



Canadian Council
of Ministers
of the Environment

Le Conseil canadien
des ministres
de l'environnement

CODE OF PRACTICE FOR RESIDENTIAL WOOD BURNING APPLIANCES

**PN 1479
ISBN 978-1-896997-87-2 PDF**

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ACKNOWLEDGEMENTS

The Canadian Council of Ministers of the Environment (CCME) *Code of Practice for Residential Wood Burning Appliances* was developed by CCME's Wood Combustion Working Group with the assistance of Levelton Consultants Ltd.

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The Working Group acknowledges the assistance of the following agencies:

Federal

Environment Canada

Health Canada

US Environmental Protection Agency

Canadian Mortgage and Housing Corporation (CMHC)

Provinces/States

Alberta Environment and Sustainable Resource Development

British Columbia Ministry of Environment

Manitoba Conservation and Water Stewardship

New Brunswick Department of Environment and Local Government

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Town of Nation, Ontario
Ville de Montreal, Québec
City of Saskatoon, Saskatchewan
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City of Whitehorse, Yukon

Industry Associations

Hearth, Patio and Barbecue Association of Canada
Wood Energy Technology Transfer Inc.

Non-Government Organizations

GTA Clean Air Partnership, Ontario
The Wood Heat Organization, Ontario

LIST OF ABBREVIATIONS AND ACRONYMS

AQHI	Air Quality Heath Index
$\mu\text{g}/\text{m}^3$	Micrograms per cubic metre
BTU	British thermal unit(s)
CCME	Canadian Council of Ministers of the Environment
CMHC	Canadian Mortgage and Housing Corporation
CO_2	Carbon Dioxide
CSA	Canadian Standards Association
CSA B415.10	CSA Standard for Performance Testing of Solid-Fuel-Burning Heating Appliances, edition B415.1 (2010)
CWS	Canada-wide standards
EPEA ¹	Environmental Protection and Enhancement Act
g	gram(s)
GHG(s)	Greenhouse gas (gases)
GTA	Greater Toronto Area
hr	Hour(s)
kg	Kilogram(s)
kt	Kilotonne(s)
kWh	Kilowatt hour(s)
MJ	Megajoule
mm	Millimetre(s)
mmBTU	1 million BTU
NAAQS	National Ambient Air Quality Standards
NRCan	Natural Resources Canada
NSPS	New Source Performance Standard
PAH(s)	Polycyclic Aromatic Hydrocarbon(s)
PM	Airborne particles with an upper size limit of approximately 100 micrometers in aerodynamic diameter
PM_{10}	Airborne particles that are 10 micrometers or less in aerodynamic diameter
$\text{PM}_{2.5}$	Airborne particles that are 2.5 micrometers or less in aerodynamic diameter, also referred to as fine particulate matter
SLCF(s)	Short Lived Climate Forcer(s)
T	Metric tonne(s)
US EPA	United States Environmental Protection Agency
VOC	Volatile Organic Compounds (often written as VOCs)

¹ Alberta RSA 2000, c E-12. See website: <http://www.qp.alberta.ca/documents/Acts/E12.pdf>

1.0 Introduction

The Code of Practice for Residential Wood Burning Appliances (the Code) has been developed to enhance governmental approaches to air pollution caused by residential wood burning. The goal of the Code is to provide federal, provincial, territorial, and municipal governments with tools and information to support their wood smoke management activities.

Residential wood burning has been a significant source of domestic heat throughout Canada's history. The use of wood as a fuel for residential heating is popular for many reasons. Wood is a renewable source of energy that requires minimal processing. It can provide a degree of self-sufficiency by reducing dependency on purchased energy and can provide an alternative heating source when and where other power is not available. Wood can be very competitive in price compared to other sources of energy and may provide additional economic benefits for rural communities engaged in woodlot production. Wood burning appliances can also provide a pleasant aesthetic and social experience, and an evening around the fireplace or woodstove is a valued tradition in many Canadian homes.

The energy in wood is released through the process of combustion. This is not necessarily problematic. However, when combustion is incomplete, air pollutants are emitted in much greater quantities. Higher levels of air pollutants are typically generated during fire start-up and when wood is smouldering. This is usually evident by white or gray visible smoke exiting the chimney. Higher than normal air pollutant emissions can also occur when a wood burning appliance is performing poorly, where fuel quality is suboptimal, or where treated wood or wood with high moisture content (typically greater than 20%) is used.

Advanced technology appliances, which conform to the United States Environmental Protection Agency's (*US EPA Standards of Performance for New Residential Wood Heaters, Section 60-532 of the 1988 Clean Air Act, subpart AAA*)² or conform to the Canadian Standards Association's (*CSA Performance Testing of Solid Fuel Burning Heating Appliances (CSA B415.1)*)³ are less likely to create pollution problems if operated according to manufacturer's instructions.

The release of air pollutants from wood burning can have serious health and environmental impacts. Exposure can exasperate chronic health issues like bronchitis and asthma and can contribute to premature death. Environmental impacts include reduced visibility (haze), crop damage, and greater vulnerability to disease in some plant species.

It is difficult to quantify all of the pollution emissions from wood burning, but in 2010 it was estimated that 104 kilotonnes (kt)⁴ of fine particulate matter (airborne particles that are 2.5 micrometers or less in aerodynamic diameter - PM_{2.5}) was emitted to the atmosphere in Canada

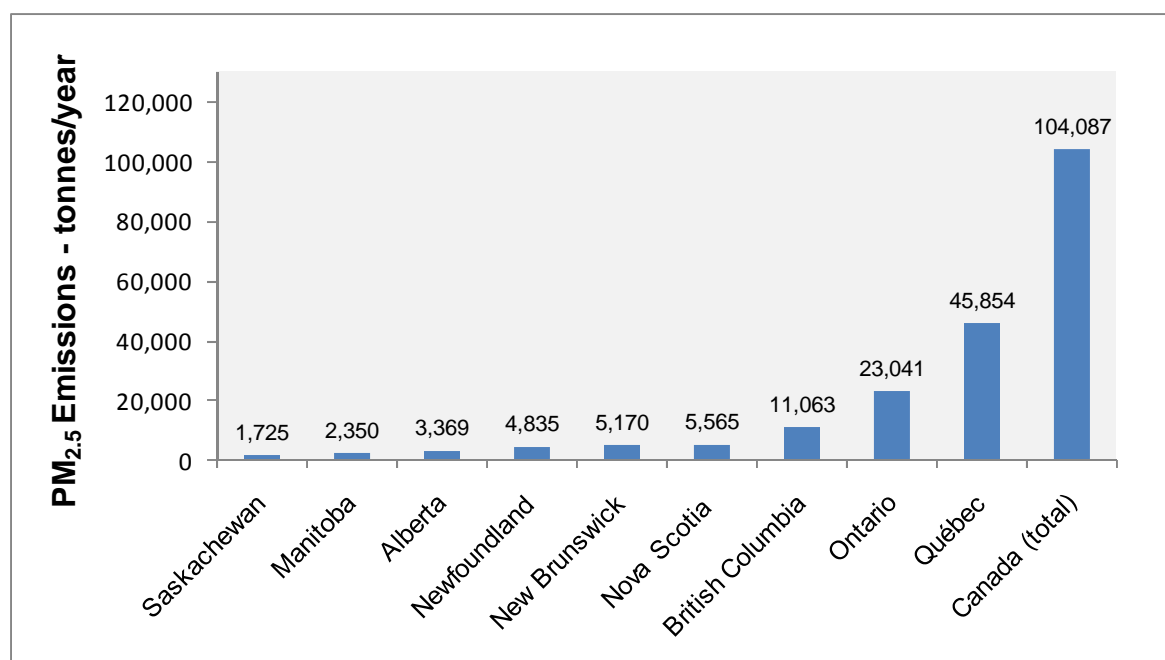
² See website: <http://www.epa.gov/compliance/resources/policies/monitoring/caa/woodstoverule.pdf>

³ Performance Testing of Solid-Fuel Burning Stoves, Inserts and Low-Burn-Rate Factory-Built Appliances, A National Standard of Canada. See website: <http://mha-net.org/docs/CSA-B451b.PDF>

⁴ Source: National Pollutant Release Inventory (NPRI), Pollutant Inventories and Reporting Division, Environment Canada (March, 2012)

from residential wood combustion. A provincial breakdown of these emissions is provided in Figure 1.

FIGURE 1: PROVINCIAL PM_{2.5} EMISSIONS FROM RESIDENTIAL WOOD COMBUSTION IN 2010



It is hoped that through a combination of policy options and voluntary (non-regulatory) programs such as those described in this Code, wood burning emissions can be substantially reduced. Additional guidance on the appropriate use of wood heat systems can be found in the Canada Housing and Mortgage Corporation publication *A Guide to Residential Wood Heating*.⁵

1.1 About this Code

The Code was developed by the Canadian Council of Ministers of the Environment (CCME) to assist municipal, federal, provincial, and territorial governments in their response to air quality problems, energy efficiency, firewood and carbon conservation, and enhance measures for fire prevention and protection.

The Code will aid municipalities in by-law and program development to help drive change-outs of conventional wood burning appliances in favour of advanced technology (certified) appliances and fireplaces. Where municipal authority does not exist in jurisdictions this code may apply to provincial regulations.

⁵ See website: http://www.cmhc-schl.gc.ca/en/co/maho/enefcosa/upload/wood_heating_EN_W.pdf

The Code also provides guidance on wood burning curtailment in response to air quality advisories, along with emissions testing for individual sources, and complaint response strategies – all of which provide useful reference points for the development of wood smoke management plans. Adopting a wood smoke management plan and engaging residents in addressing heavy wood burning activity is an important responsibility, especially when atmospheric conditions may prevent dispersion of smoke away from a community or region. The Code, therefore, provides advice based on six best practices for consideration by jurisdictions in designing policies and programs to reduce wood smoke emissions (see Section 5.0).

The Code also provides guidance for jurisdictions in the form of *A Model By-law and Regulatory Elements for Residential Wood Burning Appliances* (see Appendix 1). Jurisdictional background information on wood smoke management is located in *Review of Municipal, Provincial and Federal Policies for Wood Burning Appliances in Selected Canadian and U.S. Jurisdictions* (CCME, 2012)⁶.

1.2 Scope and Limitations

The Code focuses on residential wood burning; it is not intended for industrial or commercial scale applications. Other frameworks may apply to wood-fired combustors, commercial, institutional, or industrial wood burning units, boilers, thermal plants and the heating of large residential units.

Jurisdictions should note that this Code is not intended to promote wood burning over other fuel burning appliances. However, CCME does encourage those individuals who wish to use a wood burning appliance or fireplace to purchase the cleanest model available and to operate it appropriately, as indicated in this Code.

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⁶ See www.ccme.ca

2.0 Health and Environmental Impacts

Wood smoke contains a complex mixture of air pollutants, including a number of “non-threshold pollutants” for which there is some probability of harm at any level of exposure (e.g., PM_{2.5}). Exposure to these substances should always be minimized.

Exposure to wood smoke pollutants can occur both indoors and outdoors. Outdoor exposure is affected by factors such as poor combustion, poor wind dispersal, and other atmospheric conditions. Indoor air quality can be impacted by wood smoke contaminants drawn from outside, and also through leakage from pipes or back-drafting from chimneys.⁷

2.1 Wood Smoke Health Effects

The people most susceptible to the negative health effects of wood smoke emissions are young children and older adults, especially those with existing cardiovascular and respiratory conditions or vascular complications from diabetes. Studies of wood smoke exposure have documented respiratory symptoms such as increased congestion and wheezing among children between the ages of one and five, and reported cough, sore throat, chest tightness and phlegm among adults.

