneously, allowing current to flow through multiple paths.

Glow Coil Electrical Sequence

Power Entry

Power enters through the 1 V circuit with the pilot switch closed at three points simultaneously

Pilot Switch Action

Pilot flame heats mercury bulb, creating pressure that moves the pilot switch arm, opening 4-1 and 4-3 circuits, and closing the 4-2 circuit

Multiple Circuits

Connection 4–1 allows current through pilot solenoid coil and warp switch; Connection 4-3 allows current through warp switch heater and transformer; Holding circuit maintains pilot solenoid

Ignition

Glow coil heats to white hot and ignites pilot gas

Door Opening Safety Feature

1 **Voltage Cut-off**

If the dryer door should be opened at any time during the cycle, voltage to the main burner is cut off.

2 **Gas Valve Closure**

Both the main burner and pilot gas valves close, stopping gas flow.

3 **Burner Shutdown**

Both the main and pilot burners go out, even though the door is closed again. (The pilot valve will not open because of the 800 Ω resistor.)

4 **Cooling Period**

After about two minutes, the mercury cools and the pilot switch moves back to connect 4-1 and 4-3 circuits again.

5 **Reignition**

The burner ignition steps are then repeated.

Warp Switch Safety Function

Purpose

The warp switch acts as a safety device to break the circuit to the glow coil and pilot valve when certain malfunctions occur.

Malfunction Detection

- The main burner does not light at initial start-up because of interrupted gas supply
- The pilot fails to light
- The pilot flame is faulty and not generating enough heat to cause the pilot switch to operate

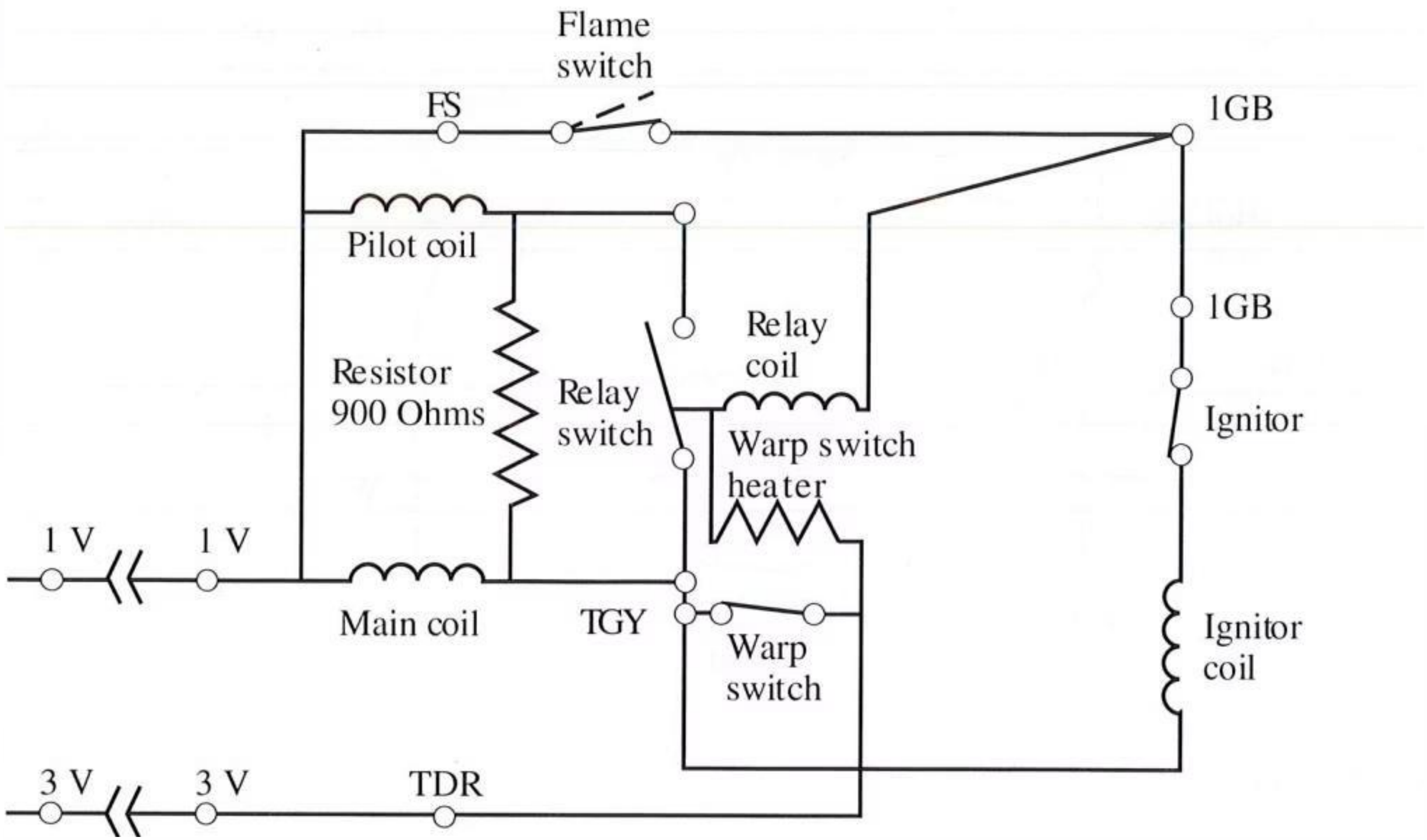
Operation

The warp switch is composed of a bimetal arm that warps or bends when heat (supplied by the resistance heaters) is applied to one side of it. If left in the circuit, the warp switch will open after three to four minutes.

Normal Conditions

Under normal operating conditions, the pilot ignites and the pilot switch swings to the 4-2 circuit, removing the resistance heater from the circuit before the warp switch can react.

Spark Ignition Burner System



The spark ignition burner is sometimes referred to as a direct ignition burner. There is no pilot in this system as the gas is ignited directly by a spark.

System Operation

When voltage is applied to the burner assembly, a circuit is completed from 1 V through the normally closed flame and igniter switches, the igniter coil, and the normally closed warp switch to the 3 V terminal. This circuit starts three circuits simultaneously: the igniter circuit, main coil circuit, and relay coil circuit.

Ignition Process

The igniter assembly consists of a coil, a stationary contact arm, and a movable contact arm. The movable contact arm is motor actuated by circuitry through the contact points. The arm oscillates 6 to 12 times a second and is returned to its normally closed position by a spring. Arcing occurs each time the contacts break to provide ignition.

Spark Ignition Circuit Operation

1

Main Coil Circuit

The circuit from the 1 V terminal, through the main coil and the normally closed warp switch, contacts to the 3 V terminal. Although this circuit energizes the main coil, no gas flows to the main burner at this time because of the resistor in the pilot coil circuit.

2

Relay Coil Circuit

The circuit from terminal 1 GB through the relay coil and warp switch heater to the 3 V terminal. This circuit closes the normally open relay switch, which completes a circuit directly to the pilot coil (bypassing the resistor).

3

Gas Flow and Ignition

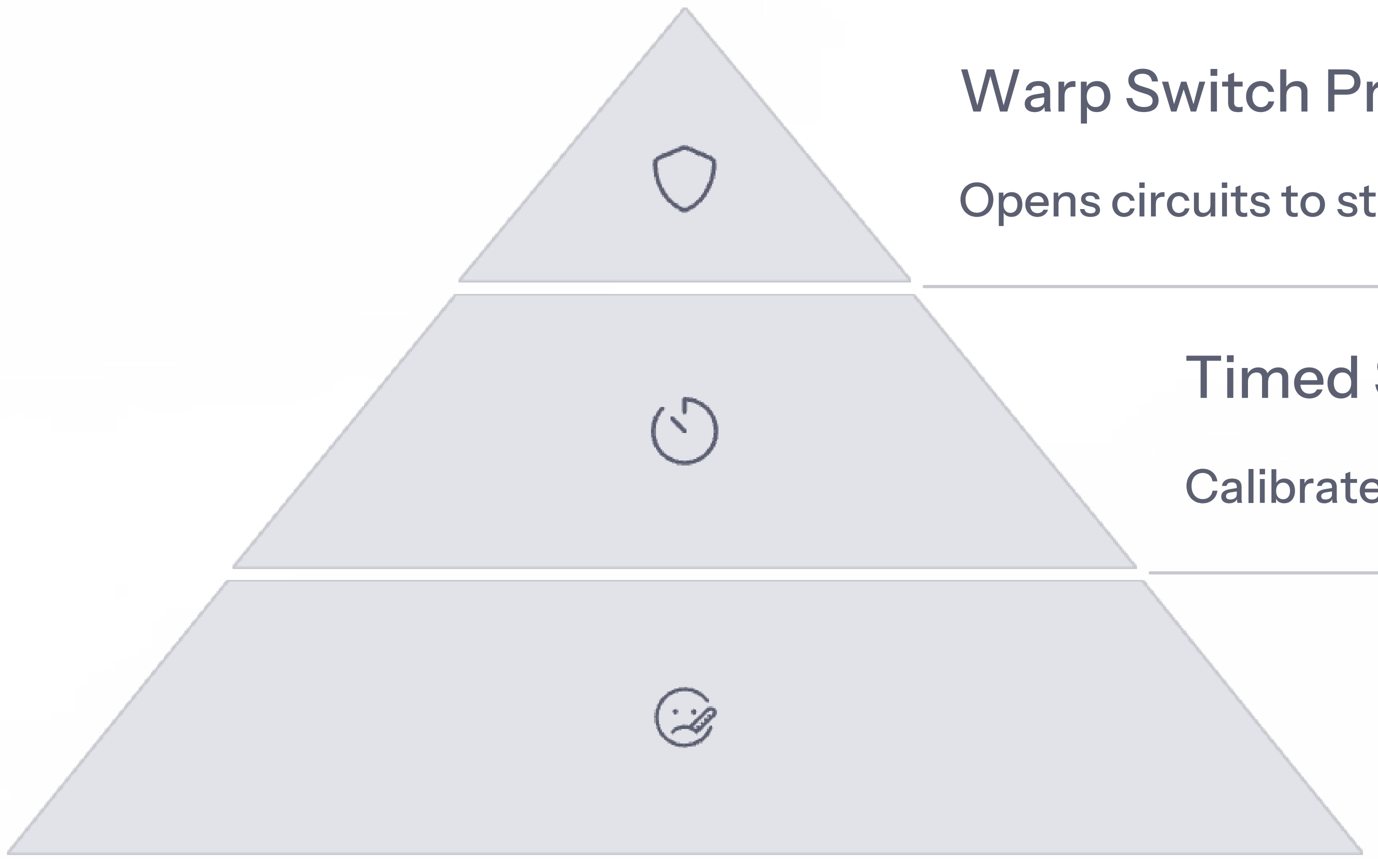
The increased voltage across the pilot coil provides enough energy to "pull in" the gas solenoid valve. Gas now flows through to the main burner where ignition occurs.

4

Flame Detection

Within 3 to 5 seconds after burner ignition takes place, the burner flame heat applied to the heat probe of the flame switch will cause the flame switch contacts to open. This action opens circuitry to the igniter, relay coil, and warp switch heater and stops igniter action.

Spark Ignition Safety Features



Warp Switch Protection

Opens circuits to stop gas flow if ignition fails

Timed Safety Response

Calibrated to open between 15-40 seconds

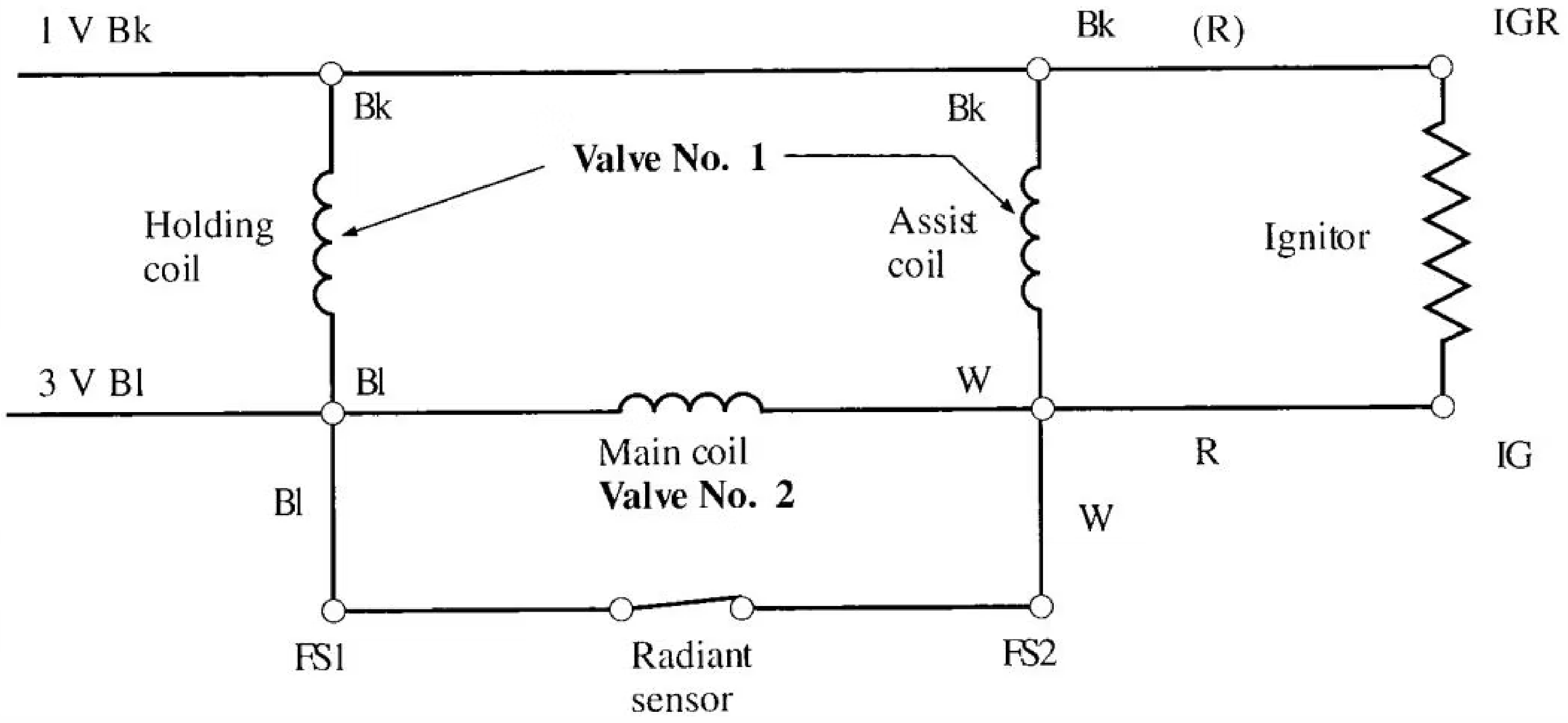
Heat Detection

1000 Ω heater activates the safety response

If, for any reason, the burner flame should fail to ignite or the flame switch should fail to open, heat generated by the warp switch heater will open the normally closed warp switch contacts. This opens the circuits to the pilot and main burner coils and stops the flow of gas. Warp switches on spark ignition burner are typically actuated by a 1000 Ω heater and calibrated to open between 15 and 40 seconds.

Glo-sil Burner System

Figure 2-13
The Glo-sil burner system



System Evolution

The Glo-sil type burner was developed to bring a hotter igniter and a much faster response to combustion in the firing of the dryer burner. It has been used in production for many years. The "K" series was used until 1984 when the "M" series was phased into production.

Operation Principles

Although they look different, both function the same way. After the gas passes through the regulator, it encounters the first of two electrical solenoid control valves. Both valves are spring-loaded closed, and the solenoids must be energized for them to open. Both valves must be open for the burner to work.

Glo-sil Burner Operation Sequence

Power Application

A circuit is completed from the 1 V terminal to the igniter and sensor back to the 3 V terminal. Simultaneously, the hold coil is energized and the assist coil is energized through the sensor.

Valve 1 Opens

Both the hold coil and the assist coil must have full line voltage applied to lift valve no. 1 off its seat. The igniter is heating, and valve no. 1 is open.

Igniter Reaches Temperature

When the igniter reaches a temperature hot enough to open the radiant sensor contacts (about 2200°F or 1204 °C), the only path left is through the valve no. 2 coil. This causes valve no. 2 to open.

Gas Flow and Ignition

Gas now flows through valve no. 2 and is ignited instantly by the hot igniter. Magnetism through the assist coil is reduced. Magnetism through the hold coil is enough to hold open valve no. 1 open.

Glo-sil Power Interruption Safety

1. **Power Failure Occurs**

   If the voltage to the burner is momentarily interrupted from a power failure

2. **Power Restoration**

   When power is restored, valve no. 2 opens

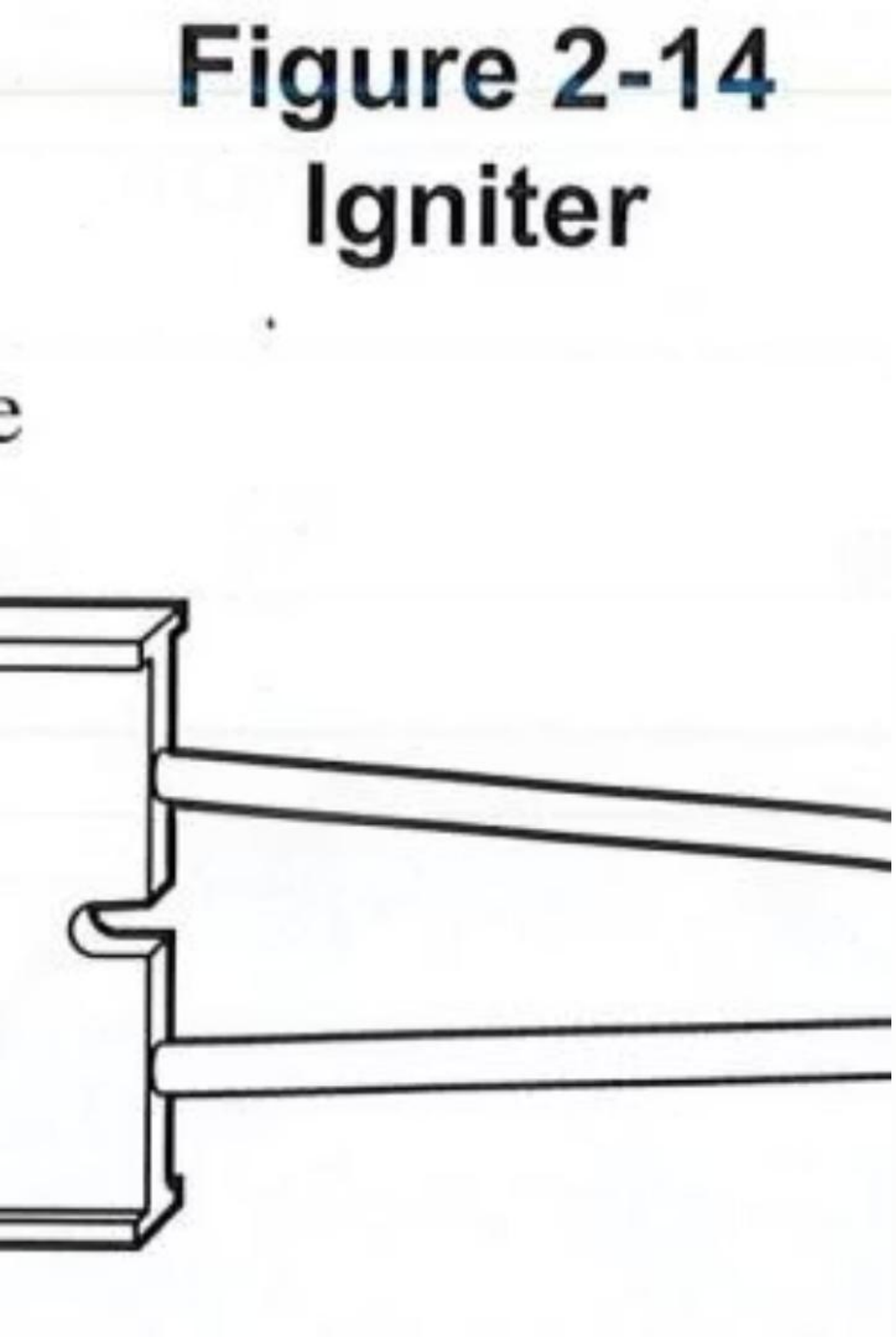
3. **Valve 1 Remains Closed**

   With the reduced current through the assist coil (now in series with valve no. 2), valve no. 1 will not open

4. **Safety Restart**

   When the sensor cools and its contacts re-close, ignition will resume

This safety sequence prevents gas from flowing when power is restored after an interruption, ensuring that ignition only occurs under controlled conditions.



The Glo-sil Igniter

Operating Temperature

The igniter heats to a temperature of about 2200°F (1204 °C) in about 15 to 30 seconds after line voltage is applied to it.

Material Composition

Since it is made from recrystallized silicon carbide and is very brittle, take care when servicing this type of burner ignition system.

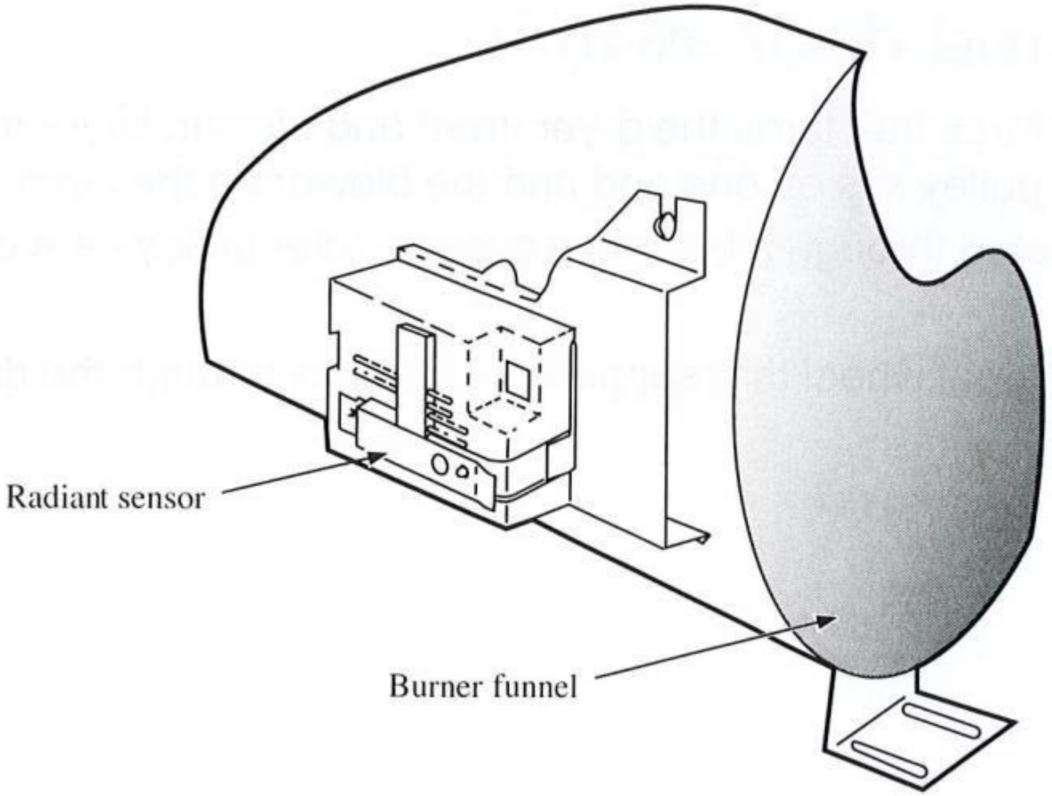
Design Variations

Several different styles have been used, but they all function the same way.

The silicon carbide igniter is a critical component that must reach precise temperatures to ensure proper gas ignition. Its brittle nature requires careful handling during installation and service.

The Radiant Sensor

Figure 2-15
Placement of the radiant sensor



Mounting Location

The radiant sensor is mounted on the side of the burner tube and controls the opening of valve no. 2. A cut-out in the funnel allows radiant heat from the igniter and gas flame to contact the sensor.

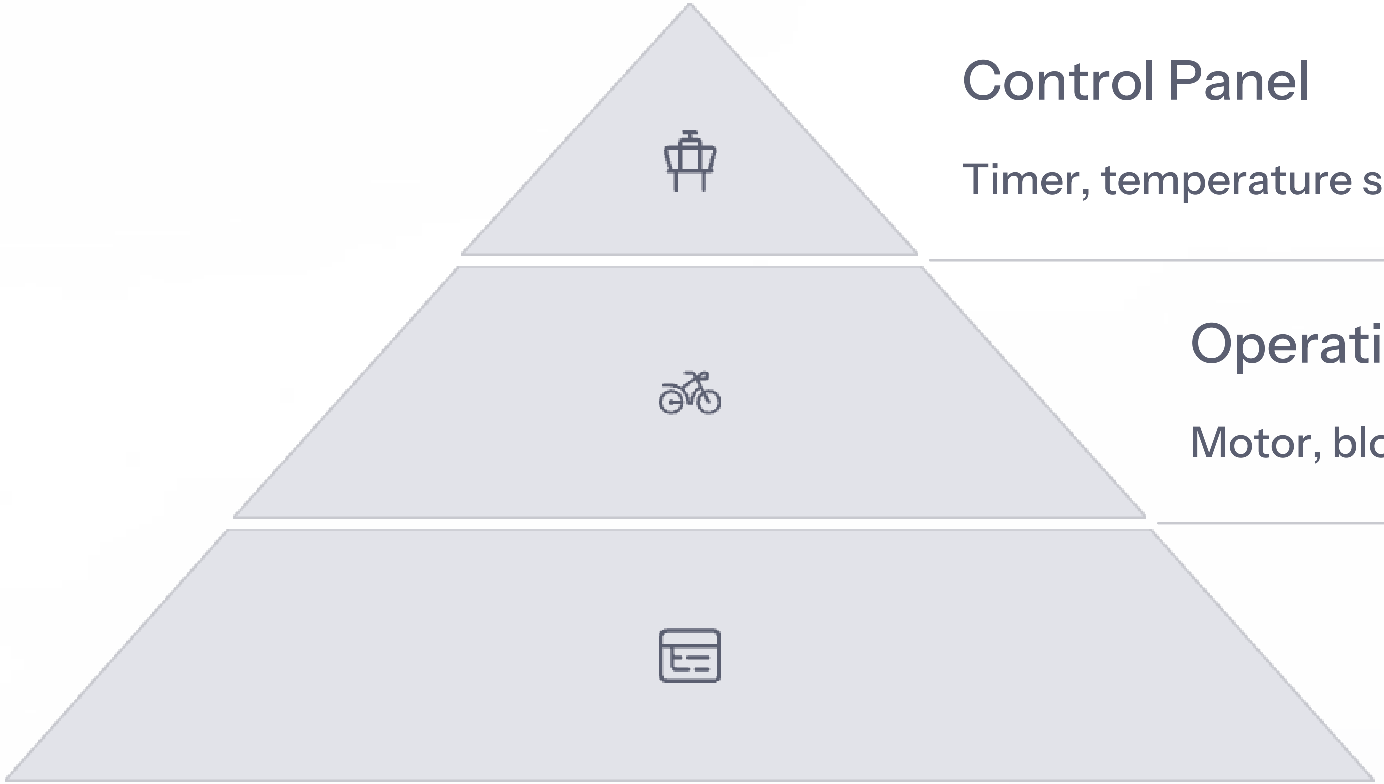
Contact Operation

Its contacts are single-pole, single-throw, and are calibrated to open when the igniter reaches its operating temperature, about 2200°F (1204 °C). Heat from the burner flame holds the contacts open after ignition.

