

outdoor WOOD-FIRED hydronic heaters

What you need to know.



Ministry of
Environment

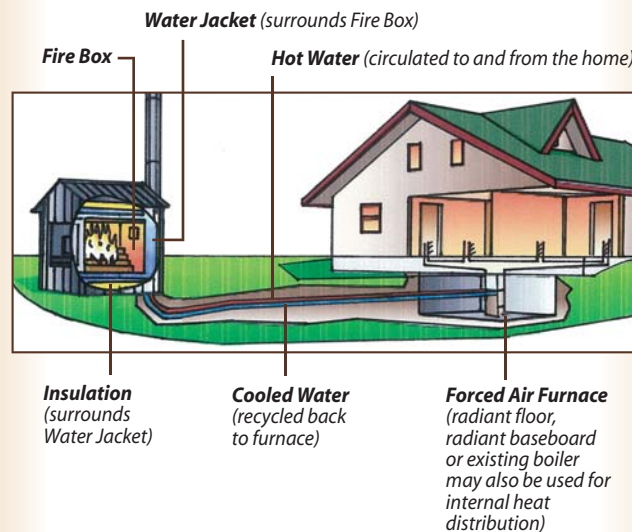
THE  LUNG ASSOCIATION™
British Columbia

outdoor WOOD-FIRED hydronic heaters

Outdoor wood-fired hydronic heaters (OWHHs) are free-standing metal fireboxes with stacks that are commonly separated from the space being heated. They are known by various names, including outdoor wood boilers, outdoor wood heaters, water stoves, and outdoor wood furnaces.

Outdoor hydronic heaters are used to provide heating and/or hot water to homes and outbuildings as well as to heat agricultural operations such as greenhouses and dairy farms. Outdoor hydronic heaters may be the right heating solution where there are multiple buildings to heat and there are no neighbours living nearby.

However, these heating units can pose a serious problem in populated areas because their technology does not allow for efficient combustion on a consistent basis. Inefficient combustion occurs when there is not enough oxygen present in a heating system, producing a greater volume of by-products, some of which are harmful to humans and the environment alike. Unlike wood stoves and pellet stoves, OWHHs are currently not regulated in British Columbia.



Source: http://www.hpba.org/fileadmin/PDFs/OWF_white_paper_2006.pdf

HOW they work

A large firebox heats water contained in a jacket surrounding the firebox. Heated water is then passed through a system of underground pipes to supply heating and/or hot water to homes and buildings. When the water circulating in the heater reaches an upper set point, air supply to the fire is cut off. When the water temperature drops to a lower set point, air supply is reintroduced to the system, thus starting the cycle all over again.

reasons for CONTINUED use

Despite the health problems associated with outdoor hydronic heaters, they remain in use because gas and electrical heating costs continue to rise and many people have easy access to free or cheap wood. Outdoor hydronic heaters are also easy to control with an internal thermostat, and they may in fact save a homeowner insurance costs by being located outside the house and presenting a low risk for fire. Finally, outdoor wood-fired heaters have an advantage over indoor installations because they leave no mess from ash and soot within the home.

reasons for CONCERN

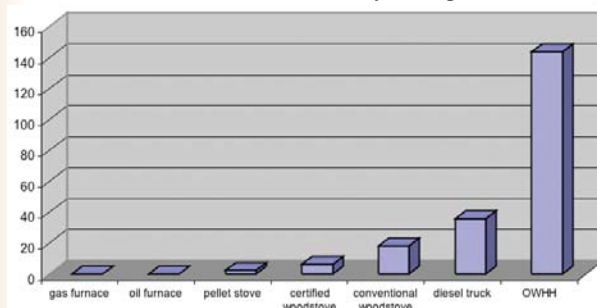
1. *Compared with other home heating technologies, OWHHs can be substantially dirtier, resulting in ash residue and increased emissions.¹*

When the combustion temperature inside the heater is kept relatively cool by the water jacket surrounding the firebox, a process known as cool combustion takes place, producing smoldering, smoky fires.

2. *OWHHs emit high concentrations of particulates and toxics.* OWHHs have dampers that operate cyclically, opening or closing depending on demand. When the damper is closed, fire smolders, causing very poor combustion and heavy, foul-smelling smoke. Smoldering fire also causes creosote to form on the cool internal surfaces that ignite at the start of an "up" cycle; creosote results in additional smoke emissions.

OWHHs emit hundreds to thousands times more fine particulate air pollution than oil and gas appliances and at least twenty times more emissions than Environmental Protection Agency (EPA) emissions-certified woodstoves. Fine particulates can be carried deep into the lungs and contribute to such human health problems as cardiovascular disease, chronic lung conditions, and premature death. Much of the smoke emitted by outdoor hydronic heaters is fine, condensed, organic material that does not burn under cool, oxygen-deprived conditions. Toxic pollutants such as benzene, formaldehyde, dioxins, and polycyclic aromatic hydrocarbons are produced, all of which may cause cancer.