Long term exposure to elevated levels of airborne particulate matter from wood smoke has been linked to reduced lung function, development of asthma and chronic bronchitis, heart problems and premature mortality.⁸ Short-term exposure to elevated levels of PM has also been associated with acute bronchitis, asthma attacks, aggravation of lung diseases and increased susceptibility to respiratory infections.⁹

Residential wood combustion emissions also contain sulphur oxides, nitrogen oxides, carbon monoxide, volatile organic compounds (VOCs) and other toxic or carcinogenic compounds such as benzene, formaldehyde and polycyclic aromatic hydrocarbons (PAHs) including benzo(a)pyrene, and dioxins.¹⁰ Although the effects of these carcinogens on human health via exposure to wood smoke have not been extensively studied, they still raise additional health concerns regarding long term exposure to wood stove emissions.

While it is difficult to separate out the relative health risks and associated costs of wood smoke emissions from other air pollutants, Canadian Medical Association (CMA) statistics¹¹ indicate significant economic penalties due to air pollution in general. Canadian health costs associated with acute premature mortality resulting from smog (fine particulate matter and ozone) are summarized in Table 1. The CMA has estimated that air pollution accounted for 21,000 deaths in

⁷ Basrur, Sheela V. 2002. Toronto Medical Officer of Health, Air Pollution from Wood burning Fireplaces and Stoves

⁸ Woodsmoke Health Effects: A Review, Inhalation Toxicology, 19:67-106, 2007

⁹ US EPA. Burn Wise: Consumers – Health Effects of Breathing Woodsmoke. United States Environmental Protection Agency. August, 2011.

¹⁰ NEIPTG. 2000. 1995 Criteria Air Contaminants Emissions Inventory Guidebook. National Emissions Inventory and Projections Task Group. Canadian Council of Ministers of the Environment.

¹¹ No Breathing Room - National Illness Costs of Air Pollution, Canadian Medical Association, August 2008. See website:

http://www.cma.ca/multimedia/CMA/Content/Images/Inside_cma/Office_Public_Health/ICAP/CMA_ICAP_sum_e.pdf

Canada in 2008, with associated costs of 8 billion dollars. By 2031, the estimate is more than 38,000 deaths, with an associated annual cost of over 13 billion dollars. Additionally, between 2008 and 2031, hospital admissions from exposure to air pollution are estimated to rise over 62% to 18,000 annually.

Table 1: National Economic Costs Summary for PM and Ozone: 2008, 2015, 2031 and Total 2008-2031 (expressed in millions of dollars)¹²

Cost Indicator	2008	2015	2031	Total of Annual Costs for the Years 2008 - 2031
Lost Productivity	\$688	\$721	\$765	\$17,576
Healthcare Costs	\$438	\$485	\$614	\$12,549
Quality of Life	\$379	\$410	\$487	\$10,370
Loss of Life	\$6,552	\$7,905	\$11,836	\$217,439
Total Cost	\$8,058	\$9,522	\$13,702	\$257,934

2.2 Nuisance Impacts of Wood Smoke

Wood smoke can also be a nuisance, causing haze and odour problems. For example, when numerous wood burning appliances are being used in an area, and there is little wind to clear the air, visibility is often obscured by fine PM and aerosols¹³ and the scent of burnt wood may be noticeable both indoors and outdoors. These nuisance conditions can have real impacts on personal health and on the general quality of life in a community.

2.3 Impact on Climate Change

When wood is burned it produces black carbon¹⁴ (or “soot”), which is part of a group of substances known as short lived climate forcers (SLCF). Though SLCFs remain in the atmosphere for much less time than long-lived greenhouse gases like carbon dioxide (CO₂) -- in the case of black carbon, mere days or weeks -- they are considered to be responsible for a significant portion of current global warming.

Black carbon has a two-fold warming effect: it absorbs solar radiation, thereby directly warming the surrounding air; also, when deposited on snow and ice surfaces, it reduces the reflection of

¹² No Breathing Room - National Illness Costs of Air Pollution, Canadian Medical Association, August 2008. See website:

http://www.cma.ca/multimedia/CMA/Content/Images/Inside_cma/Office_Public_Health/ICAP/CMA_ICAP_sum_e.pdf

¹³ United States Environmental Protection Agency. See website: <http://www.epa.gov/burnwise>

¹⁴ "Black Carbon as a Short Lived Climate Forcer - A Profile of Emission Sources and Co-Emitted Pollutants", Venkatesh Rao and Summers, J.H., U.S. EPA, Emissions Inventory Conference, San Antonio, TX, 2010

solar radiation, leading to accelerated melting. Reducing black carbon and other SLCFs offers an opportunity to reduce the rate of global warming in the near term.

Nonetheless, burning locally-sourced wood for residential fuel can be less carbon and energy intensive than petrochemical alternatives (e.g., natural gas and fuel oils), which require more processing and transportation. Thus, as with the other health and environmental impacts associated with wood burning, the impact on climate change can be improved by ensuring that appliances are designed with efficiency in mind and are appropriately operated.

3.0 Wood Burning Appliances - Definition of Types

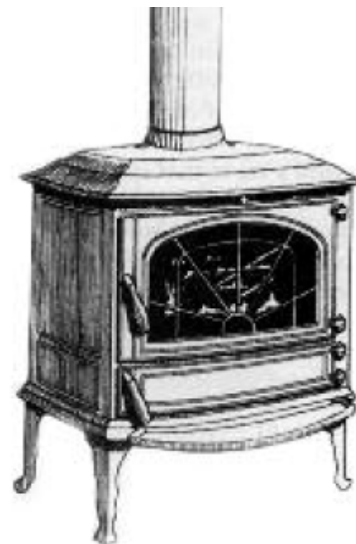
The following section compares types of wood burning appliances and fireplaces currently on the market.^{15,16} Indoor wood burning appliances include wood stoves, pellet stoves, fireplaces, conventional fireplaces, advanced technology fireplaces, fireplace inserts, wood cook stoves, masonry heaters, central heating furnaces and boilers. Outdoor boilers and hydronic heaters are also included.

A list of advanced technology appliance manufacturers in Canada may be found on the Hearth, Patio and Barbecue Association of Canada's web-site at www.hpbacanada.org/trade/links.html. A comprehensive list of certified wood burning appliances sorted by type, manufacturer, model name, particulate emission rate, heat output and efficiency was published by the US EPA in January 2012.¹⁷

Additional guidance on the appropriate use of wood heat systems can be found in the Canada Housing and Mortgage Corporation publication *A Guide to Residential Wood Heating*.¹⁶

3.1 Wood Stoves

Wood stoves are free-standing space heating appliances used either as the principal source of heat for a home or to supplement conventional heating systems. A typical wood stove will hold a fuel load of 15 to 40kg, which results in 4 to 12 hours of operation between refuelling. Wood stoves fall into two categories, conventional and advanced combustion types.



Source: Canada Mortgage and Housing Corporation (CMHC). *Guide to Residential Wood Heating*, 2008. All rights reserved. Reproduced with the consent of CMHC. All other uses and reproductions of the material are expressly prohibited.

¹⁵ Descriptions provided by the Wood Heat Organization. See website www.woodheat.org

¹⁶ *A Guide to Residential Wood Heating*, 2008, Canada Mortgage and Housing Corporation. See website: http://www.cmhc-schl.gc.ca/en/co/maho/enefcosa/upload/wood_heating_EN_W.pdf

¹⁷ See website: <http://www.epa.gov/Compliance/resources/publications/monitoring/caa/woodstoves/certifiedwood.pdf>

Conventional stoves do not have advanced combustion technologies and tend to have relatively high smoke emissions and heat loss through the chimney. This category includes Franklin woodstoves, parlour stoves, and older airtight wood stoves from the 1970s and 80s.

Advanced combustion wood stoves use advanced technology for energy efficiency and lower particulate emissions relative to conventional wood stoves. Advanced combustion stoves fall into two subtypes:

Catalytic stoves are equipped with a ceramic combustor coated with palladium located in the appliance downstream of the firebox. The catalyst reduces the ignition temperature of the smoke so it burns more completely, cutting smoke emissions at normal stove operating temperatures; and,

Non-catalytic advanced combustion design includes an insulated firebox, an internal baffle that acts as a reflective surface and separates the firebox from the secondary combustion chamber, and a system to pre-heat and distribute a secondary air supply above the fuel bed.

Both catalytic and non-catalytic designs have proved successful in achieving lower emissions, but in recent years the non-catalytic category has come to dominate the market.

3.2 Pellet Stoves



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Pellet stoves burn wood or biomass pellets. Sawdust or other waste biomass material is compressed into small cylinders about 8mm in diameter and from 10 to 30mm long to produce pellets. The raw feedstock for pellet production does not include binders or other additives, except in some cases to assist in the extrusion process.

In a pellet stove, the fuel is moved from the storage container (hopper) to the small combustion chamber by a motorized auger. The exhaust is forced into a vent by a fan.

Because steady burning can be approximated by adjusting the fuel and air mixture, pellet stoves can burn with lower emissions on average than wood stoves. In contrast, the combustion of a batch of wood in a wood stove never stabilizes, so combustion air requirements are constantly fluctuating and good combustion conditions are transitory. Pellet stoves can deliver about the same efficiency as advanced combustion wood burning stoves.

3.3 Fireplaces

The term fireplace was traditionally used to describe a wood burning device built into the structure of a living area and in which the fire can be viewed while it burns. However, the distinction between wood stoves and fireplaces is no longer as clear as it once was. For example, most advanced combustion wood stoves have glass panels in their doors and incorporate a

technology that sweeps combustion air behind the glass to keep it clear for effective fire viewing. Also, some fireplaces now have advanced combustion technologies and heat ducts connected for use as central heating systems. As well, some masonry heaters look like fireplaces but have the efficiency and low emissions of advanced combustion wood stoves. Therefore, the term fireplace must be used with some caution. It is used here to mean a device that is not free-standing but is built into the wall of a living space. The term does not refer to strictly decorative appliances.

Fireplaces can be divided into two broad categories:

1. **Masonry fireplaces** are constructed of brick, stone or other masonry materials and assembled on site and usually connected to a masonry chimney.
2. **Factory-built** (also called prefabricated and informally as zero-clearance) **fireplaces** in which the main structural material is usually metal, are also usually installed on site as a package with the specified metal chimney.

3.3.1 Conventional Fireplaces

Conventional fireplaces, whether masonry or factory-built, do not incorporate emission reduction technologies. Generally, conventional fireplaces are not effective for home heating purposes because of heat transfer characteristics and air flow issues. Some masonry, and virtually all factory-built conventional fireplaces, incorporate an air circulation jacket around the firebox connected to grilles that take air from floor level, heat it and return it to the room. However, these air circulation systems are mainly to permit reduced clearances to combustible material by cooling the outer skin of the fireplace rather than for space heating.

Conventional fireplaces do not incorporate emission reduction technologies, and as a result they generally have higher emissions than advanced technology fireplace inserts (see below).

