6560-50-P

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 60

[EPA-HQ-OAR-2009-0734; FRL-9904-05-OAR]

RIN 2060-AP93

Standards of Performance for New Residential Wood Heaters, New Residential Hydronic Heaters and Forced-Air Furnaces, and New Residential Masonry Heaters

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule.

SUMMARY: The EPA is proposing to amend the Standards of Performance for New Residential Wood Heaters and to add two new subparts: Standards of Performance for New Residential Hydronic Heaters and Forced-Air Furnaces and Standards of Performance for New Residential Masonry Heaters. This proposal is aimed at achieving several objectives for new residential wood heaters and other wood-burning appliances, including applying updated emission limits that reflect the current best systems of emission reduction; eliminating exemptions over a broad suite of residential wood combustion devices; strengthening test methods as appropriate; and streamlining the certification process. This proposal does not include any requirements for heaters solely fired by gas, oil or coal. In addition, it does not include any requirements associated with appliances that are already in use. The EPA continues to encourage state, local, tribal, and consumer efforts to changeout (replace) older heaters with newer, cleaner, more efficient heaters, but that is not part of this federal rulemaking.

Particulate pollution from wood heaters is a significant national air pollution problem and human health issue. Health benefits associated with these proposed

regulations are valued to be much greater than the cost to manufacture cleaner, lower emitting appliances. These proposed regulations would significantly reduce particulate matter (PM) emissions and many other pollutants from these appliances, including carbon monoxide (CO), volatile organic compounds (VOC), and hazardous air pollutants (HAP). Emissions from wood stoves occur near ground level in residential communities across the country, and setting these new requirements for cleaner stoves into the future will result in substantial reductions in exposure and improved public health.

DATES: Comments must be received on or before **[INSERT DATE 90 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER]**. Under the Paperwork Reduction Act, comments on the information collection provisions are best assured of having full effect if the Office of Management and Budget (OMB) receives a copy of your comments on or before **[INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**.

Public Hearing. The EPA will hold a public hearing on this proposed rule on February 26, 2014, in Boston, Massachusetts. The hearing will be at the following location:

EPA New England Regional Office, 5 Post Office Square, Suite 100, Leighton Hall, Boston, MA. For directions and public transportation, visit: http://www.epa.gov/region1/directions/. Please note that 5 Post Office Square is a federal building, and proper identification is required for entry.

The public hearing will provide interested parties the opportunity to present data, views or arguments concerning the proposed rule. The EPA may ask clarifying questions during the oral presentations, but will not respond to the presentations at that time.

Written statements and supporting information submitted during the comment period will be considered with the same weight as any oral comments and supporting information presented at the public hearing. Written comments must be postmarked by the last day of the 90-day comment period.

If you would like to present oral testimony at the hearing, please register on-line (preferred method for registering) at http://www2.epa.gov/residential-wood-heaters no later than February 19, 2014, to request a general time slot for you to speak and any special equipment. If this method is not available to you, please notify Mr. David Cole no later than February 19, 2014, by email: cole.david@epa.gov); or by telephone: (919) 541-5565. The EPA will make every effort to follow the schedule as closely as possible on the day of the hearing. The public hearing will begin each day at 9 a.m. (local time) and continue into the evening until 7 p.m. (local time). The EPA will make every effort to accommodate all other speakers who arrive and register before 7 p.m. (local time) on the day of the hearing. The EPA is scheduling lunch breaks from 12:30 until 2 p.m. (local time).

Testimony will be limited to five (5) minutes for each commenter to address the proposal. We will not be providing equipment for commenters to show overhead slides or make computerized slide presentations unless we receive special requests in advance. The EPA encourages commenters to provide written versions of their oral testimonies either electronically on computer disk or CD–ROM or in paper copy.

The hearing schedule, including lists of speakers, will be posted on the EPA's webpage for the proposal at: http://www2.epa.gov/residential-wood-heaters prior to the

hearing. Verbatim transcript of the hearing and written statements will be included in the rulemaking docket.

ADDRESSES: Submit your comments, identified by Docket ID No. EPA-HQ-OAR-2009-0734, by one of the following methods:

- www.regulations.gov: Follow the on-line instructions for submitting comments.
- Email: a-and-r-docket@epa.gov, Attention Docket ID No. EPA-HQ-OAR-2009-0734.
- Fax: (202) 566-9744, Attention Docket ID No. EPA-HQ-OAR-2009-0734.
- Mail: United States (U.S.) Postal Service, send comments to EPA Docket Center, EPA West (Air Docket), Attention Docket ID Number EPA-HQ-OAR-2009-0734, U.S. Environmental Protection Agency, Mailcode: 2822T, 1200 Pennsylvania Ave., NW, Washington, DC 20004. Please include a total of two copies. In addition, please mail a copy of your comments on the information collection provisions to the Office of Information and Regulatory Affairs, Office of Management and Budget, Attn: Desk Officer for EPA, 735 17th St., NW, Washington, DC 20503.
- Hand Delivery: EPA Docket Center, EPA West (Air Docket), Room 3334, 1301 Constitution Avenue, NW, Washington, DC, Attention Docket ID Number EPA-HQ-OAR-2009-0734. Such deliveries are only accepted during the Docket's normal hours of operation, and special arrangements should be made for deliveries of boxed information.

Instructions: Direct your comments to Docket ID No. EPA-HQ-OAR-2009-0734. The EPA's policy is that all comments received will be included in the public docket without change and may be made available online at www.regulations.gov, including any personal information provided, unless the comment includes information claimed to be

Confidential Business Information (CBI) or other information whose disclosure is restricted by statute. Do not submit information that you consider to be CBI, or otherwise protected, through www.regulations.gov or email. The www.regulations.gov website is an "anonymous access" system, which means the EPA will not know your identity or contact information unless you provide it in the body of your comment. If you send an email comment directly to the EPA without going through www.regulations.gov, your email address will be automatically captured and included as part of the comment that is placed in the public docket and made available on the Internet. If you submit an electronic comment, the EPA recommends that you include your name and other contact information in the body of your comment and with any disk or CD-ROM you submit. If the EPA cannot read your comment due to technical difficulties and cannot contact you for clarification, the EPA may not be able to consider your comment. Electronic files should avoid the use of special characters, any form of encryption, and be free of any defects or viruses. For additional information about the EPA's public docket, visit the EPA Docket Center homepage at www.epa.gov/epahome/dockets.htm. For additional instructions on submitting comments, go to section I.D.2 of the SUPPLEMENTARY INFORMATION section of this document.

Docket: The EPA has established a docket for this rulemaking under Docket ID Number EPA-HQ-OAR-2009-0734. All documents in the docket are listed in the www.regulations.gov index. Although listed in the index, some information is not publicly available, *e.g.*, CBI or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, will be publicly available only in hard copy form. Publicly available docket materials are available either electronically in

www.regulations.gov or in hard copy at the EPA Docket Center, EPA West, Room 3334, 1301 Constitution Ave., NW, Washington, DC. The Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566-1744, and the telephone number for the Air Docket is (202) 566-1742.

FOR FURTHER INFORMATION CONTACT: For questions about this proposed action, contact Mr. Gil Wood, Office of Air Quality Planning and Standards, Outreach and Information Division, Community and Tribal Programs Group (C304-03), U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711; telephone number: (919) 541-5272; fax number: (919) 541-0242; email address: wood.gil@epa.gov.

SUPPLEMENTARY INFORMATION: The information in this preamble is organized as follows:

I. General Information

A. Executive Summary

1. Purpose of the Regulatory Action

The purpose of this action is to propose amendments to the Standards of Performance for New Residential Wood Heaters (40 CFR part 60, subpart AAA) and to add two new subparts: Standards of Performance for New Residential Hydronic Heaters and Forced-Air Furnaces and Standards of Performance for New Residential Masonry Heaters (40 CFR part 60, subparts QQQQ and RRRR). This proposal was developed following a Clean Air Act (CAA) section 111(b)(1)(B) periodic review of the current

residential wood heaters new source performance standards (NSPS). We concur with numerous stakeholders that the current body of evidence justifies revision of the current residential wood heaters NSPS to capture the improvements in performance of such units and to expand the applicability of this NSPS to include additional wood-burning residential heating devices that are in the market. The proposed changes are aimed at achieving several objectives, including applying updated emission limits that reflect the current best systems of emission reduction (BSER); eliminating exemptions over a broad suite of residential wood combustion devices; strengthening test methods as appropriate; and streamlining the certification process. This proposal does not include any requirements for heaters solely fired by gas, oil or coal. In addition, it does not include any requirements associated with wood heaters or other wood-burning appliances that are already in use. The EPA continues to encourage state, local, tribal, and consumer efforts to changeout (replace) older heaters with newer, cleaner, more efficient heaters, but that is not part of this federal rulemaking.

These revisions will help reduce the health impacts of fine particle pollution, of which wood smoke is a contributing factor in many areas. Residential wood smoke contains fine particles with an aerodynamic diameter of 2.5 micrometers or less ($PM_{2.5}$), CO, toxic air pollutants (*e.g.*, benzene and formaldehyde), and climate-forcing emissions (e.g., methane and black carbon). Residential wood smoke can increase $PM_{2.5}$ to levels that cause significant health concerns. Populations that are at greater risk for experiencing health effects related to fine particle exposures include older adults, children and individuals with pre-existing heart or lung disease. Each year, smoke from wood heaters contributes hundreds of thousands of tons of fine particles throughout the country –

mostly during the winter months. Nationally, residential wood combustion accounts for 44 percent of total stationary and mobile polycyclic organic matter (POM) emissions, nearly 25 percent of all area source air toxics cancer risks and 15 percent of noncancer respiratory effects.[1] Residential wood smoke causes many counties in the U.S. to either exceed the EPA's health-based national ambient air quality standards (NAAQS) for fine particles or places them on the cusp of exceeding those standards.[2] To the degree that older, higher emitting, less efficient wood heaters are replaced by newer heaters that meet the requirements of this rule, or better, the emissions would be reduced, the efficiencies would be increased and fewer health impacts should occur.

This action is conducted under the authority of section 111 of the CAA, "Standards of Performance for New Stationary Sources," under which the EPA establishes federal standards of performance for new sources within source categories that cause or contribute significantly to air pollution, which may reasonably be anticipated to endanger public health or welfare. Consistent with section 111(h), if it is not feasible to prescribe or enforce a standard of performance, the Administrator may instead promulgate a design, equipment, work practice, or operational standard, or combination thereof, that reflects the best system of continuous emission reduction, which (taking into consideration the cost of achieving such emission reduction, and any

[1] *Strategies for Reducing Residential Wood Smoke*. EPA-456/B-13-001, March 2013. Prepared by Outreach and Information Division, Air Quality Planning Division, Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711. pp. 4-5.

[2] Air Quality and Emissions Data; Supporting Information for the Residential Wood Heater New Source Performance Standard, August 14, 2013.

non-air quality, health, and environmental impact and energy requirements) the Administrator determines has been adequately demonstrated.

2. Summary of the Major Provisions of this Proposed Regulatory Action

In response to the results of the NSPS review, we are proposing to amend 40 CFR part 60, subpart AAA, Standards of Performance for New Residential Wood Heaters. The current regulation applies to affected appliances manufactured after 1988. The current emission limits would remain in effect for the heaters and model lines manufactured before the effective date of this rule until their current EPA certification expires (maximum of 5 years) or is revoked. After the certification expires or is revoked, these heaters and other new heaters would have to meet updated emission standards. We propose to broaden the applicability of the regulation beyond adjustable burn rate wood heaters (the focus of the original regulation), to specifically include all single burn rate wood heaters/stoves and pellet heaters/stoves. (Some pellet heaters/stoves were not affected by the 1988 regulation.) Note that this preamble uses the following terms interchangeably: heaters, stoves and heaters/stoves. Heaters/stoves and model lines manufactured after the effective date of the rule would be required to meet PM standards.

As with the 1988 regulation, the source category covered by this NSPS is fundamentally different from the typical NSPS source category in several ways. For example, most NSPS source categories focus on industrial or commercial facilities, and typically these heaters are installed and operated in residences, not industrial or commercial facilities. Also, residential wood heaters, hydronic heaters, forced-air furnaces, and most masonry heaters are mass-produced consumer items, rather than industrial processes typically regulated by NSPS. Therefore, as in 1988, we are proposing

that manufacturers participate in a certification program that tests a representative heater per model line rather than requiring testing each heater. If the representative heater meets the applicable emission limits, the entire model line may be certified and the manufacturer would not be required to test every heater. Individual heaters within the model line would still be subject to all other requirements, including labeling and operational requirements. Manufacturers would be required to have quality assurance programs to ensure that all heaters within the model line conform to the certified design and meet the applicable emission limits. The EPA would continue to have the authority to conduct audits to ensure compliance. We ask for comments on all aspects of this approach, especially whether more than one representative heater should be tested prior to certification of the model line.

The 1988 regulation also addressed some of the specific characteristics of this source category by developing a two-step compliance approach that provided a reasonable, phased implementation of emission limits for manufacturers. We believe such an approach is prudent this time also to allow manufacturers lead time to develop, test, field evaluate and certify current technologies across their consumer product lines. In 1988, there were “logjam” concerns about the capacity of accredited laboratories to conduct certifications tests and time for the EPA to review the tests and adequately assure compliance if all the NSPS requirements were to be immediate. Those concerns have been expressed this time also. Thus, upon the effective date of this rule, new heaters/stoves would be required to meet Step 1. Five years later, new heaters/stoves would be required to meet Step 2. The rule also would require that each unit be equipped with a permanent NSPS label. The two-step approach would apply to all the heater types

addressed in this rulemaking except for masonry heaters. For masonry heaters, we are not proposing a second more stringent emission limit.

Additional requirements would apply to entities other than the manufacturer. The wood heater test laboratory would be subject to quality assurance requirements. The rule would continue to require the proper burn practices that currently apply to the owner or operator of a wood heating appliance. In addition, new pellet heater/stove owners and operators would be required to use only the grade of licensed pellet fuels that are included in the heater/stove certification tests, or better. We are proposing to streamline the current enforcement and audit provisions of the current subpart to reflect changes in industry practices and development of new tools and procedures. We are proposing improvements to the previous test methods as well as new test methods.

We are also proposing new subpart QQQQ, which would apply to new wood-fired residential hydronic heaters and forced-air furnaces, and new subpart RRRR, which would apply to new residential masonry heaters. These new subparts are being proposed to address the remaining heater appliance types in the 1987 residential wood heater source category listing that were not regulated by the 1988 NSPS. Both subparts are designed using principles similar to those in subpart AAA, *i.e.*, certification testing of a representative unit in a model line, label requirements, associated quality assurance requirements and phased implementation. Subpart RRRR has some additional features to address very small volume manufacturers, including a proposed compliance extension and the ability to use a software certification approach rather than a laboratory emission test.

The proposed PM standards for subparts QQQQ and RRRR would be implemented in two steps. For subpart QQQQ, upon the effective date of the rule, hydronic heaters would be required to meet a Step 1 PM limit of 0.32 pound per million British thermal unit (lb/MMBtu) output and forced-air furnaces would be required to meet a Step 1 PM limit of 0.93 lb/MMBtu heat output. Five years after the effective date of the rule, both hydronic heaters and forced-air furnaces would be required to meet a Step 2 PM limit of 0.06 lb/MMBtu heat output. For subpart RRRR (masonry heaters), upon the effective date of the rule, large manufacturers (defined as manufacturers constructing greater than or equal to 15 masonry heaters per year) would be required to meet a PM limit of 0.32 lb/MMBtu heat output. Five years after the effective date of the rule, small volume masonry heater manufacturers (defined as manufacturers constructing less than 15 masonry heaters per year) would be required to meet the 0.32 lb/MMBtu heat output PM limit.

3. Costs and Benefits

Consistent with Executive Order 13563, "Improving Regulation and Regulatory Review," we have estimated the cost and benefits of the proposed rule. The estimated net benefits of our proposed rule at a 3 percent discount rate are $1.8 billion to $4.1 billion or $1.7 billion to $3.7 billion at a 7 percent discount rate. The non-monetized benefits include 33,000 tons of CO reductions; 3,200 tons of VOC reductions; reduced exposure to HAP, including formaldehyde, benzene, and POM; reduced climate effects due to reduced black carbon emissions; reduced ecosystem effects; and reduced visibility impairments. Table 1 is a summary of the results of the analysis per type of residential wood heater. We have provided estimates reflecting average annual impacts for the 2014

to 2022 timeframe, which are the implementation years for the options analyzed in the RIA for this proposal. Monetized benefits are not currently available for masonry heaters. We ask for emission and projected sales data per model that would help us prepare emission reduction estimates and corresponding monetized benefits estimates for masonry heaters.

Table 1. Summary of Compliance Costs, Monetized Benefits, and Monetized Net Benefits (2010 dollars) by Type of Heater in the 2014–2022 Time Frame for the Proposed Rule

Type of Heater	Total Annualized Costs ($ millions)	Monetized Benefits ($ millions)[a, b]	Monetized Net Benefits ($ millions)
Wood stoves	$4.2	$62 to $140	$62 to $140
Single burn rate stoves	$0.9	$290 to $650	$290 to $650
Pellet stoves	$3.5	$19 to $43	$19 to $43
Forced-air furnaces	$2.3	$1,000 to $2,200	$1,000 to $2,200
Masonry heaters	$0.3	N/A[c]	N/A
Hydronic heating systems	$4.5	$480 to $1,100	$480 to $1,100

[a] All estimates are for the time frame from 2014 to 2022 inclusive. These results include units anticipated to come online and the lowest cost disposal assumption. Total annualized costs are estimated at a 7 percent interest rate.

[b] Total monetized benefits are estimated at a 3 percent discount rate. The total monetized benefits reflect the human health benefits associated with reducing exposure to $PM_{2.5}$ through reductions of directly emitted $PM_{2.5}$. It is important to note that the monetized benefits include many but not all health effects associated with $PM_{2.5}$ exposure. Benefits are shown as a range from Krewski et al. (2009) to Lepeule et al. (2012). These models assume that all fine particles, regardless of their chemical composition, are equally potent in causing premature mortality because the scientific evidence is not yet sufficient to allow differentiation of effect estimates by particle type. Because these estimates were generated using benefit-per-ton estimates, we do not break down the total monetized benefits into specific components.

[c] The monetized benefits for masonry heaters are not available because we do not have national estimates of the potential emission reductions.

B. Does this action apply to me?

The potentially regulated sources that are the subject of this proposal are listed in Table 2 of this preamble. Table 2 is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be affected by this proposed action. This standard, and any changes considered in this rulemaking, would be directly applicable to sources as a federal program. Thus, federal, state, local and tribal government entities are not affected by this proposed action.

Table 2. Potentially Regulated Entities

Category	NAICS[a] Code	Examples of Regulated Entities
Residential Wood Heating	333414 - Heating Equipment (except Warm Air Furnaces) Manufacturing	Manufacturers, owners and operators of wood heaters, pellet heaters/stoves, hydronic heaters, and masonry heaters
	333415 - Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing	Manufacturers, owners and operators of forced-air furnaces
	238140 - Masonry Contractors	Manufacturers, owners, operators and testers of masonry heaters
Testing Laboratories	541380 - Testing Laboratories (except Medical, Veterinary)	Testers of wood heaters, pellet heaters/stoves, hydronic heaters and masonry heaters

[a]North American Industry Classification System

C. Where can I get a copy of this document?

In addition to being available in the docket, an electronic copy of this proposal, following signature by the EPA Administrator, will be posted at the following address: http://www2.epa.gov/residential-wood-heaters.

D. What should I consider as I prepare my comments for the EPA?

1. Submitting CBI

Do not submit information containing CBI to the EPA through www.regulations.gov or email. Instead, clearly mark the part or all of the information that you claim to be CBI and send or deliver only to the following address: Roberto Morales, OAQPS Document Control Officer (C404-02), Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711, Attention Docket ID Number EPA-HQ-OAR-2009-0734. For CBI information on a disk or CD-ROM that you mail to the EPA, mark the outside of the disk or CD-ROM as CBI and then identify electronically within the disk or CD-ROM the specific information that you claim as CBI. In addition to one complete version of the comment that includes information claimed as CBI, you must submit a copy of the comment that does not contain the information claimed as CBI for inclusion in the public docket. If you submit a disk or CD-ROM that does not contain CBI, mark the outside of the disk or CD-ROM clearly that it does not contain CBI. Information not marked as CBI will be included in the public docket and the EPA's electronic public docket without prior notice. Information marked as CBI will not be disclosed except in accordance with procedures set forth in 40 CFR part 2.

2. Tips for Preparing Your Comments

When submitting comments, remember to:

- Identify the rulemaking by docket number and other identifying information (subject heading, *Federal Register* date and page number).
- Follow directions. Respond to specific questions and organize comments by a section number.
- Explain why you agree or disagree; suggest alternatives and substitute language for your requested changes.
- Describe any assumptions and provide any technical information and/or data that you used.
- If you estimate potential costs or burdens, explain how you arrived at your estimate in sufficient detail to allow it to be reproduced.
- Provide specific examples to illustrate your concerns and suggest alternatives.
- Explain your views as clearly as possible, avoiding the use of profanity or personal threats or character assassination.
- Make sure to submit your comments by the comment period deadline.

II. Background

A. What is the NSPS program?

Under section 111 of the CAA, "Standards of Performance for New Stationary Sources," the EPA lists categories of sources that, in the EPA's judgment, cause or contribute significantly to air pollution, which may reasonably be anticipated to endanger public health or welfare pursuant to section 111(b)(1)(A), and then promulgates federal standards of performance for new sources within such categories under section 111(b)(1)(B). At the time the EPA proposes and establishes standards for certain pollutants for a source category, the EPA prepares an analysis of the potential costs and

benefits associated with the NSPS, which includes the benefits from reductions in pollutants for which the standards do not set limits. For example, emission reductions associated with the requirements of this proposed rule will generate health benefits by reducing emissions of $PM_{2.5}$, other criteria pollutants, such as CO, and non-criteria HAP. Consistent with section 111(h), if it is not feasible to prescribe or enforce a standard of performance, the Administrator may instead promulgate a design, equipment, work practice, or operational standard, or combination thereof, which reflects the best system of continuous emission reduction which (taking into consideration the cost of achieving such emission reduction, and any non-air quality, health, and environmental impact and energy requirements) the Administrator determines has been adequately demonstrated. The NSPS do not establish standards of performance for existing sources. However, numerous states have acted independent of this rule to address new and existing sources as part of state implementation plan (SIP) measures necessary to ensure attainment and maintenance of the NAAQS. Several examples are discussed in section II.E of this preamble.

The level of control prescribed by section 111 of the CAA historically has been referred to as "Best Demonstrated Technology" or BDT. To better reflect that section 111 was amended in 1990 to clarify that "best systems" may or may not be "technology," the EPA is now using the term "best systems of emission reduction" or BSER. As was done previously in analyzing BDT, the EPA uses available information and considers the emissions reductions and incremental costs for different systems available at reasonable cost. The residential wood heaters source category is different from most NSPS source categories in that it is for mass-produced residential consumer products. Thus, important

elements in determining that BSER include the significant costs and environmental impacts of delaying production while models with those systems are being designed, tested, field evaluated and certified. As noted earlier and discussed more fully later in this preamble, the 2-step approach that the EPA is proposing considers these factors. That is, for this rulemaking, the EPA has determined the appropriate emission limits and compliance deadlines that together are representative of BSER. Details of the BSER determinations are included in section V.B. of this preamble.

Section 111(b)(1)(B) of the CAA requires the EPA to periodically (every 8 years) review an NSPS unless it determines "that such review is not appropriate in light of readily available information on the efficacy of such standard." If needed, the EPA must revise the standards of performance to reflect improvements in methods for reducing emissions, including consideration of what emissions limitation is achieved in practice. Numerous stakeholders have suggested that the current body of evidence justifies the revision of the current residential wood heaters NSPS to capture the improvements in performance of such units and to expand the applicability of this NSPS to include additional residential wood-burning heating devices that are available today. The states of New York, Connecticut, Maryland, Massachusetts, Oregon, Rhode Island and Vermont, as well as the Puget Sound Clean Air Agency, have filed in U.S. District Court in Washington, D.C., to ask the court to order the EPA to promptly review, propose and adopt necessary updates to the NSPS for residential wood heaters. Likewise, the American Lung Association, the Environmental Defense Fund, the Clean Air Council, and Environment and Human Health, Inc., have filed a similar request. Also, some stakeholders have suggested that the EPA develop additional NSPS to regulate residential

heating devices that burn fuels other than or in addition to wood, *e.g.*, coal, corn or grass. This proposal does not include any requirements for heaters that solely burn fuels other than wood.

B. Why was the original residential wood heaters NSPS developed?

The development of the residential wood heater regulations began in the mid-1980s in response to the growing concern that wood smoke contributes to ambient air quality-related health problems. Several state and local governments developed their own regulations for wood heaters. Then, in response to a lawsuit filed by New York State and the Natural Resources Defense Council (NRDC), the EPA agreed to initiate a residential wood heaters NSPS rulemaking, with a schedule calling for final action by January 31, 1988. The original standard was developed using a regulatory negotiation process with the key stakeholders (the wood heating industry, state governments, and environmental and consumer groups) under the Federal Advisory Committee Act (FACA).

Pursuant to CAA section 111(b)(1)(A), the EPA listed the residential wood heater source category based on its determination that residential wood heaters cause, or contribute significantly to, air pollution which may reasonably be anticipated to endanger public health or welfare (52 FR 5065, February 18, 1987). The EPA also proposed regulations for residential wood heaters (52 FR 4994, February 18, 1987). The final standards were published on February 26, 1988 (53 FR 5860). At the time the original NSPS was proposed, the EPA estimated that a typical pre-NSPS conventional wood heater emits about 60 to 70 g/hr of PM and that a wood heater complying with the NSPS would emit 75 to 86 percent less than conventional wood heaters.

C. What are the requirements of the current 1988 NSPS?

The current subpart AAA defines a wood heater as an enclosed, wood-burning appliance capable of and intended for space heating or domestic water heating that meets all of the following criteria:

1. An air-to-fuel ratio (ratio of the mass of combustion air introduced into the firebox to the mass of dry fuel consumed) in the combustion chamber averaging less than 35-to-1 as determined by the test procedure prescribed in 40 CFR 60.534 performed at an accredited laboratory;

2. A usable firebox volume of less than 0.57 cubic meters (20 cubic feet);

3. A minimum burn rate (weight of dry test fuel consumed per hour) of less than 5 kilograms per hour (kg/hr) (11 pounds per hour (lb/hr)) as determined by the test procedure prescribed in 40 CFR 60.534 performed at an accredited laboratory; and

4. A maximum weight of 800 kg (1,760 lb), excluding fixtures and devices that are normally sold separately, such as flue pipe, chimney, and masonry components that are not an integral part of the appliance or heat distribution ducting.

In the 1988 rulemaking, the EPA identified several types of residential wood combustion appliances that are not subject to the current 1988 NSPS:

- Open masonry fireplaces constructed on site
- Boilers/Heaters
- Furnaces
- Cook Stoves

In addition, the current 1988 NSPS exempts the following from the emission limits:

- Wood heaters used solely for research and development (R&D) purposes

- Wood heaters manufactured for export
- Coal-only heaters

As noted earlier, because of the specific characteristics of this source category (*e.g.*, it applies to mass-produced residential consumer items), the residential wood heaters NSPS (also sometimes informally referred to as the wood stove NSPS) allows compliance for model lines to be certified "pre-sale" by the manufacturers. A typical NSPS source category approach that imposes emission standards and then requires a unit-specific compliance demonstration would have been very costly and impractical. Therefore, the 1988 NSPS was designed to allow manufacturers of wood heaters to use a certification program to test representative wood heaters on a model line basis. Once a model line is certified, all of the individual units within the model line are subject to labeling, operational and other requirements. Manufacturers are then required to conduct a quality assurance program to ensure that appliances produced within a model line conform to the certified design and meet the applicable emission limits. There are also provisions for the EPA to conduct audits to ensure compliance.

As discussed in the 1988 rulemaking, the standards limiting PM emissions from wood heaters in the current 1988 NSPS were phased in for this source category because of the need to consider the costs of delayed production while new models were being developed and certified. Advanced technology heaters/stoves including both catalytic and noncatalytic systems were considered to be BDT (now called BSER), because the net emissions of both systems over time were estimated to be similar (even though the initial certification test results were lower for catalytic models) due to possible degradation and lack of catalyst replacement. The EPA considered requiring catalyst replacement on a

regular schedule but determined that enforcement of such a requirement would be difficult or impractical. The EPA did require manufacturers to provide 2-year unconditional warranties on the catalysts and prohibited the operation of catalytic heaters/stoves without a catalyst. Principally because of these concerns, the EPA wanted to ensure that both catalytic and noncatalytic technology would continue to be options for manufacturers to use and further develop. The Subpart AAA Phase I standards issued in 1988 were very similar to the Oregon Department of Environmental Quality standards that had been in existence for a few years. The Subpart AAA Phase II standards, issued in 1988 and which are still in effect, are more stringent and had to be met within 2 years of publication of the final rule, *i.e.*, by 1990. Models equipped with a catalytic combustor cannot emit more than a weighted average of 4.1 g of PM per hour. Models that are not equipped with a catalytic combustor cannot emit more than a weighted average of 7.5 g of PM per hour. The lower initial emission limit for the catalytic combustor-equipped models incorporates an expected deterioration rate for the catalysts such that after 5 years the emissions from those models were expected to be similar to the emissions from noncatalytic models.

D. What are the major developments since the original NSPS was published?

New systems for residential wood heating devices are commercially available in the U.S. that perform at significantly lower g/hr emission rates than required under the current 1988 NSPS. Furthermore, even greater performance potentially can be achieved by greater deployment of the best U.S. systems and the typical systems already widely employed in Europe, especially for outdoor and indoor hydronic heaters. The EPA has conducted a research project “Environmental Characterization of Outdoor Wood-fired

Hydronic Heaters" through a cooperative R&D agreement with the New York State Energy Research and Development Authority (NYSERDA) that evaluated four types of technology ranging from a common outdoor wood boiler/heater to a state-of-the-art, high-efficiency pellet boiler/heater from Austria. The study showed considerable emission reduction due to a 2-stage combustion technology that includes gasification of the fuel and more complete combustion.[3]

Many stakeholders have expressed concern to the EPA about a broad range of residential wood heating appliances that do not have emission standards in the current 1988 NSPS. These include single burn rate wood heaters; pellet heaters/stoves that are not subject to the current standard via the NSPS air-to-fuel ratio; wood "boilers" (hydronic heaters); forced-air furnaces; and masonry heaters. Some stakeholders have also expressed an interest in regulating non-"heater" devices, such as indoor and outdoor fireplaces, fire pits, cook stoves and pizza ovens.

One category of wood heating appliances that has undergone significant growth is wood heaters/boilers or "hydronic heaters." (Note that these units are technically called heaters rather than boilers because many are not pressurized and do not boil the liquid.) Hydronic heaters are typically located outside the buildings they heat in small sheds with short smokestacks. These appliances burn wood to heat a liquid (water or a water-antifreeze mixture) that is piped to provide heat and hot water to occupied buildings, such as homes. Often, in addition to supplying heat for homes, the same unit is used to provide heat for barns and greenhouses and to provide warm water for swimming pools. Hydronic

[3] *Environmental, Energy Market, And Health Characterization Of Wood-Fired Hydronic Heater Technologies*. Prepared by U.S. EPA Office of Research and Development, *et al*., prepared for NYSERDA. June 2012.

heaters may also be located indoors and may use other biomass (such as corn or wood pellets) or coal or a combination for fuel.

Studies have shown that $PM_{2.5}$ concentrations in proximity to a typical outdoor hydronic heater (aka outdoor wood boiler) can exceed the 24-hour NAAQS.[4] Thus, the EPA developed a hydronic heater voluntary partnership program in order to encourage manufacturers to reduce impacts on air quality and health through developing and distributing cleaner hydronic heaters for those locations where local jurisdictions allow hydronic heaters. We developed the voluntary partnership program with the goal of bringing cleaner models to market faster than the traditional federal regulatory process. Properly operated Phase 1[5] emission level (0.60 lb/MMBtu heat input) qualifying[6] units are approximately 70 percent cleaner than typical unqualified units. After March 31, 2010, units that only meet the Phase 1 emission level are no longer considered "qualified models" under the voluntary partnership program. Properly operated Phase 2 emission level (0.32 lb/MMBtu heat output) qualifying units are estimated to be approximately 90 percent cleaner than typical unqualified units. Typically, qualified models have improved

[4] For more information on wood smoke health effects, see: "Smoke Gets in Your Lungs: Outdoor Wood Boilers in New York State," prepared by Judith Schrieber, Ph.D., *et al*., for the Office of the Attorney General of New York. August 2005. See also: "Assessment of Outdoor Wood-fired Boilers," prepared by NESCAUM, March 2006 (revised June 2006).

[5] "Phase 1" and "Phase 2" emission levels refer to levels established in EPA voluntary partnership programs. The earlier use of the term "Phase II" (with a Roman numeral) standard refers to standards established in the current subpart AAA for residential wood heaters.

[6] The terms "qualified" and "unqualified," or other similar terms, refer to models that meet or have not been shown to meet the voluntary partnership program performance levels. Later use of the terms "certified" and "uncertified," or other similar terms, refers to models that are deemed to be in compliance or noncompliance with the NSPS emission limits.

insulation, secondary combustion, separation of the firebox from the water jacket, and the addition of improved heat exchangers.

In addition to the voluntary partnership program, the EPA provided technical and financial support for the Northeast States for Coordinated Air Use Management (NESCAUM) to develop a model rule that several states have adopted to regulate hydronic heaters. The model rule is a starting point for local regulatory authorities to consider, and additional actions may be needed due to site-specific concerns, *e.g.*, local terrain, meteorology, proximity of neighbors and other exposed individuals. Thus, some regulatory authorities have instituted additional requirements, such as limits on proximity to neighbors, limits on visible emissions and limits on use in non-heating seasons. Some authorities have banned hydronic heaters entirely in some areas.

The EPA also developed a similar voluntary partnership program for low mass fireplaces (engineered, pre-fabricated fireplaces) and site-built masonry fireplaces. Fireplaces were not included in the 1988 NSPS for residential wood heaters because typical fireplaces are not considered to be effective "heaters." Most of the heat content from the wood burned in a typical fireplace is lost out the chimney rather than heating a room. The voluntary program began in February 2009, and pertained only to low mass fireplaces at that time. In July 2009, the program was expanded to masonry fireplaces. Under this program, cleaner burning fireplaces are ones that qualify for the Phase 1 emissions level of 7.3 grams of particles emitted per kilogram (g/kg) of fuel burned (approximately 57 percent cleaner than unqualified models) or the Phase 2 emissions level of 5.1 g/kg (approximately 70 percent cleaner than unqualified models). So far, 36 models (of hundreds of models on the market) have qualified under this voluntary

partnership program at the Phase 2 level. Typically, qualified models have improved insulation and added secondary combustion and/or a catalyst to reduce emissions. Some manufacturers have added doors to reduce the excess air and thus improve combustion. The Phase 2 emission level in the voluntary fireplace program has been considered as a starting point for some local regulatory authorities, and additional actions have also been considered due to site-specific concerns, *e.g.*, local terrain, meteorology, proximity of neighbors and other exposed individuals, and magnitude of other emissions in the airshed. Thus, some regulatory authorities have instituted additional requirements (*e.g.*, "no burn" days on which the fireplaces cannot be operated) and some have banned new wood-burning fireplaces in some areas.

The current 1988 NSPS in subpart AAA have been in effect for over 25 years and manufacturers and test laboratories have gained considerable experience in complying with the requirements of the program. As a result, many manufacturers and test laboratories have suggested changes to the certification process to better implement the program, such as developing an electronic system for submittals and approval. Many manufacturers and test laboratories have also questioned the effectiveness of some of the current audit procedures. In addition, they have participated in the development of new test methods and test method improvements as part of the efforts of ASTM International (formerly known as the American Society of Testing and Materials). The 1988 NSPS left a placeholder for development of an efficiency test method for use in subpart AAA. On June 1, 2007, the EPA approved the Canadian Standards Association (CSA) stack loss method in B415 as an alternative for wood heater efficiency testing in subpart AAA provided that the tests use the same burn rate categories specified in the EPA Reference

Method 28. We are now proposing that the current version of this method be used for efficiency testing (CSA B415.1-10). We are also proposing EPA Method 28 WHH (wood-fired hydronic heaters) that has been used for qualification testing of hydronic heaters in the EPA voluntary partnership program and numerous state regulations. Other issues that have been identified over the years regarding test methods and emissions calculations include emissions averaging, burn rate weightings, hot start versus cold start, emission caps per burn rate, and catalyst degradation. Another issue is whether to change current requirements to conduct certification tests with "crib" wood to "cord" wood. "Crib wood" is a specified configuration and quality of dimensional lumber and spacers, which was intended to improve the repeatability of the test method in 1988. "Cord wood" is a different specified configuration and quality of wood that more closely resembles what a typical homeowner would use. We address all these issues as part of this proposal.

E. Why is residential wood smoke a concern?

1. Health and air quality concerns. There is increasing recognition of the health impacts of particle pollution, to which wood smoke is a contributing factor in many areas. Wood smoke contains a mixture of gases and fine particles that can cause immediate effects, including burning eyes, runny nose and bronchitis. Exposure to fine particles has been associated with a range of health effects, including aggravation of heart or respiratory problems (as indicated by increased hospital admissions and emergency department visits), changes in lung function and increased respiratory symptoms, as well as premature death. Populations at greater risk for experiencing health effects related to fine particle exposures include older adults, children and individuals with pre-existing

heart or lung disease.[7] Residential wood smoke contains fine particles and toxic air pollutants (*e.g.*, benzene and formaldehyde). Each year, smoke from wood heaters contributes hundreds of thousands of tons of fine particles throughout the country – mostly during the winter months. Nationally, residential wood combustion accounts for 44 percent of total stationary and mobile POM emissions, nearly 25 percent of all area source air toxics cancer risks, and 15 percent of noncancer respiratory effects.[8]

In a number of communities, residential wood smoke increases particle pollution to levels that cause significant health concerns. Several areas with wood smoke problems either exceed the EPA's health-based NAAQS for fine particles or are on the cusp of exceeding those standards. For example, in places such as Keene, New Hampshire; Sacramento, California; Tacoma, Washington; and Fairbanks, Alaska; wood combustion can contribute over 50 percent of daily wintertime fine particle emissions.[9]

In December 2012, the EPA issued revised NAAQS for PM to provide increased protection of public health and welfare. The 2012 NAAQS for PM strengthened the annual NAAQS for fine particles to 12 micrograms per cubic meter ($\mu g/m^3$) from the 1997 standard of 15 $\mu g/m^3$ and retained the existing 24-hour fine particle standard of 35 $\mu g/m^3$ issued in 2006. The 2012 NAAQS for PM also retains the current 24-hour PM_{10} standards for health and environmental effects at a level of 150 $\mu g/m^3$ to continue to provide protection against effects associated with exposure to thoracic coarse particles.

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[7] EPA Burn Wise (Consumer - Health Effects), http://www.epa.gov/burnwise/healtheffects.html.

[8] Strategies for Reducing Residential Wood Smoke. EPA-456/B-13-001, March 2013. Prepared by Outreach and Information Division, Air Quality Planning Division, Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711. pp. 4-5.

[9] Memorandum dated April 4, 2013, from David Cole, EPA, to Docket ID No. EPA-HQ-OAR-2009-0734.

Areas that do not meet the standards must take steps to reduce PM emissions. The National Association of Clean Air Agencies (NACAA), the Environmental Council of States (ECOS), NESCAUM, the Western States Air Resources Council (WESTAR), and the Lake Michigan Air Directors Consortium (LADCO) have argued that more stringent standards for new wood heating devices would provide a much needed tool for states and local communities to use in addressing the growth of pollution from these sources.[10, 11] Recent health studies considered in the review of the PM NAAQS confirm the impacts on public health. The latest information on the PM NAAQS reviews is at http://www.epa.gov/pm/actions.html.

There is also concern about the health effects of other pollutants found in wood smoke. In addition to PM, wood smoke contains harmful chemical substances such as CO, formaldehyde and other organic gases, and nitrogen oxides (NO_x).

Health effects from CO include:

- Interference with the blood's ability to carry oxygen to the brain, which impairs thinking and reflexes
- Heart pain
- Lower birth weights and increased deaths in newborns
- Death

Health effects from formaldehyde and other organic gases include:

- Irritation of eyes, nose, and throat
- Inflammation of mucous membranes, irritation of the throat and sinuses

[10] Arthur Marin, Executive Director of NESCAUM and Dan Johnson, Executive Director of WESTAR, to Steve Page, Director OAQPS/EPA. April 28, 2008.
[11] Arthur Marin, Executive Director of NESCAUM, to Gina McCarthy, Assistant Administrator for Air and Radiation/EPA. January 14, 2011.

- Interference with lung function
- Allergic reactions
- Nose and throat cancer in animals and cancer in humans

Nitrogen oxide can irritate the eyes and respiratory system, may damage the immune system by impairing the body's ability to fight respiratory infection and can affect lung function.[12]

Residential wood combustion emissions contain potentially carcinogenic compounds including formaldehyde, polycyclic aromatic hydrocarbons (PAHs), benzene, and dioxin, which are toxic air pollutants, but their effects on human health via exposure to wood smoke have not been studied as extensively.[13]

2. Concerns about existing sources. Many areas of the country are struggling with reducing PM emissions due to residential wood smoke from existing wood-burning appliances. Existing wood heaters will not be affected by this rule. In addition, due to the long life span of wood-burning appliances and slow turnover, it may be many years before the full benefits of these regulations on new appliances will be shown. However, there are strategies to reduce wood smoke that states, counties and townships can take to reduce wood smoke independent of this rule.[14] Some states have direct legislative authority, and all states have authority to address new and existing sources as SIP measures necessary to ensure attainment and maintenance of the NAAQS. For examples, the State of Oregon, Washoe County (NV), and Township of Mammoth Lakes (CA) have

[12] Department of Ecology, State of Washington, Brochure on Wood Smoke and Your Health. September 2008, http://www.ecy.wa.gov/pubs/91br023.pdf.
[13] EPA Burn Wise (Health Effects of Breathing Wood Smoke), http://www.epa.gov/burnwise/pdfs/woodsmoke_health_effects_jan07.pdf.
[14] "Strategies for Reducing Residential Wood Smoke," EPA-456/B-13-001. March 2013.

required that, when a home is sold, existing wood heaters that have not been certified to meet the NSPS be removed and destroyed and not resold. As additional SIP strategies, some states and local authorities have banned wood burning during certain high PM events, restricted the amount of burning, and regulated the type of materials being burned. Non-regulatory programs, such as education programs to teach the public how to use their wood-burning appliances in ways that minimize emissions, have also been implemented. The EPA has also implemented programs that encourage good burning practices, which can have a significant impact on emissions. The EPA, some state and local agencies, and other stakeholders, including the Hearth, Patio and Barbecue Association (HPBA), have been active in promoting wood heater/stove changeout programs to replace older, higher-emitting heaters/stoves with lower-emitting EPA-certified heaters/stoves, pellet heaters/stoves, or other cleaner burning appliances.

F. What are the major issues that drove the review process?

We received several requests to conduct a review of the residential wood heaters NSPS, including a joint letter from WESTAR and NESCAUM that urged us to update and develop regulations relating to a variety of wood combustion devices. The authors cited concerns that many communities are measuring ambient conditions above or very close to the $PM_{2.5}$ NAAQS and that, in many instances, emissions from wood smoke are a large contributor to those high $PM_{2.5}$ levels. In addition, wood heater technology has greatly improved since the last revision of the NSPS. The standards we are proposing today recognize the cleaner, more efficient technologies developed in recent years. Other states, environmental groups, and HPBA have also recommended several changes to the NSPS. The HPBA Outdoor Wood-fired Hydronic Heater (OWHH) Manufacturers

Caucus wrote the EPA to express their unanimous support for the EPA to develop a federal regulation for OWHH.[15]

Specific requests from stakeholders include:

- Tightening emission standards based on current performance data
- Addressing other pollutants of concern
- Reviewing the format of the standards, including adding requirements to document the tested efficiency of the unit
- Reevaluating exemptions, such as those based on air-to-fuel ratios and size and weight
- Adding other wood heating devices such as pellet heaters/stoves, hydronic heaters, and masonry heaters to the NSPS
- Regulating fireplaces and other "non-heater" devices (*e.g.*, cook stoves)
- Regulating heating devices that burn fuel other than wood (*e.g.*, other solid biomass and coal)
- Updating test methods
- Streamlining the certification process to use electronic data submittals/reviews
- Considering use of International Organization for Standardization (ISO)-accredited labs and ISO-accredited certifying bodies
- Improving compliance assurance/enforceability and quality assurance/quality control
- Making the rule more consumer friendly by making more information readily available on-line

III. Summary of Proposed Residential Wood Heater Appliance Amendments

[15] HPBA OWHH Caucus letter to Greg Green, Director, Outreach and Information Division, EPA. September 27, 2007.

