

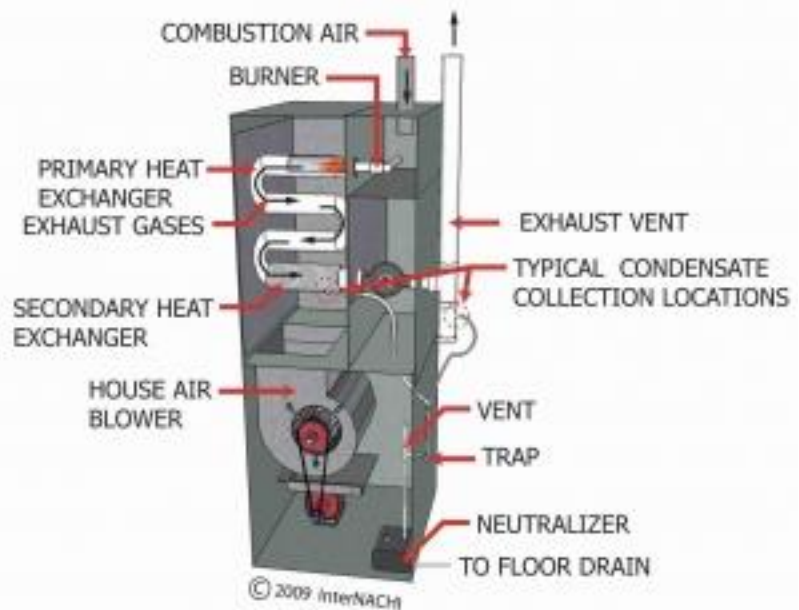
Gas Furnace Inspection Checklist

InterNACHI

This is a basic inspection checklist for inspecting a gas-fueled central duct furnace or heating system. Many of the inspection tasks listed in this inspection checklist are beyond the scope of a home inspection.

Every Habitable Room

Every house in certain climates and geographical areas (where the winter design temperature is below 60° F) must have a heating system that maintains a room temperature of at least 68° F at a point 3 feet above the floor and 2 feet from exterior walls for every habitable room, which may include living spaces used for living, sleeping, eating, cooking, bathing, washing and sanitation purposes.



Standards of Practice

According to the [InterNACHI® Home Inspection Standards of Practice](#), the home inspector is required to inspect the heating system using normal operating controls. The inspector shall describe the location of the thermostat of the heating system, the energy source, and the heating method. The inspector shall inspect readily accessible and visible portions of the chimney connected to the heating system, where applicable. The inspector shall report as in need of correction

any heating system that did not operate, and if the heating system was deemed inaccessible.

Manufacturer and Code

The manufacturer's installation instructions and local building codes describe the provisions and requirements of a properly installed heating system.

Unsafe

- Check to see if the system is safe to operate.

If it is determined that there is an unsafe condition, the inspector should shut off the furnace at the electric service switch and advise the occupant and/or owner of the unsafe condition. The local utility company may be contacted for further immediate evaluation.

Inoperable

- Check to determine if the system is operable.

If the furnace is not operating properly, report the heating system as in need of correction. The inspector may look through the sight glass to check for a blinking light signaling an error code and document the code, if applicable. The error codes or diagnostic indicator table or chart may be attached to the furnace.

INSPECTION CHECKLIST

Thermostat

- Look at the thermostat.
- In the inspection report, describe the thermostat's location.

Furnace Description & Location

- Look at the furnace and its location.
- Describe the furnace's energy source and heating method.
- Report the heating system as in need of correction, if it was deemed inaccessible or if it did not operate.
- Check the accessibility of the system.

The furnace must be accessible for inspection, servicing, and replacement with an unobstructed passageway and solid continuous flooring at least 24 inches wide. If the furnace is located in the attic or underfloor crawlspace, the unobstructed passageway or opening should be at least 30 inches high by 22 inches wide, and the solid continuous flooring should be at least 24 inches wide and not more than 20 feet long. An opening for the furnace (such as an opening in an attic floor) should be at least 20x30 inches. There should be a 30x30-inch level workspace in front of a furnace.