3.3.2 Advanced Technology Fireplaces

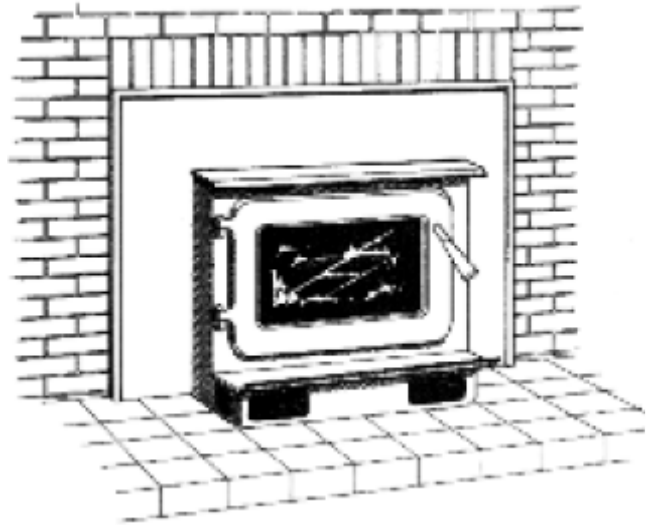
Advanced technology fireplaces are factory-built units that employ the same technologies used in advanced combustion wood stoves and have similarly low emissions. Unlike conventional fireplaces, these fireplaces can be used for home heating. Some have an integral central heating capability using a series of ducts to distribute heat to other parts of the house.



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3.3.3 Fireplace Inserts

Fireplace inserts are wood stoves that have been adapted by their manufacturers to fit within the firebox of masonry fireplaces. A few inserts are certified for installation in factory-built fireplaces. An insert converts a conventional fireplace into an effective heating system. Both conventional and advanced technology fireplace inserts are available and their emissions performance can be assumed to be about the same as conventional and advanced wood stoves. Inserts conserve energy and firewood while releasing particulate matter and greenhouse gases at a slower rate.



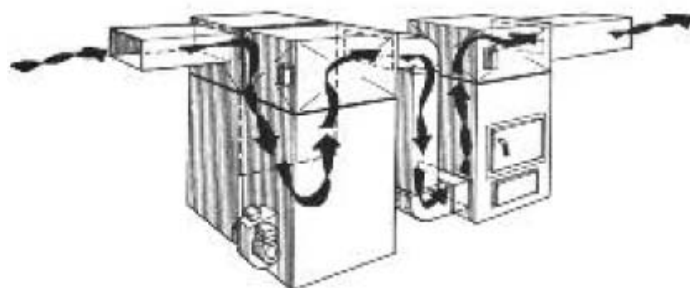
A hearth mount stove is a wood stove that is vented through the throat of an existing masonry fireplace in the same way that an insert is.

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3.4 Central Heating

A central heating system uses a network of air ducts or water pipes to distribute heat to all rooms of the house. Furnaces heat air, which is forced through ducts with a fan. Boilers heat water that is pumped through pipes to heat floors or radiators. Wood-fired central heating systems are available in several forms:

- **add-on warm air furnaces** for connection to existing oil or electric furnaces;
- **combination furnaces** that use electricity or burn oil in addition to wood; and
- **boilers** that heat water and use a system of pipes to distribute heat.



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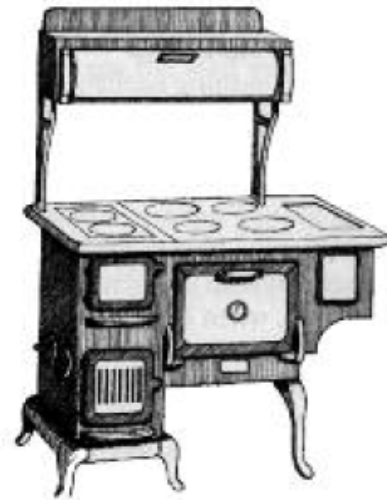
Wood-fired boilers, otherwise termed hydronic heaters, are typically installed outdoors, sometimes enclosed in separate structures but in some instances they may be located within the buildings they are intended to heat.

Most hydronic units are designed to burn dry seasoned wood although they also can be fired on green wood which produces significantly more smoke. Combustion of household trash or construction waste may release harmful

pollutants and is typically in contravention of provincial, state or municipal by-laws.

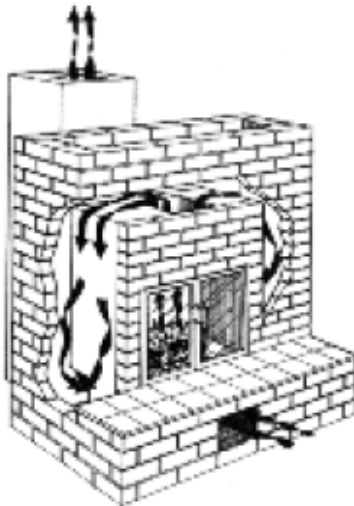
3.5 Wood Cook Stoves

Wood burning cook stoves have a cook-top surface, a baking oven, and sometimes a reservoir for domestic hot water. Cook stoves are not common in Canada, although a few models are still available for sale in specialty stores. Cook stoves do not typically include advanced combustion technologies because practical cooking features and low emission combustion technology are incompatible. Smoke emissions performance for cooking ranges is not available, but particulate emissions are probably similar to conventional wood stoves.



Source: Canada Mortgage and Housing Corporation (CMHC). Guide to Residential Wood Heating, 2008. All rights reserved. Reproduced with the consent of CMHC. All other uses and reproductions of the material are expressly prohibited.

3.6 Masonry Heaters



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Masonry heaters are space heating devices that capture thermal energy from the intermittent combustion of fuels (primarily wood), and radiate it over a prolonged period of time at a relatively constant temperature. As the name suggests, they are constructed of brick, stone or tile and are free-standing but require significant support structures to bear their weight.

A typical masonry heater consists of a firebox and heat exchange channels or partitions that provide additional surface area to absorb heat from the hot exhaust gases before they exit into the chimney. Since the firebox is masonry, rather than metal, fires can and do burn much hotter than in a metal stove resulting in substantially reduced emissions. The refractory concrete which lines the firebox can handle temperatures in excess of 1,100°C. When not being fired, the connection from the masonry heater to the chimney is sometimes damped to minimize unnecessary heat loss up the chimney. During these periods, the unit continues to radiate internally stored heat between 12 to 20 hours after the fire goes out. Combustion efficiencies of approximately 90% can be obtained from masonry heaters.

4.0 Standards, Initiatives, and Regulations

The following is a summary of Canadian federal, provincial and territorial regulations as well as US Environmental Protection Agency (EPA) regulations concerning wood burning appliances, including design and emission standards. Detailed information, including selected Canadian municipal regulations, selected U.S. state regulations and county ordinances are provided in *Review of Municipal, Provincial and Federal Policies for Wood Burning Appliances in Selected Canadian and U.S. Jurisdictions* (CCME, 2012).¹⁸

4.1 Canadian Standards for Wood Burning Appliances

As discussed in Section 3, conventional wood burning appliances, including Franklin wood stoves and airtight units, are generally inefficient and emit significantly more PM_{2.5} than oil and gas fired appliances and advanced low-emissions wood stoves. Some conventional wood-fired boilers also produce significantly higher emissions.¹⁹

To address this problem, emission standards for advanced wood burning appliances have been developed. In 2000, the Canadian Standards Association (a not-for-profit organization) developed the *Performance Testing of Solid Fuel Burning Heating Appliances*²⁰ CSA B415.1 which was based on the US EPA *Standards of Performance for New Residential Wood Heaters, Section 60-532 of the 1988 Clean Air Act, subpart AAA*.²¹ Both standards require independent testing of appliances by an accredited laboratory and specify the test procedures for measuring the emissions, heat output, and efficiency. The standards also defined PM emission limits of 7.5 grams per hour for non-catalytic wood burning appliances and 4.1 grams per hour for catalytic wood burning appliances. The Canadian standard was updated in 2010 (CSA B415.10) and it is currently more stringent than the emission limits of the US EPA standard (see Table 2), but compliance with the Canadian standard is voluntary (except where regulated provincially or municipally).

In the United States, the EPA standard is a federal regulation; it is not a voluntary standard. Certification is required before a wood burning stove model line can be offered for sale, which includes wholesale activities such as displaying or demonstrating the models at trade shows.

In Canada, CSA B415.10 (as amended²² in 2010) is a consensus-based standard intended to provide appliance manufacturers, regulatory agencies and testing laboratories in Canada with methods for determining thermal efficiencies, particulate emissions and flue gas flow rates of solid fuel burning appliances. In response to the development of CSA B415.10 and the US EPA standard, new efficient, wood burning appliances are now commercially available. As well,

¹⁸ See www.ccme.ca

¹⁹ State of New York, Attorney General: Smoke Gets in Your Lungs: Outdoor Wood Boilers in New York State, 2005

²⁰ Performance Testing of Solid-Fuel Burning Stoves, Inserts and Low-Burn-Rate Factory-Built Appliances, A National Standard of Canada. See website: <http://mha-net.org/docs/CSA-B451b.PDF>

²¹ See website: <http://www.epa.gov/compliance/resources/policies/monitoring/caa/woodstoverule.pdf>

²² As at the time of preparation of this Code, the current version is CSA B415.10, amended in 2010. This version is available for purchase at: <http://shop.csa.ca/en/canada/fuel-burning-equipment/b4151-10/inv/27013322010/>

because this national standard can become enforceable when referenced in provincial/territorial regulations and municipal by-laws, it has had impacts on construction and design standards in many areas of Canada. (Note: because many wood burning appliances on the Canadian market have been designed and built according to U.S. specifications, Canadian jurisdictions recognize the US EPA standard and CSA B415.10 as being equivalent even though there are a number of differences between them.)

Table 2: Comparison of US EPA and CSA B415.10 Wood Burning Appliance Particulate Matter¹ (PM) Emission Limits

Type of Device	US EPA Standard (2012-2016)	CSA B415.10 (2012-2015)
Catalytic wood burning devices	4.1 g/hr NSPS ² (1988) NSPS (2013): 2.5 g/hr	2.5 g/hr
Non-catalytic wood burning devices	7.5 g/hr NSPS (1988) NSPS (2013): 4.5 g/hr	4.5 g/hr
Low mass (factory built) fireplaces	5.1 g/hr EPA Phase 2 Voluntary Level (2012)	Currently no limit
Site-Built Masonry Heaters	Currently no limit NSPS Proposed (2014): 2.0 g/hr daily average, 0.32 lb / mmBTU heat output	Currently no limit
Site-Built Masonry Fireplaces	Currently no limit (certification of masons proposed)	Currently no limit
Decorative Factory-built Fireplaces	Currently no limit	Currently no limit
Indoor Boilers and Furnaces	<ul style="list-style-type: none"> • 0.32 lb/MMBtu heat output for indoor HH in 2014 (NSPS)³ • 0.15 lb/mmBTU heat output for both indoor HH in 2016 	0.4 g/MJ
Outdoor Wood Hydronic Heaters (HH)	<ul style="list-style-type: none"> • 0.32 lb/MMBtu heat output for outdoor HH in 2013 (NSPS)³ • 0.15 lb/mmBTU heat output for both outdoor HH in 2016 (NSPS) 	0.13 g/MJ

¹ PM emissions from conventional, uncertified wood-fired boilers averaged 72 g/hr and conventional, uncertified wood stoves averaged 18 g/hr²³.

² NSPS: New Source Performance Standards under the US Clean Air Act.

