



# HOUSE DIAGNOSTIC SERVICES

Minnesota Department of Commerce Energy Information Center

Having your house 'diagnosed' will give you critical information you should have before you invest in any major home improvement projects.

Does your home have moisture problems, ice dams, window condensation, or poor ventilation? Are you concerned about carbon monoxide and other indoor pollutants? Are your utility bills too high? If so, you may need house diagnostic service performed by a professional building performance specialist. These specialists, sometimes referred to as "house doctors," have the diagnostic tools and the expertise to find the underlying cause of your home's problems and understand the "house as a system."

This guide explains what house diagnostics entails and will help you decide if and when your house needs diagnostic service. By providing a simple explanation of the various diagnostic tests available to you as a homeowner or builder, you will be prepared to shop for the specific services you need, whether it be one specific test for one specific problem or a comprehensive, whole house diagnostic package.

Following is a list of the primary diagnostic tests and services available to homeowners. Not all service providers perform all the tests, so make sure you find a specialist with the tools and expertise needed to properly address your home's problems.

### For the building envelope:

- Visual inspection for attic, wall, window, roof, foundation and crawlspace problems
- Infrared inspection of attic, wall, and foundation insulation
- Moisture test of building materials
- Air pressure diagnostics for air leakage (blower door test)

### For fuel combustion appliances:

- Carbon monoxide testing
- Draft pressure and spillage tests
- Combustion efficiency test
- Heat exchanger leak test
- Inspection and testing of ductwork leakage
- Combustion air requirements
- Make-up air requirements

### For indoor air quality:

- Measuring carbon dioxide levels
- Measuring humidity levels
- Carbon monoxide testing
- Identifying mold sources
- Evaluating mechanical ventilation



### Related Guides:

- Combustion & Makeup Air
- Indoor Ventilation
- Home Insulation
- Caulking & Weatherstripping
- Basement Insulation
- Attic Bypasses
- Windows & Doors
- Home Moisture
- New Homes

## What diagnostic testing will tell you

Having your house 'diagnosed' by a building performance specialist provides critical information about your house before you invest in any major improvements.

- Is there enough fresh air coming in for your health and comfort and for your fuel burning appliances to operate safely?
- Could your house be too 'tight'?
- What is the carbon monoxide level in your home? (long term and short term levels)
- Are the furnace, boiler, and water heater properly venting to the outside? Are they operating as efficiently as they should be?
- Is the air inside your home too dry?
- Where are the inside air leaks and attic bypasses that are causing ice dams on the roof?
- Are there gaps in your wall or attic insulation?

## When does a house need diagnostic services?

Most any home, new or old, benefits from house diagnostic testing. However, there are occasions when having a professional diagnosis can make the difference between spending or saving a lot of time and money to get the results you want. For example, if you experienced damage from ice dams, a new roof may not be the solution. Rather, you need to identify and correct the cause of the ice dams, which may be attic bypasses or a complex roof design. Diagnostic testing is most important in the following situations:

- **Homeowners who are planning a remodeling project or investing in any major home repair projects** should consider home diagnostic services a worthwhile investment before they begin the project and after completion.
- **When replacing appliances such as a furnace or boiler or a water heater, installing new windows or doors or adding new siding to a home**, the air leakage rate is changed. Any improvements made to a home that reduces air flow in a house may result in insufficient natural ventilation to remove moisture and other home pollutants and may reduce the amount of combustion air available for fuel burning appliance to operate safely.
- **Kitchen remodeling** where a new range and exhaust fan are added.
- **Prior to investing in mechanical ventilation** a blower door test can help determine the tightness of a house as well as the need for and type of controlled ventilation.
- **If mold and mildew are a problem**, diagnostic testing may be used to identify the moisture source causing the mold. Keep in mind, however, that most home performance specialists are not mold experts and that diagnostic testing does not always identify types of mold.
- **Any home with unexplained or chronic moisture problems** needs house diagnostic services to discover the sources of moisture. This will not only save money and time wasted on unsuccessful trial and error attempts at remedies, but can save the house itself from structural damage.