The radiant sensor plays a crucial role in the safety and operation of the Glo-sil system, ensuring that gas only flows when the igniter is hot enough to provide immediate ignition.

Dryer Controls Overview

Figure 2-16
Positioning of components and controls within dryer



Control Panel

Timer, temperature selector, and start switch

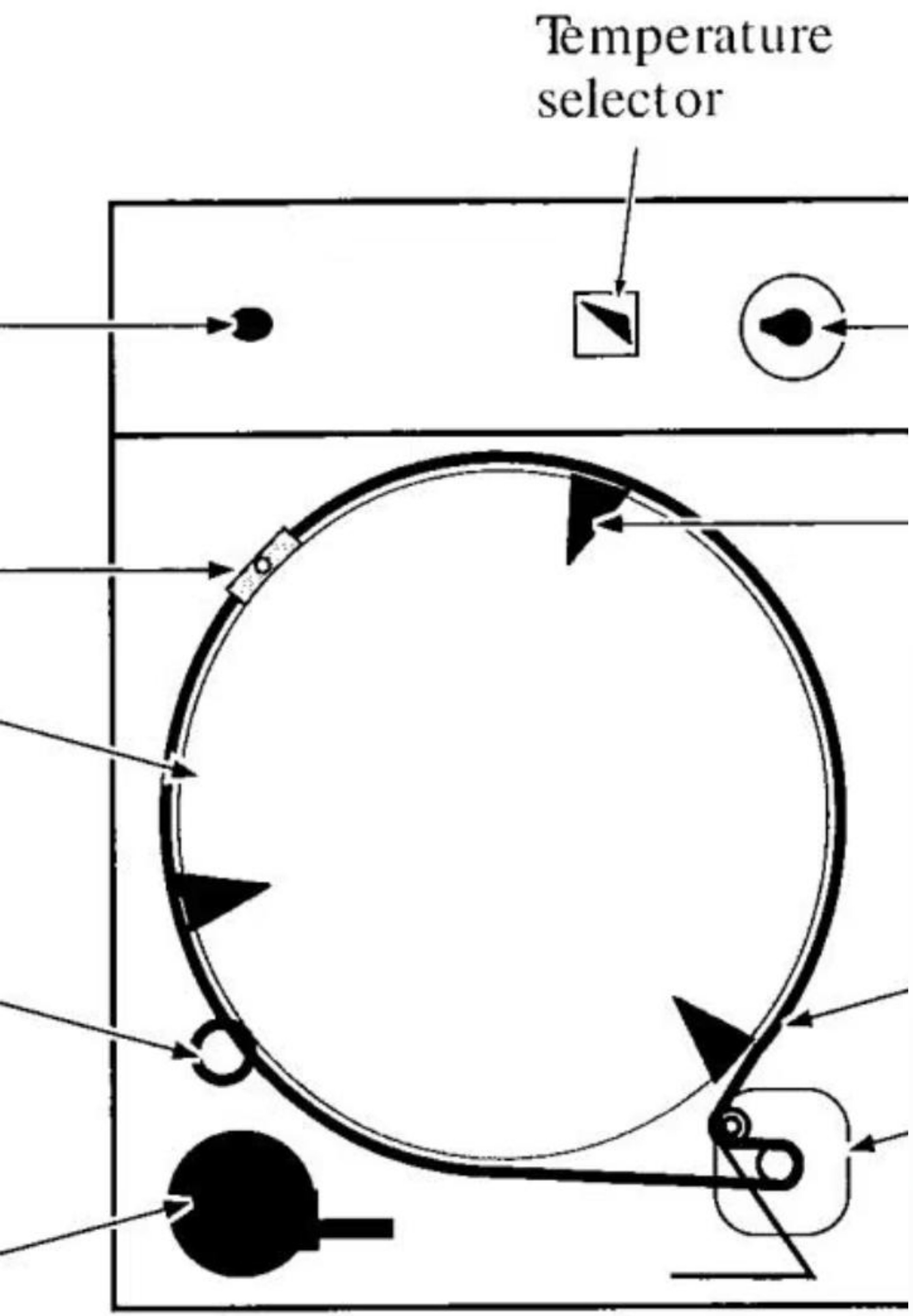
Operational Components

Motor, blower, and burner assembly

Structural Support

Bulkhead assembly for drum support

The dryer controls and devices are situated within the dryer bulkhead assembly. The bulkhead assembly is welded or bolted together to form a rigid support for the drum. The motor, blower housing, and burner are mounted at the base of the bulkhead. The top panel and console assembly consists of the timer, push-to-start switch, and temperature selector. It may also have a buzzer attached that indicates when the dryer has completed its cycle.



Dryer Bulkhead Components

Timer

Controls cycle duration and operation sequence

Temperature Selector

Sets heat level for different fabric types

Push-to-Start Switch

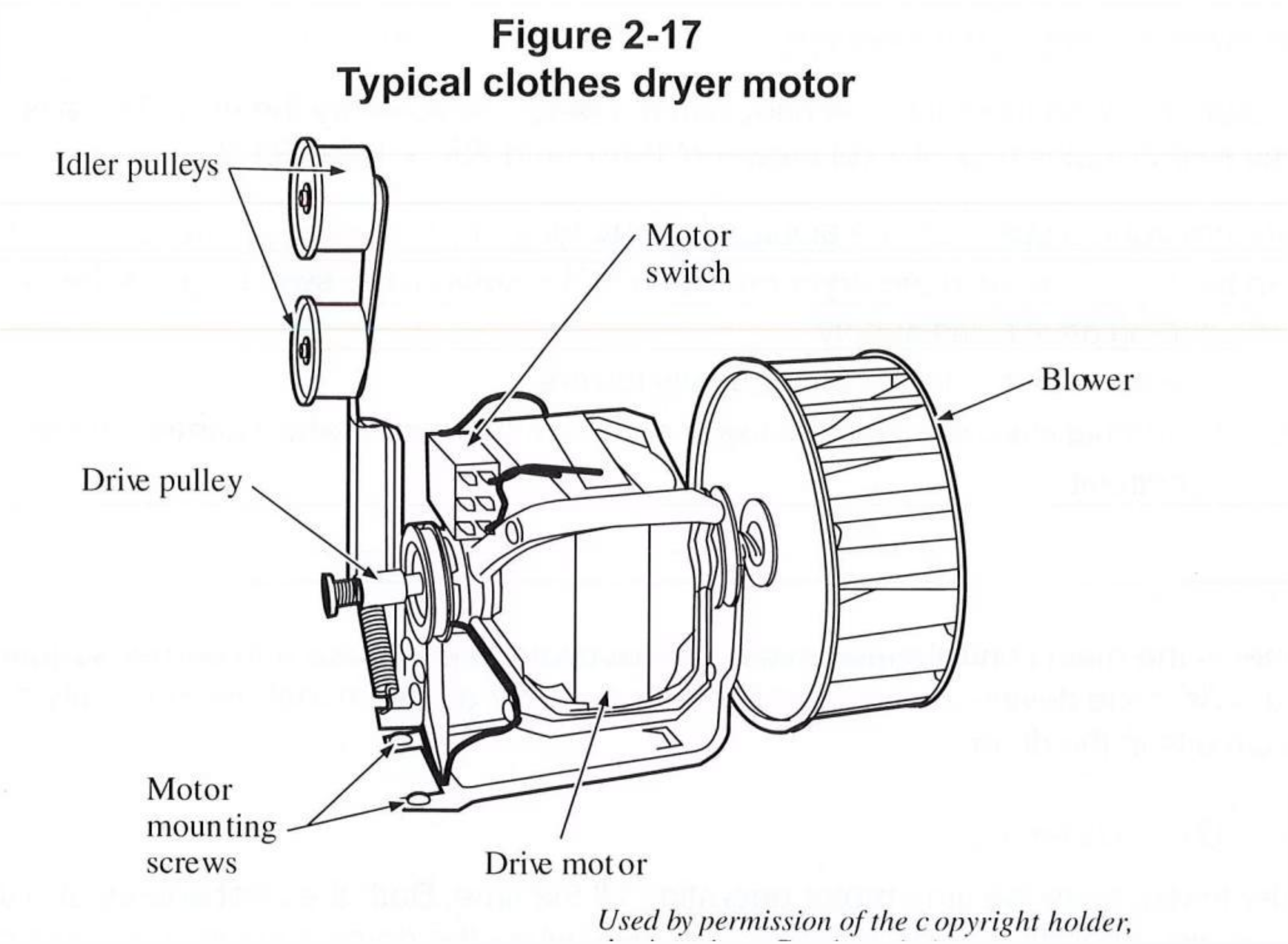
Initiates the drying cycle

Cycle Completion Buzzer

Signals when drying is complete

These controls work together to provide the user with options for different fabric types and drying needs while ensuring safe operation of the appliance.

Drum Motor and Door Switch



Double-Shafted Motor

The motor is the driving force that turns the dryer drum and blower. Dryer motors are double-shafted: a pulley sits on one end and the blower on the other end. The dryer drum is rotated through a belt drive system. Idler pulleys are used to keep the belt tight.

Centrifugal Blower

The blower is a centrifugal wheel that supplies the air flow through the dryer. It creates the negative pressure needed to draw air through the heating chamber and into the drum, then pushes the moist air out through the exhaust vent.

The Drying Cycle Process

Load Placement

Damp clothing is placed into the dryer and the control adjusted for a drying time

Moisture Evaporation

Heat applied by the dryer evaporates the moisture in the clothing with little rise in exhaust air temperature

Temperature Increase

As the load becomes drier, less heat is used to evaporate moisture and the air temperature starts to increase

Thermostat Regulation

When the temperature reaches a set point, the thermostat turns off the gas supply, then turns it back on when temperature drops

Temperature Controls

User-Selectable Range

Temperature controls modulate the heat within a range selected by the user.

High Limit Switch

There is also a fixed high limit switch that is typically set between 190°F and 250°F (88-121°C).

Air Temperature Sensing

Temperature control switches are actuated by the temperature of the air that passes across them.

Cycling Operation

When the temperature in the dryer rises above the set point, the switch opens the circuit to the burner, cutting off the gas supply. When the temperature reaches the lower set point, the temperature control closes, energizing the burner circuit.

Dryer Timers

Main Control Function

The timer is the main control mechanism since it controls the motor and burner sequence. It is either a solid-state device, or it consists of a timer motor and cam that mechanically opens and closes circuits in the dryer.

Time-Dry Timers

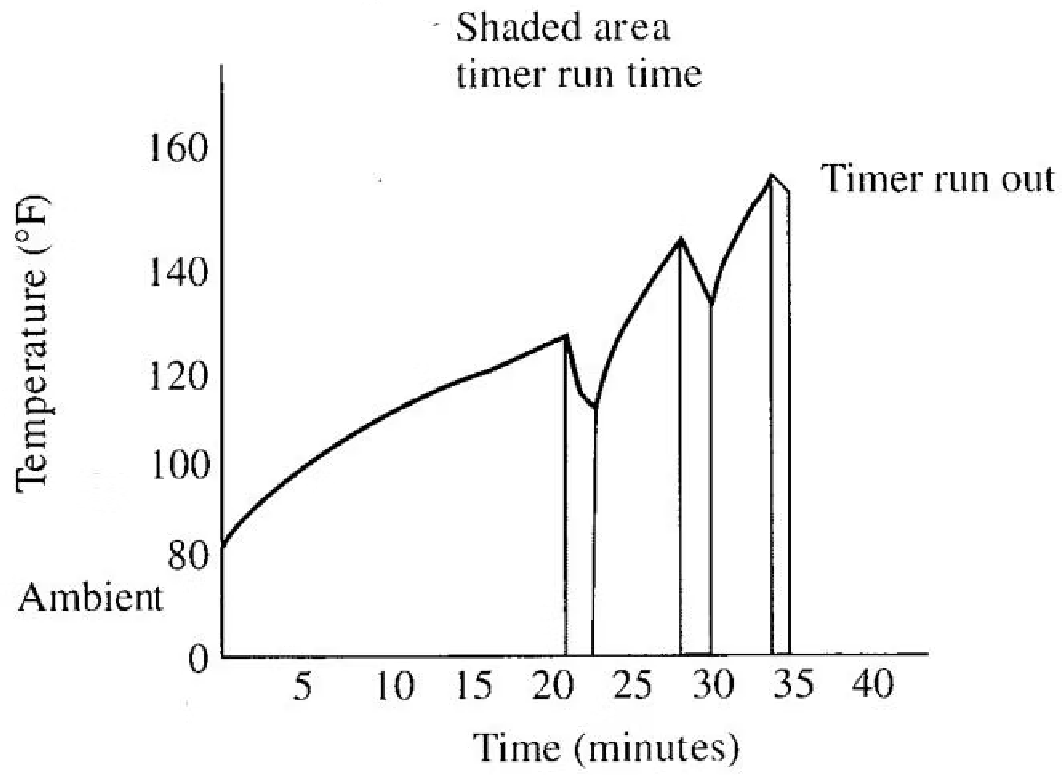
Time-dry timers have the time motor operating all the time. Both the heat source and the dryer motor are also operating at the same time, except when the dryer is in the cool down cycle. In this case, the heat circuit is open.

Automatic Cycle

The automatic cycle of a dryer also includes a timer. When the control is set to AUTO DRY it operates in the same way as the time-dry timer except that the timer motor is not on when the heat source is operating. A thermostat controls the switching between the heat source and the timer motor.

Automatic Cycle Operation

Figure 2-18
Typical automatic cycle timer chart



Timer and Heat Alternation

In the automatic cycle, the timer motor is not on when the heat source is operating. The chart shows the periods when the timer is operating (shaded area). The rest of the time the heating circuit is closed, and the timer circuit is open.

Drying Time Factors

In the automatic cycle, the drying time depends on four things:

- The amount of run time selected for the timer
- The type and size of clothes loads
- The wetness of the clothes in the dryer
- The ambient temperature and humidity

With auto dry settings, the user can set the control for different cycles depending on the clothing being dried. These settings adjust the drying temperatures, the length of the timer operation, and the

Cool-Down Period

Wrinkle Prevention

Whether set to timed dry or the automatic cycle, there is a cool-down period when the heat is off. This is just before the end of its timed cycle and is used to prevent excessive wrinkling.

Extended Operation

The dryer operates for a longer period of time after the clothing is dry, with no heat being added to the air.

Damp Dry Option

Some dryers allow clothing to be damp dried to prepare the clothing for ironing. In this case, as soon as the thermostat cycles the heat off, the timer motor advances to OFF.

Air Fluff Cycle

There may also be an air fluff cycle wherein the dryer operates without heat being supplied.

Start Switches

Safety Device

All dryers have a momentary contact start switch that must be activated for the dryer to operate. These switches are also called push-to-start switches and are a safety device on the dryer.

Motor Start Circuit

The switch is a single-pole, spring-return in series with the start windings of the drive motor. It must be held in momentarily until the dryer motor reaches approximately 1200 revolutions per minute (r/min or rpm), and then the centrifugal switch in the motor closes the circuit internally.

Circuit Interruption

Should the electric motor circuit be interrupted from any source - this includes opening the clothes dryer door - the drum stops revolving. It is necessary to push the START button to start the dryer again.

Dryer Thermostats

Control Thermostat

Located on the exhaust vent, it controls the amount of heat supplied to the dryer.

Safety Thermostat

Wired in series with the control thermostat and heat source. If the heat rises above about 250°F (121°C), it opens the circuit to the heat source.

Cool-down Thermostat

Measures air temperature at the end of a timed cool-down period. When the air drops below a set temperature, it advances the timer to the end of its cycle.

These three thermostats work together to ensure proper temperature control, safety, and cycle completion in the dryer.

Safety Thermostat Function

Negative Pressure Monitoring

The blower creates a negative pressure in the heater box that is monitored by the safety disc (a temperature sensing snap disc).

Normal Operation

This switch is mounted over a hole in the burner box and normally air is drawn in, keeping the snap disc cool.

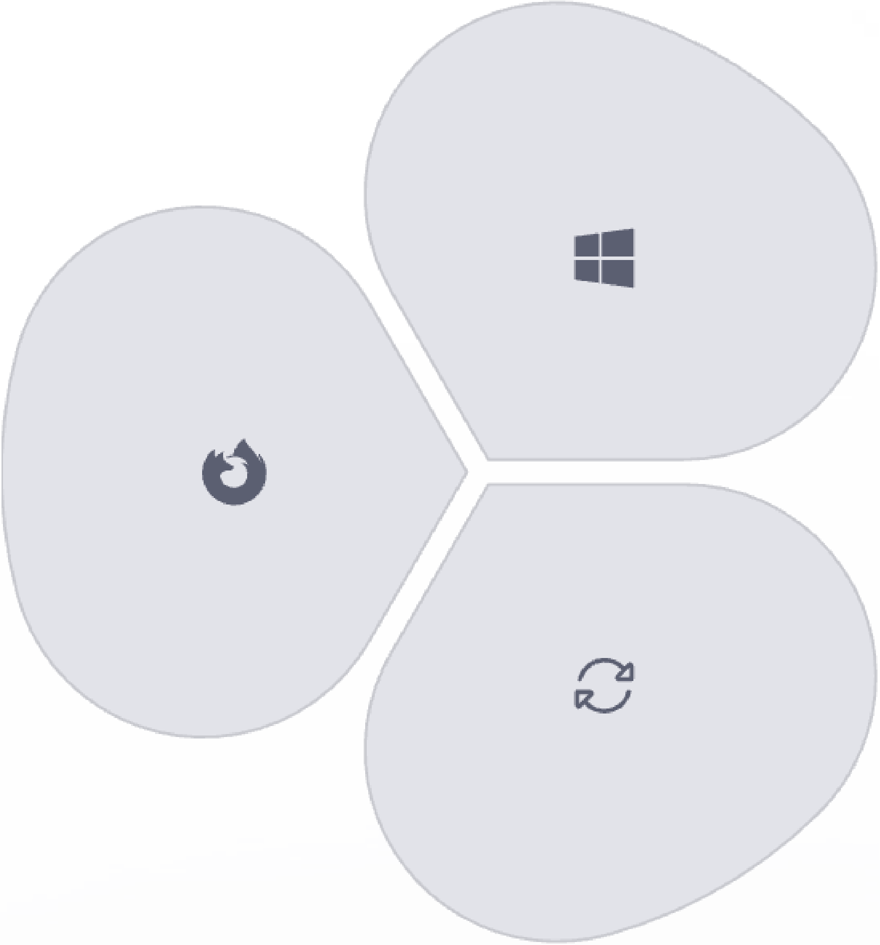
Blockage Detection

When the lint screen or vent system becomes blocked, the negative pressure in the heater box is reduced and the heat from the burner flows out the hole.

Safety Response

When the safety thermostat senses the increase in temperature, it shuts off the burners and cycles them until the condition is rectified.

Elements of Proper Drying



Heat

Provided by the burner

Raises temperature to evaporate moisture

Air Movement

Provided by the blower

Circulates heated air and removes moisture

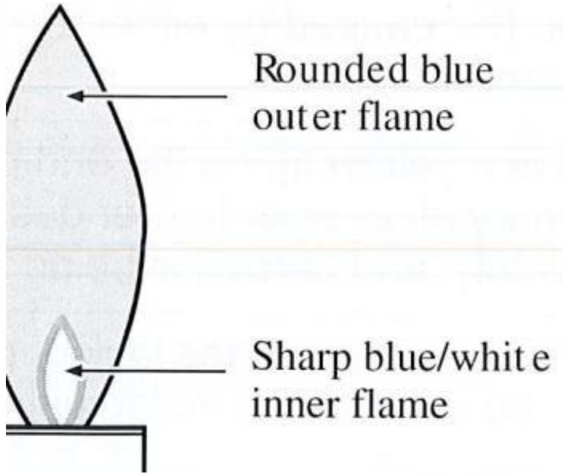
Exposure

Enhanced by drum rotation and baffles

Ensures all clothing surfaces contact heated air

Proper and efficient drying requires these three elements working together. The burner provides heat, the blower provides air movement, and the speed of drum rotation along with baffles enhance exposure of clothing to the air movement.

Ideal Flame Characteristics



Proper Flame Appearance

The flame should be blue and lively, but not too loud. It should not be scrubbing the top of the burner cone (funnel) but should extend to the cone, tailing up slightly.

Importance of Flame Quality

A properly adjusted flame ensures that the air is heated efficiently and within the set temperature ranges. If it is not, it can lead to unburned carbon particles dirtying the clothing in the dryer, as well as the formation of dangerous gases and dryer inefficiencies.

An ideal clothes dryer flame has no yellow in it, indicating complete combustion with the proper air-to-gas ratio.

Air Requirements for Combustion

Primary Air

The primary air is the air mixed with the gas before ignition. This air affects the characteristics of the flame. You can adjust the amount of primary air supplied to the burner by opening or closing the air shutter. The location of the air shutter will be included in the manufacturer's literature. It is normally locked in place with a locking screw.

Secondary Air

The secondary air is the air around the flame during burning. This air completes the combustion process after the initial ignition. Proper secondary air flow is essential for complete combustion and efficient operation.

With the burner operating, loosen the locking screw and gradually slide the shutter open or close it until the flame meets the manufacturer's suggested flame characteristics.

Flame Characteristics and Problems

Lifting (Blowing)

The flame will look as though it has lifted off the mouth of the burner. It is caused by either too much primary air, high gas pressure, or both.

Yellow Tipping

There is a yellow tip on the end of the flame caused by a shortage of primary air or poor burner design. The fuel gas is not burning completely, and carbon is being formed.

Yellow Flame

A yellow flame indicates lack of primary air that may be caused by dirt in the venturi or a maladjusted venturi.

Orange Flashes

Oranges flashes in the flame are caused by dust in the air and do not indicate a problem with the burner.

Flashback

The flame will appear to have travelled back through the burner tube to the orifice. This is caused by a low velocity gas-air mixture.

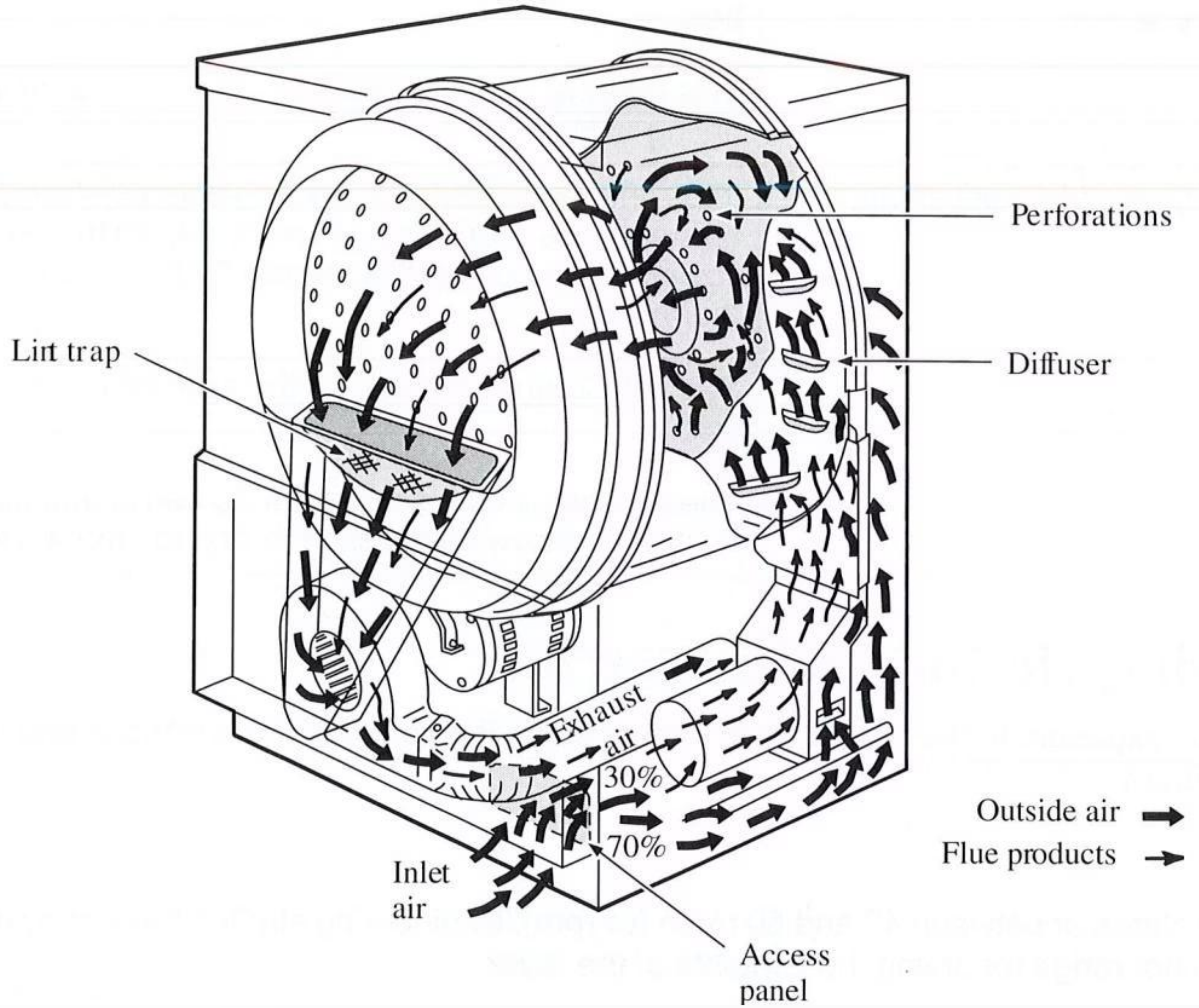
Lazy Flame

A lazy flame is one that wavers and hits the top of the cone. This indicates an air flow problem.

Note: Flame characteristics are only a guide. Other checks and tests must be done to confirm the problem.

Air Movement in a Dryer

Figure 2-20
Dryer air flow



System Efficiency Requirements

Proper Drum Sealing

The front and rear of the drum must be properly sealed. If the drum seal is defective, air can bypass the heater box. This creates a loss of negative pressure, reducing the drying efficiency.

Clean Lint Trap

The lint trap must be kept clean. If the lint trap is clogged, the negative pressure in the burner box is reduced and the heat from the burner flows out the hole and is sensed by the safety thermostat. The end result of a blocked lint screen is that air will not be able to move freely, and the drying time will increase.

For the system to work efficiently, these two elements must be maintained properly. Regular cleaning of the lint trap and inspection of drum seals are essential maintenance tasks.

Drum Rotation and Clothing Exposure

Optimal Rotation Speed

The drum rotates at between 47 and 50 r/min (or rpm). Engineering studies have shown that this is the optimum range for drying the contents of the dryer. If the drum turns any faster, the clothes would be pressed against the outside of the drum and not tumble. If the drum turns more slowly, the clothes ball up in the drum. In both of these cases, the drying times are greatly increased.