In addition, draft US EPA New Source Performance Standards (NSPS) for CO expected:

- 1000 mg / m³ at 12% O₂ in 2013/2014
- 650 mg / m³ at 12% O₂ in 2016
- Draft NSPS limit for Visible Emissions: 6 minutes per hour (in field).

³ Typical state regulatory level: 0.32 lb / mmBTU heat output

²³ State of New York, Office of the Attorney General, Smoke Gets in Your Lungs: Outdoor Wood Boilers in New York State, 2005

In Canada, manufacturers of appliances can have an appliance tested and certified to CSA B415.10 by contracting a laboratory accredited by the Standards Council of Canada.²⁴ In the United States, manufacturers can apply to the US EPA for certification of their appliances.

Advanced stoves manufactured according to these standards have the following advantages over older, uncertified appliances:²⁵

- Toxic emissions reduced by as much as 55%
- PM_{2.5} emissions reduced by as much as 70%
- Energy efficiency increased by at least 70%
- Use 30-50% less firewood

(These figures are considered approximate since the results shown are typically based on controlled conditions. These values are also expected to vary from model to model and actual day-to-day use by individual users.)

4.1.1 Canada's Model Municipal By-law for Wood-Burning Appliances (2006)

In 2006 Environment Canada (EC) developed a Model Municipal By-law for Regulating Wood-burning Appliances in collaboration with representatives from industry, municipalities, provincial/territorial governments, and environmental non-governmental organizations (NGOs) under the Intergovernmental Working Group on Residential Wood Combustion. This initial model provided reference material for many municipalities during early by-law development and helped inform this Code.

4.1.2 Natural Resources Canada's Energy Efficiency Rebate Program

Natural Resources Canada's Office of Energy Efficiency offered an energy efficiency rebate program to qualifying individuals planning to replace conventional wood burning appliances with advanced technology models. The program covered a wide variety of appliances including specific wood burning stoves and similar devices. The program ended in January, 2012.

4.1.3 Natural Resources Canada's R-2000 Housing Standard

R-2000 is a voluntary standard administered by Natural Resources Canada (NRCan) and developed in partnership with Canada's residential construction industry. The initiative's aim is to promote the use of cost-effective energy-efficient building practices and technologies.

The updated 2012 R-2000 housing standard requires all wood stoves to meet CSA B415.1-10 *Performance Testing of Solid-Fuel-Burning Heating Appliances*, or the U.S. Environmental Protection Agency (EPA) wood burning appliance standards (1990), 40 CFR Part 60.

²⁴ See website: <http://www.scc.ca/en/agl-palcan>

²⁵ Environment Canada, Impact of Residential Wood Stove Replacement on Air Emissions in Canada <http://www.ec.gc.ca/residentiel-residential/default.asp?lang=En&n=C9D08C1A-1>

4.2 Provincial and Territorial Initiatives and Regulations

Alberta

The principal body of legislation regulating discharge of emissions to the environment in Alberta is the Alberta Environmental Protection and Enhancement Act (EPEA). There are currently no specific provincial regulations with respect to the operation of wood stoves. However, there are general provisions within the Substance Release Regulation that ban the burning of prohibited debris unless authorized through an approval. Additionally, Section 109 of EPEA has a general prohibition on the release of a substance that could cause a significant adverse effect.

British Columbia

The principal body of legislation regulating emissions from wood stoves in B.C. is the Environmental Management Act. The Solid Fuel Burning Domestic Appliance Regulation (B.C. Reg. 302/94) (currently under review²⁶) contains the following requirements:

A person who carries on business in British Columbia as an appliance manufacturer, wholesaler or retailer must not sell for use or for resale an appliance manufactured on or after November 1, 1994 unless the person

- (a) ascertains, on the basis of testing carried out in accordance with section 3, that the appliance conforms to either
 - (i) the particulate emission requirements of the Canadian standard, as determined by the test methods and procedures in that standard, or
 - (ii) the particulate matter emission limits set out in the US Standard, as determined by the test methods and procedures in that standard, and
- (b) ensures that, at the time of the sale, the appliance bears a permanently affixed label.

The Government of British Columbia also sponsors a provincial wood stove exchange program²⁷ designed to encourage British Columbians to change out older, smoky wood stoves for low-emission appliances including US EPA/CSA certified clean-burning wood stoves. Funding is available to qualifying regions, municipalities and airshed management groups in the province, which provide incentives to residents to exchange their old wood burning appliances for new wood, pellet, or gas appliances.

Further rebates are available through the LiveSmart BC Efficiency Retrofit Program,²⁸ including \$500 for a new pellet stove or insert when switching out an old wood or gas appliance. The program ends March 31, 2013.

In B.C., both municipalities and regional districts can create by-laws to regulate certain activities causing emissions within their boundaries²⁹. The province of B.C. authorizes the powers of local

²⁶ For more information about the Solid Fuel Burning Domestic Appliance Regulation review, see website: <http://www.env.gov.bc.ca/epd/codes/solid-fuel/index.htm>

²⁷ See website: <http://www.bcairquality.ca/topics/wood-stove-exchange-program/whats-new.html>

²⁸ See website: http://www.livesmartbc.ca/homes/h_rebates.html

²⁹ The relevant sections of the Local Government Act and Community Charter which provide authority for regional districts and municipalities to create by-laws for residential wood home heating are described in the 2011 Inventory of Air Quality By-laws in BC, 2012, BC Ministry of Environment. See website: <http://www.bcairquality.ca/reports/pdfs/by-laws-2011.pdf>

governments through the Local Government Act (regional districts) and the Community Charter (municipalities).

Manitoba

The Environment Act, C.C.S.M. c. E125, is the principal piece of provincial legislation governing the discharge of pollutants in Manitoba. There are currently no provincial regulations specific to wood stove operation in Manitoba.

New Brunswick

The New Brunswick Department of Energy administers the provincial Energy Efficiency Act. In June 2012, Regulation 95-70 under that act was amended to require all solid fuel burning heating appliances manufactured and sold (retail) in New Brunswick to comply with CSA standard B415.1-00.

The New Brunswick Department of Environment and Local Government administers the provincial Clean Air Act. The Act establishes ambient air quality standards for a number of contaminants, and provides a regulatory framework to oversee emissions from industrial sources. There are currently no regulations in place under that Act specific to wood smoke emissions.

The Department of Environment has partnered with the New Brunswick Lung Association, Environment Canada, and neighbouring provincial jurisdictions in the production of an educational pamphlet about wood smoke issues.

Newfoundland and Labrador

The Department of Environment and Conservation Air Pollution Control Regulations, NLR 39/04 stipulate that:

- Commencing July 1, 2008 a person shall not manufacture, sell or permit the selling of a residential woodstove, fireplace insert or factory built fireplace which may emit particulate matter into the environment in excess of:
 - the emission requirements of the Canadian standard; or
 - the emission requirements of the US EPA standard.
- The emission requirements under subsection (1) shall be determined by the test methods and procedures contained in that standard.
- Each unit manufactured, permitted or sold under subsection (1) shall have a readily visible, permanently affixed manufacturer's label which:
 - (a) conforms to the labeling requirements in that standard; and
 - (b) indicates that the unit conforms to the particulate matter emission requirements of that standard.

Newfoundland and Labrador also offered a 25% rebate for the purchase of new pellet burning appliances. The rebate ended in March, 2011.

Nova Scotia

The Nova Scotia Energy Efficient Appliance Regulations³⁰ apply to solid fuel burning appliances in the province. These prescribe acceptable air to fuel ratios and burn rates and also require that appliances must meet US EPA or CSA standards and carry appropriate labelling.

In response to complaints regarding residential wood burning, new policies for wood burning appliance regulations may be developed in the near future to include additional types of fuel burning appliances.

A pilot fuel substitution program was implemented in 2011 for 100% electrically heated homes to receive an incentive to install wood burning appliances in their homes with emissions ratings under 4.5 g/hr PM and be installed and/or inspected by a Wood Energy Technology Transfer (WETT)³¹ trained representative.

Ontario

The Environmental Protection Act is the main provincial legislation governing the discharge of pollutants in Ontario. The Act requires that an environmental compliance approval be obtained for equipment which may result in the discharge of a contaminant to air. There are some exemptions from the need to obtain an environmental compliance approval for certain equipment types or installations including residential wood burning appliances. Generally, wood burning appliances used in the institutional, commercial or industrial sector do require environmental compliance approvals.

The Ontario Ministry of the Environment in conjunction with the Greater Toronto Area (GTA) Clean Air Council (Clean Air Partnership) and other stakeholders, prepared a *Draft Model Municipal Code of Practice for Wood Burning Appliances in Ontario* (2010) to address smoke from indoor fireplaces, wood stoves, and outdoor wood boilers which provided the framework for the current CCME Code.

Prince Edward Island

The Department of Environment, Labour and Justice currently has no regulations that relate to wood burning appliances.

The province's Office of Energy Efficiency provided a 15% rebate to homeowners and consumers to replace old wood burning wood stoves, fireplaces, furnaces or outdoor boilers with new CSA/EPA-compliant appliances. At the time of writing this report, the program funding was exhausted.

Québec

The provincial ministry regulating indoor and outdoor wood burning in Québec is the Ministère du Développement durable, de l'Environnement de la Faune et des Parcs³² (MDDEFP). R.S.Q., c.

³⁰ See website: <http://www.gov.ns.ca/just/regulations/regs/eeappliances.htm>

³¹ See website: <http://www.wettinc.ca/>

³² See website: http://www2.publicationsduquebec.gouv.qc.ca/dynamicSearch/telecharge.php?type=2&file=%2F%2FQ_2%2FQ2R1_A.htm

Q-2, ss. 31, 109.1, 124.0.1 and 124.1 regulates indoor and outdoor heating and cooking appliances. This Regulation applies to any stove, furnace, boiler, fireplace insert and factory-built fireplace designed to burn only wood in any of its forms. However, it does not apply to the following:

- Fireplaces intended for outdoor use only;
- A boiler or furnace with a nominal heat output of 150 kW or more;
- A maple syrup evaporator; or
- A wood burning appliance intended exclusively for export from Québec.

Wood burning appliances are required to comply with either US EPA or CSA B415.10 certification requirements.

Ville de Montréal has adopted a bylaw prohibiting the installation of solid fuel burning equipment (only certified pellet stoves are authorized) and at time of writing was considering mandatory removal of existing wood burning apparatus, except for certified pellet stoves.

Saskatchewan

There are currently no provincial regulations specific to wood stove operation in Saskatchewan. The Saskatchewan Ministry of Environment has posted a Fact Sheet on-line regarding residential wood/coal burning appliances.

Northwest Territories and Yukon

The Department of Environment and Natural Resources (ENR) of the Northwest Territories delivers the Energy Efficiency Incentive Program (EEIP)³³ which was designed to help homeowners and consumers purchase new, more energy efficient commonly used appliances.

EEIP provides a rebate of up to 25% towards the purchase cost (up to a maximum of \$700) to homeowners and consumers who purchase qualifying new wood and wood pellet stoves. Qualifying wood pellet and wood stove appliances must be CSA/EPA-compliant appliances or wood pellet stoves with ULC certification. Rebates are obtained through application to the Arctic Energy Alliance, who also provide advice and public activities to promote wood heating.

ENR also delivers an Alternative Energy Technologies Program (AETP) which provides one-third the cost of purchasing and installing high efficiency wood pellet furnaces and boilers, up to a maximum of \$5,000 and \$15,000 to NWT residents and businesses respectively.