We are proposing to amend 40 CFR part 60, subpart AAA, Standards of Performance for New Residential Wood Heaters. We are also proposing two new subparts to address additional types of residential wood heating appliances. Specifically, we are proposing subpart QQQQ, Standards of Performance for New Residential Hydronic Heaters and Forced-Air Furnaces, and subpart RRRR, Standards of Performance for New Residential Masonry Heaters. The following sections describe the major provisions of each subpart. This proposal does not include any requirements that would apply to heaters that are fueled solely by gas, oil or coal. In addition, this proposal does not include any requirements associated with wood heaters or other wood-burning appliances that are already in use. The EPA continues to encourage state, local, tribal, and consumer efforts to changeout (replace) older heaters with newer, cleaner, more efficient heaters, but that is not part of this federal rulemaking.

A. Room Heaters

The current 1988 regulation (subpart AAA) applies to affected appliances manufactured since 1988. The current emission limits would remain in effect for the heaters and model lines manufactured before the effective date of this rule until their current EPA certification expires (maximum of 5 years) or is revoked. After the certification expires or is revoked, these heaters and other new heaters would have to meet updated emission standards. We propose to broaden the applicability of the wood heaters regulation beyond adjustable burn rate wood heaters (the focus of the original regulation) to specifically also include single burn rate wood heaters/stoves, pellet heaters/stoves, and any other affected appliance as defined in the proposed subpart AAA as a "room heater." The proposed subpart AAA does not apply to new residential

hydronic heaters, new residential forced-air furnaces and new residential masonry heaters because they would be subject to their own subparts. Like the 1988 current subpart AAA, the proposed subpart AAA does not apply to fireplaces. This proposal tightens the definition for "cook stoves" and adds definitions for "camp stoves" and "traditional Native American bake ovens" to clarify that they would not be subject to the standard other than appropriate labeling for cook stoves and camp stoves. Finally, the proposed subpart AAA clarifies that the emission limits would only apply to wood-burning devices (*i.e.*, not to devices that only burn fuels other than wood, *e.g.*, gas, oil or coal).

As discussed in section II, NSPS determinations of BSER must consider costs. The fact that this source category is for consumer products manufactured for residential sale results in cost considerations that are different from those for industrial process source categories that are typical for most NSPS. Specifically, if production and sales were to be suspended while designing, testing, field evaluating and certifying cleaner models, the cost of potential lost revenues would be significant, which necessitates reasonable lead times for compliance with proposed emission limitations. This was true in 1988, and is still true today. Thus, we propose to allow a transition period so that heaters/stoves with EPA certification currently in effect can continue to be manufactured and sold until the current certification expires (5 years from date of certification) or is revoked by the Administrator, whichever date is earlier. We would not allow renewal of these certifications. That is, in the near term, we are proposing to retain the current Phase II PM emission limits (issued in the current 1988 standards for compliance in 1990) for adjustable burn rate wood heaters and pellet heaters/stoves with a current EPA certification issued prior to the effective date of this rule. While our top priorities are to

ensure that emission reductions occur in a timely manner and that there is no backsliding from the improvements that many manufacturers have already made, it is also important to avoid unreasonable economic impacts on those manufacturers (mostly small businesses) who need additional time to develop a full range of cleaner models. The compliance schedule should also help avoid potential "logjams" at laboratories conducting certification testing. We ask for specific comments on the length of this proposed transition and the degree to which there would be any critical economic impacts on manufacturers who have heaters with current certifications if we were to not allow up to the full 5-year certification period for units manufactured after the effective date of the final rule. We also ask for specific comments on allowing grandfathering of Step 1 models that are tested in good faith according to the proposed test methods and the proposed emission limits, even though the final test methods may differ from this proposal, and if so, for how long.

We are proposing a two-step compliance approach (referred to herein as the "Proposed Approach") that would apply to all new adjustable burn rate wood heaters, single burn rate wood heaters and pellet heaters/stoves. Under this Proposed Approach, the Proposed Step 1 emission limits for these sources would apply to each source (a) manufactured on or after the effective date of the final rule or (b) sold at retail on or after the date 6 months from the effective date of the final rule. Proposed Step 2 emission limits for these sources would apply to each adjustable rate wood heater, single burn rate wood heater and pellet heater/stove manufactured or sold on or after the date 5 years after the effective date of the final rule. We ask for specific comments on the Proposed Approach and the degree to which these dates could be sooner.

We are also asking for comments on a three-step compliance approach (referred to herein as the "Alternative Approach") for all adjustable rate wood heaters, single burn rate wood heaters and pellet heaters/stoves. Under this Alternative Approach, the Alternative Step 1 emission limits would apply to each source: (a) manufactured on or after the effective date of the final rule, or (b) sold at retail on or after the date 6 months from the effective date of the final rule. (Step 1 under the Alternative Approach is the same as Step 1 under the Proposed Approach.) The Alternative Step 2 emission limits would apply to each source manufactured or sold on or after the date 3 years after the effective date of the final rule. The Alternative Step 3 emission limits would apply to each source manufactured or sold on or after the date 8 years following the effective date of the final rule (thus providing 5 years between the Alternative Step 2 and Alternative Step 3). We ask for specific comments on this Alternative Approach, including data and potential environmental and economic impacts on this alternative, and the degree to which the Alternative Approach emission levels and dates could be considered BSER. Our current preference is the Proposed Approach, but we intend to finalize a single compliance approach after fully considering the comments received during the public comment period on this proposed rulemaking.

Table 3 summarizes the PM emissions standards that would apply to each wood heater appliance under this Proposed Approach at each step. Table 4 summarizes the PM emissions standards that would apply to each wood heater appliance under each step of the Alternative Approach.

Table 3. Proposed Approach Subpart AAA PM Emissions Limits

Appliance	Phases/Steps	PM Emissions Limit
Adjustable Rate Wood	Transition period from	4.1 g/hr for catalytic

Heaters or Pellet Heaters/Stoves with current EPA certification issued prior to the effective date of the Final Rule	1988 rule through the later of the effective date of the final revised rule or expiration of current certification (maximum of 5 years certification and no renewal)	heaters/stoves and 7.5 g/hr for noncatalytic heaters/stoves
All Other Adjustable Rate Wood Heaters, Single Burn Rate Wood Heaters or Pellet Heaters/Stoves (includes currently certified heaters after the certification expires, catalytic and noncatalytic)	Step 1: upon the effective date of final rule Step 2: 5 years after the effective date of the final rule	4.5 g/hr 1.3 g/hr

Table 4. Alternative Approach Subpart AAA PM Emissions Limits

Appliance	Phases/Steps	PM Emissions Limit
Adjustable Rate Wood Heaters or Pellet Heaters/Stoves with Current EPA Certification Issued Prior to the effective date of Final Rule	Transition period from 1988 rule through the later of the effective date of the final revised rule or expiration of current certification (maximum of 5 years certification and no renewal)	4.1 g/hr for catalytic heaters/stoves and 7.5 g/hr for noncatalytic heaters/stoves
All Other Adjustable Rate Wood Heaters, Single Burn Rate Wood Heaters or Pellet Heaters/Stoves (includes currently certified heaters after the certification expires, catalytic and noncatalytic)	Step 1: upon the effective date of final rule Step 2: 3 years after the effective date of the final rule Step 3: 8 years after the effective date of the final rule	4.5 g/hr 2.5 g/hr 1.3 g/hr

Although the 1988 promulgated subpart AAA (53 FR 5860, February 26, 1988) included an additional 1-year compliance extension for low-volume manufacturers, *i.e.*, companies that manufacture (or export to the U.S.) fewer than 2,000 heaters per year, this proposal does not include a similar compliance extension. We are not proposing a delay for adjustable burn rate wood heaters or pellet heaters/stoves because the majority of these appliances already comply with the proposed Step 1 emission levels. See section V.C. of this preamble for more discussion of this topic. However, we are requesting comments on the possible need for such a compliance extension for single burn rate wood heaters, which are not subject to the current subpart AAA requirements.

We are proposing to make a single determination of BSER for both catalytic and noncatalytic heater systems. The EPA considered requiring catalyst replacement on a regular schedule but determined that federal enforcement of such a requirement would be difficult. As in the current 1988 rule, we are proposing to require manufacturers to provide warranties on the catalysts and prohibit the operation of catalytic heaters/stoves without a catalyst. In addition, we are proposing to require warranties for noncatalytic heaters/stoves. Though we are not proposing efficiency standards at this time, we are proposing to require testing and reporting of these data; however, we are requesting specific comment on the need to propose efficiency standards and any data to support the basis for these standards.

We are also proposing to require emission testing and reporting based on both crib wood and cord wood for the proposed Step 1 compliance, and allowing manufacturers to choose whether to certify with crib wood or cord wood for the proposed Step 1 upon the effective date of the final rule. For the proposed Step 2 compliance 5

years after the effective date of the final rule, we would require certifying with cord wood only. As discussed earlier in this preamble, “crib wood” is a specified configuration and quality of dimensional lumber and spacers that was intended to improve the repeatability of the test method in 1988. “Cord wood” is a different specified configuration and quality of wood that more closely resembles what a typical homeowner would use. We ask for comments and test data to compare heater performance with crib wood and cord wood.

Although we lack sufficient data to propose a separate CO emissions standard at this time, we propose to require that the manufacturer determine CO emissions during the compliance test and report those results to the EPA. We specifically request emission and cost data for systems that reduce CO emissions. If those systems warrant inclusion in the final rule, we would consider doing so. In addition, we ask for specific comments on whether the final rule should explicitly require indoor CO monitors as a critical safety component for heaters installed in occupied buildings or other buildings or enclosures in which the operator would enter to add fuel to the heater or conduct other normal operation and maintenance of the heater. Numerous stakeholders have indicated that an explicit requirement is needed.

Like the current 1988 subpart, the EPA is using its authority under section 114 of the CAA to require each manufacturer to submit certifications of compliance with this rule for all models and all units. As in the 1988 rule, provided that the certifications are timely, complete, and accurate, the EPA is proposing to allow certification to be determined based on testing of a representative unit within the model line. As in 1988, the cost of testing each unit would be an order of magnitude greater than the cost of a wood heater/stove and would be economically prohibitive. In addition, as in 1988, the

testing of each unit could create a potential "logjam" that would stymie the certification of cleaner model lines. However, as discussed earlier, we are asking for specific comments on whether we should require testing of more than one representative unit prior to certification of a model line. The proposed subpart revises the definition of "Accredited Test Laboratory," from only EPA-accredited laboratories to laboratories approved by the EPA after being accredited by a nationally recognized accrediting body to perform testing for each of the test methods specified in this NSPS under ISO-IEC[16] Standard 17025, to conduct the certification testing. The laboratories would have to register their credentials with the EPA and be approved by the EPA prior to conducting any certification testing or related work used as a basis for compliance with this rule. Also, they would be required to report any changes in their accreditation and any deficiencies found under ISO 17025, and the EPA may revoke the approval if appropriate. Our proposal is this laboratory definition revision be effective upon the effective date of the final rule. However, we request specific comments on whether we should allow a transition period.

The proposal would require a "Certifying-Body-Based Certification Process," upon the effective date of the final rule. Under this process, after testing is complete, a certification of conformity with the PM emissions standards must be issued by a certifying body with whom the manufacturer has entered into contract for certification services. The certification body would have to be accredited under ISO-IEC Standard 17065 and register their credentials with the EPA and receive EPA approval prior to conducting any certifications or related work used as a basis for compliance with this rule

[16] The International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) prepare and publish international standards.

and report any changes in their accreditation and any deficiencies found under ISO 17065. We believe any certifying body that is approved by the EPA and is ISO-accredited should be expected to act in such a way that will not create a conflict of interest. The EPA would oversee the certification body's work and retain the right to revoke the approval if appropriate. Upon review of the test report and quality control plan submitted by the manufacturer, the certifying body may certify compliance and submit the required documentation to the EPA's Office of Enforcement and Compliance Assurance for review, approval and listing of the certified appliance. Our preference is to require the new expanded certification process (*i.e.*, inclusion of ISO-accredited and EPA-approved certifying bodies) for certifications that occur after the effective date of the final rule. However, we request specific comments on whether we should allow a transition period; that is, whether we should retain the current "Administrator Approval Process" to review the certification application, including test results, for the first year following the effective date of the final rule. Note that models certified prior to the effective date of the final rule would not have to be re-tested until the certification expires or is revoked.

As in the current 1988 NSPS, each affected unit would be required to have an applicable permanent label and have an owner's manual that contains specified information. We are proposing that permanent labels would be required for each affected unit on the effective date of the final rule. We propose to clarify that the permanent label must be installed so that it is readily visible both before and after the unit is installed. This clarification is needed to document the use of complying heaters that may be required by state and local rules and/or to determine the unit's applicability to any future

changeout programs. We also request specific comments on how to best assure that manufacturers and retailers and online marketers of wood heaters only use valid certification test data and not exaggerated claims.

In the current (1988) NSPS, temporary labels (*aka*, hangtags) were required for wood heaters that are subject to the standards and also for ones that are not (*e.g.*, coal heaters/stoves). These temporary labels were intended primarily to contain information useful to consumers and prospective heater purchasers to be able to compare different appliance models and to inform the consumer about the importance of proper operation and maintenance. These temporary labels included the wood heater's compliance status, comparative emission and efficiency performance data, and heat output rates and explicitly stated that the appliance will achieve low smoke output and high efficiency only if properly operated and maintained. The EPA no longer believes these temporary labels are necessary for all certified heaters because we have developed and are continuing to improve our education and outreach program for consumers on selecting the cleanest certified appliances and wood fuel with appropriate moisture content and on the effective use and operation of these appliances. Consequently, we are proposing to remove the requirement for temporary labels on certified heaters. Consumers can get additional information that would normally be contained on the temporary labels at http://www.epa.gov/compliance/monitoring/programs/caa/woodheaters.html. We request comment on the potential impact that deleting this requirement might have on a consumer's ability to select wood heaters that meet the proposed standards and are the cleanest and whether we should consider developing a voluntary labeling program for the cleanest of the clean. As discussed elsewhere, we also ask for specific comments on

language that we should require manufacturers and retailers to provide to consumers to help explain the relative benefits of high-performing heaters versus lower-performing heaters and how to reduce exaggerated claims.

In addition to the PM emissions standards, we are proposing to continue to require the proper burn practices that already apply to the owner or operator of a wood heating appliance. That is, the current 1988 standards already include the requirement that the owner or operator must operate the heater consistent with the owner's manual and not burn improper fuels and manufacturers typically void their warranties in cases of improper operation. Numerous states have expressed their support for the continuation of these requirements. Some states and local jurisdictions have enforced similar requirements, and this proposal would allow potential delegation of enforcement authority of these NSPS requirements upon the EPA approval of state requests.

The proposed revision clarifies that the current requirement to operate according to the owner's manual continues to include a list of prohibited fuel types that create poor or even hazardous combustion conditions and includes operation of pellet fuel appliances only with the grades of pellet fuels that are included in the certification tests, or better. We propose that pellets for the certification tests be only those that have been produced under a licensing agreement with the Pellet Fuels Institute (PFI), or equivalent (after request and subsequent approval by the EPA), to meet certain minimum requirements and procedures for a quality assurance process. Details of the PFI program are available at http://pelletheat.org/pfi-standards/pfi-standards-program/. We are not aware of any other U.S. organization that has a pellet fuel quality assurance program similar in quality to the PFI program. However, we request specific comments on whether another high quality

program exists. Manufacturers' data show that pellet fuel quality assurance is necessary to ensure that the appliances operate properly such that emissions are reduced as intended. We ask for specific comments on how to determine equivalency for fuel pellets, and whether we should include other requirements of best burn practices or adjustments to help ensure proper operation, *e.g.*, chimney height and draft specifications, moisture content of wood and limits on visible emissions.

The proposed subpart AAA still contains the crucial quality assurance provisions in the current 1988 NSPS. A comprehensive discussion of the rationale is included in the 1988 preamble. For example, a model line must be recertified whenever any change is made in the original design that could affect the emissions rate for that model line or when any of several specified tolerances of key components are changed. The 1988 requirements for manufacturer quality assurance programs would be superseded by a Certifying-Body-Based Quality Assurance program. (As noted earlier in this preamble, we would not require retesting for models that are certified prior to the effective date of the final rule until the certification expires or is revoked.) The certifying body would conduct regular, unannounced audits to ensure that the manufacturer's quality control plan is being implemented properly.

The EPA audit testing programs of the 1988 NSPS will be maintained under the proposed changes, although they will be streamlined and simplified to better ensure compliance and to clarify that audits can be based on any information the EPA has available and do not have to be statistically random. Also, we clarify that the EPA and states are allowed to be present during the audits and that states (and other entities,

including the public) may provide the EPA with information that may ultimately be used in the EPA enforcement and compliance assurance efforts.

As discussed earlier, the EPA developed Method 28 in 1987 and 1988 as part of our efforts on the 1988 NSPS. We received input at that time from manufacturers, laboratories, and some states. Oregon Method 7 was the starting point for Method 28 and, thus, Method 28 has many aspects similar to Oregon Method 7. The details on the history and development of Method 28 are contained in the February 18, 1987, proposal in the *Federal Register* (52 FR 5003) and the February 26, 1988, final rule in the *Federal Register* (53 FR 5866).

The manufacturers, laboratories, states and the EPA have more than 25 years of experience with Method 28, and it has been very useful for certifying hundreds of model lines of wood heaters/stoves. We asked the manufacturers, EPA-accredited laboratories and states for their insights on Method 28. Many stakeholders agree that changes should be made to improve the reproducibility and repeatability of the test procedures and to address concerns about how to best ensure protection across the entire U.S. when various operating scenarios are used and various wood species and densities are used. For example, to address some of these concerns, ASTM has used a "consensus-based" process to develop E2515-10 "Standard Method for Determination of Particulate Matter Emissions in a Dilution Tunnel." The EPA is proposing that this sampling and analysis method be used for all of the appliances in this rulemaking. As with all test methods, there are opportunities for continual improvement, and the EPA requests specific comments and supporting data for additional potential improvements to E2515-10.

A number of states have expressed concern about ASTM's Intellectual Property

Policy which requires all participants to give their intellectual property rights to ASTM so that, in turn, ASTM can control distribution of the drafts and final test methods and sell the final test methods to potential users. Attorneys General for several states have indicated that state employees in their states cannot give to ASTM the property rights for property that their states paid for via the employee salaries and other expenditures and thus cannot participate in ASTM's "consensus-based" process. For this rulemaking, ASTM is allowing public review, for no charge, of the ASTM test methods and draft work products relevant to this proposed rule at www.astm.org/epa. The EPA requests specific comments and supporting data on the substance of all of the test methods relevant to this rulemaking and specific comments on the ASTM process and ways to ameliorate the process concerns.

The ASTM methods E2779-10 "Standard Test Method for Determining Particulate Emissions from Pellet Heaters" and E2780-10 "Standard Test Method for Determining Particulate Emissions from Wood Heaters" are being considered for potentially replacing the wood heater fueling and operation requirements in Method 28 for pellet heaters and wood heaters, respectively. Note that ASTM intends to use the same E2515-10 for the sampling and analysis portion for all the appliances and then separate methods per appliance types for the fueling and operation portions of these methods. The EPA believes E2525-10 is a sound method for sampling and analysis and we are proposing its use. The EPA also believes that E2779-10 is a sound method for measuring emissions from pellet heaters/stoves and includes reasonable measures to reduce testing costs for continuously-fed appliances, and we are proposing its use. However, because, as noted earlier, some states were not able to participate in the ASTM

method development process, we specifically request comments and supporting data of all aspects of not only these test methods but also all the proposed methods as part of the comments on this proposed rule.

Similarly, the EPA believes that ASTM Method E2780-10 includes improvements for testing adjustable and single burn rate wood heaters, and we are proposing many of the improvements today. For example, we are proposing the use of the E2780-10 appendix for testing single burn rate appliances. However, we, and some states, do not agree with all the changes that ASTM has made for adjustable burn rate wood heaters, and some provisions are not as protective as we, and some states, now believe they need to be. As noted above, several states are concerned about how to best ensure that the methods are protective for the entire U.S., considering differences in wood species, density, and homeowner operation. The EPA and the states are particularly concerned about scenarios in which heaters/stoves will have higher emissions in home use than the emissions measured in the laboratories. For example, the states and the EPA are concerned about the ASTM changes on burn rate categories, *i.e.*, easing or eliminating the lowest burn rates that often occur in home operations and are typically the highest emitting and least efficient. The EPA is asking for specific comments on these issues and recommendations and supporting data for other changes. The following paragraphs discuss some of the key test method provisions we are proposing and not proposing. Additional information on the methods is at http://www2.epa.gov/residential-wood-heaters and at www.astm.org/epa.

1. We do not agree with the ASTM changes to the burn rate categories, low burn rate requirement, and weightings in Method 28. Several states are very concerned that

easing these items would create the potential for backsliding. Also, we are aware of several design changes being considered by a number of manufacturers that are relatively inexpensive (*i.e.*, less than $20 dollars) and will reduce the emissions during periods when operated at low burn rates. We instead propose that the original provisions in Method 28 be retained for the burn rate categories and low burn rate requirement. We considered the weightings and believe that if weightings are to be used, they should be the same as the original requirements in Method 28. We are also proposing that the burn rates not be weighted at all for the Step 2 standards but rather that the emission limits be separate for Burn Rate Category 1 (lowest burn rate category) and Burn Rate Category 4 (maximum burn rate category) and that compliance for each be shown separately.

2. We propose to not allow 5 minutes for startup before closing the doors because startup is often the highest emitting part of the wood heater operation, and manufacturers need to ensure that startup emissions are also reduced. Again, relatively inexpensive means exist to reduce these emissions.

3. We are not proposing to use the new ASTM equation for converting the emission test values between the EPA Reference Method 5G "Determination of Particulate Emissions From Wood Heaters From a Dilution Tunnel Sampling Location" and the EPA Reference Method 5H "Determination of Particulate Emissions From Wood Heaters From a Stack Location" currently allowed in the NSPS. Rather, we are proposing that Method 5G(3) test values be reported as tested for heaters that have valid certifications prior to the effective date of this rule and ASTM E2515-10 for all other heaters and that Method 5H not be used for testing for certifications after the effective date of this rule. We request data to help inform our decision for the final rulemaking.

4. We are not proposing to allow manufacturers to specify a smaller volume of the firebox for testing because of our concerns about how to ensure that homeowners do not circumvent such a specification during operation, thereby increasing emissions beyond the levels that are measured during testing.

5. We are proposing several tighter specifications on the test fuel moisture content, fuel load and coal bed depth in order to improve the reproducibility and repeatability of the certification tests. This part of the proposal is based on recommendations from one of the original EPA-accredited laboratories. We specifically request comments and supporting data regarding the following proposed tighter specifications for the laboratory test: (a) tightening fuel load dry-basis moisture content tightened from the Method 28-allowed 6 percentage-point range from 19 percent to 25 percent to a reduced range of 22.5 percent +/-1 percent; (b) tightening the Method 28-allowed range for fuel load weight from 7.0 lb/ft^3+/-10 percent of the fuel load weight (or 7 lb/ ft^3 +/-0.7 lb/ft^3) to 7 lb/ft^3 +/-1 percent (or 7 lb +/-0.07 lb) of the fuel load weight, calculated in accordance with Method 28; and (c) tightening the Method-28-allowed range for the test-initiation coal-bed weight from 20 percent to 25 percent of the fuel load weight to 22 percent +/-1 percent of the fuel load weight.

6. We propose to require efficiency testing according to CSA B415.1-10[17] using the stack loss method. That is, during each test run, data must be obtained and presented for the purpose of calculation of overall efficiency as specified in CSA B415.1-10. This would include CO and carbon dioxide (CO_2), flue gas temperature and appliance mass. CSA B415.1-10 was developed by a "consensus" process, but no states were part of the

[17] "CSA B415.1-10: Performance testing of solid-fuel-burning heating appliances," Canadian Standards Association, Mississauga, Ontario, Canada. 2010.

process. Thus, we specifically request comments on our proposal to require use of this method.

7. We propose that electronic test report submittals include the locked spreadsheets so the formulas used and relevant calculations can be evaluated in detail. We request comments on this specific proposal.

8. We propose that the test report include a narrative detailing specifics about test conditions and operations, such as how the test was run, operating conditions, issues and special procedures.

9. We propose that each individual moisture content reading must be in the range of 18 to 28 percent on a dry basis and the average moisture content of each piece of test fuel must be in the range of 19 to 25 percent. Also, we propose the following procedure for the moisture measurements: "Using a fuel moisture meter as specified, determine the fuel moisture for each test fuel piece used for the test fuel load by averaging at least five fuel moisture meter readings, one from each of three sides, measured parallel to the wood grain. Penetration of the moisture meter insulated electrodes shall be ¼ (one-fourth) the thickness of the fuel piece or 19 millimeters (mm) (3/4 in.), whichever is less, for 3 of the measurements made at approximately 3 inches from each end and the center. Two additional measurements at approximately one-third the thickness shall be made centered between the other three locations."

10. We also propose this alternate procedure developed by Brookhaven National Laboratory:[18] "Select three pieces of cord wood from the same batch of wood as the test

[18] "A Test Method for Certification of Cord Wood-Fired Hydronic Heating Appliances with Partial Thermal Storage: Measurement of Particulate Matter (PM) and Carbon Monoxide (CO) Emissions and Heating Efficiency of Wood-Fired Hydronic Heating

fuel and the same weight as the average weight of the pieces in the test load ± 1.0 lb. From each of these three pieces, cut three slices. Each slice shall be ½" to ¾" thick. One slice shall be cut across the center of the length of the piece. The other two slices shall be cut half way between the center and the end. Immediately measure the mass of each piece in pounds. Dry each slice in an oven at 220°F for 24 hours or until no further weight change occurs. The slices shall be arranged in the oven so as to provide separation between faces. Remove from the oven and measure the mass of each piece again as soon as practical in pounds. The moisture content of each slice, on a dry basis, shall be calculated as:

$MC_{slice} = 100 \cdot (W_{SliceWet} - W_{SliceDry}) / W_{SliceDry}$

Where: $W_{SliceWet}$ = weight of the slice before drying in pounds; $W_{SliceDry}$ = weight of the slice after drying in pounds; [and] MC_{Slice} = moisture content of the slice in % dry basis."

11. We propose to require two Step 1 tests, one using crib wood and one using cord wood and reasonable additional non-binding tests with a range of fuels for which the appliance is designed for warranted and/or advertized operation. These tests are needed to show how emissions and efficiency vary according to test methods, operating scenarios, wood species and density and other variables such as cord wood versus crib wood. We believe that such testing would help assure consumers, neighbors and other stakeholders that the appliances perform as well on all manufacturer-listed fuels and operating scenarios as they do for the EPA laboratory test scenarios. Proposed Step 2 tests will use cord wood and not crib wood. The EPA, industry and states believe that moving to cord wood testing will help address concerns about actual emissions from heaters/stoves in

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Appliances with Partial Thermal Storage." Prepared for NYSERDA by Brookhaven National Laboratory, February 15, 2013.

home use versus test laboratories. We are working with states and industry on a cord wood test method and evaluating potential revisions to the current version of the ASTM E2780-10 cord wood test method. Industry is conducting tests now using the cord wood test method, and we will consider the results of that testing when it becomes available during the public comment period of this rulemaking.

B. Central Heaters: Hydronic Heaters and Forced-Air Furnaces

The proposed subpart QQQQ would apply to new wood-fired residential hydronic heaters and forced-air furnaces and any other affected appliance as defined in subpart QQQQ as a "central heater." We believe this new "central heater" categorization will better ensure that all appliances potentially affected under new proposed subpart QQQQ are included in this proposed action. The provisions of subpart QQQQ would apply to each affected unit that is manufactured or sold on or after **[INSERT DATE 60 DAYS AFTER PUBLICATION OF THE FINAL RULE IN THE FEDERAL REGISTER].** This proposal does not include any requirements for heaters that are fueled solely by gas, oil or coal. In addition, this proposal does not include any requirements associated with appliances that are already in use. The EPA continues to encourage state, local, tribal and consumer efforts to changeout (replace) older heaters with newer, cleaner, more efficient heaters, but that is not part of this federal rulemaking.

As discussed earlier in this preamble, subpart QQQQ affects a source category of mass-produced residential consumer products rather than typical industrial processes. Thus, this proposed NSPS has many aspects that are similar to those in Subpart AAA, *e.g.*, certification of model lines and phased implementation. This Proposed Approach would apply to all new residential hydronic heaters and forced-air furnaces. Under the

Proposed Approach, the Proposed Step 1 emission limit for residential hydronic heaters and forced air heaters would apply upon the effective date of the final rule. The Proposed Step 2 emission limit for residential hydronic heaters and forced air heaters would apply 5 years after the effective date of the final rule. We ask for specific comments on the Proposed Approach and the degree to which these dates could be sooner.

We also considered an alternative three-step approach (Alternative Approach) for residential hydronic heaters and forced air heaters. Under this Alternative Approach, as in the Proposed Approach, the Alternative Step 1 emission limits for residential hydronic heaters and forced air heaters would apply upon the effective date of the final rule. The Proposed Step 1 emission limits and the Alternative Approach Step 1 emission limits are identical. The Alternative Step 2 emission limit for residential hydronic heaters and forced air heaters would apply 3 years after the effective date of the final rule. The Alternative Step 3 emission limit for residential hydronic heaters and forced air heaters would apply 8 years after the effective date of the final rule (thus providing 5 years between the Alternative Step 2 and the Alternative Step 3). The Proposed Step 2 emission limits and the Alternative Approach Step 3 emission limits are identical. We ask for specific comments on this Alternative Approach and the degree to which these dates could be sooner.

Table 5 summarizes the proposed PM emissions standards that would apply under this Proposed Approach at each step. Table 6 summarizes the PM emissions standards that would apply under each step of the Alternative Approach. Similar to the proposed requirements for subpart AAA, we are not proposing a standard for CO or efficiency, but we are proposing to require manufacturers to collect and report CO emissions and

efficiency data during certification tests. Some regulatory authorities have instituted additional requirements such as limits on visible emissions and limits on use in non-heating seasons and we ask for specific comments on the appropriateness of such limits and other requirements in this NSPS.

Table 5. Proposed Approach Subpart QQQQ PM Emissions Standards

Appliance	Steps	Particulate Matter Emissions Limits
Residential Hydronic Heater	Step 1: Upon the effective date of the final rule	0.32 lb/MMBtu heat output and a cap of 7.5 g/hr for individual test runs
	Step 2: 5 years after the effective date of final rule	0.06 lb/MMBtu
Forced-Air Furnace	Step 1: Upon the effective date of the final rule	0.93 lb/MMBtu
	Step 2: 5 years after the effective date of final rule	0.06 lb/MMBtu

Table 6. Alternative Approach Subpart QQQQ PM Emissions Standards

Appliance	Steps	Particulate Matter Emissions Limits
Residential Hydronic Heater	Step 1: Upon the effective date of the final rule	0.32 lb/MMBtu heat output and a cap of 7.5 g/hr for individual test runs
	Step 2: 3 years after the effective date of final rule	0.15 lb/MMBtu
	Step 3: 8 years after the effective date of the final rule	0.06 lb/MMBtu

Forced-Air Furnace	Step 1: Upon the effective date of the final rule	0.93 lb/MMBtu
	Step 2: 3 years after the effective date of final rule	0.15 lb/MMBtu
	Step 3: 8 years after the effective date of final rule	0.06 lb/MMBtu

Unlike the 1988 subpart AAA requirements, the subpart QQQQ requirements would not provide an additional time period for the sale of unsold units manufactured before the compliance date. No additional time is prudent because cleaner EPA-qualified Phase 2 hydronic heaters systems have already been readily available for several years, the older systems have caused numerous complaints nationwide, and this proposal publication is ample notice for the remaining old high-emitting units. For the same reasons, the subpart QQQQ requirements would not include a small volume manufacturer compliance extension. See section V.C. of this preamble for more discussion of this topic. We ask for comments on the timing for implementation.

As in the current subpart AAA for wood heaters/stoves, we are proposing a list of prohibited fuels because their use would cause poor combustion or even hazardous conditions. We request comment on these requirements and data to support additional requirements, if warranted. Also, as in the current subpart AAA for wood heaters/stoves, we are proposing that the owner or operator must not operate the hydronic heater or forced-air furnace in a manner that is inconsistent with the owner's manual. For pellet-fueled appliances, this proposal makes it clear that operation according to the owner's manual includes operation only with pellet fuels that have been used in the certification

test and have been graded and marked under a licensing agreement with the PFI, or equivalent (after request and subsequent approval by the EPA), to meet certain minimum requirements and procedures for a quality assurance process. Details of the PFI program are available at http://pelletheat.org/pfi-standards/pfi-standards-program/. Data show that quality assurance provisions are necessary to ensure that the appliances operate properly such that emissions are reduced as intended. We ask for specific comments on the use of the PFI program and the PFI specifications, especially the degree to which the PFI program will adequately ensure the absence of construction and demolition waste (and associated toxic contaminants) in the pellets. (No other organization has volunteered to develop such a quality program.)

The proposed labeling requirements and owner's manual requirements are similar to the guidelines in the EPA's current voluntary hydronic heater program with some improvements. We request specific comments on ways to improve the delivery of information on the permanent label and in the owner's manual and whether different information might be useful to the consumer and to the regulatory authorities.

The structure of the rest of the proposed subpart QQQQ is similar to the proposed subpart AAA certification and quality assurance process. We request specific comments on changes or improvements to that process that might be needed to address any special concerns related to the certification of hydronic heaters and forced-air furnaces.

As discussed earlier, the EPA developed Method 28 OWHH, in 2006, as part of our efforts for voluntary qualification of cleaner hydronic heaters. We received input at that time from manufacturers, laboratories, and some states in order to quickly develop a mostly consensus-based method that we incorporated into the program partnership

agreements. We used Method 28 for wood heaters/stoves as the foundation. Thus, Method 28 OWHH has many aspects similar to Method 28. Three significant differences are: (1) Method 28 OWHH uses larger cribs because hydronic heater fireboxes are typically much larger than wood heater fireboxes; (2) Method 28 OWHH uses red oak instead of Douglas fir because red oak is the more common fuel in the U.S.; and (3) Method 28 OWHH includes procedures for determining 8-hour heat output and efficiency. The manufacturers, laboratories, states and the EPA have now had over 7 years of experience with Method 28 OWHH and its successor Method 28 WHH (improved and expanded to include indoor heaters, not just outdoor heaters).

All the stakeholders that have provided input on the test methods agree that the methods should be thoroughly vetted and changed as necessary to improve the method's accuracy and precision and to address concerns about how to best ensure protection across the entire U.S. when various operating scenarios and wood species and densities are used. ASTM has developed E2618-13 to address some of these concerns, and the EPA believes that E2618-13 does include some improvements. However, as with the wood heater/stove methods, we and some states do not agree with all the changes that ASTM has made. For example, the states of Washington and Oregon are very concerned that Method 28 WHH and ASTM E2618-13 do not specify fueling with Douglas Fir, which is used in EPA Method 28 for wood heaters/stoves and which these states require in their regulations for residential wood heaters, including hydronic heaters. They are concerned that hydronic heaters tested with red oak will have higher emissions when fueled with Douglas Fir and other less dense species typical in their states and have provided test data that shows higher emissions. Thus, they require testing with Douglas

Fir in their states. Also, a number of states and the EPA are concerned about the ASTM changes to the burn rate categories, *i.e.*, easing or eliminating testing at the lowest burn rates, which often occur in home operations and are typically the highest-emitting and least efficient. For several years, we have been communicating with European certification laboratories to learn how they conduct their tests under EN 303-5 and to consider if incorporating some of their testing procedures might improve our test methods.

More recently, because of initial concerns about some surprisingly high laboratory test efficiencies for a couple of the EPA voluntary partnership program Phase 2 qualified partial heat storage models, the EPA, the Northeast states that regulate hydronic heaters, laboratories (including EPA-accredited laboratories and Brookhaven National Laboratory) and manufacturers have conducted a review of voluntary partnership program qualifying test reports. All of the stakeholders that provided input on the test methods agree that we need a change in the test method for testing of non-integral partial heat storage models (*i.e.*, models that have separate heat storage but the storage does not have the capacity to safely handle all the heat generated by a full load of fuel). ASTM has been leading an effort to develop an Appendix X2 to the test method for such models but has not completed that effort as of this proposal. Brookhaven National Laboratory recommended a method to the New York State Department of Environmental Conservation (NYSDEC) and NYSDEC is requiring that method be used for certification of such models in their states. We are proposing that method be used for certification of the NSPS for hydronic heaters equipped with a partial heat storage unit.[19]

[19] See footnote 18.

Further, we are proposing revisions to Method 28 WHH that would require that all affected non-pellet hydronic heaters, subject to new subpart QQQQ, conduct certification compliance testing using both crib wood and cord wood for the Step 1 emission limits upon the effective date of the final rule and solely cord wood for the Step 2 emission limits 5 years after the effective date of the final rule.

We are asking for specific comments on whether the EPA should use: (1) one or more of the draft versions of Appendix X2 being considered as part of ASTM work product WK26581; (2) the European Union test method EN303-05 as the Maine Department of Environmental Protection approved for certification of hydronic heaters in their state as equivalent to the EPA Method 28 WHH; (3) the partial thermal storage test method developed by Brookhaven National Laboratory; and/or (4) some other test method(s). For use of any of the test methods, the EPA would require that the amount of heat storage for the actual sale and installation of the hydronic heaters be no less than the amount used for the certification tests. Because EN303-05 does not currently use heat storage during the certification test, if the EPA were to use EN303-05 test results, the EPA would require the installed heater to have heat storage that can safely handle at least 60 percent of the maximum heat output of the heater or a greater level if the manufacturer specifies a greater level. The EPA is asking for specific comments on the appropriateness of this heat storage level or other levels. The EPA will consider any or all of these options as the preferred reference test methods or as acceptable emission testing alternatives. (ASTM previously developed an Appendix X1 for testing of models that have “full” heat storage that can safely accept the heat from the full load of fuel.) We request comments on all aspects of heater testing and are especially interested in emission test data that

compare the results for testing by these different methods.

Also, the review discussed above found a number of areas in the methods to improve the quality of the data and reduce anomalies. In June 2011, the voluntary partnership program stakeholders agreed to a number of changes to Method 28 OWHH, and we are proposing the revised method as EPA Reference Method 28 WHH. The EPA is asking for specific comments on this method and recommendations and supporting data for other changes or acceptable alternatives. The following paragraphs discuss some of the changes we are proposing for comment. Additional information on the EPA methods is available at http://www2.epa.gov/residential-wood-heaters. The ASTM methods and draft work products are available at www.astm.org/epa.

1. Heater (*aka* Boiler) temperature range

We propose that for all tests, the return water temperature to the heater must be 120°F or greater. We additionally propose that if the manufacturer specifies a thermal control valve or other arrangement to be installed and set to control the return temperature at 120°F or higher, the valve must be installed and set per the manufacturer's written instructions.

2. Efficiency calculations

We propose to require the use of thermopiles to measure the temperature change "delta T" and verify accuracy of the load side flow meter. The accuracy of the flow meter is determined separately by direct weighing of timed water collection. Thermocouples must measure water temperature at the inlet and outlet of the load side heat exchanger. We propose to delete the requirement for supply side flow measurements and require one load side reading with thermopiles (using a commercial system or a homemade system).

Efficiency would be measured on the output (load) side of the heat exchanger. The flow meter would be calibrated before and after each test run within the flow range used for the test.

3. Time period for recording temperatures

We propose that all water temperatures, differential water temperatures and water flow rates must be recorded at time intervals of 1 minute or less. This data file must be submitted with the test report. For determination of heat output, the data for these parameters must be measured in equal time intervals no greater than 10 minutes or at a frequency that results in a minimum of 50 equal intervals per test run, whichever is greater.

4. Test fuel moisture content

We propose that each individual test fuel moisture content reading must be in the range of 18 to 28 percent on a dry basis and the average moisture content of each piece of test fuel must be in the range of 19 to 25 percent.

We also propose the following moisture measurement procedure: Using a fuel moisture meter as specified in the test method, determine the fuel moisture for each test fuel piece used for the test fuel load by averaging at least five fuel moisture meter readings, one from each of three sides, measured parallel to the wood grain. Penetration of the moisture meter insulated electrodes must be one-fourth the thickness of the fuel piece or 19 mm (3/4 in.), whichever is less for 3 of the measurements made at approximately 3 inches from each end and the center. Two additional measurements at approximately one-third the thickness shall be made centered between the other three locations. We request specific comments on the moisture content limits and the

procedures for determining the moisture content and the typical variances due to the measurement procedures.

We also request specific comments on the following approach for determining moisture content. "Select three pieces of cord wood from the same batch of wood as the test fuel and the same weight as the average weight of the pieces in the test load ± 1.0 lb. From each of these three pieces, cut three slices. Each slice shall be ½" to ¾" thick. One slice shall be cut across the center of the length of the piece. The other two slices shall be cut half way between the center and the end. Immediately measure the mass of each piece in pounds. Dry each slice in an oven at 220°F for 24 hours or until no further weight change occurs. The slices shall be arranged in the oven so as to provide separation between faces. Remove from the oven and measure the mass of each piece again as soon as practical in pounds. The moisture content of each slice, on a dry basis shall be calculated as:

$MC_{slice} = 100 \cdot (W_{SliceWet} - W_{SliceDry}) / W_{SliceDry}$

Where: $W_{SliceWet}$ = weight of the slice before drying in pounds; $W_{SliceDry}$ = weight of the slice after drying in pounds; [and] MC_{Slice} = moisture content of the slice in % dry basis."[20]

Also, we propose that moisture must not be added to previously dried fuel pieces except by storage under high humidity conditions and temperature up to 100ºF. Fuel moisture must be measured no more than 4 hours before using the fuel for a test. The test report must describe the source and storage history of the test fuel.

5. Water density

[20] See footnote 19.

a. We propose that the measured volumetric flow from the flow meter be converted to mass basis by using the water density based on water temperature. The same method must be used on both the load and supply side if the optional supply side meter is used.

b. We propose that the water density be calculated using the water temperature measured at the flow meter.

6. Calculations

a. We propose that the electronic test reports submittals include all data within the locked spreadsheets so the formulas used and relevant calculations can be reviewed in detail.

b. To ensure common application, we propose to require averages to be calculated on each 10-minute reading rather than averaging over the entire test run.

7. Overall efficiency (CSA B415.1-10 Stack Loss Method)

We propose that during each test run, data must be obtained and presented for the purpose of calculation of overall efficiency as specified in the stack loss method in CSA B415.1-10. This includes CO and CO_2, flue gas temperature, and appliance mass (remaining fuel weight). Overall efficiency for each run must be determined as per CSA B415.1-10 and reported. Whenever the CSA B415.1-10 overall efficiency is found to be lower than the overall efficiency based on the load side measurements, as determined by this method, the report must include a discussion of the reasons for this result.

8. Wood loading

Test fuel loads would be determined by multiplying the firebox volume by 4.54 kg (10 lb) of wood (as used, wet weight) per cubic foot, or a higher load density as

recommended by the manufacturer's operating instructions. As discussed earlier, the EPA will require separate tests in the proposed Step 1 using cribs and using cord wood. In the proposed Step 2, the tests would all be using cord wood. There are ongoing discussions on how to improve both types of tests. We are working with states and industry on a cord wood test method and evaluating making revisions to the current version of the ASTM cord wood test method and states' ideas on cord wood testing. Also, we are reviewing European experiences with cord wood testing.

9. Drawing of test apparatus

The test report would be required to contain a drawing of the test apparatus, including thermocouples, piping arrangements including any recirculation loops, the thermopile and flow meter(s).

10. Aquastat settings

Aquastat or other heater output control device settings that are adjustable would be set using manufacturer specifications, either as factory set or in accordance with the owner's manual, and must remain the same for all burn categories.