The location of the furnace must not be in a sleeping room, bathroom, storage closet, or in a space that opens only into such rooms or spaces. There are exceptions: if the furnace is a direct-vent furnace, or is a furnace installed in a room that meets certain volume criteria outlined in the local building code. The furnace may be installed in a space that opens directly to a bedroom if there is a solid weatherstripped door that has a self-closing device and the combustion air is taken directly from outside.

Furnace Category

- Check the furnace category.

You'll commonly find Category I and Category IV furnaces. Category I furnaces operate with a negative vent pressure. They do not produce condensate, and their vent connector pipes are metal Type B (negative, no condensate, metal). Category IV furnaces operate with a positive vent pressure. They produce condensing flue gases, and their vent connector pipes are plastic (positive, condensate, plastic). The plastic vent pipes for Category IV furnaces may be specified or furnished by the manufacturer. Common plastic combustion air and venting pipes are made of Schedule 40 PVC or CPVC, but the manufacturer's installation instructions will identify the required plastic pipe material.

Type B vent connector pipes are made of metal and are designed for venting non-condensing gas appliances equipped with a draft hood or fan-assisted furnaces with a non-positive vent pressure (Category I).

Venting

- Look at the furnace venting.

According to the [InterNACHI® Home Inspection Standards of Practice](#), the home inspector is not required to inspect the interior of flues, chimneys, or vent connector pipes.

- Look at the exterior surfaces of the vent exhaust system (possibly the chimney, chimney liner, flue, inlet and exhaust vent) for signs of improper condensation, water corrosion, cracks, damage, and blockages.

Vent connector pipes connect the furnace to the vertical chimney or vent. The common connector pipe for Category I gas furnaces is Type B Double Wall, and the metal pipe should be installed from the

furnace to termination. Vent pipes must not pass through any air duct or furnace plenum.

- Look at the vent connector pipes for proper support, slope, and termination. Plastic vent connector pipes must slope at least 1/4" per foot of run so that condensate drains back to the furnace.
- Look at the outlet and inlet vent exhaust pipes and connections.
- Look for secure fastening and support of vent connector pipes. Supports should be installed every 4 feet without sags or dips.
- Look for insulation around plastic vent pipes that run through unconditioned spaces where below-freezing temperatures are expected.
- Look at the exterior surfaces of vent and chimney connector pipes for rust, discoloration, loose connections, and signs of condensate.
- Look at the vent connector pipes for inadequate clearance from combustible materials.
- Look at the exhaust transition connection between a draft inducer fan and the vent connector pipe.

There should be a minimum 1" clearance (air space) between the Type B vent connector pipe and combustible materials. A single-wall vent connector pipe requires at least 6" of clearance. The building code and the manufacturer's installation instructions will indicate the minimum clearances required between the furnace vent connector pipes and unprotected combustible materials. If a vent pipe passes through insulation, a metal shield should be installed to provide clearance between the vent pipe and the insulation.

- Look at the gas vent pipe termination.

Requirements for metal gas vent pipe terminations are described in the local building code. Gas vents of 12 inches or less in size and at least 8 feet away from a wall must terminate at least 1 foot above the roof surface having a slope of between flat and 6:12.

Chimneys and gas vent pipes, where applicable, must have flashing installed and must terminate with a listed cap.

Protective Barrier

- Look for a protective barrier.

Protective barriers must be installed if the furnace could be damaged by a moving vehicle, particularly if the furnace is inside an attached garage.

Light & Receptacle

- Look for a light.
- Look for a receptacle.

A light and an electric receptacle should be installed near the furnace.

Disconnect & Emergency Switch

An electrical service disconnect switch should be installed at the furnace.

- Look at the switch, its electrical box, plate cover, and wire.

An emergency shut-off switch may be installed at a distance far away enough from an unsafe condition at the furnace.