The Department also intends to develop a Code of Practice to assist NWT communities developing or updating by-laws to address particulate emission concerns from residential, commercial and institutional wood heating.

These initiatives to promote wood heating are consistent with provisions in the NWT Biomass Energy Strategy.

³³ See website: <http://www.enr.gov.nt.ca/live/pages/wpPages/EEIP.aspx>

In Yukon, there are no territory-wide regulations specifically for wood stoves. The Good Energy Rebate Program³⁴ currently offered by the Yukon Energy Solutions Centre provides rebates for CSA/EPA compliant wood stoves and boilers as well as ULC-compliant pellet stoves.

Nunavut

The Nunavut Department of the Environment has commissioned a brochure titled “Environmental Guidelines for the Operation of Wood Burning Appliances”³⁵ which provides best management practices on appliance selection based on US EPA/CSA standards for the location and citing of appliances, recommended fuel types and proper operating practices. Otherwise, no regulations currently exist for domestic wood burning appliances in Nunavut.

4.3 United States - Federal (US EPA) Initiatives

The United States Environmental Protection Agency (US EPA) has been regulating wood heater particulate emissions since 1988. All wood burning stoves and fireplace inserts offered for sale in the US must be certified by the US EPA in accordance with Title 40 of the Code of Federal Regulations (CFR), Part 60, Subpart AAA – Standards of Performance for New Residential Wood Heaters, Section 60-532 (US EPA standard) under the Clean Air Act. The following conditions must be met:

- Appliances require independent testing by an accredited laboratory to meet US EPA standards, particulate emissions limits of 7.5 grams per hour for non-catalytic wood stoves and 4.1 grams per hour for catalytic wood stoves (Note: EPA is currently updating emission limits to maintain consistency with CSA B415.10 and Washington State standards).
- Certified appliances offered for sale must bear a permanent label indicating that they meet the US EPA standard.
- EPA is currently revising the New Source Performance Standard (NSPS) for new residential wood heaters. Changes may include more stringent emission standards to reflect best demonstrated technology. They may also incorporate heaters not previously regulated, and update requirements for certification and test methods.

The Agency also administers two voluntary partnership programs to encourage manufacturers to develop and distribute efficient and cleaner-burning units. Through participation in these programs, manufacturers are able to demonstrate that their models are much cleaner than unqualified units. However, models meeting program requirements are not the same as certified units under the US EPA wood stove performance standard outlined above. In turn, US EPA assists participating manufacturers in promoting the purchase of these qualified models.

Emission requirements for these voluntary programs are provided below. State and air district governments may incorporate these requirements in their regulations for air quality management purposes to ensure compliance with the US National Ambient air Quality Standard.

³⁴ See website: http://www.energy.gov.yk.ca/good_energy.html

³⁵ See website: <http://env.gov.nu.ca/sites/default/files/Guideline%20Woodburning%20Appliances.pdf>

4.3.1 US EPA Initiatives: Hydronic Heaters - Voluntary Partnership Program

The US EPA has implemented a voluntary program for manufacturers of hydronic heaters the intent of which is to encourage manufacturers to produce and market more efficient, cleaner models.

In order to qualify for the US EPA outdoor hydronic heater program, partners must adhere to the test method and demonstrate that particulate matter emissions do not exceed 0.32 pounds per million BTU output (Phase 2 level). These heaters may achieve 90% cleaner emissions relative to unqualified models.

Heaters are to be tested using Test Method 28 for Measurement of Particulate Emissions and Heating Efficiency of Wood-fired Hydronic Heating Appliances. This method is also applicable to the testing of indoor models.

NESCAUM's model regulation³⁶ for states and local agencies stipulates the following EPA Phase 2 Emission Standards for residential hydronic heaters:

"No person shall distribute or sell, lease, import, or install an outdoor hydronic heater after March 31, 2010 unless it has been certified to meet a particulate matter emission limit of 0.32 lb/MMBtu heat output. In addition, within each of the burn rate categories, no individual test run shall exceed 18 grams per hour. Compliance with this particulate emission limit shall be determined in accordance with the test method and procedures in Section 6 and 7 of this Regulation."

4.3.2 US EPA Initiatives: Wood Burning Fireplace Program – Voluntary Partnership

This US EPA program sets Phase 1 (7.3 g/kg) or Phase 2 (5.1 g/kg) emission limits for both new low mass (factory built) fireplaces as well as site built masonry fireplaces. Program partners must adhere to the test method outlined in the partnership agreement. As of February 19, 2012, only the Phase 2 limit will apply.

Fireplaces will be tested using ASTM E2558, *Test Method for Determining Particulate Matter Emissions from Fires in Low Mass Wood burning Fireplaces* and ASTM E2515, *Test Method for Determination of Particulate Matter Emissions Collected by a Dilution Tunnel*, and the test procedure in the test guidelines for determining worst case operating conditions.

³⁶ The purpose of NESCAUM is to provide scientific, technical, analytical, and policy support to the air quality and climate programs of the eight Northeast states. See website: <http://www.nescaum.org/>

4.4 Additional Regulations and By-laws in Other Jurisdictions

Aside from the federal and provincial regulations described in the preceding sections, the interjurisdictional review included some 20 selected US states as well as more than 180 municipalities and regional districts across Canada and the US. Although specific local regulations and by-laws differed widely, they were based primarily on provincial, territorial or state air quality standards and US EPA/CSA certification.

In several instances, local air management groups actively supported provincial or state initiatives to control emissions from wood burning appliances. These variously included community outreach and education programs as well as wood burning appliance exchange or change-out programs.

Complete details of the regulatory and voluntary programs in other jurisdictions surveyed are presented in *Review of Municipal, Provincial and Federal Policies for Wood Burning Appliances in Selected Canadian and U.S. Jurisdictions* (CCME, 2012).³⁷

5.0 Wood Smoke Management Toolbox

This section identifies best management practices with respect to government efforts to reduce wood smoke emissions and related impacts. These suggestions are based on programs and activities identified through interjurisdictional reviews. They are provided for consideration by governments in designing policies and programs to reduce wood smoke emissions.

The suggested best practices are categorized under six main headings:

- 5.1 Regulating Appliance Efficiency
- 5.2 Air Quality Advisories and ‘No-Burn Days’
- 5.3 Limits on Installation or Operation of Wood Burning Appliances
- 5.4 Incentives to Change
- 5.5 Public Outreach and Education
- 5.6 Performance Management – Planning for and Measuring Success

Related policy and/or management options are provided for each.

Management efforts should consider all of the approaches described below. However, some may not be as applicable as others in all areas (*e.g.*, rural areas where incorporated municipalities may not exist). Flexibility and creativity may be required on the part of governments and their partners.

³⁷ See www.ccme.ca

5.1 Regulating Appliance Efficiency

Jurisdictions should consider requiring wood burning appliances to meet CSA standard B415.10 or the US EPA New Source Performance Standards. Due to the local nature of most wood smoke impacts, municipalities (where they exist) are often the best placed governing body to implement this suggestion.

However, it is recognized that all levels of government may potentially play a role in the development of policy tools and regulations for wood burning appliance management. As such, the Code can inform other measures that might be explored in the future (e.g. federal or provincial measures affecting the importation or manufacturing of uncertified wood burning appliances).

5.1 Regulating Appliance Efficiency

Jurisdictions should consider requiring wood burning appliances to meet CSA or US EPA efficiency standards.

Management Options:

- (i) **Municipal By-Laws:** Municipalities can address nuisance and health related wood smoke issues by adopting by-laws (where legal authority exists) to reduce wood smoke emissions. Such by-laws can include detailed requirements for appliance certification, installation, and operation. *Appendix 1 - Model By-Law Elements for Residential Wood Burning Appliances* has been prepared as guidance for municipalities wishing to pursue this option. (Note: Outreach and education steps under Recommendation 5.5 should be undertaken prior to public announcement of by-laws or regulations.)
- (ii) **Provincial and Territorial Regulations:** Provinces and territories that contain unincorporated areas and/or smaller municipalities with little by-law enforcement capacity may wish to establish regulations and/or revise building codes to encourage installation of certified appliances. Although principally targeting a municipal audience, *Appendix 1 - Model By-Law Elements for Residential Wood Burning Appliances*, may also inform these provincial/territorial efforts.

5.2 Air Quality Advisories and ‘No-Burn Days’

Jurisdictions should consider curtailing wood burning activities during poor air quality episodes, as implemented successfully by many local governments in the US and Canada. These ‘No-Burn Day’ notices may be issued by municipal and provincial agencies during Air Quality Advisories³⁸; they can include bans on burning wood and/or other materials, and can be mandatory or voluntary.

Wood burning curtailment may take two approaches:

- **Mandatory No-Burn Days** – Regulations or by-laws that prohibit wood burning during periods of poor air quality. Notification is provided by radio, television, newspaper, public notice or other means. No-Burn Days are usually enforced by counties or municipalities and fines are given to those who do not comply. Example: Prince George, BC, Clean Air By-law 8266, 2010.
- **Voluntary No-Burn Days** – Guidelines or programs requesting that the public voluntarily refrain from using wood burning appliances during periods of poor air quality. No-burn day voluntary advisories can be a useful adjunct to air quality management planning particularly where by-laws are lacking. Example: as described in Environment Canada’s Model Municipal By-law for Regulating Wood Burning Appliances (2006).

When adopting mandatory no-burn days, individual jurisdictions should also consider providing exemptions to residents whose primary heating fuel is wood.

³⁸ e.g., In Ontario, The Ministry of Environment issues a “smog watch” when there is at least a 50 per cent probability that the Air Quality Index (AQI) will reach or exceed 50 in the next three days. A “smog advisory” is issued when there is a high probability that the AQI will reach or exceed 50 in the next 24 hours.

5.2 Air Quality Advisories and ‘No-Burn Days’

Jurisdictions should consider curtailing the operation of existing wood burning appliances during poor air quality episodes.

Management Options:

- (i) **Notification:** Local municipalities, provinces and territories should make a reasonable effort to notify residents about any concerns for the use of Wood Burning Appliances during an Air Quality Advisory. The notification could be called ‘No-Burn Days’. Notices could be disseminated through local radio stations, internet, newspapers or by distribution of leaflets. Initial notices may request voluntary wood burning curtailment in the community.
- (ii) **By-laws:** Municipal By-laws to curtail wood burning during Air Quality Advisories could include mandatory restrictions on appliance usage. *Appendix 1-Model By-Law Elements for Residential Wood Burning Appliances* identifies draft by-law text for two-staged burn restrictions (see Part 2, s.5).
- (iii) **Burn Restrictions:** ‘No-Burn Days’ should be considered in two stages:
 - Stage 1: Burn Restrictions with emphasis placed on avoiding uncertified appliance usage when there is a forecasted risk of air quality deterioration due to heavy appliance usage and unfavourable meteorological events; and,
 - Stage 2: Burn Restrictions with emphasis on avoiding use of all non-essential appliances (certified and non-certified) when air quality has deteriorated and is otherwise considered ‘poor’.

5.3 Limits on Installation or Operation of Wood Burning Appliances

In areas that experience significant episodes of air quality degradation from wood smoke (often in combination with unfavourable weather conditions) jurisdictions should consider limiting the use of certain types of wood burning appliances.