11. Narrative

The test report would be required to include a statement that the test was conducted according to the method specified. If there are any deviations from the test procedure requirements, the test report would need to include a section identifying those deviations, the reasons for those deviations, and an evaluation of the data quality implications, if any, of such deviations on the test results.

12. The test report would include a standard summary page as a quick check for the reviewer that results are within method specifications.

13. We propose to require testing with a range of all fuels for which the appliance is designed, per the manufacturer's warranty and owner's manual, to show how emissions and efficiency vary according to species and density and cord wood versus crib wood.

In addition, ASTM has developed a draft test method that uses cord wood rather than crib wood to better represent real world conditions. All stakeholders agree that a test method that better represents real world conditions would be a significant improvement and help ameliorate concerns that some heaters do not perform as well in home use as they do in laboratories. We are also interested in real-time emission test methods that measure cold or warm startup emissions and emission peaks/durations. We are also interested in field test methods and less expensive test methods that regulators and neighbor can use to better quantify impacts in the real world. The EPA is asking for specific comments and data on all these potential methods, issues and recommendations.

The EPA is proposing to rely on the test method that has been developed by the CSA for forced-air furnaces. All CSA standards are developed through a consensus development process approved by the Standards Council of Canada. This process brings together volunteers representing varied viewpoints and interests to achieve consensus and develop a standard. CSA worked for years on development of this test method that has its roots in earlier U.S. efforts on wood heaters/stoves. The current version of CSA B415.1-10 was published in March 2010, and it includes not only the forced-air furnace test method but also new Canadian emission performance specifications for indoor and outdoor central heating appliances.

Although the CSA B415.1-10 technical committee included numerous U.S. manufacturers and laboratories, it did not include any states or environmental groups, and the EPA participation was minimal during the development. Now that we have reviewed this method in substantively, we are satisfied that it warrants proposal for this rulemaking. We request specific comments and supporting data. We ask for specific comments on the appropriateness of using the CSA test method in its entirety, including the use of cord wood instead of crib wood that are used in current versions of Method 28 and Method 28 WHH. To review the CSA test method, please go to www.csa.ca.

C. Masonry Heaters

The proposed subpart RRRR would apply to new residential masonry heaters. The provisions apply to each affected unit that is manufactured on or after **[INSERT DATE 60 DAYS AFTER PUBLICATION OF THE FINAL RULE IN THE FEDERAL REGISTER]**. We are proposing that, as of the effective date of the final rule, no person would manufacture or sell a residential masonry heater that does not meet the proposed emission limit of 0.32 lb of PM per MMBtu heat output. We are also proposing a 5-year small volume manufacturer compliance extension that would apply to companies that construct fewer than 15 masonry heaters per year. See section V.C. of this preamble for more discussion of compliance date related issues. We request specific comments on the degree to which these dates can be sooner. As in the case of subpart AAA and subpart QQQQ, we are proposing requirements that would apply to the operator of the masonry heater, including a provision to operate the unit in compliance with the owner's manual; a prohibition on use of certain fuels; and a requirement to use licensed wood pellets or equivalent, if applicable. We are not proposing efficiency or CO standards for new

residential masonry heaters at this time because sufficient data are not yet available to support the basis for such standards.

The EPA is proposing to rely on ASTM method E2817-11 for masonry heaters. The laboratories, some states and the masonry heater industry worked for years on drafts of this method that has its roots in earlier regulatory efforts in Colorado. The EPA has participated in the discussions from time to time over the years and has provided comments and suggestions. The current ASTM methods are ASTM E2817-11 "Standard Test Method for Test Fueling Masonry Heaters" and the draft work product ASTM WK26558 "Specification for Calculation Method for Custom Designed, Site-built Masonry Heaters." (http://www.astm.org/DATABASE.CART/WORKITEMS/WK26558.htm.) We propose that they be used for this rulemaking. We request specific comments on these methods and any changes that should be considered and supporting data for those changes. We request specific comments and supporting emission test data on the use of "Annex A1. Cordwood Fuel" and "Annex A2. Cribwood Fueling." ASTM is allowing public review, for no charge, of the ASTM test methods and draft work products relevant to this rule at www.astm.org/epa.

As an alternative to testing, we are proposing that manufacturers of masonry heaters may choose to submit a computer model simulation program, such as ASTM WK 26558 noted above, for the EPA's review and approval. Masonry heater manufacturers and laboratories developed computer simulations as a way to encourage good designs without having to conduct emission tests for slight variations, especially because there are so few masonry heaters built every year per manufacturer. Since these units are built

on-site, it is not easy to test each of them. These units are typically cleaner than pre-NSPS certified wood stoves. Considering all of these factors, we believe a simple computer simulation showing how new models would perform may be all that is necessary for many of these models.

The structure of the rest of the proposed new subpart RRRR is similar to the proposed subpart AAA certification and quality assurance process and contains similar requirements for labels, owner's manual, etc. One difference, however, is that for small custom unit manufacturers, we are requiring less stringent quality control (QC) procedures. Specifically, we are proposing that the initial certification for these custom units is sufficient and that no further QC is necessary since each unit is a unique model and subject to certification. We request comment on changes or improvements that might be needed to address special concerns related to certification of masonry heaters.

IV. Summary of Environmental, Cost, Economic, and Non-Air Health and Energy Impacts

The EPA estimates the proposed NSPS's total annualized average nationwide costs would be $15.7 million ($2010) over the 2014 through 2022 period. The economic impacts for industries affected by this proposed rule over this same period range from 4.3 percent for manufacture of wood heater/stove models to 6.4 percent compliance cost-to-sales estimate for manufacture of single burn rate wood heater models. These impacts do not presume any pass-through of impacts to consumers. With pass-through to consumers, these impact estimates to manufacturers will decline proportionate to the degree of pass-through.

A. What are the air quality impacts?

To determine the air quality impacts, we developed emission factors for each appliance type and then applied those emission factors to shipment data for each of the appliance types subject to the proposed NSPS.[21] We developed the emission factors using the EPA Residential Wood Combustion (RWC) emission estimation tool,[22] which is a Microsoft Access database that compiles nationwide RWC emissions using county-level, process-specific data and calculations. The compilation of such data is a large, important, continually improving effort by the EPA and the states to ensure that we and the states have access to the best information available. We summed the estimated nationwide number of appliances and the estimated total tons of wood burned for each of the relevant product categories in the inventory and then made some adjustments/assumptions to the baseline RWC inventory to reflect emission characteristics specific to new units.

We used the resulting subset of the RWC database to calculate an average emission rate per appliance for each category, as follows. First, we multiplied the total tons of wood burned by devices within the category by the category emission factor to calculate the total tons of emissions for each of the pollutants $PM_{2.5}$, VOC and CO emissions for that category. Then we divided these values by the number of appliances in the category to calculate the average emissions of $PM_{2.5}$, VOC and CO per individual appliance. We then developed adjusted emission factors to reflect the NSPS options and then used the adjusted factors to calculate average tons of emissions of each of these three pollutants per appliance for each category.

[21] Memo to Gil Wood, USEPA, from EC/R, Inc. Estimated Emissions from Wood Heaters. February 15, 2013.
[22] rwc_2008_tToolv4.1_feb09_2010.zip available in the docket.

We used data in the Frost & Sullivan Market (F&S) report[23] on 2008 shipments by product category and F&S revenue forecasts, which incorporated the weak economy in years 2009 and 2010, to calculate the reduced number of shipments in years 2009 and 2010. We adjusted these data to include appliances not covered in the F&S report (*e.g.*, forced-air furnaces). For years 2011 through 2038, we estimated shipments based on a forecasted revenue growth rate of 2.0 percent, in keeping with the average annual growth in real gross domestic product (GDP) predicted by the U.S. Bureau of Economic Analysis.[24] Historically wood heater shipments have most closely corresponded to GDP, housing starts, and price of wood relative to gas. We think the overall trend in the projection is reasonable in the absence of additional specific shipment projections. We did not change the relative percentages of one type of residential wood heater versus other types of residential wood heaters over this time period. We ask for comments and data that would support improved projections.

The next step was to calculate the total emissions per appliance category. First, we multiplied the emission factor for each category by the inventory value of total tons of wood burned by all appliances within that category, and then divided by the number of appliances in the inventory population. The appliance value was then multiplied by the number of units shipped to calculate total emissions from each category per year using the baseline conditions emission factors (*i.e.*, in the absence of a revised NSPS). Using

[23] Market Research and Report on North American Residential Wood Heaters, Fireplaces, and Hearth Heating Products Market. Prepared by Frost & Sullivan. April 26, 2010, pp. 31-32.
[24] 2013 Global Outlook projections prepared by the Conference Board in November 2012; http://www.conference-board.org/data/globaloutlook.cfm.

the same procedure, category emissions were then calculated using the emission factors for the proposed NSPS.

Table 7 is a summary of the average emissions reductions over years 2014 through 2022 resulting from implementing the proposed NSPS compared to baseline conditions (for the years analyzed in the RIA). Note that we do not have national emission impacts from masonry heaters because they are not included in the RWC emission estimation tool. Because of the relatively high cost of emission testing versus the current small number of masonry heaters sold per manufacturer, and in total, there are few emission test data from masonry heater manufacturers and laboratories. Based on the limited data we have, we believe that nationwide emissions from masonry heaters are relatively low, given the low number of sales. Thus, we also believe that the total emission reductions from masonry heaters will be relatively low. However, the limited data we have do show that the emission reductions could be significant for some models that do not follow current best designs, perhaps as high as 70 percent for some designs. We do not know how many of these typically custom-made heaters already use best practice designs versus other designs and thus we do not have nationwide estimates of baseline emissions. We ask for comments and data to help us prepare emission estimates.

Table 7. Estimated Annual Average (2014-2022) Air Quality Impacts[25]

Appliance Type	$PM_{2.5}$ (tons)			VOC (tons)			CO (tons)		
	Baseline	Revised NSPS	Emission Reduction	Baseline	Revised NSPS	Emission Reduction	Baseline	Revised NSPS	Emission Reduction
Wood Heaters	548	385	163	781	551	230	7,857	5,448	2,409
Single Burn Rate Heaters	932	178	754	1,614	244	1,370	7,029	2,860	4,169
Pellet Heaters/Stoves	199	150	49	3	2	1	1,035	778	257
Furnace: Indoor, Cord Wood	3,044	434	2,610	1,290	184	1,106	20,294	2,896	17,398
Hydronic Heating Systems	1,332	84	1,249	565	35	530	8,883	557	8,326
Total	6,055	1,230	4,825	4,253	1,016	3,237	45,098	12,538	32,559

Note: This table only includes the emissions during the first year of the life of each wood heater. That is, this table does not include the emissions that continue for the duration of the lifetime of each appliance's use, typically greater than 20 years.

[25] See footnote 24.

B. What are the benefits?

Emission reductions associated with the requirements of this rule will generate health benefits by reducing emissions of $PM_{2.5}$, HAP, as well as criteria pollutants and their precursors, including CO and VOC. VOC are precursors to $PM_{2.5}$ and ozone. For this rule, we were only able to quantify the health co-benefits associated with reduced exposure to $PM_{2.5}$ from directly emitted $PM_{2.5}$. Our benefits reflect the average of annual $PM_{2.5}$ emission reductions occurring between 2014 and 2022 (inclusive). We estimate the monetized $PM_{2.5}$ -related health benefits of the proposed residential wood heaters NSPS in the 2014-2022 timeframe to be $1,800 million to $4,100 million (2010 dollars) at a 3-percent discount rate and $1,700 million to $3,700 million (2010 dollars) at a 7-percent discount rate. Using alternate relationships between $PM_{2.5}$ and premature mortality supplied by experts, higher and lower benefits estimates are plausible, but most of the expert-based estimates fall between these two estimates.[26] A summary of the emission reduction and monetized benefits estimates for this rule at discount rates of 3 percent and 7 percent is in Table 8 of this preamble, except for masonry heaters. As requested earlier in this preamble, we ask for emission and sales data per model that would help us prepare emission reduction estimates and corresponding monetized health benefits for masonry heaters.

Table 8. Summary of Monetized $PM_{2.5}$-related Health Benefits for Proposed Residential Wood Heaters NSPS in 2014-2022 Timeframe (millions of 2010 dollars)[a, b, c]

Pollutant	Estimated Emission Reductions (tpy)	Total Monetized Benefits (3% Discount Rate)	Total Monetized Benefits (7% Discount Rate)

[26] Roman, *et al*, 2008. "Expert Judgment Assessment of the Mortality Impact of Changes in Ambient Fine Particulate Matter in the U.S.," Environ. Sci. Technol., 42, 7, 2268 – 2274.

Directly emitted $PM_{2.5}$	4,825	$1,800 to $4,200	$1,700 to $3,700
$PM_{2.5}$Precursors			
VOC	3,250	--	--

[a] All estimates are for the 2014-2022 timeframe (inclusive) and are rounded to two significant figures so numbers may not sum across rows. The total monetized benefits reflect the human health benefits associated with reducing exposure to $PM_{2.5}$ through reductions of $PM_{2.5}$ precursors, such as NO_X, and directly emitted $PM_{2.5}$. It is important to note that the monetized benefits do not include reduced health effects from exposure to HAP, direct exposure to NO_2, exposure to ozone, VOC, ecosystem effects or visibility impairment.

[b] PM benefits are shown as a range from Krewski, *et al*. (2009) to Lepeule, *et al*. (2012). These models assume that all fine particles, regardless of their chemical composition, are equally potent in causing premature mortality because the scientific evidence is not yet sufficient to allow differentiation of effects estimates by particle type.

[c] The emission reductions and monetized benefits for masonry heaters are not included in this summary.

These benefits estimates represent the monetized human health benefits for populations exposed to less $PM_{2.5}$ from emission limits established to reduce air pollutants in order to meet this rule. Due to analytical limitations, it was not possible to conduct air quality modeling for this rule. Instead, we used a "benefit-per-ton" approach to estimate the benefits of this rulemaking. To create the benefit-per-ton estimates, this approach uses a model to convert emissions of $PM_{2.5}$ precursors into changes in ambient $PM_{2.5}$ levels and another model to estimate the changes in human health associated with that change in air quality, which are then divided by the emissions in specific sectors. These benefit-per-ton estimates were derived using the approach published in Fann *et al*. (2012),[27] but they have since been updated to reflect these studies and population data in

[27] Fann, N., K.R. Baker, and C.M. Fulcher. 2012. "Characterizing the PM2.5-related health benefits of emission reductions for 17 industrial, area and mobile emission sectors across the U.S." Environment International 49 41–151.

the 2012 PM NAAQS RIA.[28] Specifically, we multiplied the benefit-per-ton estimates from the "Residential Wood Heaters" category by the corresponding emission reductions.[29] All national-average benefit-per-ton estimates reflect the geographic distribution of the modeled emissions, which may not exactly match the emission reductions in this rulemaking, and thus they may not reflect the local variability in population density, meteorology, exposure, baseline health incidence rates, or other local factors for any specific location. More information regarding the derivation of the benefit-per-ton estimates for this category is available in the technical support document, which is referenced in the footnote below and is available in the docket.

These models assume that all fine particles, regardless of their chemical composition, are equally potent in causing premature mortality because the scientific evidence is not yet sufficient to allow differentiation of effects estimates by particle type. Even though we assume that all fine particles have equivalent health effects, the benefit-per-ton estimates vary between precursors depending on the location and magnitude of their impact on $PM_{2.5}$ levels, which drive population exposure.

It is important to note that the magnitude of the $PM_{2.5}$ benefits is largely driven by the concentration response function for premature mortality. We cite two key empirical

[28] U.S. Environmental Protection Agency (U.S. EPA). *Regulatory Impact Analysis for the Final Revisions to the National Ambient Air Quality Standards for Particulate Matter*. EPA-452/R-12-003. Office of Air Quality Planning and Standards, Health and Environmental Impacts Division. December 2012. Available at http://www.epa.gov/pm/2012/finalria.pdf.

[29] U.S. Environmental Protection Agency. Technical support document: Estimating the benefit per ton of reducing $PM_{2.5}$ precursors from 17 sectors. Research Triangle Park, NC. January 2013.

studies, one based on the American Cancer Society cohort study[30] and the extended Six Cities cohort study.[31] In the Regulatory Impact Analysis (RIA) for this rule, which is available in the docket, we also include benefits estimates derived from expert judgments (Roman *et al*, 2008) as a characterization of uncertainty regarding the PM2.5-mortality relationship.

Considering a substantial body of published scientific literature, reflecting thousands of epidemiology, toxicology, and clinical studies, the EPA's Integrated Science Assessment for Particulate Matter[32] documents the association between elevated $PM_{2.5}$ concentrations and adverse health effects, including increased premature mortality. This assessment, which was reviewed twice by the EPA's independent Science Advisory Board, concluded that the scientific literature consistently finds that a no-threshold model most adequately portrays the PM-mortality concentration-response relationship. Therefore, in this analysis, the EPA assumes that the health impact function for fine particles is without a threshold.

In general, we are more confident in the magnitude of the risks we estimate from simulated $PM_{2.5}$ concentrations that coincide with the bulk of the observed PM

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[30] Krewski, C.A., III, R.T. Burnett, M.J. Thun, E.E. Calle, D. Krewski, K. Ito, and G.D. Thurston. 2002. "Lung Cancer, Cardiopulmonary Mortality, and Long-term Exposure to Fine Particulate Air Pollution." *Journal of the American Medical Association* 287:1132-1141.

[31] Lepeule J, Laden F, Dockery D, Schwartz J 2012. "Chronic Exposure to Fine Particles and Mortality: An Extended Follow-Up of the Harvard Six Cities Study from 1974 to 2009." *Environ Health Perspect.* Jul;120(7):965-70.

[32] U.S. Environmental Protection Agency (U.S. EPA). 2009. *Integrated Science Assessment for Particulate Matter (Final Report)*. EPA-600-R-08-139F. National Center for Environmental Assessment – RTP Division. December. Available on the Internet at http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=216546.

concentrations in the epidemiological studies that are used to estimate the benefits. Likewise, we are less confident in the risk we estimate from simulated $PM_{2.5}$ concentrations that fall below the bulk of the observed data in these studies. Concentration benchmark analyses (*e.g.*, lowest measured level [LML] or one standard deviation below the mean of the air quality data in the study) allow readers to determine the portion of population exposed to annual mean $PM_{2.5}$ levels at or above different concentrations, which provides some insight into the level of uncertainty in the estimated $PM_{2.5}$ mortality benefits. There are uncertainties inherent in identifying any particular point at which our confidence in reported associations becomes appreciably less, and the scientific evidence provides no clear dividing line. However, the EPA does not view these concentration benchmarks as a concentration threshold below which we would not quantify health benefits of air quality improvements.

For this analysis, policy-specific air quality data are not available. Thus, we are unable to estimate the percentage of premature mortality associated with this specific rule's emission reductions at each $PM_{2.5}$ level. As a surrogate measure of mortality impacts, we provide the percentage of the population exposed at each $PM_{2.5}$ level using the source apportionment modeling used to calculate the benefit-per-ton estimates for this sector. Using the Krewski, *et al,* (2009) study, 93 percent of the population is exposed to annual mean $PM_{2.5}$ levels at or above the LML of 5.8 $\mu g/m^3$. Using the Lepeule, *et al,* (2012) study, 67 percent of the population is exposed above the LML of 8 $\mu g/m^3$. It is important to note that baseline exposure is only one parameter in the health impact function, along with baseline incidence rates, population, and change in air quality. Therefore, caution is warranted when interpreting the LML assessment for this rule

because these results are not consistent with results from rules that had air quality modeling.

Every benefit analysis examining the potential effects of a change in environmental protection requirements is limited, to some extent, by data gaps, model capabilities (such as geographic coverage) and uncertainties in the underlying scientific and economic studies used to configure the benefit and cost models. Despite these uncertainties, we believe the benefit analysis for this rule provides a reasonable indication of the expected health benefits of the rulemaking under a set of reasonable assumptions. In addition, we have not conducted air quality modeling for this rule, and using a benefit-per-ton approach adds another important source of uncertainty to the benefits estimates. The 2012 $PM_{2.5}$ NAAQS benefits analysis provides an indication of the sensitivity of our results to various assumptions.

One should note that the monetized benefits estimates provided above do not include benefits from several important benefit categories, including exposure to HAP, VOC and ozone exposure, as well as ecosystem effects and visibility impairment. Although we do not have sufficient information or modeling available to provide monetized estimates for these benefits in this rule, we include a qualitative assessment of these unquantified benefits in the RIA[33] for this proposal.

For more information on the benefits analysis, please refer to the RIA for this rule, which is available in the docket.

C. *What are the cost impacts*?

[33] Regulatory Impact Analysis (RIA) for Residential Wood Heaters NSPS. **[INSERT DATE RULE IS SIGNED]**.

In analyzing the potential cost impacts of the proposed NSPS, we considered two types of impacts. The first was the impact to the manufacturer to comply with the proposed standards. The second was the increase in price of the affected unit. In both of these cases, we considered the same input variables: R&D cost to develop and certify complying model lines, certification costs (where these are separate from R&D), reporting and recordkeeping costs, numbers of shipments of each appliance category (modified, from Frost & Sullivan report), number of manufacturers, and number of models per manufacturer. This section of the preamble contains a summary of these costs. For more detailed information, see the manufacturer cost impact memo[34] and unit cost memo[35] in the docket. Unless otherwise specified, all costs are in 2010 dollars.

To develop average R&D costs, we reviewed information provided by manufacturers. Based on this information, we estimated [36] average costs to develop a new model line, including testing, of $356,250 for certified wood heaters and pellet heaters/stoves. We also assumed $356,250 for single burn rate wood heaters, which may be high if currently available units can meet the standards without significant modifications as some manufacturers have suggested. We also assumed development costs for forced-air furnaces and hydronic heaters of $356,250. Finally, we also assumed development costs of $356,250 for the masonry heaters. The estimates of the cost of R&D are crucial to our estimates of overall costs and economic impacts and greatly

[34] Memo to Gil Wood, USEPA, from EC/R, Inc. Residential Heater Manufacturer Cost Impacts. February 22, 2013.
[35] Memo to Gil Wood, USEPA, from EC/R, Inc. Unit Cost Estimates of Residential Wood Heating Appliances. February 21, 2013.
[36] In developing average R&D costs, the EPA used the highest industry R&D estimates supplied, in order to avoid under-estimating potential costs per model line and to avoid understating the number of model lines that would undergo R&D nationwide.

influence our decisions on BSER, implementation lead times and small volume provisions. Thus, we request specific comments on these estimates, including whether they should be reduced and thus allow greater emission reductions sooner.

We annualized the R&D costs over 6 years, applied the NSPS implementation assumptions, and estimated the average manufacturing cost per model line per manufacturer. Under the proposed rules, pellet heaters/stoves will only face certification (testing) costs (no R&D should be required), so we estimated certification costs of $10,000 per model line. Similarly, many masonry heater model lines that would comply with the proposed standards have already been developed. These manufacturers would also face certification costs of $10,000 per model line. We estimated post R&D period certification costs for hydronic heaters and forced-air furnaces at $20,000 per model line.

The masonry heater compliance costs included implementation of a software package based on a European masonry heater design standard. This software has been verified in the laboratory and under field conditions to produce masonry heaters that would meet the proposed NSPS emission limits. The cost of this software to the user is approximately $1,500 for the package with an approximately $450 annual fee that commences in the second year following purchase. In addition, we believe that some manufacturers will use this approach to demonstrate that “similar” model designs meet the proposed emissions standards.

The estimate of the number of model types was derived from information provided by HPBA, individual manufacturers, and Internet searches of product offerings. For numbers of manufacturers, we started with HPBA data and modified the dataset based on Internet searches of manufacturers of the major appliance types. Table 9 is a

summary of the nationwide average annual NSPS-related cost increases to manufacturers. The average annual cost increases are presented over the 2014 to 2022 period consistent with the years analyzed in the RIA,[37] as well as over the 2013 to 2038 period. The 2013 to 2038 period encompasses the first year of estimated NSPS-related costs (2013 since some companies have already started in anticipation of the NSPS) through the life span of models designed to meet the NSPS, as explained further below and in our background analyses.[38]

Table 9. Summary of Nationwide Average Annual Cost Increases (2010$)

Appliance Type	2014-2022 Period	2013-2038 Period
Wood Heaters	$4,212,303	$1,749,726
Single Burn Rate Heaters	$901,732	$456,316
Pellet Heaters/Stoves	$3,460,489	$1,702,796
Forced-Air Furnaces	$2,252,284	$1,171,222
Hydronic Heating Systems	$4,554,152	$2,221,551
Masonry Heaters	$307,511	$228,896
Total Average Annual Cost	$15,688,471	$7,530,507

To develop estimates of potential unit cost increases, we used major variables including the estimated number of units shipped per year, the costs to develop new models, baseline costs of models, and the schedule by which the proposed revised NSPS would be implemented. Both the number of shipped units and the baseline costs of models were based on data from the Frost & Sullivan report with modifications to address additional appliances or subsets of appliances. The 20-year model design life

[37] See footnote 36.
[38] Memo to Gil Wood, USEPA, from EC/R, Inc. Residential Heater Cost Effectiveness Analysis. February 26, 2013.

span and 20-year use/emitting appliance life span are based on actual historical design certification and heater use data. That is, the data show that many models developed for the current 1988 NSPS are still being sold (after 25 years), many "new" models still have the same internal working parts with merely exterior cosmetic changes, and most residential wood heaters in consumer homes emit for at least 20 years and often much longer. Therefore, our analysis tracks shipments and costs through year 2038 (*i.e.*, 19 years after a model designed to meet the NSPS Step 2 emission limits expected to be implemented in 2020 has completed development and is shipped). Finally, we also estimated the potential additional manufacturing costs to make NSPS complying models. These expenses result from the use of more expensive structural materials, components to enhance good combustion, etc. We estimated the following additional manufacturer price increases per unit based on appliance type:

- Certified wood heaters and pellet heaters/stoves represent a well-developed technology, and we could not identify price differences between models due solely to lower emission levels compared to models with higher emission levels. Rather, price differences are more closely related to cosmetic differences and output. Therefore, we have assumed no additional manufacturing costs.
- One manufacturer estimated that it will cost an average of $100 more to manufacture a lower emitting single burn rate product.
- We have seen a range of estimates for additional price increases for manufacture of a cleaner hydronic heater, with an average being approximately $3,000 (as compared to a typical pre-regulation sales price of $7,500).

- We estimate that the additional price increases to manufacture a certified forced-air furnace will be comparable to the price increases for manufacturing certified hydronic heaters, *i.e.*, $3,000 (as compared to a typical pre-regulation price of $900).

Our next step was to develop the following incremental cost formula: Cost of R&D multiplied by number of units shipped per year divided by number of models multiplied by model life equals the incremental cost of developing a new unit, spread over the number of units expected to be sold during the model life. In developing this calculation, we included the concept that the R&D costs per model line are recovered in the sales price of future models, which means that the more units that are sold or the longer the model life, the lower the incremental cost per unit. For our unit cost analysis, we assumed a flat growth rate in shipments – that is, we assumed future shipments over the 20 years of model design life would be equal to the shipments estimated in the first NSPS compliance year. We did not assume lower sales due to market competition with other wood heaters or non-wood heaters. We did not assume lower projected sales for increased prices because of the uncertainty of other demand factors. Where there are additional manufacturing costs as discussed above, we added these to the unit cost number. Table 10 is a summary of the baseline unit costs, NSPS unit costs, and incremental cost increase.

Table 10. Summary of Unit Cost Impacts (2010 $)

Appliance Type	Baseline	Post-NSPS	Incremental Increase
Certified Wood Heaters	$859	$883	$24
Single Burn Rate Heaters	$253	$479	$226
Pellet Heaters/Stoves	$1,295	$1,319	$24
Forced-Air Furnaces	$912	$4,174	$3,262
Masonry Heaters	$9,157	$9,245 - $9,997	$88 - $840

Hydronic Heating Systems	$7,528	$13,986	$6,458

We request specific comments on these estimates, which significantly affect the estimates of costs per model lines and per unit sold and potential changes in sales and, thus, affect decisions on the affordability of candidate BSER. For example, if the number of model lines was less and the number of heaters per model line was greater, then the cost per unit sold would be less and more stringent options for BSER could potentially be implemented sooner.

D. What are the economic impacts?

The economic impacts of the proposed rule are estimated using industry-level estimates of annualized compliance cost to value of shipments (receipts) for affected industries. In this case, cost-to-receipts ratios approximate the maximum price increase needed for a producer to fully recover the annualized compliance costs associated with a regulation. Essentially, the revenues to producers will likely fully cover the annualized compliance cost incurred by producers at this maximum price increase. Any price increase above the cost-to-receipts ratio provides revenues that exceed the compliance costs. These industry level cost-to-receipts ratios can be interpreted as an average impact on potentially affected firms in these industries. Cost-to-receipts ratios for the affected product types range from 2.3 percent for pellet heaters/stoves up to 6.4 percent for single burn rate wood heaters for the proposed option. More information on how these impacts are estimated can be found in Chapters 5 and 6 of the RIA. In estimating the net benefits of regulation, the appropriate cost measure is “social costs.” Social costs represent the welfare costs of the rule to society. We believe that the social costs are best approximated by the compliance costs estimated for this rule. Thus, the annualized social costs for this

proposal are best estimated to be $15.7 million for the proposed option, based on the estimate of costs to manufacturers for the proposal and assuming no cost pass-through to consumers. More information on how these social costs are estimated can be found in Chapter 5 of the RIA.

E. What are the non-air quality health and energy impacts?

These proposed NSPS are anticipated to have no impacts or only negligible impacts on water quality or quantity, waste disposal, radiation or noise. To the extent new NSPS models are more efficient, that would lead to reduced wood consumption, thereby saving timber and preserving woodlands and vegetation for aesthetics, erosion control, carbon sequestration, and ecological needs.

It is difficult to determine the precise energy impacts that might result from this proposed rule. On the one hand, to the extent that the NSPS wood-fueled appliance is more efficient, energy outputs per mass of wood fuel consumed will rise. However, wood-fueled appliances compete with other biomass forms as well as more traditional oil, electricity, and natural gas. We have not determined the potential for consumers to choose other types of fuels and their associated appliances if the consumer costs of wood-fueled appliances increase and at what level that increase would drive consumer choice. Similarly, we have not determined the degree to which better information on the energy efficiency of the NSPS appliances will encourage consumers to choose new wood-fueled appliances over other new appliances.

V. Rationale for Proposed Amendments

A. Why are we proposing to expand the scope of appliances subject to the NSPS?

As described in section II, the EPA has had ongoing discussions with many stakeholders regarding the need to expand the scope of the current residential wood heater regulation. Stakeholders described adverse health and environmental impacts arising from the increasing use of some appliances, actions taken at the state and local levels to address such concerns, and growth in types and numbers of appliances that are currently on the market. Numerous states (*e.g.,* Vermont, New York, Maine, Michigan, Minnesota) have indicated to us that individuals' concerns about smoke from residential wood burning, particularly by hydronic heaters, are the top source of environmental complaints. In the case of masonry heaters, we believe EPA certification of these typically cleaner devices, would allow them to be excellent emission reduction alternatives to replace pre-NSPS wood heaters and be a good consumer alternative in parts of the country that currently ban uncertified appliances (contingent upon approval by the local jurisdiction). We also saw a need to address the residential heating market in a way that recognizes that some heaters and fuels are substitutes for each other. Regulating only one type of heater may result in unintended incentives for consumers to favor purchase and use of unregulated and potentially higher emitting devices. We felt a comprehensive assessment was needed. Therefore, as part of the NSPS review process, we evaluated a wide range of residential biomass heating devices and non-heating devices (such as cook stoves and fireplaces) to determine what expansions in scope might be needed.[39]

The residential wood heaters NSPS is a "standard of performance" as defined by section 111(a) of the CAA. The term "standard of performance" means a "standard for

[39] Subpart AAA—Standards of Performance for New Residential Wood Heaters: Revised Draft Review Document. Prepared for EPA by EC/R Incorporated. December 30, 2009.

emissions of air pollutants which reflects the degree of emission limitation achievable through the application of the best system of emission reduction which (taking into account the cost of achieving such reduction and any non-air quality health and environmental impacts and energy requirements) the Administrator determines has been adequately demonstrated." As discussed earlier, the level of control prescribed by section 111 historically has been commonly referred to as "Best Demonstrated Technology" or BDT. To better reflect that section 111 was amended in 1990 to clarify that "best systems" may or may not be "technology," the EPA is now using the term "best systems of emission reduction" or BSER. As previously with BDT, in determining BSER, the EPA uses available information and considers the emissions reductions and incremental costs for different systems available at reasonable cost. The residential wood heaters source category is mass-produced residential consumer products, fundamentally different from the typical NSPS source category that regulated industrial processes. Thus, for the residential wood heaters source category important elements in determining BSER include the significant costs and environmental impacts of delaying production and sales while models with those systems are being designed, tested, field evaluated, and certified. The EPA determines the appropriate emission limits representative of BSER. After the emission limits are established, in general, the source may use whatever systems meet the emission limits. In developing the proposed rule, we evaluated possible systems both at baseline conditions (conditions in the absence of additional regulation) and under other scenarios. In most cases, candidate BSER for residential wood heaters is based on improved combustion techniques, primarily improvements in model-specific combinations of time, temperature, and turbulence. That is, the improved combustion

models have greater airflow residence time, better insulation to increase temperatures, and passageways and directed flows to improve mixing and turbulence. In addition, some heaters also use catalytic combustors to reduce emissions. Each manufacturer has a potential myriad of combinations of specific designs that could incorporate these key aspects. Many systems reduce emissions significantly, increase efficiency, and provide good operator flexibility. The key differences tend to be confidential business information as to the specifics of the combination that the manufacturer uses and does not share with other manufacturers but rather holds as proprietary. Similarly, the industry trade association cannot facilitate exchange of such information because of antitrust regulations. Because each appliance type has a potentially unique emissions profile, market niche, and manufacturer profile, we made BSER determinations for each heater type, as described below.

For certain types of devices, information is lacking. For example, we have no information or very limited information on emissions and emission reduction techniques for cook stoves, pizza ovens, chimineas, coal stoves and biomass (other than wood or wood pellet) stoves/furnaces (*e.g.*, fueled with grass, corn, cherry pits). We are interested in receiving data for contributions to air quality, endangerment of public health and welfare, emissions, potential emission reductions, costs, prices, and sales of coal stoves and biomass stoves because we believe we do not have sufficient information at this time to list these sources under section 111(b) and develop proposed standards. For example, usage rates of some of these appliances are limited both in numbers of new units and in the number of markets they occupy. Also, some stakeholders have stated that use of coal stoves is more common in some coal mining regions, where the consumer may have

access to free or cheap coal, but such stoves are not typically used in other areas. We request data on any of these appliances that might help us potentially develop national programs or standards for these devices in the future.

We are also deferring any regulatory action addressing emissions from wood-burning fireplaces at this time. Fireplaces typically are not designed to be "wood heaters" and thus are not within the current scope of the "residential wood heater" source category listed on February 18, 1987, pursuant to the authority of section 111(b). (Fireplaces are typically used for ambience and most of the heat content of the wood is lost out the chimney with the relatively large amounts of excess combustion air rather than heating the room. For effective heating, some homeowners have inserted a new EPA certified wood stove into an otherwise open masonry fireplace. In those cases, new wood heaters/stoves are regulated under the current 1988 rule and would be regulated by this proposal. Also, some fireplaces have restricted excess combustion air to less than 35:1 air-to-fuel ratio and are certified under the current 1988 NSPS.) Fireplaces are addressed in the current EPA voluntary partnership program that encourages the development and sale of lower-emitting wood-burning fireplaces over the sale of higher-emitting fireplaces. The EPA's fireplace program covers new masonry and prefabricated (low-mass) fireplaces and retrofit devices for existing fireplaces. See the voluntary partnership program website for more information: www.epa.gov/burnwise/participation.html#fireplace. We request comments and additional data on contributions to air quality, endangerment of public health and welfare, emissions, potential emission reductions, costs, prices, and sales of fireplaces. We request data that might help us potentially develop new or revised national programs or a source

category listing and standards under section 111(b) for these devices in the future. We are especially interested in data on current and projected sales of new wood-burning fireplaces versus gas-fired fireplaces, current and projected usage patterns for new fireplaces versus existing fireplaces, current and projected quantities of wood burned per existing and new fireplaces, current and projected best systems of emission reduction for new fireplaces versus existing fireplaces and costs of current and projected best systems versus current costs of fireplaces. Also, we are interested in national data and how these data vary by state and local areas.

B. How did we determine BSER and the proposed emission standards?

As discussed earlier in this preamble, the proposed subparts AAA, QQQQ, and RRRR recognize that the sources covered by these subparts are fundamentally different from the typical NSPS source category in that residential wood heaters are mass-produced residential consumer products whereas most NSPS regulate industrial processes. Discussions in sections V.B.1 through V.B.4 of this preamble focus on the analysis of PM emission reductions under our proposed two-step phased-in standards for each appliance type affected by this proposal. In general, for this rulemaking, we have determined that the proposed first step represents the emission levels that almost all models can readily achieve now using today's designs and technology. Further, we have determined that the proposed second step represents stronger emission levels achievable for all appliance types at reasonable cost, but allows appropriate lead times for manufacturers to redesign their model lines to accommodate the improved technology across multiple model lines and test, field evaluate, and certify the new model lines. See section V.B.5 for a discussion of the Alternative Approach we considered to reduce PM

emissions based on three-step phased-in standards, under which the strongest emission standard would be 8 years after the effective date of the final rule rather than the proposed 5 years. Section V.B.6 discusses other provisions we considered and for which we request additional data and information from commenters.

For these source categories, our BSER determination rests on: (1) the achievability of the proposed emission levels (*i.e.*, the fact that top-performing models for each appliance type are already achieving the proposed emission levels); and (2) the cost effectiveness of the proposed standards when considering the design life span and the emitting life span of the appliances in residences. The net monetized benefits of the proposal far exceed the costs for all options considered. Realistic model design and appliance emitting life span assumptions are essential components for a meaningful cost effectiveness analysis. As explained above in section IV.C. and in our background documentation,[40] a model design life span of 20 years is supported by the historical data that show that the non-cosmetic aspects of wood heaters designed to meet the 1988 NSPS are still being used today in some model lines. While some manufacturers may choose to make more frequent cosmetic changes to their models, the internal design changes a manufacturer must make to a wood heater model line to comply with the NSPS are longer lasting. Furthermore, once installed in consumer homes, wood heaters emit for at least 20 years and many are operated in residences for much longer time periods (a key fact motivating wood heater/stove changeout programs). Once purchased, consumers tend to only replace appliances when they no longer serve their functional purpose. Wood heaters tend to serve the basic function of producing heat for well over 20 years. Table 11

[40] See footnotes 24, 36 and 38.

presents our estimated cumulative costs, $PM_{2.5}$ emission reductions, and associated cost per ton for our proposed limits, based on a model design life span of 20 years and an appliance emitting life span of 20 years.

For all of the standards proposed in this *Federal Register* notice, the EPA invites specific comments on the data and analyses on which we base the proposed standards. Moreover, the EPA invites specific comments that provide additional data and analyses that would support a different standard. Interested persons should note that the EPA will consider promulgating a more stringent or less stringent standard than what we are proposing for any of these categories, if the record contains data or analyses that support a different standard.

Table 11. Cost Effectiveness of $PM_{2.5}$ Emission Reductions of Proposed Standards and Emission Co-Reductions based on Cumulative Analysis (2013-2057)[41]

Appliance Type	Nationwide Cumulative Cost (2010$)	**$PM_{2.5}$ Reductions**		**VOC Co-Reductions**		**CO Co-Reductions**	
		Cumulative Emission Reduction (tons)	Cost per ton (2010$)	Cumulative Emission Reduction (tons)	Cost per ton (2010$)	Cumulative Emission Reduction (tons)	Cost per ton (2010$)
Cord Wood Stoves	$45,492,874	96,523	$471	136,293	$334	1,426,240	$32
Single Burn Rate Stoves	$11,864,204	236,254	$50	416,828	$28	1,602,218	$7
Pellet Stoves	$44,272,694	29,269	$1,513	392	$112,894	152,082	$291
Furnaces	$30,451,763	823,770	$37	349,207	$87	5,491,797	$6
Hydronic Heaters	$57,760,316	360,587	$160	$152,858	$378	2,403,916	$24
Total*	$189,841,851	1,546,403	$123	1,055,578	$180	11,076,253	$17

*Note: Masonry Heaters are not included in this analysis because representative emission tons per appliance could not be determined.

[41] Analysis period assumes that manufacturers will incur R&D costs beginning in 2013, in anticipation of final rule. Analysis is 2013 through 2057, based on assumption that the internal emission-related components of a model designed to meet the proposed Step 2 emission limit will be manufactured/shipped for 20 years, and shipped models will emit in residences for another 20 years. See footnotes 24, 36 and 38. PM $_{2.5}$, VOC and CO costs per ton are calculated independently for illustrative purposes, even though VOC and CO reductions would actually occur with no additional cost as the $PM_{2.5}$ reductions are achieved.

1. Room Heaters

The current subpart AAA definition of "wood heater" specifies certain conditions, including that affected sources are those that have an air-to-fuel ratio of less than 35:1. As part of the regulatory negotiation for the current 1988 NSPS, the EPA included the air-to-fuel criterion in the rule primarily to exclude typical fireplaces from the affected source definition. An unintended side effect, however, is that it also resulted in the exclusion of the majority of pellet heaters/stoves. Also included in the current 1988 NSPS definition of "wood heater" is an exclusion of heaters that have a minimum burn rate of greater than 5 kg/hr. The definition and test methods had the effect of excluding a large number of single burn rate wood heaters. As described below, we are proposing to change the applicability of subpart AAA to include all three types of "room heater" appliances: adjustable burn rate wood heaters, pellet heaters/stoves and single burn rate wood heaters. Our intent is that this rule will be stated in broad enough terms to regulate any future room heater appliances that may come into the U.S. market and function as room heaters.

a. Adjustable Burn Rate Wood Heaters

Adjustable burn rate wood heaters include freestanding heaters and heaters modified to fit within a firebox (sometimes called fireplace inserts). These units were the primary focus of the 1988 NSPS and are subject to current NSPS limits of 7.5 g/hr for noncatalytic heaters and 4.1 g/hr for catalytic heaters. As discussed in the February 26, 1988, final rule (53 FR 5865) and earlier in this preamble, the EPA considered the performance of catalytic heaters and noncatalytic heaters co-BDT (now called BSER) because the net emissions over time were estimated to be similar (even though the initial certification test results are typically lower for catalytic models) assuming possible

degradation of the catalyst and lack of catalyst replacement by the operator. The EPA considered requiring catalyst replacement on a regular schedule, but determined that enforcement of such a requirement would be difficult. The EPA did require manufacturers to provide 2-year unconditional warranties on the catalysts and prohibited the operation of catalytic heaters/stoves without a catalyst. Additionally, because of these concerns, the EPA wanted to ensure that further development of both noncatalytic and catalytic technology would continue.

Since the 1988 NSPS was developed, the state of Washington issued standards in 1995 imposing limits of 4.5 g/hr for noncatalytic heaters and 2.5 g/hr for catalytic heaters. In developing the proposed revisions to the NSPS, we evaluated and identified these "improved" catalytic and noncatalytic systems and associated emission levels as the proposed Step 1. This analysis showed that the state of Washington level of 4.5 g/hr is achieved by 107 out of 121 (88 percent) of the EPA-certified adjustable burn rate wood heater models in production and sold in the U.S. today (noncatalytic and catalytic models combined). This statistic includes 92 of the 106 certified noncatalytic wood heater models (87 percent) and 15 of the 15 certified catalytic models (100 percent). The median certification value for noncatalytic models was 3.2 g/hr and for all certified models was 3.4 g/hr. Details of the analysis are in the docket.[42]

For the proposed Step 2 (5 years after the effective date of the final standard), we considered "state-of-the-art" systems that achieve a certification value of 1.3 g/hr (using crib wood as the test fuel as specified in Method 28 as required by the 1988 NSPS). This is approximately 50 percent less than the 1995 state of Washington standard for catalytic

[42] Attachment A of Residential Wood Heaters Manufacturer Cost Memorandum to Gil Wood, USEPA, from EC/R Inc. February 22, 2013.

models (2.5 g/hr). The EPA certification test data show that a level of 1.3 g/hr is achieved by 27 adjustable burn rate wood heater models as of December 2013. This includes 11 certified noncatalytic wood heater models and 16 certified catalytic models. There were no apparent break points other than the current state of Washington initial certification level of 4.5 g/hr for noncatalytic heaters. That is, the distribution of certification values was relatively linear with no step functions other than at the state of Washington level of 4.5 g/hr. We ask for comments and emission test data using cord wood to help us determine if the proposed emission levels should be adjusted for any differences between crib wood and cord wood.