Cabinet

- Look at the cabinet, cabinet fasteners, and cabinet panels.
- Look at the required clearance (combustion and service) around cabinet.

The manufacturer's installation instructions will indicate the minimum clearances required between the furnace and unprotected combustible materials. There should be a clearance of at least 3 inches for a working space around the furnace cabinet.

- Turn off the furnace using the service shut off switch. Remove the cabinet panels from the furnace. This task is beyond the scope of a visual-only home inspection.

Blower Door Switch & Control Board

- Look at the blower door air lock switch, which is a safety switch for the blower fan compartment.
- Look at the blower housing, blower motor, fan blades, and electrical wires. Look for dirt accumulation.
- Look at the fan belt, if present.
- Look for free rotation and minimal play at the blower fan.
- Look at the connection of the blower fan assembly to the blower compartment.
- Look at the main control board or circuit board, which is typically located inside the blower fan compartment.
- Look at the transformer. Look at the wiring.
- Look at the electrical junction box.
- Check and listen to the blower fan during operation. Listen for unusual noise. Check for excessive vibration.

Gas Shut-off Valve, Sediment Trap, and Piping

- Look at the gas shut-off valve outside of the cabinet, near to the furnace.

The valve should be accessible, located within the same room as the furnace, installed within 6 feet of the furnace, and installed upstream of the union, connector or disconnect device.

- Look at the sediment trap (drip leg).

It should be installed downstream from the furnace's gas shut-off valve as close to the inlet of the furnace as possible. It can be of any length.

- Look at the gas piping.

There should not be flexible gas connector pipe installed inside the furnace cabinet. The gas piping must be solid pipe. Only hard metal gas pipe can pass through the furnace cabinet to connect with the gas valve assembly. The gas flexible connector (if installed) can not pass through the furnace cabinet. The gas flex connector must be completely visible in the same room with the furnace.

- Look for corrugated stainless steel tubing (CSST).

Look for Yellow-Jacketed Corrugated Stainless Steel Tubing (CSST). Yellow-Jacketed CCST is required to be electrically continuous and bonded to the electrical service grounding electrode system or, where provided, the lightning protection grounding electrode system. Look for a bonding jumper connected to a metallic pipe, pipe fitting, or CSST fitting. The bonding jumper must be at least 6 AWG copper wire or equivalent.

Black-Jacketed CSST has an arc-resistant jacket or coating system. The Black-Jacketed CSST must be electrically continuous and bonded

to an effective ground fault current path. Black-Jacketed CSST is considered to be bonded where it is connected to a furnace that is connected to an appliance grounding conductor of the circuit that supplies that furnace.

Gas Valve Assembly

- Look at the gas valve assembly.
- Check the inlet gas operation.

A label must be present if the furnace was converted from natural gas to Liquefied Propane (LP).

Inducer Motor

- Look at the inducer fan motor and blower assembly while it is operating.

Natural draft furnaces are old and no longer manufactured, energy-inefficient, and beyond their service life expectancies.

Pressure Switches

- Look at the pressure switches and hoses. There may be more than one installed for common two-stage furnaces.

Condensate

- Look at the condensate trap (for condensing units).
- Look at the condensate removal installation.
- Look at the condensate drainpipe and traps.

Category IV appliances produce condensate. Condensing furnaces should be provided with an auxiliary drain pan where damage may occur if the condensate drainage system fails. A pan is not necessary if the appliance has an automatic shut-down device installed.

- Look at the condensate pump, if one is installed.

If a condensate pump is connected to a furnace located in an uninhabitable space (such as an attic or crawlspace), the furnace should be installed to turn off automatically if its condensate pump fails. The condensate pump should have an overflow shutoff capability.

Burners & Manifold

The manifold is a metal gas pipe or tube that carries the gas from the main gas valve assembly to the burners.