Factors Affecting Drum Speed

The drum speed on the dryer is affected by the:

- Belt diameter
- Belt alignment
- Condition of the belt

Be sure to check and replace the belt if required.

Dryer Baffles Function

Clothing Movement

The baffles inside the dryer are positioned so that the clothing is tossed around, increasing its exposure to the heated air.

Drying Efficiency

Without the baffles, the clothing would not dry as quickly.

Surface Exposure

Baffles ensure that all surfaces of the clothing items are exposed to the heated air, preventing clumping and uneven drying.

Design Considerations

The number, size, and placement of baffles are carefully engineered to provide optimal tumbling action for various load sizes and fabric types.

Dryer Service Approach

Problem Assessment

A gas technician/fitter is often faced with a dryer that has already been installed but is not operating properly. It is then necessary to determine the cause of the problem by troubleshooting the problem and running tests on the dryer.

Wiring Diagram Interpretation

Properly testing the components of a dryer requires that you be able to read and interpret wiring diagrams. This is covered in Unit 12 Basic electricity for gas fired equipment, Chapter 2. Interpret electrical drawings.

Systematic Testing

Following a logical sequence of tests helps isolate the problem area quickly and efficiently, leading to accurate diagnosis and repair.

Electrical Sequence of Operation

1 Timer Activation

As soon as the timer is turned on, all the circuits close.

2 Door Switch Circuit

The circuit from the timer to the door switch is completed through the door switch to the timer motor and drive motor.

3 Motor Circuits

The timer motor circuit is completed. The drive motor circuit is completed. The centrifugal switch is closed.

4 Burner Activation

The circuit from the timer through the thermostat to the main coil valve is closed. The neutral from the main coil valve is completed through the limit switch and the centrifugal switch. The burner is activated.

5 Lighting

The circuit from the timer to the panel and drum lights is closed (this may differ from dryer to dryer).

Knowing the sequence of operation for the electrical start-up of the dryer will make it easier to determine possible faults. If this basic sequence of operation does not occur, there is a problem with the dryer.

General Electrical Troubleshooting

Problem Isolation

Isolating the source of the problem is the first step in fixing the problem.

Initial Testing

To locate the general problem area: Turn on the dryer. Set the temperature to high. Check the power at the burner. Test switches and loads.

Power Verification

There are only two possible results when checking power at the burner: If there is power to the burner, concentrate your tests on the burner. If there is no power to the burner, check the operating switches in the dryer circuit.

Three-Point Testing Method

Testing Conditions	What to Expect
Open Switch	Voltage reading across the switch Voltage reading on the inlet terminal to ground No voltage on the outlet terminal to ground
Closed Switch	No voltage reading across the switch Voltage reading on the inlet terminal to ground Voltage reading on the outlet terminal to ground
On a Load	Voltage reading across the load Voltage reading on the hot terminal to ground No voltage reading on the neutral terminal to ground
On a Load that has lost the neutral	No voltage reading across the load Voltage reading on the hot terminal to ground Voltage reading to the neutral terminal to ground

Check the wiring diagram and use the three-point test to test the switches and loads. This will help in locating the most electronic faults. A good quality multimeter is required to do these tests.

Burner Ignition Troubleshooting

System-Specific Approach

Due to the various ignition systems, troubleshooting the burner ignition is dependent on the system used in the dryer. The sequence of operation for each of these burner ignition systems is discussed in the Burner ignition systems section.

Glo-sil and Spark Ignition Testing

When line voltage is applied to the Glo-sil igniter, it should heat up to its operating temperature in 10 to 30 seconds. The resistance across the terminals of a good igniter should be between 50 and 25 Ω in the Glo-sil coils.

Glo-sil Ignition Testing Procedure

Power Verification

If there is power to the burner, shut the power off.

Disconnect Leads

Disconnect the leads to the burner.

Multimeter Testing

Use a multimeter to check the sensor switch and Glo-sil.

Visual Inspection

Check for cracks in the Glo-sil.

Sensor Testing

If the Glo-sil is fine, check the radiant sensor for continuity.

Important! Never apply line voltage directly to the sensor.

Gas Smell Troubleshooting

Cause	Solution
Igniter points welded	Sand down or replace
Overfired burner	Check input
Broken fan	Replace fan
Valve bypassing	Replace valve
Sensor opens before reaching 2200°F (1200°C)	Replace sensor

The main complaint that a user may have with the Glo-sil and spark ignition systems is that the clothing smells of gas. This table shows the possible causes and solutions to this problem.

Constant Pilot Burner Troubleshooting

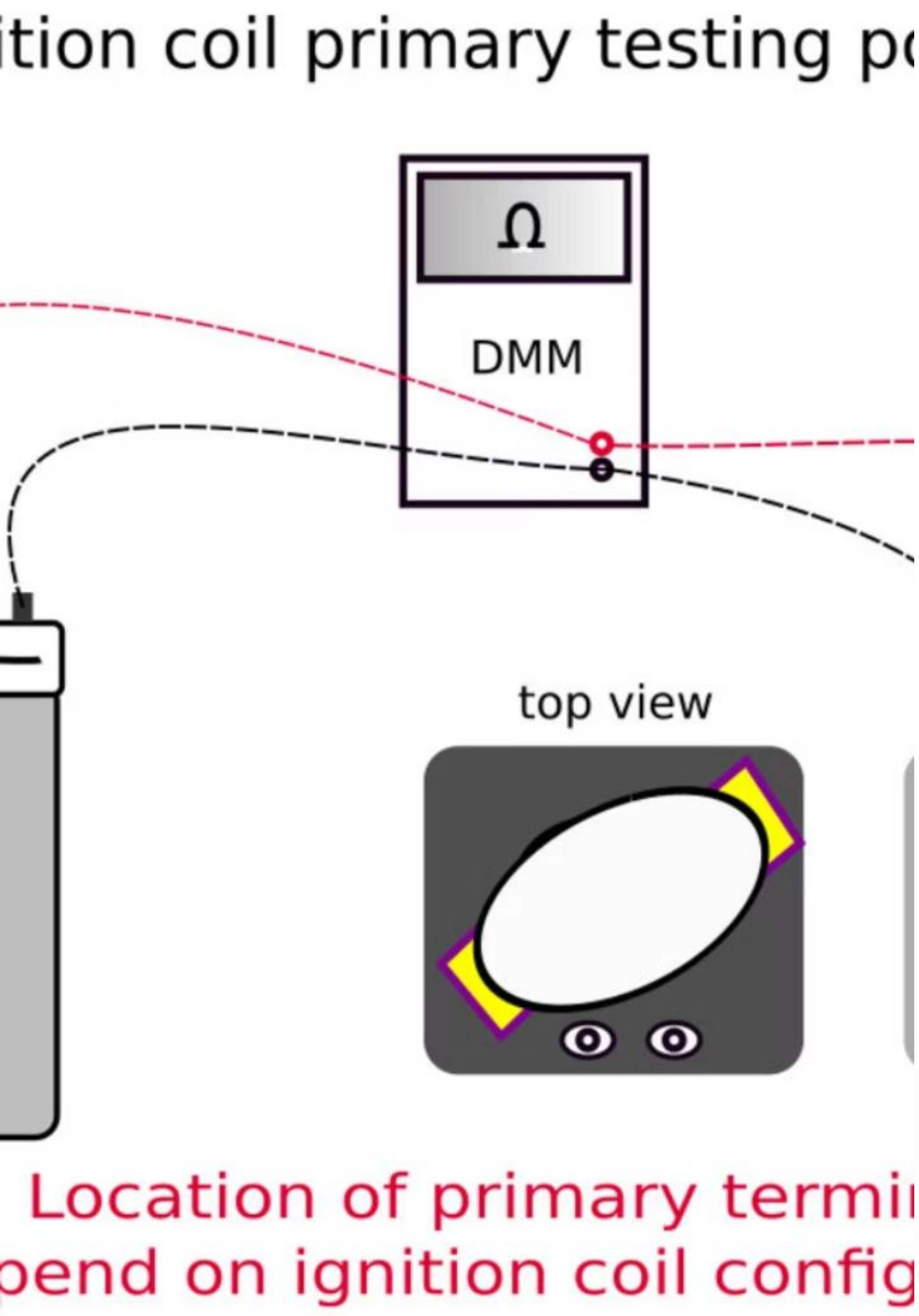
Faults	Possible causes	Corrective action
Pilot extinguishes	Drafts coming in	Check outside vent flapper
	Dirty pilot	Remove and clean
	Mercury switch not holding plunger up	Replace mercury switch
Pilot lights but no heat to dryer	Door not staying closed	Repair door latch
	Blown fuse	Replace and check cause
	Unplugged	Plug in
	Plugged lint trap	Clean lint trap

If the dryer has a constant pilot burner, this table serves as a guide to troubleshooting common dryer problems.

More Constant Pilot Troubleshooting

Faults	Possible causes	Corrective action
Pilot lights but no heat to dryer (continued)	Open limit switch	Check for blocked lint trap and exhaust vent
	Broken belt	Replace belt
	Defective gas valve	Replace valve
	Control set to AIR (FLUFF)	Set to HIGH

These additional troubleshooting steps help address situations where the pilot light is functioning but the dryer isn't producing heat.



Glow Coil Ignition Testing

Component Integration

The transformer, warp switch, and warp switch heater are all combined into one unit. If any one of the three components fails, they must all be replaced as a complete assembly.

Testing Procedure

To check the unit: Apply 120 V to the burner with the gas supply turned off. The glow coil should glow for approximately 3.5 to 4 minutes and then go out as the warp switch opens.

Reset Period

Turn the dryer off, and after 10 to 15 minutes the warp switch heater will cool sufficiently to allow the warp switch to again close.

Glow Coil Troubleshooting

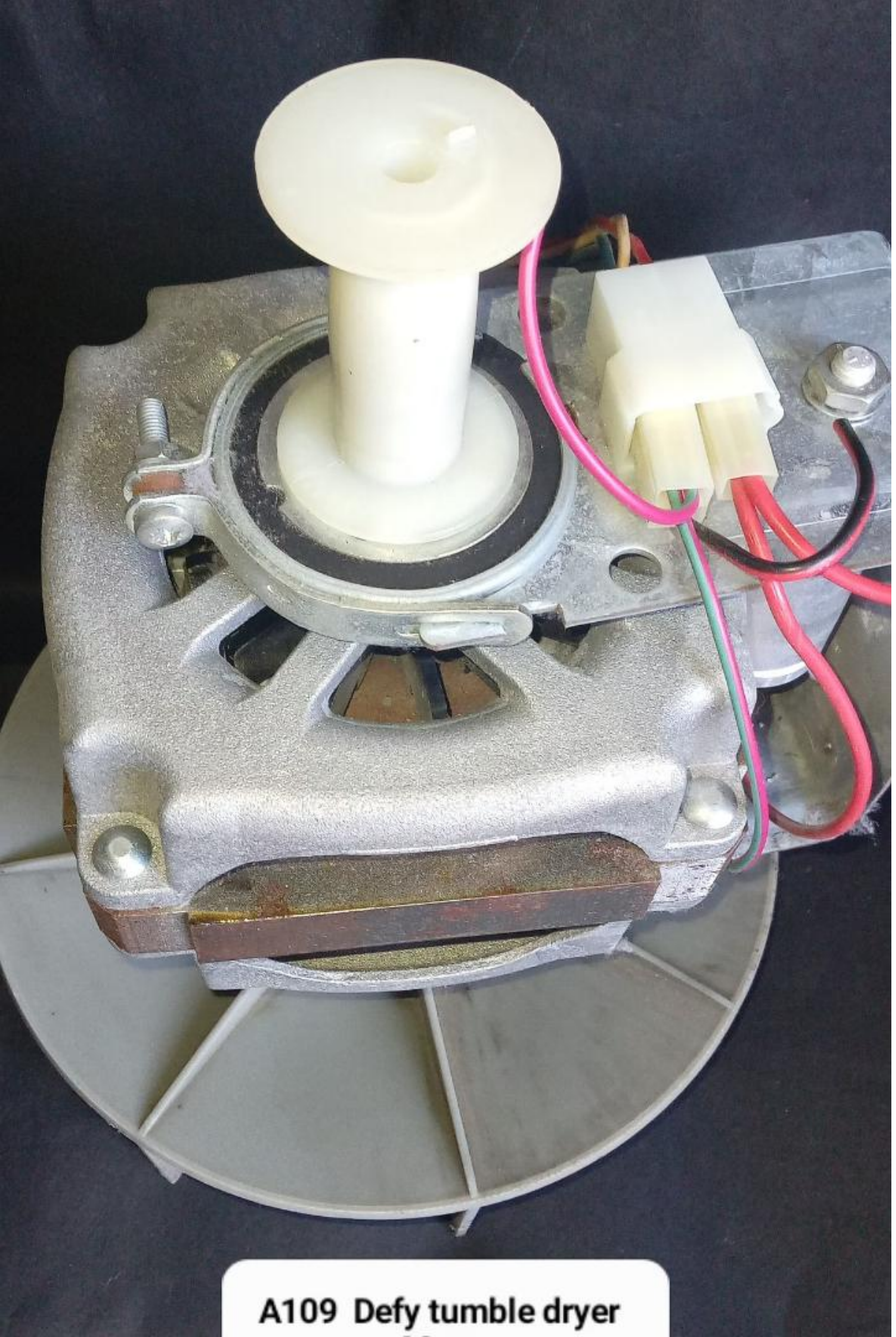
Faults	Possible causes	Corrective action
Warp switch does not open	Defective warp switch heater	Test heater with an ohmmeter and replace warp switch, heater, and transformer unit
Glow coil does not glow	Corroded terminals on transformer	Clean terminals
	Transformer defective	Measure the voltage at the glow coil terminals
	Defective pilot switch	Replace
	Defective glow coil	Replace glow coil

This table details the common faults along with the possible causes and corrective action to take when troubleshooting glow coil systems.

More Glow Coil Troubleshooting

Faults	Possible causes	Corrective action
Glow coil glows but does not ignite gas	Screen plugged with lint restricts primary air	Clean screen
	Glow coil warped out of position	Reposition glow coil
	Defective glow coil	Replace
No pilot flame	Pilot coil is not energized	Test pilot switch
	Defective pilot switch	Replace

These additional troubleshooting steps address situations where the glow coil is functioning but not igniting the gas properly.



Motor Troubleshooting

Operating problem	Cause	Solution
The motor runs but the drum does not turn	Broken or loose belt	Replace or tighten belt
	Loose motor or idler pulley	Position and tighten pulleys
	Frozen drum shaft	Clean the shaft Replace bearings if necessary Lubricate
Motor hums and drum does not turn	Centrifugal switch has defective contacts	Replace switch
	Centrifugal switch activation mechanism stuck	Clean or replace

Motors on dryers have an overload protector, which is similar to a fuse. It protects the motor from burning out if there is a mechanical or electrical overload. When checking a motor, check that the overload protector has not failed. If the protector has failed, the motor will need to be replaced.

More Motor Troubleshooting

Operating problem	Cause	Solution
Motor hums and drum does not turn (continued)	Start winding of motor open	Replace motor
	Motor seized	Replace motor
	Drive components seized	Lubricate or replace
Motor will not stop	Incorrect wiring	Check wiring diagram
	Grounded motor or wiring	Check motor and other components for shorts to ground
	Faulty timer	Check timer

Motor Start Problems

Operating problem	Cause	Solution
Motor does not start	The fuse is out	Replace fuse
	Timer is inoperative	Check timer
	Motor is inoperative	Check motor
	Dryer is not properly connected	Check that the dryer is connected properly, and the voltage is correct
	Poor, or inoperative, door switch connection	Test the door switch circuit connections
	Loading door is not closed properly	Check the door to make sure that the strike is in the correct position

Motor Running Problems

Operating problem	Cause	Solution
Motor runs intermittently (will only re-start after cooled down)	Motor covered with lint	Clean motor
	Motor bearings getting tight	Lubricate or replace motor
	Dryer bearings or other rotating equipment getting tight	Lubricate or replace
Motor runs louder than normal, stops, and detect a burning odour	Centrifugal switch contacts failing to open	Replace motor
	Centrifugal switch activation mechanism stuck	Clean or replace

Dryer and Drum Problems

Operating problem	Cause	Solution
Dryer smokes	Lint has accumulated in the dryer	Remove all lint
	Wire insulation is burning	Check and correct a short circuit. Replace or properly position all wiring
	Overheated motor	Check motor for lint buildup and air circulation around it
Clothes drying too slowly	A blocked lint trap or vent pipe	Clean the lint trap and vent system
	Defective drum seal	Replace drum seal
	Vent pipe too long	Shorten venting system

More Drying Problems

Operating problem	Cause	Solution
Clothes drying too slowly (continued)	Temperature control thermostat set too low	Check the blower temperature at which the thermostat turns off
	Heat selector switch defective	Check program switch
	Drum seal failure	Replace drum seals
	Safety thermostat is tripping	Replace the thermostat if it trips in normal operation
	House voltage is fluctuating or too low	Call the power company
Clothes are not drying on AUTO DRY	Timer advances to OFF too soon	Set timer for more time on AUTO DRY
	Open control thermostat to heat source	Check thermostat

Improper Drying Problems

Operating problem	Cause	Solution
Dryer does not dry properly	The dryer is overloaded	Instruct the user on proper load size
	The blower assembly is plugged	Remove the lint
	The lint trap is blocked	Remove the lint
	Door not sealing tightly	Adjust the cabinet door position or replace the seal
	Safety or control thermostats not working correctly	Check the thermostats
	Bad selector switch	Check selector switch

Heating Problems

Operating problem	Cause	Solution
The drum turns but the heater is not energized	Inoperative timer	Check the timer
	Faulty selector switch	Check the selector switch
	Loose terminal	Check and tighten all connections
	Inoperative thermostat	Check both the cycling and safety thermostats
	Inoperative motor switch	Check the motor
	Broken wire in wiring harness	Check individual wire continuity

Drum Noise Problems

Operating problem	Cause	Solution
Drum operates, but noisily	Drum warped	Replace drum
	Lower drum guide sticking or out of place	Reposition or replace mechanical lower drum glide
	Idler pulley noisy	Replace idler pulleys
	Lubricating does not last	
	Belt squeaking	Use bar soap to lubricate the outer surface of the belt, or replace belt
	Foreign objects are in the drum	Remove all foreign objects from the drum

More Drum Noise Problems

Operating problem	Cause	Solution
Drum operates, but noisily (continued)	Belt is frayed	Replace the belt
	Drum support bearings are worn or need lubrication	Lubricate or replace the bearings
	Motor pulley loose	Position and tighten the pulley set screw
	The front or rear drum seals or bearings are worn out	Replace seals or drum bearings
	Machine not level or levelling legs not all on floor	Level

Burner Operation Problems

Operating problem	Cause	Solution
Main burner does not light	Safety thermostat wiring connections are loose	Check the wiring or replace the thermostat
	Temperature control thermostat is inoperative	Replace the thermostat
	Motor centrifugal switch contacts are bad	Clean contacts
Main burner does not operate properly	The motor wiring connections are loose, or the timer is not working	Check the motor Check the timer
	Bad door switch	Replace the door switch
	Faulty temperature control thermostat	Replace the thermostat

CSA Unit 15

Chapter 3
Barbecues

Gas-fired barbecues, whether set up for natural gas or propane, are one of the simplest gas appliances that the technician/fitter will encounter. However, there are service and installation procedures that need to be followed to prolong the life of the unit and ensure satisfactory operation.

Barbecue Installation and Operation Objectives

Installation Requirements

Describe the installation requirements for barbecues

Components

Describe the components of barbecues

Operation

Describe the operation of barbecues

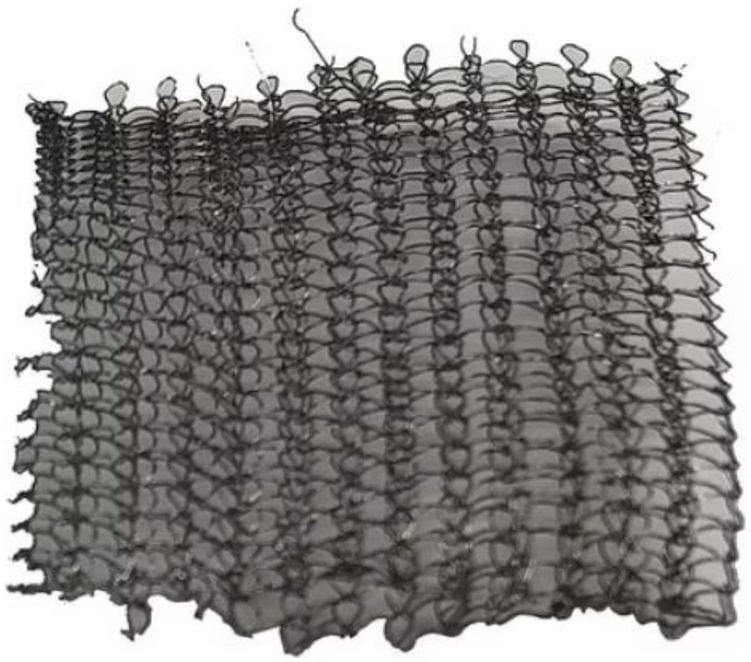
Servicing

Describe the servicing of barbecues

Barbecue Terminology

Term	Abbreviation	Definition (Symbol)
Spider guard		Prevents spiders and other insects from nesting in burner tubes

Understanding the terminology associated with barbecues is essential for proper installation, maintenance, and troubleshooting. The spider guard is a critical component that prevents insects from creating blockages in the burner tubes.



Gas Dryer Installation Knowledge Check

Maximum Length of Metal Connector

What is the maximum length of a flexible metal gas connector used to connect a gas dryer?

- a) A maximum 0.6 m long flexible metal gas connector
- b) A maximum 1.0 m long flexible metal gas connector
- c) A maximum 2.0 m long flexible metal gas connector
- d) A maximum 3.0 m long flexible metal gas connector

Moisture Exhaust Duct Joints

What should be used to connect dryer moisture exhaust duct joints?

- a) Foil duct tape
- b) Electrical tape
- c) Cloth mesh duct tape
- d) Three evenly spaced sheet metal screws

More Gas Dryer Installation Questions

1 Common Venting

The moisture exhaust duct can be connected to another gas appliance vent connector to create a common vent.

a) True

b) False

2 Exhaust Hood Height

How far above ground level should the exhaust hood terminate?

a) 8 inches (200 mm)

b) 12 inches (300 mm)

c) 20 inches (500 mm)

d) 40 inches (1000 mm)

3 Exhaust System Length

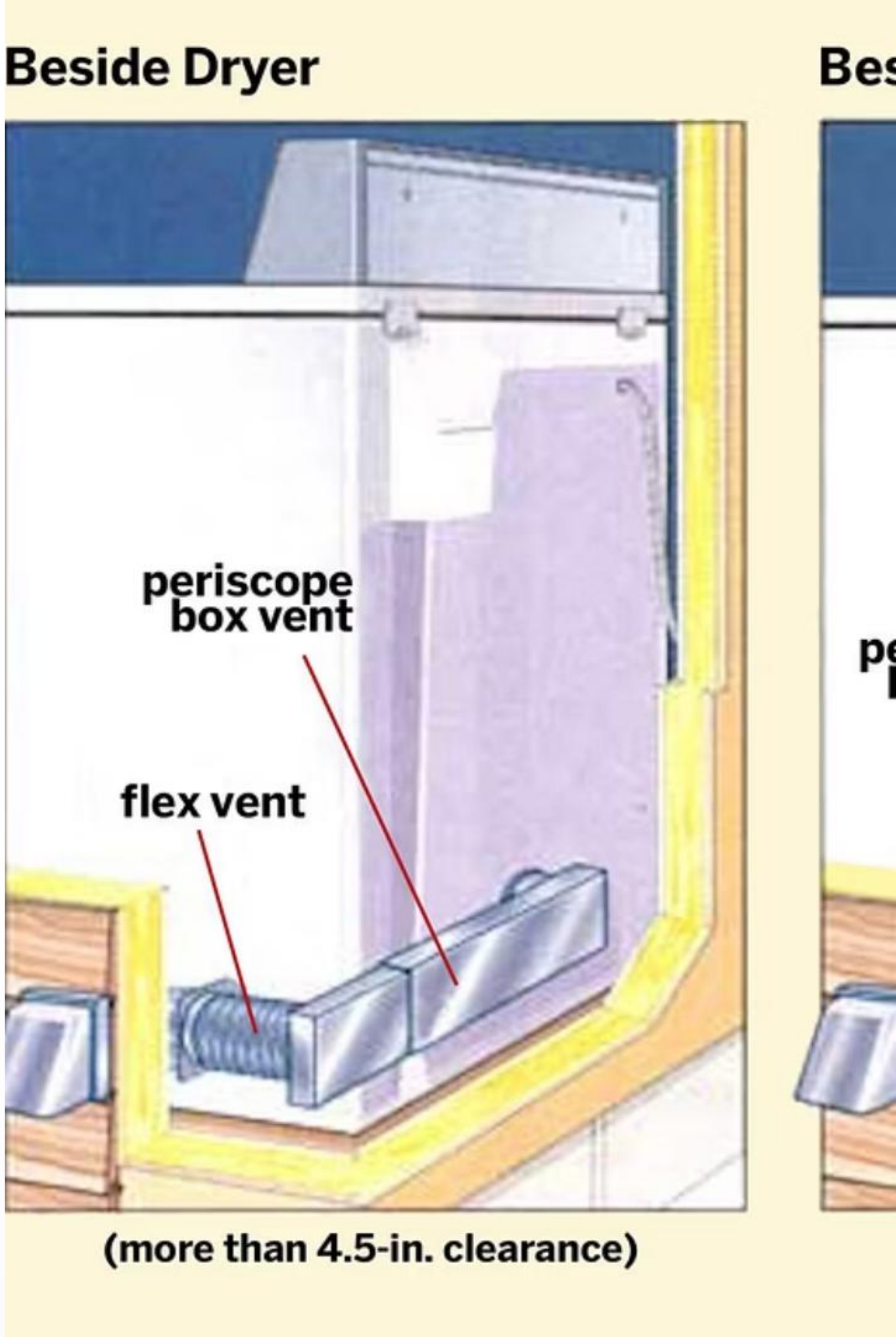
What determines the maximum length of the exhaust system?

a) Type of exhaust hood

b) Type of vent material

c) Number of elbows

d) All of the choices



Gas Dryer Troubleshooting Questions

Door Switch Issue

What will cause a gas dryer to keep running after its door is opened?

- a) Faulty door switch
- b) Faulty booster coil
- c) Faulty holding coil
- d) Defective centrifugal switch

Drum Seal Problem

What problem would a defective drum seal cause?