This source category is fundamentally different from the typical NSPS source category composed of industrial processes. This source category involves the manufacture and sale of mass-produced residential consumer products that are significantly affected by production and sales volumes and timing of testing and certification. Thus, we are proposing implementing the proposed Step 2 BSER emission limit 5 years after the effective date of the final standard to allow for longer lead times for redesign, testing, field evaluation and certification. This also spreads the costs over a longer time and a larger number of units. The intent behind the proposed Step 2 BSER emission limit is to recognize that current state-of-the-art level of performance appears to be significantly better than the state of Washington limit of 4.5 g/hr met by over 85 percent of the heaters sold today on a sales-weighted basis (*i.e.*, 92 out of 106 noncatalytic models and 15 out of 15 catalytic models), and furthermore better than the state of Washington catalytic limit of 2.5 g/hr for over 25 percent of the adjustable burn rate wood heaters sold in the U.S. today (*i.e.*, 20 out of 106 or approximately 19 percent

of noncatalytic models and 13 out of 15 or approximately 87 percent of catalytic models). As noted earlier and discussed more fully in the paragraphs below, our decisions on BSER for this source category have fully considered not only the emission performance but also the cost and economic impacts, including the costs to accommodate the best systems in additional model lines. The net monetized benefits far exceed the costs of all options considered.

The cost impacts of the proposed Step 1 are very small. This is because, despite being a limit that was originally developed for only one state, over 85 percent of currently EPA-certified non-catalytic and catalytic heaters that are in active production already meet the state of Washington initial certification test values. We also believe production of any certified heaters that do not meet the proposed Step 1 standard would be discontinued, as manufacturers would likely focus on models that already comply with the proposed standard in the short term. While implementing the proposed Step 1 standard would not impose any significant additional costs on most of the manufacturers, it also would not achieve a large amount of new emissions reductions for most of the models. However, implementing an emission standard associated with the proposed Step 1 would have the benefit of ensuring consistent nationwide standards and ensuring that the remaining 15 percent of non-complying adjustable burn rate wood heater models could no longer be sold. It would also ensure that wood heater/stove changeout programs aimed at reducing emissions from old, pre-NSPS or pre-state of Washington heaters/stoves would result in replacement models that meet the state of Washington levels or better.

The proposed Step 1 limit eliminates the distinction between catalytic and non-catalytic heater models, which we view as progress. It is important to remember that the lower emission level catalytic standards were initially instituted because of concerns that the early generation catalysts would degrade over time, resulting in eventual real world emission levels comparable to non-catalytic units. After 25 years of catalyst heater development experience, manufacturers have demonstrated that the performance of these heaters typically remains consistently good over the course of proper operation because of changes manufacturers have made to improve heater design to protect the catalysts from flame impingement and other factors that previously caused catalysts to degrade significantly. For example, one recent study of four catalytic combustors from the two selected heaters/stoves showed that the combustors maintained substrate integrity without substantial PM emissions performance reduction.[43] Therefore, establishing a separate limit to accommodate "degradation" seems to create a distinction where none exists and adds unnecessary confusion to the overall regulation.

We recognize that there may be concern that a single limit based on the Washington State non-catalytic limit could result in "backsliding" of current catalytic heater models. We think that the likelihood of actual backsliding is extremely low because of other factors driving the wood heater market. Given the pending implementation of the proposed Step 2 limits described below and that some manufacturers have heaters that already achieve Step 2, all manufacturers would have market incentives to improve performance as soon as possible rather than degrade

[43] The Interim Wood Stove Catalytic Combustor Longevity Study, Prepared for the Catalytic Hearth Coalition by L. Pitzman *et al*, OMNI Environmental Services. January 4, 2010.

performance. Also, with consumer education regarding the impacts of PM emission levels, we believe that consumer pressure will favor better performing units that in general are more energy efficient and lower emitting at reasonable cost, especially as they compare wood heaters and gas heaters. However, we are requesting comments on whether we should maintain a separate, lower limit for catalytic heater models for the proposed Step 1 emission limits, based on the current state of Washington catalytic standard of 2.5 g/hr.

The proposed Step 2 state-of-the-art BSER cost and economic impacts would be significant, but our analysis shows a very reasonable cost per ton of emission reduction when considering the typical design and appliance life spans.[44] Our data show that at the proposed Step 2 BSER emission level of 1.3 g/hr, about 20 percent of catalytic models and 5 percent of noncatalytic models currently manufactured would already comply with the proposed Step 2 standard. Thus, manufacturers would need to either modify noncomplying lines or develop new ones to continue production for approximately 95 percent of the current market. Some unknown fraction of manufacturers may be able to switch some of their production from noncomplying models to complying models. Because we do not know this fraction, because the total of complying units is only 6 percent (combined catalytic and non-catalytic models) at this time, and because many manufacturers have no complying models at this time, we have assumed this fraction to be zero for our analysis. Historically, those manufacturers that chose to comply with the 1988 NSPS did so for a full range of models. Thus, our analysis shows the potential emission and cost impacts for the approximately 95 percent of adjustable burn rate wood

[44] See footnotes 24, 36 and 38.

heater models projected to undertake R&D needed to develop the heater-specific combinations of time, temperature, and turbulence to achieve higher efficiencies and lower (proposed Step 2 compliant) emissions. That is, although the manufacturers know the factors that are important for good combustion and low emissions, they still need to develop and test the laboratory-specific combinations that can be incorporated into the design of specific model lines. Alternatively, some manufacturers might convert noncatalytic models to catalytic models or hybrids as ways to reduce emissions.

We estimated the resulting nationwide costs based on the cost assumptions explained in section IV.C. The average annual cost increase to manufacturers of adjustable burn rate wood heaters during the 2014 through 2022 period analyzed in the RIA is approximately $4.2 million. Estimated nationwide annual $PM_{2.5}$ emissions, averaged over this same period (2014-2022), are projected to be 548 tons/year under baseline conditions versus 385 tons/year under the proposed two-step BSER, an average reduction of 163 tons/year, considering only the first year of emissions for each new heater sold. Given that limited snapshot for these cost and emission estimates, the average cost of reducing each new ton of $PM_{2.5}$ emissions during the 2014-2022 period would be approximately $26,000 per ton annually. As explained in section IV.C, the cost-to-sales ratio, which is an indicator of the ability of the manufacturer to successfully absorb the regulatory impacts, is high at 4.3 percent. However, when considering the total costs and cumulative emission reductions over the more representative full model design life span and appliance emitting life span of 20 years; the overall cost effectiveness is approximately $500 per ton (shown above in Table 11).[45]

[45] See footnotes 24, 36 and 38.

Given the reasonable cost effectiveness of imposing the two-step BSER when considering total costs and cumulative emission reductions, and given the 6-year lead time (from the date of these proposed standards) until models must meet the proposed Step 2 emission limit, we determined that the two-step phased-in emission limits represent BSER for these residential consumer product appliances at this time. Thus, we are proposing a two-step standard for adjustable burn rate wood heaters, in which Proposed Step 1 is required upon the effective date of the final rule and Proposed Step 2 is required 5 years after the effective date of the final rule. Section V.B.5 discusses a three-step alternative approach that we also considered for adjustable burn rate wood heaters, and on which we are seeking comment.

We note that there have been some technical questions associated with measuring the emission levels associated with the proposed Step 2, which we are addressing in this proposed rule. That is, the currently available laboratory proficiency test results cast some doubt on the reproducibility of test results at lower levels of the standard for the current EPA Test Method 28. An HPBA analysis[46] found that the repeatability and reproducibility of the current test method for wood heater emissions, as demonstrated by the EPA-accredited laboratory proficiency test data, may be poor based on the scope of their analysis. Their analysis stated:

- "At the 95-percent confidence level, repeatability for the EPA weighted average emission rate is at best ±2.9 g/hr and ranged as high as ±5.4 g/hr."
- "The reproducibility was no better than ±4.5 g/hr and ranged as high as ±6.4 g/hr."

[46] Final Report: EPA Wood Heater Emission Test Method Comparison Study. Prepared by Robert Ferguson, Ferguson, Andors & Company for the Hearth, Patio and Barbecue Association. December 1, 2010.

We believe some mitigating factors are not accounted for in their analysis, such as the lack of regulatory requirements or incentives for the test laboratories to achieve highly reproducible results in proficiency testing (*i.e.*, the laboratories are not required to meet a certain proficiency level; they are not paid for the proficiency tests, but rather they absorb the costs as part of their overhead; and, in some cases, they intentionally staged the test to demonstrate that variability was possible within the current protocol). Also, these factors do not reflect the proposed changes to improve the repeatability and reproducibility of the test method. Consequently, we believe the previous results merit consideration of concerns about implementing a lower emission standard, but they do not mean that lower emission standards cannot be measured accurately. For example, the State of Washington Department of Ecology has successfully used lower emission levels in their regulations since 1995, and the Oregon Department of Environmental Quality has used lower levels for tax credits for low-emitting pellet heaters/stoves.

As noted earlier in this section, we ask for comments and emission test data using cord wood to help us determine if the proposed emission levels should be adjusted for any differences between crib wood and cord wood.

b. Pellet Heaters/Stoves

Several certified pellet heaters/stoves are subject to current subpart AAA. However, most models currently offered for sale are exempt due to air-to-fuel ratios greater than 35:1. We considered candidate options similar to those discussed earlier for wood heaters/stoves, *i.e.*, improved catalytic and improved noncatalytic systems and state-of-the-art systems. Our data set for currently manufactured U.S. pellet heaters/stoves, for which we have reproducible emissions data, contains 24 models, of

which 23 would meet the 4.5 g/hr proposed Step 1 BSER emission limit. We also compared the listings of certified pellet heaters/stoves for both the EPA and the state of Washington. Of the 224 pellet heater/stove models from both lists, 221 models produced by 35 manufacturers would meet the state of Washington emission standard. Only three models produced by three manufacturers would not meet the standard. Assuming that the rest of the pellet heater/stove market has comparable performance, we would expect to see only a small cost impact of requiring the proposed Step 1 BSER emission levels of 4.5 g/hr for noncatalytic and catalytic pellet heaters in terms of having to redesign units to meet the proposed Step 1 BSER.

Even though additional R&D would not be required to meet the proposed Step 1 BSER, manufacturers would need to test and certify their heaters/stoves to sell them after the effective data of the final rule, which we expect to occur in 2015. Some manufacturers of pellet heaters/stoves have started incurring costs in anticipation of the final rule. They would also incur ongoing recertification costs for the fraction of heaters/stoves with expiring certifications.

Some stakeholders have argued that pellet heaters/stoves are relatively cleaner burning than other wood heaters and that regulation is not needed. Other stakeholders have argued that pellet heater/stove standards should be tighter to show how clean they are and encourage consumers to purchase pellet heaters/stoves instead of cord wood heaters/stoves. Considering both positions, and because pellet heaters/stoves are cleaner burning in general, we think there is environmental value in ensuring they have an EPA certification so they can be sold in jurisdictions that require such certification of any wood-burning appliance (contingent upon approval by the local jurisdiction). This would

help avoid a competitive imbalance regarding wood heaters. Also, we believe there is environmental value in having third-party accredited laboratory test results available in all areas so that consumers can make informed choices among competing residential heaters.

We are also proposing implementation of a Step 2 state-of-the-art BSER 5 years after the effective date of the final rule. We estimate that at least 30 percent of current U.S. pellet heater/stove models already meet the proposed Step 2 emission level. We assume that manufacturers will either modify the remaining models or invest in developing new model lines that can meet the proposed Step 2 emission level. This assumption may somewhat overstate the potential cost and economic impacts of requiring a proposed Step 2 BSER, because some noncomplying models will be dropped and manufacturers may consolidate their model lines in the short term. However, we do not know how many models will be dropped. This industry has a history of manufacturing a wide range of choices of models for the marketplace.

The nationwide annualized total costs are significant based on our cost assumptions explained in section IV.C and in our background documentation.[47] The average annual cost increase to manufacturers of pellet heaters/stoves during the 2014 through 2022 period analyzed in the RIA is approximately $3.5 million. Estimated nationwide annual $PM_{2.5}$ emissions, averaged over this same period (2014-2022), are projected to be 199 tons/year under baseline conditions versus 150 tons/year under the proposed two-step BSER, an average reduction of 49 tons/year, considering only the first year of emissions for each new heater sold. Given this limited snapshot for these cost and

[47] See footnotes 36 and 38.

emission estimates, the average cost of reducing each new ton of $PM_{2.5}$ emissions during the 2014-2022 period is approximately $71,000 per ton annually as compared to the monetized health benefits of $360,000 per ton to $810,000 per ton of reducing direct $PM_{2.5}$. The annualized cost-to-sales ratio is 2.3 percent. However, when considering the total costs and cumulative emission reductions over the more representative full model design life span and appliance emitting life span of pellet heaters/stoves, the overall cost effectiveness is approximately $1,500 per ton (shown above in Table 11).[48]

Given the reasonable cost effectiveness of imposing the proposed two-step BSER when considering total costs and cumulative emission reductions, and given the 6-year lead time (from the date of these proposed standards) until model lines must come into compliance with the proposed Step 2 limit, we determined that the two-step phased-in limits represent BSER for these residential consumer appliances at this time. Thus, we are proposing a two-step standard for pellet heaters/stoves, in which Proposed Step 1 is required upon the effective date of the final rule, and Proposed Step 2 is required 5 years after the effective date of the final rule. Section V.B.5 discusses a three-step alternative approach that we also considered for pellet heater/stoves, and on which we are seeking comment.

c. Single Burn Rate Wood Heaters

Single burn rate wood heaters represent a huge regulatory exemption in the current residential wood heater market. We estimate that over 40,000 of these units are sold per year. We evaluated all of the available emission data and discussed the state of R&D with manufacturers of single burn rate wood heaters. The data show that the BSER

[48] See footnotes 24, 36, and 38.

for single burn rate wood heaters based on improved combustion could achieve the same emission levels for one individual burn rate category as adjustable burn rate category wood heaters do for the weighted average of four burn rates. To compare single burn rate emissions to adjustable burn rate emissions, however, one must remember that single burn rate wood heaters are by definition incapable of operating at the lowest burn rates, and that these low burn rates result in the greatest level of emissions in an adjustable burn rate wood heater. Thus, the certification test method for single burn rate wood heaters must be modified to take the single burn rate into account (instead of the multiple burn rates for the adjustable rate heaters). For example a rate of 3.0 g/hr could be considered to be equivalent to the state of Washington standards (of 4.5 g/hr for adjustable burn rate wood heaters) adjusted to the single burn rate.

Considering that single burn rate wood heaters will not be expected to operate at the typically higher-emitting burn rates, we expect the majority of single burn rate wood heaters to meet the proposed Step 1 BSER limit of 4.5 g/hr for adjustable burn rate wood heaters, if the design is focused on one optimal single burn rate. However, some models would require modifications to ensure that they consistently pass the test and to add tamper-proof settings to ensure that operators do not circumvent the intent of the NSPS. For our analyses, we assumed that all existing models would need to be modified through R&D, resulting in significant emission reductions to achieve the proposed Step 1 BSER. We request specific data and comments regarding these assumptions. Since 2009, single burn rate wood heater designs have been undergoing R&D in anticipation of the proposed NSPS, and the information that we have from industry is that cleaner designs are nearly

market-ready.[49] Nonetheless, because these devices were previously unregulated and may need to transfer technology from adjustable burn rate wood heaters, our cost analysis assumed that R&D efforts would intensify in order to meet the proposed Step 1 standard while also beginning R&D to develop models to meet the more stringent proposed Step 2 BSER limit. Specifically, for single burn rate wood heaters, we doubled our R&D estimate of $356,250 per model for other appliances in these early years.

The nationwide annualized total costs are based on the cost assumptions explained in section IV.B and in the background documentation.[50] The average annual cost increase to manufacturers of single burn rate heaters during the 2014 through 2022 period analyzed in the RIA is approximately $902,000. Estimated nationwide annual $PM_{2.5}$ emissions, averaged over this same period (2014-2022), are projected to be 932 tons/year under the baseline (unregulated) condition versus 178 tons/year under the proposed two-step BSER, an average reduction of 754 tons/year, considering only the first year of emissions for each new heater sold. Given this limited snapshot for these cost and emission estimates, the average cost of reducing each new ton of $PM_{2.5}$ emissions during the 2014-2022 period is approximately $1,200 per ton annually as compared to the monetized health benefits of $360,000 per ton to $810,000 per ton of reducing direct $PM_{2.5}$. The cost-to-sales ratio is 6.4 percent and is calculated based on only the initial 5-year period. However, when considering the total costs and cumulative emission reductions over the more representative full model design life span and appliance

[49] See footnote 36.
[50] See footnotes 24, 36 and 38.

emitting life span, the overall cost effectiveness is approximately $50 per ton (shown above in Table 11).[51]

Given the reasonable cost effectiveness of imposing the two-step BSER when considering total costs and cumulative emission reductions, and given the 6-year lead time (from the date of these proposed standards) until new model lines must meet the proposed Step 2 emission limit, we determined that the two-step phased-in limits represent BSER for these residential consumer appliances at this time. Thus, we are proposing a two-step standard for single burn rate wood heaters, in which Proposed Step 1 is required upon the effective date of the final rule and Proposed Step 2 is required 5 years after the effective date of the final rule. Section V.B.5 discusses a three-step alternative approach that we also considered for single burn rate wood heaters, and on which we are seeking comment.

2. Central Heaters

We are proposing subpart QQQQ for wood-burning appliances that function as "central heaters" with the purpose of heating the entire residence, including current new residential hydronic heaters and forced-air furnaces. Our intent is that this rule will be stated in broad enough terms to regulate any future central heater wood-burning appliances that may come into the U.S. market and function as central heaters. In this section, we describe our rationale for determining BSER and the associated proposed emission standards for both hydronic heating systems ("hydronic heaters") and forced-air furnaces. As discussed earlier in this preamble, the source categories to be regulated by proposed subparts AAA, QQQQ, and RRRR are fundamentally different from the typical

[51] See footnotes 24, 36 and 38.

NSPS source category that includes industrial processes whereas subparts AAA, QQQQ, and RRRR include mass-produced residential consumer products. Thus, additional factors are included in the analyses presented today. Section V.B.2.a. below discusses hydronic heaters. Section V.B.2.b. discusses forced-air furnaces.

a. Hydronic Heaters

As described in section II.D, hydronic heaters (commonly known as "outdoor wood boilers" although there are indoor units as well) are the subject of an EPA voluntary partnership program, started in January 2007. The EPA's voluntary partnership program provided criteria in 2007 for qualification of units to be approximately 70 percent cleaner than unqualified models (Phase 1, "orange hangtag"). In October 2008, the program evolved to Phase 2, and EPA-qualified Phase 2 ("white hangtag") units are approximately 90 percent cleaner than older, pre-program unqualified units. Under the Phase 2 voluntary partnership program, new qualified models must emit no more than 0.32 lb/MMBtu of heat output and have a cap of 18 g/hr on any individual test run conducted during the qualifying test. (As noted in the hydronic heaters test method discussion in this preamble, the EPA, the manufacturers, the laboratories, and key states conducted an additional review of the test reports to support these qualifications and made some changes to the test methods to improve the reliability and reproducibility of the test results.)

The proposed Step 1 emission limit for hydronic heaters is the Phase 2 qualifying level of the hydronic heater voluntary partnership program, 0.32 lb/MMBtu. There are currently 36 models (27 cord wood and 9 pellet models) built by 17 U.S. manufacturers

that have been qualified to meet the 2008 Phase 2 level of 0.32 lb/MM BTU.[52] In almost all cases, the manufacturers developed models that rely upon improved combustion techniques, primarily improvements in time, temperature, and turbulence. That is, the improved combustion models have greater residence time, separation of the firebox and the water jacket and the addition of better heat exchangers and better insulation to increase temperatures, and passageways and directed flows to improve mixing and turbulence. In some cases, manufacturers are also using catalyst technology. Each manufacturer has developed their own confidential business combinations of specific designs that incorporate these key aspects and some other techniques.

In addition to the voluntary partnership program, the EPA provided technical and financial support for NESCAUM to develop a model rule for outdoor hydronic heaters, which several states have adopted or plan to adopt to regulate those units in their jurisdictions. The model rule Phase 2 emission limits and the voluntary partnership program Phase 2 emission levels/caps are identical, and are the same as our proposed Step 1 limit. In several states, the Phase 2 emission levels have become regulatory requirements for new units. Based on our experience with the hydronic heater market through the voluntary partnership program, we understand that it is dominated by a few manufacturers in terms of the bulk of sales, and each of these manufacturers has at least one qualifying model already.

For these reasons, we consider the Phase 2 voluntary partnership program level the appropriate emission level for the NSPS proposed Step 1 BSER, effective upon the

[52] A list of cleaner hydronic heaters participating in the EPA's voluntary partnership program is located at http://www.epa.gov/burnwise/owhhlist.html.

effective date of the final rule. As noted above, there are currently 36 models (27 cord wood and 9 pellet models) built by 17 U.S. manufacturers that have already been qualified to meet the Phase 2 voluntary partnership program level of 0.32 lb/MM BTU.

The EPA believes the proposed Step 2 limit for hydronic heaters is achievable for some manufacturers now and would be achievable for all manufacturers 5 years after the effective date of the final rule. We consider this compliance period a reasonable amount of time for manufacturers to complete development across model lines and complete testing, field evaluation, and certification so that sufficient models are ready for sale. We reviewed all the hydronic heater emission data available, and we found our proposed Step 2 emission limit of 0.06 lb/MMBtu is already met by 4 hydronic heater models (2 cord wood and 2 pellet models) built by 2 U.S. manufacturers (using crib wood as specified in Method 28 WHH in the voluntary partnership program),[53] as well as over 50 European models per test method EN 303-05 (which uses cord wood).[54] We ask for comments and emission test data using cord wood and different test methods to help us determine if the proposed emission levels should be adjusted for any differences in test methods and test fuels, *e.g.*, between crib wood and cord wood.

Our review of the available data also showed a break point at the emission level of 0.15 lb/MMBtu heat output. We considered this break point as a candidate for interim Step 2 in the three-step Alternative Approach, as discussed in section III above. Several years ago, we discussed the 0.15 lb/MMBtu level with the voluntary program

[53] See footnote 54.

[54] European Wood-Heating Technology Survey: An Overview of Combustion Principles and the Energy and Emissions Performance Characteristics of Commercially Available Systems in Austria, Germany, Denmark, Norway, and Sweden; Final Report; Prepared for the New York State Energy Research and Development Authority; NYSERDA Report 10–01; April 2010.

stakeholders, including states and manufacturers, as a potential future "Phase 3" interim target in the voluntary partnership program to reduce emissions to approximately one-half of the Phase 2 voluntary partnership program level. Some of the manufacturers responded quickly to this informal target and now 11 of the 36 models (6 cord wood and 5 pellet models) that currently qualify under the Phase 2 voluntary partnership program already qualify at an emission level of 0.15 lb/MMBtu or better.

The proposed BSER levels include both outdoor hydronic heaters and indoor hydronic heaters. The initial manufacturers who actively participated in the voluntary partnership program were primarily manufacturers of outdoor units, due to the very large concern about the health effects of emissions from the outdoor units and the fact that over 90 percent of hydronic heater sales were and still are for outdoor models. When we moved to Phase 2 of the voluntary partnership program in October 2008, we explicitly included indoor units to more strongly encourage cleaner indoor units and to provide another tool for the states and local jurisdictions, especially since some states were concerned that some high-emitting indoor units were avoiding rules that only specified outdoor units. Indoor and outdoor models compete in the marketplace and having standards on only outdoor units would provide a market advantage to indoor models. Indoor and outdoor models both can use currently available improved combustion and improved heat transfer techniques to achieve similar emission levels. Given the number of years the voluntary partnership program has already been in existence, we believe our proposed Step 1 limit upon the effective date of the final rule and the proposed Step 2 limit 5 years after the effective date of the final standard provide reasonable lead time to incorporate BSER in both outdoor and indoor residential consumer models. We ask for

specific comments and data on this determination and the degree to which other options would be appropriate.

We estimate that there are 30 manufacturers producing approximately 120 hydronic heater models for sale in the U.S. On a sales-weighted basis, less than 25 percent of the models currently sold would need to undertake R&D to meet the proposed Step 1 BSER limit, with a higher percentage that would need to undertake R&D to meet the proposed Step 2 BSER limit. We assumed that any manufacturer undertaking R&D to develop a new model would aim to meet the proposed Step 2 limit to maximize the lifetime of the resulting product, while shifting production to models that already meet the proposed Step 1 limit. For our cost analysis, we assumed that 100 percent of the 120 hydronic heater models would incur NSPS-related R&D costs to achieve the proposed Step 2 BSER limit. Considering typical R&D lead times, and even the different starting dates for outdoor versus indoor manufactures, we concluded that 5 years after the effective date of the final standard is an achievable compliance deadline for both outdoor and indoor models, even if they were just starting their R&D now. As discussed earlier in this preamble, most manufacturers have known of the hydronic heater emission concerns for over 7 years already.

We also investigated the performance of European models in considering BSER options. Several European countries have already established emission limits, and they are considering more stringent limits in the near future. This has encouraged the European industry to develop more energy efficient and lower emitting technologies. Most of these state-of-the-art models use multiple-stage combustion and some use oxygen sensors and CO sensors and automated feedback controls to help optimize

combustion conditions. A concern in comparing the emission performance of European models with North American models is the difference in test methods. All European models are tested on cord wood fuel in Europe by European laboratories to meet European standards. Few have been imported to the U.S. (by U.S. companies) and very few have been tested in the U.S. according to U.S. testing requirements. However, a recent report[55] included an effort to compare the performance of the European models to U.S. type performance standards. Although a perfect comparison is not possible due to differences in duty-cycle (*i.e.*, proportion of time the unit is operating) to be evaluated in the test and the emissions sampling and analysis protocols, the analysis indicates that the top 20 percent performing European wood boilers (*i.e.*, hydronic heaters) in the size range of 120,000 - 170,000 Btu would meet an output-based emission rate of 0.06 lb/MMBtu using the European test methods. The underlying test data and limited comparative testing show that over 50 European models would likely be considered state-of-the-art BSER and be capable of meeting the proposed Step 2 BSER associated emission level of 0.06 lb/MMBtu heat output, using EN 303-05, which specifies cord wood as the test fuel. We ask for comments and emission test data using different test methods and cord wood to help us determine if the proposed emission levels should be adjusted for any differences in test methods and between fuels, *e.g.*, crib wood and cord wood.

The nationwide annualized total costs are based on the cost assumptions explained in section IV.C and in the background documentation.[56] The average annual cost increase to manufacturers of hydronic heaters during the 2014 through 2022 period

[55] See footnotes 24, 36 and 38.
[56] See footnotes 36 and 38.

anlayzed in the RIA is approximately $4.6 million. Estimated nationwide annual $PM_{2.5}$ emissions, averaged over this same period (2014-2022), are projected to be 1,332 tons/year under the baseline (unregulated) condition versus 84 tons/year under the proposed two-step BSER, an average reduction of 1,249 tons/year, considering only the first year of emissions for each new heater sold. Given this limited snapshot for these cost and emission estimates, the average cost of reducing each new ton of $PM_{2.5}$ emissions during the 2014-2022 period is approximately $3,600 per ton annually. The annualized cost-to-sales ratio is 3.3 percent for hydronic heater models. However, when considering the total costs and cumulative emission reductions over the more representative full model design life span and appliance emitting life span, the overall cost effectiveness is approximately $160 per ton (shown above in Table 11).[57]

Given the reasonable cost effectiveness of imposing the two-step BSER, and given the 6-year lead time (from the date of these proposed standards) until model lines must come into compliance with the proposed Step 2 limit, we determined that the two-step phased-in limits represent BSER for these residential consumer appliances at this time. Thus, we are proposing a two-step standard for hydronic heaters, in which Proposed Step 1 is required upon the effective date of the final rule, and Proposed Step 2 is required 5 years after publication of the final rule. Section V.B.5 discusses a three-step alternative approach that we also considered for hydronic heaters, and on which we are seeking comment.

b. Forced-air Furnaces

[57] See footnotes 36 and 38.

Emissions from wood-fired, forced-air furnaces have not previously received much attention in the U.S. However, industry information suggests that there are three times more sales of wood-fired, forced-air furnaces each year compared to wood-fired hydronic heaters. These units are relatively easy to retrofit into existing structures, and their sales price is substantially less than hydronic heaters but greater than gas or oil furnaces. Because they are whole-house heating systems, they have the capacity to generate large amounts of emissions. Also, they compete with wood-fired hydronic heaters, which we propose to regulate. Not regulating wood-fired, forced-air furnaces could create an adverse competitive imbalance with the wood-fired hydronic heater market segment of the residential wood heater source category. Both forced-air furnaces and hydronic heaters compete with oil and gas furnaces. Consumer choices vary with consideration of upfront sales price, financing costs, and operating costs, *e.g.*, the cost of obtaining seasoned wood versus oil or gas.

Wood-fired, forced-air furnaces are not currently regulated in the U.S. (with the exceptions of broader bans or use limits on wood-burning appliances), but they are beginning to be regulated in Canada. The main regulatory mechanisms are local and provincial regulations requiring listing per CSA B415.1-10, which is the CSA specification for emission performance of solid-fuel-burning heating appliances.[58] All CSA standards are developed through a consensus standards development process approved by the Standards Council of Canada. This process brings together stakeholder volunteers representing varied viewpoints and interests to achieve consensus and develop a standard. The most recent B415.1-10 Committee consisted of manufacturers,

[58] CSA B415.1-10: Performance testing of solid-fuel-burning heating appliances, Canadian Standards Association, Mississauga, Ontario, Canada. March 2010.

Environment Canada,[59] provincial agency staff, test laboratories and the EPA. The current version of B415.1-10 was published in March 2010, and it includes new requirements for indoor and outdoor central heating appliances, including wood-fired forced-air furnaces. In addition to establishing performance test requirements, B415.1-10 also includes emissions requirements for PM. Section 4.2.1(c) of the CSA standard establishes an average particulate emission rate of less than or equal to 0.40 g/MJ, which is equivalent to 0.93 lb/MMBtu. Manufacturers anticipate that CSA Standard B415.1-10 will effectively establish the minimum requirements for future units sold in Canada. For example, the province of British Columbia has enacted regulations limiting the sale of wood-burning appliances to those that comply with B415.1-10 (or the U.S. NSPS when the EPA issues such a standard), and other provinces and municipalities in Canada are in the process of amending their regulations to apply to central heating systems, including forced-air furnaces.

In developing the B415.1-10 emissions limit of 0.40 g/MJ (0.93 lb/MMBtu) for solid-fuel central heating systems, the CSA committee thoroughly reviewed the best systems available, developed a test method for such systems and supported emission testing of candidate best systems. A B415.1-10 validation-testing program performed by Intertek in Middleton, Wisconsin, included both a high-tech furnace and a conventional furnace. The high-tech furnace achieved average particulate emissions of 0.46 g/MJ output (1.067 lb/MMBtu). The conventional furnace achieved average particulate emissions of 1.65 g/MJ (3.828 lb/MMBtu) output. Thus, the CSA limit of 0.40 g/MJ

[59] Environment Canada was created in 1971, and has the responsibility to implement the Government of Canada's environmental agenda including, but not limited to, Canada's environmental and wildlife legislation, enforcement activities and other efforts to protect, conserve and enhance the environment.

(0.93 lb/MMBtu) output corresponds to a 75 percent reduction in emissions when using the average particulate emissions of the conventional furnace tested by Intertek as part of the CSA B415.1-10 validation program.

We also investigated the performance of European production forced-air furnace models to determine whether their performance might be better than what CSA found in North America. However, forced-air furnaces are not commonly used in Europe because they are considered to be an inferior technology for home heating in Europe; thus we had no European candidate BSER to consider.

Manufacturers are actively conducting R&D in response to both the current CSA standard and the anticipated NSPS we are proposing. For example, one company has recently had an EPA-certified laboratory test two of their newest models. These tests, using the test method in CSA B415.1-10, show particle emissions below 0.1 lb/MMBtu heat output. Considering all of the above, we believe that BSER for forced-air furnaces may be demonstrated at the same emission levels as for hydronic heaters. We have considered proposing standards for forced-air furnaces that match the Step 1 and Step 2 standards we are proposing for hydronic heaters, that is, a proposed Step 1 BSER of 0.32 lb/MMBtu heat output and a cap of 18 g/hr as determined by the test methods and procedures in CSA B415.1-10 upon the effective date of the final standard and a proposed Step 2 BSER of 0.06 lb/MMBtu heat output as determined by the test methods and procedures in CSA B415.1-10, 5 years after the effective date of the final standard. However, we have concerns that only one U.S. manufacturer currently has models that have been tested by CSA B415.1-10 and shown to achieve these levels, and, thus, we are proposing that the Step 1 BSER for forced-air furnaces match the current CSA B415.1-10

level of 0.93 lb/MMBtu heat output. We are also proposing, however, that by 5 years after the effective date of the final standard, forced-air furnaces be subject to the same standards as hydronic heaters and be required to meet the proposed Step 2 BSER of 0.06 lb/MMBtu that hydronic heaters must meet then under this proposal.

Given that the largest U.S. forced-air furnace manufacturer already has a catalytic model meeting 0.06 lb/MMBtu, we think the 6 years of lead time is sufficient time in which to conduct R&D to produce comparably lower emitting model lines, although we are seeking comment on an alternative 3-step approach with a longer lead time. Since there are limited emissions data available for forced-air furnaces that reflect hydronic heater proposed Step 1 and proposed Step 2 BSER, we request specific comments and data on the proposed emission levels and compliance deadlines, as well as the environmental impacts and market implications for setting emission limits that match what we are proposing for hydronic heaters.

The nationwide annualized total costs are based on the cost assumptions explained in section IV.C and in the background documentation.[60] The average annual cost increase to manufacturers of forced air furnaces during the 2014 through 2022 period analyzed in the RIA is approximately $2.3 million. Estimated nationwide annual $PM_{2.5}$ emissions, averaged over this same period (2014-2022), are projected to be 3,044 tons/year under the baseline (unregulated) condition versus 434 tons/year under the proposed two-step BSER, an average reduction of 2,610 tons/year, considering only the first year of emissions for each new heater sold. Given this limited snapshot for these cost and emission estimates, the average cost of reducing each ton of $PM_{2.5}$ emissions during

[60] See footnotes 37 and 38.

the 2014-2022 period is approximately $860 per ton annually, as compared to the monetized health benefits of $360,000 per ton to $810,000 per ton of reducing direct $PM_{2.5}$. The cost-to-sales ratio is 2.4 percent. However, when considering the total costs and cumulative emission reductions over the more representative full model design life span and appliance emitting life span, the overall cost effectiveness is approximately $40 per ton (shown above in Table 11).[61]

Given the reasonable cost effectiveness of imposing the two-step BSER, and given the 6-year lead time (from the date of these proposed standards) until new model lines must come into compliance with the proposed Step 2 limit, we determined that the two-step phased-in limits represent BSER for these residential consumer appliances at this time. Thus, we are proposing a two-step standard for forced air furnaces, in which Proposed Step 1 is required upon the effective date of the final rule and Proposed Step 2 is required 5 years after the effective date of the final rule. Section V.B.5 discusses the three-step alternative approach that we also considered for forced air furnaces, and on which we are seeking comment.

3. Masonry Heaters

We are proposing subpart RRRR for new masonry heaters. With a few exceptions, masonry heater emissions are not subject to specific PM emission limits in North America or Europe. Some states and local areas do not allow any residential wood heaters that are not certified to meet the current residential wood heater NSPS. The states of Colorado and Washington have set 6 grams of particles emitted per kilogram of wood burned (g/kg) and 7.3 g/kg limits, respectively (each of which is based on different test

[61] See footnotes 24, 36 and 38.

methods), and a small number of appliances have been tested and certified for those states. (The BSER level we are proposing below uses a different format but is commonly accepted to be only slightly more stringent than the Colorado and Washington limits.) We considered various forms for a masonry heater standard, and we believe that an appropriate format could be a daily average g/hr limit for the heating cycle coupled with a limit for emissions per heat output (lb/MMBtu output). The daily average over the heating cycle format seems to be well adapted to the nature of the technology of masonry heater operation, which involves one or two short high burn rate cycles where hot gases are generated during combustion of a fuel load in the firebox and then pass through the channels, saturating the masonry mass with heat. The masonry mass then radiates heat into the area around the masonry heater for 12 to 24 hours. Unfortunately, we lack sufficient data to set the level of a daily average data approach, so we are proposing instead a heat output format. The heat output format has the advantage of providing a good metric for consumers and regulatory agencies to compare emissions of competing residential heating appliances for an equivalent heat output. We ask for specific comments on whether a g/kg format would be better.

We had numerous discussions with states, masonry heater manufacturers, and laboratories on heater designs, test methods and heater emissions and performance. The best performing improved combustion technology masonry heaters have well-engineered designs with long channels to maximize complete combustion and heat transfer. The manufacturers provided all available current emissions data. For example, one manufacturer provided an archive of available data. The data set included results from 31 tests (measuring emissions per heat output) that ranged from 0.07 g/MJ to 0.51 g/MJ

(~0.17 to 1.22 lb/MMBtu), with an average rate of 0.26 g/MJ (0.621 lb/MMBtu). As we discussed earlier in this preamble, we do not have good information on how many heaters emit at each of these levels and thus have not developed a good estimate of baseline emissions and we ask for data that would help inform us. However, looking at this data set in more detail, we can see that the best "improved combustion" systems have an emission level of 0.13 g/MJ (0.32 lb/MMBtu) heat output. We note that this level is consistent with the proposed Step 1 BSER for hydronic heaters.

As discussed earlier in this preamble, the source categories to be regulated by the proposed subparts AAA, QQQQ, and RRRR are fundamentally different from the typical NSPS source category in that most NSPS regulate industrial processes whereas the source categories in subparts AAA, QQQQ, and RRRR include mass-produced residential consumer products. Thus, additional factors are included in the analyses presented today as compared to typical NSPS. For example, we considered whether we should allow longer lead time over which small manufacturers/builders could spread their R&D costs in order to stay in business. The Small Business Regulatory Enforcement Act Panel strongly recommended that we consider allowing more time. See section V.C of this preamble for discussion of this topic.

We estimated proposed Step 1 improved combustion BSER emissions and cost and economic impacts based on four groups of costs. The first group of costs consisted of the two large manufacturers that we know have already developed potentially complying models and would only face the costs of certification tests. For the second group of costs, we estimated the costs incurred by an additional two large manufacturers that conduct R&D to develop a total of four new model lines. For the third group of costs, we

estimated the cost of one of the manufacturers using the computer simulation approach to certify additional model lines. Finally, for the fourth group of costs, we estimated the cost for all of the small, custom-built manufacturers using the computer simulation approach to certify their model lines. We do not anticipate a large nationwide emission reduction resulting from requiring the proposed Step 1 BSER versus what most manufacturers would have done in the absence of a rule; however we believe there are some masonry heaters that do not use current best designs and for those heaters there can be an emission reduction of 70 percent or more. We believe it is important to ensure that all new models achieve the BSER emission levels and avoid backsliding.

The nationwide annualized total costs are based on the cost assumptions explained in section IV.C and in the background documentation.[62] The average annual cost increase to manufacturers of masonry heaters during the 2014 through 2022 period analyzed in the RIA is approximately $294,000. The estimated cost-to-sales ratio is 4.8 percent. If one were to spread the costs over the much longer typical lifetimes of masonry heaters (over 40 years), the average annual costs would be much lower. We concluded that the proposed Step 1 BSER level of 0.32 lb/MMBtu heat output is appropriate for these appliances.

For masonry heaters, we are proposing that large manufacturers of masonry heaters (defined as those manufacturers constructing 15 or more masonry heaters per year) would be required to comply with these standards upon the effective date of the final rule. We are proposing that small manufacturers (defined as those manufacturers of less than 15 masonry heaters per year) would be required to comply with these standards

[62] See footnotes 24, 36 and 38.

5 years after the effective date of the final rule. We are requesting specific comments on the proposed BSER option and data that might support alternative findings and enhance our impact analyses. For example, if we were to develop a g/hr average format in addition to the lb/MMBtu heat output format, are there products that might meet a daily average over the heating period versus the averaging only over the combustion period, and if so, how would this affect levels of performance and impacts on the environment? Further, we are seeking comment on the degree to which these dates could be sooner.

4. Alternative Approach for Comment

As noted in section III, in addition to the proposed two-step standards described above for appliances regulated as "room heaters" under subpart AAA (currently catalytic and noncatalytic adjustable burn rate wood heaters, single burn rate wood heaters, and pellet heaters/stoves) and for appliances regulated as "central heaters" under subpart QQQQ (currently hydronic heaters and forced-air furnaces), we also considered a different approach, an "alternative three-step approach" for subparts AAA and QQQQ. We seek comments on whether the final rule should be our (preferred) proposed two-step approach or whether the final rule should be this alternative three-step approach. We do not intend for the final rule to allow a choice between the two approaches. We did not develop a three-step approach for masonry heaters under subpart RRRR, since it is a one-emission-level standard, but we are seeking comments on our proposed 5-year compliance extension for small volume masonry heater manufacturers.

We compared unit cost increases,[63] nationwide manufacturer cost estimates,[64] emission reductions,[65] and overall cost effectiveness of the two-step proposal to the three-

[63] See footnote 38.
[64] See footnote 24, 36 and 38.

step alternative approach considered.[66] Table 12 compares the unit cost increase, nationwide average cost to manufacturers and the annual particulate emission reductions, during the 2014 through 2022 period analyzed in the RIA, for appliances currently affected by this proposal, considering only the first year of emissions for each new heater sold. Based on the cost and emission reduction estimates presented in this table, the overall cost effectiveness for this proposal over the 2014-2022 period is $3,250 per ton, but $5,800 per ton for the alternative approach considered (assuming no emission reductions for masonry heaters, for the sake of this analysis). Additional information on the impacts is included in the RIA in the docket.

Table 12. Comparison of Proposal and Alternative Approach (2014-2022)

Appliance Type	Unit Cost Increase from Baseline (2010$)		Nationwide Average Cost Increase from Baseline (2010$)		Emission Reduction from Baseline (tons)	
	Proposal	Alternative	Proposal	Alternative	Proposal	Alternative
Certified Wood Heaters	24	48	4,212,303	8,090,026	163	136
Single Burn Rate Heaters	226	337	901,732	1,540,600	754	756
Pellet Heaters/ Stoves	24	47	3,460,489	6,255,536	49	24
Forced-Air Furnaces	3,262	4,891	2,252,284	3,813,898	2,610	2,712
Hydronic Heating Systems	6,458	9,672	4,554,152	8,302,026	1,249	1,250
Masonry Heaters	300 (ave.)	300 (ave.)	307,511	293,776	Not estimated	Not estimated
Total	10,294	15,295	15,688,471	28,295,862	4,825	4,878

[65] See footnote 24.
[66] See footnote 24, 36 and 38.

We are seeking comment and information on potential justifications for implementing such a three-step standard, instead of our proposed two-step standard for each of the appliances affected by this proposed rule, to provide additional flexibility for manufacturers that have different capabilities and resources to ultimately reach the most stringent BSER. The proposed two-step standards rely on the assumption that the proposed Step 2 BSER, already demonstrated by various models in each appliance category affected by the proposed rule, is achievable within 5 years of the proposed Step 1 BSER. There is a significant emission reduction achieved by the proposed Step 2 BSER compared to the proposed Step 1 BSER in each appliance category discussed above in section V, but there are no proposed interim emission limits imposed during the transition from the proposed Step 1 to the proposed Step 2. In the alternative approach considered, there is a longer transition period of 8 years between Step 1 and Step 3 (with the same significant emission reduction achieved between our proposed Step 1 and proposed Step 2), but there is an interim Step 2 limit which manufacturers must meet 3 years after the proposed Step 1. If we were to give a longer timeframe to redesign across model lines to accommodate the best systems, test, field evaluate, and certify a wide range of model lines, we believe there would be benefit to establishing required interim limits to codify progress in reducing emissions and to focus positive attention on early achievers as they show compliance in the period between 2015 and 2023.

