



The Ontario Association of
Home Inspectors

Working Draft of the

Performance Standard and Knowledge Base
for the
HVAC

(Heating Ventilation & Air Conditioning)

Mandatory Baseline Accreditation
Requirement

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1. Introduction

- a. Home inspectors are independent consultants providing an impartial assessment of building conditions to assist their clients' property decisions. Inspections are typically performed for buyers or occupants of small residential and light commercial (non-assembly) properties. The goal of the inspection is to:
 - (i) describe installed building systems by their type,
 - (ii) identify defects that are significant to safety, normal function, and the clients's intended use, and
 - (iii) report the findings and recommendations to the client.
- b. This document is restricted to the skills and knowledge required for the competent inspection of HVAC systems. HVAC (Heating, Ventilation, Air conditioning) refers to permanently installed systems providing heating, cooling, ventilation and associated air tempering (such as filtration, humidification and dehumidification) to the building.
- c. This document is based on the OAHI validation session held at Humber College in January 2001, during which a group of experienced OAHI members validated the component skills and knowledge required for the various inspection subtasks.
- d. This document is the property of the Ontario Association of Home Inspectors. The information contained within this document is subject to change without notice. This document may be freely distributed in Adobe Acrobat format, but must not be altered from the original format. This document was written by Terry Carson of Guardian Home Inspectors Inc. Toronto for the OAHI.

2. Purpose

The purpose of this document is

- a. to provide students and educators in the home inspection field with the areas of study and background knowledge needed to achieve a basic understanding of the HVAC requirements for small buildings of residential and light commercial (non-assembly) occupancies, in order to perform inspections of these systems in accordance with the standards of the OAHI; and
- b. to provide the profession with a format for defining the HVAC curriculum for home inspectors, and determining the importance of various skills and background knowledge for curriculum development and qualification testing.

3. Learning Outcomes

Upon successful completion of areas of study outlined in this document, the student will be able to:

- a. identify the various components typically found in residential HVAC Systems and be familiar with the fundamental principles of their operation (background theory and terminology);
- b. identify typical residential HVAC Systems, both new and old, have a basic understanding of the legal requirements regulating the installation and maintenance of these systems, and know where to find references;
- c. understand how to safely perform visual inspections of HVAC Systems in accordance with OAHV standards, and understand proper use of tools and procedures necessary to do so;
- d. identify and report deficiencies commonly found in these installations, and make recommendations to the client in a clear and concise manner; and
- e. understand the interrelationship of HVAC systems and components with other building components, and the impact of HVAC related deficiencies on the building and its occupants.

4. Knowledge and Skill Types

A home inspector requires five knowledge and skill types to competently perform the various inspection tasks. Students should be able to demonstrate a basic understanding of the following:

- a. Background Theory and Terminology

Understand terminology, operating principles, normal operation, and interaction of HVAC systems and their components with other building systems, to the extent that these concepts can be explained to a non technical client.
- b. Installation and Maintenance Practices

Understand how HVAC systems and their components should be installed and maintained, to the extent that significant installation and maintenance deficiencies can be identified and described.

c. Related Regulations and Requirements

Understand code and other legal requirements for installation and maintenance for HVAC systems, to the extent that significant deviations can be identified and described, with the assistance of appropriate references.

d. Inspection Procedures, Tools and Safety

Understand which visual and functional tests should be performed, parameters of acceptable conditions, which tools used, and associated limitations and safety issues, to the extent that the student can describe appropriate inspection procedures, acceptable conditions and safety concerns for common HVAC equipment.

e. Reporting Defects

Understand how defects should be reported both verbally and in writing to the extent that the client or others affected understand the significance of the situation, and act accordingly. Students should be able to apply the OAHV Defect Recognition and Reporting Five-Step Model for Analyzing and Reporting conditions.

- i. Describe the component and its installation
- ii. Identify the function it performs
- iii. Identify the deficiency and how it affects the function
- iv. Identify how will this condition affect the client, owner or occupant
- v. Report so the client understands and acts on your recommendations

5. HVAC Inspection Task Types (Description and Rationale)

Tasks typically performed by home inspectors are as follows:

a. Identify a system or component by its type

The home inspector identifies a system or component by its characteristics to distinguish it from other types. The home inspector describes the system or component in writing to document that the component was inspected and to verify technical information which may have been represented by others. The home inspector frequently explains details of the operation, required maintenance and other serviceability issues to the client, based on the type.

Aspects of the system or component which are commonly identified by type include:

- i purpose or function of the system or component,
- ii location of equipment,

- iii energy source(s),
- iv efficiency rating,
- v extent of building area served by the system,
- vi operating controls, and
- vii distribution system.

b. Visually observe the physical condition

The home inspector conducts a visual examination of readily accessible components with the goal of determining if the components appear to be in safe and serviceable conditional, capable of meeting the required function. The home inspector reports in writing situations in which equipment appears to be unsafe, damaged, deteriorated, unserviceable or not functioning, and provides recommendations regarding corrective action or further evaluation.

Aspects of the physical condition which are typically observed include:

- i location and clearances of equipment,
- ii age, rating and size (capacity) of the equipment,
- iii installation, and connections to other components
- iv apparent state of repair, and
- v presence of deterioration, damage or other conditions that affect normal operation.