- a) Dryer smokes
- b) Clothes drying too slowly
- c) Drum operates, but noisily
- d) Main burner does not light

Barbecue Installation Requirements

Consult Codes

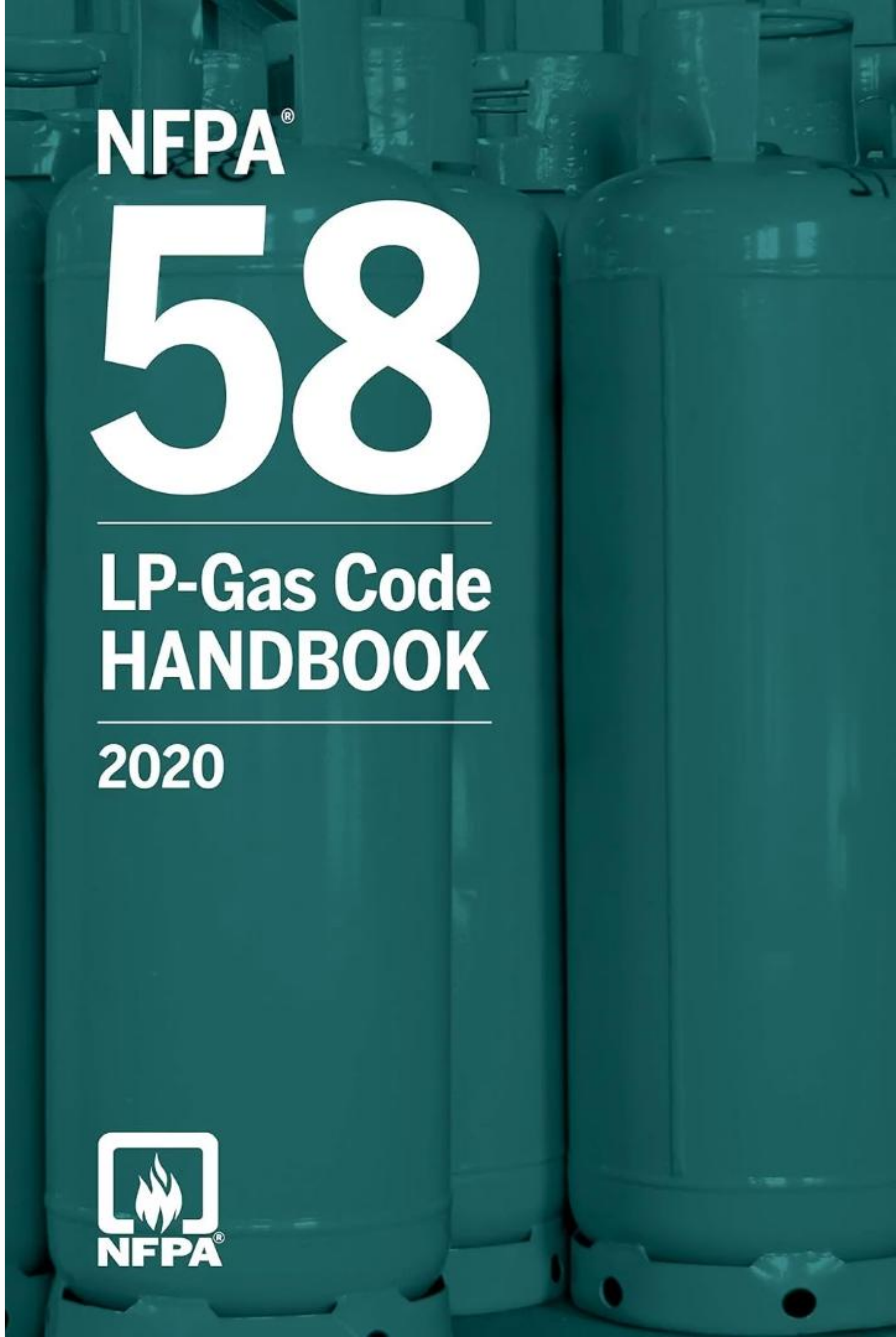
Where relevant, consult CSA B149.1 and CSA B149.2 for requirements on piping and tubing.

Follow Piping Requirements

The CSA B149 series of Codes sets requirements for the use of piping and hoses, as well as for the marking of different types of piping.

Check Local Regulations

Before installing any piping or tubing, consult the Code and contact the local municipality to get any additional regulations.



Barbecue Conversion

Check Rating Plate

All gas appliances including barbecues have an attached rating plate that indicates the type of gas that must be used with the appliance. First, check the rating plate to see what type of gas the barbecue is set up for.

Determine Need for Conversion

If the appliance is set up for a different type of gas than the one being supplied, the appliance must be converted.

Follow Manufacturer Guidelines

The Code states that the manufacturer's guidelines must be followed when converting an appliance. If there are no guidelines, the appliance must be approved after conversion.

Update Rating Plate

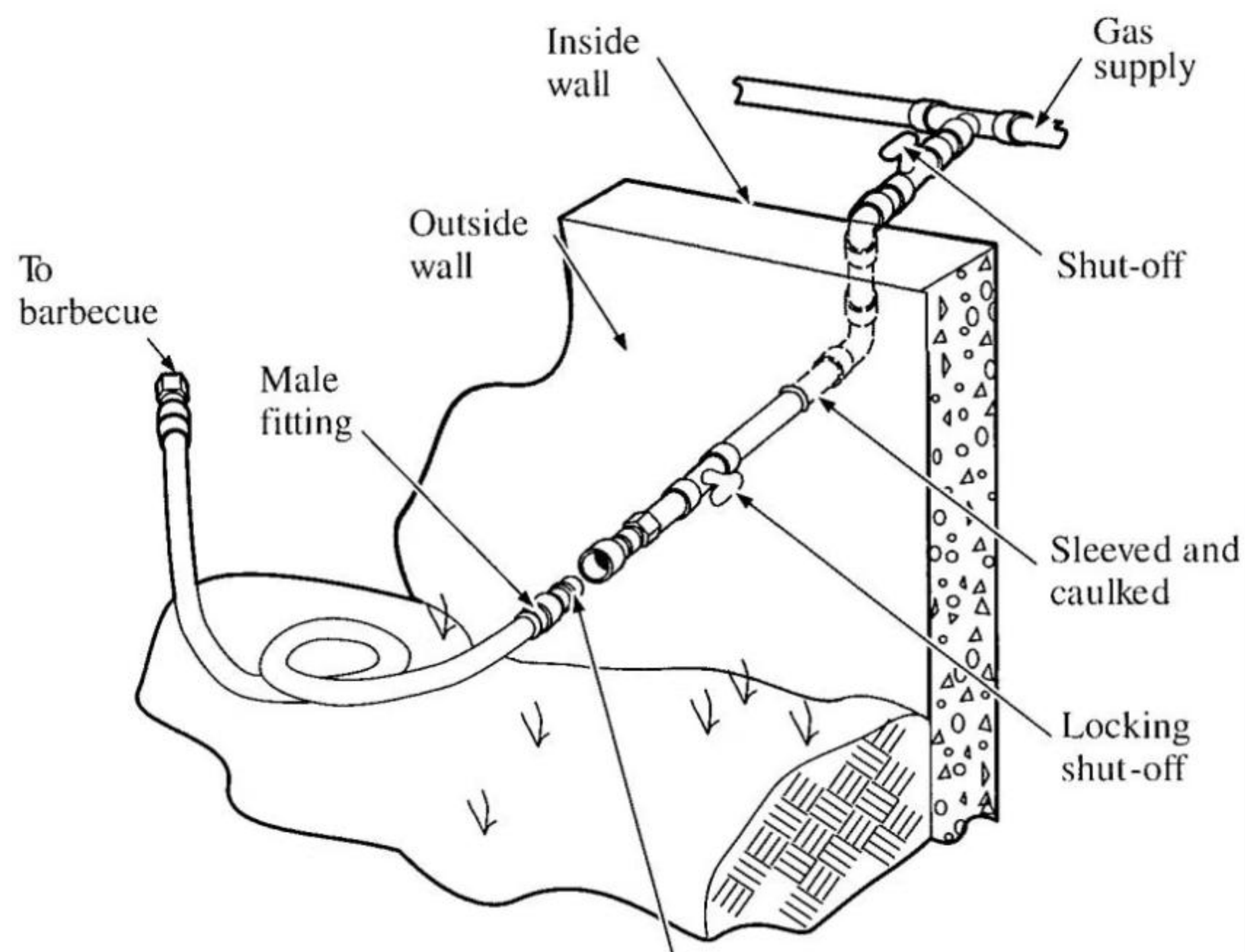
If a barbecue is converted from one gas to another, the rating plate must be changed to indicate what type of gas the barbecue has been converted to.

Common Barbecue Conversions

Propane to Natural Gas

The most common type of conversion is to convert a propane barbecue for a natural gas supply. This typically requires changing the orifices and adjusting the air shutters to accommodate the different gas properties.

Figure 3-1
Typical natural gas supply installation
Courtesy of Weber-Stephen Products Company



Natural Gas to Propane

The same criteria and conditions apply when converting a natural gas barbecue for propane supply. For more information on appliance conversion, see Unit 9 Introduction to gas appliances, Chapter 6. Requirements for converting an appliance between propane and natural gas.

If you have no previous conversion experience, it is a good idea to get an experienced person to assist you.

Underground Copper Tubing Installation

Use Proper Connections

A common practice when installing natural gas barbecues is to run copper tubing underground. If this is done, the tubing must be connected by brazing or approved mechanical compression fittings.

Test Connections

All connections must be tested for leaks before covering the tubing.

Rise Above Grade

Before the piping enters a building, it must rise above grade.

Follow Code Requirements

All installations must comply with local codes and regulations for underground gas piping.

Barbecue Hose Connection Requirements

Location Restrictions

The hose may not go from one room into another, and it may not pass through walls, partitions, ceiling, or floors.

Prohibited Connections

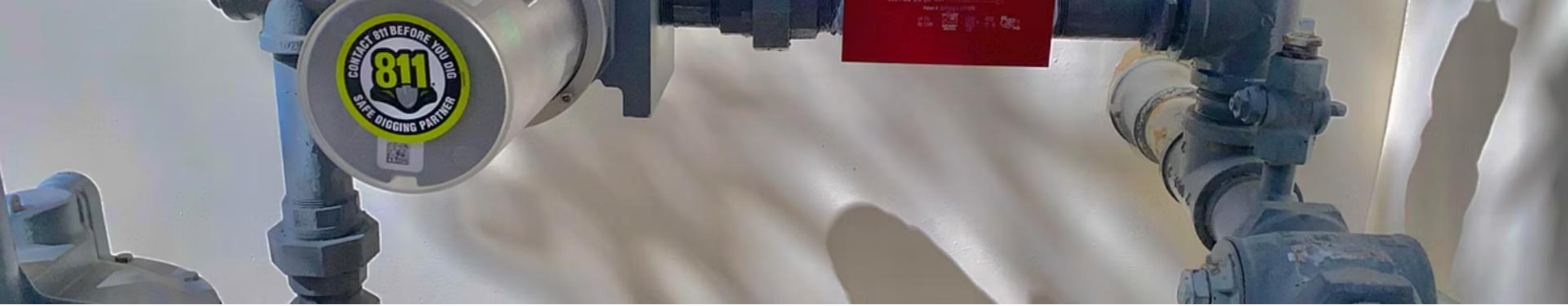
Slip-on-ends are not permitted.

Maintenance Requirements

The hose must be replaced the moment any damage or wear is noticed.

Length Limitation

The maximum length of the hose is 10 ft (3 m).



Shut-Off Valve Requirements

Valve Location

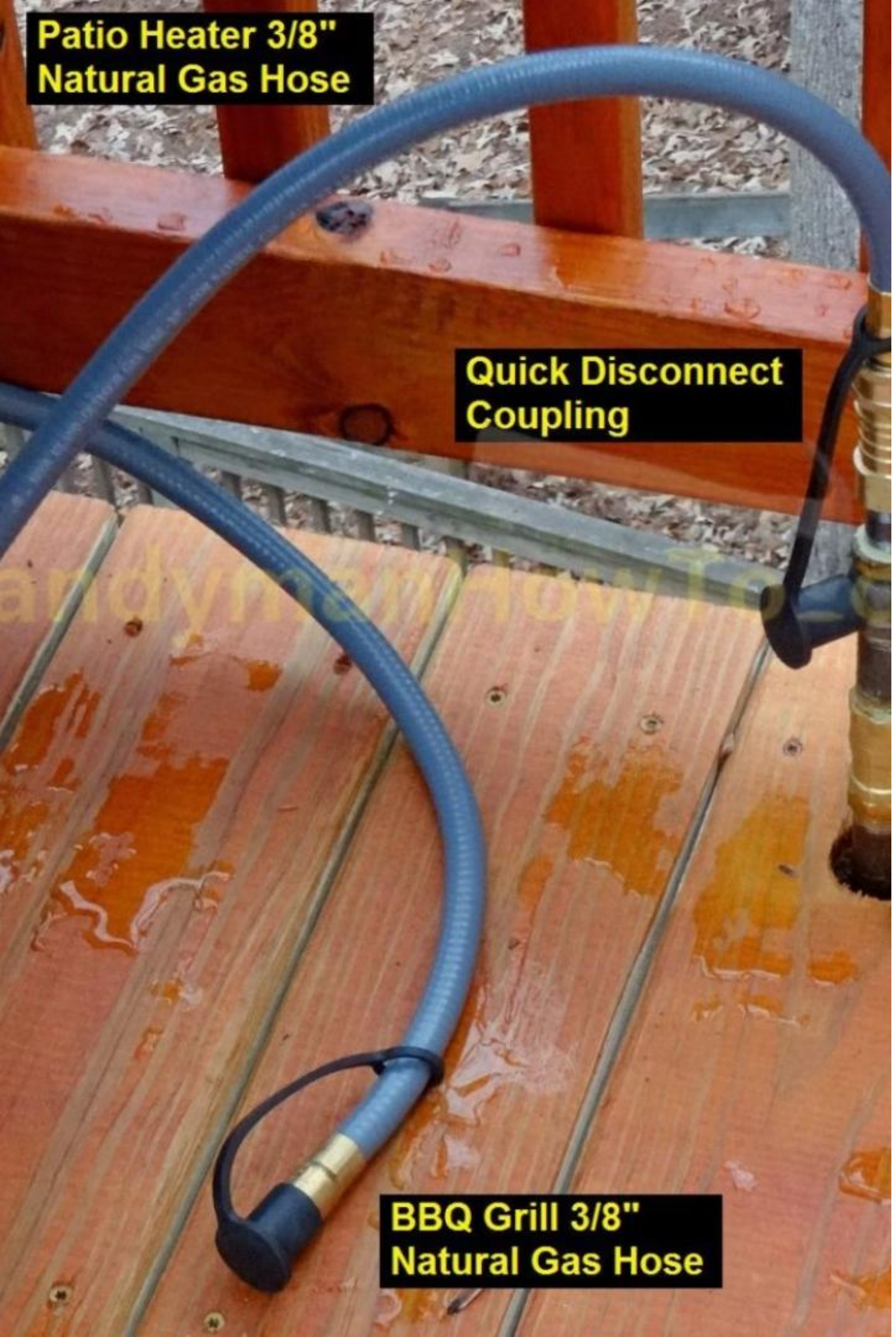
The shut-off valve for the barbecue must be in the gas supply piping or tubing and be installed immediately upstream of the hose.

Handle Placement

The handle of a shut-off valve on an independent connection must not be closer than 6 inches (150 mm) from the handle of any other shut-off valve.

Safety Positioning

The shut-off valve must not be placed at floor level or any other location where it may be turned on by accident.



Hose Placement Requirements

Visibility

The hose must be visible (it must not be routed under a deck)

Temperature Protection

Prevented from contacting a hot surface, and it must not be subjected to temperatures in excess of 125°F (50 °C)

Grease Protection

Protected from dripping grease and other causes of damage

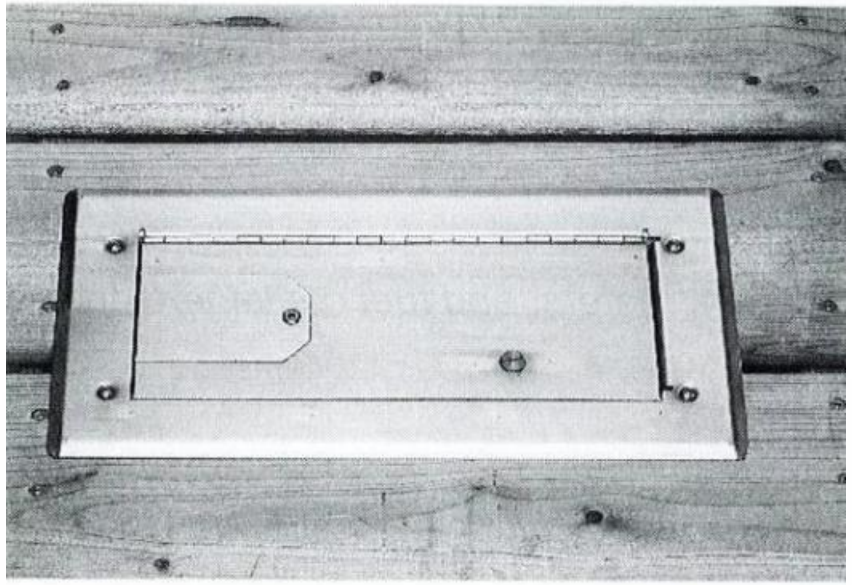
Traffic Protection

Protected from passing traffic and placed so that the passage of traffic over the hose is at a minimum

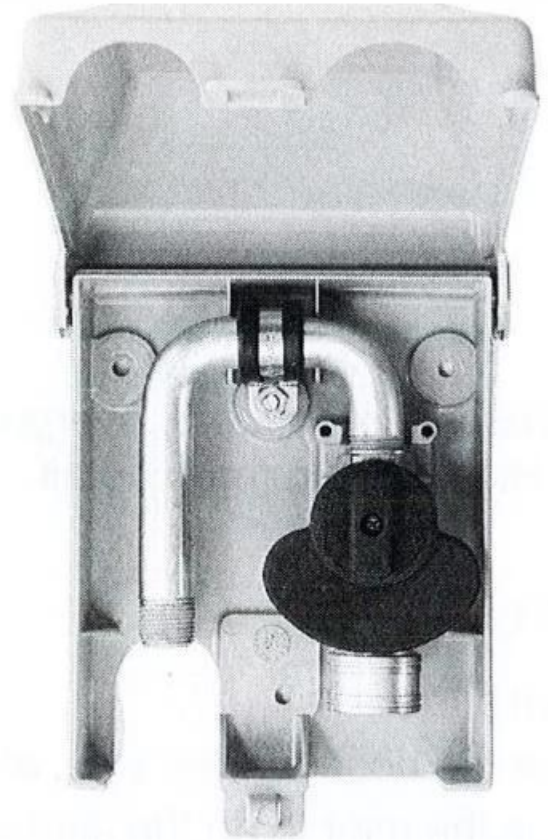
Quick Disconnect Fittings

Shut-Off Valve Requirement

Most gas barbecue systems use quick disconnect fittings. If this is the case, a readily accessible manual shut-off valve must be installed upstream of the quick disconnect device. A quick disconnect device cannot be substituted for a manual shut-off valve.



Exterior concealed barbecue quick connect kit (left)

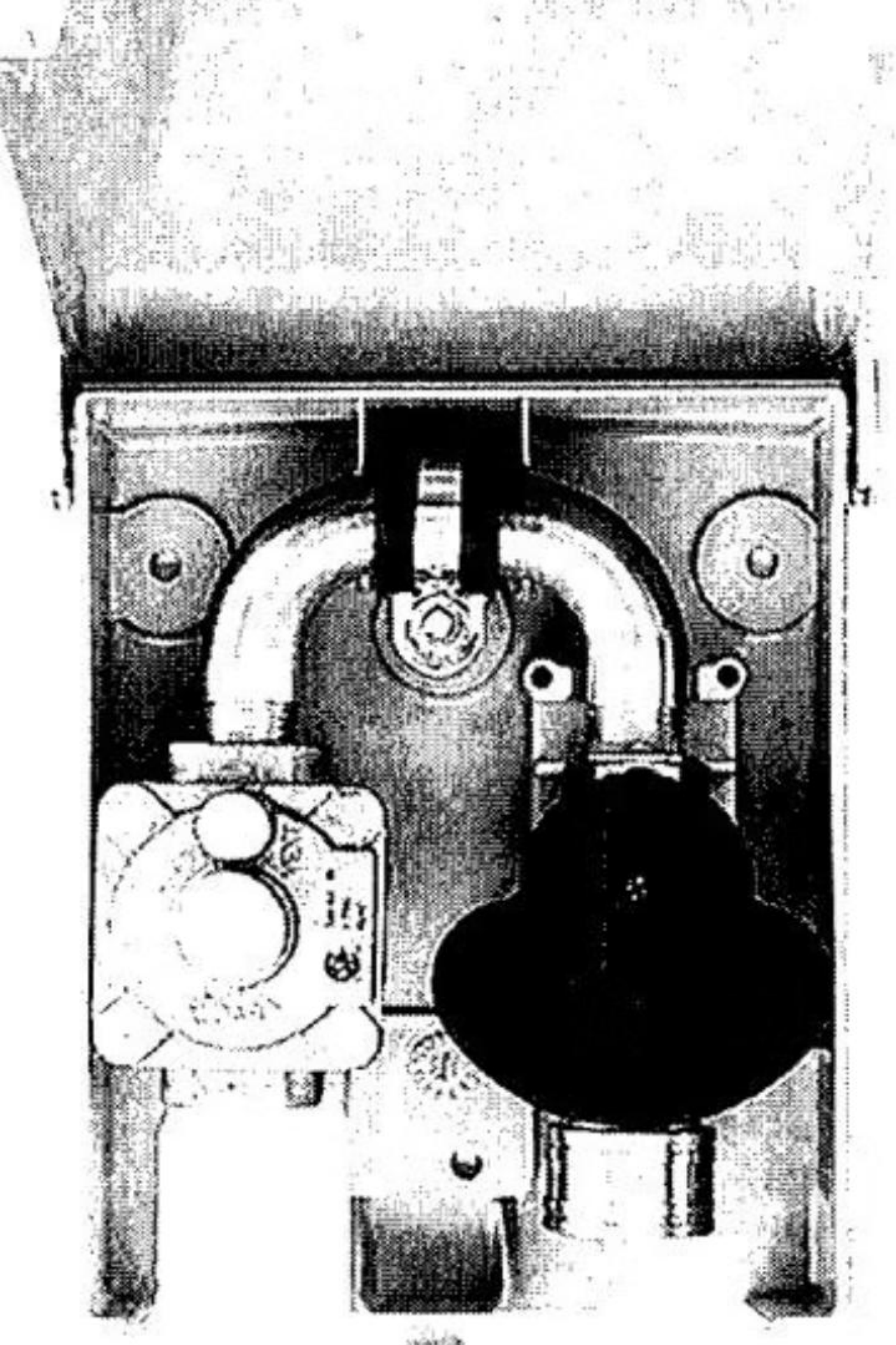


PVC surface mounted kit with shut-off valve designed so that it must be closed before the hose can be disconnected (right)

Quick Disconnect Safety Procedures

When	Then
Disconnecting a barbecue with a quick disconnect	Make sure that the shut-off valve is closed.
Connecting the quick disconnect hookup	Check that the fitting end on the quick disconnect is clean and free of debris.

Following proper safety procedures when connecting and disconnecting quick disconnect fittings is essential to prevent gas leaks and ensure safe operation of the barbecue.



Pressure Regulators for Barbecues

Reduce Pressure

Pressure regulators are used to reduce the incoming gas pressure

Maintain Consistency

Keep the pressure supplied to the barbecue at a constant level

2-PSI Systems

If a house has a 2-pound per square inch (psi) gas system, the barbecue supply will require an approved line pressure regulator

Testing Barbecue Connections

Inspect the Hose

Check the hose for any cuts, abrasions, and nicks.

Advise the User

Advise the user to do the same every time the barbecue is used.

Replace if Damaged

If the hose is damaged, replace it immediately.

Test for Leaks

All gas connections must be tested for leaks. A leak detector or soap test can be used to do this.

Leak Testing Procedure

Burners Off

When testing for leaks, make sure all burners are in the off position

Gas Supply On

Ensure the gas supply is on

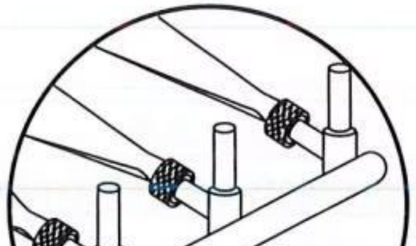
After Testing

- Turn the gas supply off
- Rinse all the connections

Check Key Positions

- Hose to manifold connection
- Valves to manifold connection
- Hose to quick disconnect connection
- Other connection points

Figure 3-4
Gas leak checks
Courtesy of Weber-Stephen Products Company



Barbecue Gas Supply Types

Natural Gas Supply

If a barbecue is attached to a natural gas supply, the gas is piped to the barbecue from a main supply line outside the building.

Propane Supply

If a barbecue uses propane, the gas is supplied from a main supply line to outside or a cylinder.

The component parts of a propane cylinder are covered in Unit 11 Pressure regulators, overpressure protection, meters, and fuel containers.

Barbecue Burner Types

Standard Burners

Some barbecues have only one burner while others have two burners placed side by side. Some barbecues also come with side burners.

Infrared Burners

Many barbecues today incorporate infrared burner technology used as rotisserie burners and, even in some cases, as the main burner. The infrared burner works by focusing the flame of a standard gas burner onto a ceramic tile that has thousands of microscopic holes in it.

Infrared Burner Benefits

Less Fuel Use

An infrared grill uses less fuel because it cooks faster and does not require the same amount of fuel as a gas barbecue to reach cooking temperatures.

Faster Cooking Time

Once lit, an infrared burner will heat to over 1000°F (540 °C) in approximately three minutes.

Better Taste

The high, direct heat sears meat quickly, locking in juices for better flavor.

Simpler Cleaning

The high heat helps vaporize drippings, reducing flare-ups and making cleanup easier.