We expect that the manufacturers that do not already meet the strongest emission limits would like the longer time to meet the Alternative Approach Step 3 but would prefer to not have an interim Step 2 requirement. However, we do not currently see adequate justification for allowing extra time without also requiring satisfactory progress,

especially because numerous models already achieve the strongest emission levels. We also have concerns about the complexity of a 3-step approach and whether it would be harder for the EPA to enforce. Thus, we seek comment, including data and potential environmental and economic justifications, on whether the described Alternative Approach Step 2 emission limits represent BSER within 3 years of the effective date of the final rule. We also seek comment on whether an additional 5 years would be necessary to transition from the Alternative Approach Step 2 to the Alternative Approach Step 3 limit, or whether such a transition could be made in a shorter time period. Finally, for single burn rate wood heaters and forced-air furnaces, we are seeking comment on whether the alternative Step 1 limit should become effective upon the effective date of the final rule or after a 1-year "adjustment" period. The EPA seeks to encourage national achievement of the (proposed Step 2) BSER for each appliance category as soon as possible and as efficiently as possible, which is why we prefer the proposal over the alternative approach we considered. However, we also seek to balance industry's R&D needs with timely and efficient standards, and so we are seeking comment on the alternative approach outlined immediately above and in section III.

5. Other Proposed Emissions Testing and Reporting

a. Efficiency Testing and Reporting

While the CAA gives the EPA authority to set standards for emissions, and we have issued final rules that have used a variety of formats for such standards, including efficiency, we lack sufficient data to propose efficiency standards for residential wood heaters at this time. We are proposing only to require testing and reporting but not a minimum efficiency standard. Current data and other information from manufacturers

and testing laboratories and the NYSERDA "European Wood-Heating Technology Survey" discussed earlier in this preamble show that, in general, the same types of improved combustion BSER designs that tend to reduce $PM_{2.5}$ emissions also tend to increase combustion efficiency, reduce CO emissions and improve efficiency. Current subpart AAA allows sources to either measure efficiency or report a default efficiency value. We believe these proposed subparts are an excellent opportunity to standardize the collection and reporting of such data.

Most industry members support the collection and reporting of tested efficiency values, but some do not necessarily support an efficiency standard because they have concerns that efficiency standards would encourage a "ratings race" and worry that some manufacturers would sacrifice operational viability in the field for a higher efficiency rating. We agree that some heat loss is necessary to ensure adequate draft out the chimney/stack and not backdrafting into living areas. However, we do not expect manufacturers to jeopardize their reputation or operator safety for a higher rating, and we believe that competition among manufacturers to increase their heaters/stoves' efficiencies is good for consumers and the environment. We request specific comments and supporting data that would help inform the need for and level of a possible efficiency standard. Also, we ask for specific comments on how, in the meantime, to best ensure consumers have access to the best information on efficiency performance, *e.g.*, labels, owner's manual, Burn Wise website and/or other means.

b. CO Testing and Reporting

We considered developing CO emission limits for all new residential wood heaters. However, our current data for CO emissions performance and methods of control

are not sufficiently robust to support strong CO emission limits, and it would delay the NSPS if we were to seek additional data elsewhere at this time to support strong CO emission limits. We expect the CO emissions to be reduced as a result of the control of PM, because meeting the PM standards will be achieved primarily by BSER based on good combustion (and in some cases catalysts and hybrids) which will also result in good CO reductions without additional standards for CO. However, we are proposing that manufacturers measure and report CO. We believe this information will be useful to consumers and state and local regulators. Requiring manufacturers to measure and report CO emissions would also result in the collection of data that could be used in the future to establish a CO emissions limit. We are requesting specific comments and supporting data on the need for and level of a possible CO emissions standard. Also, we ask for comments on whether we should require CO monitors to help ensure proper operation of the heater and to reduce health and safety concerns for appliances that are installed in occupied areas.

c. Pellet Fuel Requirements

A wide variety of pellet fuels is available for purchase. However, in some cases, quality claims on the pellet fuel bag do not necessarily reflect what is in the bag and there can be variable performance. Manufacturers' data show that some fuel qualities have worse burning characteristics and operational characteristics than others, which results not only in heater performance problems but also increased emissions of PM. The PFI, an industry trade organization, has had pellet fuel quality standards in place since 1995, with updated standards issued in 2005, and again, most recently in 2011 (http://pelletheat.org/wp-content/uploads/2011/11/PFI-Standard-Specification-

November-2011.pdf), in response to the EPA's planned revisions to the residential wood heaters NSPS. We have reviewed the PFI program and believe it is a good program that obviates the need for the EPA to develop our own program at this time. Under the proposed NSPS, pellet burning appliances would be tested using PFI (or, upon request to the EPA Administrator, an equivalent organization's) graded pellet fuel(s). Once certified, pellet burning appliances would only be allowed to burn the grade of fuel that the appliance manufacturer chose for the appliance certification test and the manufacturer specifies in their owner's manual for the operator to use. As discussed above, use of inferior grades would cause heater operational problems and increase emissions. The overall intent of the certification process is to increase the consistency and quality of pelletized fuel throughout the industry, and, thus, reducing appliance operational problems and helping certified appliances perform at the emission levels to which they are certified. Heater manufacturers have indicated to us that market competition will compel them to specify the widest range of grades for which their heaters will properly perform.

The PFI is also implementing a quality assurance program to ensure that manufacturers reliably produce graded fuels. We propose to require adherence to this program (or equivalent) as a condition of producing graded pellet fuels to be used in obtaining certification under the NSPS. Similar to the NSPS quality assurance program, the PFI quality assurance program relies on use of accreditation and auditing bodies that:

- Accredit auditing agencies and testing laboratories
- Implement and enforce the program, including testing that the pellet fuels meet the grading specifications

- Maintain the enforcement regulations
- Administer a laboratory proficiency program
- Pursue product complaints

In addition, accredited auditing agencies perform the following tasks:

- Certify the production of densified fuel manufacturers
- Authorize production facilities to use PFI's "grading mark"
- Conduct regular audits and extracts samples for third party verification
- Revoke authority to use the PFI mark, if necessary

Accredited testing laboratories perform the following activities:

- Provide QA/QC testing for fuel producers – "as needed"
- Provide testing for samples collected by auditing agencies
- Participate in the accreditation body's proficiency testing program

Finally, the densified fuel producers perform the following activities:

- Develop an in-house QA/QC program based on the PFI QA/QC handbook and the PFI

standard specification

- Select an auditing agency and test lab
- Demonstrate compliance with grading system component
- Maintain compliance through periodic audits, inspection and testing

As noted earlier, we have reviewed the PFI program and believe it is a good program that obviates the need for the EPA to develop our own program at this time. We ask for specific comments on this decision and the PFI program.

d. Prohibited Fuel Types

As regulated in the current 1988 subpart AAA standards for residential wood heaters/stoves, operation according to the owner's manual requires operation with the appropriate fuels because the choice of fuels to burn in any appliance can have a major impact on emissions and efficient operation of the appliance. For clarity, we are proposing a list of prohibited fuel types (*e.g.*, trash, plastics, yard waste) to emphasize the responsibility of owners and operators to use appropriate fuels that will result in the performance of the unit as certified, to avoid the creation of possibly hazardous fumes from burning inappropriate materials, and to ensure that appliance continues to operate as designed. Even with burning clean wood, one of the key factors affecting emissions is the moisture content. Some advocates have suggested that we only allow use of wood certified to a certain moisture level and that we include visible emission limits as a tool to help with practical enforceability of the requirements for proper operation and maintenance. Manufacturers typically include in their owner's manuals information on proper maintenance and operation and state that the wood must be properly seasoned so that the moisture content is not too high for proper operation. Some manufacturers include moisture meters for the operators. We are proposing to require commercial owners (direct distribution manufacturers and retailers) to provide a moisture meter with the wood heater at the time of sale, along with the owner's manual and a copy of the warranty. We request specific comments on whether we should include more specific

requirements on proper operations, such as the moisture content of the wood and visible emission limitations.

C. How did we establish the proposed compliance timelines?

The following table summarizes the proposed compliance timelines for the appliances covered by the three subparts.

Table 13. Summary of Proposed Compliance Dates

Appliance Type	Compliance Date
Adjustable Rate Wood Heaters or Pellet Heaters/Stoves with Current EPA Certification Issued Prior to the Effective Date of the Final Rule	1988 requirements remain in effect for these heaters/stoves through the later of the effective date of the final revised rule or expiration of current certification (maximum of 5 years after certification and no renewal)
All Other Adjustable Rate Wood Heaters or Pellet Heaters/Stoves (includes currently certified heaters after the certification expires)	Step 1: upon the effective date of the final rule Step 2: 5 years after the effective date of the final rule
Single Burn Rate Heaters	Step 1: Upon the effective date of the final rule Step 2: 5 years after the effective date of the final rule
Hydronic Heaters	Step 1: Upon the effective date of the final rule Step 2: 5 years after the effective date of the final rule
Forced-Air Furnaces	Step 1: Upon the effective date of the final rule Step 2: 5 years after the effective date of the final rule
Masonry Heaters	Large manufacturers: Upon the effective date of the final rule for large manufacturers Small manufacturers: 5 years after the effective date of the final rule

The proposed compliance dates are tied to the effective date of the final standards. As stated earlier, an element of the BSER determination includes reasonable lead time for R&D to develop and certify cleaner units. We think limited or no R&D is needed to comply with the proposed Step 1 BSER standards. This allows manufacturers approximately 1 year between the date of this proposal and the date of the final rule to meet proposed compliance standards and limits. This 1-year period is in addition to the time that manufacturers have had leading up to this proposed rule.

We allowed small producers of masonry heaters that do not have a history of federal or extensive state regulation, or experience with voluntary partnership programs, 5 years after the effective date of the final rule to come into compliance with the same emission standards as larger masonry heater manufacturers in order to ensure a reasonable lead-time.

Finally, we think our proposal for a 6-year lead time before the Step 2 BSER limits (*i.e.*, 5 years after the effective date of the final rule) would allow manufacturers a reasonable time to develop complying models, access the necessary capital to develop them, and complete the certification process.

We are proposing a 6-month "sold at retail" provision for adjustable burn rate wood heaters, single burn rate heaters/stoves, and pellet heaters/stoves that were manufactured prior to the effective date of the final rule, but not yet sold. This "sold at retail" provision is similar to that provided in the current subpart AAA, and provides a reasonable transition for manufacturers to recoup their investment in their stock on hand. We believe this provision would have a nominal impact on air quality, because the majority of these appliances are already expected to achieve the Step 1 emission limits.

For small producers of masonry heaters, we are proposing an additional 5-year lead-time. We are not proposing to apply these extensions to other sources regulated by this proposal. We do not believe that an additional "sold at retail" provision is needed for outdoor and indoor hydronic heaters and forced-air furnaces. In the case of hydronic heaters, we believe that any delay of the compliance deadline for sales would also result in the sale and long-term use of non-complying units, with a potentially adverse quality impact. We request specific comments on whether there are other factors we should consider regarding this "sold at retail" window and what length of time might be considered appropriate in specific circumstances.

While the original subpart AAA created a 1-year compliance extension for wood heater manufacturers producing less than 2,000 heaters per year, this proposed rule does not include a compliance extension provision for single burn rate heaters. The purpose of the original NSPS compliance date extension was to reduce the potential for a testing logjam and to provide small manufacturers additional time to conduct R&D, obtain financing, or purchase complying designs likely to meet the proposed standards. We believe that manufacturers and testing facilities have now had sufficient time and have gained the expertise necessary to meet these standards as proposed and that meeting the proposed compliance dates will impose no undue imposition on manufacturers or testing facilities. We request comment on the need for such a compliance extension and the number of models that might qualify as a small single burn rate heater manufacturer.

As stated above, we are proposing a 5-year compliance date extension for masonry heater manufacturers that sell fewer than 15 units per year. We also seek comments on whether we should have a cap on the total units sold in the 5 years, perhaps

50 units. Most of these manufacturers are very small companies. There are only a few major producers. According to one manufacturer, the Finnish firm, Tulikivi, manufactures and supplies about one-half of the U.S. masonry heater units installed yearly through its network of installing distributors. The second largest producer is a Canadian firm, Temp-Cast, which manufactures and exports a large percentage of the remainder as internal core components only to U.S. dealer/installers and homeowners. This manufacturer states that the remainder of the industry is dozens of small producers and installers who produce only a few units, most of which are custom and individually designed. This manufacturer also stated that over 80 percent of U.S. masonry heater installations use manufactured core product installation and are not custom site built (brick-by-brick).

Because of the resources required to develop, test, and certify masonry heaters (estimated by industry to be approximately $250,000 per model, although our cost analysis used a larger estimate), we have concluded that a manufacturer of a small number of custom site-built model(s) of masonry heaters would likely be unable to recover the total cost of R&D and certification testing costs in a reasonable timeframe. Similarly, a company that makes core components or sells design kits would be unable to recover total costs if only a few such components or kits are sold per year. We estimated that the annualized cost for developing, testing and certifying a single model is approximately $60,000, most of which is the cost of R&D. If a seller makes $5,000 of profit on each model sold, he or she would need to sell 12 units per year to break even. The masonry heater industry recognized concerns about these costs, and it has developed an alternative compliance method based on computer simulations. The industry expects

that this alternative will allow sharing licensing of cleaner designs such that the initial software purchase would cost approximately $1,500 but ongoing annual licensing cost will be approximately $450 per manufacturer. We believe the 5-year compliance date extension discussed above for masonry heater manufacturers that sell fewer than 15 units per year will allow sufficient time for manufacturers to become comfortable with this alternative, and use it to demonstrate compliance**.**

We considered proposing a compliance exemption for small manufacturers of masonry heaters because of the overall small size of the market. However, we were concerned that this might encourage installation of cheaper, low-performing models, which would place complying models at a potential disadvantage. We request comment on the need for either a compliance date extension or a compliance date exemption for masonry heaters and the length of time that we should allow.

We are not proposing any extensions or exemptions for small manufacturers of adjustable burn rate wood heaters or pellet heaters/stoves. Adjustable burn rate wood heaters are already subject to the NSPS, and we have estimated that they should not face any R&D expenses to comply with the Step 1 standards. To reduce unnecessary certification costs, we are proposing to allow a one-time waiver from performance testing for the first certification period for any manufacturer that has previously conducted a valid certification test that demonstrates the wood heaters in the model line meet the proposed standards. We also believe that pellet heaters/stoves would not face any R&D costs to comply with the proposed Step 1 standards, and we estimate that certification costs will only pose a minor impact. We request comment on whether there are other

factors we should consider regarding a small manufacturer compliance extension for these appliances.

We also are not proposing a small manufacturer compliance extension for the Step 1 standards for new residential hydronic heaters or forced-air furnaces. There are currently 36 hydronic heater models built by 17 U.S. manufacturers that have already been qualified to meet the Phase 2 voluntary partnership program level of 0.32 lb/MM BTU. Manufacturers of hydronic heaters and forced-air furnaces have known for several years that we were drafting this proposal and that the states have been very concerned about emissions from the models that may not meet the proposed standards; and we do not want to perpetuate sales and use of models unless they demonstrate they do meet the standards. Once again, we request comment on whether there are other factors we should consider regarding a small manufacturer compliance extension for these appliances and what number of appliances sold would constitute a small volume manufacturer.

As discussed above, we recognize there is some concern, as there was with the initial NSPS compliance dates, that testing laboratories capacity may not be able to meet the demand for certification tests in the first few years. However, we believe that the steps we have already proposed, the availability of additional ISO-accredited labs, the advance notice that industry has had concerning the NSPS prior to this proposal, and the time between this proposal and the proposed compliance date of the final rule, should ensure that adequate compliance certification resources are available. The logjam provisions of the current 1988 NSPS were never invoked, and we do not think they are needed at this time. However, we are taking comment on this issue. We also request comment on whether these compliance timelines strike the right balance between

avoiding undue economic burdens and the need to get better performing models on the market as soon as possible to reduce emissions, and whether other compliance dates would be appropriate.

D. How are we proposing to streamline the requirements for certification, quality assurance and laboratory accreditation?

As part of the NSPS review process, several stakeholders stated the need to improve the current certification and quality assurance requirements. For example, some pellet heaters/stove manufacturers said one reason they avoid certifying their heaters/stoves is because they are concerned that the current process is a barrier to rapid product development and making changes to respond to market demand. Many manufacturers were also concerned that, as the scope of the NSPS program expands to include multiple appliance types, the certification program would act as a logjam. Some states are concerned, however, that moving away from the EPA certification might result in less effective oversight. At the EPA, we are also looking for ways to use our enforcement resources more effectively.

We believe that the proposed changes, described in section III.A regarding a third-party certification program by an ISO-accredited certifying body and testing at ISO-accredited labs, will facilitate the development of improved designs by providing a faster approval process and reducing redundancies in quality assurance for emissions testing and safety testing, and will improve enforcement by providing for more frequent on-site inspections of manufacturing facilities and laboratories. For example, safety certification audits take place quarterly and include the random inspection of manufactured units for

compliance with design and safety factors. The experience of the voluntary partnership programs' ISO process has shown that the third-party approach can work.

We also reviewed the list of design changes (the "k" list; See 40 CFR, subpart AAA, § 60.633(k)) that would result in a need to recertify a model line when certain tolerances are exceeded. We reviewed this list based on the experience we have to date on the types of changes that are significant and knowledge about current manufacturing processes that help prevent these changes from occurring. The resulting list focuses on the following key tolerances:

- Firebox dimensions
- Air introduction systems
- Dimensions and locations of the baffle, catalyst, refractory/insulation, flue gas exit, and the outer shielding and covering
- Dimensions and fit of the gaskets for the door and catalyst bypass
- Fuel feed system
- Forced air combustion system

We believe these changes will focus resources on the significant changes that could affect emissions performance of the model in question. We ask for specific comments on this list and the level of appropriate tolerances.

We propose to revise the requirement for manufacturers to conduct quality assurance emission tests once a specified number of units are sold. Instead, we propose to replace this numerical trigger with a requirement to retest when manufacturer-specific quality assurance criteria (*e.g.*, multiple errors in safety tests) are exceeded. We believe that development of a manufacturer–specific quality assurance plan with specific criteria

and approval by an ISO-accredited certifying body (or EPA-approved equivalent) and required follow-up by that certifying body is a more direct measure of possible performance issues, but we request comment on the exact event(s) that should be used as the trigger(s) to retest and whether the triggering event(s) should vary by appliance type.

We are proposing to retain final EPA approval of the certification, and we also propose to require the manufacturer to submit with the application for certification a statement signed by a responsible official that the manufacturer has complied with all requirements of the subpart and that the manufacturer understands that he or she remains responsible for compliance regardless of noncompliance by the certifying body. We believe this combination of requirements would provide meaningful EPA oversight, assign clear lines of responsibility, and free up resources to do more on-site inspections and other quality assurance activities, such as addressing issues of counterfeit certificates or absence of certificates.

The current random compliance audit testing of the certification testing program is considered underused by many. The EPA recognized this and has recently initiated such testing.

A key element of the current 1988 NSPS laboratory audit program is the “round robin” test program. In this program, the EPA purchases a wood heater and sends it to each of the accredited laboratories to conduct emissions tests (two runs at each burn rate for a total of eight runs). The EPA then compares the results to determine inter-laboratory performance. The EPA recognizes that we have not given this program as much attention as was envisioned in 1988. Thus, we propose to strengthen this program by specifying that every laboratory conducting certification tests under the NSPS must participate in the

round robin tests every other year. If a lab's results are not within ±10 percent of the value at which the heater was certified, then the lab must conduct another 8 runs. Also, we will remind the manufacturers that, as always, the EPA may potentially use this information to help determine the need for manufacturer audits and potential enforcement actions. We think that these requirements and reminders, combined with the proposed changes in test methods (described in greater detail in the test methods discussion in this preamble) and implementation of the ISO process will help improve inter-laboratory repeatability and reproducibility.

E. What changes and additions to the allowed test methods are we proposing?

As described earlier in this preamble, we are proposing changes to the test methods required by subpart AAA. We are also proposing test methods for the new subparts QQQQ and RRRR (as described earlier). In addition, we are proposing new requirements for testing and ultimately certifying using cord wood, which is what the consumer burns. All affected devices required to be tested using Method 28 or Method 28 WHH would now be required to conduct such tests using crib wood and cord wood. Under Proposed Step 1, manufacturers would have the option of selecting which of these test results to use to show compliance with the emissions standards. In other words, we are proposing to require manufacturers to conduct two separate tests, one with crib wood and one with cord wood. We are also proposing that manufacturers be required to report the results of both tests to the EPA, but manufacturers can choose to certify with either crib or cord wood under Proposed Step 1. Under Proposed Step 2, manufacturers would be required to show compliance testing with cord wood.

We are also proposing to revise the test methods to require the addition of 1-hour filters for each test run to gather data regarding startup and anticipated peaks. Further, we are proposing new compliance requirements for Step 2 with emissions limits at the lowest burn rate (Category 1) and the maximum burn rate (Category 4), not a weighted average of the four burn rates, as in the current 1988 NSPS.

Based on the extensive consensus development process, history of the subpart AAA NSPS and hydronic heater voluntary partnership program emission test experience, and review of similar international standards, we believe the proposed methods reflect state-of-the-art test methods. However, we request specific comment on test method related issues and any data supporting such issues or concerns.

F. What other changes and additions to the administrative requirements are we proposing?

Consistent with Executive Order 13563: Improving Regulation and Regulatory Relief, we reviewed the entire current subpart AAA to identify information that is no longer relevant or useful and removed associated reporting and recordkeeping requirements. For example, because of the changes in the audit procedures, we do not believe it is necessary for manufacturers to keep records of the number of affected appliances that are sold each year, by certified model lines, for purposes of these subparts.

The prohibitions section in each of the proposed subparts (§ § 60.538, 60.5480, 60.5492) is based substantially on the current prohibitions section in subpart AAA. Similarly, the delegation section in each proposed subpart (§ § 60.539a, 60.5482, 60.5494) is based primarily on the current delegation section in subpart AAA. In general,

we believe these delegations have worked well and are still appropriate with some clarifications and additions. The intent of the prohibitions section is to clarify the responsibility of owners and operators and manufacturers to comply with the proposed subparts. Key provisions for owners and operators emphasize that appliances must be operated in accordance with the owner's manual and the appliances must not be altered in any way to circumvent the design and operation of a certified appliance. Key provisions for manufacturers emphasize the importance of complying with the label requirements and the need to maintain current certification for all heaters that are offered for sale. The intent of the delegation section is to clarify the regulatory provisions for which the EPA has retained sole enforcement authority (definitions, compliance and certification, test methods and procedures, laboratory accreditation, reporting and recordkeeping, revocation of certification, and hearings and appeals procedures). However, we have proposed to include the ability to delegate provisions to state, local or tribal agencies where local enforcement is essential, such as enforcement of permanent labels and owner's manual content, and presentation of false or misleading information. Note that when the EPA "delegates" enforcement authority, we retain our authority to enforce while allowing the delegatees also to be able to enforce the delegated provisions. Also note that the delegations are upon request, not a requirement by the EPA.

We are proposing to replace the current subpart AAA hearing and appeal procedures with a streamlined Petition for Review process and also use this process in subparts QQQQ and RRRR. This process would allow accredited laboratories and manufacturers to contest audit test findings, laboratory accreditations, certification denials, and certification revocations by submitting a written request and supporting

documentation to the EPA. This process would allow for expedited review and resolution. We request specific comments on this proposed process and other ways to improve or streamline procedures while preserving the integrity of the program.

VI. Statutory and Executive Order Reviews

A. Executive Order 12866: Regulatory Planning and Review and Executive Order 13563: Improving Regulation and Regulatory Review

Under Section 3(f)(1) of Executive Order 12866 (58 FR 51735, October 4, 1993), this action is an "economically significant regulatory action" because it is likely to have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or state, local, or tribal governments or communities. The $100 million threshold can be triggered by either costs or benefits, or a combination of them. Accordingly, the EPA submitted this action to OMB for review under Executive Orders 12866 and 13563 (76 FR 3821, January 21, 2011) and any changes made in response to OMB recommendations have been documented in the docket for this action.

In addition, the EPA prepared an analysis of the potential costs and benefits associated with this action. This analysis is contained in the RIA for this proposed rule. A copy of the analysis is available in the docket for this action.

A summary of the monetized benefits and net benefits for the proposed rule at discount rates of 3 percent and 7 percent is in Table 8 of this preamble, and a more detailed discussion of the benefits is found in section IV.B of this preamble. For more information on the benefits analysis, please refer to the RIA for this rulemaking, which is

available in the docket.

B. Paperwork Reduction Act

The information collection requirements in this proposed rule have been submitted for approval to OMB under the *Paperwork Reduction Act*, 44 U.S.C. 3501 *et seq*. Information Collection Request (ICR) documents have been prepared for each proposed subpart. The subpart AAA ICR has been assigned the EPA ICR number 1176.10, which is a revision of the currently approved ICR number 1176.09. The subpart QQQQ ICR is a new collection, which has been assigned the EPA ICR number 2442.01. The subpart RRRR ICR also is a new collection, which has been assigned the EPA ICR number 2443.01. The new information collection requirements are not enforceable until OMB approves them.

The proposed rules would require manufacturers of new residential wood heating devices to submit applications for certification of model lines, to submit results of emissions tests conducted to demonstrate that the model lines would comply with the standards and produce certified units according to a quality control plan approved by an independent certifying body. Manufacturers must submit a notification of the initial test and biennial reports that each certified model line remains unchanged. They must also maintain records of all certification data, maintain results of quality assurance program inspections and emissions test data, and seal and store the tested appliance.

Consistent with the current ICR for subpart AAA, we have included costs to manufacture and apply permanent labels (for all models) on each applicable unit prior to sale. These labels provide important compliance information to enforcement officials.

Test laboratories that want to conduct NSPS certification testing would need to apply for accreditation, conduct initial and biennial proficiency testing and report the results of all such testing. Accredited test laboratories would also be required to participate in an audit compliance program. Finally, the accredited laboratories must maintain records of all certification tests, proficiency tests and compliance audit test data.

The required notifications are used to inform the agency when a new model line is expected to be tested. The EPA may then observe the testing operation, if desired. Emissions test reports are needed as these are the agency's record of a model line's initial capability to comply with the emission standard, and serve as a record of the operating conditions under which compliance was achieved.

Adequate recordkeeping and reporting are necessary to ensure compliance with these standards as required by the CAA. The information collected from recordkeeping and reporting requirements is also used for targeting inspections and is of sufficient quality to be used as evidence in court. As discussed earlier, we have reviewed all the current requirements and are proposing to remove the portions of the recordkeeping that are not necessary.

The estimated burden for proposed subpart AAA is based on an estimated 72 respondents (66 manufacturers and 6 testing laboratories) that would be subject to the rule. The number of total annual responses for subpart AAA is estimated at 265. The annual burden for this information collection averaged over the first 3 years of this ICR is estimated to be a total of 6,489 labor hours per year at a total labor cost of $516,188 per year. The ICR estimates that capital and the associated operation and maintenance

(O&M) costs for these systems would be $1,452,177 per year. The average annual labor burden per response is 24 hours.

The estimated burden for proposed subpart QQQQ is based on an estimated 41 respondents (37 manufacturers and 4 testing laboratories) that would be subject to the rule. The number of total annual responses for subpart QQQQ is estimated at 67. The annual burden for this information collection averaged over the first 3 years of this ICR is estimated to be a total of 2,134 labor hours per year at a total labor cost of $169,745 per year. The ICR estimates that capital and operation and maintenance (O&M) costs would be $715,796 per year. The average annual labor burden per response is 32 hours.

The estimated burden for proposed subpart RRRR is based on an estimated 48 respondents (45 manufacturers and 3 testing laboratories) that would be subject to the rule. The number of total annual responses for subpart RRRR is estimated at 108. The annual burden for this information collection averaged over the first 3 years of this ICR is estimated to be a total of 2,044 labor hours per year at a total labor cost of $162,589 per year. The ICR estimates that capital and operation and maintenance (O&M) costs would be $89,037 per year. The average annual labor burden per response is 19 hours. Burden is defined at 5 CFR 1320.3(b).

An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for the EPA's regulations in 40 CFR are listed in 40 CFR part 9.

To comment on the agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, the EPA has established a public docket for this rule, which includes this ICR,

under Docket ID number EPA-HQ-OAR-2009-0734. Submit any comments related to the ICR to the EPA and OMB. See **ADDRESSES** section at the beginning of this notice for where to submit comments to the EPA. Send ICR-related comments to OMB at the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th Street, NW, Washington, DC 20503, Attention: Desk Office for EPA. Since OMB is required to make a decision concerning the ICR between 30 and 60 days after **[INSERT DATE OF PUBLICATION IN THE FEDERAL REGISTER],** a comment to OMB is best assured of having its full effect if OMB receives it by **[INSERT DATE 30 DAYS FROM DATE OF PUBLICATION IN THE FEDERAL REGISTER].** The final rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

C. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations and small governmental jurisdictions.

For purposes of assessing the impacts of this proposed rule on small entities, small entity is defined as: (1) a small business that is primarily engaged in manufacturing heating equipment (except electric and warm air furnaces), such as heating boilers (heaters), heating stoves, floor and wall furnaces, and wall and baseboard heating units, as defined by NAICS code 333414 with fewer than 500 employees, or is primarily

engaged in manufacturing air-conditioning and warm air heating equipment as defined by NAICS code 333415 with fewer than 750 employees, or is primarily engaged in masonry contracting, as defined by NAICS code 238140 with annual receipts less than 14 million dollars (based on Small Business Administration size standards); (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.

Pursuant to section 603 of the RFA, the EPA prepared an initial regulatory flexibility analysis (IRFA) that examines the impact of the proposed rule on small entities along with regulatory alternatives that could reduce that impact. The IRFA contained within the RIA for this proposed rule is available for review in the docket and is summarized below:

- Reason Why Action Is Being Considered. As discussed earlier in this preamble, this proposal was developed following CAA section 111(b)(1)(B) review of the existing residential wood heater NSPS.
- Statement of Objectives and Legal Basis of Proposed Rule. As discussed earlier in this preamble, the EPA is proposing to amend Standards of Performance for New Residential Wood Heaters and to add two new subparts: Standards of Performance for New Residential Hydronic Heaters and Forced-Air Furnaces and Standards of Performance for New Residential Masonry Heaters. This proposal would achieve several objectives, including applying updated emission limits that reflect BSER; improving coverage of the broad suite of residential wood heaters; improving the test

methods; and streamlining the certification process. This proposal does not include any requirements on heaters that are solely fired by gas or oil. This proposal does not affect existing heaters. This proposal was developed under the authority of CAA section 111.

- Description and Estimate of the Number of Small Entities. As discussed earlier in this preamble, small entities that the EPA anticipates being affected by this proposal would include almost all manufacturers of residential wood heaters. We estimate that roughly 250–300 U.S. companies manufacture residential wood heaters. We believe that approximately 90 percent of these manufacturers meet the SBA small-entity definition of having fewer than 500 employees.
- Description of reporting, recordkeeping and other compliance requirements. The reporting and recordkeeping requirements are described in the section immediately above (*B. Paperwork Reduction Act*). As discussed there, the information collection requirements (ICR), including reporting and recordkeeping, in this proposed rule have been submitted for approval to OMB under the *Paperwork Reduction Act*, 44 U.S.C. 3501 *et seq*. For subpart AAA, we estimated the potential annual burden averaged over the first 3 years of the ICR to be a total of 6,489 labor hours per year at a total labor cost of $516,188 per year and an average annual labor burden per response of 24 hours. For subpart QQQQ, we estimated 2,134 labor hours per year at a total labor cost of $169,745 per year and an average annual labor burden per response of 32 hours. For subpart RRRR, we estimated 2,044 labor hours per year at a total labor cost of $162,589 per year and an average annual labor burden per response of 19 hours.

- Description of other compliance requirements. As described earlier in this preamble, this proposal would apply updated emission limits that reflect the current best systems of emission reduction and improve the coverage of the expanded variety of types of residential wood heaters. We estimate the proposed NSPS's total annualized average nationwide costs would be $15.7 million (2010$) over the 2014 through 2022 period. The economic impacts for industries affected by this proposed rule over this same period range from 4.3 percent for manufacture of wood heater/stove models to as much as an 6.4 percent compliance cost-to-sales estimate for manufacture of single burn rate wood heater models. These impacts do not presume any pass-through of impacts to consumers. With pass-through to consumers, these impact estimates to manufacturers will decline proportionate to the degree of pass-through. We estimate that small entities will have annualized costs of greater than 1 percent of their sales in all industries except NAICS 332510, 333414 and 423720 with fewer than 20 employees, and NAICS 236115, 238140 and 442299 with receipts less than $10 million. Those establishments in NAICS 332510, 333414 and 423720 with cost-to-receipt ratios higher than 1 percent account for 80 percent of small entities affected in these industries. Establishments in NAICS 236115, 238140 and 442299 with cost-to-receipt ratios higher than 1 percent account for 99 percent of small entities affected in these industries.
- Relevant federal rules that may overlap or conflict with this proposal. There are no other relevant federal rules.

• Significant alternatives. The significant alternatives to this proposal, especially those that might minimize potential impacts on small entities, are presented in the remainder of this section.

As required by section 609(b) of the RFA, as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA), the EPA also convened a Small Business Advocacy Review Panel (Panel) to obtain advice and recommendations of representatives of the small entities that potentially would be subject to the rule's requirements. The following paragraphs describe the process, the type of small entity representatives, the outreach efforts and the Panel members.

Well before beginning the formal SBREFA process, the EPA actively engaged in outreach with HPBA, the Masonry Heater Association (MHA) and PFI and many of their member companies to discuss the rule under development and to provide these contacts with an early opportunity to ask questions and discuss their concerns.[67] The EPA provided each small business with general information on the SBREFA process and background information on the NSPS rulemaking process and current schedule.

Based on consultations with the Small Business Administration, and resulting from solicited self-nominations, we prepared a list of 30 potential Small Entity Representatives (SERs), from residential wood heating appliance manufacturers (wood heaters, pellet heaters/stoves, hydronic heaters, forced-air furnaces and masonry heaters), other wood-burning appliance manufacturers (fireplaces, cook stoves), equipment suppliers, chimney sweeps, test laboratories, masons and trade associations. Once the

[67] Also, as noted in this preamble in the discussion of development of the hydronic heater emission limits, the EPA worked with the hydronic heater industry in 2006 to develop a voluntary partnership program to encourage manufacture of cleaner models, www.epa.gov/burnwise/participation.

official pre-Panel process began and potential SERs were identified, the EPA held an outreach meeting with the potential SERs and invited representatives from the Office of Advocacy of the Small Business Administration (OA/SBA) and the Office of Information and Regulatory Affairs within the Office of Management and Budget (OIRA/OMB) on June 29, 2010, to solicit their feedback on the upcoming proposed rulemaking. Representatives from 26 of the 30 companies and organizations that we selected as potential SERs for this SBREFA process participated in the meeting (in person and by phone). At that meeting, the EPA solicited written comments from the potential SERs, which were later summarized and shared with the Panel as part of the convening document.

The SBAR Panel convened on August 4, 2010. The Panel consisted of representatives of the EPA, OA/SBA and OIRA/OMB. The Panel held a formal outreach meeting/teleconference with the SERs on August 25, 2010. To help the SERs prepare for this meeting, on August 11, 2010, the Panel sent a list of questions, preliminary cost information and other materials to each of the SERs via email. Additional materials were emailed to the SERs on August 19, 2010. The Panel provided the opportunity for questions and comment during the meeting on various aspects of the proposal being developed, including the expanded scope of the rule, changes to the current requirements under consideration, preliminary cost information and follow up from the June 29, 2010, meeting on the SERs' ideas for regulatory flexibility. During the August 25 meeting, SERs voiced general support for the planned proposed rule and shared specific concerns with the Panel members. As a result of this meeting, the EPA received many useful

verbal comments, and the EPA received many helpful written comments by September 10, 2010.

Consistent with the RFA/SBREFA requirements, the Panel evaluated the assembled materials and small-entity comments on issues related to elements of the IRFA. A copy of the Panel final full report is included in the docket for this proposed rule. We invite comments on the report. A summary of the Panel recommendations is presented below. We have attempted to follow the Panel's recommendations to the degree we can while also ensuring that the options are practicable, enforceable, environmentally sound and consistent with the CAA. For those recommendations not adopted by the EPA, we have included an explanation for why we rejected them.

Many of the SERs and the Panel had concerns about the breadth of this rulemaking and the challenges the EPA faces in conducting rulemaking for all of these source categories at one time and the challenges that the small businesses will face in having to comply with standards for all of these source categories at one time. The Panel recommended that the EPA should consider focusing efforts first on emissions sources that have the greatest potential to impact public health through the magnitude of emissions and population exposure. We have focused our efforts. The Panel noted the adverse effects of the 1988 NSPS on numerous wood heater/stove manufacturers, and the need to carefully develop a rule that will minimize business closures, while still achieving significant emission reductions. All Panel members believed that the EPA had adequate information to move forward with developing revisions that apply to the residential wood heater categories that are already regulated by the 1988 NSPS. However, two Panel members recommended that the EPA Administrator consider taking more time to collect

additional information to better determine BSER for the certified wood heater category. They concluded that the EPA did present to the Panel enough information to justify regulation of this subcategory, but the EPA did not adequately inform the SERs about the other categories. These two Panel members believed it was unclear whether adoption of a more stringent standard for new sources would slow the adoption of new, cleaner burning heaters, potentially delaying improvements in air quality. The two Panel members further believed, based on the information available from the EPA and the SERs at that time, that they could not conclude that a nationwide NSPS limit on the other categories would be the preferred approach for reducing wood heater emissions.

Following the Panel's convening on August 4, 2010, the EPA collected additional information, and we refined the economic and technical analyses based, in part, on input from the SERs as the basis for this proposal. The Panel recommended that the EPA Administrator consider assessing the availability of data to better characterize each source category prior to considering proposal of standards. In particular, the Panel recommended that the EPA consider characterizing the emissions per unit, operating hours per year, and the distribution of emissions across the unit types within each category under discussion at that time to better understand the magnitude of emissions reductions that may or may not be reduced through alternative regulatory and non-regulatory mechanisms. As discussed earlier, the EPA has considered such characterizations and alternatives.

The following is a list of Panel recommendations and how we incorporated them into this proposal:

- The Panel recommended that the EPA should consider focusing efforts first on emissions sources that have the greatest potential to impact public health through the magnitude of emissions and population exposure. *This proposal focuses on those sources.*
- The Panel encouraged the EPA to consider flexibilities that will most directly minimize the small business burdens, for example delayed compliance dates for low volume production. The delayed compliance approach was predicated on the concept that it will take a number of years for manufacturers to recover the costs of the R&D investment in order to achieve compliance. *This proposal has incorporated a stepped approach for emission limits and asks for comments on other alternative approaches.*
- The Panel recommended that the EPA consider the availability and feasibility of certification, testing labs, testing standards and other requirements. In particular, the Panel recommended that the EPA consider ways to streamline compliance certification, identifying flexible approaches and procedures that will reduce the burden and time for manufacturers to complete the application, testing and approval process for new model lines. For example, the Panel recommended that the EPA consider allowing the use of International Standards Organization (ISO)-accredited laboratories and certifying bodies to expand the number of facilities that would be required for testing and certification of the new residential solid biomass combustion appliances. Additionally, the Panel recommended that the EPA consider different compliance time frames for different product categories to reduce the potential for logjams at test labs and the overall impact on companies that manufacture multiple categories. *This proposal includes stepped emission limits for different categories and*

adds ISO-accredited laboratories and ISO-accredited certifying bodies to increase the availability of laboratories and certifiers. Further, this proposal asks for specific comments on the schedules.

- The Panel recommended that the EPA continue to allow manufacturers to test a representative unit for a model line rather than testing and reporting results for each individual unit. *This proposal continues to allow that.*
- The Panel recommended that the EPA consider emphasizing that the NSPS will address only new units. *This proposal emphasizes that it does not affect existing units.*
- In the Panel Report, SBA and OMB recommended that the EPA not move forward with proposed emission limits for pellet stoves, indoor hydronic heaters, biomass pellet stoves, masonry heaters, masonry fireplace kits, site-built masonry fireplaces, coal stoves, cook stoves, bake ovens (including Native American Traditional Bake Ovens), camp stoves, outdoor fireplaces and chimineas. *This proposal establishes emission limits for pellet stoves/heaters, which compete with adjustable burn rate wood stoves/heaters in the "room heaters" consumer marketplace. There is confusion in the marketplace as to why some pellet stoves are regulated and why some are not. As discussed earlier in this preamble, the potential exclusion of pellet stoves with greater than 35-to-1 air-to-fuel ratio is an unintended consequence of the 1988 actual intention of not setting emission limits for open fireplaces with high excess combustion air that do not operate as effective heaters. We believe that not moving forward on pellet stoves now would contribute to further confusion and an uneven playing field in the marketplace. Further, the emission levels we are proposing for pellet stoves/heaters are at the same level as the proposed wood stove/heater*

standards and are already achieved by most pellet stove/heater models and thus do not impose substantial compliance costs. Similarly, masonry heaters compete in the residential wood heaters consumer marketplace and there is confusion as to why they are regulated by some states, but not the EPA, and are even banned by some air districts because masonry heaters are not EPA-certified. Most masonry heaters are effective heaters and relatively clean and efficient, especially compared to pre-NSPS wood stoves. Requiring valid certification testing and reporting and providing that information to regulators and consumers and the public will help inform all as they strive to make appropriate choices on wood heating and air quality. That is, the masonry heaters can be an excellent emission reduction choice for replacing higher emission pre-NSPS wood stoves and should be encouraged over old wood stoves in most air sheds. Further, the emission levels we are proposing are already achieved by most masonry heater designs and we allow extra time for small manufacturers. This proposal addresses indoor hydronic heaters because they compete with outdoor hydronic heaters and forced-air furnaces in the "central heaters" consumer marketplace and there already is confusion as to why some are regulated by some states and some are not. Further, the magnitude of their emissions is of great concern and BSER controls are highly justified on cost-benefit grounds. The remainder of the appliances listed above are not included in this proposal.

- In the Panel report, SBA and OMB recommended that "where EPA estimates that the nationwide emissions are less than 300 tons per year (or some other value)... the EPA Administrator should consider options of not issuing an NSPS but rather consider allowing Regions and States to control such sources and consider other efforts,

including voluntary standards to lower emissions." *We considered this recommendation but we could not find a legal or policy justification for an arbitrary cutoff and it is not included in this proposal. Also, we note that many states are prohibited from setting control requirements more stringent than the EPA requirements and all states have concerns about the lack of resources necessary to develop and adopt and implement state standards or voluntary programs, especially when most believe it is the EPA's responsibility, and some have sued the EPA for failure to review and promulgate national standards on time as statutorily required. Further, the EPA does not agree with this recommendation, especially considering the strong recommendations by many states that the EPA regulate all residential wood heaters as soon as possible to provide another tool to help them with their efforts to reduce wood smoke emissions. As stated elsewhere in this proposal, the EPA is not proposing standards at this time for biomass pellet heater/stoves that are designed to only combust biomass other than wood, bake ovens, fireplaces, coal-only stoves, chimineas, ceremonial fires and commercial pizza ovens.*

- Two Panel members recommended that if the EPA decides to later pursue regulation of categories other than certified wood heaters, the EPA should convene another Panel to address those subcategories at the appropriate time. *The EPA does not agree with this recommendation for residential wood heaters because the EPA believes that the SERs already have had multiple opportunities to address those subcategories. Furthermore, the EPA has conducted numerous meetings after the Panel process was completed to provide much additional information (e.g., technical discussions of refined alternatives) and updates to stakeholders including the SERs and other small*

businesses and other interested parties. We emphasize that this proposal is not a final rule but rather it is a proposal for public review and comment. We welcome comments and data on all aspects of this proposal that will help us prepare the final rulemaking.

As noted earlier, a copy of the Panel final full report is included in the docket for this proposed rule. We invite comments on the report and on all aspects of the proposal and its impacts on small entities.

D. Unfunded Mandates Reform Act

This proposed rule contains no federal mandates under the provisions of Title II of the Unfunded Mandates Reform Act of 1995 (UMRA), 2 U.S.C. 1531-1538 that may result in expenditures of $100 million or more for state, local or tribal governments, in the aggregate, or to the private sector in any 1 year. This proposed action imposes no enforceable duty on any state, local or tribal governments. The nationwide annualized average compliance cost of this proposed rule for directly affected appliances is $15.7 million/yr in the 2014-2022 timeframe (2010$). Therefore, this proposed rule would not be subject to the requirements of sections 202 or 205 of the UMRA.