General Limitations - A home inspector by virtue of his or her training should be capable of opening access panels intended for the use of the occupant, or designed to permit easy component inspection without disassembly of operating components. The home inspector should not be opening equipment where there is a risk of damage, disruption or safety may be compromised. The client should be advised when equipment can not be observed and why.

c. Observe operation of a system or component

The home inspector operates the system or component by activating normal operating controls intended for the use of the occupant, such as thermostats. The home inspector reports in writing situations in which the operation of a component can not be tested, or appears to be unsafe, not functioning, malfunctioning or not capable of meeting its required function and provides recommendations regarding corrective action or further evaluation.

Aspects of the operation of a system or component which are typically observed include:

- i combustion or cooling sequences and cycles,
- ii operating temperatures,
- iii intake and distribution of heated, cooled or tempered air or water
- iv presence of abnormal discharge, leaks, odours, vibration or other apparent malfunctions.

General Limitations - A home inspector by virtue of his or her training should be capable of operating systems with controls intended for the use of the occupant and detecting readily observable defects and malfunction. The home inspector should not be operating equipment which is shut down, where the controls are unclear, or any other situation where there is a risk of damage, disruption or safety may be compromised. The client should be advised when equipment can not be operated and why.

6. HVAC Systems and Components (Typical Types)

Home inspectors need to be familiar with the typical residential HVAC system types and components as listed below.

a. Typical Heating System Types

The following heating system types are typically encountered by home inspectors:

i Central forced air system

A central forced air heating system consists of a central furnace (or heat producing unit) providing heat throughout the building by means of a fan driven distribution system with air ducts to an outlet in each room or area. The student should be familiar with the common fuel/ energy sources: natural gas and fuel oil, and to a lesser extent propane, electricity, auxiliary heat pump, wood and ground source heat. Gravity air systems without fan driven distribution are included within this category.

ii Central hot water

Central hot water heating systems consists of a central furnace or boiler providing heat throughout the building by means of heating pipes to a radiator in each room or area. The student should be familiar with central hot water (hydronic) systems, and to a lesser extent, steam systems. The student should be familiar with the common fuel/ energy sources: natural gas and fuel oil, propane, and electricity. Central hot water systems can be combined with forced air distribution systems, and domestic hot water systems.

iii Space or room heaters

These systems consist of permanently installed heaters with heat distribution restricted to the area immediately adjacent to the heater. The fuel/ energy source is typically natural gas, fuel oil, propane, electricity, or heat pump. Space or room heaters may be the primary heat source in a building, or may provide supplemental heat to a central system. Portable heaters powered by electricity or kerosene are not considered permanently installed heaters intended to provide the required heating needs of the building, but the reliance on such portable heaters or unsafe conditions may be an issue reported by the home inspector.

iv Wood Stoves and Fireplaces

Wood stoves and fireplaces provide heat to the area immediately adjacent to these units. Wood stoves and fireplaces may provide the primary heat source for a small building, or may provide supplemental heat to a room or area, or merely serve a decorative purpose. With the exception of some automatic pellet stoves and gas fireplaces (which may also be classified as space or room heaters), wood stoves and fireplaces generally lack automatic temperature and safety controls.

v Other permanently installed heating equipment

Some heat producing appliances and equipment operate in the same manner as systems providing heat to the building. Domestic hot water heaters with combustion energy sources are within the scope of the inspection. Inspection of other equipment is not required according to OAHV Standards, but may impact on occupant safety or other building systems. Examples include gas fired ranges, clothes dryers, pool heaters, gas barbecues and electric saunas. The home inspector should be able to draw on knowledge and skills to identify the equipment type, and refer the client to obtain further technical evaluation of the equipment when appropriate. The home inspector may encounter defects and should report conditions such as; excessive moisture, insufficient clearances, and deteriorated fuel and flue connections. The client should understand the extent of inspection performed on such components.

b. Heating Components Inspected

The components inspected typically include:

- i fuel/ energy sources and fuel distribution;
- ii operating and safety controls;
- iii combustion or heat producing equipment;
- iv exhaust gas flues and vents;
- v combustion air supply;
- vi heat distribution system (fans, plenums, ducts, pumps pipes, outlets, radiators, convectors, pipes, etc.); and
- vii ancillary cooling, ventilation and air tempering equipment such as air conditioning cooling evaporator coils, humidifiers, filters and HRV's.

Home inspectors typically identify heating system types according to:

- i fuel;
- ii method of heat distribution (eg. forced air or hot water);
- iii efficiency rating;
- iv combustion venting; and
- v location served.

c. Typical Cooling System Types

The following cooling system types are typically encountered by home inspectors:

i Central forced air

A central forced air cooling system consists of a condenser and evaporator unit coupled with a central ventilation system. Cooled air is circulated to different parts of the building by air ducts, typically shared with a central forced air heating system, or separate. These systems are typically electrically powered, though a limited number of gas powered condensers remain in use. Most condensers are air cooled, though water cooled systems are also in use.

ii Space or room cooling units

Space or room cooling units consist of a condenser and evaporator unit which provides cooled air to the area immediately adjacent to the indoor cooling unit. These systems are typically electrically powered and air cooled. They may be installed as a single unit such as window or wall air conditioner; a split system where the condenser is located outside and an indoor evaporator unit is connected by coolant lines; or a single condenser serving several indoor evaporator units.

iii Heat Pumps

Heat pumps are cooling units which may be operated in reverse cycle to provide building heat during cold weather, as well as cooling during warm weather. Heat pumps may be central forced air or space / room units. The heat producing ability is diminished below outside freezing temperatures. A heat pump for this reason usually has an auxiliary heating unit, or is part of a central heating system.

iv Other permanently installed cooling equipment

Other cooling equipment beyond the scope of OAHV Standards may impact on occupant safety or other building systems. Examples include portable window air conditioners, gas fired refrigerators, pool heaters (heat pumps), and refrigerated wine storage rooms. The home inspector should be able to draw on knowledge and skills to identify the equipment type, and refer the client to obtain further technical evaluation of the equipment when appropriate. Obvious defects such as insufficient clearances, support, electrical supply, fuel and flue connections should be reported.

d. Cooling Components Inspected

The components inspected typically include:

- i energy sources;
- ii operating and safety controls;
- iii cooling equipment such as condensers, compressors, evaporators, coolant lines and condensate discharge;
- iv cold air distribution; and
- v ancillary air tempering equipment such as air filters as described below.

