

TORONTO STAFF REPORT

December 24, 2002

To: Board of Health
From: Dr. Sheela V. Basrur, Medical Officer of Health
Subject: Reducing Emissions from Residential Wood-burning Appliances

Purpose:

This report summarizes the impact of emissions from fireplaces and wood stoves on health in the City of Toronto and investigates policy options available to reduce air pollution from wood-burning appliances.

Financial Implications:

There are no financial implications associated with this report.

Recommendations:

It is recommended that:

- (1) the Board of Health:
 - (a) commend the Federal and Ontario Ministers of Environment for their commitment to significantly reduce emissions from residential wood-burning appliances, and request implementation of the Joint Initial Actions agreed upon under the Canada-wide Standards for Particulate Matter (PM) and Ozone, by 2005;
 - (b) request the Federal Minister of Environment to include the characterization of emissions from burning artificial logs, and assessment of their performance as a clean fuel for residential wood-burning appliances, as an additional focus of the Intergovernmental Working Group on Residential Wood Combustion (IGWGRWC);

- (c) request the Ontario Minister of Municipal Affairs and Housing to include provisions in the Ontario Building Code that require that newly installed residential fireplaces and wood stoves meet the low-emission certification requirements of the Canadian Standards Association or the US Environmental Protection Agency;
 - (d) request the Commissioner of Works and Emergency Services, as Chair of the Toronto Inter-departmental Environment Committee, to ensure that the City's Air Quality Strategy includes consideration of measures that can be taken to reduce emissions of, and exposure to, residential wood smoke; and
 - (e) request the Medical Officer of Health to continue to support educational initiatives that aim to reduce air pollution and health impacts from residential wood burning;
- (2) this report be forwarded to the Federal and Ontario Ministers of Environment, the Federal Minister of Natural Resources, the Ontario Minister of Municipal Affairs and Housing, the Ontario and Canadian Lung Associations, the Ontario Public Health Association, the Federation of Canadian Municipalities, the Association of Municipalities of Ontario, the Association of Local Public Health Agencies, all health units in Ontario, and Works and Emergency Services, for their information and action as appropriate; and
- (3) the appropriate City Officials be authorized and directed to take the necessary action to give effect thereto.

Background:

On May 29, 2000, the Medical Officer of Health presented to the Board of Health the report, "Air Pollution Burden of Illness in Toronto". The Board of Health requested that the Medical Officer of Health investigate the policy options available to the City to reduce air pollution from key contributors including residential wood stoves and fireplaces.

On April 8, 2002, the Medical Officer of Health presented to the Board of Health the report, "Ten Key Carcinogens in Toronto Workplaces and Environment". Benzene, polycyclic aromatic hydrocarbons and dioxins were identified as priorities for reduction. Wood burning in the City of Toronto is one source of these carcinogens.

This report summarizes the health impacts of wood burning and ways in which emissions from residential wood stoves and fireplaces in Toronto can be reduced. This report has been prepared in consultation with Works and Emergency Services staff.

Comments:

Emissions from Residential Wood Burning

Province-wide, it is estimated that residential wood burning accounts for 11 percent of the respirable particulate matter (particulate matter of diameter less than or equal to 2.5 micrometres, or PM_{2.5}) and 15 percent of volatile organic compounds found in Ontario's air (OMOE, 1999). In the City of Toronto, it is anticipated that residential wood-burning results in a smaller contribution than the provincial average because wood-burning for home heating and cooking is more prevalent in rural areas. While little Toronto emission data is available and the quantity of wood burned in Toronto is not known, the impact on air quality and health is estimated to be significant because the vast majority of PM emitted by residential fuelwood combustion is respirable PM_{2.5}. Controlling very fine particulate pollution is important for health because PM_{2.5} can be drawn deep into the human lung, and it is known to contribute to respiratory and cardiovascular problems. Reducing emissions from the residential wood-burning sector presents an opportunity for improving the City's indoor and outdoor air quality.

Emissions from wood-burning stoves and fireplaces consist of a complex mixture of gases and particles including inhalable particulate matter (particulate matter of diameter less than or equal to 10 micrometres, or PM₁₀), the finer respirable particulate matter (PM_{2.5}) and contaminants that contribute to poor air quality and smog, for example sulphur oxides, nitrogen oxides and carbon monoxide. Residential wood-burning emissions also contain carcinogenic compounds, including polycyclic aromatic hydrocarbons, benzene, formaldehyde and dioxin.