This proposed rule would also not be subject to the requirements of section 203 of UMRA because it contains no regulatory requirements that might significantly or uniquely affect small governments. The proposed rule would not apply to such governments and would impose no obligations upon them.

E. Executive Order 13132: Federalism

Executive Order 13132 (64 FR 43255, August 10, 1999) requires the EPA to develop an accountable process to ensure "meaningful and timely input by state and local

officials in the development of regulatory policies that have federalism implications." "Policies that have federalism implications" are defined in the Executive Order to include regulations that have "substantial direct effects on the states, on the relationship between the national government and the states, or on the distribution of power and responsibilities among the various levels of government."

This proposed rule does not have federalism implications. It would not have substantial direct effects on the states, on the relationship between the national government and the states, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. The proposed rule would not impose any requirements on state and local governments. Thus, Executive Order 13132 does not apply to this proposed rule. Although section 6 of Executive Order 13132 does not apply to this proposed action, the EPA did consult with representatives of state and local governments in developing this action. In the spirit of Executive Order 13132 and consistent with the EPA policy to promote communications between the EPA and state and local governments, the EPA specifically solicits comment on this proposed rule from state and local officials.

F. Executive Order 13175: Consultation and Coordination with Indian Tribal Governments

This proposed action does not have tribal implications, as specified in Executive Order 13175 (65 FR 67249, November 9, 2000). This proposed rule would not impose any requirements on tribal governments; thus, Executive Order 13175 does not apply to this action. Although Executive Order 13175 does not apply to this action, we recognize that the air quality and public health benefits to be achieved by this rule would benefit

tribes, and we conducted outreach to tribal environmental staff and consulted with representatives of tribal officials in developing this action.

During the development of this proposed rulemaking, the EPA conducted outreach with numerous tribal representatives to provide opportunities for input prior to development of the proposed rule. We provided information at the July 2010, National Tribal Forum/National Tribal Air Association (NTAA) meeting in Albuquerque, New Mexico, and the November 2010, EPA Region 10 Tribal Leaders Summit in Juneau, Alaska. We also presented information on this proposed rulemaking in the April 2010, issue of Tribal Air News and during the EPA/NTAA tribal workgroup conference calls (April 2010, July 2010, August 2010, and May 2013). Specifically, we received input from the EPA/NTAA tribal workgroup members on culturally relevant exclusions from the proposed standards. We agreed with their input, clarified that we do not intend to regulate ceremonial fires, and added a definition to the rule to exclude traditional Native American bake ovens.

On February 18, 2011, the EPA mailed letters to about 600 elected tribal leaders in the U.S. offering an opportunity for consultation on this proposal. We received requests from six tribes. These tribes agreed to discuss this proposal with us in a conference call held on March 22, 2011. The tribes were very supportive of this proposal and provided some helpful clarifications of definitions (*e.g.*, Native American bake ovens) that we have incorporated in this proposal.

We plan to continue to provide updates on the rule on the EPA/NTAA conference calls and to offer opportunities to tribal leaders for consultation. The EPA specifically solicits additional comment on this proposed action from tribal officials.

G. Executive Order 13045: Protection of Children from Environmental Health Risks and Safety Risks

Executive Order 13045, "Protection of Children from Environmental Health Risks and Safety Risks" (62 FR 19885, April 23, 1997), applies to any rule that: (1) is determined to be "economically significant," as defined under Executive Order 12866; and (2) concerns an environmental health or safety risk that the EPA has reason to believe may have a disproportionate effect on children. If the regulatory action meets both criteria, the EPA must evaluate the environmental health or safety effects of the planned rule on children and explain why the planned regulation is preferable to other potentially effective and reasonably feasible alternatives considered by the Agency.

This proposed rule is not subject to Executive Order 13045 (62 FR 19885, April 23, 1997) because the agency does not believe the environmental health risks or safety risks addressed by this action present a disproportionate risk to children. The report, "Analysis of Exposure to Residential Wood Combustion Emissions for Different Socio-Economic Groups,"[68] shows that on a nationwide basis, cancer risks due to residential wood smoke emissions among disadvantaged population groups generally are lower than the risks for the general population due to residential wood smoke emissions. One of the demographic variables examined for this report was that of children 18 years and younger.

[68] "Analysis of Exposure to Residential Wood Combustion Emissions for Different Socio-Economic Groups, Revised Draft Report." Prepared for Gil Wood, U.S. EPA, Office of Air Quality Planning and Standards, Research Triangle Park, NC. Prepared by EC/R Inc., EPA Contract No. EP-D-05-085, Work Assignment No. 4-3. April 22, 2010.

This proposed rule is expected to reduce environmental impacts for everyone, including children. This action proposes emissions limits at the levels based on BSER, as required by the CAA. Based on our analysis, we believe this rule would not have a disproportionate impact on children, and, in fact, will result in improvements to children's health.

The public is invited to submit comments or identify peer-reviewed studies and data that assess effects of early life exposure to smoke from residential wood heaters.

H. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use

This proposed rule is not a "significant energy action" as defined in Executive Order 13211 (66 FR 28355, May 22, 2001), because it is not likely to have a significant adverse effect on the supply, distribution, or use of energy. Further, we have concluded that this rule is not likely to have any significant adverse energy effects. In general, we expect the NSPS to improve technology, including energy efficiency. Reducing emissions and increasing efficiency might increase the use of wood fuel, which would relieve pressure on traditional coal or petroleum based energy sources. However, as described in section IV.E, it is difficult to determine the precise energy impacts that might result from this rule. This is because wood-fueled appliances compete with other biomass forms as well as more traditional oil, electricity and natural gas. We have not determined the potential conversion to other types of fuels and their associated appliances if the consumer costs of wood-fueled appliances increase and at what level that increase would drive consumer choice.

I. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 ("NTTAA"), Public Law No. 104-113 (15 U.S.C. 272 note) directs the EPA to use voluntary consensus standards (VCS) in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. VCS are technical standards (*e.g.*, materials specifications, test methods, sampling procedures and business practices) that are developed or adopted by VCS bodies. The NTTAA directs the EPA to provide Congress, through OMB, explanations when the Agency decides not to use available and applicable voluntary consensus standards.

This proposed rulemaking involves technical standards. The EPA proposes to use several VCS test methods, in full or in part, including the following methods available for review at the ASTM website www.astm.org/EPA-review: E2515-10 "Standard Test Method for Determination of Particulate Matter Emissions Collected by a Dilution Tunnel" (See also ASTM WK20442 proposed revision and ASTM WK31433 proposed revision); E2779-10 "Standard Test Method for Determining Particulate Matter Emissions from Pellet Heaters;" E2780-10 "Standard Test Method for Determining Particulate Matter Emissions from Wood Heaters;" E2618-13 "Standard Test Method for Measurement of Particulate Matter Emissions and Heating Efficiency of Outdoor Solid Fuel-Fired Hydronic Heating Appliances;" ASTM E2817-11 "Standard Test Method for Test Fueling Masonry Heaters;" ASTM WK26558 "Specification for Calculation Method for Custom Designed, Site Built Masonry Heaters." Also, we propose to use, in part, the following test method available for review at the CSA website http://shop.csa.ca/en/canada/fuel-burning-equipment/b4151-10/invt/27013322010/: CSA B415.1-10 "Performance Testing of Solid-fuel-burning Heating Appliances." Finally, we

propose to use, in part, the following test method prepared by the European Union: EN 303-5 "Heating boilers for solid fuels, hand and automatically stoked nominal heat output of up to 1025 MBtu –Terminology, requirements, testing, and marketing." We believe that all the methods listed above have some positive aspects that can help stakeholders determine emissions under various operation conditions. For more details on each method, please refer to the discussions in Section III of this preamble.

In addition, we determined that the VCS ASTM E871-82 (2006), "Standard Test Method for Moisture Analysis of Particulate Wood Fuels" is acceptable as an alternative to Methods 5H and 28.

The search identified five other VCS that were potentially applicable for this rule in lieu of the EPA reference methods. However, the EPA determined that the five candidate VCS would not be practical due to lack of equivalency, documentation, validation data and other important technical and policy considerations. The five VCS and other information and conclusion, including the search and review results, are in the docket for this proposed rule. The EPA welcomes comments on this aspect of the proposed rulemaking. Specifically, we invite the public to identify potentially applicable voluntary consensus standards and to explain why such standards, in whole or in part, should or should not be used in this regulation.

J. Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 (59 FR 7629, February 16, 1994) establishes federal executive policy on environmental justice. Its main provision directs federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part

of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies and activities on minority populations and low-income populations in the U.S. The EPA defines "Environmental Justice" to include meaning involvement of all people regardless of race, color, national origin or income with respect to the development, implementation and enforcement of environmental laws, regulations and policies.

As discussed earlier, the report, "Analysis of Exposure to Residential Wood Combustion Emissions for Different Socio-Economic Groups," shows that on a nationwide basis, cancer risks due to residential wood smoke emissions among disadvantaged population groups generally are lower than the risks for the general population due to residential wood smoke emissions. Thus, we have determined that this proposed rule would not have disproportionately high and adverse human health or environmental effects on minority, low-income or indigenous populations because it increases the level of environmental protection for all affected populations without having any disproportionately high and adverse human health or environmental effects on any population, including any minority low-income or indigenous population.[69] This proposed rule establishes national standards that would reduce primarily PM emissions from new residential wood heaters and, thus, would decrease the amount of these emissions to which all affected populations are exposed.

[69] "Analysis of Exposure to Residential Wood Combustion Emissions for Different Socio-Economic Groups, Revised Draft Report." Prepared for Gil Wood, U.S. EPA, Office of Air Quality Planning and Standards, Research Triangle Park, NC. Prepared by EC/R Inc., EPA Contract No. EP-D-05-085, Work Assignment No. 4-3. April 22, 2010.

List of Subjects in 40 CFR Part 60

Environmental protection, Administrative practice and procedure, Air pollution control, Carbon monoxide, Hazardous substances, Intergovernmental relations, Particulate matter, Reporting and recordkeeping requirements**.**

Dated: January 3, 2014

Gina McCarthy,
Administrator.

For the reasons stated in the preamble, title 40, chapter I, of the Code of Federal Regulations is proposed to be amended as follows:

PART 60 – STANDARDS OF PERFORMANCE FOR NEW SOURCES

1. The authority citation for part 60 continues to read as follows:

Authority: 42 U.S.C. 7401-7671q.

Subpart A—GENERAL PROVISIONS

2. Section 60.17 is amended by:

a. Adding paragraphs (a)(109) through (a)(115); and

b. Adding paragraph (p) to read as follows:

§ 60.17 Incorporations by reference.

* * * * *

(a) * * *

(109) ASTM E871-82 (2006), Standard Test Methods for Moisture Analysis of Particulate Wood Fuels, IBR approved for appendix A: Method 5H and Method 28.

(110) ASTM E2515-10, Standard Test Method for Determination of Particulate Matter Emissions Collected by a Dilution Tunnel, IBR approved for §60.534(c), § 60.5476(b) and § 60.5488(b).

(111) ASTM E2779-10, Standard Test Method for Determining Particulate Matter Emissions from Pellet Heaters, IBR approved for § 60.534(a)(2).

(112) ASTM E2618-13 Standard Test Method for Measurement of Particulate Matter Emissions and Heating Efficiency of Outdoor Solid Fuel-Fired Hydronic Heating Appliances, IBR approved for § 60.5476(a)(2).

(113) ASTM E2780-10, Standard Test Method for Determining Particulate Matter Emissions from Wood Heaters, IBR approved for § 60.534(a)(2)

(114) ASTM E2817-11, Standard Test Method for Test Fueling Masonry Heaters, IBR approved for § 60.5488(a).

(115) ASTM WK26558, New Specification for Calculation Method for Custom Designed, Site Built Masonry Heaters, IBR approved for § 60.5488(c)(1).

* * * * *

(p) This material is available for purchase from the Canadian Standards Association (CSA) at http://shop.csa.ca/en/canada/fuel-burning-equipment/b4151-10/invt/27013322010/.

(1) CSA B415.1-10, Performance Testing of Solid-fuel-burning Heating Appliances, IBR approved for § 60.534(d) and § 60.5476(c) and (d).

(2) [*Reserved*]

3. Revise subpart AAA to read as follows:

Subpart AAA—Standards of Performance for New Residential Wood Heaters

Sec.

60.535 What procedures must I use for laboratory accreditation or certifying body accreditation?

60.536 What requirements must I meet for permanent labels and owner's manuals?

60.537 What records must I keep and what reports must I submit?

60.538 What activities are prohibited under this subpart?

60.539 What Petition for Review procedures apply to me?

60.539a Who implements and enforces this subpart?

60.539b What parts of the General Provisions do not apply?

Subpart AAA—Standards of Performance for New Residential Wood Heaters

§ 60.530 Am I subject to this subpart?

(a) You are subject to this subpart if you operate, manufacture, sell, offer for sale, import for sale, distribute, offer to distribute, introduce, or deliver for introduction, into commerce in the United States, an affected wood heater specified in paragraphs (a)(1) or (a)(2) of this section:

(1) Each adjustable burn rate wood heater with a current EPA certificate of compliance, single burn rate wood heaters with a current EPA certificate of compliance, and each pellet stove with a current EPA certificate of compliance issued prior to **[EFFECTIVE DATE OF FINAL RULE]** according to the certification procedures in effect in this subpart at the time of certification that are manufactured on or after July 1, 1988 are affected wood heaters.

(2) All other residential wood heaters under this subpart manufactured or sold on or after **[EFFECTIVE DATE OF FINAL RULE]** are affected wood heaters.

(b) Each affected wood heater must comply with the provisions of this subpart unless exempted under paragraphs (b)(1) through (b)(6) of this section.

(1) Affected wood heaters manufactured in the United States for export are exempt from the applicable emission limits of § 60.532 and the requirements of § 60.533.

(2) Affected wood heaters used for research and development purposes that are never offered for sale or sold and that are not used for the purpose of providing heat are exempt from the applicable emission limits of § 60.532 and the requirements of § 60.533. No more than 50 wood heaters manufactured per model line can be exempted for this purpose.

(3) Appliances that do not burn wood or wood pellets (such as coal-only heaters that meet the definition in § 60.531 or corn-only pellet stoves) are exempt from the applicable emission limits of § 60.532 and the requirements of § 60.533.

(4) Cook stoves that meet the definition in § 60.531 are exempt from the applicable emission limits of § 60.532 and the requirements of § 60.533.

(5) Camp stoves that meet the definition in § 60.531 are exempt from the applicable emission limits of § 60.532 and the requirements of § 60.533.

(6) Modification or reconstruction, as defined in § 60.14 and § 60.15 of Subpart A will not, by itself, make a wood heater an affected facility under this subpart.

(c) The following are not affected wood heaters and are not subject to this subpart:

(1) Residential hydronic heaters and residential forced-air furnaces subject to subpart QQQQ of this part.

(2) Residential masonry heaters subject to subpart RRRR of this part.

(3) Appliances that are not residential heating devices (for example, manufactured or site-built masonry fireplaces).

(4) Traditional Native American bake ovens that meet the definition in § 60.531.

§ 60.531 What definitions must I know?

As used in this subpart, all terms not defined herein have the meaning given them in the Clean Air Act and subpart A of this part.

Adjustable burn rate wood heater means an enclosed, wood-burning appliance capable of and intended for residential space heating or domestic water heating that is equipped with or installed with a damper or other mechanism to allow the operator to vary burn rate conditions, regardless of whether it is internal or external to the appliance. This definition does not distinguish between heaters that are free standing or fireplace inserts.

Accredited test laboratory means a test laboratory that is accredited for wood heater certification testing under § 60.535 or is an independent third-party test laboratory that is accredited by a nationally recognized accrediting entity under ISO-IEC Standard 17025 to perform testing using the test methods specified in § 60.534 and approved by the EPA for conducting testing under this subpart.

At retail means the sale by a commercial owner of a wood heater to the ultimate purchaser.

Camp stove (sometimes also called cylinder stove or wall tent stove) means a portable stove equipped with a pipe or chimney exhaust capable of burning wood or coal intended for use in a tent or other temporary structure used for hunting, camping, fishing,

or other outdoor recreation. The primary purpose of the stove is to provide space heating, although cooking and heating water may be additional functions.

Catalytic combustor means a device coated with a noble metal used in a wood heater to lower the temperature required for combustion.

Certifying entity means an independent third party that is accredited by a nationally recognized accrediting entity under ISO-IEC Standard 17020 to perform certifications, inspections and audits under ISO-IEC Guide 17065 and approved by the EPA for conducting certifications, inspections and audits under this subpart.

Coal-only heater means an enclosed, coal-burning appliance capable of space heating, or domestic water heating, which has all of the following characteristics:

(1) An opening for emptying ash that is located near the bottom or the side of the appliance;

(2) A system that admits air primarily up and through the fuel bed;

(3) A grate or other similar device for shaking or disturbing the fuel bed or power-driven mechanical stoker;

(4) Installation instructions that state that the use of wood in the stove, except for coal ignition purposes, is prohibited by law; and

(5) The model is listed by a nationally recognized safety-testing laboratory for use of coal only, except for coal ignition purposes.

Commercial owner means any person who owns or controls a wood heater in the course of the business of the manufacture, importation, distribution (including shipping and storage), or sale of the wood heater.

Cookstove means a wood-fired appliance that is designed primarily for cooking food and that has the following characteristics:

(1) An oven, with volume of 0.028 cubic meters (1 cubic foot) or greater, and an oven rack;

(2) A device for measuring oven temperatures;

(3) A flame path that is routed around the oven;

(4) An ash pan;

(5) An ash clean-out door below the oven;

(6) The absence of a fan or heat channels to dissipate heat from the appliance;

(7) A cooking surface measured in square inches or square feet that is 1.5 times greater than the firebox, which is measured in cubic inches or cubic feet. Example: A firebox of 2 cubic feet would have a cooking surface of at least 3 square feet;

(8) A portion of at least four sides of the oven is exposed to the flame path during the heating cycle of the oven. A flue gas bypass may exist for temperature control.

Manufactured means completed and ready for shipment (whether or not packaged).

Manufacturer means any person who constructs or imports into the United States a wood heater.

Model line means all wood heaters offered for sale by a single manufacturer that are similar in all material respects.

Particulate matter (PM) means total particulate matter including coarse PM (PM_{10}) and fine PM ($PM_{2.5}$).

Pellet stove means an enclosed, solid fuel burning device capable of and intended for residential space heating or domestic water heating that is designed specifically to burn wood pellet fuel that incorporates induced air flow, is installed with an automatic pellet feeder, and is a free standing room heater or fireplace insert.

Representative affected wood heater means an individual wood heater that is similar in all material respects to other wood heaters within the model line it represents.

Room heater means an enclosed, wood-burning appliance capable of and intended for residential space heating. Unless otherwise specified, these devices include adjustable burn rate wood heaters, single burn rate wood heaters and pellet stoves.

Sale means the transfer of ownership or control, except that a transfer of control of an affected wood heater for research and development purposes within the scope of § 60.530(b)(2) is not a sale.

Seasoned wood means wood with a moisture content of 20 percent or less.

Similar in all material respects means that the construction materials, exhaust and inlet air system, and other design features are within the allowed tolerances for components identified in § 60.533(k).

Single burn rate wood heater means an enclosed, wood-burning appliance capable of and intended for residential space heating or domestic water heating that is not equipped with or installed with a damper to allow the operator to vary burn rate conditions.

Traditional Native American bake oven means a wood or other solid fuel burning appliance that is designed primarily for use by Native Americans for food preparation, cooking, warming, or for instructional, recreational, cultural or ceremonial purposes.

Valid certification test means a test that meets the following criteria:

(1) The Administrator was notified about the test in accordance with §60.534(f);

(2) The test was conducted by an accredited test laboratory;

(3) The test was conducted on a wood heater similar in all material respects to other wood heaters of the model line that is to be certified; and

(4) The test was conducted in accordance with the test methods and procedures specified in § 60.534.

Wood heater means an enclosed, wood burning-appliance capable of and intended for residential space heating or domestic water heating. Unless otherwise specified, these devices include adjustable burn rate wood heaters, single burn rate wood heaters and pellet stoves.

Wood pellet fuel means refined and densified wood shaped into small pellets or briquettes that are uniform in size, shape, moisture, density and energy content.

§ 60.532 What standards and associated requirements must I meet and by when?

(a) *1990 Particulate Matter Standards*. Unless exempted under § 60.530, each adjustable burn rate wood heater and pellet stove with a current EPA certification issued prior to **[EFFECTIVE DATE OF FINAL RULE]**, according to the certification procedures in effect in this subpart at the time of certification, must comply with the following particulate matter emission limits as determined by the applicable test methods and procedures in § 60.534(a) through (c) until the current certification expires as specified in § 60.533(h)(1), or it is revoked by the Administrator as specified in § 60.533(l), whichever is first. After the certificate expires or is revoked, individual wood

heaters in that model line can no longer be manufactured or sold unless the manufacturer receives a new certificate of compliance from the Administrator.

(1) An affected wood heater equipped with a catalytic combustor must not discharge into the atmosphere any gases that contain particulate matter in excess of a weighted average of 4.1 g/hr (0.009 lb/hr) as specified in the applicable test method. Particulate matter emissions during any test run at any burn rate that is required to be used in the weighted average as specified in the applicable test method must not exceed the value calculated for "C" (rounded to 2 significant figures) calculated using the following equation:

(i) At burn rates less than or equal to 2.82 kg/hr (6.2 lb/hr),

$C=K_1BR+K_2$

Where:

BR = Burn rate in kg/hr (lb/hr)

C = Actual particulate matter emission rate in g/hr (lb/hr) per burn rate in a given test run

K_1= 3.55 g/kg (0.00355 lb/lb)

K_2= 4.98 g/hr (0.0.011 lb/hr)

(ii) At burn rates greater than 2.82 kg/hr (6.2 lb/hr), C = 15 g/hr (0.033 lb/hr).

(2) An affected wood heater not equipped with a catalytic combustor must not discharge into the atmosphere any gases that contain particulate matter in excess of a weighted average of 7.5 g/hr (0.017 lb/hr) as specified in the applicable test method. Particulate matter emissions must not exceed 15 g/hr (0.033 lb/hr) during any test run at a burn rate less than or equal to 1.5 kg/hr (3.3 lb/hr) that is required to be used in the weighted average as specified in the applicable test method and particulate matter

emissions must not exceed 18 g/hr (0.040 lb/hr) during any test run at a burn rate greater than 1.5 kg/hr (3.3 lb/hr) that is required to be used in the weighted average as specified in the applicable test method.

(3) As an alternative, an affected wood heater subject to paragraph (a) of this section may elect to comply with the requirements in paragraph (b) of this section.

(b) *2015 Particulate Matter Standards*. Unless exempted under § 60.530 or subject to the standards specified in paragraph (a) of this section, each adjustable burn rate wood heater or pellet stove manufactured on or after **[EFFECTIVE DATE OF FINAL RULE]** or sold at retail for use in the United States on or after **[6 MONTHS AFTER EFFECTIVE DATE OF FINAL RULE]** must comply with the emission limits specified in paragraphs (b)(1) or (b)(2) of this section, as applicable. Unless exempted under § 60.530, each single burn rate wood heater manufactured on or after **[EFFECTIVE DATE OF FINAL RULE]** or sold at retail on or after **[6 MONTHS AFTER EFFECTIVE DATE OF FINAL RULE]** must comply with the emission limit specified in paragraph (b)(3) of this section. Compliance for all sources must be determined by the test methods and procedures in § 60.534.

(1) An adjustable burn rate wood heater or pellet stove that is an affected wood heater equipped with a catalytic combustor must not discharge into the atmosphere any gases that contain particulate matter in excess of a weighted average of 4.5 g/hr (0.01 lb/hr).

(2) An adjustable burn rate wood heater or pellet stove that is an affected wood heater not equipped with a catalytic combustor and capable of making burn rate

adjustments must not discharge into the atmosphere any gases that contain particulate matter in excess of a weighted average of 4.5 g/hr (0.01 lb/hr).

(3) A single burn rate wood heater that is an affected wood heater must not discharge into the atmosphere any gases that contain particulate matter in excess of 4.5 g/hr (0.01 lb/hr).

(c) *2020 Particulate Matter Standards*. Unless exempted under § 60.530 or subject to the standards specified in paragraph (a) of this section, each adjustable burn rate wood heater, pellet stove or single burn rate wood heater manufactured or sold at retail for use in the United States on or after **[5 YEARS AFTER EFFECTIVE DATE OF FINAL RULE]** must not discharge into the atmosphere any gases that contain particulate matter in excess of 1.3 g/hr (0.003 lb/hr) for any burn rate. Compliance for all sources must be determined by the test methods and procedures in § 60.534.

(d) [*Reserved*]

(e) *Pellet Fuel Requirements*. Operators of wood heaters that are certified to burn pellet fuels may only burn pellets that have been produced under a licensing agreement with the Pellet Fuels Institute or an equivalent organization approved by the EPA. The pellet fuel must meet the following minimum requirements:

(1) Density: consistent hardness and energy content with a minimum density of 38 pounds/cubic foot;

(2) Dimensions: maximum length of 1.5 inches and diameter between 0.230 and 0.285 inches;

(3) Inorganic fines: less than or equal to 1 percent;

(4) Chlorides: less than or equal to 300 parts per million by weight;

(5) Ash content: no more than 2 percent; and

(6) A quality assurance process licensed by the Pellet Fuels Institute or equivalent organization approved by EPA.

(f) *Prohibited Fuel Types*. No person is permitted to burn any of the following materials in an affected wood heater:

(1) Residential or commercial garbage;

(2) Lawn clippings or yard waste;

(3) Materials containing rubber, including tires;

(4) Materials containing plastic;

(5) Waste petroleum products, paints or paint thinners, or asphalt products;

(6) Materials containing asbestos;

(7) Construction or demolition debris;

(8) Paper products, cardboard, plywood, or particleboard. The prohibition against burning these materials does not prohibit the use of fire starters made from paper, cardboard, saw dust, wax and similar substances for the purpose of starting a fire in an affected wood heater;

(9) Railroad ties or pressure treated wood;

(10) Manure or animal remains; or

(11) Salt water driftwood or other previously salt water saturated materials.

(g) *Owner's Manual*. A person must not operate an affected residential wood heater in a manner inconsistent with the owner's manual. The owner's manual must clearly specify that operation in a manner inconsistent with the owner's manual would violate the warranty.

(h) *Temperature Sensor Requirement*. An affected wood heater equipped with a catalytic combustor must be equipped with a temperature sensor that can monitor combustor gas stream temperatures within or immediately downstream [within 2.54 centimeters (1 inch)] of the catalytic combustor surface.

§ 60.533 What compliance and certification requirements must I meet and by when?

(a) *Certification Requirement*. Each affected wood heater must be certified to bein compliance with the applicable emission standards and other requirements of this subpart. For each model line manufactured or sold by a single entity, *e.g.*, company or manufacturer, compliance with applicable emission standards of § 60.532 may be determined based on testing of representative affected wood heaters within the model line. If one entity, licenses a model line to another entity, each entity's model line must be certified. If an entity changes the name of the entity or the name of the model, the manufacturer must apply for a new certification.

(1) Prior to **[EFFECTIVE DATE OF FINAL RULE]**, the manufacturer must submit to the EPA the information required in paragraph (b) of this section and follow either the certification process in paragraphs (b) through (e) of this section or the certifying entity based application process specified in paragraph (f) of this section.

(2) On or after **[EFFECTIVE DATE OF FINAL RULE]**, the manufacturer must submit the information required in paragraph (b) of this section and follow the certifying entity based application process specified in paragraph (f) of this section.

(b) *Application for Certificate of Compliance*. Any manufacturer of an affected wood heater must apply to the Administrator for a certificate of compliance for each model line. The application must be submitted to: Wood Heater NSPS Compliance

Program at www.epa.gov/Wood_Heater_NSPS_Compliance_Program. The application must be signed by a responsible representative of the manufacturer or an authorized representative and must contain the following:

(1) The model name and/or design number and responsible contact information for the manufacturer and all authorized representatives, including name, affiliation, physical address, telephone number, and email address.

(2) Engineering drawings and specifications of components that may affect emissions (including specifications for each component listed in paragraph (k) of this section). Manufacturers may use complete assembly or design drawings that have been prepared for other purposes, but must designate on the drawings the dimensions of each component listed in paragraph (k) of this section. Manufacturers must identify tolerances of components of the tested unit listed in paragraph (k)(2) of this section that are different from those specified in that paragraph, and show that such tolerances may not reasonably be anticipated to cause wood heaters in the model line to exceed the applicable emission limits. The drawings must identify how the emission critical parts, such as air tubes and catalyst, can be readily inspected and replaced. The drawings may be submitted either in hard copy or electronic format.

(3) A statement whether the firebox or any firebox component (including the materials listed in paragraph (k)(3) of this section) will be composed of material different from the material used for the firebox or firebox component in the wood heater on which certification testing was performed and a description of any such differences.

(4) Clear identification of any confidential business information. Submit such information under separate cover to the EPA CBI Office; Attn: Residential Wood Heater

Compliance Program. Note that emissions data, including information necessary to determine emission rates in the format of the standard, cannot be claimed as confidential business information.

(5) All documentation pertaining to a valid certification test, including the complete test report and, for all test runs: raw data sheets, laboratory technician notes, calculations, and test results. Documentation must include the items specified in the applicable test methods. The test report must include a summary table that clearly presents the individual and overall emission rates, efficiencies, and heat output range. Submit the test report and all associated required information according to the procedures for electronic reporting specified in § 60.537(f).

(6) A copy of the warranties for the model line, including a statement that the warranties are void if the unit is used to burn materials for which the unit is not certified by the EPA.

(7) A statement that the manufacturer or certifying entity will conduct a quality assurance program for the model line that satisfies the requirements of paragraph (m) of this section.

(8) A statement describing how the tested unit was sealed by the laboratory after the completion of certification testing and that such unit will be stored by the manufacturer in the sealed state until 1 year after the certification expires.

(9) Statements that the wood heaters manufactured under this certificate will be—

(i) Similar in all material respects as defined in this subpart to the wood heater submitted for certification testing, and

(ii) Labeled as prescribed in § 60.536.

(iii) Accompanied by an owner's manual that meets the requirements in § 60.536. In addition, a copy of the owner's manual must be submitted to the EPA and be available on the manufacturer's website.

(10) A statement that the manufacturer has entered into a contract with an accredited laboratory that satisfies the requirements of paragraph (e) of this section.

(11) A statement that the accredited certifying body is allowed to submit information on behalf of the manufacturer.

(c)(1) *Administrator Approval Process*. The Administrator will electronically issue a certificate of compliance for a model line if the Administrator determines, based on all information submitted by the applicant and any other relevant information available, that:

(i) A valid certification test demonstrates that the representative affected wood heater complies with the applicable emission standards in § 60.532,

(ii) Any tolerances for components listed in paragraph (k)(2) of this section that are different from those specified in those paragraphs may not reasonably be anticipated to cause wood heaters in the model line to exceed the applicable emission limits; and

(iii) The requirements of paragraph (b) of this section have been met.

(2) The Administrator will deny certification if the Administrator determines that the criteria in paragraph (c)(1) of this section have not been satisfied. Upon denying certification under this paragraph, the Administrator will give written notice to the manufacturer setting forth the basis for this determination.

(d) Prior to **[EFFECTIVE DATE OF THE FINAL RULE]**, the Administrator will issue the certificate for the most stringent particulate matter emission standard that the unit meets under § 60.532(a) or (b), as applicable.

(e) To receive EPA certification, a manufacturer must enter into a contract with the accredited laboratory that performed the certification test, under which the laboratory will:

(1) Conduct the compliance audit test at no additional cost to the manufacturer if the EPA selects that laboratory to conduct the test; or

(2) Pay the manufacturer the cost of a compliance audit test (as determined by the EPA) if the EPA selects any other laboratory to conduct the test.

(f) *Certifying Entity-Based Application Process*.

(1) Any manufacturer of an affected wood heater must apply to the Administrator for a certificate of compliance for each model line. The manufacturer must meet the following requirements:

(i) The manufacturer must contract with a certifying entity for certification services.

(ii) The manufacturer must submit the materials specified in paragraph (b) of this section and a quality control plan that meets the requirements of paragraph (m)(4) of this section to the certifying entity. The quality control plan must ensure that units within a model line accurately reflect emission-critical components of the model line design, and it must include design drawings for the model line.

(iii) The manufacturer must apply to the certifying entity for a certification of conformity with the applicable requirements of this subpart for the model line.

(A) After testing by an accredited test laboratory is complete, certification of conformity with the emission standards in § 60.532 must be performed by the manufacturer's contracted certifying entity.

(B) The certifying entity can certify conformity if the emission tests have been conducted per the appropriate guidelines and the test report is complete and accurate and the instrumentation is properly calibrated and the test report shows that the representative affected wood heater meets the applicable emission limits specified in § 60.532 and the quality control plan is adequate to ensure that units within the model line will be similar in all material respects to the wood heater submitted for certification testing.

(iv) The manufacturer must then request that the certifying entity electronically submit, on behalf of the manufacturer, an application for EPA certification that includes the certification of conformity, quality control plan, test report and supporting documentation.

(v) The submission must include a statement signed by a responsible official of the manufacturer that the manufacturer has complied with all requirements of this subpart and that the manufacturer remains responsible for compliance regardless of any error by the certifying entity.

(2) The Administrator will electronically issue to the manufacturer a certificate of compliance for a model line if it is determined, based on all of the information submitted in the application for certification and any other relevant information, that:

(i) A valid certification of conformity has demonstrated that the representative affected wood heater complies with the applicable emission standards in § 60.532; and

(ii) Any tolerances or materials for components listed in paragraph (k)(2) or (3) of this section that are different from those specified in those paragraphs may not be reasonably anticipated to cause wood heaters in the model line to exceed the applicable emission limits.

(iii) The requirements of paragraphs (b) of this section have been met.

(iv) A valid certificate of conformity for the model line has been prepared and submitted.

(3) The Administrator will deny certification if the Administrator determines that the criteria in paragraph (f)(2) of this section have not been satisfied. Upon denying certification under this paragraph, the Administrator will give written notice to the manufacturer setting forth the basis for the determination.

(g) *Waiver from Submitting Test Results*. An applicant for certification may apply for a potential waiver of the requirement to submit the results of a certification test pursuant to paragraph (b)(3) of this section, if the wood heater meets either of the following conditions:

(1) The wood heaters of the model line are similar in all material respects, as defined in this subpart, to another model line that has already been issued a certificate of compliance. A manufacturer that seeks a waiver of certification testing must identify the model line that has been certified, and must submit a copy of an agreement with the owner of the design permitting the applicant to produce wood heaters of that design.

(2) The manufacturer has previously conducted a valid certification test to demonstrate that the wood heaters of the model line meet the applicable standard specified in § 60.532(a), and that test also demonstrates that the wood heaters of the

model line meet the applicable standard specified in § 60.532(b). This option is only potentially available a maximum of one time per model line.

(h) *Certification Period*. Unless revoked sooner by the Administrator, a certificate of compliance will be valid for the following periods as applicable:

(1) For a model line certified as meeting the emission standards in § 60.532(a), a certificate of compliance will be valid for 5 years from the date of issuance.

(2) For a model line certified as meeting emission standards in § 60.532(b), a certificate of compliance will be valid for 5 years from the date of issuance.

(3) For a model line certified as meeting emission standards in § 60.532(c), a certificate of compliance will be valid for 5 years from the date of issuance.

(i) *Renewal of Certification*.

(1) The certificate must be recertified or renewed every 5 years or the manufacture may choose to no longer manufacture or sell that model. If the manufacturer chooses to no longer manufacture or sell that model, then the manufacturer must submit a statement to EPA for that model. A manufacturer of an affected wood heater may apply to the Administrator for potential renewal of their certificate by submitting the material specified in § 60.533(b) and following the procedures specified in § 60.533(f) or by affirming in writing that the wood heater has been subject to no changes that would impact emissions and requesting a potential waiver from certification testing.

(2) If the Administrator grants a renewal of certification, the Administrator will give written notice to the manufacturer setting forth the basis for the determination and issue a certification renewal.

(3) If the Administrator denies the request for a renewal of certification, the Administrator will give written notice to the manufacturer setting forth the basis for the determination.

(j) [*Reserved*]

(k) *Recertification*.

(1) The manufacturer must recertify a model line whenever any change is made in the design submitted pursuant to paragraph (b)(2) of this section that is presumed to affect the particulate matter emission rate for that model line. The manufacturer of an affected wood heater must apply to the Administrator for potential recertification by submitting the material specified in § 60.533(b) and following the procedures specified in § 60.533(f) or by affirming in writing that the wood heater has been subject to no changes that would impact emissions and requesting a potential waiver from certification testing. The Administrator may potentially waive this requirement upon written request by the manufacturer, if it is determined that the change may not reasonably be anticipated to cause wood heaters in the model line to exceed the applicable emission limits. The granting of such a waiver does not relieve the manufacturer of any compliance obligations under this subpart.

(2) Any change in the design tolerances of any of the following components (where such components are applicable) is presumed to affect particulate matter and carbon monoxide emissions and efficiency if that change exceeds ±0.64 cm (±1/4 inch) for any linear dimension and ±5 percent for any cross-sectional area relating to air introduction systems and catalyst bypass gaps unless other dimensions and cross-

sectional areas are previously approved by the Administrator under paragraph (c)(1)(ii) of this section:

(i) Firebox: Dimensions;

(ii) Air introduction systems: Cross-sectional area of restrictive air inlets and outlets, location and method of control;

(iii) Baffles: Dimensions and locations;

(iv) Refractory/insulation: Dimensions and location;

(v) Catalyst: Dimensions and location;

(vi) Catalyst bypass mechanism and catalyst bypass gap tolerances (when bypass mechanism is in closed position): Dimensions, cross-sectional area, and location;

(vii) Flue gas exit: Dimensions and location;

(viii) Door and catalyst bypass gaskets: Dimensions and fit;

(ix) Outer shielding and coverings: Dimensions and location;

(x) Fuel feed system: For wood heaters that are designed primarily to burn wood pellets and other wood heaters equipped with a fuel feed system, the fuel feed rate, auger motor design and power rating, and the angle of the auger to the firebox; and

(xi) Forced air combustion system: For wood heaters so equipped, the location and horsepower of blower motors and the fan blade size.

(3) Any change in the materials used for the following components is presumed to affect particulate matter emissions and efficiency:

(i) Refractory/insulation; or

(ii) Door and catalyst bypass gaskets.

(4) A change in the make, model, or composition of a catalyst is presumed to affect particulate matter and carbon monoxide emissions and efficiency, unless the change has been approved in advance by the Administrator, based on test data in the same model stove that demonstrate that the replacement catalyst is equivalent to or better than the original catalyst in terms of particulate matter emission reduction.

(l) *Criteria for Revocation of Certification*.

(1) The Administrator may revoke certification if it is determined that the wood heaters being manufactured or sold in that model line do not comply with the requirements of this subpart. Such a determination will be based on all available evidence, including but not limited to:

(i) Test data from a retesting of the original unit on which the certification test was conducted or a similar unit;

(ii) A finding that the certification test was not valid. (iii) A finding that the labeling of the wood heater model line or the owner's manual or marketing information does not comply with the requirements of § 60.536;

(iii) Failure by the manufacturer to comply with reporting and recordkeeping requirements under § 60.537;

(iv) Physical examination showing that a significant percentage (as defined in the quality assurance plan, but no larger than 1 percent) of production units inspected is not similar in all material respects to the representative affected wood heater submitted for testing; or

(v) Failure of the manufacturer to conduct a quality assurance program in conformity with paragraph (m) of this section.

(2) Revocation of certification under this paragraph will not take effect until the manufacturer concerned has been given written notice by the Administrator setting forth the basis for the proposed determination and an opportunity to request a review under § 60.539.

(m) *Quality Assurance Program*.

(1) On or after **[EFFECTIVE DATE OF FINAL RULE]**, for each certified model line, the manufacturer must conduct a quality assurance program that satisfies the requirements of this section The quality assurance program requirements of this section supersede the quality assurance plan requirements specified in § 60.533(o) of the 1988 rule. By **[60 DAYS AFTER EFFECTIVE DATE OF FINAL RULE]**, for model lines that had a valid EPA certification on **[60 DAYS AFTER EFFECTIVE DATE OF FINAL RULE]**, manufacturers must submit the quality assurance plan to the EPA Administrator for review and approval.

(i) The manufacturer must prepare and operate according to a quality assurance plan for each certified model line that has specific inspection and testing requirements for ensuring that units within a model line accurately reflect emission-critical components of the model line design and meet the emissions standards in § 60.532.

(ii) The quality assurance plan must be approved within 30 days by the certifying entity as part of the certification of conformity process specified in paragraph (f) of this section.

(iii) Within 30 days after approval by the certifying entity, the quality control plan must also be submitted to EPA for review and approval.

(iv) The certifying entity must conduct quarterly unannounced audits under ISO-IEC Guide 17065 and ISO-EC Standard 17020 to ensure that the manufacturer's quality control plan is being implemented.

(v) The certifying entity must prepare a report for each audit under ISO-IEC Guide 17065 and ISO-EC Standard 17020 that fully documents the results of the audit, and the manufacturer must include in their contract with the certifying entity the authorization and requirement to submit all such reports to the EPA within 30 days. In the audit report, the certifying entity must identify deviations from the manufacturer's quality control plan and specify the corrective actions that need to be taken to address each identified deficiency.

(vi) The manufacturer must report within 30 days to the certifying entity and to the EPA its responses to any deficiencies identified in an audit report.

(n) *EPA Compliance Audit Testing*.

(1)(i) The Administrator may select by written notice wood heaters for compliance audit testing to determine compliance with the emission standards in § 60.532.

(ii) The written notification shall be forwarded to the manufacturer by the Administrator and shall include the name and address of the laboratory selected to perform the audit test and the model name and serial number of the wood heater(s) selected to undergo audit testing.

(2)(i) The Administrator may test, or direct the manufacturer to have tested, the wood heater(s) selected under paragraph (n)(1)(i) of this section in a laboratory accredited under § 60.535 that is selected pursuant to paragraph (n)(3) of this section.

(ii) The expense of the compliance audit test is the responsibility of the wood heater manufacturer. A manufacturer may require the laboratory that performed the certification test to bear the expense of an audit test by means of the contract required under paragraph (e) of this section. The manufacturer will bear the cost of audit testing if the laboratory with which the manufacturer had a contract has ceased business or is otherwise legally unable to honor the contract. The manufacturer will also bear the cost of audit testing if the manufacturer has not entered into contract with an accredited test laboratory to perform audit testing.

(iii) The test must be conducted using the same test method and procedure used to obtain certification or a new test method approved by the EPA Administrator. If the certification test consisted of more than one particulate matter sampling test method, the Administrator may direct the test laboratory as to which of these methods to use for the purpose of audit testing. The Administrator will notify the manufacturer at least 1 week prior to any test under this paragraph, and allow the manufacturer and/or his authorized representatives to observe the test.

(3) The Administrator may select any accredited test laboratory or federal laboratory for audit testing.

(4) Revocation of Certification.

(i) If emissions from a wood heater tested under paragraph (n)(2) of this section exceed the certification emission values limit by more than 50 percent, the Administrator will notify the manufacturer that certification for that model line is suspended effective 72 hours from the receipt of the notice, unless the suspension notice is withdrawn by the Administrator. The suspension will remain in effect until withdrawn by the

Administrator, or 30 days from its effective date (if a revocation notice under paragraph (n)(5)(ii) of this section is not issued within that period), or the date of final agency action on revocation, whichever occurs earlier.

(ii)(A) If emissions from a wood heater tested under paragraph (n)(2) of this section exceed the applicable emission limit, the Administrator will notify the manufacturer that certification is revoked for that model line.

(B) A suspension under paragraph (n)(4)(i) or a revocation notice under paragraph (n)(4)(ii)(A) of this section will become final and effective 60 days after receipt by the manufacturer, unless it is withdrawn, a supplemental review is requested under § 60.539, or the deadline for requesting a supplemental review is extended.

(C) The Administrator may extend the deadline for requesting a supplemental review for up to 60 days for good cause.

(D) A manufacturer may extend the deadline for requesting a supplemental review for up to 6 months, by agreeing to a voluntary suspension of certification.

(iii) Any notification under paragraph (n)(4)(i) or (n)(4)(ii) of this section will include a copy of a preliminary test report from the accredited test laboratory or federal test laboratory. The test laboratory must provide a preliminary test report to the Administrator within 10 days of the completion of testing, if a wood heater exceeds the applicable emission limit in § 60.532. The test laboratory must provide the Administrator and the manufacturer, within 30 days of the completion of testing, all documentation pertaining to the test, including the complete test report and raw data sheets, laboratory technician notes, and test results for all test runs.