Home inspectors typically identify cooling system types according to:

- i energy source;
- ii location of cooling equipment;
- iii whether air cooled or water cooled,
- iv cold air distribution; and
- v location served

e. Ventilation Systems Inspected

The following ventilation system types are typically encountered by home inspectors and should be familiar to students.

i Exhaust fans, Fresh air sources and HRV's

Exhaust fans are commonly installed in high humidity areas such as bathrooms, laundry rooms and kitchens to reduce moisture levels and odours. Other exhaust fans may be installed in roofs spaces or other locations. A similar exhaust fan function is served by clothes dryers (not part of OAHV Standards). Fresh air sources may be present as a source of make up air for combustion appliances, as a direct connection to forced air return air systems and as part of a heat recovery ventilation (HRV) unit. An HRV is commonly installed in energy efficient buildings to transfer the heat from exhausted stale air to incoming fresh cold air.

ii Humidification

Humidifiers may be either independent or part of a forced air heating or cooling system. Humidifiers are commonly rotating drum or flow through type.

iii Air filters

Air filters are usually part of forced air or other ventilation system. Filters installed as part of a forced air heating or cooling system are commonly passive or electrostatic type.

iv Other air tempering equipment

Specialty air tempering equipment, such as indoor pool area dehumidifiers may be encountered, but should be referred for specialized technical evaluation, due to its complexity. Improper use or failure of this equipment can have adverse effects on the building interior.

f. Ventilation and Air Tempering

The components inspected include:

- i energy sources;
- ii operating and safety controls;
- iii air handling equipment such as fans and motors;
- iv attached ducts, inlets, and discharge outlet points.; and
- v air tempering equipment such as filters, humidifiers and dehumidifiers.

Home inspectors typically identify ventilation and air tempering system types according to:

- i function,
- ii location, and
- iii attachment to other heating or cooling equipment.

7. Specific HVAC Inspection Tasks and Required Knowledge/Skills

The knowledge and skills required to competently perform inspections are listed in the Appendix according to the Tasks summarized below. This listing is not intended to be all inclusive and may not include all systems or situations a home inspector may encounter in the field.

Heating

1. Identify heating system type
2. Inspect condition of fuel distribution and storage
3. Inspect condition of heat producing equipment
4. Inspect condition of operating and safety controls
5. Inspect condition of exhaust gas flues and vents
6. Inspect condition of combustion air supply
7. Inspect condition of heat distribution system: (fan, pump, plenum, ducts, pipes etc.)
8. Inspect condition of ancillary ventilation equipment such as filters and humidifiers.
9. Observe operation of heating system
10. Observe condition of fireplaces and wood stoves

Cooling (Including Heat Pumps)

11. Identify cooling / heat pump system type
12. Inspect condition of cooling equipment
14. Inspect condition of air distribution fans, plenums, ducts, inlets and outlets
15. Inspect condition of ancillary ventilation equipment such as filters
16. Observe operation of cooling / heat pump system

Ventilation

17. Identify ventilation system type
18. Inspect condition of operating and safety controls
19. Inspect condition of air handling equipment such as fans and motors
20. Inspect condition of air distribution system such as attached ducts, inlets, and discharge points
21. Inspect condition of humidifiers, filters and other air tempering equipment
22. Observe operation of ventilation system

8. Explanation of Importance Scale

The importance of the knowledge and skills has been validated by experienced OAHV members, according to a Likert scale ranking of Importance or Frequency of Practice. The home inspector is likely to encounter certain types of equipment and issues based on geographic location, individual tools and practices, and types of properties inspected. The importance of various skills and background knowledge and the ranking of individual skills and knowledge required may change in future updates of this document. The following scale has been applied:

Likert Scale Ranking of Importance or Frequency of Practice

- | | | |
|----|-----------|---|
| 1. | Never | The skill or knowledge is never required for performing a competent inspection. |
| 2. | Seldom | The skill or knowledge is seldom or infrequently required for performing a competent inspection. |
| 3. | Sometimes | The skill or knowledge is sometimes or frequently required for performing a competent inspection. |
| 4. | Usually | The skill or knowledge is usually or in most situations required for performing a competent inspection. |
| 5. | Always | The skill or knowledge is always required for performing a competent inspection. |

The Mean score of Importance indicates the average ranking (as scored by a number of individuals) and may be categorized and interpreted as follows:

- i Essential Category (Mean score between 3.5 and 5.0)

These skills and knowledge are fundamental to performing a competent inspection and should receive priority for educational presentation and qualification testing.

- ii Useful Category (Mean score between 2.0 and 3.5)

These skills and knowledge are useful and sometimes required for performing a competent inspection, but should receive lower priority in both educational presentation and qualification testing.

- iii Peripheral Interest (Mean score between 0 and 2.0)

These skills and knowledge are seldom required for performing a competent inspection, but should receive some (minimal) mention in educational presentation and qualification testing.