Appendix 1- Model By-Law and Regulatory Elements for Residential Wood Burning Appliances provides guidance with respect to by-laws and regulations for controlling appliance stocks.

5.3 Limits on Installation or Operation of Wood Burning Appliances

In problem areas, jurisdictions should consider limiting the number and types of wood burning appliances that can be used.

Management Options:

- (i) **Assessment:** Before considering limits on appliances jurisdictions should assess the wood smoke risks in their management area. This assessment should consider ambient air quality monitoring information, odour complaints, visible haze, reported health impacts, appliance inventories, and appliance usage patterns.
- (ii) **Prohibition of All Wood Burning Appliances:** Regulations or by-laws that prohibit installation and operation of wood burning appliances. Example: Ville de Hampstead, Québec by-law prohibits installation of any new wood burning appliances and operation of existing appliances as of November 3, 2015.
- (iii) **Prohibition of New Wood Burning Appliances:** Regulations or by-laws that prohibit the installation and operation of new wood burning appliances. Existing wood burning appliances are ‘grandfathered’ in and allowed to operate, or can be upgraded to advanced technology appliances. Example: Golden, BC, by-law 1150, 2005.
- (iv) **Prohibition of Specific Appliance Types:** Regulations or by-laws that prohibit or include operating conditions for wood burning appliances such as outdoor fireplaces, chimeneas, and outdoor wood-fired hydronic heaters. Indoor appliances such as wood stoves and indoor fireplaces are allowed to operate. Example: City of St. Thomas, Ontario’s By-law 138 -2003 and the Township of Ramara, Ontario By-law 2011-31/37.

The success of this approach depends on the capacity for a given jurisdiction to carry out appliance inspection. Enforcement requires staff awareness of the prohibitions and any unique considerations on how to enforce the rules.

5.4 Incentives to Change

Jurisdictions can reduce wood smoke emissions by providing incentives to encourage homeowners to remove uncertified conventional appliances from use. Change-out programs have been shown to be effective in this regard.

5.4 Incentives to Change

Jurisdictions should consider providing incentives, in the form of carefully crafted change-out programs to reduce the number of non-certified appliances being used.

Management Options:

- (i) **Rebates for Wood Burning Appliance Replacement:** Provides some financial compensation for the replacement of inefficient wood burning appliances with either an EPA or CSA-certified wood burning appliance or an appliance utilizing other fuels (including pellet, natural gas or electric). Most change-out programs in Canada fall under this category.
- (ii) **Rebates for Wood Burning Appliance Fuel Switching:** Provides financial compensation to replace inefficient wood burning appliances with an equivalent appliance using a different fuel (i.e., replacing a wood burning furnace with a natural gas furnace). Example: Québec and Équiterre's Feu Vert program.
- (iii) **Financial Compensation for Wood Burning Appliance Removal:** Provides compensation to remove an old wood burning appliance with no requirement to replace with a new appliance. Example: Québec and Équiterre's Feu Vert program.

In urban centres where alternative sources of heat, such as natural gas, are readily available, any one of the change-out programs presented above may be considered by policy makers and regulators to address local wood smoke issues. Although fuel switching and the removal of old wood burning appliances (without replacement) should improve both indoor and outdoor air quality, these approaches may not be suitable for rural areas where wood is the primary home heating fuel and there are no tie-ins to alternative fuel supplies.

Change-out programs are often conducted in phases. The first phase generally targets old non-certified wood burning appliances. Fuel switching and heating alternatives, such as weatherization and energy conservation, are promoted in subsequent phases.

5.4.1 Change-out Program Potential Pitfalls

Findings from jurisdictional reviews indicated that the participation rate in change-out programs has sometimes been low. Some of the contributing factors to the low response rate include:

- Limited awareness of the environmental and health impacts of wood smoke;
- Concern about out-of-pocket costs for new appliances and fuel;
- Resistance to wood burning restrictions and reluctance to change burning habits;
- Difficulty establishing a stable funding mechanism; and,
- Insufficient rebate level, funding, partner participation, and regulatory support.

As evident in the list of barriers presented above, the success of a change-out program is dependent upon the interaction of many policy and program elements. The following two jurisdictions offer good examples of appliance change-out programs that overcame local barriers.

5.4.2 Change-out Program Success: British Columbia's Provincial Wood Stove Exchange Program

After 10 years of sporadically funded change-out programs with low results, the province of British Columbia decided to pilot a community-based social marketing approach in 2007. Community-based social marketing³⁹ is useful in that it specifically looks to address the barriers to behaviour change (as identified above). The Provincial Wood Stove Exchange Program is run at a community level through grants provided by the province. The program includes financial incentives to upgrade old wood stoves or inserts and education to help everyone improve their wood burning practices. A provincial rebate of \$250 is often supplemented by community rebate contributions ranging from \$50 to \$500. The Hearth Products Industry also contributed a discount of \$150 during part of the program.

By the end of the 5th year of the program in 2012, it is anticipated that over 5000 old stoves will be exchanged for cleaner burning models. This equates to an annual reduction of over 310 tonnes of PM_{2.5}. And because new wood burning appliances can burn 30-50% less wood, reduced fuel costs and increased heating efficiency are also realized. Provincial spending per stove exchanged is approximately \$360 (which includes the \$250 rebate and additional funds to cover education and coordination of the program at the local level). Provincial spending is leveraged 3:1 by community and industry partnerships.

Perhaps an equally impressive outcome of the Provincial Woodstove Exchange Program is the number of municipalities and regional districts who, having decided to participate in the program, are now committed to addressing residential wood burning. Over 44 municipalities and villages and 18 regional districts have partnered to offer incentives and wood burning education to their community members. Since 2007, 31 new or updated by-laws for residential wood combustion have been enacted, representing an increase in the number of by-laws by 74%. As a result, 39% of BC's population is now covered in some way by residential wood burning appliance by-laws⁴⁰.

³⁹ See www.cbsm.com for more information.

⁴⁰ BC Ministry of Environment, 2012, "2011 Inventory of Air Quality By-laws in British Columbia".

5.4.3 Change-out Program Success: City of Libby Montana's Wood Stove Exchange Program

In the City of Libby, Montana, a town without industrial sources of air pollution, wood smoke was identified as the primary source of fine particulate matter. The smoke comes from Libby's sizable low income population which relies on wood burning as their primary source of home heating. The local topography also compounds the problem.

Libby designed its change-out program to be delivered in two phases. (Though note that the financial resources provided for this program are generally not available to other programs⁴¹). In Phase 1 Libby replaced wood stoves in low income households at no cost upon verification of economic status and/or face-to-face interviews with applicants. In Phase 2, Libby targeted the remaining residential wood stove owners and businesses by providing vouchers that would cover the majority of the wood stove replacement costs. In addition, a reward was given to each household that surrendered its old wood stoves for disposal. And, an updated air quality control regulation was introduced in Lincoln County, Montana to forbid the operation of an uncertified stove when the Phase 2 change-out program expired and a fine of \$25/day would be imposed if an uncertified unit was used.

The lessons learned from this highly successful change-out program are highlighted below⁴² and may help jurisdictions that are contemplating the use of change-out programs:

- Establish broad-based partnerships including environmental, health and other government departments, industry associations, academia and interested environmental groups to assist in public outreach and day-to-day program administration as well as to provide funding and program support in areas such as product and resource donations, expertise and training for the installation and operation of new stoves, air monitoring and others.
- Secure sufficient funding since a change-out program is solely dependent on financial incentives.
- Design the program to include options based on the socioeconomics of the participants.
- Consider individual economics to ensure potential participants are aware of all out-of-pocket costs not covered by the program.
- Implement outreach and education programs early since these are critical to the long term success of the change-out. Examples include advertising through news media, mailings, public meetings, stove fairs and education/training sessions for change-out participants.
- Consider air monitoring for particulate matter before and after the change-out.

⁴¹ Hearth Patio Barbeque Association through its member companies donated approximately \$1 million in stoves, chimney venting, and cash for installation to help the most needy families in Libby replace their old wood stoves. The U.S. EPA provided the community with a \$100,000 grant to assist this first phase of the program. Later, a \$1 million congressional earmark provided purchase incentives to the other families in the community.
(<http://www.woodstovechangeout.org/index.php?id=27>)

⁴² Hearth, Patio & Barbecue Association, 2008, "Clearing the Smoke, the Wood Stove Change-out in Libby, Montana", Preliminary Report.

- Emphasize the health and safety benefits of upgrading to a certified wood stove.
- Determine the best time of year to conduct a wood burning appliance change-out campaign and the willingness of retailers to participate. Stay flexible and allow for necessary adjustments to program plan such as program extensions.
- Budget for proper administrative staffing for program delivery.
- Provide financial incentives for early program participants.
- Dispose/recycle old stoves properly to avoid re-use.
- Introduce by-law or regulatory elements to coincide with change-out program target dates in order to help encourage residents to replace old stoves.

5.5 *Public Outreach and Education*

Public outreach and education programs help to raise awareness about the health and air quality impacts associated with wood burning. They also provide a means to educate homeowners with respect to the proper operation and maintenance of their wood burning appliances. Outreach campaigns are particularly useful when building stakeholder acceptance for new or soon-to-be-new by-laws and regulations, for disseminating information over a long period of time, and for promoting initiatives that encourage public participation in related programs (*e.g.*, change-out programs).

Outreach programs can be conducted by public, private, and non-profit organizations, and benefit by involving a broad range of interested stakeholders (*e.g.*, volunteer groups, retailers, etc.)

5.5 Public Outreach and Education

Jurisdictions should consider outreach and education programs as a means to raise awareness, promote voluntary change, and to facilitate acceptance of new rules and programs with respect to wood burning.

Management Options:

- (i) **Electronic Resources:** Wood burning best practices, health information, and information on energy efficient appliances can be communicated on websites and through retail video demonstrations.
- (ii) **Training Programs:** Industry and retail experts can be engaged to educate the public about wood burning best practices in the form of workshops and demonstrations.
- (iii) **Multimedia Public Notification:** Local television, newspapers, posters, pamphlets and billboards can be used to inform the public about issues relating to wood burning. Figure 2 illustrates this type of outreach.
- (iv) **Community-Based Social Marketing:** Research and actions can be targeted to address specific barriers to behavior within a community.
- (v) **Pending By-laws or Regulations:** Communication of the possibility of pending by-laws or regulations in support of the implementation of advanced technology wood burning appliance standards under CSA B415.1 or US EPA standards and related operating practices.
- (vi) **Local Campaign Leaders:** A locally recognised individual can provide an effective central point for coordinating outreach components.
- (vii) **Timing for Best Effect:** Be aware of the need to communicate information at the appropriate time. Providing communications in advance of actions (e.g. new by-laws or programs) can make a significant difference.

Figure 2: Example Pamphlet



WOOD SMOKE SIGNALS AN INEFFICIENT FIRE, WASTES ENERGY AND CONTRIBUTES TO POOR AIR QUALITY

HEATING WITH WOOD MAKES GOOD USE OF A RENEWABLE RESOURCE... HERE ARE SOME GREAT RESOURCES TO HELP YOU TO BURN EFFICIENTLY, CLEANLY, AND RESPONSIBLY:

Environment Canada series of short, informative videos
http://www.ec.gc.ca/cleanair-airpur/videos/Woodstove_mgt-Eng.wmv

CMHC Guide to Residential Wood Heating
<http://www.cmhc-schl.gc.ca/en/co/mah/enecoosa/loader.cfm?url=/commonspot/security/getfile.cfm&PageID=189906>

Variety of Hearth, Patio and Barbeque Association videos
<http://www.youtube.com/user/HomeHeatingHelp#p/u>

Please contact us for copies of this information:

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HEAT WITH WOOD?