These chemicals contribute to the atmospheric burden of smog precursors and carcinogens already present in Toronto's air. Consequently, residential wood burning is one source of the air pollutants that affect the health of Toronto residents.

The exact composition of the emissions from wood burning is influenced by the type of stove or fireplace and the wood or other material used as fuel, among other factors. Environment Canada has estimated that residential wood-burning sources emit approximately three percent of Canada's total annual dioxin emissions.

Health Impacts of Wood-burning Emissions

When wood is burned, emissions are released to both indoor and outdoor air. The complex mixture found in wood smoke has been linked to increased occurrence of respiratory infection and ear infection, increased symptoms of respiratory irritation and exacerbation of asthma symptoms.

Fine particles can cause lung irritation in healthy people and exacerbate asthma and other respiratory illnesses in at-risk groups such as children, the elderly and those with pre-existing illness. Wood smoke contains some carcinogenic compounds such as polycyclic aromatic hydrocarbons, formaldehyde and benzene.

Residential wood burning can impact air quality both outdoors and indoors. Indoor air quality is especially important for health, given that most people spend the majority of their time indoors. Data suggest that respirable particulate matter from various contributing sources indoors, including residential wood burning, can contribute to nasal irritation, respiratory infections, bronchitis and lung cancer. Insufficient data exist at this time to determine the relative health impact of burning synthetic logs, as compared to those from burning clean, dry wood.

Approaches to Reducing Emissions from Burning Wood

While Toronto residents will continue to burn wood in fireplaces and wood stoves, several approaches exist to minimize both emissions of and exposure to wood smoke contaminants both indoors and outdoors.

(a) Low-emission certification of cleaner-burning technologies:

Low-emission wood-burning appliances that are cleaner burning than traditional appliances can be identified as “CSA/EPA-certified”. “CSA/EPA-certified” refers to low-emission certification by the Canadian Standards Association and/or the US Environmental Protection Agency. In Canada, all wood-burning appliances must be certified for safety. However, certification that these appliances meet the low-emission standard of the CSA/EPA is currently required only in British Columbia. Wood stoves and fireplaces sold in the USA must be emission-certified. CSA/EPA-certified appliances are sometimes described as “advanced-combustion” wood stoves or fireplaces.

Emissions from CSA/EPA-certified wood stoves and fireplaces are much lower than those from conventional appliances. For example, they are 94 percent lower for particulate matter, 80 percent lower for volatile organic compounds and 85 percent lower for polycyclic aromatic hydrocarbons than conventional appliances. Advanced-combustion wood stoves are also up to 20 percent more fuel efficient than older, conventional wood stoves. Certified appliances can be expected to reduce emissions not only outdoors, but inside the home as well. The effectiveness of CSA/EPA-certified appliances to reduce dioxin emissions has yet to be quantified.

Under the Canada-wide Standards (CWS) for Particulate Matter and Ozone, residential wood burning has been identified as a priority sector for the reduction of emissions of particulate matter, polycyclic aromatic hydrocarbons, dioxins and furans. As part of this process, the Canadian Council of Ministers of the Environment (CCME) has committed to a list of Joint Initial Actions. The Joint Initial Actions include:

- i) an update of the CSA standards for new wood-burning appliances;
- ii) development of a national regulation for new, clean-burning residential wood-heating appliances;
- iii) national public education programs; and
- iv) an assessment of the option of a national wood stove upgrade or change-out program.

Environment Canada staff emphasize the importance of implementing the proposed actions to achieve dramatic reductions in wood-burning emissions of particulate matter, volatile organic

compounds, polycyclic aromatic hydrocarbons and carbon monoxide. The proposed emission-reduction activities set out in the list of Joint Initial Actions are consistent with Toronto Public Health's view on residential wood-burning emission reductions and should be supported.

The Hearth Products Association of Canada (HPAC, an industry association) has asked the Governments of Canada and Ontario to require that new wood-burning appliances installed across Canada be CSA/EPA-certified as having low emissions. Federal government staff have indicated that they plan to meet the joint initial action commitments for residential wood burning by the original deadline of 2005. These commitments include development of a national regulation on new, clean burning wood-heating appliances.