- **Anyone considering building a new home** may want to include diagnostic testing in their plans. A house diagnostician can identify potential problems and make improvements during the planning stage. Performing a blower door test before the sheetrock is in place will identify points of air leakage where potential moisture problems could develop. After the sheetrock and all appliances are installed, the house should be tested again for possible backdrafting problems.

## Common diagnostic tests

**Blower door test:** A blower door test is a primary air pressure diagnostic tool that uses controlled pressure to locate the air leaks and determine the overall tightness of the house. The blower door equipment measures the structural air leakage by using a calibrated fan which creates an artificial pressure difference between the interior and exterior of the house. This test helps the specialist assess if there is sufficient natural ventilation to provide fresh air for the occupants of the house and adequate combustion and make-up air for appliances, such as the furnace or boiler, the water heater or gas stove. Identifying 'tightness' is an important element in understanding many problems, including window condensation.

**Series leakage test:** A series leakage test, a blower door test, provides more specific information about building air leakage, such as how much attic bypass leakage is there? Are the knee walls leaky to the inside or to the outside? How leaky is the basement perimeter? Are there leaks between the attached garage and the house? How will sealing the garage affect the house? Series leakage tests are a critical component in measuring air leakage and then predicting the results of sealing bypasses. For example, this type of pressure diagnostics may be used to detect carbon monoxide coming from an attached garage.

**Combustion Safety Test:** Combustion appliances such as gas furnaces and boilers, gas water heaters, or gas fireplaces should be checked for backdrafting potential at the time of installation and again when any modifications are made to the home. This appliance safety test measures the draft pressure for most furnaces, boilers and water heaters, with the exception of sealed combustion and power vented equipment. The test is performed when all exhaust appliances such as a

clothes dryer, and bathroom and kitchen exhaust fans are operating. A blower door may be used to simulate down draft conditions. If spillage and backdrafting occur, the diagnostician should recommend the appropriate course of action.

**Infrared inspection test:** An infrared camera inspection can identify air leakage paths, called bypasses, as well as air movement in a home. It may detect high moisture content of building materials, including wet insulation. The infrared scan detects surface temperatures and visualizes “heat energy” in wall cavities enabling the building performance specialist to identify problem areas such as gaps in insulation and bypasses.

**Indoor air quality test:** If the major pollutant sources in the house are eliminated, the combustion equipment is safe, and ventilation is adequate, the house will usually have good indoor air quality. Diagnostic testing offers the homeowner an understanding of how their house is performing and which strategies to use for improving indoor air quality. Keep in mind that most house diagnosticians are not experts on mold. While they can identify its source, do not expect them to evaluate or classify the mold itself.

**Moisture diagnostic test:** Many factors may influence moisture levels in a house. If a home has window condensation, evidence of mold, moisture on walls or in the attic, a building performance specialist can perform a test to determine the indoor humidity levels. The specialist may use a moisture meter to determine the moisture level of the building materials or a relative humidity gauge, called a hygrometer, to determine the humidity level of the indoor air. Along with this information the homeowner is offered recommendations for managing indoor humidity. If installing exhaust fans is required to remove moisture from the home, then it is critical that a combustion safety test and draft pressure test is performed to ensure that combustion gases are not backdrafting into the house. Keep in mind that combustion gases may or may not include carbon monoxide.

## What is the cost of diagnostic service?

Before you begin diagnostic testing, ask your local gas or electric utility if they offer home energy audits. Having an energy audit done first will provide you with valuable information that can limit the cost of, or preclude the need for, diagnostic testing. Some diagnostic testing may be included in utility audits.

The cost of diagnostic service varies with the degree of analysis and expertise, so it is advisable to shop around for a service provider as you would shop for other products and services. Be aware that many home performance specialists provide only a diagnosis and recommendations for treatment and do not do the repair work themselves. Others may offer to fix the problems and the homeowner may choose to contract with them. Most specialists will send information to you describing their services and a price list. The more specific you can be about the problems in your home, the more you will be able to get a reliable estimate from the diagnostician.