9. Qualification Testing Formula

Students should be evaluated according to the following weighting.

a. Weighting of Skill Types (50% Theory and 50% Application)

As a guideline, 50 % of the grade weighting should be comprised of background Theory and Terminology, Installation and Maintenance Practices, and Related Regulations and Requirements. The remaining 50 % should be comprised of Inspection Procedures, Tools, Safety and Reporting Defects.

b. Importance of the Concepts

As a guideline, 60 % of the weighting should be concepts considered to be in the Essential Category, 30 % of the weighting should be concepts considered to be in the Useful Category, and the remaining 10% of the weighting should be concepts considered to be in the Peripheral Category.

10. Reference Texts

a. Background Theory, Terminology, Installation and Maintenance

i Fundamentals of Gas Utilization (3rd Ed.)

ii Residential Mechanical Ventilation (HRAI)

iii Wood Energy Technical Training Reference Manual

b. Regulations

i Ontario Building Code 1997
Part 6. Heating Air Conditioning and Ventilation
Section 9.32 Ventilation systems
Section 9.21 Fireplaces

ii Ontario Gas Utilization Code
(Natural Gas and Propane Installation Codes B149.1-00)

iii Fuel Oil Code

iv Solid Fuel Installation Code (CSA B 365)

c. Home Inspection Practice and Procedures

Various authors and proprietary training materials.

Ref. refers to inspection tasks described in Section 7, Specific HVAC Inspection Tasks and Required Knowledge/Skills
 Validation Score (between 0-5) and Importance are described in Section 8, Explanation of Importance Scale

Ref.	Validation Score Importance	To complete the inspection task, a competent home inspector requires the knowledge and skills as described	
1.01		Identify heating system type Understand the basic operating principles and components of heating systems, their similarities and distinguishing characteristics of the following system types: forced air, gravity air, hydronic, steam, mid and high efficiency gas, central electric, heat pump, combined forced air hydronic, combined hydronic/ domestic hot water, wood stoves, fireplaces and various room and space heater types.	Background Theory and Knowledge
1.02		Identify heating system type Understand the similarities and distinguishing characteristics of the following fuel type systems: natural gas, propane, fuel oil, electricity, and wood.	Background Theory and Knowledge
1.03	4.89 Essential	Identify heating system type Understand principles of heat transfer, convection, conduction, radiation as they apply to all heating system types.	Background Theory and Knowledge
1.04		Identify heating system type Understand the principles of combustion including the fire triangle; properties of various fuels; requirements for combustion air, dilution air and combustion gas venting.	Background Theory and Knowledge
1.05	4.56 Essential	Identify heating system type Understand principles of latent heat, evaporation, sensible heat, condensation, how systems work by these principles, furnace efficiency and ratings as they apply to all systems and fuel types.	Background Theory and Terminology
1.06	4.80 Essential	Identify heating system type Understand how to read rating plates, installation and approval tags, and other markings to determine rated input, output, efficiency, required clearances and age of equipment.	Inspection Procedures Tools and Safety
1.07	4.30 Essential	Identify heating system type Understand how to use reference books, flashlight, and mirror to distinguish type and age of heating equipment.	Inspection Procedures Tools and Safety
1.08		Identify heating system type Understand the basic principles of determining the heating requirements of a building including: heat loss heat gain calculations, sizing of heat outlets in each room or area, the installation and approval process and be able to interpret heat layout plans.	Installation and Maintenance Practices
1.09		Identify heating system type Understand which government jurisdictions and other authorities regulate installation and maintenance of heating systems.	Related Regulations and Requirements
1.10	3.60 Essential	Identify heating system type Understand the various sections of the Ontario Building Code and the Ontario Gas Utilization Code governing the sizing and installation of heating equipment.	Related Regulations and Requirements

Ref. refers to inspection tasks described in Section 7, Specific HVAC Inspection Tasks and Required Knowledge/Skills
 Validation Score (between 0-5) and Importance are described in Section 8, Explanation of Importance Scale

Ref.	Validation Score	Importance	Description	Knowledge/Skills
			To complete the inspection task, a competent home inspector requires the knowledge and skills as described	
1.11	4.40	Essential	Identify heating system type Understand how to report deficiencies such as the misapplication of furnace type or installation.	Reporting Defects
2.01	4.60	Essential	Inspect condition of fuel distribution or storage Understand the properties of various fuels (natural gas, fuel oil, propane, wood) including physical state, relative volatility, and odours; and the requirements for distribution and/or storage of these fuels.	Background Theory and Terminology
2.02	4.50	Essential	Inspect condition of fuel distribution or storage Recognize common defects with the assistance of reference standards, flashlight and mirror.	Inspection Procedures Tools and Safety
2.03	4.90	Essential	Inspect condition of fuel distribution or storage Understand methods to inspect for fuel leaks, such as odours (smell), soap solutions, gas detectors, prohibited practices such as use of open flame testing.	Inspection Procedures Tools and Safety
2.04	4.70	Essential	Inspect condition of fuel distribution or storage Recognize signs of deterioration and damage such as rust on tanks, supports and underground storage tanks.	Inspection Procedures Tools and Safety
2.05	4.60	Essential	Inspect condition of fuel distribution or storage Understand how to use a flashlight and mirror for inspecting fuel distribution and storage systems.	Inspection Procedures Tools and Safety
2.06	2.20	Essential	Inspect condition of fuel distribution or storage Understand how to use a gas detector for finding leaks in fuel distribution lines.	Inspection Procedures Tools and Safety
2.07	4.70	Essential	Inspect condition of fuel distribution or storage Distinguish piping materials, storage tanks, pressure regulators and understand requirements for connections, joints, clearances and supports.	Installation and Maintenance Practices
2.08	4.70	Essential	Inspect condition of fuel distribution or storage Recognize inappropriate materials for piping and fittings.	Installation and Maintenance Practices
2.09	4.30	Essential	Inspect condition of fuel distribution or storage Recognize proper locations, clearances, materials, supports.	Installation and Maintenance Practices
2.10	4.70	Essential	Inspect condition of fuel distribution or storage Understand requirements for installation and maintenance of fuel distribution and storage systems including the fire code, fuel safety codes, and requirements for oil storage tanks., including removal of abandoned underground oil storage tanks.	Related Regulations and Requirements