Particulate Matter (PM_{2.5}) Emission Comparison (grams/hour)²



3. OWHHs operate all year.

Unlike most home heating devices, OWHHs are designed to provide heat and hot water all-year round, so their effects are continuous. Fuel for outdoor hydronic heaters is also easily obtainable as even unseasoned, wet wood can be used.

4. OWHHs have short stacks.

Stacks of OWHHs are usually less than 3.5 metres from the ground, resulting in poor smoke dispersion and causing extremely smoky conditions in surrounding areas. Low-level heavy smoke often lingers and seeps through nearby ventilation systems, cracks in windows, doors, etc., exposing people to various nuisance conditions and health risks.

5. OWHHs have large fireboxes.

Large fireboxes allow people to burn a variety of toxic materials, including garbage, tires, plastics, and treated wood. In addition, their size allows fireboxes to accommodate wood of longer lengths that are difficult to season properly, remove excess moisture from, and burn efficiently. Fireboxes also encourage the burning of backyard waste like leaves that could otherwise be turned into compost, which further contributes to smoke emissions.

the EPA voluntary program

In the spring of 2007, the U.S. Environmental Protection Agency (EPA) started a voluntary program that encourages OWHH manufacturers to make cleaner models of outdoor hydronic heaters available in both the U.S. and Canada.

Fourteen manufacturers have signed an agreement requiring them to make at least one model that has a particulate matter (PM_{2.5}) emission rate of no more than 0.258 grams per megajoule (g/MJ) of heat input. Heat input is directly related to the amount of fuel burned.

This new emission rate standard is expected to reduce emissions by 70 per cent. Outdoor hydronic heaters that meet the new rate standard will be tagged as cleaner units at the point of sale.

WHAT the local government can do

Develop public education programs. Public education programs should educate citizens about outdoor hydronic heaters and their associated health risks, help the public make informed choices, and raise awareness about the importance of cleaner burning/heating methods.

Establish property line setbacks and stack height requirements. To protect neighbouring properties from nuisance smoke and odours, setbacks should be at least 150 metres away from buildings and the stack height should be 1.5 metres from the roofline of nearby buildings. Incorporating these setback and stack height requirements into the building code would help ensure compliance with them.

Set emission standards. An OWHH emission limit that is even greater than the EPA's voluntary standard should be set. The Northeast States for Coordinated Air Use Management (NESCAUM) recommends that a Phase I emission limit be set at 0.189 g/MJ of heat input effective March 31, 2008, and another, for Phase II, be set at 0.137 g/MJ of heat input effective March 31, 2010. Note that the Phase I emission limit is still four to ten times dirtier³ than the EPA woodstove emission standard. NESCAUM has developed a model regulation available at <http://www.nescaum.org/topics/outdoor-hydronic-heaters>. Vermont was the first state to adopt these emission standards.

Enforce bans and prohibitions. The sale or installation of OWHHs that do not meet the emission standards of

CAN/CSA-B-415.1 (equal to EPA's emission standard) should be prohibited. As no OWHHs currently meet these standards, this strategy would effectively ban all outdoor hydronic heaters. Banning OWHHs would also help reduce the burning of prohibited material. The Regional District of Central Okanagan has a by-law requiring all indoor and outdoor solid fuel-burning appliance, furnace, or boiler to meet CSA emission standards. Environment Canada's Model Municipal By-law for Regulating Wood-Burning Appliances outlines how municipalities can apply this strategy. The information is available at www.ec.gc.ca/cleanair-airpur/. (For more information about existing bylaws in B.C., see http://www.env.gov.bc.ca/air/airquality/pdfs/aq_bylaws_bc.pdf)

how to DEAL with existing OWHHs

Develop public education programs. These programs aimed at owners of OWHHs should educate them about alternative heating methods that are safe for both humans and the environment. Vendors of OWHHs should also be targeted for education to alleviate confusion over EPA standards and environmental myths associated with these units.

Set limits on use. Restrict or limit the use of existing OWHHs during the non-heating season and/or when air quality conditions are poor. This strategy would address high emission events but not day-to-day pollution.

Establish setback and stack height requirements. Require that existing OWHHs meet the same setback and stack height requirements as new OWHHs within a set timeframe. The local government should follow up and cite OWHH owners for non-compliance.

Enforce bans. A ban should be imposed on all OWHHs that do not meet the emission standard by a certain date.

Require removal of OWHHs upon transfer of property. Where a wood-burning appliance that does not meet applicable emission standards stands in a property that is being sold, the heater should be ordered removed before the sale is completed or the property is transferred. The District of Houston and the Town of Smithers have set this requirement for wood-heating appliances, including OWHHs.

¹U.S. Environmental Protection Agency. <http://www.epa.gov/woodheaters/basicinfo.htm>

²NESCAUM (March 2006). Assessment of Outdoor Wood-fired Boilers.

³U.S. Environmental Protection Agency, "OWHH Program Frequently Asked Questions." http://www.epa.gov/owhh/pdfs/faqs_20070214.pdf