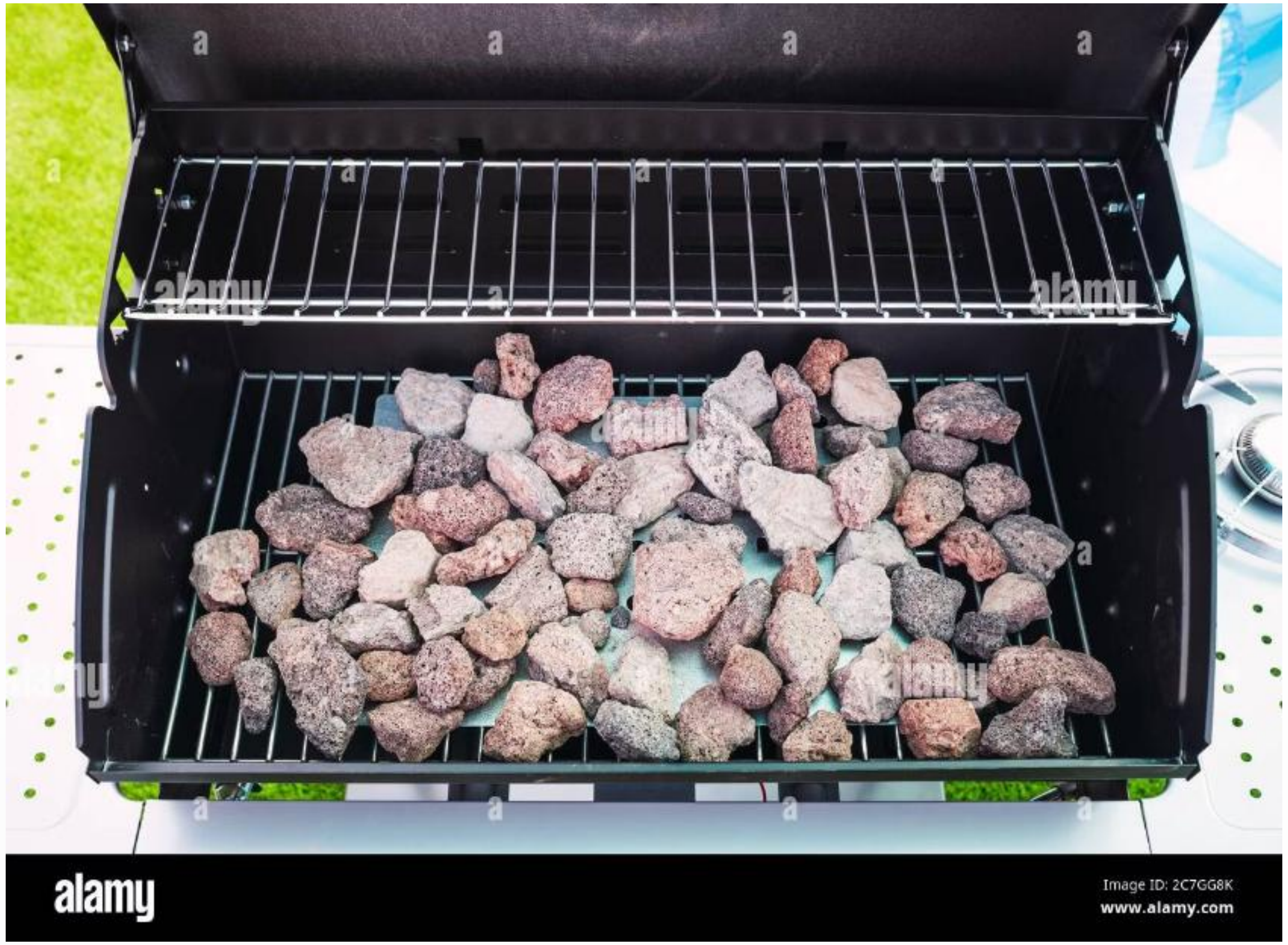
Briquettes and Lava Rock

Heat Distribution

Many barbecues use ceramic briquettes or lava rocks. The gas flame heats the surface of the briquettes or lava rocks that, in turn, radiate heat to cook the food.

Proper Amount

Take care not to have too many lava rocks or briquettes since the heat being trapped between the burner and the rocks may cause premature burner burn-out and increase cooking times.



Barbecue Ignition Systems

Crossover or Piezo Ignition

The barbecue illustrated in Figure 3-5 uses a crossover or piezo ignition system. When the piezo button is pushed, it energizes the igniter electrode inside the gas catcher ignition chamber. This creates a spark that ignites the gas.

Manual Ignition

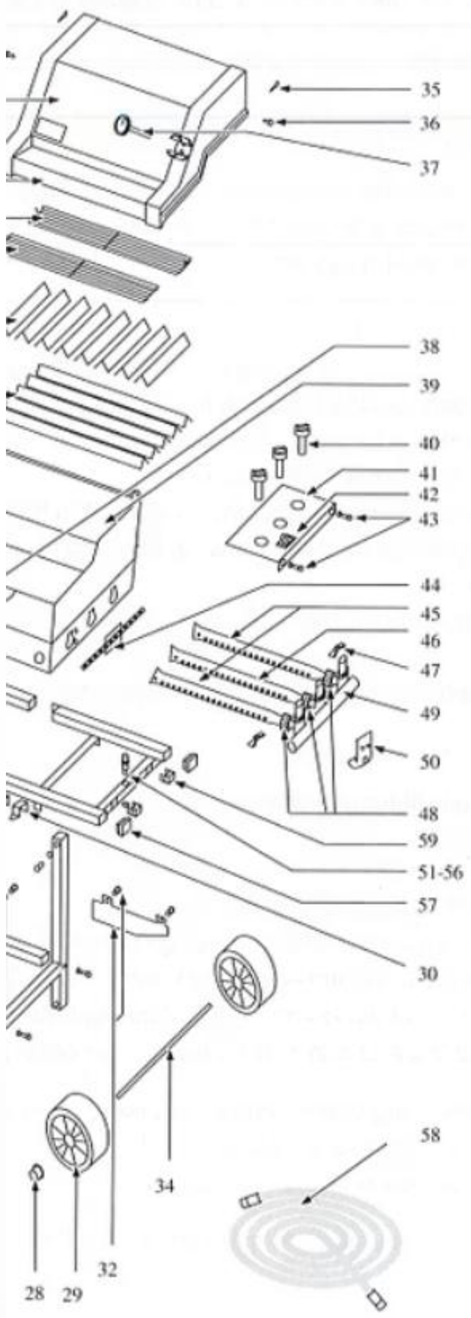
Barbecues can also be manually lit through a match-light hole in the front of the cooking box.

Caution! Always have the barbecue lid open before attempting ignition.

Barbecue Components Overview

The expanded view of a Weber® barbecue shows the various components that are common to most barbecues. Understanding these components is essential for proper installation, maintenance, and troubleshooting.

e 3-7
typical barbecue
tephen Products LLC



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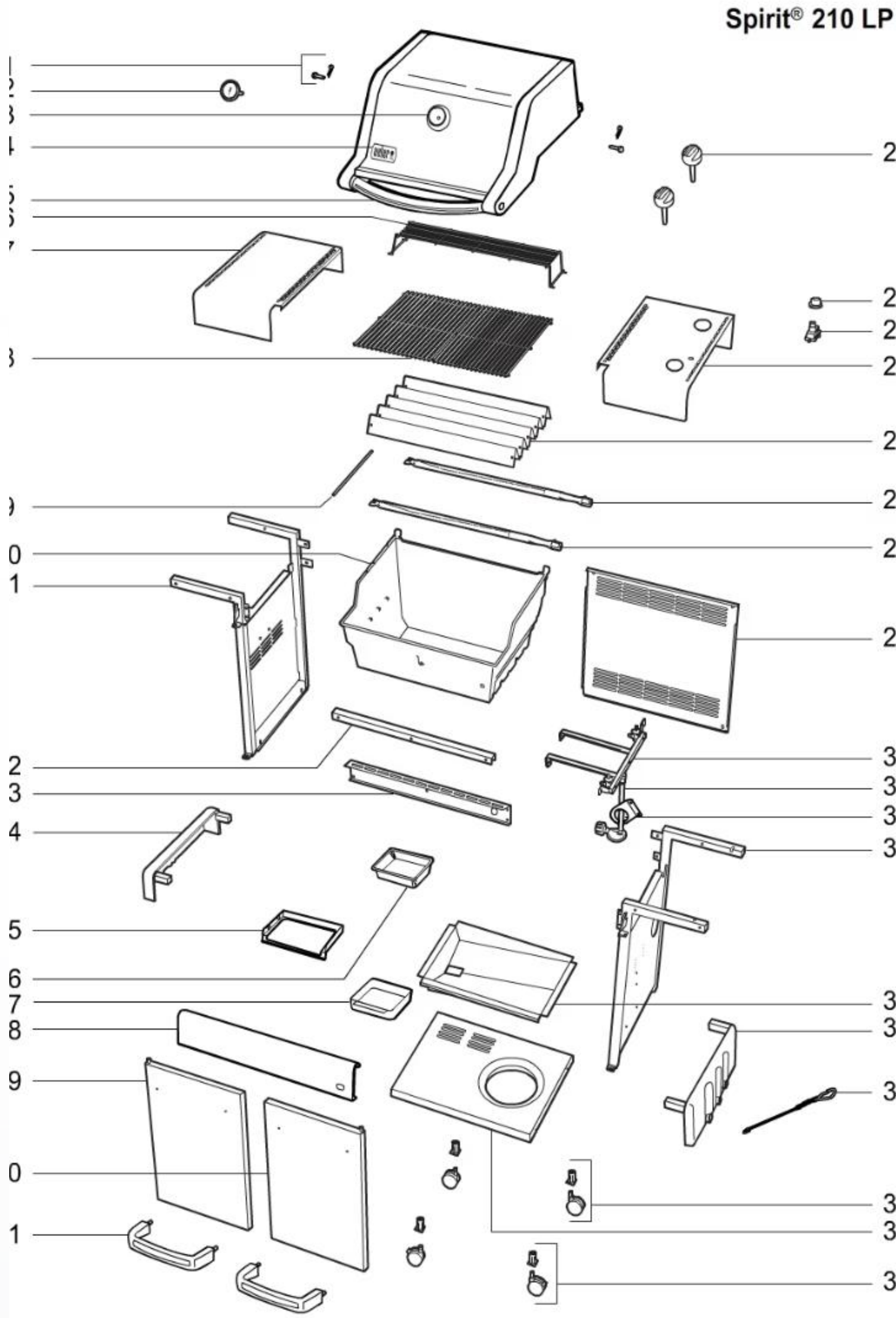
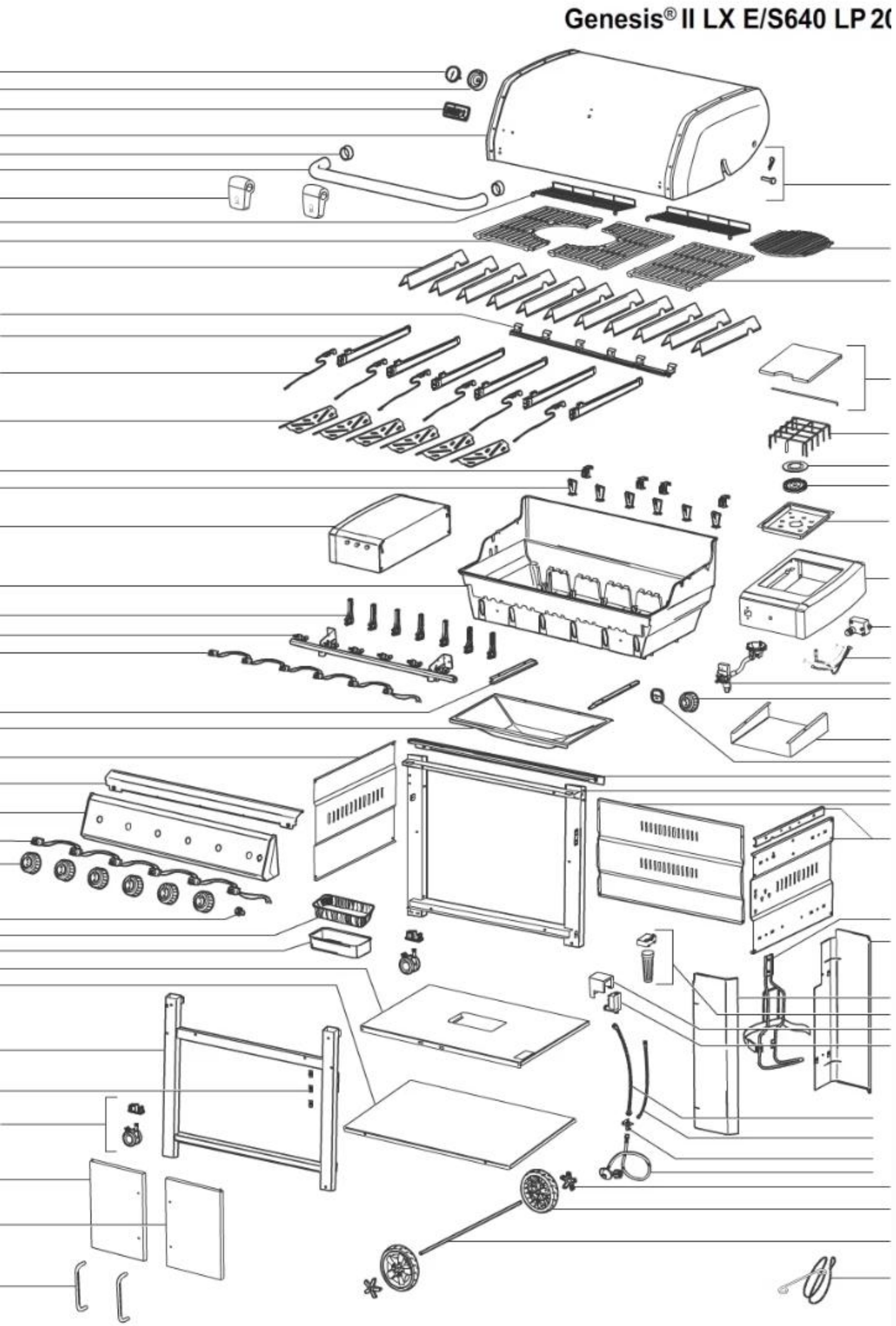
Key Barbecue Components

The main components of a barbecue include the lid, cooking grates, flavorizer bars, burner tubes, control panel, and igniter button. Each component plays a crucial role in the operation and performance of the barbecue.

Barbecue Component List (Part 1)

Label	Part	Label	Part	Label	Part
1	Lid	21	Casters	41	Control panel
2	Lid handle	22	Bottom tray	42	Igniter button
3	Warm-up basket	23	Catch pan holder	43	Screws
4	Warming rack	24	Catch pan	44	Crossover tube
5	Short flavorizer bars	25	Drip pans	45	Front and back burners





Barbecue Component List (Part 2)

Label	Part	Label	Part	Label	Part
6	Long flavorizer bars	26	Accessory trays	46	Centre burner
7	Cooking grates	27	Frame connector s	47	Nuts
8	Work table	28	Wheel hubcaps	48	Spider stopper guards
9	Tubing plugs	29	Wheels	49	Manifold assembly
10	Bolts	30	Tool holders	50	Manifold bracket

Barbecue Component List (Part 3)

Label	Part	Label	Part	Label	Part
11	Spacer bracket	31	Wheel frame	51	Igniter
12	Swing table end bracket	32	Front panel	52	Igniter lock nut
13	Left frame	33	Plastic buttons	53	Igniter gasket
14	Bolts	34	Axle	54	Gas catcher ignition chamber
15	Washers	35	Hair pin cotters	55	Igniter wire

Barbecue Component List (Part 4)

Label	Part	Label	Part	Label	Part
16	Caster frame	36	Hinge pins	56	Igniter wire
17	Swing table assembly	37	Thermometer	57	Right frame
18	Left-hand slide bar assembly	38	Nut	58	Hose
19	Screws	39	Cooking box	59	Control panel inserts
20	Nuts	40	Burner control knobs		

Barbecue Operation Safety

Seasonal Inspection

Each season, before the barbecue is used, a visual inspection must be made to ensure that all piping and tubing are sound and that there are no visible faults. Failure to do this could result in injury or death.

Ignition Systems

There are two common ignition systems used in barbecues:

- Piezo, which is an electronic ignition system
- Manual ignition system

Piezo Ignition Procedure

Ensure Burners Are Off

To light a barbecue using the piezo igniter system, ensure first that all the burner control knobs are off.

Open Lid

Always open the lid before lighting the barbecue.

Turn On Gas Supply

Turn the gas supply valve on.

Turn First Burner Control

Turn the burner control that is closest to the igniter to START or HIGH.

Push Piezo Button

Push the piezo button several times so that it clicks each time. Each click creates a spark.

Check Ignition

Check through the match-light hole in the front of the cooking box to see if the front burner is lit.

Light Other Burners

If the burner is lit, turn on the other burners. They will light from the flame of the first burner.

Manual Ignition Procedure

Open Lid

Open the lid before lighting.

2

Turn On Gas

Turn the gas supply valve on.

Light Match

Light a match and put it through the match-light hole in the front of the cooking box.

Turn Burner Control

Turn the front burner control knob to START or HIGH.

Check Ignition

Check that the burner is lit by looking through the match-light hole.

Light Other Burners

Once the first burner is lit, turn on the other burners.

Extinguishing a Barbecue

Standard Shutdown Procedure

Barbecues using either of these ignition systems are extinguished in the same way:

1. First, turn the gas supply valve off.
2. Then turn each burner control knob off.

If faced with an unfamiliar situation, check the manufacturer's instructions.

Safety Precautions

Adhere to the following safety precautions:

- Always open the lid before lighting the barbecue.
- If the burner does not ignite, wait a few minutes for the gas to clear before trying to ignite the burner again.
- Gas may collect in an area and explode when an attempt is made to ignite the barbecue.
- Never lean over the barbecue or look through the match-light hole when lighting the barbecue.

The Combustion Process in Barbecues

Gas Flow

When the burner control valve is open, gas flows into the burner tube through a venturi.

Pressure Reduction

The movement of the gas through the venturi reduces pressure in the burner tube.

Primary Air Intake

As a result, primary air is sucked into the tube through air shutters.

Ignition

The primary air mixes with the gas in the burner tube and is ignited at the burner head.

Secondary Air

When the air-gas mixture ignites, it draws in secondary air from around the burner to complete the combustion process.

Barbecue Flame Characteristics

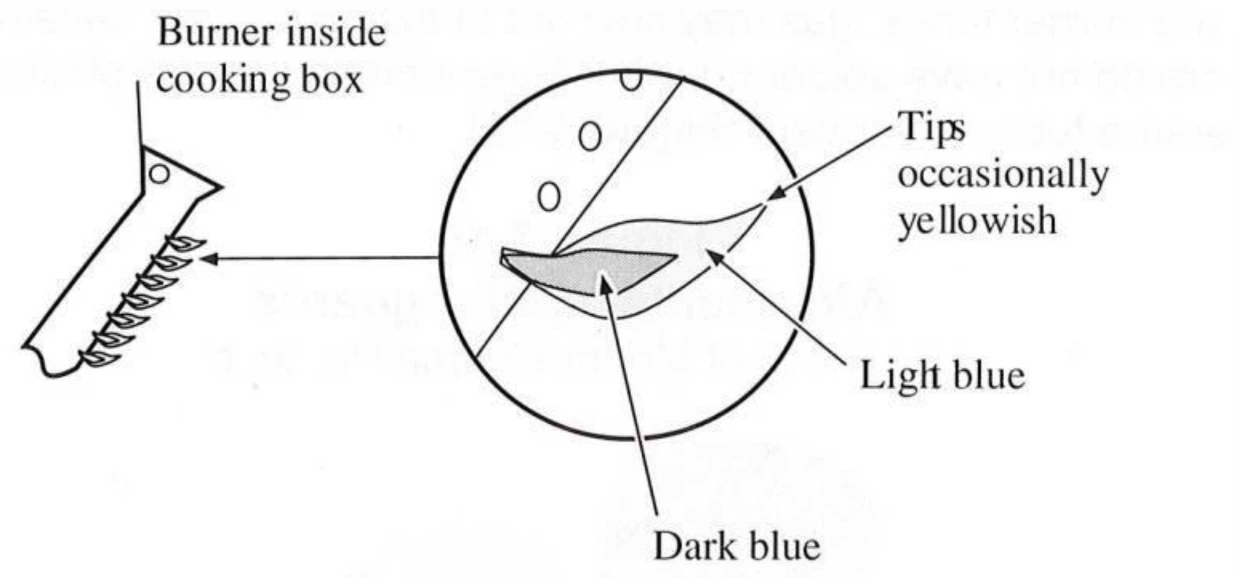
Proper Flame Appearance

A good burner flame for a barbecue should have specific characteristics that indicate proper combustion and efficient operation.

Figure 3-8
Flame characteristics
Courtesy of Weber-Stephen Products LLC

Flame Color and Shape

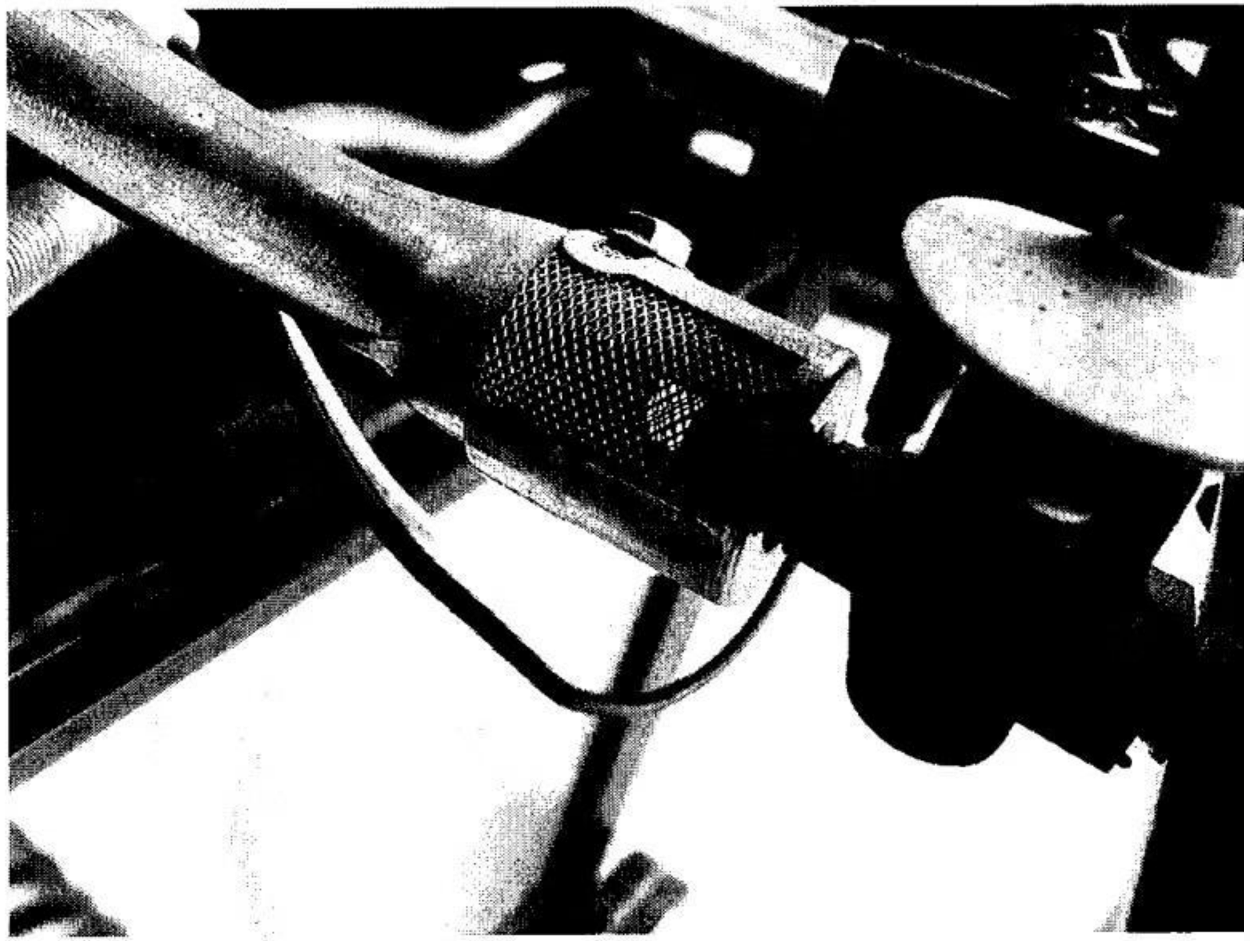
The flame should be predominantly blue with slight yellow tips. It should be steady and uniform across the burner. A yellow or orange flame indicates incomplete combustion, which may be caused by a blocked venturi or improper air-to-gas ratio.



Adjusting Primary Air in Barbecue Burners

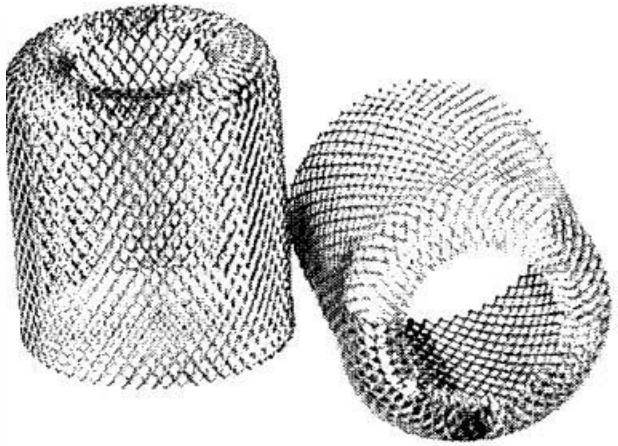
Air Shutter Adjustment

Each burner on the barbecue has an air shutter that can be adjusted to allow more or less primary air into the burner tube. For some model of burners, the spider guard will need to be removed before they can be adjusted, while other types will have shutters that will move with the screen in place.



Spider Guards

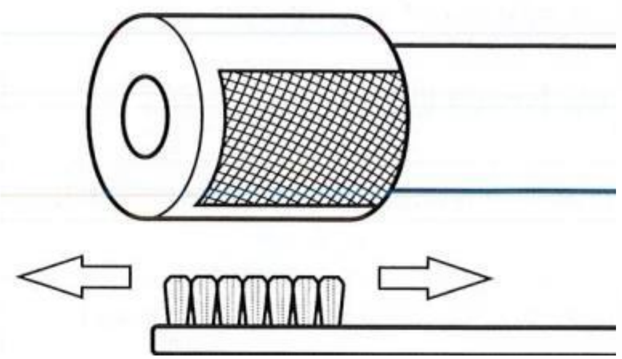
Spider guards prevent spiders and other insects from nesting in burner tubes. Without the guard and with nests in the burner tubes, gas may flow out of the air shutter, causing a fire around the shutter. The burners do not have spider guards after-market types are available that can be added over the venture tube air shutters.



Spider Guard Maintenance

Signs of Blockage

A sign that the spider guard needs cleaning is a cooking flame that appears to be yellow and lazy. This indicates that the air-gas mixture is not optimal, which can affect cooking performance and efficiency.



Cleaning Procedure

Regular cleaning of the spider guard is essential to maintain proper burner function. This typically involves removing the burner, cleaning the venturi tube with a pipe cleaner or venturi brush, and ensuring that all openings are clear of debris and insect nests.

After cleaning, reassemble the burner and check for proper flame characteristics to ensure optimal performance.