Ref. refers to inspection tasks described in Section 7, Specific HVAC Inspection Tasks and Required Knowledge/Skills
 Validation Score (between 0-5) and Importance are described in Section 8, Explanation of Importance Scale

Ref.	Validation Score	Importance		
			To complete the inspection task, a competent home inspector requires the knowledge and skills as described	
2.11	4.20	Essential	Inspect condition of fuel distribution or storage Understand requirements for bonding gas supply pipes on new installations.	Related Regulations and Requirements
2.12	3.80	Essential	Inspect condition of fuel distribution or storage Understand requirements for gas regulator location and vent termination.	Related Regulations and Requirements
2.13	4.80	Essential	Inspect condition of fuel distribution or storage Understand how to report deficiencies such as deterioration, age of tank, improper mounting, clearances.	Reporting Defects
3.01	4.80	Essential	Inspect condition of heat producing equipment Understand the principles of venting, draft, barometric controls, sizing of equipment and clearances from combustible building assemblies.	Background Theory and Terminology
3.02	4.70	Essential	Inspect condition of heat producing equipment Understand the principles of air filtration and electronic air filters and their impact on the condition of heat producing equipment.	Background Theory and Terminology
3.03	5.00	Essential	Inspect condition of heat producing equipment Understand how to inspect for soot, dirt, corrosion, connections and related combustion chamber problems, and the significance of these conditions.	Inspection Procedures and Safety
3.04	4.70	Essential	Inspect condition of heat producing equipment Understand how to inspect the heat exchanger (if accessible), and report limitations.	Inspection Procedures and Safety
3.05	4.50	Essential	Inspect condition of heat producing equipment Understand how to inspect accessible components such as wiring, controls, belts, etc.	Inspection Procedures and Safety
3.06	4.60	Essential	Inspect condition of heat producing equipment Understand how to identify equipment approval markings, inspection tags and red tags and their significance.	Inspection Procedures and Safety
3.07	4.80	Essential	Inspect condition of combustion or heat producing equipment Understand how to use a flashlight and mirror to inspect heat producing equipment.	Inspection Procedures Tools and Safety
3.08	4.30	Essential	Inspect condition of heat producing equipment Understand how to reference manufacturer's installation instructions to verify proper installation and clearances.	Installation and Maintenance Practices

Ref. refers to inspection tasks described in Section 7, Specific HVAC Inspection Tasks and Required Knowledge/Skills
 Validation Score (between 0-5) and Importance are described in Section 8, Explanation of Importance Scale

Ref.	Validation Score Importance	To complete the inspection task, a competent home inspector requires the knowledge and skills as described	
3.09	4.90 Essential	Inspect condition of heat producing equipment Understand methods to access equipment.	Installation and Maintenance Practices
3.10	5.00 Essential	Inspect condition of heat producing equipment Understand methods for identifying the age of equipment and typical service life.	Installation and Maintenance Practices
3.11	4.60 Essential	Inspect condition of heat producing equipment Understand where to find references in the fire code and fuel oil codes on installation and maintenance practices.	Related Regulations and Requirements
3.12	4.50 Essential	Inspect condition of heat producing equipment Understand how to report situations in which the authority having jurisdiction should be notified.	Related Regulations and Requirements
4.01		Inspect condition of operating and safety controls Understand principles of thermostats, set back thermostats, limit switches, pressure relief valves, safety shut off devices part of the equipment, or externally connected such as interconnected smoke alarms.	Background Theory and Knowledge
4.02		Inspect condition of operating and safety controls Understand how to activate controls including common set back thermostats.	Inspection Procedures Tools and Safety
4.03		Inspect condition of operating and safety controls Understand where thermostats should be located and typical layout of safety shut devices and controls which is part of the heating equipment.	Installation and Maintenance Practices
4.04		Inspect condition of operating and safety controls Understand requirements for location of system shut off switches and interconnected smoke alarms.	Related Regulations and Requirements
4.05		Inspect condition of operating and safety controls Understand how to report deficiencies such as missing, deteriorated controls, improper settings, rusted and corroded valves, etc.	Reporting Defects
5.01	5.00 Essential	Identify heating system type Understand principles of mid and high efficiency power venting types.	Background Theory and Knowledge
5.02	4.90 Essential	Inspect condition of exhaust gas flues and vents Understand principles of passive and power venting, stack effect, back drafting, effects of vent height, clearances, supports, materials, condition, approvals and application.	Background Theory and Terminology

Ref. refers to inspection tasks described in Section 7, Specific HVAC Inspection Tasks and Required Knowledge/Skills
 Validation Score (between 0-5) and Importance are described in Section 8, Explanation of Importance Scale