(iv) Upon receiving notification of a test failure under paragraph (n)(4)(ii) of this section, the manufacturer may request up to four additional wood heaters from the same model line be selected under paragraph (n)(1) of this section for testing at the manufacturer's expense, at the test laboratory that performed the emissions test for the Administrator.

(v) Whether or not the manufacturer proceeds under paragraph (n)(4)(iv) of this section, the manufacturer may submit any relevant information to the Administrator, including any other test data generated pursuant to this subpart. The manufacturer must pay the expense of any additional testing.

(vi) The Administrator will withdraw any notice issued under paragraph (n)(4)(ii) of this section if tests under paragraph (n)(4)(iv) of this section show either—

(A) That all wood heaters tested for the manufacturer met the applicable emission limits; or

(B) That the second and third wood heaters selected met the applicable emission limits and the average of all three (including the original audit test) was below the applicable emission limits.

(C) The Administrator will revise the certification values based on the test data and other relevant information and the manufacturer must revise the labels and marketing information accordingly.

(vii) The Administrator may withdraw any proposed revocation, if the Administrator finds that an audit test failure has been rebutted by information submitted by the manufacturer under paragraph (n)(4)(iv) of this section and/or (n)(4)(v) of this section or by any other relevant information available to the Administrator.

§ 60.534 What test methods and procedures must I use to determine compliance with the standards and requirements for certification?

Test methods and procedures specified in this section or in appendices of this part, except as provided under § 60.8(b), must be used to determine compliance with the standards and requirements for certification under § § 60.532 and 60.533 as follows:

(a)(1) Method 28 of appendix A-8 of this part must be used to establish the certification test conditions and the particulate matter emission values for affected wood heaters subject to the 1990 particulate matter standards specified in § 60.532(a).

(2) For affected wood heaters subject to the 2015 particulate matter standards specified in § 60.532(b), you must conduct testing according to paragraphs § 60.534(a)(2)(i) and (ii) of this section and submit the full test reports. You have the option of submitting the test results of either (a)(2)(i) or (ii) of this section to the Administrator as specified under § 60.537 for certification compliance.

(i) Conduct testing with crib wood using EPA Method 28R of appendix A-8 of this part to establish the certification test conditions and the particulate matter emission values.

(ii) Conduct testing with cord wood using EPA Method 28R of appendix A-8 of this part to establish the certification test conditions and the particulate matter emission values.

(3) For affected wood heaters subject to the 2020 particulate matter standards specified in § 60.532(c), you must conduct testing with cord wood using EPA Method 28R of appendix A-8 of this part to establish the certification test conditions, except that you should first test Burn Rate Categories 1 and 4 and then test 2 more times for

whichever burn rate category is worse and then report the results separately per burn rate category.

(b) For affected wood heaters subject to the 1990 particulate matter standards specified in § 60.532(a), emission concentrations must be measured with Method 5G of appendix A-3 of this part, *i.e.*, using a dilution tunnel sampling location. Method 5H is no longer allowed for certification testing.

(c) For affected wood heaters subject to the 2015 and 2020 particulate matter standards specified in § 60.532(b) and (c), emission concentrations must be measured with ASTM E2515-10.

(d) Canadian Standards Administration Method B415.1-10, section 13.7, must be used to measure the efficiency and carbon monoxide output of the tested appliance.

(e) [*Reserved*]

(f) The manufacturer of an affected wood heater must notify the Administrator of the date that certification testing is scheduled to begin by email to Wood Heater NSPS Compliance Program at www.epa.gov/Wood_Heater_NSPS_Compliance_Program. This notice must be received by the EPA at least 30 days before the start of testing. The notification of testing must include the manufacturer's name and physical and email addresses, the accredited test laboratory's name and physical and email addresses, certifying entity name, the model name and number (or, if unavailable, some other way to distinguish between models), and the dates of testing.

(g) The accredited test laboratory must allow the manufacturer, the EPA and delegated states to observe certification testing. However, manufacturers must not involve themselves in the conduct of the test after the pretest burn has begun.

Communications between the manufacturer and laboratory or certifying entity personnel regarding operation of the wood heater must be limited to written communications transmitted prior to the first pretest burn of the certification series. Written communications between the manufacturer and laboratory personnel may be exchanged during the certification test only if deviations from the test procedures are observed that constitute improper conduct of the test. All communications must be included in the test documentation required to be submitted pursuant to § 60.533(b)(3) and must be consistent with instructions provided in the owner's manual required under § 60.536(f), except to the extent that they address details of the certification tests that would not be relevant to owners or regulators.

§ 60.535 What procedures must I use for laboratory accreditation or certifying body accreditation?

(a)(1) A laboratory must apply to the Administrator for accreditation as an EPA accredited test laboratory by submitting documentation that the laboratory is accredited by a nationally recognized accrediting entity under ISO-IEC Standard 17025 to perform testing using the test methods specified under § 60.534.

(2) As part of the application, the test laboratory must:

(i) Agree to enter into a contract as described in § 60.533(e) with each wood heater manufacturer for whom a certification test has been performed;

(ii) Agree to participate biennially in a proficiency testing program conducted by the Administrator;

(iii) Agree to allow the Administrator and delegated states and certifying bodies access to observe certification testing;

(iv) Agree to comply with reporting and recordkeeping requirements that affect testing laboratories; and

(v) Agree to perform a compliance audit test (as determined by the Administrator) at the cost normally charged to manufacturers if it is selected to conduct the compliance audit test of a model line originally tested for certification at another laboratory.

(vi) Have no conflict of interest and receive no financial benefit from the outcome of certification testing conducted pursuant to § 60.533.

(vii) Agree to not perform initial certification tests on any models manufactured by a manufacturer for which the laboratory has conducted research and development tests within the last 5 years.

(3) If the EPA approves the accreditation, the Administrator will provide the test laboratory with a certificate of accreditation. If the EPA denies the accreditation, the Administrator will give written notice to the laboratory setting forth the basis for the determination.

(b)(1) The Administrator may revoke the EPA laboratory accreditation if it is determined that the laboratory:

(i) Is no longer is accredited by the nationally recognized ISO certifying entity;

(ii) Does not follow required procedures or practices;

(iii) Has falsified data or otherwise misrepresented emission data;

(iv) Failed to participate in a proficiency testing program, in accordance with its commitment under paragraph (a)(2)(ii) of this section; or

(v) Failed to seal the wood heater in accordance with paragraph (d) of this section.

(2) Revocation of accreditation under this paragraph will not take effect until the laboratory concerned has been given written notice by the Administrator setting forth the basis for the proposed determination and an opportunity for a Petition for Supplemental Review under § 60.539. However, if revocation is ultimately upheld, all tests conducted by the laboratory after written notice was given will, at the discretion of the Administrator, be declared invalid.

(c)(1) With the exception of laboratories meeting the provisions of paragraph (c)(2) of this section, and unless revoked sooner, a certificate of accreditation as an accredited test laboratory granted by the Administrator is valid for 5 years from the date of issuance.

(2) Laboratories accredited by the EPA by **[INSERT DATE OF PUBLICATION IN THE FEDERAL REGISTER]** under the provisions of § 60.535 in effect prior to that date may continue to be accredited until **[1 YEAR AFTER EFFECTIVE DATE OF FINAL RULE]**, at which time the accreditation ends unless the laboratory has obtained accreditation under § 60.535 as in effect beginning on **[EFFECTIVE DATE OF FINAL RULE]**.

(d) A laboratory accredited by the Administrator must seal any wood heater on which it performed certification tests, immediately upon completion or suspension of certification testing, by using a laboratory-specific seal. For any tests that are suspended, the laboratory must email the EPA immediately with the date suspended, the reason(s) why, and the projected date for re-starting. The laboratory must submit the operation and test data obtained, even if the test is not completed.

(e)(1) A Certifying Entity may apply to the Administrator for approval to be an EPA -approved certifying entity by submitting credentials demonstrating that they have been accredited by a nationally recognized accrediting entity to perform certifications and inspections under ISO-17025, ISO-IEC Standard 17065 and ISO-IEC Standard 10720.

(2) As part of the application, the certifying entity must:

(i) Agree to enter into a contract as described in § 60.533(e) with each wood heater manufacturer for whom a certification test has been performed and a test report has been received and reviewed;

(ii) Agree to periodically conduct audits as described in § 60.534 and manufacturer's QA/QC Plan;

(iii) Agree to participate biennially in a proficiency testing program conducted by the Administrator;

(iv) Agree to comply with reporting and recordkeeping requirements that affect accredited wood heater testing laboratories and certifying entities;

(v) Have no conflict of interest and receive no financial benefit from the outcome of certification testing conducted pursuant to § 60.533;

(vi) Agree to make available to the EPA supporting documentation for each wood heater certification and audit; and

(vii) Agree to not perform initial certification reviews on any models manufactured by a manufacturer for which the certifying entity has conducted research and development within the last 5 years.

(3) If approved, the Administrator will provide the certifying entity with a certificate of accreditation. The accreditation will expire 5 years after being issued unless

renewed by the certifying entity. If the EPA denies the accreditation, the Administrator will give written notice to the certifying entity for the basis for the determination.

(f)(1) The Administrator will revoke the EPA certifying entity accreditation if it is determined that the certifying entity;

(i) Is no longer accredited by the nationally recognized ISO certifying entity

(ii) Does not follow required procedures or practices;

(iii) Has falsified certification data or otherwise misrepresented emission data; or

(iv) Failed to participate in the EPA proficiency testing program.

(2) Revocation of accreditation under this paragraph will not take effect until the certifying entity concerned is given written notice by the Administrator setting forth the basis for the proposed determination and an opportunity for a Petition for Supplemental Review under § 60.539. However, if revocation is upheld, all tests reviewed by the certifying entity will, at the discretion of the Administrator, be declared invalid.

§ 60.536 What requirements must I meet for permanent labels and owner's manuals?

(a) *Permanent Label Requirements*. (1) Each affected wood heater manufactured on or after the date the applicable standards come into effect as specified in § 60.532, must have a permanent label affixed to it that meets the requirements of this section.

(2) Except for wood heaters subject to § 60.530(b)(1) through (b)(5), the permanent label must contain the following information:

(i) Month and year of manufacture of the individual unit;

(ii) Model name or number; and

(iii) Serial number.

(3) The permanent label must:

(i) Be affixed in a readily visible or accessible location in such a manner that it can be easily viewed before and after the appliance is installed;

(ii) Be at least 8.9 cm long and 5.1 cm wide (3 1/2 inches long and 2 inches wide);

(iii) Be made of a material expected to last the lifetime of the wood heater;

(iv) Present required information in a manner so that it is likely to remain legible for the lifetime of the wood heater; and

(v) Be affixed in such a manner that it cannot be removed from the appliance without damage to the label.

(4) The permanent label may be combined with any other label, as long as the required information is displayed, the integrity of the permanent label is not compromised, and the permanent label still meets the requirements in § 60.536(a)(3).

(5) Any label statement under paragraph (b) or (c) of this section constitutes a representation by the manufacturer as to any wood heater that bears it:

(i) That certification of compliance was in effect at the time the wood heater left the possession of the manufacturer;

(ii) That the manufacturer was, at the time the label was affixed, conducting a quality assurance program in conformity with § 60.533(o); and

(iii) That any wood heater individually tested for emissions by the manufacturer under § 60.533(o)(2) or (o)(4) met the applicable emissions limits.

(b) If the adjustable burn rate wood heater or pellet stove belongs to a model line certified under § 60.533, and it has been found to meet the applicable emission limits or

tolerances through quality assurance testing, one of the following statements, as appropriate, must appear on the permanent label:

U.S. ENVIRONMENTAL PROTECTION AGENCY

Certified to comply with 1990 particulate emission standards.

Not approved for sale or operation after **[6 MONTHS AFTER EFFECTIVE DATE OF FINAL RULE]**

or

U.S. ENVIRONMENTAL PROTECTION AGENCY

Certified to comply with 2015 particulate emission standards.

Not approved for sale or operation after **[5 YEARS AFTER EFFECTIVE DATE OF FINAL RULE]**

or

U.S. ENVIRONMENTAL PROTECTION AGENCY

Certified to comply with 2020 particulate emission standards.

(c) If the single burn rate wood heater belongs to a model line certified under § 60.533, and it has been found to meet the applicable emission limits or tolerances through quality assurance testing, the following statements must appear on the permanent label:

U.S. ENVIRONMENTAL PROTECTION AGENCY

Certified to comply with 2015 particulate emission standards.

Not approved for sale or operation after **[5 YEARS AFTER EFFECTIVE DATE OF FINAL RULE]**

or

U.S. ENVIRONMENTAL PROTECTION AGENCY

Certified to comply with 2020 particulate emission standards.

(d)(1) If an affected wood heater is manufactured in the United States for export as provided in § 60.530(b)(1), the following statement must appear on the permanent label:

U.S. ENVIRONMENTAL PROTECTION AGENCY

Export stove. May not be sold or operated within the United States.

(2) If an affected wood heater is manufactured for use for research and development purposes as provided in § 60.530(b)(2), the following statement must appear on the permanent label:

U.S. ENVIRONMENTAL PROTECTION AGENCY

Not certified. Research Stove. Not approved for sale or for operation other than research.

(3) If an affected wood heater is exclusively a non wood-burning heater as provided § 60.530(b)(3) the following statement must appear on the permanent label:

U.S. ENVIRONMENTAL PROTECTION AGENCY

This heater is not certified for wood burning. Use of any wood fuel is a violation of federal law.

(4) If an affected wood heater is a cookstove that meets the applicable definition in § 60.531, the following statement must appear on the permanent label:

U.S. ENVIRONMENTAL PROTECTION AGENCY

This unit is not a certified residential wood heater. The primary use for this unit is for cooking or baking.

(5) If an affected wood heater is a camp stove that meets the applicable definition in § 60.531, the following statement must appear on the permanent label:

U.S. ENVIRONMENTAL PROTECTION AGENCY

This unit is not a certified residential wood heater. For portable and temporary use only.

(e) The permanent label for all certified wood heaters must also contain the following statement:

"This wood heater needs periodic inspection and repair for proper operation. Consult owner's manual for further information. It is against the law to operate this wood heater in a manner inconsistent with operating instructions in the owner's manual."

(f) *Owner's Manual*.

(1) Each affected wood heater offered for sale by a commercial owner must be accompanied by an owner's manual that must contain the information listed in paragraphs (f)(2) and (f)(3) of this section. Such information must be adequate to enable consumers to achieve optimal emissions performance. Such information must be consistent with the operating instructions provided by the manufacturer to the accredited test laboratory for operating the wood heater during certification testing, except for details of the certification test that would not be relevant to the ultimate purchaser. The commercial owner must also make current and historical owner's manuals available on the company website and upon request to the EPA.

(2) Installation information: Requirements for achieving proper draft.

(3) Operation and maintenance information:

(i) Fuel loading procedures, recommendations on fuel selection, and warnings on what fuels not to use, such as treated wood, colored paper, cardboard, solvents, trash and garbage.

(ii) Fire starting procedures

(iii) Proper use of air controls

(iv) Ash removal procedures

(v) Instructions for replacement of gaskets, air tubes and other parts that are critical to the emissions performance of the unit and other maintenance and repair instructions

(vi) For catalytic models, information on the following pertaining to the catalytic combustor: Procedures for achieving and maintaining catalyst activity, maintenance procedures, procedures for determining deterioration or failure, procedures for replacement, and information on how to exercise warranty rights

(vii) For catalytic models, the following statement:

"This wood heater contains a catalytic combustor, which needs periodic inspection and replacement for proper operation. It is against federal law to operate this wood heater in a manner inconsistent with operating instructions in this manual, or if the catalytic element is deactivated or removed."

(viii) For noncatalytic models, the following statement:

"This wood heater needs periodic inspection and repair for proper operation. It is against federal law to operate this wood heater in a manner inconsistent with operating instructions in this manual."

(4) Any manufacturer using the EPA-recommended language contained in appendix I of this part to satisfy any requirement of this paragraph (f) will be considered to be in compliance with that requirement, provided that the particular language is printed in full, with only such changes as are necessary to ensure accuracy for the particular wood heater model line.

(5) Wood heaters that are affected by this subpart, but that have been owned and operated by a noncommercial owner, are not subject to paragraphs (f) of this section when offered for resale.

§ 60.537 What records must I keep and what reports must I submit?

(a)(1) Each manufacturer who holds a certificate of compliance under § 60.533(c) or (f) for a model line must maintain records containing the information required by paragraph (a) of this section with respect to that model line.

(2) All documentation pertaining to the certification test used to obtain certification, including the full test report and raw data sheets, laboratory technician notes, calculations, and the test results for all test runs.

(3) Results of the quality assurance program inspections required by § 60.533(m).

(4) For emissions tests conducted pursuant to the quality assurance program required by § 60.533(o), all test reports, data sheets, laboratory technician notes, calculations, and test results for all test runs, the remedial actions taken, if any, and any follow-up actions such as additional testing.

(b) Each accredited test laboratory and certifying entity must maintain records consisting of all documentation pertaining to each certification test, QA/QC inspection and audit test, including the full test report and raw data sheets, technician notes, calculations, and the test results for all test runs. Each accredited test laboratory must submit initial and biennial proficiency test results to the Administrator. Each certifying entity must submit each certification test, QA/QC inspection report and ISO IEC accreditation credentials to the Administrator.

(c) Each manufacturer must retain each wood heater upon which certification tests were performed based upon which certification was granted under § 60.533(c) or (f) at the manufacturer's facility for as long as the model line in question is manufactured. Each heater or furnace must remain sealed and unaltered. Any such wood heater must be made available to the Administrator upon request for inspection and testing.

(d) Each manufacturer of an affected wood heater certified under § 60.533(c) or (f) must submit a report to the Administrator every 2 years following issuance of a certificate of compliance for each model line. This report must include the sales for each model by state and certify that no changes in the design or manufacture of this model line have been made that require recertification under § 60.533(k).

(e)(1) Unless otherwise specified, all records required under this section must be maintained by the manufacturer, commercial owner of the affected wood heater, accredited test laboratory or certifying entity for a period of no less than 5 years.

(2) Unless otherwise specified, all reports to the Administrator required under this subpart must be made to: Wood Heater NSPS Compliance Program at www.epa.gov/Wood_Heater_NSPS_Compliance_Program.

(f) Within 60 days after the date of completing each performance test, each manufacturer or accredited test laboratory or certifying entity must submit performance test data electronically to the EPA’s Central Data Exchange (CDX) by using the Electronic Reporting Tool (ERT) (http://www.epa.gov/ttn/chief/ert/index.html). Only data collected using test methods compatible with ERT are subject to this requirement to be submitted electronically to the EPA’s CDX. Manufacturers may submit compliance reports to the EPA via regular mail at the address listed below if the test methods they use

are not compatible with ERT or if ERT is not available to accept reports at the time the final rule is published. Owners or operators who claim that some of the information being submitted for performance tests is confidential business information (CBI) must submit a completed ERT file, including information claimed to be CBI on a compact disk or other commonly used electronic storage media (including, but not limited to, flash drives), to the EPA, and the same ERT file, with the CBI omitted, to the EPA via CDX as described earlier in this paragraph. The compact disk must be clearly marked as CBI and mailed to U.S. EPA/OAQPS/CORE CBI Office, Attention: WebFIRE Administrator, MD C404-02, 4930 Old Page Rd., Durham, NC 27703. Emission data, including all information necessary to determine compliance, except sensitive engineering drawings and sensitive detailed material specifications, may not be claimed as CBI.

§ 60.538 What activities are prohibited under this subpart?

(a) No person is permitted to operate an affected wood heater that does not have affixed to it a permanent label pursuant to § 60.536 (b), (c), or (d)(2) through (d)(5).

(b) No commercial owner is permitted to advertise for sale, offer for sale, or sell an affected wood heater labeled under § 60.536(d)(1) except for export.

(c)(1) No commercial owner is permitted to advertise for sale, offer for sale or sell an affected wood heater permanently labeled under § 60.536 (b) or (c) unless:

(i) The affected wood heater has been certified to comply with 2020 particulate emission standards. This prohibition does not apply to wood heaters affected by this subpart that have been previously owned and operated by a noncommercial owner; and

(ii) The commercial owner provides any purchaser or transferee with an owner's manual that meets the requirements of § 60.536(f), a copy of the warranty and a moisture meter.

(2) No commercial owner is permitted to advertise for sale, offer for sale, or sell an affected wood heater permanently labeled under § 60.536(d)(3), unless the affected wood heater has been certified to comply with 2020 particulate emission. This prohibition does not apply to wood heaters affected by this subpart that have been previously owned and operated by a noncommercial owner.

(3) A commercial owner other than a manufacturer complies with the requirements of paragraph (c)(1) of this section if the commercial owner:

(i) Receives the required documentation from the manufacturer or a previous commercial owner; and

(ii) Provides that documentation unaltered to any person to whom the wood heater that it covers is sold or transferred.

(d)(1) In any case in which the Administrator revokes a certificate of compliance either for the knowing submission of false or inaccurate information or other fraudulent acts, or based on a finding under § 60.533(l)(1)(ii) that the certification test was not valid, the Administrator may give notice of that revocation and the grounds for it to all commercial owners.

(2) On and after the date of receipt of the notice given under paragraph (d)(1) of this section, no commercial owner is permitted to sell any wood heater covered by the revoked certificate (other than to the manufacturer) unless the model line has been recertified in accordance with this subpart.

(e) No person is permitted to install or operate an affected wood heater except in a manner consistent with the instructions on its permanent label and in the owner's manual pursuant to § 60.536(f).

(f) No person is permitted to operate an affected wood heater that was originally equipped with a catalytic combustor if the catalytic element is deactivated or removed.

(g) No person is permitted to operate an affected wood heater that has been physically altered to exceed the tolerance limits of its certificate of compliance.

(h) No person is permitted to alter, deface, or remove any permanent label required to be affixed pursuant to § 60.536.

(i) No certifying entity is permitted to certify its own certification test report.

§ 60.539 What Petition for Review procedures apply to me?

(a)(1) In any case where the Administrator—

(i) Denies an application under § 60.530(c) or § 60.533(f);

(ii) Issues a notice of revocation of certification under § 60.533(l);

(iii) Denies an application for laboratory accreditation under § 60.535(a); or

(iv) Issues a notice of revocation of laboratory accreditation under § 60.535(b), the manufacturer or laboratory affected may submit to the EPA, a Petition for Review request under this section within 30 days following receipt of the required notification of the action in question.

(2) In any case where the Administrator issues a notice of revocation under § 60.533(p), the manufacturer may submit to the EPA a Petition for Review request under this section with the time limits set out in § 60.533(p)(4).

(b) Any Petition for Review request must be in writing, must be signed by an authorized representative of the petitioning manufacturer or laboratory, and must include a statement and supporting documentation setting forth with particularity the petitioner's objection to the Administrator's determination or proposed determination.

(c) Upon receipt of a Petition for Review under paragraph (a) of this section, the Administrator shall provide a written response within 45 days.

§ 60.539a Who implements and enforces this subpart?

(a) In delegating implementation and enforcement authority to a state under section 111(c) of the Act, the authorities contained in paragraph (b) of this section must be retained by the Administrator and not transferred to a state.

(b) Authorities that must not be delegated to states:

(1) Section 60.531, Definitions;

(2) Section 60.533, Compliance and certification;

(3) Section 60.534, Test methods and procedures; and

(4) Section 60.535, Laboratory accreditation.

§ 60.539b What parts of the General Provisions do not apply to me?

The following provisions of subpart A of part 60 do not apply to this subpart:

(a) Section 60.7;

(b) Section 60.8(a), (c), (d), (e), (f) and (g); and

(c) Section 60.15(d).

4. Add subpart QQQQ to read as follows:

Subpart QQQQ – Standards of Performance for New Residential Hydronic Heaters and Forced-Air Furnaces

Sec.

Subpart QQQQ – Standards of Performance for New Residential Hydronic Heaters and Forced-Air Furnaces

§ 60.5472 Am I subject to this subpart?

(a) You are subject to this subpart if you operate, manufacture, sell, offer for sale, import for sale, distribute, offer to distribute, introduce, or deliver for introduction, into commerce in the United States, residential hydronic heater or forced-air furnace manufactured on or after **[EFFECTIVE DATE OF FINAL RULE]**.

(b) Each residential hydronic heater or forced-air furnace must comply with the provisions of this subpart unless exempted under paragraphs (b)(1) through (b)(3) of this section.

(1) Affected residential hydronic heaters or forced-air furnaces manufactured in the United States for export are exempt from the applicable emission limits of § 60.5474 and the requirements of § 60.5475.

(2) Affected residential hydronic heaters or forced-air furnaces used for research and development purposes that are never offered for sale or sold and that are not used to provide heat are exempt from the applicable emission limits of § 60.5474 and the requirements of § 60.5475. No more than 12 affected residential hydronic heaters or forced-air furnaces manufactured per model line may be exempted for this purpose.

(3) Appliances that do not burn wood or wood pellets (such as coal-only hydronic heaters or forced-air furnaces that meet the definition in § 60.5473 or corn-only hydronic heaters or forced-air furnaces) are exempt from the applicable emission limits of § 60.5474 and the requirements of § 60.5475.

(c) The following are not affected residential hydronic heaters or forced-air furnaces and are not subject to this subpart:

(1) Residential wood heaters subject to subpart AAA of this part.

(2) Residential masonry heaters subject to subpart RRRR of this part.

§ 60.5473 What definitions must I know*?*

As used in this subpart, all terms not defined herein have the same meaning given them in the Clean Air Act and subpart A of this part.

Accredited test laboratory means a test laboratory that is accredited for residential hydronic heater or forced-air furnace certification testing under § 60.5477 and is an independent third-party test laboratory that is accredited by a nationally recognized accrediting entity under ISO-IEC Standard 17025 to perform testing using the test methods specified in § 60.5476 and approved by the EPA for conducting certification tests under this subpart.

At retail means the sale by a commercial owner of a residential hydronic heater or forced-air furnace to the ultimate purchaser.

Central heater means a fuel-burning device designed to burn wood or wood pellet fuel that warms spaces other than the space where the device is located, by the distribution of air heated by the furnace through ducts or liquid heated in the device and distributed typically through pipes. Unless otherwise specified, these devices include residential forced-air furnaces and residential hydronic heaters.

Certifying entity means an independent third party that is accredited by a nationally recognized accrediting entity under ISO-IEC Standard 17020 to perform certifications, inspections and audits under ISO-IEC Guide 17065 and approved by the EPA for conducting certifications, inspections and audits under this subpart.

Coal-only hydronic heater or forced-air furnace means an enclosed, coal-burning appliance capable of space heating or domestic water heating that has all of the following characteristics:

(1) Installation instructions that state that the use of wood in the appliance, except for coal ignition purposes, is prohibited by law; and

(2) The model is listed by a nationally recognized safety-testing laboratory for coal use only, except for coal ignition purposes.

Commercial owner means any person who owns or controls a residential hydronic heater or forced-air furnace in the course of the business of the manufacture, importation, distribution, or sale of the unit.

Manufactured means completed and ready for shipment (whether or not packaged) for purposes of determining the date of manufacture.

Manufacturer means any person who constructs or imports into the United States a residential hydronic heater or forced-air furnace.

Model line means all residential hydronic heaters or forced-air furnaces offered for sale by a single manufacturer that are similar in all material respects as defined in this section.

Particulate matter (PM) means total particulate matter including PM_{10} and $PM_{2.5}$.

Pellet fuel means refined and densified solid wood shaped into small pellets or briquettes that are uniform in size, shape, moisture, density and energy content.

Representative residential hydronic heater or forced-air furnace means an individual residential hydronic heater or forced-air furnace that is similar in all material respects as defined in this section to other residential hydronic heaters or forced-air furnaces within the model line it represents.

Residential forced-air furnace means a fuel burning device designed to burn wood or wood pellet fuel that warms spaces other than the space where the furnace is located, by the distribution of air heated by the furnace through ducts.

Residential hydronic heater means a fuel burning device designed to burn wood or wood pellet fuel for the purpose of heating building space and/or water through the distribution, typically through pipes, of a fluid heated in the device, typically water or a water and antifreeze mixture.

Sale means the transfer of ownership or control, except that a transfer of control of an affected residential hydronic heater or forced-air furnace for research and development purposes within the scope of § 60.5472(b)(2) is not a sale.

Seasoned wood means wood with a moisture content of 20 percent or less.

Similar in all material respects means that the construction materials, exhaust and inlet air system, and other design features are within the allowed tolerances for components identified in § 60.533(k).

Valid certification test means a test that meets the following criteria:

(1) The Administrator was notified about the test in accordance with § 60.5476(f);

(2) The test was conducted by an accredited test laboratory as defined in this section;

(3) The test was conducted on a residential hydronic heater or forced-air furnace similar in all material respects as defined in this section to other residential hydronic heaters or forced-air furnaces of the model line that is to be certified; and

(4) The test was conducted in accordance with the test methods and procedures specified in § 60.5476.

§ 60.5474 What standards and requirements must I meet and by when?

(a) *Particulate Matter Standards*. Unless exempted under § 60.5472, no person is permitted to:

(1) On or after **[EFFECTIVE DATE OF FINAL RULE]**, manufacture or sell at retail a residential hydronic heater unless it has been certified to meet the 2015 particulate matter emission limits in paragraph (b)(1) of this section.

(2) On or after **[5 YEARS AFTER EFFECTIVE DATE OF FINAL RULE]** manufacture or sell at retail a residential hydronic heater unless it has been certified to meet the 2020 particulate matter emission limit in paragraph (b)(2) of this section.

(3) On or after **[EFFECTIVE DATE OF FINAL RULE]**, manufacture or sell at retail a residential forced-air furnace unless it has been certified to meet the 2015 particulate matter emission limits in paragraph (b)(3) of this section.

(4) On or after **[5 YEARS AFTER EFFECTIVE DATE OF FINAL RULE]** manufacture or sell at retail a residential forced-air furnace unless it has been certified to meet the 2020 particulate matter emission limit in paragraph (b)(4) of this section.

(b)(1) 2015 residential hydronic heater particulate matter emission limit: 0.32 lb/million Btu (0.137 g/megajoule) heat output and 7.5 g/hr (0.017 lb/hr) as determined by the test methods and procedures in § 60.5476.

(2) 2020 residential hydronic heater particulate matter emission limit: 0.06 lb/million Btu (0.026 g/megajoule) heat output as determined by the test methods and procedures in § 60.5476.

(3) 2015 forced-air furnace particulate matter emission limit: 0.93 lb/million Btu (0.40 g/megajoule) heat output and 7.5 g/hr (0.017 lb/hr) as determined by the test methods and procedures in § 60.5476.

(4) 2020 forced-air furnace particulate matter emission limit: 0.06 lb/million Btu (0.026 g/megajoule) heat output as determined by the test methods and procedures in § 60.5476.

(c) [*Reserved*]

(d) [*Reserved*]

(e) *Pellet Fuel Requirements*. Operators of outdoor residential hydronic heaters, indoor residential hydronic heaters, or residential forced-air furnaces that are certified to burn pellet fuels may only burn pellets that have been produced under a licensing agreement with the Pellet Fuels Institute or an equivalent organization approved by the EPA. The pellet fuel must meet the following minimum requirements:

(1) Density: consistent hardness and energy content with a minimum density of 38 pounds/cubic foot;

(2) Dimensions: maximum length of 1.5 inches and diameter between 0.230 and 0.285 inches;

(3) Inorganic fines: less than or equal to 1 percent;

(4) Chlorides: less than or equal to 300 parts per million by weight; and

(5) Ash content: no more than 2 percent.

(6) A quality assurance process licensed by the Pellet Fuel Institute or equivalent organization approved by EPA.

(f) *Prohibited Fuel Types*. No person is permitted to burn any of the following materials in an outdoor residential hydronic heater, indoor residential hydronic heater, or residential forced-air furnace:

(1) Residential or commercial garbage;

(2) Lawn clippings or yard waste;

(3) Materials containing rubber, including tires;

(4) Materials containing plastic;

(5) Waste petroleum products, paints or paint thinners, or asphalt products;

(6) Materials containing asbestos;

(7) Construction or demolition debris;

(8) Paper products; cardboard, plywood or particleboard. The prohibition against burning these materials does not prohibit the use of fire starters made from paper, cardboard, saw dust, wax and similar substances for the purpose of starting a fire in an affected residential hydronic heater or forced-air furnace;

(9) Railroad ties or pressure treated lumber;

(10) Manure or animal remains;

(11) Salt water driftwood or other or other previously salt water saturated materials;

(12) Unseasoned wood; or

(13) Any materials that were not included in the certification tests for the subject heater or furnace.

(g) *Owner's Manual*. A person must not operate an outdoor residential hydronic heater, indoor residential hydronic heater, or residential forced-air furnace in a manner inconsistent with the owner's manual. The owner's manual must clearly specify that operation in a manner inconsistent with the owner's manual would violate the warranty.

§ 60.5475 What compliance and certification requirements must I meet and by when?

(a)(1) *Certification Requirement*. Each affected residential hydronic heater and forced-air furnace must be certified to be in compliance with the applicable emission standards and other requirements of this subpart. For each model line manufactured or sold by a single entity, *e.g.*, company or manufacturer, compliance with applicable emission standards of § 60.5474(b) must be determined based on testing of representative affected residential hydronic heaters and forced-air furnaces within the model line. If one entity licenses a model line to another entity, each entity's model line must be certified. If a entity changes the name of the entity or the name of the model, the manufacturer must apply for a new certification.

(2) The manufacturer of each model line must submit the information required in § 60.533(b) and follow the certification procedure specified in § 60.533(f) except that, for the purposes of this paragraph, the references in § 60.533(f) to the "emission standards" in § 60.532 must be understood to refer to the emission limits in § 60.5474(b).

(b) *Waiver from Submitting Test Results*. An applicant for certification may apply for a potential waiver of the requirements to submit the results of a certification test pursuant to the certification procedures specified in § 60.533(f) according to the procedure specified in § 60.533(g)(1).

(c) *Certification Period*. Unless revoked sooner by the Administrator, a certificate of compliance will be valid 5 years from the date of issuance.

(d) *Renewal of Certification*. (1) Any manufacturer of an affected residential hydronic heater or forced-air furnace may apply to the Administrator for potential renewal of a certificate of compliance by submitting the material specified in § 60.533(b) and following the procedures specified in § 60.533(f).

(2) The certificate must be recertified or renewed every 5 years or the manufacture may choose to no longer manufacture or sell that model. If the manufacturer chooses to no longer manufacture or sell that model, then the manufacturer must submit a statement to the EPA for that model. A manufacturer may apply for potential renewal of their certificate by submitting certification information in accordance with § 60.533(b) or by affirming in writing that the wood heater has been subject to no changes that would impact emissions and request a potential waiver from certification testing.

(3) If the Administrator grants or waives certification testing under paragraph (d)(2) of this section, the Administrator will give written notice to the manufacturer setting forth the basis for the determination and issue a certification renewal.

(4) If the Administrator denies the request for a renewal of certification, the Administrator will give written notice to the manufacturer setting forth the basis for the determination.

(e) *Recertification*. The procedure specified in § 60.533(k) must be used to determine when a product line must be recertified.

(f) *Criteria for Revocation of Certification*. (1) The Administrator may revoke certification of a product line if it is determined that the residential hydronic heaters or forced-air furnaces being manufactured or sold in that model line do not comply with the requirements of this subpart. Such a determination will be based on all available evidence, including but not limited to:

(i) Test data from retesting of the original unit on which the certification was conducted or a similar unit;

(ii) A finding that the certification test was not valid. The finding will be based on problems or irregularities with the certification test or its documentation, but may be supplemented by other information;

(iii) A finding that the labeling of the residential hydronic heater or forced-air furnace model line or the owner's manual or marketing information does not comply with the requirements of § 60.5478;

(iv) Failure by the manufacturer to comply with the reporting and recordkeeping requirements of § 60.5479;

(v) Physical examination showing that a significant percentage (as defined in the quality assurance plan, but no larger than 1 percent) of production units inspected is not similar in all material respects as defined in this subpart to the representative affected hydronic heater or forced-air furnace submitted for testing; or

(vi) Failure of the manufacturer to conduct a quality assurance program in conformity with paragraph (g) of this section.

(2) Revocation of certification under this paragraph will not take effect until the manufacturer concerned has been given written notice by the Administrator setting forth the basis for the proposed determination and an opportunity to request a review under § 60.5481.

(g) *Quality Assurance Program*. For each certified model line, the manufacturer must conduct a quality assurance program according to the requirements of § 60.533(m).

(h) *EPA Compliance Audit Testing*. The Administrator will conduct compliance audit testing according to the requirements of § 60.533(n). For the purposes of this paragraph, references in § 60.533(n) to § § 60.532 through 60.535 must be understood to

refer to the comparable paragraphs in §§ 60.5474 through 60.5477 and the associated test methods specified in this subpart.

§ 60.5476 What test methods and procedures must I use to determine compliance with the standards and requirements for certification?

Test methods and procedures specified in this section or in appendix A of this part, except as provided under § 60.8(b), must be used to determine compliance with the standards and requirements for certification under §§ 60.5474 and 60.5475 as follows:

(a)(1) Method 28 WHH must be used to measure the heat output (million Btu/hr) of outdoor and indoor residential hydronic heaters.

(2) If the model is subject to the 2015 particulate matter standards specified in § 60.5474(a)(1) and is equipped with an external heat storage unit, you must conduct testing according to paragraph § 60.5476(a)(2)(i) and (ii) of this section. You have the option of submitting the test results of either (a)(2)(i) or (ii) of this section to the Administrator as specified under § 60.5479 for certification compliance.

(i) Conduct testing using crib wood as specified in Method 28 WHH. The heat input and heat output measurements must be performed according to ASTM method E2618-13 entitled "Standard Test Method for Determining Particulate Matter Emissions and Heating of Outdoor Solid Fuel-fired Hydronic Heating Appliances." Testing conducted with continuously fed biomass as the fuel(s) must be conducted according to the relevant section of the ASTM method.

(ii) Conduct testing using cord wood as specified in "A Test Method for Certification of Cord Wood-Fired Hydronic Heating Appliances with Partial Thermal Storage: Measurement of Particulate Matter (PM) and Carbon Monoxide (CO) Emissions

and Heating Efficiency of Wood-Fired Hydronic Heating Appliances with Partial Thermal Storage."

(3) If the model is subject to the 2020 particulate matter standards specified in § 60.5474(a)(2) and is equipped with an external partial heat storage unit, you must conduct cord wood testing according to the test methods and procedures of "A Test Method for Certification of Cord Wood-Fired Hydronic Heating Appliances with Partial Thermal Storage: Measurement of Particulate Matter (PM) and Carbon Monoxide (CO) Emissions and Heating Efficiency of Wood-Fired Hydronic Heating Appliances with Partial Thermal Storage."

(b) Method 28 WHH in conjunction with ASTM E2515-10 must be used to measure the particulate matter emission rate (lb/million Btu heat output) of outdoor and indoor residential hydronic heaters, except that for the 2020 standards, you should first test Burn Rate Categories 1 and 4 and then test 2 more times for whichever burn rate category is worse on a lb/million BTU heat output basis and report the results separately per burn rate category.

(c) Canadian Standards Administration (CSA) Method B415.1-10 must be used to measure the heat output (million Btu/hr) and particulate matter emission rate (lb/million Btu heat output) of forced-air furnaces, except that for the 2020 standards, you should first test Burn Rate Categories 1 and 4 and then test 2 more times for whichever burn rate category is worse on a lb/million BTU heat output basis and report the results separately per burn rate category.

(d) CSA Method B415.1-10, section 13.7, must be used to measure the thermal efficiency of outdoor and indoor residential hydronic heaters.

(e) [*Reserved*]

(f) The manufacturer of an affected residential hydronic heater or forced-air furnace must notify the Administrator of the date that certification testing is to begin, by email, to Wood Heater NSPS Compliance Program at www.epa.gov/Wood_Heater_NSPS_Compliance_Program. This notice must be at least 30 days before the start of testing. The notification of testing must include the manufacturer's name and address, the accredited test laboratory's name and address, certifying entity name, the model name and number (or, if unavailable, some other way to distinguish between models), and the dates of testing.

(g) The accredited test laboratory must allow the manufacturer, the EPA and delegated states to observe certification testing. However, manufacturers must not involve themselves in the conduct of the test after the pretest burn (as defined by EPA Method 28 WHH) has begun. Communications between the manufacturer and laboratory or certifying entity personnel regarding operation of the hydronic heater must be limited to written communications transmitted prior to the first pretest burn of the certification series. Written communications between the manufacturer and laboratory personnel may be exchanged during the certification test only if deviations from the test procedures are observed that constitute improper conduct of the test. All communications must be included in the test documentation required to be submitted pursuant to § 60.533(b)(3) and must be consistent with instructions provided in the owner's manual required under § 60.5478(f), except to the extent that they address details of the certification tests that would not be relevant to owners.

§ 60.5477 What procedures must I use for laboratory accreditation?

The accreditation procedure specified in § 60.535 must be used to certify test laboratories under this subpart.

§ 60.5478 What requirements must I meet for permanent labels and owner's manuals?

(a) *Permanent Label Requirements*.

(1) Each affected residential hydronic heater or forced-air furnace manufactured or sold on or after the date the applicable standards come into effect as specified in § 60.5474, must have a permanent label affixed to it that meets the requirements of this section.

(2) The permanent label must contain the following information:

(i) Month and year of manufacture of the individual unit;

(ii) Model name or number; and

(iii) Serial number.

(3) The permanent label must:

(i) Be affixed in a readily visible or accessible location in such a manner that it can be easily viewed before and after the appliance is installed;

(ii) Be at least 8.9 cm long and 5.1 cm wide (3 1/2 inches long and 2 inches wide);

(iii) Be made of a material expected to last the lifetime of the residential hydronic heater or forced-air furnace;

(iv) Present required information in a manner so that it is likely to remain legible for the lifetime of the residential hydronic heater or forced-air furnace; and

(v) Be affixed in such a manner that it cannot be removed without damage to the label.

(4) The permanent label may be combined with any other label, as long as the required information is displayed, the integrity of the permanent label is not compromised, and the requirements of § 60.5478(a)(3) are still met.

(b) If the residential hydronic heater or forced-air furnace belongs to a model line certified under § 60.5475, and it has been found to meet the applicable emission limits or tolerances through quality assurance testing, one of the following statements, as appropriate, must appear on the permanent label:

U.S. ENVIRONMENTAL PROTECTION AGENCY

Certified to comply with 2015 particulate emission standards.

or

U.S. ENVIRONMENTAL PROTECTION AGENCY

Certified to comply with 2020 particulate emission standards.

(c) The label under paragraph (b) of this section must also contain the following statement on the permanent label:

“This appliance needs periodic inspection and repair for proper operation. Consult owner's manual for further information. It is against the law to operate this appliance in a manner inconsistent with operating instructions in the owner's manual.”

(d) Any label statement under paragraph (b) of this section constitutes a representation by the manufacturer as to any residential hydronic heater or forced-air furnace that bears it:

(1) That the certification of compliance was in effect at the time the residential hydronic heater or forced-air furnace left the possession of the manufacturer;

(2) That the manufacturer was, at the time the label was affixed, conducting a quality assurance program in conformity with the manufacturer's quality assurance program; and

(3) That as to any residential hydronic heater or forced-air furnace individually tested for emissions by the manufacturer under § 60.5475(f), it met the applicable emission limit.

(e)(1) If an affected residential hydronic heater or forced-air furnace is manufactured in the United States for export as provided in § 60.5472(b)(1), the following statement must appear on the permanent label:

U.S. ENVIRONMENTAL PROTECTION AGENCY

Export appliance. May not be operated in the United States.

(2) If an affected residential hydronic heater or forced-air furnace is manufactured for use for research and development purposes as provided in § 60.5472(b)(2), the following statement must appear on the permanent label:

U.S. ENVIRONMENTAL PROTECTION AGENCY

Not certified. Research Appliance. Not approved for sale.

(3) If an affected residential hydronic heater or forced-air furnace is a non wood-burning hydronic heater or forced-air furnace exclusively as provided in § 60.5472(b)(3) the following statement must appear on the permanent label:

U.S. ENVIRONMENTAL PROTECTION AGENCY

This appliance is not certified for wood burning. Use of any wood fuel is a violation of federal law.