Barbecue Troubleshooting: Gas Smell

Problem	Cause	Solution
Smell of gas	Possible leak	Shut off gas immediately
		Check for leaks
		Repair leak
Leak detected at any connection	Quick disconnect coupling not seated fully	Remove coupling
		Check that the coupling is clean
		Reconnect coupling

Barbecue Troubleshooting: Connection Issues

Problem	Cause	Solution
Leak detected at any connection	Gas leak in connection	Tighten connection
		Perform leak test
	Gas leak in hose or control valves	Replace hose or control valves
Flame flashback beneath the control panel	The venturi tube is blocked	Remove the burner and clean the venturi tube
		Use a pipe cleaner or venturi brush to clean the venturi
Spark ignition failure	Poor ground connections	Check and fix ground connections

Barbecue Troubleshooting: Ignition Problems

Gas shut-off valve closed

Solution: Open gas shut-off valve

Fuel hose bent or kinked

Solution: Straighten fuel hose

Igniter wire(s) not connected

Solution: Connect the burner electrode wires

Igniter electrode misaligned on burner

Solution: Realign electrode

Igniter malfunction

Solution: Manually light the burner

Barbecue Troubleshooting: Burner Issues

Venturi blocked

Solution: Remove the burner and clean the venturi

Venturi not aligned with valve orifice

Solution: Realign venturi to orifice

Orifice blocked

Solution: Remove burner, clean orifice with a pin or fine wire

Premature burner burn-out

Cause: Too many lava rocks

Solution: Reduce the number of lava rocks

Barbecue Troubleshooting: Cooking Performance

Problem	Cause	Solution
Hot spots on cooking surface	Briquettes not evenly distributed	Spread briquettes evenly on grate
	Venturi blocked	Remove the burner and clean the venturi
Flare-ups or grease fires	Excessive grease buildup on briquettes	Clean briquettes as follows:
		· Remove the cooking grids
		Turn the briquettes over
		Light the burner
		Briquettes will self-clean
		Finish by placing the briquettes in one layer

Barbecue Troubleshooting: Additional Cooking Issues

Problem	Cause	Solution
Flare-ups or grease fires	Cooking surfaces and bottom tray dirty	Clean thoroughly
	Excessive heat	Turn burner controls to lower setting, or
		Raise cooking grid to upper position if possible
Yellow or orange flame	If yellow flame is excessive, the venturi may be blocked	Remove the burner and clean the venturi

Barbecue Maintenance Schedule

Before Each Use

- Check hose for cuts, abrasions, and nicks
- Ensure all connections are tight
- Verify proper flame characteristics

Weekly

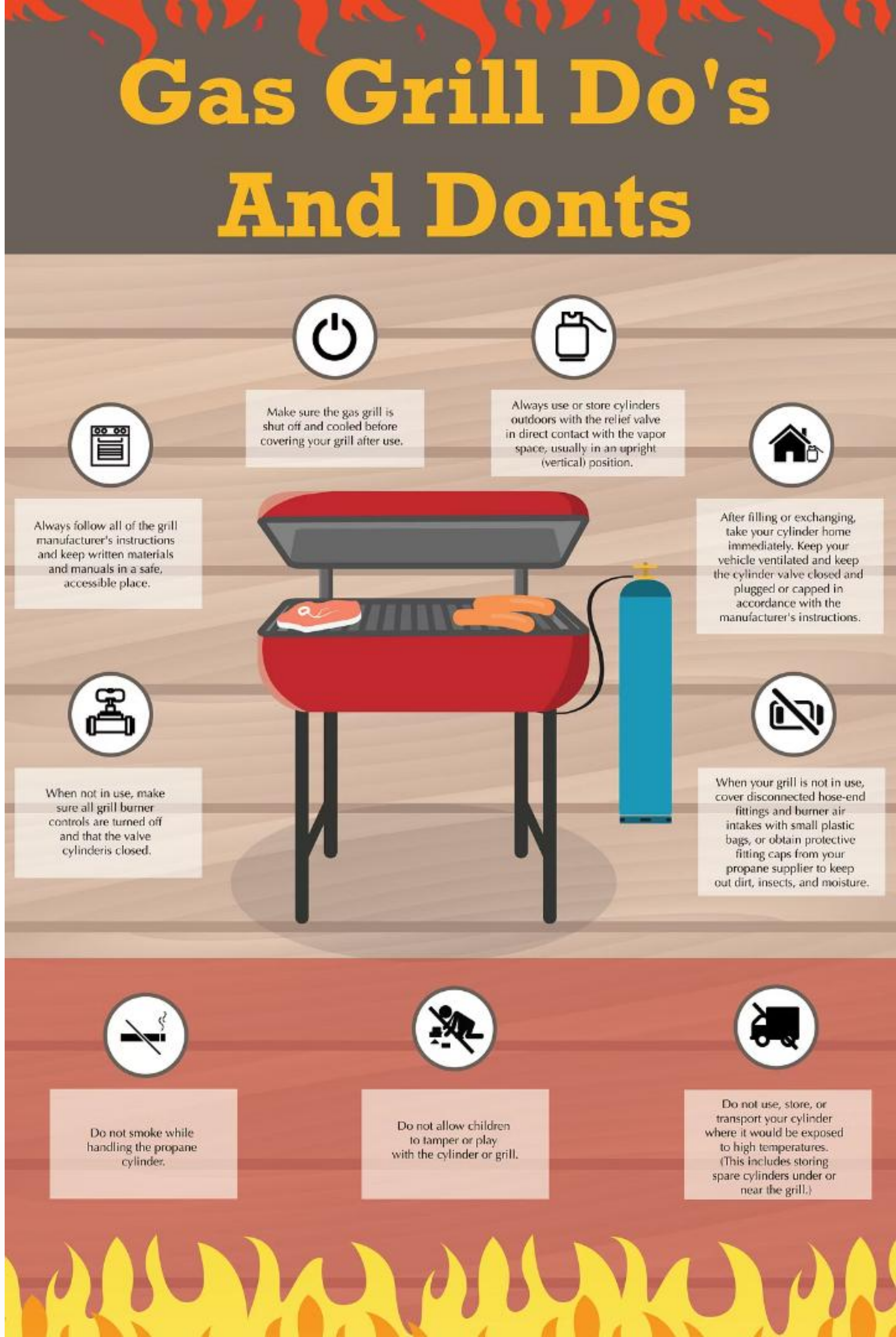
- Clean cooking grates
- Empty grease trap
- Check burner flames for proper color

Monthly

- Clean briquettes or lava rocks
- Inspect burners for blockages
- Check ignition system

Seasonally

- Perform complete visual inspection
- Clean spider guards
- Test all connections for leaks
- Check and adjust air shutters if needed



Barbecue Safety Tips

Always Open Lid Before Lighting

Prevents gas buildup that could cause a dangerous flashback

Wait Before Relighting

If ignition fails, wait 5 minutes before attempting to relight

Keep Safe Distance

Never lean over the barbecue when lighting or cooking

Supervise Children

Keep children away from the barbecue at all times

Barbecue Placement Guidelines

Distance from Structures

Keep barbecue at least 10 feet away from your house, deck railings, and other structures that could catch fire.

Overhead Clearance

Never use a barbecue under an overhang, roof, or low-hanging tree branches.

Level Surface

Always place the barbecue on a flat, stable surface to prevent tipping.

Ventilation

Ensure adequate ventilation to prevent carbon monoxide buildup.

Barbecue Storage Recommendations

Propane Tank Storage

Always store propane tanks outside in an upright position, away from heat sources and direct sunlight. Never store propane tanks indoors, in garages, or in enclosed spaces.

Barbecue Storage

When storing the barbecue for extended periods:

1. Clean all components thoroughly
2. Disconnect the gas supply
3. Cover the barbecue to protect from elements
4. Store in a dry location if possible
5. For natural gas barbecues, ensure the gas line is properly capped

Barbecue Cleaning Best Practices

Grates and Cooking Surfaces

Clean cooking grates after each use while still warm. Use a wire brush to remove food particles, then wipe with a damp cloth. For deeper cleaning, remove and soak in warm, soapy water.

Burners and Venturi Tubes

Regularly inspect and clean burners and venturi tubes to prevent blockages. Use a pipe cleaner or venturi brush to remove debris and insect nests.

Grease Management System

Empty and clean the grease trap after each use to prevent flare-ups and grease fires. Replace disposable drip pans as needed.

Exterior Surfaces

Clean exterior surfaces with mild soap and water. For stainless steel, use a specialized cleaner and always wipe in the direction of the grain.

Barbecue Fuel Efficiency Tips

Preheat Properly

Preheat for 10-15 minutes to reach optimal cooking temperature

Keep Lid Closed

Minimize opening the lid to maintain temperature and reduce fuel consumption

Use Direct/Indirect Heat

Turn off burners not in use and utilize zone cooking techniques

Regular Maintenance

Clean components regularly to ensure efficient operation

Barbecue Cooking Techniques

Direct Heat Cooking

Direct heat cooking involves placing food directly over the heat source. This method is ideal for foods that cook quickly, such as burgers, steaks, chicken breasts, and vegetables.

For direct heat cooking:

- Preheat the grill to medium-high or high heat
- Place food directly over the lit burners
- Cook with the lid closed when possible
- Turn food only once during cooking

Indirect Heat Cooking

Indirect heat cooking involves placing food adjacent to, not directly over, the heat source. This method is ideal for larger cuts of meat that require longer cooking times, such as roasts, whole chickens, and ribs.

For indirect heat cooking:

- Preheat the grill to medium heat
- Turn off one or more burners
- Place food over the unlit burners
- Cook with the lid closed
- Use a meat thermometer to check doneness

Barbecue Temperature Guide

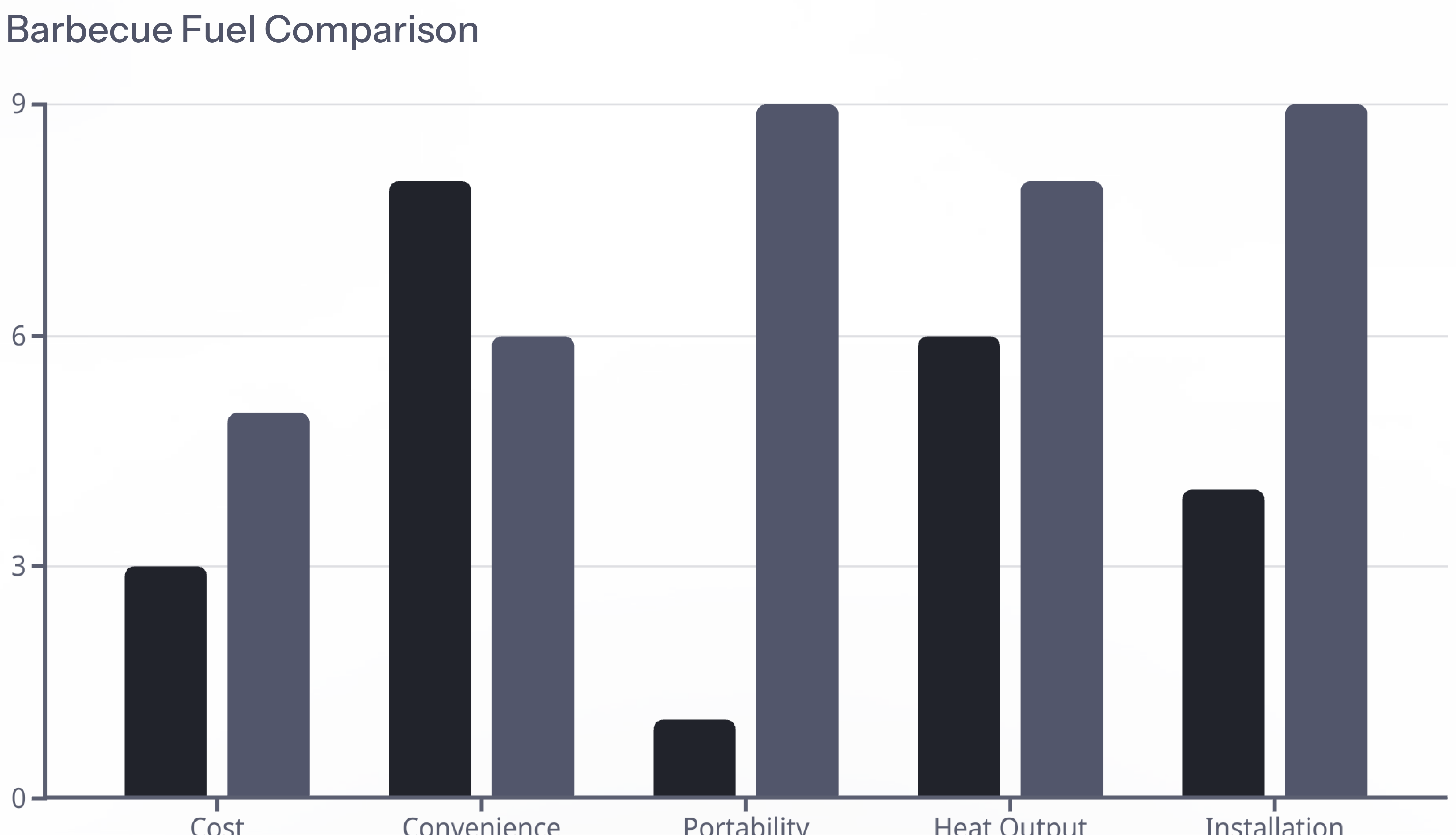
Heat Level	Temperature Range	Best For
Low	250-300°F (120-150°C)	Slow cooking, smoking, tough cuts of meat
Medium-Low	300-350°F (150-175°C)	Roasts, ribs, bone-in chicken pieces
Medium	350-400°F (175-205°C)	Most grilling, burgers, vegetables
Medium-High	400-450°F (205-230°C)	Steaks, chops, seafood
High	450-550°F (230-290°C)	Searing, quick cooking items

Barbecue Meat Doneness Guide

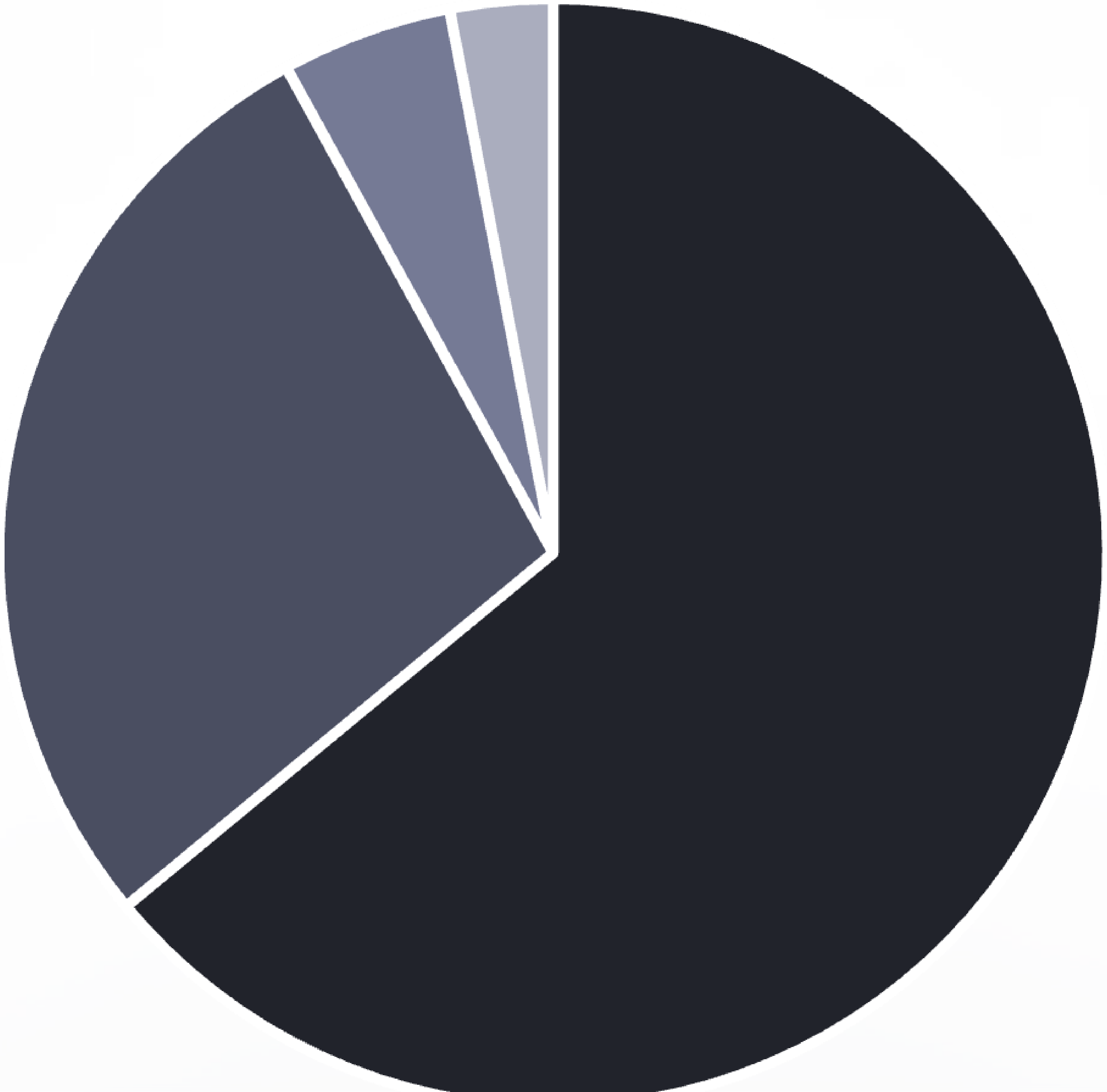
Meat Type	Doneness	Internal Temperature
Beef Steaks	Rare	125°F (52°C)
	Medium Rare	135°F (57°C)
	Medium	145°F (63°C)
	Medium Well	150°F (66°C)
	Well Done	160°F (71°C)
Ground Beef	Safe	160°F (71°C)
Pork	Safe	145°F (63°C)
Chicken/Poultry	Safe	165°F (74°C)

Barbecue Accessories Guide

Essential barbecue accessories include high-quality grilling tools (tongs, spatulas, forks), an accurate meat thermometer, a sturdy grill brush for cleaning, a weather-resistant grill cover, and optional attachments like rotisserie kits and smoker boxes to expand cooking capabilities.


Barbecue Fuel Comparison
9
6
3
0
Cost
Convenience
Portability
Heat Output
Installation

Barbecue Market Share by Type



Barbecue Environmental Considerations

40%

Lower Emissions

Natural gas barbecues produce approximately 40% less carbon dioxide than charcoal models

15%

Energy Efficiency

Modern gas barbecues are about 15% more energy efficient than models from 10 years ago

99%

Clean Burning

Natural gas is 99% methane, making it one of the cleanest burning fossil fuels

Barbecue Industry Growth

Barbecue Regional Preferences

Suburban Areas

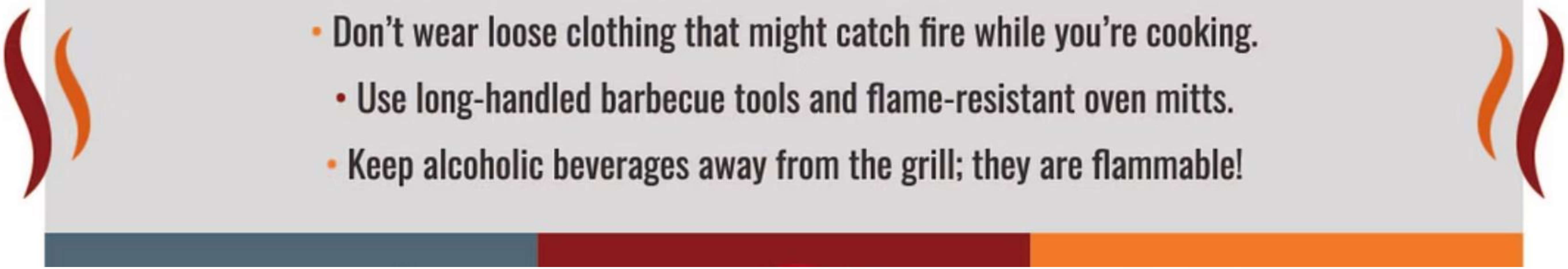
In suburban areas with established natural gas infrastructure, built-in natural gas barbecues are increasingly popular for outdoor kitchen setups. These permanent installations offer convenience and eliminate the need for propane tank refills.

Rural and Recreational Areas

In rural areas and for recreational use, portable propane barbecues dominate due to their flexibility and independence from fixed gas lines. These units are also popular for camping, tailgating, and other mobile cooking scenarios.

Urban Settings

In urban environments, compact gas barbecues designed for small spaces like balconies and patios are in high demand. These units often feature fold-down shelves and other space-saving design elements while maintaining cooking performance.



Barbecue Safety Statistics

10,600

Annual Grill Fires

Home grills cause an average of 10,600 home fires annually

19,700

Emergency Room Visits

Approximately 19,700 patients visit emergency rooms annually due to grill-related injuries

78%

Gas Grill Incidents

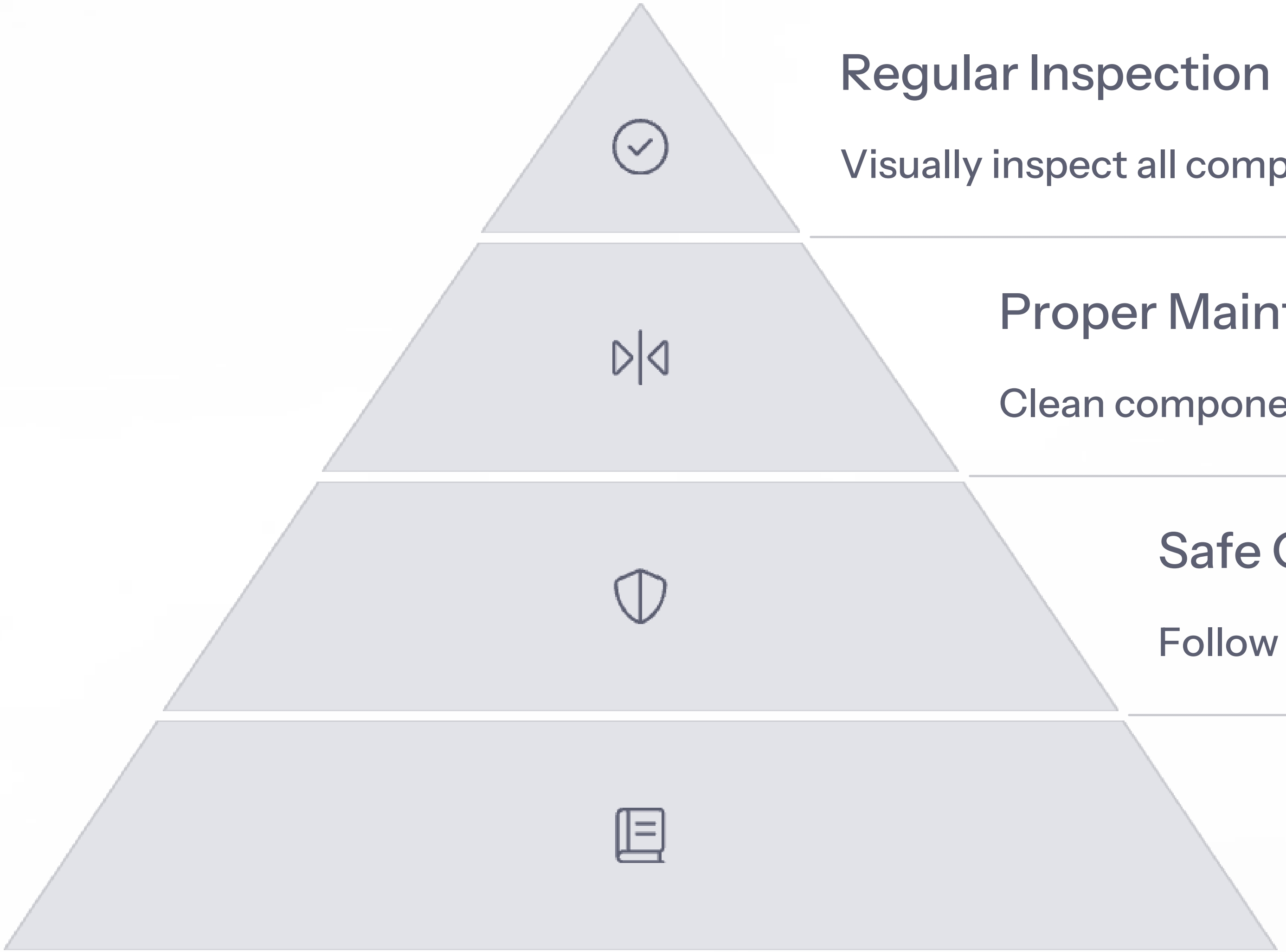
Gas grills are involved in 78% of reported home grill fires

64%

Preventable

An estimated 64% of grill accidents could be prevented with proper safety measures

Barbecue Maintenance and Safety Summary



Regular Inspection

Visually inspect all components before each use

Proper Maintenance

Clean components regularly and replace damaged parts

Safe Operation

Follow ignition procedures and monitor during use

Code Compliance

Adhere to installation requirements and local regulations

Proper maintenance and adherence to safety guidelines are essential for the safe and efficient operation of gas barbecues. Regular inspection of components, cleaning of burners and venturi tubes, testing for gas leaks, and following correct ignition procedures will help prevent accidents and ensure optimal performance. Always consult manufacturer instructions and local codes for specific requirements.

CSA Unit 15

Chapter 4
Gas Lamps: Installation, Components, Operation, and Servicing

Gas lighting was historically the most popular method of outdoor and indoor lighting in cities and suburbs. Today, gas lighting is generally used for camping, although many urban historical districts use gas lighting to create or preserve a nostalgic effect. The gas technician/fitter must install and set up lamps properly to ensure that they are both decorative and practical.

Learning Objectives

Installation Requirements

Describe the installation requirements for gas lamps

Components

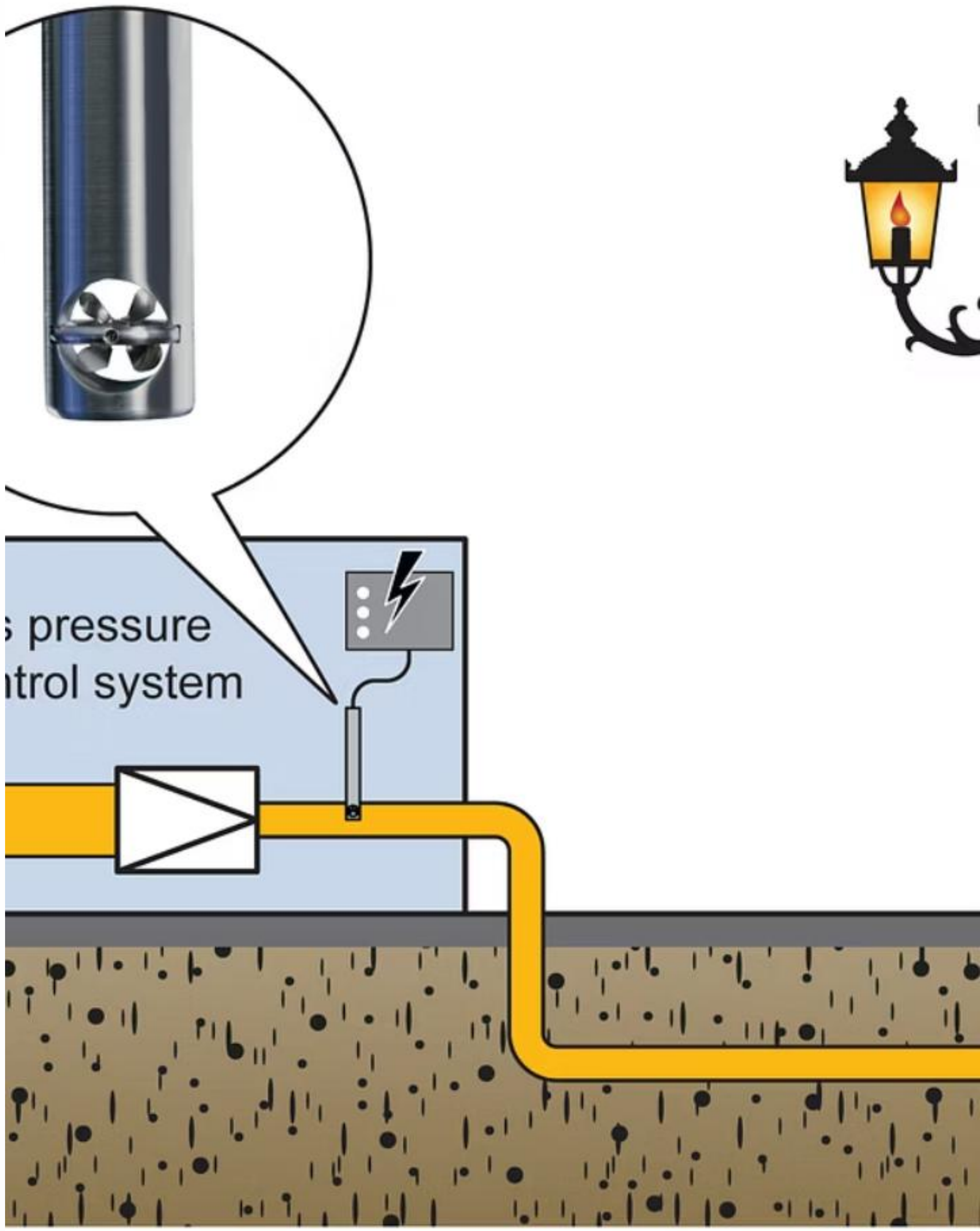
Describe the components of gas lamps

Operation

Describe the operation of gas lamps

Servicing

Describe the servicing of gas lamps



Gas Lamp Terminology

Term	Definition
Gas mantle	A device for generating bright white light when heated by a flame

Understanding the terminology associated with gas lamps is essential for proper installation and maintenance. The gas mantle is a key component that generates the bright white light characteristic of gas lamps.