Ref.	Validation Score Importance	To complete the inspection task, a competent home inspector requires the knowledge and skills as described	
5.03	5.00 Essential	Inspect condition of exhaust gas flues and vents Understand how to inspect for clearances, material type, vent insulation, corrosion, heat shields, exterior discharge and fire stops.	Inspection Procedures and Safety
5.04	4.80 Essential	Inspect condition of exhaust gas flues and vents Understand how to inspect flues, chimney clean outs and thimbles for conditions such as blockages and clearances.	Inspection Procedures and Safety
5.05	5.00 Essential	Inspect condition of exhaust gas flues and vents Understand how to use a flashlight and mirror to inspect exhaust gas flues and vents.	Inspection Procedures and Safety
5.06	5.00 Essential	Inspect condition of exhaust gas flues and vents Understand how to identify proper interior and exterior installation and clearances using manufacturer's installation instructions and rating plates.	Installation and Maintenance Practices
5.07	5.00 Essential	Inspect condition of exhaust gas flues and vents Understand the failure of plastic mid efficiency furnace vents and be able to recognize recalled installations of Ultravent, Plexvent and Selvent.	Installation and Maintenance Practices
5.08	4.50 Essential	Inspect condition of exhaust gas flues and vents Understand typical requirements for size, material and clearances of exhaust flue vents from the Ontario Building Code, fuel codes and fire code.	Related Regulations and Requirements
5.09	4.50 Essential	Identify heating system type Understand requirements for chimney liners.	Related Regulations and Requirements
5.10	5.00 Essential	Inspect condition of exhaust gas flues and vents Understand how to report deficiencies which could lead to blockages and the consequences of blockages, and situations where flues are not accessible.	Reporting Defects
6.01	5.00 Essential	Inspect condition of combustion air supply Understand the principles of combustion air supply, spillage, importance of carbon monoxide, air required for combustion and competing exhaust fans, indoor air quality issues, depressurization and the house as a system.	Background Theory and Knowledge
6.02	5.00 Essential	Inspect condition of combustion air supply Understand how to identify sources of combustion air and how to check for spillage.	Inspection Procedures and Safety
6.03	1.90 Peripheral	Inspect condition of combustion air supply Understand how to test for carbon monoxide (ambient).	Inspection Procedures and Safety

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Ref. refers to inspection tasks described in Section 7, Specific HVAC Inspection Tasks and Required Knowledge/Skills
 Validation Score (between 0-5) and Importance are described in Section 8, Explanation of Importance Scale

Ref.	Validation Score	Importance	Description	Reference
			To complete the inspection task, a competent home inspector requires the knowledge and skills as described	
6.04	2.30	Useful	Inspect condition of combustion air supply Understand how to inspect for proper draft with all appliances operating.	Inspection Procedures and Safety
6.05	4.10	Essential	Inspect condition of combustion air supply Understand how to inspect for exterior air source location.	Inspection Procedures and Safety
6.06	1.60	Peripheral	Inspect condition of combustion air supply Understand how to check combustion air using tissue paper and a barbecue lighter	Inspection Procedures Tools and Safety
6.07	4.70	Essential	Inspect condition of combustion air supply Understand requirements for interior and exterior combustion air supply and the impact of finishing a basement and enclosing a an area with heat producing equipment.	Installation and Maintenance Practices
6.08	4.10	Essential	Inspect condition of combustion air supply Understand typical requirements as listed in fuel codes, the Ontario Building Code, Ontario Fire Code and B365.	Related Regulations and Requirements
6.09	1.90	Peripheral	Inspect condition of combustion air supply Understand how to report deficiencies such as insufficient combustion air supply.	Reporting Defects
7.01	4.40	Essential	Inspect condition of heat distribution system Understand principles of sizing of ducts, pipes, rads, convectors, etc.	Background Theory and Terminology
7.02	4.70	Essential	Inspect condition of heat distribution system Understand principles of heat transfer, sizing, balancing, returns.	Background Theory and Terminology
7.03	4.60	Essential	Inspect condition of heat distribution system Understand principles of hydronic open and closed systems.	Background Theory and Terminology
7.04	2.20	Useful	Inspect condition of heat distribution system Understand principles of steam systems.	Background Theory and Terminology
7.05	4.60	Essential	Inspect condition of heat distribution system Understand how to inspect for air movement and heat at supply and return air outlets and inlets, using tissue, and touch.	Inspection Procedures and Safety

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Ref.	Validation Score Importance	To complete the inspection task, a competent home inspector requires the knowledge and skills as described	
7.06	3.40 Useful	Inspect condition of heat distribution system Understand how to inspect joints for air tight connections.	Inspection Procedures and Safety
7.07	4.30 Essential	Inspect condition of heat distribution system Understand how to inspect duct/pipe runs in unheated areas, including joint seals and insulation.	Inspection Procedures and Safety
7.08	4.70 Essential	Inspect condition of heat distribution system Understand how to inspect for potential asbestos insulation on pipes, ducts, boilers and similar components.	Inspection Procedures and Safety
7.09	4.90 Essential	Inspect condition of heat distribution system Understand how to inspect for duct openings and heating sources in an attached garage.	Inspection Procedures and Safety
7.10	3.00 Useful	Inspect condition of heat distribution system Understand how to inspect for debris in ducts, water in sub slab ducts, presence of dampers and inspection accesses.	Inspection Procedures and Safety
7.11	4.60 Essential	Inspect condition of heat distribution system Understand how to inspect the heat distribution system using a flashlight and mirror.	Inspection Procedures Tools and Safety
7.12	1.10 Peripheral	Inspect condition of heat distribution system Understand how to use an air puffer.	Inspection Procedures Tools and Safety
7.13	3.00 Essential	Inspect condition of heat distribution system Understand how to inspect the heat distribution system using a thermometer.	Inspection Procedures Tools and Safety
7.14	4.60 Essential	Inspect condition of heat distribution system Understand the basic requirements for location and sizing of outlets and returns based on room size and exterior configuration.	Installation and Maintenance Practices
7.15	4.20 Essential	Inspect condition of heat distribution system Understand how to confirm installation requirements such as clearances using manufacturer's installation instructions (room or free standing units).	Installation and Maintenance Practices
7.16	4.80 Essential	Inspect condition of heat distribution system Understand requirements for drainage and maintenance access.	Installation and Maintenance Practices