CHECK IT 



GOOD FUEL

- ☐ Burn only properly seasoned fire wood
- ☐ Collect, split and stack and cover your firewood at least a season in advance of burning it (3 – 6 months)
- ☐ Look for 'checks' in the end grain
- ☐ Check your wood for moisture content: less than 20% using a moisture metre is good to burn
- ☐ Properly seasoned wood feels lighter than wet wood
- ☐ Hit two pieces together - properly seasoned wood make a 'cracking' sound; wet wood will 'thud'



GOOD APPLIANCE

- ☐ EPA certified appliances emit less than 7 grams per hour smoke/emissions – they have a secondary burn mechanism to capture at least 70 % of the smoke and reburn it before it leaves the firebox.
- ☐ All new stoves sold in British Columbia are EPA certified - look for a label on the back of your appliance
- ☐ New stoves use about 1/3 less fuel than older models
- ☐ Consider upgrading if your stove is older than 15 years– older, uncertified stoves can emit 60 grams of smoke per hour
- ☐ Maintain and clean your stove and chimney on a regular basis



GOOD TECHNIQUE

- ☐ Watch for smoke signals! Check your chimney – other than start up, you should only see a thin wisp of steam or vapour from an efficient fire
- ☐ Burn according to manufacturer's instructions
- ☐ Burn hot, bright fires, and do not let them smoulder
- ☐ Learn how to improve your technique, try a 'top-down' fire or how to adjust your burn in the milder seasons
- ☐ Be a good neighbour... let the only sign of your wood heat be a well seasoned wood pile!
- ☐ "Check out" some of the wood heat resources listed on the back

5.6 Performance Management – Planning for and Measuring Success

Jurisdictions should consider measuring and assessing the outcomes of their wood smoke management efforts by establishing and tracking appropriate indicators. This approach requires that measurement be considered from the outset of an initiative, in the planning and evaluation phases of such work.

5.6 Performance Management – Planning for and Measuring Success

Jurisdictions should consider measuring and assessing the outcomes of their wood smoke management efforts by establishing and tracking appropriate indicators.

Management Options:

- (i) **Initial Wood Smoke Evaluation:** An initial wood smoke evaluation may include an emissions inventory, community survey, or other indicators of the wood smoke problem. This will establish a baseline from which program success can be measured. Key considerations may include the total number of appliances in the community, appliance model and type, approximate hours of operation, type of fuel used, and whether the appliances are EPA/CSA certified.
- (ii) **Selection of Actions:** Having completed an “Initial Wood Smoke Evaluation”, actions could be crafted to match the community characteristics. For example, Mandatory No-Burn Days may be considered in areas influenced by topographical barriers and where smoke dispersion can be hindered. Air quality advisories would be appropriate for communities having the potential for heavy wood smoke. Those communities where there are numerous residents relying on wood burning as a primary heat source may need to notify the public of the need for an alternative heating supply during poor air quality episodes. In some cases it may also be necessary to address other pollution sources in the community.
- (iii) **Measure Project Success:** Selected actions could also be matched with quantifiable indicators of success.⁴³ The collection of quantifiable data not only helps measure final success but can also inform ongoing tweaks to a program while it is running. This data can be used when reporting to the public, funding agencies and partners, and will inform future initiatives. Data to be tracked could include:
 - Estimating the number and types of change-outs (e.g., EPA or CSA-certified wood burning appliances, gas appliances, pellet stoves and electric appliances);
 - Determining emissions reductions from change-outs;

⁴³ Guidance on project success through emission reductions can be found in the US EPA's "Guidance for Quantifying and Using Emission Reductions from Voluntary Wood Stove Change-out Programs in State Implementation Plans" http://www.epa.gov/burnwise/pdfs/guidance_quantifying_jan.pdf

- Tracking public nuisance complaints;
- Tracking compliance and enforcement activities;
- Evidence based observations (haze, white-smoke from a chimney); and,
- Long term and/or regional ambient air monitoring.

(iv) **Program Duration:** Consider operating wood smoke management initiatives in a community or region on a continuous or periodic basis to ensure that air quality does not deteriorate over the long term.

5.6.1 Emissions Calculator Tool for Wood Stove and Fireplace Change-outs

US EPA has developed an easy-to-use emissions calculator in Microsoft Excel that estimates emissions reductions from wood stove or fireplace change-outs. This tool can help municipalities measure their contributions toward air quality improvement. The user of the calculator can input basic information such as the number of stoves/fireplaces changed out and cords of wood burned. A copy of the calculator is located at: <http://www.epa.gov/burnwise/resources.html>.

Appendix:

Model By-law and Regulatory Elements for Residential Wood Burning Appliances

Preamble

The following regulatory elements were developed based on best practices adopted from leading jurisdictions that govern wood burning appliances. This document is intended solely as an aid for jurisdictions who wish to put in regulations or by-laws for regulating wood burning appliances. Jurisdictions may need to modify these elements to align with their existing policies and authorities to regulate appliance installations and related air management programs.

Jurisdictions may want to seek public input in their regulatory development process in order to ensure that they address local wood burning issues.

Disclaimer

Jurisdictions should obtain legal advice when drafting and developing their own regulations or by-laws. Nothing in this Code of Practice and model by-law should be construed as legal advice nor should any provisions contained herein be relied upon in lieu of obtaining legal advice. The regulatory elements provided in this document are only provided as guidance and do not represent a comprehensive regulation or by-law. Jurisdictions with existing regulations or by-laws that are more stringent than those listed in the code are encouraged to maintain those requirements.

Finally, websites that do not respond when clicking on their links in this document may be copied into a web page browser for access to that site.

Part 1: Definitions

1.1 Adverse Effect includes:

- (a) impairment of the quality of the natural environment,
- (b) injury or damage to property or to plant or animal life,
- (c) harm or material discomfort to any person,
- (d) an adverse effect on the health of any person,
- (e) impairment of the safety of any person,
- (f) rendering any property or plant or animal life unfit for human use,
- (g) loss of enjoyment of normal use of property,
- (h) interference with the normal conduct of business, and
- (i) nuisances including, but not limited to, excessive smoke, odour, dust, airborne sparks, embers or reduced visibility on roadways, railways or airfields.

1.2 Air Quality Advisory is a public health warning issued through the media by the [jurisdiction's name] during periods of deteriorated air quality due to smog, also referred to as a Smog Advisory.

1.3 ASTM E2558 means the document entitled Standard Test Method for Determining Particulate Matter Emissions from Fires in Low Mass Wood burning Fireplaces, dated 2008, published by the American Society for Testing and Materials (ASTM), as amended from time to time.

1.4 ASTM E2515 means the document entitled *Standard Test Method for Determination of Particulate Matter Emissions Collected by a Dilution Tunnel*, dated 2009, published by the American Society for Testing and Materials (ASTM), as amended from time to time, and the test procedure in the test guidelines for determining worst case operating conditions.

1.5 Biomass means, (a) peat, (b) clean dry wood, (c) sawdust, (d) oat hulls, (e) crop residues or any other organic material that is grown or harvested for the purpose of being burned to generate electricity or heat.

1.6 Certified Appliance means an advanced technology wood burning appliance that bears a certification mark certifying conformity to low emissions criteria with the CSA B415.10 Standards or the US EPA New Source Performance Standards.

1.7 Chief Fire Official, where applicable, means the local municipal, provincial or territorial Chief Fire Official as defined in the [jurisdiction's name] Fire Code or other regulation [specify name of regulation].

1.8 Clean Dry Wood means firewood or woodwaste that has been allowed to dry. [Note: "dry" refers to moisture content less than 20% -wet basis]

1.9 Conventional Appliance [Note: see definition for Uncertified Appliance]

1.10 CSA B415.10 means the document entitled *Performance Testing of Solid-Fuel-Burning Heating Appliances* published by Canadian Standards Association (2010).

Note: This Standard applies to:

- (a) manually and automatically fuelled stoves and fireplace inserts;*
- (b) factory-built fireplaces with a minimum burn rate less than 5 kg/hr, and;*
- (c) furnaces and hydronic heaters designed to have the useful heat produced by the appliance conveyed to areas remote from the appliance by ducting or plumbing.*

1.11 Indoor Wood Burning Appliance or Biomass Burning Appliance includes woodstoves, wood-fired boilers, hydronic heaters, indoor-dwelling furnaces, outdoor-remote appliances, forced air wood burning furnaces, cook stoves, masonry heaters, fireplaces and pellet stoves installed and used inside a building; but does not include ‘apartment incinerators’ or ‘wood-waste’ combustors.

1.12 Municipal Authority means the local municipality, Municipal By-Law Enforcement Officer, or a person designated by the local municipality to issue permits and authorizations for enforcement of Indoor Wood burning Appliances.

1.13 Owner means the person who owns the property on which an Indoor Wood Burning Appliance is installed.

1.14 Removal means to remove from the premises or to render inoperable.

[Note: this definition enables removed stoves to be reused elsewhere, where it is legal to do so. Alternatively, the definition could be written such that removed (uncertified) equipment must be rendered inoperable].

1.16 Uncertified Appliance means a conventional indoor wood burning appliance that does not bear a certification mark (label) certifying conformity to low emissions criteria within the CSA B415.1 standards or the US EPA New Source Performance Standards.

1.17 Urban Area is an area with a population of at least 1,000 and no fewer than 400 persons per square kilometre, as defined by Statistics Canada.

1.18 EPA New Source Performance Standards means the document entitled *40 CFR 60 Subpart AAA — Standards of Performance for New Residential Wood Heaters*, dated 1988 and updated in 2000, published by the US Environmental Protection Agency, as amended from time to time.

1.19 US EPA Phase 2 Boilers (hydronic heaters) means advanced wood-fired boilers that are tested, certified and marked with a white tag as cleaner model boilers under the US EPA Phase 2 Program.

1.20 Waste includes garbage or refuse materials from residential, commercial, agricultural, industrial or institutional establishments.

- 1.21 Woodwaste** means, tree trunks, tree branches, brush, or wood products that do not contain:
- i. chromated copper arsenate, ammoniacal copper arsenate, pentachlorophenol, creosote, pesticides, paint, or
 - ii. easily removable hardware, fittings and attachments, unless they are predominantly wood or cellulose, or
 - iii. plywood or composite wood products containing varnish or glue, or an upholstered article, or
 - iv. an article to which a rigid surface treatment is affixed or adhered, unless the rigid surface treatment is predominantly wood or cellulose

[Note: this definition enables burning of clean woodwaste while contaminated woodwaste would not be suitable for burning under this code of practice].

Part 2: Indoor Wood Burning Appliances

Jurisdictions will need to decide if they want to encourage residents to replace conventional uncertified wood burning appliances with advanced certified appliances or advanced technology fireplaces, and/or other clean burning alternatives such as gas fireplaces or furnaces.

In addition, jurisdictions may want to consider a limit on the number of new wood burning appliance installations in areas where air quality may be at risk of degradation. This risk may be determined using air monitoring devices for particulate matter, appliance inventories and emission trends.