The current Ontario Building Code addresses fire safety but not levels of emissions from wood-burning appliances. The Ontario Minister of Municipal Affairs and Housing should be requested to include provisions in the Ontario Building Code that require newly installed residential fireplaces and wood stoves to be CSA/EPA-certified as having low emissions.

(b) Natural gas:

Another low-emission alternative to conventional wood-burning appliances is a natural gas fireplace. Emissions of particulate matter from natural gas fireplaces are even lower than those from CSA/EPA-certified wood-burning appliances. Natural gas is an especially attractive alternative in urban areas where it is readily available.

(c) Burning only clean wood:

When harvested sustainably, wood has the advantage of being a renewable resource. Environment Canada staff highlight the importance of only burning clean, dry wood. Burning clean wood instead of household garbage, wet wood, plywood, glossy magazines and other waste materials can significantly reduce the emissions of dioxins and other contaminants from an existing wood stove or fireplace. Toronto Public Health has insufficient data to assess the impact of commercially available synthetic logs on emissions from wood-burning appliances. Natural Resources Canada does not include synthetic logs in its definition of clean wood. The Federal Minister of Environment should be requested to characterize the emissions from burning artificial logs and to assess their performance as a clean fuel for residential wood-burning appliances.

The best way to ensure that individuals only burn appropriate materials is through increased awareness. Industry representatives have expressed interest in joint educational outreach with the City. Natural Resources Canada has implemented "Burn It Smart", a public education campaign that tells residents who plan to continue burning wood how to reduce their emissions. The program's website (www.burnitsmart.org) offers an excellent range of educational materials on reducing residential wood-burning emissions. Other complimentary educational programs addressing indoor air include the Lung Association's program, "C.A.N. DO, the Movement for Clean Air Now". The Canada Mortgage and Housing Corporation also provides educational materials on how to reduce the indoor air quality impacts of residential wood-burning appliances. Toronto Public Health will help promote existing educational programs that aim to reduce air

pollution and health impacts from residential wood burning and assist members of the public to reduce their emissions.

(d) Change-out programs:

A “change-out” program encourages members of the public to upgrade from a conventional wood stove or fireplace to cleaner technology, such as a CSA/EPA-certified wood stove. Change-outs generally provide a financial incentive and include an educational component to increase awareness about the need for wood stove and fireplace users to burn only clean wood. From January to March 2002, Natural Resources Canada, in co-operation with industry and other stakeholders, initiated a national education campaign on wood burning that included change-out programs at eight locations. A second set of wood stove educational change-out workshops is taking place from September 2002 to March 2003. At each of twenty cities, a series of 12 workshops is being held to demonstrate the differences in emissions between certified and non-certified wood stoves. Each series of workshops is co-ordinated by a local organization with a contribution by Natural Resources Canada. Currently it is not clear whether the program will be repeated in the near future.

Educational initiatives, change-out programs and other activities to reduce emissions from wood burning provide opportunities to achieve cleaner air as part of the City’s overall Air Quality Strategy. The Commissioner of Works and Emergency Services, as Chair of the Toronto Inter-departmental Environment Committee, should be requested to ensure that the City’s Air Quality Strategy includes consideration of measures that can be taken to reduce emissions of, and exposure to, residential wood smoke. Should a change-out program be adopted in the future for Toronto, given the low emissions of particulate matter and other substances from natural gas fireplaces, Toronto Public Health suggests that any change-out program in Toronto should promote CSA/EPA-certified wood-burning appliances or natural gas fireplaces.

Conclusion:

The use of wood-burning appliances is a significant source of air pollution and preventable health risk in Toronto. Wood-burning appliances that are CSA/EPA-certified emit much less pollution than conventional fireplaces and wood stoves. Emissions from natural gas appliances are even lower than those of low-emission wood-burning appliances. A number of federal and provincial emission-reduction initiatives exist for residential wood burning. Toronto Public Health will help promote existing educational programs to increase awareness of the individual actions that can be taken to reduce emissions, such as only burning clean, dry wood or upgrading from a conventional wood-burning appliance to a certified low-emission appliance.

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List of Attachments:

(1) Air Pollution from Wood-burning Fireplaces and Stoves