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Ref.	Validation Score	Importance	Description	Related Regulations and Requirements
			To complete the inspection task, a competent home inspector requires the knowledge and skills as described	
7.17	3.40	Useful	Inspect condition of heat distribution system Understand the basic principles of heat distribution system design based on heat loss and heat gain (HRAI, ASHRAE, Hydronics manual (design standards)) and be able to identify duct sizes from a heating design plan.	Related Regulations and Requirements
7.18	3.70	Essential	Inspect condition of heat distribution system Understand typical requirements for heat distribution systems, as listed in the Ontario Building Code (Part 6).	Related Regulations and Requirements
7.19	4.10	Essential	Inspect condition of heat distribution system Understand how to inspect and report improper installations and modifications that are contrary to the Electrical Code and Building Code, such as wires running through plenums and condensate taps into sanitary drain stacks.	Related Regulations and Requirements
7.20	4.60	Essential	Inspect condition of heat distribution system Understand how to report deficiencies such as return air in furnace room or close to other fuel fired appliances.	Reporting Defects
8.01			Inspect condition of ancillary cooling and ventilation equipment Refer to Cooling and Ventilation Tasks.	
9.01	5.00	Essential	Observe operation of heating system Understand principles of normal system operations, controls, thermostats, safety devices, valves, shut offs, and other electric controls.	Background Theory and Terminology
9.02	4.90	Essential	Observe operation of heating system Understand how to inspect for relief valves, over pressure conditions, back flow, temperature rise, improper sequence, flame burner, draft, ignition, cross lighting, spillage, barometric dampers.	Inspection Procedures and Safety
9.03	4.60	Essential	Observe operation of heating system Understand how to use tools such as flashlight, mirror, thermometer in inspecting the operation of the heating system.	Inspection Procedures Tools and Safety
9.04	5.00	Essential	Observe operation of heating system Understand sequence of burner, fan / pump operation and the operation of limits and other safety controls.	Installation and Maintenance Practices
9.05	4.90	Essential	Observe operation of heating system Understand how to report malfunction deficiencies such as failure to operate, overheating, improper lighting or fan sequence, improper flame appearance, gas odours, improper draft, restrictions in air flow or heat to outlets, etc.	Reporting Defects

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Ref.	Validation Score	Importance	Description	Knowledge Area
			To complete the inspection task, a competent home inspector requires the knowledge and skills as described	
10.01			Inspect condition of fireplace or wood stove Understand the basic operating principles of fireplaces and wood stoves including: heating efficiency, the effect on air movement, and safety concerns.	Background Theory and Knowledge
10.02			Inspect condition of fireplace or wood stove Understand what components of fireplaces and wood stoves can be visually inspected.	Inspection Procedures Tools and Safety
10.03			Inspect condition of fireplace or wood stove Understand how to report common deficiencies of fireplaces and wood stoves and report concealed flue conditions.	Inspection Procedures Tools and Safety
10.04			Inspect condition of fireplace or wood stove Understand the basic installation and maintenance requirements for modern and older fireplaces and wood stoves.	Installation and Maintenance Practices
10.05			Inspect condition of fireplace or wood stove Understand the B365 and Fire Code retroactive requirements for clearances and maintenance of fireplaces and wood stoves.	Related Regulations and Requirements
11.01	4.56	Essential	Identify cooling / heat pump system type Understand characteristics of the various types of systems commonly found including split, combination and multi package units and heat pumps.	Background Theory and Terminology
11.02			Identify cooling / heat pump system type Understand characteristics of alternate systems (ground and water source heat, etc.).	Background Theory and Terminology
11.03	5.00	Essential	Identify cooling / heat pump system type Understand characteristics of cooling systems to be able to distinguish the following systems: air, water, ground heat, evaporative and gas absorption systems.	Background Theory and Terminology
11.04	4.43	Essential	Identify cooling / heat pump system type Understand the operating principles of typical residential cooling systems including; furnace plenum, attic and split system types.	Background Theory and Terminology
11.05	4.20	Essential	Identify cooling / heat pump system type Understand how to inspect for location, rating tag, size and age.	Inspection Procedures and Safety
11.06	3.40	Useful	Identify cooling / heat pump system type Understand how to identify proper installation and maintenance practices with the assistance of manufacturer's instructions.	Installation and Maintenance Practices