SECTION 1: INSTALLATION

An indoor wood burning appliance shall be installed in *[jurisdiction's name]* in accordance with the following provisions:

- 1.1 The indoor wood burning appliance shall conform to a certified appliance under the Canadian Standards Association (CAN/CSA B415.10 Performance Testing of Solid-Fuel-Burning Heating Appliances) standard or the US EPA equivalent standard, or low mass fireplace standards (ASTM E2558 and ASTM E2515) as determined under a recognized voluntary program.
- 1.2 The certified appliance shall not be used to burn waste.
- 1.3 The certified appliance shall burn only clean dry wood or biomass.
- 1.4 The owner of an indoor wood burning appliance shall not create an adverse effect or nuisance.

Note: A by-law exemption may need to be applied to pellet stoves that have not been certified but are otherwise known to meet certified appliance standards.

SECTION 2: INDOOR WOOD BURNING APPLIANCE CHANGE-OUTS

Jurisdictions may want to define a phase-out period for the removal of uncertified wood burning appliances. This section would best apply to jurisdictions where complaints and air quality problems due to wood stoves are prevalent or where growth in use of appliances is expected. Municipal and/or provincial financial incentives and period extensions for change-outs may need to be established for low-income families. Exemptions for homes not having any other sources of heat should be considered.

In addition, local municipalities could require the removal of any uncertified wood burning appliances prior to the completion of a sale or transfer of any real property and major

renovations after a certain date, through the review of building permits. If your municipality chooses to phase-out uncertified appliances then the following element may be considered:

2.1 All non-certified wood burning appliances within the *[jurisdiction's name]* shall be removed from all properties by *[specify date]* or rendered permanently inoperable by *[specify date]*.

Note 1: Exemptions from this section should be provided for appliances installed at heritage sites or otherwise considered 'antique'.

Note 2: Municipalities could establish a removal program for uncertified wood burning appliances that may incorporate incentives for energy conservation and air quality improvement including, but not limited to, household insulation, insulating products, non-certified wood stove replacement and substitution of heating methods and appliances, including certified wood burning appliances.

SECTION 3: OUTDOOR WOOD-FIRED BOILERS

(Alternative 1) No person shall install, use, or maintain an outdoor wood-fired boiler in *[jurisdiction's name]*.

Note: See Alternative 2, below, if a prohibition on outdoor wood-fired boilers does not apply to the jurisdiction,

- or -

(Alternative 2) An outdoor wood-fired boiler shall be installed and used in *[jurisdiction's name]* in accordance with all of the following provisions:

3.1 The wood-fired boiler unit shall be in compliance with a certified appliance by the Canadian Standards Association (CAN/CSA B415.10 Performance Testing of Solid-Fuel-Burning Heating Appliances) or the US EPA Phase 2 Boilers (white tag models –see Chapter 5.2) or the US EPA Phase 2 Boilers that burn pellets.

3.2 The outdoor wood-fired boiler shall not be used to burn waste.

3.3 The outdoor wood-fired boiler shall be used to burn only clean dry wood or biomass materials.

3.4 The outdoor wood-fired boiler shall be located at least **[insert a distance appropriate]** from the nearest building which is not on the same property as the wood-fired boiler or any nearby structure used as a dwelling

Note: a substantial minimum distance is recommended to help avoid nuisance issues and health risks.

3.5 The owner of the wood-fired boiler shall obtain an annual permit from the Chief Fire Official or other Municipal Authority in accordance with Part 3 of this by-law if the boiler is located within **[insert a specified distance]**.

Note: If a permit will not be required for wood-fired boilers, omit this paragraph entirely. If a permit will be required for all wood-fired boilers, end the sentence after the word “by-law.” If a permit will be required only if there are nearby neighbors, insert an appropriate distance such as 30 m (100 feet), 90 m (300 feet) or 150 m (500 feet) from property line or from the nearest building which is not on the same property. The use of a wood-fired boiler that meets the distance and stack height requirements provided in the regulation or by-law may not be adequate in some areas due to topography or meteorology that could render the operation of one or more wood-fired boilers problematic.

Jurisdictions should ensure that boiler distances are relevant to their area’s topography, population density and appliance requirements, thereby preventing nuisance or health problems, and that permits may be revoked in the event of complaints.

3.6 The wood-fired boiler shall have a chimney that extends at least [insert a minimum height] above the ground surface.

Note: A minimum chimney height of 4.5 m (15 feet) is recommended. The Chief Fire Official or other Municipal Authority may approve a lesser height on a case-by-case basis and required minimum separation to neighbors if the smoke from the lower chimney height does not create a nuisance for neighbors.

3.7 No person operating a wood-fired boiler shall create an adverse effect.

SECTION 4: OUTDOOR WOOD-FIRED BOILER CHANGE-OUTS

Jurisdictions may want to define a phase-out period for the removal of all Uncertified Outdoor Wood burning (OWB) Boilers. This section would best apply to jurisdictions where complaints and air quality issues due to wood boilers are prevalent or where growth in use of OWB is expected. Generally, urban areas with populations greater than 10,000 have prohibited wood boiler installations and use. In addition, a jurisdictions financial incentives and period extensions for change-outs may need to be established for low-income families.

Local municipalities could also require the removal of any uncertified outdoor wood burning appliances prior to the completion of a sale or transfer of any real property and major renovations after a certain date, through the review of building permits. If your municipality chooses to phase-out uncertified appliances then the following element may be considered:

4.1 All non-certified wood burning boilers within the [jurisdiction’s name] shall be removed from all properties by [specify date] or rendered permanently inoperable by [specify date].

Note: Municipalities could establish a removal program for outdoor wood-fired boilers that may incorporate incentives for energy conservation and air quality improvement including, but not limited to, household insulation, insulating products, non-certified wood stove replacement and substitution of heating methods and appliances, including certified wood burning appliances.

SECTION 5: UNFAVOURABLE METEOROLOGICAL CONDITIONS

Local municipalities should make a reasonable effort to notify residents about any restrictions on the use of wood burning appliances during a Stage 1 Air Quality Advisory, when there is a risk of air quality deterioration, or during a Stage 2 Air Quality Advisory when poor air quality is evident. Residents can be notified of these situations through local radio stations, internet, newspapers or distribution of leaflets. Emphasis could be placed on avoiding practices that utilize uncertified appliances.

Stage 1 Burn Restrictions:

- 5.1** No person shall burn wood or manufactured fire logs in fireplaces or conventional uncertified wood burning appliances at any time when a stage 1 Air Quality Advisory is in effect, except to heat premises that are equipped with no heating appliance or facilities other than the wood burning appliance.
- 5.2** An EPA or CSA advanced technology certified wood burning appliance, pellet stoves, natural gas and propane fireplaces can be used during a Stage 1 Air Quality Advisory.
- 5.3** No visible smoke is allowed from any wood burning appliance, beyond a 20 minute start-up period during a Stage 1 Air Quality Advisory.

Stage 2 Burn Restrictions:

- 5.4** No person shall use an advanced certified wood burning appliance, conventional uncertified appliance, pellet stove or fireplace at any time when a Stage 2 Air Quality Advisory is in effect, except to heat premises that are equipped with no heating appliance or facilities other than the wood burning appliance.
- 5.5** A fireplace unit that uses natural gas or propane may be used during a Stage 2 Air Quality Advisory.
- 5.6** No visible smoke is allowed from any wood burning appliance at any time.

Note 1: Municipalities may want to consider requiring any new building supplied with heat, in an urban area, to be fitted with a primary form of space heating other than a wood burning appliance, such as a natural gas, propane, oil furnace, or electric heat sufficient to meet the space heating requirements of the building. A primary heating source will ensure that during smog advisories or municipal burn bans due to smoke haze are in effect, the occupant will be able to heat the building with a system other than a wood burning appliance.

Note 2: Municipalities may require residents to hold a letter stating they have no other source of heating other than wood or biomass burning appliances.

Part 3: Fire Permits, Complaints and Enforcement

SECTION 1: FIRE PERMITS

Municipalities may want to consider fire permits for uncertified wood-fired boilers, excluding US EPA Phase 2 Boilers white tag models or US EPA Phase 2 Boilers that burn pellets, to ensure best practices for the operation of these appliances. Information in a permit provides an opportunity for public education on fire safety, smoke and environmental issues.

- 1.1 No person shall start or maintain an uncertified wood-fired boiler excluding Phase 2 appliances in *[jurisdiction's name]* except under and in accordance with a fire permit issued by the **[insert "Chief Fire Official", other Municipal Authority, or title(s) of other person(s) authorized to issue burning permits]**.

The fee for each fire permit shall be **[insert cost of permit]**. *Note: Your municipality will have to decide whether or not to require a fee and how to collect it.*

- 1.2 A burning permit issued under this section shall require compliance with all applicable provisions of this **[by-law or regulation]** and any additional special restrictions deemed necessary to protect public health and safety.
- 1.3 Any violation of the conditions of a fire permit shall be deemed a violation of the *[applicable regulation or by-law name]*. Any violation of this by-law **[or regulation]** or the fire permit shall void the permit.

SECTION 2: RESPONSE TO COMPLAINTS

- 2.1 The owner or operator of a wood burning appliance is responsible for making a reasonable effort to respond to local resident complaints received about smoke issues. *Note: Smoke or odour emissions will have to be resolved by the operator; otherwise the operator may be required to stop burning.*
- 2.2 The owner shall extinguish the fire if it creates an adverse effect at any time.
- 2.3 If the Municipal Authority receives complaints about an outdoor wood-fired boiler or other wood burning appliance, a Municipal By-law Enforcement Officer or other Municipal Authority may enter the land to inspect or extinguish the fire.

SECTION 3: INSPECTIONS AND ENFORCEMENT

- 3.1 A By-law Enforcement Officer, or other Municipal Authority, may enter on land at any reasonable time for the purpose of carrying out an inspection to determine whether this By-law, or an Order to Discontinue Activity is being complied with.
- 3.2 The By-law Officer or other local Municipal Authority may order the Owner to extinguish any fire at any time and the Owner shall extinguish the fire; or the Municipal Authority or his designate may take the necessary steps to do so *(including making the fireplace unit*

inoperable by sealing shut the appliance doors), and recover the costs of extinguishing the fire and sealing of the unit from the Owner.

- 3.3** An Officer or other Municipal Authority may enter the premises at a reasonable time, with prior notice and the consent of the occupier, for the purpose of inspecting heating appliances.

Note 1: Municipalities may specify penalties for persons who install and operate indoor wood burning appliances and outdoor wood-fired boilers in breach of municipal by-laws.

Note 2: Municipalities should obtain legal advice to determine whether it has authority to authorize any inspection or compliance actions.

Note 3: In general, every person is responsible for complying with the provisions of the [provincial environmental legislation name, if applicable, e.g. Environmental Protection Act - EPA]. No person shall discharge a contaminant or cause or permit a discharge of a contaminant that causes or may cause an adverse health effect. Any contravention of [provincial environmental legislation name] such as the burning of waste or hazardous waste materials may result in an investigation and prosecution under the Act.

SECTION 4: LIABILITY

Note: Municipalities may specify penalties for persons who operate outdoor wood burning appliances in breach of municipal by-laws. This enforcement section will need to include specific municipal penalties.

- 4.1** Any person who contravenes any of the provisions of this by-law is guilty of an offence and upon conviction is liable to a fine.
- 4.2** If any person fails to pay the fine set out above, within thirty (30) days, the amount of the fee may be recovered by the Corporation in like manner as municipal taxes in accordance with the **[provincial legislation, if applicable]**.