Common Barbecue Problems and Solutions

Problem	Cause	Solution
Spider stopper guard is blocked	Obstruction	Clean the spider stopper guard
Burner ports blocked	Dirt or debris	Remove the burner and clean with a soft bristle brush or scraper
The flame is low in HIGH position	Fuel hose bent or kinked	Straighten fuel hose
Inside of lid appears to be peeling	Caused by a buildup of grease, not faulty paint	Clean with stiff bristle brush or scraper

Figure 3-12
Cleaning the venturi and burner tube

Venturi Tube Maintenance

Cleaning Process

Clean venturi tubes using a pipe cleaner or venturi brush to eliminate any blockages caused by spiders or insects.

Installation Guidance

When installing parts on a barbecue, always refer to the manufacturer's instructions.

Importance

Proper maintenance of venturi tubes ensures efficient gas flow and prevents dangerous blockages that could affect performance.

Assignment Questions - Chapter 3

1 Barbecue Gas Compatibility

Most barbecues can be used on Propane or natural gas without any modifications.

- a) True
- b) False

2 Shut-off Valve Requirements

A shut-off valve is not necessary when using a quick disconnect device?

- a) True
- b) False

3 Piezo Ignition Systems

Barbecues equipped with a piezo ignition can be match-lit?

- a) True
- b) False

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TRAINING AND EXAM PREP

Installation Requirements for Gas Lamps

Follow Code Requirements

Refer to CSA B149.1 Section 7 Installation of specific types of appliances when installing gas lighting or lighting fixtures.

Follow Manufacturer Instructions

All gas lamps must be installed according to the manufacturer's instructions, and the installation must comply with the Code.

Provide Operating Instructions

Once a lamp has been installed, the operating instructions must be left with the user.

Rating Plate and Specifications

Required Information

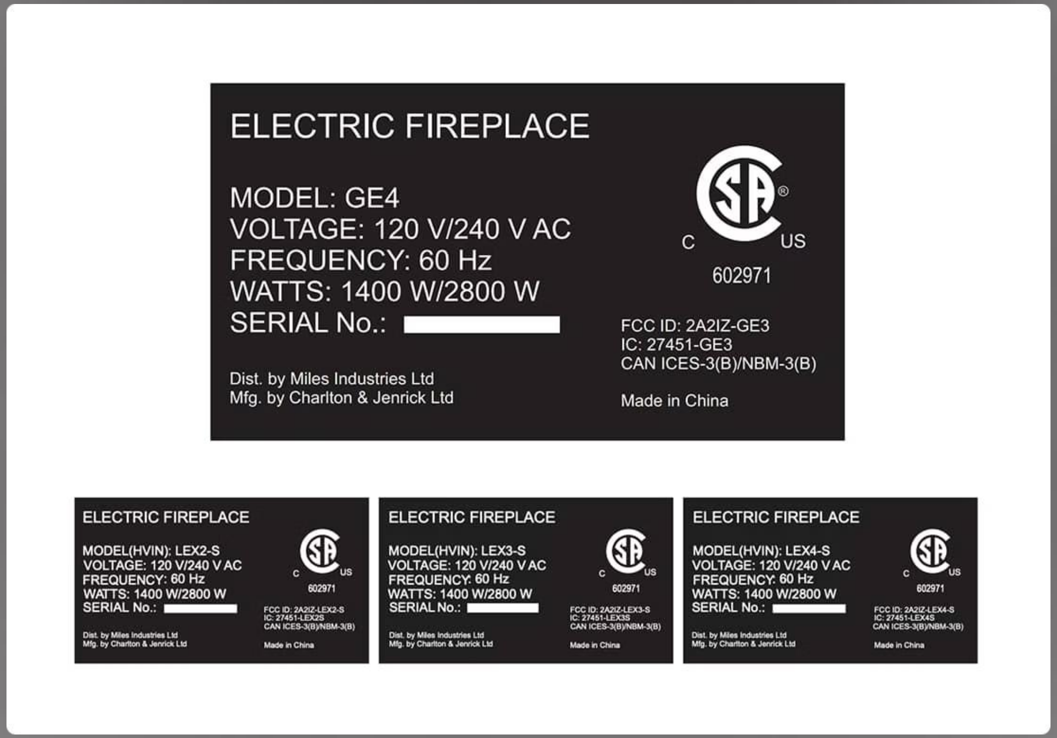
- Type of gas
- British thermal unit (Btu) rating
- Model number
- Serial number
- Clearances

Pressure Considerations

Most gas lamps do not have an appliance regulator and, therefore, operate at the pressure supplied by the piping system (usually 7 inches w.c. for natural gas). In these cases, the burner manifold pressure may not be noted on the rating plate.

Conversion Documentation

Note: If a gas lamp has been converted, this must be noted on the rating plate.



Gas Lamp Specifications

Design Variation

Gas lamps vary considerably in design, making standardized specifications difficult to find.

Flame Characteristics

Some lamps "flicker," which makes it difficult to gauge the consumption and output of the lamp.

Documentation Importance

Manufacturers' specifications are important to read during installations.

Mantle Variation

Not all lamps have a mantle, affecting their light output and appearance.

Clearance Requirements for Gas Lamps

Minimum Clearances from Combustible Material

According to Clause 7.31.3 of CSA B149.1, a bracket or pendant fixture shall have the following minimum clearances from combustible material:

- Above - 18 in (450 mm)
- All sides - 5 in (125 mm)

Main Objective

The main objective of the clearances for gas lamps is to prevent the globe from contacting combustible materials. Note that ignition temperatures vary for different materials. For example, paper on wallboard ignites at a lower temperature than wood or plastic.

Therefore, locate the lamp, taking into consideration the temperature tolerance of the surrounding materials.

Reduced Clearance Allowances

Approved Authority

The Code allows a reduction of clearance if it is approved as being safe to do so by an approved authority and the reduced clearance level is marked on the rating plate.

Protected Materials

Clearance can be reduced if the combustible material is protected and the reduced clearance is in accordance with the Code.

Safety Considerations

Even with reduced clearances, safety must remain the primary concern to prevent fire hazards.

Piping and Tubing Requirements

Code Compliance

All piping and tubing used with gas lamps must meet Code requirements.

Proper Mounting

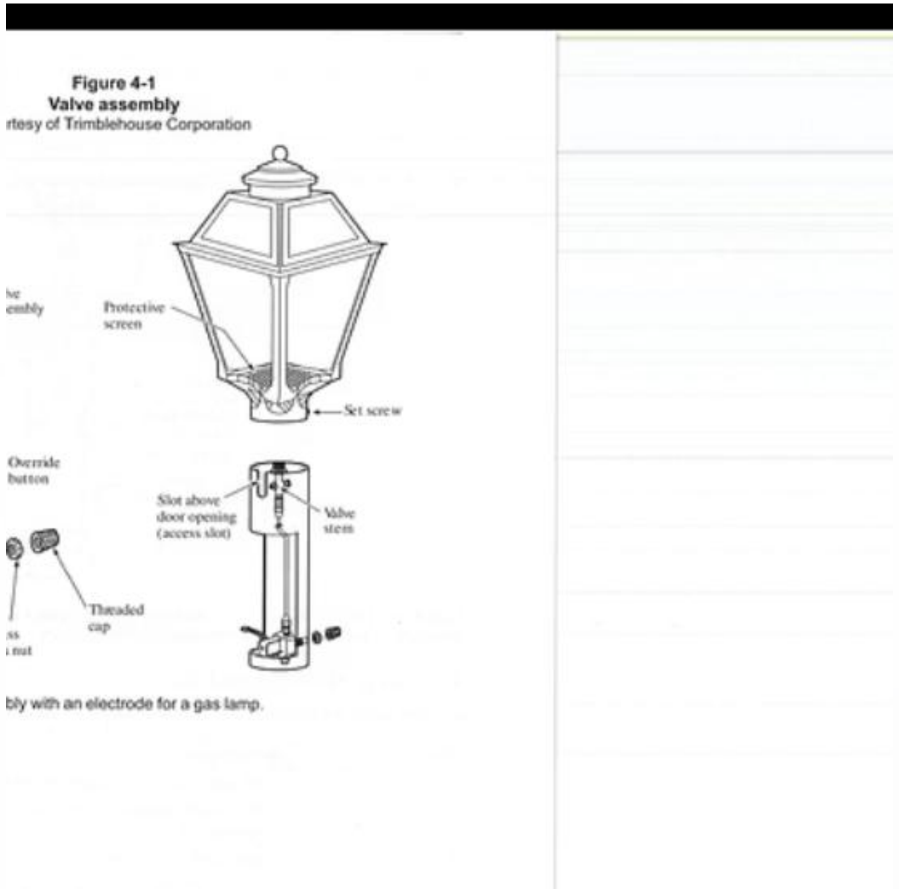
The gas lamp must be confirmed properly mounted and supported to avoid putting any pressure on the piping supplying the lamp.

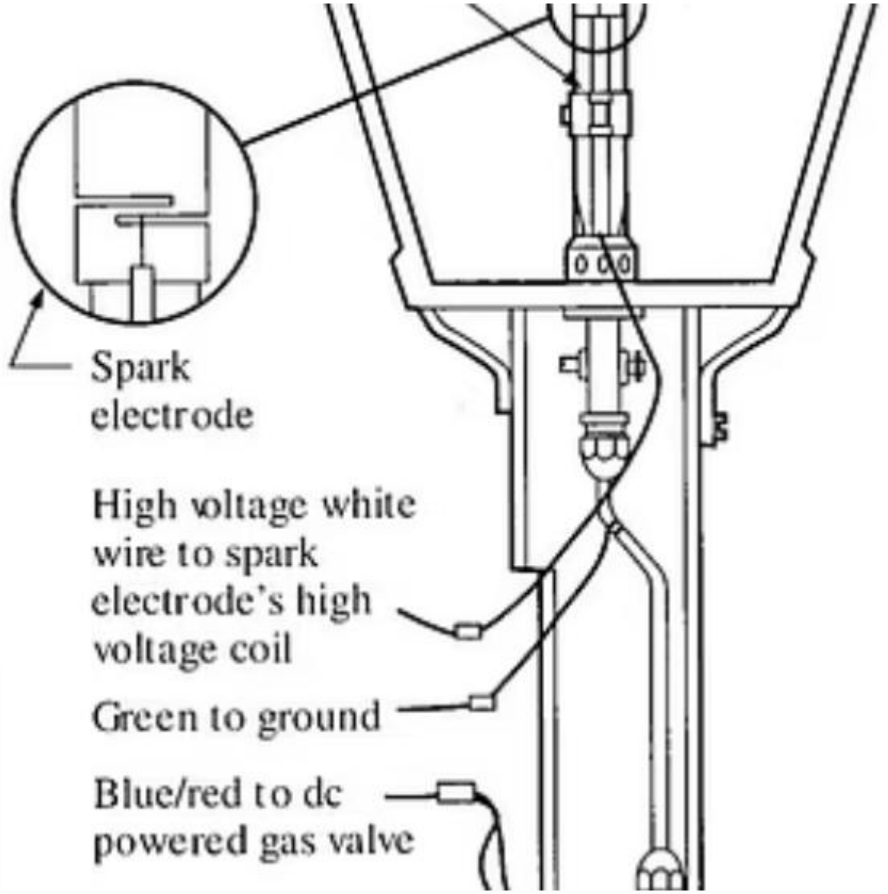
Wall Bracket Requirements

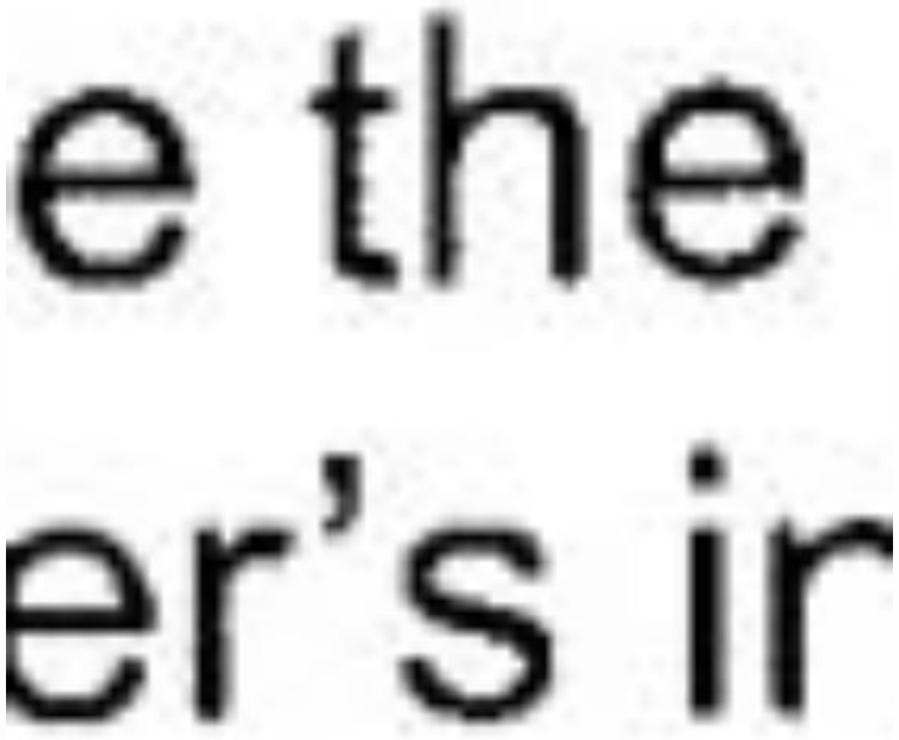
Clause 7.31.2 of CSA B149.1 states: A wall bracket fixture shall be firmly supported, and if of the swing type, it shall be provided with a stop to prevent contact of the globe with combustible material.

Gas Lamp Components

There are many different types of gas lamps, and their components often vary from one lamp to the next. The manufacturer's assembly instructions normally list the lamp's components.







Venturi Assembly

The venturi assembly is a critical component of gas lamps that controls the mixture of gas and air for proper combustion.

Gas Inlet

Gas enters the venturi at a controlled pressure

Air Intake

Primary air is drawn in through ports

Mixing Chamber

Gas and air mix for proper combustion

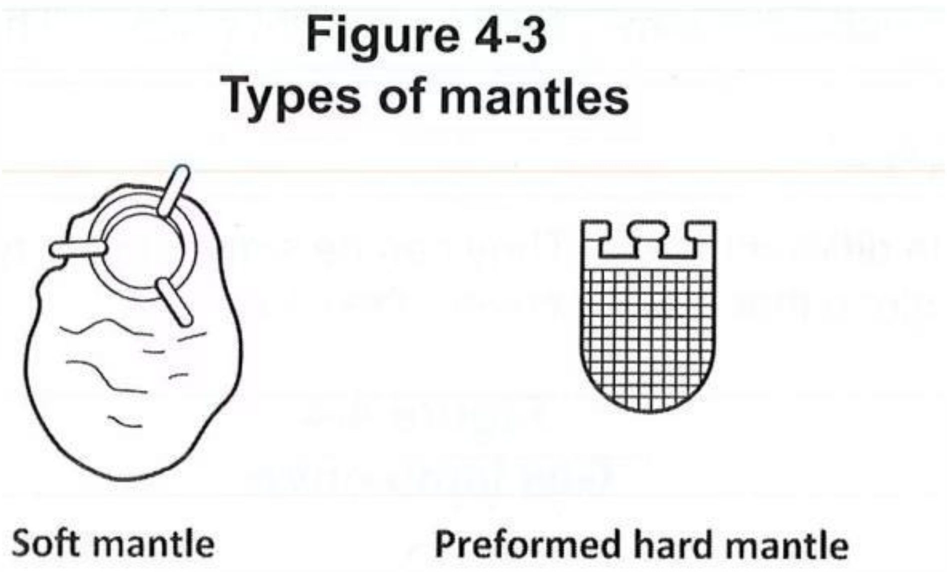
Burner Output

Mixture flows to burner for ignition

Construction Materials for Gas Lamps

Part	Construction
Frame	Usually made of iron, aluminum, brass, copper, or bronze. Brass and copper are commonly used on gas lamps because of their resistance to rust.
Burner	Will either be copper or ceramic. Is often enclosed by a glass globe (The glass is tempered to withstand temperature changes.)

Gas Lamp Mantles



Purpose

Lamps are equipped with mantles, a device for generating bright white light when heated by a flame.

Types of Mantles

There are two basic types of mantles:

- Soft mantles (soft auto-form mantles)
- Preformed hard mantles

Installing a Soft Mantle

Preparation

Ensure the lamp valve is closed and the light has been off long enough to cool down. Remove the old mantle.

Attachment

Loop the tie-on strings at the throat of the mantle. Use your fingers to enlarge the throat so it will fit over the burner. Fit the mantle over the burner so that it seats in the lower groove of the burner nose.

Securing

Shape the mantle evenly. Pull the ends of the tie-on strings so that the mantle and strings are seated securely in the burner nose groove. Tie a double knot in the string and cut off the ends.

Burning Off

Hold a lit match close to, but not touching, the mantle. The mantle should smoulder as its protective coating burns off. Once this is done, the mantle becomes a form of chemical ash and must be handled carefully. It may break if touched.

Completing Soft Mantle Installation

Cooling Period

Let the mantle cool for a few minutes after the coating has burnt off.

Ignition

Now turn the gas on, and light the mantle without touching it with the match. On a new installation, it may take a while for the mantle to burn because of air in the gas line.

Adjustment

Turn the gas on fully to allow the mantle to burn to its proper shape. After about five minutes, adjust the gas control for the desired amount of light.

Verification

When the gas light is burning properly, the flame is a bright white and has no visible outlines.

Installing a Preformed Hard Mantle

Turn Off Gas

Ensure the gas supply is turned off and the light has been off long enough to cool.

Remove Old Mantle

Carefully remove the old mantle from the burner.

Unpack New Mantle

Take the mantle out of its box, and place the throat over the burner nose.

Complete Installation

Follow steps 6 to 12 from the procedure for soft mantles.

Figure 4-4
Gas lamp cover

Gas Lamp Covers

Types

Gas lamp covers come in different forms. They can be similar to the type shown in the image, or they can be more like a globe that directly covers the flame.

Purpose

Gas lamp covers serve a decorative purpose as well as protect the flame from weather and other external effects. They also safely enclose the burning flame.

Material Requirements

The cover, including the glass, should be able to resist the sudden temperature changes that occur when the lamp is switched on or off.

Gas Lamp Operation

Manufacturer's Instructions

Since there are many different types of gas lamps, it is important to read the manufacturer's instructions for specific lamps.

User Documentation

These instructions should be left with the user after the lamp has been installed.

Operational Variations

Different models may have unique operating procedures and maintenance requirements.

Types of Gas Lamps

Indoor Gas Lamps

Indoor gas lamps serve both practical and decorative purposes. Make sure these lamps are used only in properly vented rooms. Carbon monoxide is formed if there is incomplete combustion. If the room is not properly vented, there may be a buildup of dangerous gases.

The area around the lamp must also be kept free of combustible materials, including flammable vapours and liquids such as gasoline.

Outdoor Gas Lamps

Outdoor gas lamps are used mainly for decorative purposes. They can usually operate in all types of weather and are useful in the event of a power outage.

- With these lamps, there must be no obstruction to the primary air flow.
- The lamp must be properly vented.
- There should be no combustible materials near the lamp.

Indoor Gas Lamp Requirements

Primary Air Flow

Even though the gas flame is small, it still requires primary air for combustion. The gas flows through a venturi to the burner. The movement of gas through the venturi sucks in air through the air ports.

No Obstructions

There should be no obstruction to the flow of primary air.

Clean Burner

If the burner is dirty or has insects nesting in it, the air flow will be obstructed. The burner must be kept clean.

Gas Lamps With and Without Mantles

Selection Criteria

The selection of a lamp with or without a mantle depends on the intended use of the lamp.

Decorative Lamps

Gas lamps without mantles give a "flicker flame" and are intended purely for decorative purposes.

Functional Lighting

For functional lighting purposes, a lamp equipped with a mantle is required.

Gas Lamps with a Mantle

Flame	Description
Bright white and has no visible outlines	Flame is burning properly.
Not bright white or has visible outlines	The air flow to the gas may need adjustment.
Yellow flame	Air flow should be increased.
Poor flame quality	The cause may be a broken mantle, in which case the mantle must be replaced.

In a mantle-equipped gas lamp, the mantle burns white hot and gives off light.

Adjusting the Primary Air Flow

Air-Shutter Rings

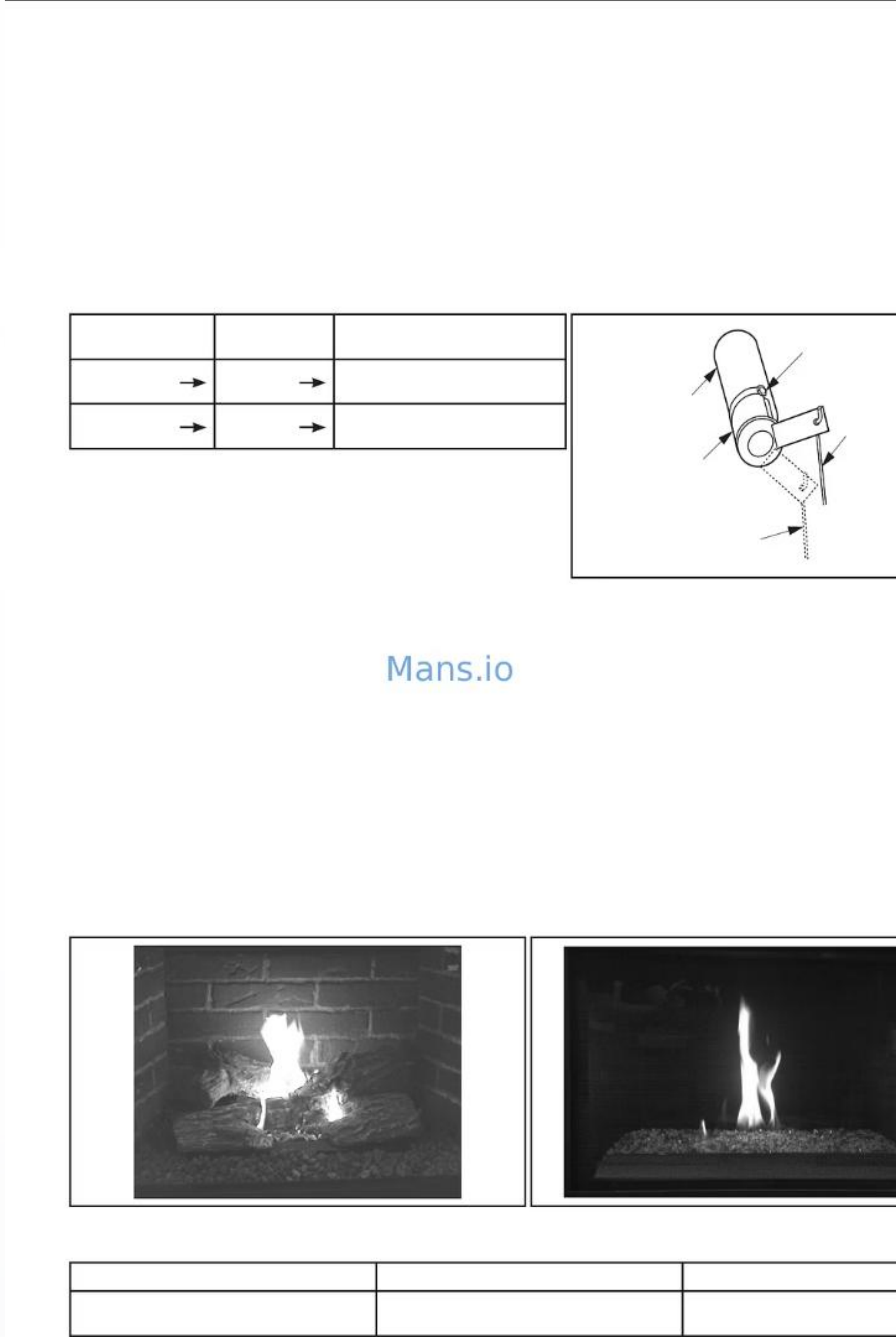
The primary air flow is controlled by adjusting the air-shutter rings near the burner. (Check manufacturer's instructions to determine the exact location.)

Optimal Light

Adjust the air-shutter rings until the optimal light is obtained.

Gas Pressure

The gas pressure may also need adjustment. Check the manufacturer's instructions to find the correct pressure setting.



Gas Lamp Ignition Methods

Electrode Ignition

An electrode that is operated manually with a switch or automatically with a photosensor.

In automatic systems, a solar cell detects the light falling below a certain point and opens an electronic circuit to the electrode. It also opens the gas valve.

- The electrode will spark until the gas lamp is lit.
- A photosensor detects when the lamp is lit and stops the electrode from sparking.

Manual Ignition

Manually using an open flame, such as a match.

This method requires the user to manually open the gas valve and apply a flame to ignite the gas.

Automatic Ignition System Operation

Darkness Triggers System

When light falls below threshold, circuit activates

Gas Valve Opens

Electronic signal opens gas valve

Electrode Sparks

Electrode creates spark to ignite gas

Flame Detection

Photosensor detects flame and stops sparking

Light Detection

Solar cell monitors ambient light levels

Automatic Shutdown Process

Light Level Increases

Ambient light reaches threshold at sunrise

Solar Cell Activates

Solar cell detects sufficient light

Circuit Closes

Electronic signal sent to valve

Gas Valve Closes

Valve shuts off gas flow, extinguishing lamp

Gas Lamp Service

Manufacturer's Instructions

Because there are so many different types of gas lamps available, it is important to consult the manufacturer's instructions before installing or replacing any components.

Proper Procedures

It is important that manufacturer's procedures are followed. Otherwise, the lamp may not work properly.