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Ref.	Validation Score Importance	To complete the inspection task, a competent home inspector requires the knowledge and skills as described	
11.07	4.14 Essential	Identify type of cooling and/ or heat pump system Understand differences of common installation such as; plenum, attic, high velocity (space pac), and split types.	Installation and Maintenance Practices
11.08	2.50 Essential	Identify cooling / heat pump system type Understand requirements for set backs of condensers, noise and water use bylaws, condo regulations.	Related Regulations and Requirements
11.09	4.57 Essential	Identify cooling / heat pump system type Understand requirements for installation, such as OBC.	Related Regulations and Requirements
11.10	4.50 Essential	Identify cooling / heat pump system type Understand how to report deficiencies such as inappropriate size, type and location.	Reporting Defects
11.11	3.00	Identify type of cooling and/ or heat pump system Understand how to report deficiencies such as misapplication of cooling and/ or heat pump system.	Reporting Defects
12.01	4.60 Essential	Inspect condition of cooling equipment such as condensers, compressors, evaporators, Understand how to inspect for level installation of condenser, connections, mechanical damage, mechanical manipulation, insulation of high pressure line, corrosion (from leaks) clearances and obstructions, and electrical disconnect (after 1996).	Inspection Procedures and Safety
12.02	4.29 Essential	Inspect condition of cooling equipment Understand how to check for connections, supports, configuration, alterations.	Inspection Procedures and Safety
12.03	4.70 Essential	Inspect condition of cooling equipment Understand requirements for electrical overload protection and condensate discharge.	Related Regulations and Requirements
13.01	4.86 Essential	Inspect condition of operating and safety controls Understand requirements for thermostats and electrical disconnects.	Installation and Maintenance Practices
13.02	4.43 Essential	Identify type of cooling and/ or heat pump system Understand how to report deficiencies such as gaps in conduit building entry points, disconnect ions, obstructions, and improper alterations.	Reporting Defects
14.01	4.00 Essential	Inspect condition of air distribution fans, plenums, ducts, inlets and outlets Understand basic principles of duct layout, sizing and direction changes for supply and return air ducts.	Background Theory and Terminology

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Ref.	Validation Score Importance	To complete the inspection task, a competent home inspector requires the knowledge and skills as described	
14.02	4.14 Essential	Inspect condition of air distribution fans, plenums, ducts, inlets and outlets Understand how to inspect ducts and outlets for debris and obstructions.	Inspection Procedures and Safety
15.01	4.43 Essential	Observe operation of cooling / heat pump system Understand how to check temperature drop.	Inspection Procedures and Safety
15.02	4.60 Essential	Identify type of cooling and/ or heat pump system Understand how to use rating plates, manufacturer's.	Inspection Procedures Tools and Safety
16.01	4.57 Essential	Observe operation of cooling / heat pump system Understand principles of operation including operating cycle, temperature drop and air movement.	Background Theory and Terminology
16.02	4.71 Essential	Observe operation of cooling / heat pump system Understand how to check air flow at filter, supply and return grills.	Inspection Procedures and Safety
16.03	4.43 Essential	Observe operation of cooling / heat pump system Understand how to check condensate flow and pump operation if present.	Inspection Procedures and Safety
16.04	4.57 Essential	Observe operation of cooling / heat pump system Understand how to check for ice build up, noise, vibration, condensation leaks.	Inspection Procedures and Safety
16.05	1.60 Peripheral	Observe operation of cooling / heat pump system Understand how to measure current (amprobe) to confirm condenser operation.	Inspection Procedures and Safety
16.06	3.00 Useful	Observe operation of cooling / heat pump system Understand how to use a thermometer to measure temperature drop.	Inspection Procedures Tools and Safety
16.07	4.29 Essential	Observe operation of cooling / heat pump system Understand normal operating range.	Installation and Maintenance Practices
17.01	4.50 Essential	Identify ventilation system type Understand the principles of evaporation, psychometrics, mold growth, relative humidity, and building moisture.	Background Theory and Knowledge

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Ref.	Validation Score Importance	To complete the inspection task, a competent home inspector requires the knowledge and skills as described	
17.02		Identify ventilation system type Understand mechanical ventilation requirements in the OBC, such as exhaust fans, HRV's and for wood burning fireplaces.	Related Regulations and Requirements
17.03		Identify ventilation system type Understand how to report deficiencies such as misapplication of ventilation equipment, excessive humidification, obstructed filters, etc.	Reporting Defects
18.01	4.50 Essential	Inspect condition of operating and safety controls Understand requirements for wiring, controls, filters and evaporative pads, valves, location of unit, and access.	Installation and Maintenance Practices
19.01		Inspect condition of air handling equipment such as fans and motors Understand how to inspect for air flow and safety precautions when accessing air handling equipment.	Inspection Procedures Tools and Safety
19.01	3.00 Useful	Inspect condition of air handling equipment such as fans and motors Understand the requirements for plumbing and wiring connections, location, and access for servicing equipment.	Installation and Maintenance Practices
20.01		Inspect condition of air distribution system such as attached ducts, inlets, and discharge points Understand requirements for locating exterior building inlets and outlets, ducts running through unheated areas and vents for gas clothes dryers.	Related Regulations and Requirements
21.01	4.00 Essential	Inspect condition of humidifiers, filters and other air tempering equipment Understand how to inspect for scaling, calcification, leaks.	Inspection Procedures and Safety
21.02		Inspect condition of humidifiers, filters and other air tempering equipment Understand requirements for installation and maintenance of passive and electrostatic air filters, Pad and flow through humidifiers and HRV's.	Installation and Maintenance Practices
22.01	2.80 Useful	Observe operation of ventilation system Understand how to inspect for mechanical operation and air flow of various ventilation systems.	Inspection Procedures and Safety
22.02		Observe operation of ventilation system Understand how to report deficiencies such as failure to operate, fan malfunction, reduced or lack of air flow, back pressure, etc.	Reporting Defects
23.01	2.40 Useful	General - Applies to all systems and components inspected Understand how to use a camera to document conditions.	Inspection Procedures Tools and Safety