- Look at the burner assembly and manifold. In-shot burners are common.
- Look at the cover panel. Look for indications of water, corrosion, and blockage.
- Look at the air shutters (if present).
- Check the burner ignition sequence during operation. Look at the burners as they turn on and fire.

Ignitor & Flame

- Look at the ignitor, the hot-surface ignitor or spark ignitor, and associated wiring. Look for corrosion, cracks, or damage.
- Look at the flame sensor, which is a small metal rod (flame-rectification probe), and associated wiring.
- Look at the flame roll-out switches and wires.

- Look for cracks at the hot-surface ignitor (you'll see white spots when it's energized).
- Check for proper operation. Listen to the clicking at a spark ignitor.
- Look at the ignition source. The ignition source should be at least 18 inches above a garage floor. In relation to this provision, rooms or spaces that are not part of the living space of a house and are open to a garage are considered to be part of the garage.
- Look at the flame for an erratic flame or anomalies during the operation of the blower fan._____

Limit Switches

- Look at the temperature limit switches and wires.

Electrical

- Look at the electrical components, connections, and wires.

Combustion Air

According to the [InterNACHI® Home Inspection Standards of Practice](#), the home inspector is not required to inspect combustion, ventilation, or dilution air. Air for combustion, ventilation and dilution of flue gases for gas-fueled central furnaces and heating systems must be provided by certain provisions listed in the manufacturer's installation instructions and the local building code. Outdoor air may be introduced in accordance with one of the methods described in the building code. Makeup air must be provided where clothes dryers and exhaust fans may interfere with the furnace's safe operation. The

minimum amount of indoor combustion air for the furnace is 50 cubic feet per 1,000 BTU/h of the furnace's input rating. The minimum amount of outdoor combustion air for the furnace may be provided by one permanent opening that is 12 inches from the top of the enclosure, or by two permanent openings, with one 12 inches from the top and one 12 inches from the bottom of the enclosure.

Air Distribution System

- Look for vibration isolators installed between the furnace and the metal ducts.
- Look at the air filter for dirt accumulation.
- Look at the air filter compartment, access opening, and air seal.
- Look at accessible ductwork for indications of moisture accumulation or biological growth.
- Look at accessible ductwork insulation, including exterior vapor retarders. Look for rips, voids, and damage.
- Look at accessible ductwork support, including duct strapping, hangers, sections, joints, and seams. Look for loose sections, open air leakage, and failing duct tape or mastic.
- Look for material on the duct indicating possible asbestos material. This is a defect and a hazard, even if the material appears to be intact.

Return air for a furnace should not be taken from a furnace room, an unconditioned attic, a closet, bathroom, kitchen, or a garage.

- Look for a supply source (duct register). Every habitable room should have a supply of conditioned air.
- Look at a representative number of grilles, registers, diffusers, and dampers for dirt accumulation.

Sequence of Operation

- Thermostat calls for heat.
- Inducer motor turns on.
- Pressure and limit switches check for problems.
- Hot-surface ignitor turns on and glows, or the electronic spark ignitor sparks.
- Power is sent to the gas valve, the gas valve opens (with a click), gas is supplied to the burners, and the burners ignite.
- Flame sensor confirms that there is flame.
- Flames heat the exchanger.
- Blower motor fan turns on and circulates air through the heat exchanger.
- Delta T is achieved.

Delta T

Delta T is the temperature difference between the supply air and return air. Delta T can be used to help diagnose system performance. Calculating Delta T is complex and is beyond the scope of a home inspection. Calculating Delta T at a forced-air ducted furnace involves an HVAC technician subtracting the return air temperature from the supply air temperature, and the difference is the Delta T or the difference in the temperature.

Delta T for a heating system may be indicated by the data plate on the furnace as the temperature rise minimum and maximum. It may be a 30-degree difference in temperature. If the Delta T is high, poor airflow may be the problem. If Delta T is low, the furnace capacity may be inadequate.

References:

- [InterNACHI® Home Inspection Standards of Practice](#)
- 2018 International Residential Code, Chapter 24: Fuel Gas

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