Documentation

A typical manufacturer's instruction sheet for installing a gas lamp is provided in Appendix A.

Servicing and Troubleshooting Preparation

Turn Off Gas Supply

Before starting any repairs, ensure the gas supply is completely shut off.

Allow Cooling

Wait for the lamp to cool completely to prevent burns.

Remove and Clean Glass

Take off the glass components and clean them thoroughly.

Check Mantle

Replace the mantle if it is broken or damaged.

General Maintenance for Gas Lamps

Venturi and Screens

Ensure that the venturi and all screens are clean and clear of insects.

Solar Cell

Make sure the solar cell is clean, if so equipped.

Glass Casings

Clean the glass casings to maintain optimal light output.

Annual Maintenance

At least once a year, an outdoor gas lamp should be properly cleaned and painted if necessary.

Leak Testing Procedures

Detect Gas Smell

If there is a smell of gas or if a new gas lamp or new fittings have been installed to the gas supply line, perform a leak test

Apply Soap Solution

Use soap solution or leak detector on all connections

Check All Joints

Check all joints and connections for bubbles indicating leaks

Tighten Connections

Tighten any connections that may be loose

Caution! Never use an open flame to test for leaks.

Flame Impingement Issues

Identifying the Problem

Burned metal on a gas lamp indicates one of the two situations:

- Flame that is too hot
- Flame impingement

Understanding Flame Impingement

Flame impingement means that the flame is in contact with a surface causing the flame to cool. When the flame cools, it cannot burn all of the gas, so carbon or carbon monoxide (CO) is produced.

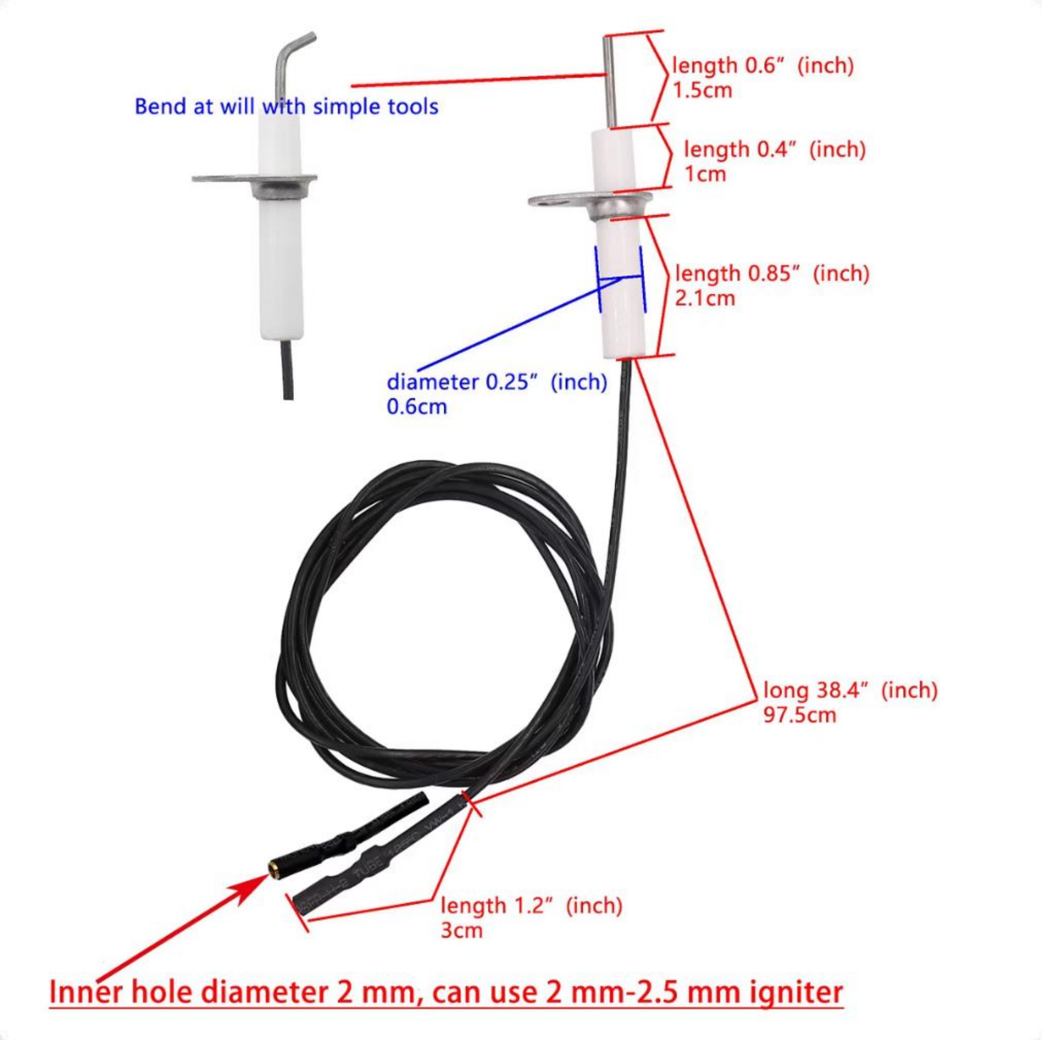
Corrective Actions

To correct this problem:

- Adjust the air openings
- Adjust the gas pressure

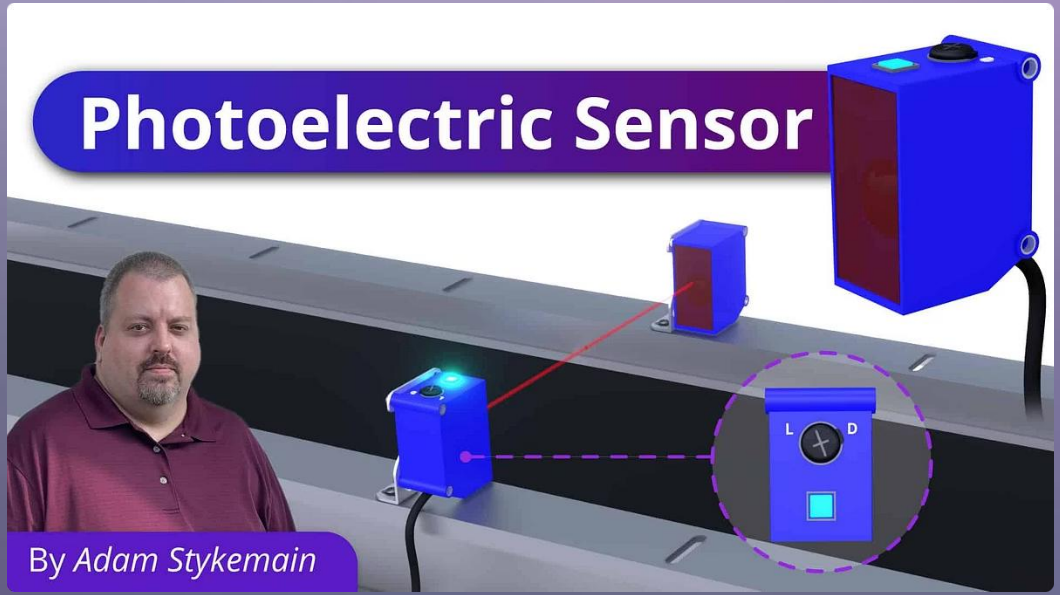
Troubleshooting Electrode Ignition Systems

Problem	Solution
Electrode will not begin sparking when it gets dark	Check battery connection. Check that battery voltage matches manufacturer's specifications. Check solar cell connection and polarization. Check electrode wire and ground wire connections.
Electrode will not stop sparking after ignition	Check the alignment of the mantle over the photosensor. Check that the photosensor is clean. Check the alignment of the photosensor. Check the gas pressure.



More Electrode Ignition System Issues

Problem	Solution
Lamp keeps burning after it gets light	Check solar cell connection and polarization. Check polarization of valve connection to the circuit board.
Valve does not open or allow operation	Check polarization of valve connection to the circuit board. Check that battery voltage matches manufacturer's specifications.
Valve open, electrode sparks, but the mantles do not ignite	Check that the gas supply line is properly bled of air. Check that the electrode is aligned with the burner head. Check the alignment of the mantle.



Final Electrode Ignition System Troubleshooting

Nighttime Operation Issues

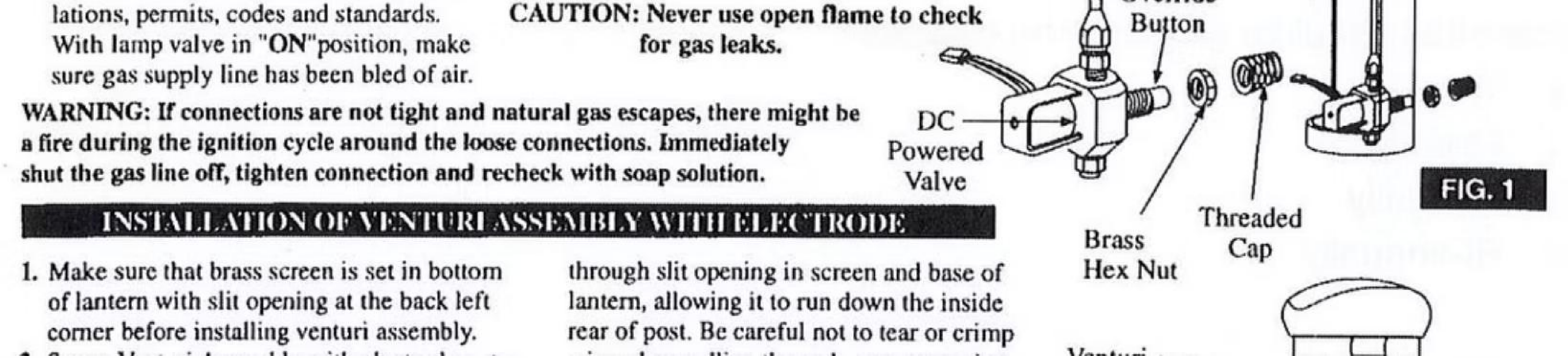
At night, lamp ignites, but then turns off

- Check the alignment of the mantle over the photosensor
- Check that the photosensor is clean
- Check the alignment of the photosensor
- Check the gas pressure

Battery Issues

Battery voltage lower than manufacturer's specifications

- Check that solar panel is facing the sun, and allow the battery to charge


lations, permits, codes and standards. With lamp valve in "ON"position, make sure gas supply line has been bled of air.

CAUTION: Never use open flame to check for gas leaks.

WARNING: If connections are not tight and natural gas escapes, there might be a fire during the ignition cycle around the loose connections. Immediately shut the gas line off, tighten connection and recheck with soap solution.

INSTALLATION OF VENTURI ASSEMBLY WITH ELECTRODE

1. Make sure that brass screen is set in bottom of lantern with slit opening at the back left corner before installing venturi assembly.

through slit opening in screen and base of lantern, allowing it to run down the inside rear of post. Be careful not to tear or crimp

Manufacturer's Installation Instructions

Following manufacturer's installation instructions is crucial for proper gas lamp operation and safety. The image above shows a typical instruction sheet that would be provided with a gas lamp.

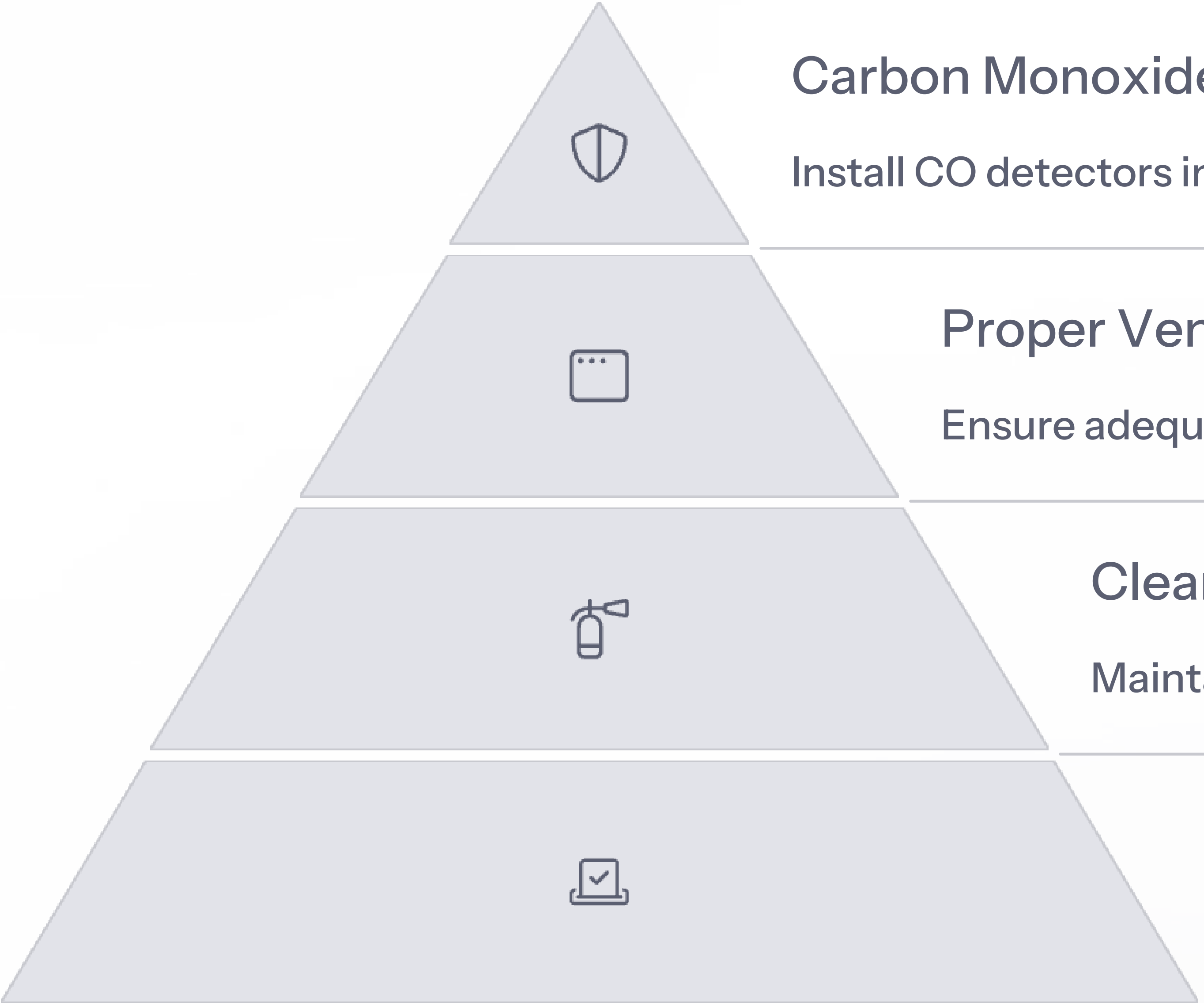
Documentation Importance

Always keep the manufacturer's instructions for future reference and maintenance.

User Instructions

Provide the end user with all documentation after installation is complete.

Indoor Gas Lamp Safety Considerations



Carbon Monoxide Detection

Install CO detectors in rooms with gas lamps

Proper Ventilation

Ensure adequate air exchange in the room

Clearance from Combustibles

Maintain safe distances from all flammable materials

Regular Inspection

Check for proper operation and gas leaks

Outdoor Gas Lamp Weather Considerations

Rain Protection

Ensure the lamp cover provides adequate protection from precipitation.

Wind Resistance

Verify the lamp is securely mounted to withstand strong winds.

Cold Weather Operation

Some components may require special attention in freezing temperatures.

UV Exposure

Regular maintenance may be needed to address sun damage to exterior finishes.

Gas Lamp Efficiency Considerations

7

Inches W.C.

Typical natural gas pressure for most gas lamps without regulators

18

Inches

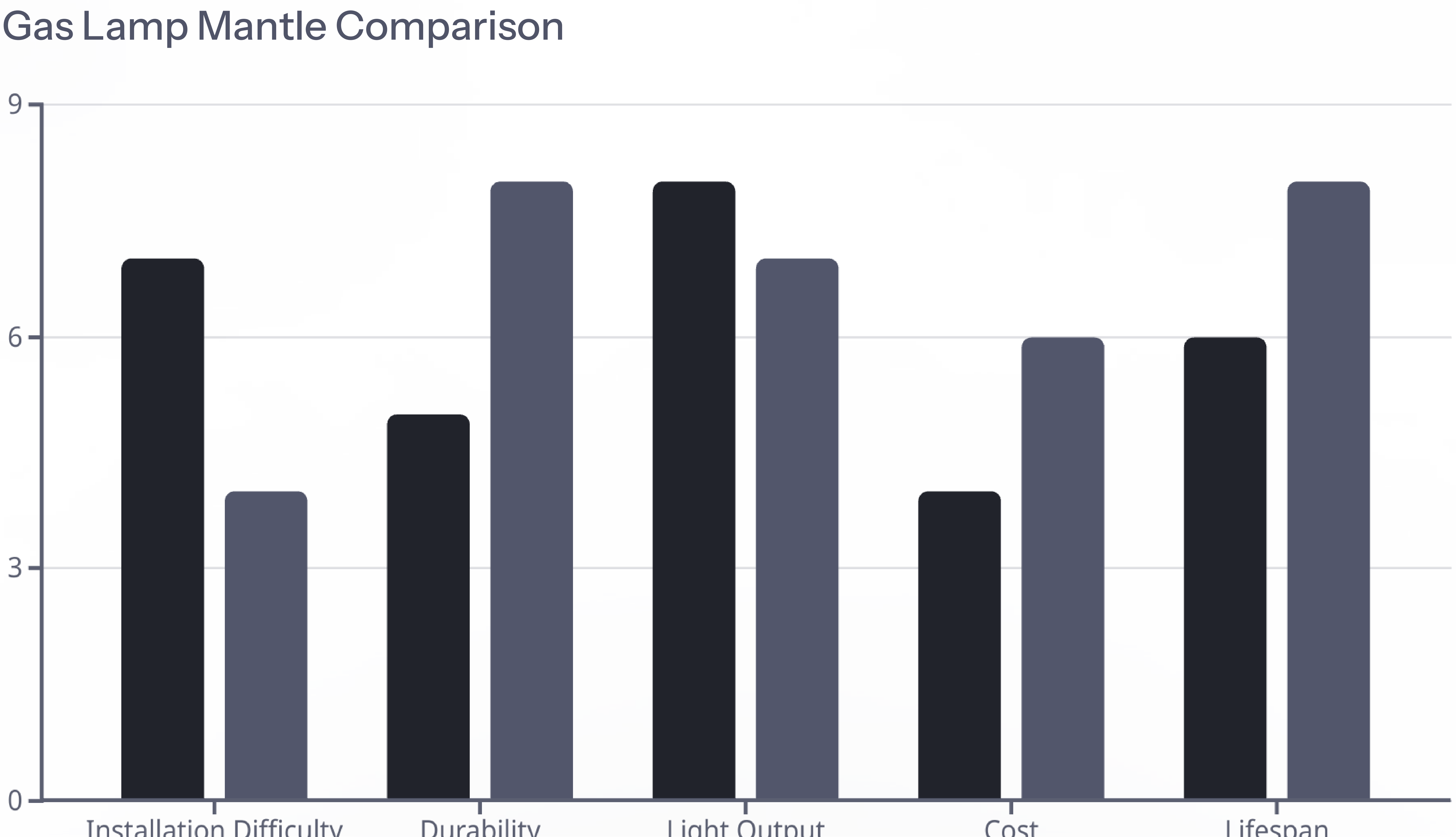
Minimum clearance above a bracket or pendant fixture

5

Inches

Minimum clearance on all sides from combustible materials

Understanding these key measurements is essential for proper installation and efficient operation of gas lamps. Maintaining correct gas pressure and proper clearances ensures both safety and optimal performance.



Gas Lamp Mantle Comparison
9
6
3
0
Installation Difficulty
Durability
Light Output
Cost
Lifespan

Gas Lamp Styles Through History

1 1800s

Early gas lamps introduced for street lighting in major cities, revolutionizing urban nightlife

2 Early 1900s

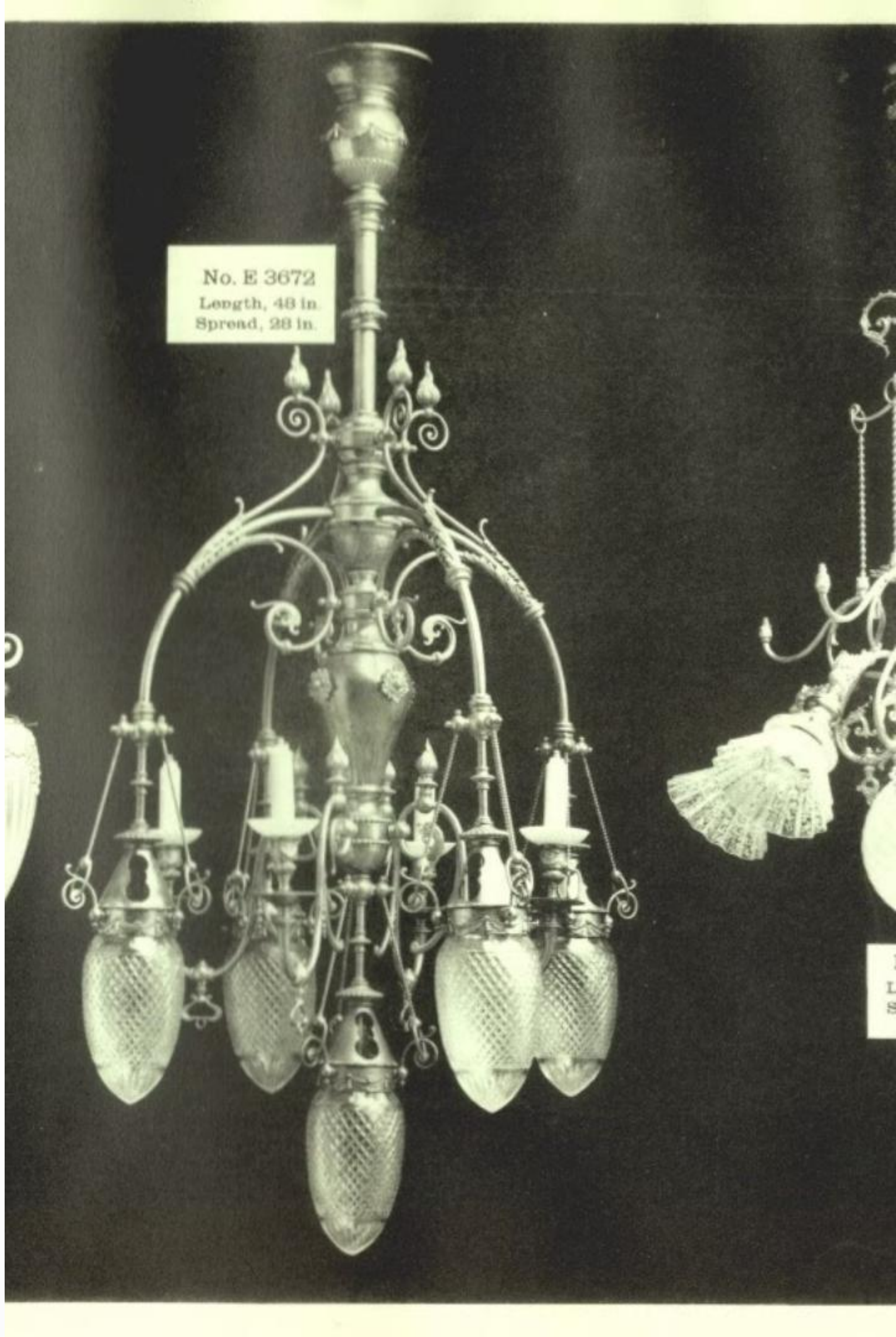
Gas mantles improved efficiency and brightness, making gas lighting more practical for indoor use

3 Mid 1900s

Electric lighting largely replaced gas lamps for practical purposes, but gas remained popular for decorative uses

4 Present Day

Gas lamps primarily used for decorative purposes in historic districts and for camping applications



Gas Lamp Applications

Residential Landscaping

Gas lamps add a classic, elegant touch to home gardens and walkways. Their warm, flickering light creates an inviting atmosphere that electric lighting cannot replicate.

Historic Districts

Many urban historic districts maintain gas lighting to preserve authentic period aesthetics. These lamps contribute significantly to the historic character and charm of these neighborhoods.

Camping and Outdoor Recreation

Portable gas lamps remain popular for camping, providing reliable illumination regardless of electricity availability. Modern designs offer improved efficiency and safety features.

Environmental Considerations for Gas Lamps

Fuel Selection

Natural gas produces fewer emissions than other fossil fuels

Efficiency Optimization

Proper adjustment minimizes gas consumption

Sustainable Materials

Choose durable components that reduce replacement frequency

Timed Operation

Automatic controls prevent unnecessary runtime

Gas Lamp Decorative Elements





Gas lamps often feature intricate decorative elements that enhance their aesthetic appeal. These can include ornate metalwork in brass, copper, or iron; decorative glass panels; and artistic finials. The decorative aspects of gas lamps make them not just functional lighting fixtures but also architectural features that add character to their surroundings.

Professional vs. DIY Gas Lamp Installation

Professional Installation

Advantages:

- Code compliance expertise
- Proper gas line connection
- Safety testing
- Warranty protection
- Liability coverage

DIY Installation Risks

Challenges:

- Code violation potential
- Gas leak hazards
- Improper clearances
- Warranty invalidation
- Insurance complications

While DIY projects can be rewarding, gas lamp installation involves working with potentially dangerous fuel sources. Professional installation ensures safety, code compliance, and proper operation. Many jurisdictions require licensed professionals for gas appliance installation.

Gas Lamp Conversion Options

Natural Gas to Propane

Converting from natural gas to propane typically requires changing the orifice size and adjusting the air mixture. The conversion must be noted on the rating plate, and all components must be approved for propane use.

Manual to Automatic Operation

Adding electronic ignition systems to manual lamps requires installing electrodes, photosensors, and control circuits. This modernization can improve convenience while maintaining traditional appearance.

Gas to Electric Simulation

Some historic areas allow electric lamps that simulate gas flame appearance. These provide the aesthetic of gas lighting without actual combustion, which may be preferable in certain indoor settings.

Commercial Applications for Gas Lamps

Restaurants and Hospitality

Gas lamps create an inviting, upscale atmosphere for restaurant patios and hotel entrances. The warm, flickering light enhances the dining experience and creates a memorable ambiance for guests.

Retail Districts

Shopping areas often use gas lamps to create a distinctive character and encourage evening shopping. The classic lighting helps establish a unique identity for the district and attracts visitors.

Public Spaces

Parks, plazas, and other public gathering spaces use gas lamps to provide both illumination and aesthetic appeal. These fixtures often become iconic elements of the landscape design.

Future of Gas Lamp Technology

Smart Controls

Integration with home automation systems for remote operation

Eco-Friendly Fuels

Development of renewable biogas options for traditional lamps

Hybrid Systems

Combination of gas and solar power for improved efficiency

Advanced Sensors

Improved detection systems for safer, more efficient operation

While gas lamps have a rich history, they continue to evolve with new technologies that improve their efficiency, safety, and convenience. These innovations allow gas lamps to remain relevant in modern settings while preserving their classic charm and distinctive lighting quality.