## Where can I find a building performance specialist?

The Energy Information Center recommends the Home Performance with ENERGY STAR program. This federal government program is a whole-house approach to improving the overall comfort and energy efficiency of your home. A qualified contractor who understands how your house acts as a “system” will perform a top to bottom energy inspection of your home using the diagnostic tools described in this guide. The inspection will help discover the cause of problems such as cold rooms, ice dams, damp basements, and moisture problems. A list of ENERGY STAR qualified home performance specialists in Minnesota is available from the ENERGY STAR Web site ([www.energystar.gov](http://www.energystar.gov) > “Home Improvement” > scroll down to “Need Help” and select Minnesota).

For additional information contact the Energy Information Center.

## Minnesota Department of Commerce

Suite 500  
85 7th Place East  
St. Paul, MN 55101  
www.commerce.state.mn.us

## Energy Information Center

Twin Cities:  
651-296-5175

TTY: 651-297-3067

E-mail:  
energy.info@state.mn.us

This information will be made available, upon request, in alternative formats such as large print, Braille, cassette tape, CD-ROM.

This publication was produced with funds from a U.S. Department of Energy State Energy Program grant. However, any opinions, findings, conclusions, or recommendations expressed herein are those of the author and do not necessarily reflect the views of the Department of Energy.



MINNESOTA  
DEPARTMENT OF  
COMMERCE

022500D

## Minnesota Home Energy Guides

This guide is one in a series of publications designed to help Minnesotans save energy in their homes. Copies of the titles listed below are available by calling or contacting the Minnesota Department of Commerce.

**CD-ROM** contains all of the Home Energy Guides as well as several other publications of interest to homeowners, builders and contractors.

**Appliances** advises consumers on what to look for in energy efficient appliances and includes information on efficient operation and maintenance of refrigerators, freezers, washers, dryers, dishwashers, cooktops, ovens, and home office equipment.

**Attic Bypasses** explains how to find those "hidden air passageways" and fix them to prevent costly heat loss and damage to roofs, ceilings, walls, and insulation.

**Basement Insulation** discusses options to improving basement comfort, many not even involving insulation. It also provides details on exterior basement insulation, special foundation products and recommendations on interior insulation.

**Caulking and Weatherstripping** describes how to identify sources of air leaks, lists various types of caulk and weatherstripping, and provides illustrated how-to-apply instructions.

**Combustion & Makeup Air** describes the causes of dangerous combustion air problems and tells how to install an outside combustion air supply. It also tells how to test your home for combustion air problems.

**Energy Saving Landscapes** describes how to use trees and shrubs for long-term energy savings, and lists trees appropriate for energy-savings.

**Home Cooling** tells you how to cool without air conditioning, and provides information on buying and operating energy efficient air conditioners.

**Home Heating** describes proper maintenance techniques and helps you become an educated shopper if you are buying a new heating system.

**Home Insulation** helps the homeowner evaluate the benefit of added insulation, providing information on buying and installing insulation.

**Home Lighting** looks at new technologies for residential lighting, identifying four basic strategies and providing examples for putting them into practice.

**Home Moisture** describes symptoms of moisture problems, lists common indoor and outdoor causes, and discusses preventive and corrective measures.

**Indoor Ventilation** describes the types of home mechanical ventilation systems that are available, the amount of ventilation air needed, and how best to operate and maintain the system.

**Low Cost/No Cost** addresses the often overlooked energy saving tips for all areas of your home.

**New Homes** discusses a wide range of options for increasing energy efficiency beyond the normal building code requirements. Subjects covered include insulation, ventilation, air-vapor controls, heating and cooling, windows, doors, and appliances.

**Water Heaters** helps you determine whether to buy a new water heater or improve the old one. It explains the efficiency of different types of water heaters and provides installation tips.

**Windows and Doors** helps you decide whether to replace or repair windows or doors and gives a good summary of energy efficient replacement options.

**Wood Heat** offers advice on purchasing and installing a wood stove, with special emphasis on safety.