(f) *Owner's Manual*. (1) Each affected residential hydronic heater or forced-air furnace offered for sale by a commercial owner must be accompanied by an owner's manual that must contain the information listed in paragraph (f)(2) of this section (pertaining to installation), and paragraph (f)(3) of this section (pertaining to operation and maintenance). Such information must be adequate to enable consumers to achieve optimal emissions performance. Such information must be consistent with the operating instructions provided by the manufacturer to the accredited test laboratory for operating the residential hydronic heater or forced-air furnace during certification testing, except for details of the certification test that would not be relevant to the ultimate purchaser. The commercial owner must also make current and historical owner's manuals available on the company website.

(2) Installation information: Requirements for achieving proper draft.

(3) Operation and maintenance information:

(i) Fuel loading procedures, recommendations on fuel selection, and warnings on what fuels not to use, such as treated wood, colored paper, cardboard, solvents, trash and garbage.

(ii) Fire starting procedures

(iii) Proper use of air controls

(iv) Ash removal procedures

(v) Instructions for replacement of gaskets and other parts that are critical to the emissions performance of the unit and other maintenance and repair instructions

(vi) The following statement: “This wood heating appliance needs periodic inspection and repair for proper operation. It is against federal law to operate this wood heating appliance in a manner inconsistent with operating instructions in the manual.”

(4) Any manufacturer using the EPA model language contained in appendix I of this part to satisfy any requirement of this paragraph (f) will be considered to be in compliance with that requirement, provided that the particular model language is printed in full, with only such changes as are necessary to ensure accuracy for the particular model line.

(5) Residential hydronic heaters and forced-air furnaces that are affected by this subpart but have been operated by a noncommercial owner are not subject to paragraph (f) of this section when offered for resale.

§ 60.5479 What records must I keep and what reports must I submit?

(a) Each manufacturer who holds a certificate of compliance pursuant to § 60.5475(a)(2) for a model line must maintain records containing the following information with respect to that model line.

(1) All documentation pertaining to the certification test used to obtain certification, including the full test report and raw data sheets, laboratory technician notes, calculations, and the test results for all test runs.

(2) Results of the quality assurance program inspections required pursuant to § 60.5475(g).

(3) For emissions tests conducted pursuant to the quality assurance program required by § 60.5475(g), all test reports, data sheets, laboratory technician notes,

calculations, and test results for all test runs, the corrective actions taken, if any, and any follow-up actions such as additional testing.

(b) Each accredited test laboratory must maintain records consisting of all documentation pertaining to each certification test and audit test, including the full test report and raw data sheets, laboratory technician notes, calculations, and the test results for all test runs. Each accredited test laboratory must submit initial and biennial proficiency test results to the Administrator.

(c) Each manufacturer must retain each residential hydronic heater and forced-air furnace upon which certification tests were performed and certification granted under § 60.5475(a)(2) at the manufacturer's facility for as long as the model line is manufactured. Each heater or furnace must remain sealed and unaltered. Any such residential hydronic heater or forced-air furnace must be made available upon request to the Administrator for inspection and testing.

(d) Each manufacturer of an affected residential hydronic heater or forced-air furnace certified pursuant to § 60.5475(a)(2) must submit a report to the Administrator every 2 years following issuance of a certificate of compliance for each model line. This report must include the sales for each model by state and certify that no changes in the design or manufacture of the model line have been made that require recertification pursuant to § 60.5475(e).

(e)(1) Unless otherwise specified, all records required under this section must be maintained by the manufacturer, commercial owner of the affected residential hydronic heater or forced-air furnace, accredited test laboratory or certifying entity for a period of no less than 5 years.

(2) Unless otherwise specified, all reports to the Administrator required under this subpart must be made to: Wood Heater NSPS Compliance Program at www.epa.gov/Wood_Heater_NSPS_Compliance_Program.

(f) Within 60 days after the date of completing each performance test, each manufacturer or accredited test laboratory or certifying entity must submit performance test data electronically to the EPA's Central Data Exchange (CDX) by using the Electronic Reporting Tool (ERT) (http://www.epa.gov/ttn/chief/ert/index.html). Only data collected using test methods compatible with ERT are subject to this requirement to be submitted electronically to EPA's CDX. Manufacturers may submit compliance reports to the EPA via regular mail at the address listed below if the test methods they use are not compatible with ERT or if ERT is not available to accept reports at the time the final rule is published. Owners or operators who claim that some of the information being submitted for performance tests is confidential business information (CBI) must submit a completed ERT file, including information claimed to be CBI on a compact disk or other commonly used electronic storage media (including, but not limited to, flash drives), to the EPA and the same ERT file, with the CBI omitted, to the EPA via CDX as described earlier in this paragraph. The compact disk must be clearly marked as CBI and mailed to U.S. EPA/OAQPS/CORE CBI Office, Attention: WebFIRE Administrator, MD C404-02, 4930 Old Page Rd., Durham, NC 27703. Emission data and all information necessary to determine compliance, except sensitive engineering drawings and sensitive detailed material specifications, may not be claimed as CBI.

§ 60.5480 What activities are prohibited under this subpart?

(a) No person is permitted to operate an affected residential hydronic heater or forced-air furnace that does not have affixed to it a permanent label pursuant to § 60.5478(b) or (c).

(b)(1) No commercial owner is permitted to advertise for sale, offer for sale, or sell an affected residential hydronic heater or forced-air furnace that does not have affixed to it a permanent label pursuant to § 60.5478(b) or (e)(3).

(2) No commercial owner is permitted to advertise for sale, offer for sale, or sell an affected residential hydronic heater or forced-air furnace labeled under § 60.5478(e)(1) except for export.

(c)(1) No commercial owner is permitted to advertise for sale, offer for sale, or sell an affected residential hydronic heater or forced-air furnace permanently labeled under § 60.5478(b) or (e)(3) unless:

(i) The affected appliance has been certified to comply with 2020 particulate emission standards. This prohibition does not apply to affected residential hydronic heaters or forced-air furnaces regulated under this subpart that have been previously owned and operated by a noncommercial owner; and

(ii) The commercial owner provides any purchaser or transferee with an owner's manual that meets the requirements of § 60.5478(f), a copy of the warranty and a moisture meter.

(2) A commercial owner other than a manufacturer complies with the requirements of paragraph (c)(1) of this section if the commercial owner:

(i) Receives the required documentation from the manufacturer or a previous commercial owner; and

(ii) Provides that documentation unaltered to any person to whom the residential hydronic heater or forced-air furnace that it covers is sold or transferred.

(d)(1) In any case in which the Administrator revokes a certificate of compliance either for the knowing submission of false or inaccurate information or other fraudulent acts, or based on a finding under § 60.5475(e)(1)(ii) that the certification test was not valid, the Administrator may give notice of that revocation and the grounds for it to all commercial owners.

(2) On and after the date of receipt of the notice given under paragraph (d)(1) of this section, no commercial owner is permitted to sell any residential hydronic heater or forced-air furnace covered by the revoked certificate (other than to the manufacturer) unless the model line has been recertified in accordance with this subpart.

(e) No person is permitted to install or operate an affected residential hydronic heater or forced-air furnace except in a manner consistent with the instructions on its permanent label and in the owner's manual pursuant to § 60.5478(f), including only using fuels for which the unit is certified.

(f) No person is permitted to operate an affected residential hydronic heater or forced-air furnace that has been physically altered to exceed the tolerance limits of its certificate of compliance.

(g) No person is permitted to alter, deface, or remove any permanent label required to be affixed pursuant to § 60.5478.

(h) No certifying entity is permitted to certify its own certification test report.

§ 60.5481 What Petition for Review procedures apply to me?

(a) In any case where the Administrator:

(1) Denies an application under § 60.5475(a)(2);

(2) Issues a notice of revocation of certification pursuant to § 60.5475(e);

(3) Denies an application for laboratory accreditation pursuant to § 60.5477; or

(4) Issues a notice of revocation of laboratory accreditation pursuant to § 60.5477, the manufacturer or laboratory affected may submit to the EPA a request for review under this section pursuant to the procedures specified in § 60.539 within 30 days following receipt of the required notification of the action in question.

(b) In any case where the Administrator issues a notice of revocation pursuant to § 60.5475(g), the manufacturer may submit to the EPA a Petition for Review request under this section with the time limits set out in § 60.533(p)(4).

§ 60.5482 Who implements and enforces this subpart?

(a) In delegating implementation and enforcement authority to a state under section 111(c) of the Clean Air Act, the authorities contained in paragraph (b) of this section must be retained by the Administrator and not transferred to a state.

(b) Authorities that must not be delegated to states:

(1) Section 60.5473, Definitions;

(2) Section 60.5475, Compliance and certification;

(3) Section 60.5476, Test methods and procedures; and

(4) Section 60.5477, Laboratory accreditation.

§ 60.5483 What parts of the General Provisions do not apply to me?

The following provisions of subpart A of part 60 do not apply to this subpart:

(a) Section 60.7;

(b) Section 60.8(a), (c), (d), (e), (f) and (g); and

(c) Section 60.15(d).

5. Add subpart RRRR to read as follows:

Subpart RRRR – Standards of Performance for New Residential Masonry Heaters

Sec.

Subpart RRRR – Standards of Performance for New Residential Masonry Heaters

§ 60.5484 Am I subject to this subpart?

(a) You are subject to this subpart if you operate, manufacture, sell, offer for sale, import for sale, distribute, offer to distribute, introduce, or deliver for introduction, into commerce in the United States, a residential masonry heater manufactured on or after **[EFFECTIVE DATE OF FINAL RULE]**.

(b) Each affected masonry heater must comply with the provisions of this subpart unless exempted under paragraphs (b)(1) through (b)(3) of this section.

(1) Affected masonry heaters manufactured in the United States for export are exempt from the applicable emission limits of § 60.5486 and the requirements of § 60.5487.

(2) Affected masonry heaters used for research and development purposes that are never offered for sale or sold and that are not used to provide heat are exempt from the applicable emission limits of § 60.5486 and the requirements of § 60.5487. No more than six affected masonry heaters manufactured per model line may be exempted for this purpose.

(3) Affected masonry heaters that do not burn wood or wood pellets (such as coal-only heaters that meet the definition in § 60.5485 or corn-only heaters) are exempt from the applicable emission limits of § 60.5486 and the requirements of § 60.5487.

(c) The following are not affected masonry heaters and are not subject to this subpart:

(1) Residential wood heaters subject to subpart AAA of this part.

(2) Residential hydronic heaters and forced-air furnaces subject to subpart QQQQ of this part.

§ 60.5485 What definitions must I know?

As used in this subpart, all terms not defined herein have the same meaning given them in the Clean Air Act and subpart A of this part.

Accredited test laboratory means a test laboratory that is accredited for masonry heater certification testing under § 60.5489 or is an independent third party test laboratory

that is accredited by a nationally recognized accrediting entity under ISO-IEC Standard 17025 to perform testing using the test methods specified in § 60.5488 and approved by the EPA for conducting certification tests under this subpart.

At retail means the sale by a commercial owner of a residential masonry heater to the ultimate purchaser.

Certifying entity means an independent third party that is accredited by a nationally recognized accrediting entity under ISO-IEC Standard 17020 to perform certifications and inspections under ISO-IEC Guide 17065 and approved by the EPA for conducting certifications, inspections and audits under this subpart.

Coal-only heater means an enclosed, coal-burning appliance capable of space heating or domestic water heating which has all of the following characteristics:

(1) Installation instructions that state that the use of wood in the heater, except for coal ignition purposes, is prohibited by law; and

(2) The model is listed by a nationally recognized safety-testing laboratory for coal use only, except for coal ignition purposes.

Commercial owner means any person who owns or controls a residential masonry heater in the course of the business of the manufacture, importation, distribution, or sale of the unit.

Manufactured means completed and ready for shipment (whether or not packaged) or installed in a residence in the case of custom-built masonry heaters for purposes of determining the date of manufacture.

Manufacturer means any person who constructs or imports into the United States a residential masonry heater.

Model line means all residential masonry heaters offered for sale by a single manufacturer that are similar in all material respects as defined in this section.

Particulate matter (PM) means total particulate matter including PM_{10} and $PM_{2.5}$.

Pellet fuel means refined and densified wood shaped into small pellets or briquettes that are uniform in size, shape, moisture, density and energy content.

Representative affected masonry heater means an individual residential masonry heater that is similar in all material respects as defined in this section to other residential masonry heaters within the model line it represents.

Residential masonry heater means a factory-built or site-built wood-burning device that has the following characteristics:

(1) The device has a core constructed primarily of manufacturer-built, supplied, or specified masonry materials (such as stone, cemented aggregate, clay, tile, or other non-combustible, non-metallic solid materials) that weighs at least 1700 pounds;

(2) The firebox effluent of the masonry heater travels horizontally and/or downward through one or more heat absorbing masonry duct(s) for a distance at least the length of the largest single internal firebox dimension before leaving the masonry heater. These parameters are determined as follows:

(i) Horizontal or downward travel distance is defined as the net horizontal and/or downward internal duct length, measured from the top of the uppermost firebox door opening(s) to the exit of the masonry heater as traveled by any effluent on a single pathway through duct channel(s) within the heater (or average of net internal duct lengths for multiple pathways of different lengths, if applicable). Net internal duct length is measured from the center of the internal side or top surface of a duct, horizontally or

vertically to the center of the opposite side or the bottom surface of the same duct, and summed for multiple ducts or directions on a single pathway, if applicable. For duct channel(s) traversing horizontal angles of less than ninety degrees from vertical, only the net actual horizontal distance traveled is included in the total duct length; and

(ii) The largest single internal firebox dimensions is defined as the longest of either the length or the width of the firebox hearth and the height of the firebox, measured from the hearth to the top of the uppermost firebox door opening(s);

(3) The device has one or more air-controlling doors for fuel-loading that are designed to be closed during the combustion of fuel loads, and that control the entry of combustion air (beyond simple spark arresting screens) to one or more inlets as prescribed by the masonry heater manufacturer; and

(4) The device is assembled in conformance with Underwriters Laboratories' and/or manufacturer's specifications for its assembly and, if the core is constructed with a substantial portion of materials not supplied by the manufacturer, is certified by a representative of the manufacturer to be substantially in conformance with those specifications.

Sale means the transfer of ownership or control, except that a transfer of control of an affected heater for research and development purposes within the scope of § 60.5484(b)(2) is not a sale.

Seasoned wood means wood with a moisture content of 20 percent or less.

Similar in all material respects means that the construction materials, exhaust and inlet air system, and other design features are within the allowed tolerances for components identified in § 60.533(k).

Valid certification test means a test that meets the following criteria:

(1) The Administrator was notified about the test in accordance with § 60.5488(d)

(2) The test was conducted by an accredited test laboratory as defined in this section;

(3) The test was conducted on a residential masonry heater similar in all material respects as defined in this section to other residential masonry heaters of the model line that is to be certified; and

(4) The test was conducted in accordance with the test methods and procedures specified in § 60.5488.

§ 60.5486 What standards and requirements must I meet and by when?

(a) *Particulate Matter Standard*. Unless exempted under § 60.5484:

(1) On or after **[EFFECTIVE DATE OF FINAL RULE]**, no person is permitted to manufacture and, on or after **[6 MONTHS AFTER EFFECTIVE DATE OF FINAL RULE]**, no person is permitted to sell at retail a residential masonry heater unless the heater has been certified to meet the particulate matter emission limit in paragraph (b) of this section or the manufacturer is a small manufacturer as defined in paragraph (a)(2) of this section.

(2) On or after **[5 YEARS AFTER EFFECTIVE DATE OF FINAL RULE]**, no small manufacturer is permitted to manufacture a residential masonry heater unless it has been certified to meet the particulate matter emission limit in paragraph (b) of this section. For the purposes of this subpart, a small manufacturer is defined as a manufacturer that constructs less than 15 residential masonry heaters per year. A small

manufacturer may elect to comply with the emission limit in paragraph (b) of this section earlier than specified in this paragraph.

(b) Residential masonry heater particulate matter emission limit: 0.32 lb/million Btu (0.137 g/megajoule) heat output as determined by the test methods and procedures in § 60.5488.

(c) *Pellet Fuel Requirements*. Operators of masonry heaters that are certified to burn pellet fuels may only burn pellets that have been produced under a licensing agreement with the Pellet Fuel Institute or an equivalent organization approved by EPA. The pellet fuel must meet the following minimum requirements:

(1) Density: consistent hardness and energy content with a minimum density of 38 pounds/cubic foot;

(2) Dimensions: maximum length of 1.5 inches and diameter between 0.230 and 0.285 inches;

(3) Inorganic fines: less than or equal to 1 percent;

(4) Chlorides: less than or equal to 300 parts per million by weight; and

(5) Ash content: no more than 2 percent.

(6) A quality assurance process licensed by the Pellet Fuel Institute or equivalent organization approved by the EPA.

(d) *Prohibited Fuel Types*. No person is permitted to burn any of the following materials in a residential masonry heater:

(1) Residential or commercial garbage;

(2) Lawn clippings or yard waste;

(3) Materials containing rubber, including tires;

(4) Materials containing plastic;

(5) Waste petroleum products, paints or paint thinners, or asphalt products;

(6) Materials containing asbestos;

(7) Construction or demolition debris;

(8) Paper products, cardboard, plywood, or particleboard. The prohibition against burning these materials does not prohibit the use of fire starters made from paper, cardboard, saw dust, wax and similar substances for the purpose of starting a fire in an affected masonry heater;

(9) Railroad ties or pressure treated wood;

(10) Manure or animal remains; or

(11) Salt water driftwood or other previously salt water saturated materials.

(e) *Owner's Manual*. A person must not operate a residential masonry heater in a manner inconsistent with the owner's manual. The owner's manual must clearly specify that operation in a manner inconsistent with the owner's manual would violate the warranty.

§ 60.5487 What compliance and certification requirements must I meet and by when?

(a)(1) *Certification Requirement*. Each affected residential masonry heater must be certified to be in compliance with the applicable emission standards and other requirements of this subpart. For each model line manufactured or sold by a single entity, *e.g.*, company or manufacturer, compliance with applicable emission standards of § 60.5486(b) must be determined based on testing of representative affected appliances within the model line. If one entity licenses a model line to another entity, each entity's

model line must be certified. If an entity changes the name of the entity or the name of the model, the manufacturer must apply for a new certification.

(2) The manufacturer of each model line must submit to the EPA the information required in paragraph (b) of this section and follow the certification procedure specified in § 60.533(f) except that, for the purposes of this paragraph, the reference in § 60.533(f) to the emission limits in § 60.532 must be understood to refer to the emission limits in § 60.5486(b) and the associated test methods are those specified in this subpart.

(3) As an alternative to the certification process described in paragraph (a)(2) of this section, an applicant may choose to submit a computer model simulation program for review and certification by the certifying entity and subsequent review and approval by the Administrator for use as a surrogate for emissions testing. The Administrator will post the certified model on the EPA Burnwise website.

(b) *Waiver from Submitting Test Results*.

(1) An applicant for certification may apply for a potential waiver of the requirements to submit the results of a certification test pursuant to the certification procedures specified in § 60.533(f) according to the procedure specified in § 60.533(g)(1).

(2) Alternatively, an applicant may submit results using a validated computer model simulation program that demonstrates the masonry heater design meets the emission limit in § 60.5486(b).

(c) *Certification Period*.

(1) Unless revoked sooner by the Administrator, a certificate of compliance will be valid for 5 years from the date of issuance.

(2) If the manufacturer qualifies as a small manufacturer as defined in § 60.5486(a)(2) and the model was certified using the procedure defined in paragraph (a)(3) of this section, the certificate of compliance will be valid for the life of the model line unless it is revoked by the Administrator.

(d) *Renewal of Certification*.

(1) Any manufacturer of an affected masonry heater may apply to the Administrator for potential renewal of a certificate of compliance by submitting the material specified in § 60.533(b) and following the process specified in § 60.533(f).

(2) A certificate issued pursuant to paragraph (c)(1) of this section must be recertified or renewed every 5 years or the manufacture may choose to no longer manufacture or sell that model. If the manufacturer chooses to no longer manufacture or sell that model, then the manufacturer must submit a statement to EPA for that model. A manufacturer may apply to the Administrator for potential renewal of their certificate by submitting certification information in accordance with § 60.533(b) or by affirming in writing that the wood heater has been subject to no changes that would impact emissions and request a potential waiver from certification testing.

(3) If the Administrator waives certification testing under paragraph (c)(2) of this section, the Administrator will give written notice to the manufacturer setting forth the basis for the determination and issue a certification.

(4) If the Administrator denies the request, the Administrator will give written notice to the manufacturer setting forth the basis for the determination.

(e) *Recertification*.

(1) The procedure specified in § 60.533(k) must be used to determine when a model line must be recertified.

(2) If the manufacturer qualifies as a small manufacturer as defined in § 60.5486(a)(2) and the model line was certified using the procedure defined in paragraph (a)(3) of this section, the recertification provisions of paragraph (e)(1) of this section do not apply.

(f) *Criteria for Revocation of Certification.*

(1) The Administrator may revoke certification of a model line if it is determined that the residential masonry heaters produced in that model line do not comply with the requirements of this subpart. Such a determination will be based on all available evidence, including but not limited to:

(i) Test data from retesting of the original unit on which the certification was conducted or a similar unit;

(ii) A finding that the certification test or model simulation was not valid;

(iii) A finding that the labeling of the residential masonry heater model line or the associated owner's manual or marketing information does not comply with the requirements of § 60.5490;

(iv) Failure by the manufacturer to comply with the reporting and recordkeeping requirements of § 60.5491;

(v) Physical examination showing that an inspected production unit is not similar in all material respects as defined in this subpart to the representative affected masonry heater submitted for testing; or

(vi) Failure of the manufacturer to conduct a quality assurance program in conformity with paragraph (f) of this section.

(2) Revocation of certification under this paragraph will not take effect until the manufacturer concerned has been given written notice by the Administrator setting forth the basis for the proposed determination and an opportunity to request a Petition for Review under § 60.5493.

(g) *Quality Assurance Program*. For each certified model line, except for any model line at small manufacturers as defined in § 60.5486(a)(2) and where the model line was certified using the procedure defined in paragraph (a)(3) of this section, the manufacturer must conduct a quality assurance program according to the requirements of § 60.533(m).

(h) *EPA Compliance Audit Testing*. The Administrator may conduct compliance audit testing according to the requirements of § 60.533(n). For the purposes of this paragraph, references in § 60.533(p) to § § 60.532 through 60.535 must be understood to refer to the comparable paragraphs in § § 60.5486 through 60.5489, respectively. The requirements of this paragraph do not apply to small manufacturers as defined in § 60.5486(a)(2) and where the model line was certified using the procedure defined in paragraph (a)(3) of this section.

§ 60.5488 What test methods and procedures must I use to determine compliance with the standards and requirements for certification?

Test methods and procedures specified in this section or in appendix A of this part, except as provided under § 60.8(b), must be used to determine compliance with the standards and requirements for certification under § § 60.5486 and 60.5487 as follows:

(a) ASTM E2817-11, Standard Test Method for Test Fueling Masonry Heaters, must be used to measure the heat output (million Btu/hr) of residential masonry heaters.

(b) ASTM E2515-10 must be used in conjunction with ASTM E2817-11 to measure the particulate emission rate (lb/million BTU heat output) of residential masonry heaters.

(c)(1) ASTM WK26558, New Specification for Calculation Method for Custom Designed, Site Built Masonry Heaters may be used as an alternative to certification testing as specified in paragraphs (a), (b) and (d) of this section.

(2) If the Administrator approves an alternative computer model simulation program pursuant to §60.5487(a)(3), the approved simulation program also may be used as an alternative to certification testing as specified in paragraphs (a) and (b) of this section.

(d) Method 10 in appendix A-4 of this part must be used to measure CO emissions of residential masonry heaters.

(e) The manufacturer of an affected masonry heater must notify the Administrator of the date that certification testing is to begin, by email, to Wood Heater NSPS Compliance Program at www.epa.gov/Wood_Heater_NSPS_Compliance_Program. This notice must be received at least 30 days before the start of testing. The notification of testing must include the manufacturer's name and address, the accredited test laboratory's name and address, certifying entity name, the model name and number (or, if unavailable, some other way to distinguish between models), and the dates of testing.

(f) The accredited test laboratory must allow the manufacturer, the EPA and delegated states to observe certification testing. However, manufacturers must not

involve themselves in the conduct of the test after the pretest burn (as defined by ASTM E2817-11) has begun. Communications between the manufacturer and laboratory or certifying entity personnel regarding operation of the masonry heater must be limited to written communications transmitted prior to the first pretest burn of the certification series. Written communications between the manufacturer and laboratory personnel may be exchanged during the certification test only if deviations from the test procedures are observed that constitute improper conduct of the test. All communications must be included in the test documentation required to be submitted pursuant to § 60.533(b)(3) and must be consistent with instructions provided in the owner's manual required under § 60.5490(g), except to the extent that they address details of the certification tests that would not be relevant to owners.

§ 60.5489 What procedures must I use for laboratory accreditation?

The accreditation procedure specified in § 60.535 must be used to certify test laboratories under this subpart.

§ 60.5490 What requirements must I meet for permanent labels and owner's manuals?

(a) *Permanent Label Requirements*.

(1) Each affected masonry heater manufactured on or after the date the applicable standards come into effect as specified in § 60.5486, must have a permanent label affixed to it that meets the requirements of this section.

(2) The permanent label must contain the following information:

(i) Month and year of manufacture of the individual unit;

(ii) Model name or number; and

(iii) Serial number.

(3) The permanent label must:

(i) Be affixed in a readily visible or accessible location in such a manner that it can be easily viewed before and after the appliance is installed;

(ii) Be at least 8.9 cm long and 5.1 cm wide (3 1/2 inches long and 2 inches wide);

(iii) Be made of a material expected to last the lifetime of the residential masonry heater;

(iv) Present required information in a manner so that it is likely to remain legible for the lifetime of the residential masonry heater; and

(v) Be affixed in such a manner that it cannot be removed without damage to the label.

(4) The permanent label may be combined with any other label, as long as the required information is displayed, the integrity of the permanent label is not compromised, and the requirements of § 60.5490(3) are still met.

(b)(1) If the residential masonry heater belongs to a model line certified under § 60.5487, and it has been found to meet the applicable emission limits or tolerances through quality assurance testing, the following statement must appear on the permanent label:

U.S. ENVIRONMENTAL PROTECTION AGENCY

Certified to comply with 2015 particulate emissions standards.

(2) If the masonry heater belongs to a model line owned by a manufacturer that qualifies for the small volume manufacturer delay as specified in § 60.5486(a)(2), the following statement must appear on the permanent label:

U.S. ENVIRONMENTAL PROTECTION AGENCY

This masonry heater was produced by a small volume manufacturer that manufactures or exports to the United States fewer than 15 masonry heaters per year. This appliance cannot be sold after **[5 YEARS AFTER EFFECTIVE DATE OF FINAL RULE]**.

(c) The label under paragraph (b) of this section must also contain the following statement on the permanent label: "This appliance needs periodic inspection and repair for proper operation. Consult owner's manual for further information. It is against the law to operate this appliance in a manner inconsistent with operating instructions in the owner's manual."

(d) Any label statement under paragraph (b) of this section constitutes a representation by the manufacturer as to any residential masonry heater that bears it:

(1) That the certification was in effect at the time the residential masonry heater left the possession of the manufacturer;

(2) That the manufacturer was, at the time the label was affixed, conducting a quality assurance program in conformity with the manufacturer's quality assurance program; and

(3) That as to any residential masonry heater individually tested for emissions by the manufacturer under § 60.5487(f), it met the applicable emission limit.

(e)(1) If an affected masonry heater is manufactured in the United States for export as provide in § 60.5484(b)(1), the following statement must appear on the permanent label:

U.S. ENVIRONMENTAL PROTECTION AGENCY

Export unit. May not be operated in the United States.

(2) If an affected masonry heater is manufactured for research and development purposes as provided in § 60.5484(b)(2), the following statement must appear on the permanent label:

U.S. ENVIRONMENTAL PROTECTION AGENCY

Not certified. Research unit. Not approved for sale.

(3) If an affected masonry heater is a non wood-burning masonry heater exclusively as provided § 60.5484(b)(3) the following statement must appear on the permanent label:

U.S. ENVIRONMENTAL PROTECTION AGENCY

This appliance is not certified for wood burning. Use of any wood fuel is a violation of federal law.

(f) *Owner's Manual*.

(1) Each affected masonry heater offered for sale by a commercial owner must be accompanied by an owner's manual that must contain the information listed in paragraph (f)(2) of this section (pertaining to installation), and paragraph (f)(3) of this section (pertaining to operation and maintenance). Such information must be adequate to enable consumers to achieve optimal emissions performance. Such information must be consistent with the operating instructions provided by the manufacturer to the accredited test laboratory for operating the residential masonry heater, except for details of the certification test that would not be relevant to the ultimate purchaser. The commercial owner must also make current and historical owner's manuals available on the company website.

(2) Installation information: Requirements for achieving proper draft.

(3) Operation and maintenance information:

(i) Fuel loading procedures, recommendations on fuel selection, and warnings on what fuels not to use, such as treated wood, colored paper, cardboard, solvents, trash and garbage.

(ii) Fire starting procedures

(iii) Proper use of air controls

(iv) Ash removal procedures

(v) Instructions for replacement of gasket and other parts that are critical to the emissions performance of the unit and other maintenance and repair instructions

(vi) The following statement: "This wood heating appliance needs periodic inspection and repair for proper operation. It is against federal law to operate this wood heating appliance in a manner inconsistent with operating instructions in the manual."

(4) Any manufacturer using the EPA model language contained in appendix I of this part to satisfy any requirement of this paragraph (f) will be considered to be in compliance with that requirement, provided that the particular model language is printed in full, with only such changes as are necessary to ensure accuracy for the particular model line.

(5) Residential masonry heaters that are affected by this subpart but have been operated by a noncommercial owner are not subject to paragraph (f) of this section when offered for resale.

§ 60.5491 What records must I keep and what reports must I submit?

(a) Each manufacturer who holds a certificate of compliance pursuant to § 60.5487(a)(2) for a model line must maintain records containing the information required by this paragraph (a) with respect to that model line.

(1) All documentation pertaining to the certification test or computer simulation used to obtain certification.

(i) For certification tests, this includes the full test report and raw data sheets, laboratory technician notes, calculations, and the test results for all test runs.

(ii) For computer simulations, this includes all data input into the simulation program and all computer-generated output.

(2) Results of the quality assurance program inspections required pursuant to § 60.5487(f).

(3) For emissions tests conducted pursuant to the quality assurance program required by § 60.5487(f), all test reports, data sheets, laboratory technician notes, calculations, and test results for all test runs, the remedial actions taken, if any, and any follow-up actions such as additional testing.

(4) If a masonry heater manufacturer qualifies as a small volume manufacturer as specified in § 60.5486(a)(2) and elects to defer compliance as allowed by that paragraph, records of the number of masonry heaters produced or constructed per year during the deferral period.

(b) Each accredited test laboratory must maintain records consisting of all documentation pertaining to each certification test, audit test, or computer simulation, including the full test report and raw data sheets, laboratory technician notes,

calculations, and the test results for all test runs. Each accredited test laboratory must submit initial and biennial proficiency test results to the Administrator.

(c) Each manufacturer must retain each residential masonry heater upon which certification tests were performed and certification granted pursuant to § 60.5487(a)(2) at the manufacturer's facility for as long as the model line is manufactured. Each masonry heater must remain sealed and unaltered. Any such residential masonry heater must be made available upon request to the Administrator for inspection and testing.

(d)(1) Each manufacturer of an affected masonry heater certified pursuant to § 60.5487 must submit a report to the Administrator every 2 years following issuance of a certificate of compliance for each model line. This report must include the sales for each model by state and certify that no changes in the design or manufacture of the model line have been made that require recertification pursuant to § 60.5487(d).

(2) If the manufacturer qualifies as a small manufacturer as defined in § 60.5486(b)(2) and the model line was certified using the procedure defined in paragraph (a)(3) of this section, the reporting provision of paragraph (d)(1) of this section does not apply.

(e)(1) Unless otherwise specified, all records required under this section must be maintained by the manufacturer, commercial owner of the affected masonry heater, accredited test laboratory or certifying entity for a period of no less than 5 years.

(2) Unless otherwise specified, all reports to the Administrator required under this subpart must be made to: Wood Heater NSPS Compliance Program at www.epa.gov/Wood_Heater_NSPS_Compliance_Program.

(f) Within 60 days after the date of completing each performance test, each manufacturer or accredited test laboratory or certifying entity must submit performance test data, except opacity data, electronically to the EPA's Central Data Exchange (CDX) by using the Electronic Reporting Tool (ERT) (http://www.epa.gov/ttn/chief/ert/index.html). Only data collected using test methods compatible with ERT are subject to this requirement to be submitted electronically to the EPA's CDX. Manufacturers may submit compliance reports to the EPA via regular mail at the address listed below if the test methods they use are not compatible with ERT or if ERT is not available to accept reports at the time the final rule is published. Owners or operators who claim that some of the information being submitted for performance tests is confidential business information (CBI) must submit a completed ERT file, including information claimed to be CBI, on a compact disk or other commonly used electronic storage media (including, but not limited to, flash drives), to the EPA, and the same ERT file, with the CBI omitted, to the EPA via CDX as described earlier in this paragraph. The compact disk must be clearly marked as CBI and mailed to U.S. EPA/OAQPS/CORE CBI Office, Attention: WebFIRE Administrator, MD C404-02, 4930 Old Page Rd., Durham, NC 27703. Emission data and all information necessary to determine compliance, except sensitive engineering drawings and sensitive detailed material specifications, may not be claimed as CBI.

§ 60.5492 What activities are prohibited under this subpart?

(a) No person is permitted to operate an affected masonry heater manufactured after **[EFFECTIVE DATE OF FINAL RULE]** or sold at retail after **[6 MONTHS**

AFTER EFFECTIVE DATE OF FINAL RULE] that does not have affixed to it a permanent label pursuant to § 60.5490.

(b)(1) No manufacturer or commercial owner is permitted to advertise for sale, offer for sale, or sell an affected masonry heater manufactured after **[EFFECTIVE DATE OF FINAL RULE]** or sold at retail after **[6 MONTHS AFTER EFFECTIVE DATE OF FINAL RULE]** that does not have affixed to it a permanent label pursuant to § 60.5490.

(2) No manufacturer or commercial owner is permitted to advertise for sale, offer for sale, or sell an affected masonry heater manufactured after **[EFFECTIVE DATE OF FINAL RULE]** or sold at retail after **[6 MONTHS AFTER EFFECTIVE DATE OF FINAL RULE]** labeled under § 60.5490(d)(1) except for export.

(c)(1) No commercial owner is permitted to advertise for sale, offer for sale or sell an affected masonry heater permanently labeled under § 60.5490(b) unless:

(i) The affected appliance regulated under this subpart was previously owned and operated by a noncommercial owner;

(ii) The commercial owner provides any purchaser or transferee with an owner's manual that meets the requirements of § 60.5490(g), a copy of the warranty and a moisture meter.

(2) A commercial owner other than a manufacturer complies with the requirements of paragraph (c) of this section if the commercial owner:

(i) Receives the required documentation from the manufacturer or a previous commercial owner; and

(ii) Provides that documentation unaltered to any person to whom the residential masonry heater that it covers is sold or transferred.

(d)(1) In any case in which the Administrator revokes a certificate of compliance either for the knowing submission of false or inaccurate information or other fraudulent acts, or based on a finding under § 60.5487(e)(1)(ii) that the certification test was not valid, the Administrator may give notice of that revocation and the grounds for it to all commercial owners.

(2) On and after the date of receipt of the notice given under paragraph (d)(1) of this section, no commercial owner is permitted to sell any residential masonry heater covered by the revoked certificate (other than to the manufacturer) unless the model line has been recertified in accordance with this subpart.

(e) No person is permitted to install or operate an affected masonry heater except in a manner consistent with the instructions on its permanent label and in the owner's manual pursuant to § 60.5490(g), including only using fuels for which the unit is certified.

(f) No person is permitted to operate an affected masonry heater that has been physically altered to exceed the tolerance limits of its certificate of compliance.

(g) No person is permitted to alter, deface, or remove any permanent label required to be affixed pursuant to § 60.5490.

(h) No certifying entity is permitted to certify its own certification test report.

§ 60.5493 What Petition for Review procedures apply to me?

(a) In any case where the Administrator:

(1) Denies an application under § 60.5487(a)(2);

(2) Issues a notice of revocation of certification under § 60.5487(e);

(3) Denies an application for laboratory accreditation pursuant to § 60.5489; or

(4) Issues a notice of revocation of laboratory accreditation pursuant to § 60.5489, the manufacturer or laboratory affected may submit to the EPA a Petition for Review request under this section pursuant to the procedures specified in § 60.593 within 30 days following receipt of the required notification of the action in question.

(b) In any case where the Administrator issues a notice of revocation under § 60.5487(e), the manufacturer may submit to the EPA a Petition for Review request under this section pursuant to the procedures specified in § 60.5493 with the time limits set out in § 60.533(p)(4).

§ 60.5494 Who implements and enforces this subpart?

(a) In delegating implementation and enforcement authority to a state under section 111(c) of the Clean Air Act, the authorities contained in paragraph (b) of this section must be retained by the Administrator and not transferred to a state.

(b) Authorities that must not be delegated to states:

(1) Section 60.5473, Definitions;

(2) Section 60.5475, Compliance and certification;

(3) Section 60.5476, Test methods and procedures; and

(4) Section 60.5477, Laboratory accreditation.

§ 60.5495 What parts of the General Provisions do not apply to me?

The following provisions of subpart A of part 60 do not apply to this subpart:

(a) Section 60.7;

(b) Section 60.8(a), (c), (d), (e), and (f); and

(c) Section 60.15(d).

6. Part 60 Appendix A-8 is amended by adding Methods 28R, 28WHH, and 28WHH-PTS to follow Method 28A to read as follows:

Appendix A-8 to Part 60—Test Methods 26 through 30B

* * * * *

Test Method 28R for Certification and Auditing of Wood Heaters

1.0 Scope and Application

1.1 This test method applies to certification and auditing of wood-fired room heaters and fireplace inserts.

1.2 The test method covers the fueling and operating protocol for measuring particulate emissions, as well as determining burn rates, heat output and efficiency.

1.3 Particulate emissions are measured by the dilution tunnel method as specified in ASTM E2515-10 Standard Test Method for Determination of Particulate Matter Emissions Collected in a Dilution Tunnel.

2.0 Procedures

2.1 This method incorporates the provisions of ASTM E2780-10 except as follows:

2.1.1 The burn rate categories, low burn rate requirement, and weightings in Method 28 shall be used.

2.1.2 The startup procedures shall be the same as in Method 28.

2.1.3 The equation for converting the emission test values between the EPA Reference Method 5G "Determination of Particulate Emissions From Wood Heaters From a Dilution Tunnel Sampling Location" and EPA Reference Method 5H

"Determination of Particulate Emissions From Wood Heaters From a Stack Location" shall be the same as in Method 28.

2.1.4 Manufacturers shall not specify a smaller volume of the firebox for testing than the full usable firebox.

2.1.5 The test fuel moisture content, fuel load, and coal bed depth shall be as follows:

(a) The fuel load dry-basis moisture content shall be within a range of 22.5 percent +/- 1 percent;

(b) The fuel load weight shall be 7 lb/ft^3 +/- 1 percent (or 7 lb +/-0.07 lb) of the fuel load weight, calculated in accordance with Method 28; and

(c) The range for the test-initiation coal-bed weight shall be 22 percent +/- 1 percent of the fuel load weight.

Test Method 28 WHH for Measurement of Particulate Emissions and Heating Efficiency of Wood-Fired Hydronic Heating Appliances

1.0 Scope and Application

1.1 This test method applies to wood-fired hydronic heating appliances. The units typically transfer heat through circulation of a liquid heat exchange media such as water or a water-antifreeze mixture.

1.2 The test method measures particulate emissions and delivered heating efficiency at specified heat output rates based on the appliance's rated heating capacity.

1.3 Particulate emissions are measured by the dilution tunnel method as specified in ASTM E2515-10 Standard Test Method for Determination of Particulate Matter Emissions Collected in a Dilution Tunnel. Delivered Efficiency is measured by

determining the heat output through measurement of the flow rate and temperature change of water circulated through a heat exchanger external to the appliance and determining the input from the mass of dry wood fuel and its higher heating value. Delivered efficiency does not attempt to account for pipeline loss.

1.4 Products covered by this test method include both pressurized and non-pressurized heating appliances intended to be fired with wood. These products are wood-fired hydronic heating appliances that the manufacturer specifies for indoor or outdoor installation. They are often connected to a heat exchanger by insulated pipes and normally include a pump to circulate heated liquid. They are used to heat structures such as homes, barns and greenhouses and can heat domestic hot water, spas or swimming pools.

1.5 Distinguishing features of products covered by this standard include:

1.5.1 Manufacturer specifies for indoor or outdoor installation.

1.5.2 A firebox with an access door for hand loading of fuel.

1.5.3 Typically an aquastat that controls combustion air supply to maintain the liquid in the appliance within a predetermined temperature range provided sufficient fuel is available in the firebox.

1.5.4 A chimney or vent that exhausts combustion products from the appliance.

1.6 The values stated are to be regarded as the standard whether in I-P or SI units. The values given in parentheses are for information only.

2.0 Summary of Method and References

2.1 Particulate matter emissions are measured from a wood-fired hydronic heating appliance burning a prepared test fuel crib in a test facility maintained at a set of

prescribed conditions. Procedures for determining burn rates, and particulate emissions rates and for reducing data are provided.

2.2 Referenced Documents

2.2.1 EPA Standards

2.2.1.1 Method 28 Certification and Auditing of Wood Heaters

2.2.2 Other Standards

2.2.2.1 ASTM E2515-10 Standard Test Method for Determination of Particulate Matter Emissions Collected in a Dilution Tunnel.

2.2.2.2 CAN/CSA-B415.1-2010 Performance Testing of Solid-Fuel-Burning Heating Appliances.

3.0 Terminology

3.1 Definitions

3.1.1 Hydronic Heating – A heating system in which a heat source supplies energy to a liquid heat exchange media such as water that is circulated to a heating load and returned to the heat source through pipes.

3.1.2 Aquastat – A control device that opens or closes a circuit to control the rate of fuel consumption in response to the temperature of the heating media in the heating appliance.

3.1.3 Delivered Efficiency **–** The percentage of heat available in a test fuel charge that is delivered to a simulated heating load as specified in this test method.

3.1.4 Manufacturer's Rated Heat Output Capacity −The value in BTU/hr (MJ/hr) that the manufacturer specifies that a particular model of hydronic heating appliance is

capable of supplying at its design capacity as verified by testing, in accordance with Section 13.

3.1.5 Burn rate − The rate at which test fuel is consumed in an appliance. Measured in pounds (lbs) of wood (dry basis) per hour (kg/hr).

3.1.6 Firebox − The chamber in the appliance in which the test fuel charge is placed and combusted.

3.1.7 Test fuel charge − The collection of Test Fuel layers placed in the appliance at the start of the emission test run.

3.1.8 Test Fuel Layer **–** Horizontal arrangement of Test Fuel Units.

3.1.9 Test Fuel Unit − One or more Test Fuel Pieces with ¾ inch (19 mm) spacers attached to the bottom and to one side. If composed of multiple Test Fuel Pieces, the bottom spacer may be one continuous piece.

3.1.10 Test Fuel Piece − A single 4 x 4 (4 ± 0.25 inches by 4 ± 0.25 inches)[100 ± 6 mm by 100 ± 6 mm] white or red oak wood piece cut to the length required.

3.1.11 Test Run – An individual emission test that encompasses the time required to consume the mass of the test fuel charge.

3.1.12 Overall Efficiency (SLM) – The efficiency for each test run as determined using the CSA B415.1-2010 Stack Loss Method.

3.1.13 Thermopile - A device consisting of a number of thermocouples connected in series, used for measuring differential temperature.

4.0 Summary of Test Method

4.1 Dilution Tunnel. Emissions are determined using the "dilution tunnel" method specified in ASTM E2515 Standard Test Method for Determination of Particulate Matter

Emissions Collected in a Dilution Tunnel. The flow rate in the dilution tunnel is maintained at a constant level throughout the test cycle and accurately measured. Samples of the dilution tunnel flow stream are extracted at a constant flow rate and drawn through high efficiency filters. The filters are dried and weighed before and after the test to determine the emissions catch and this value is multiplied by the ratio of tunnel flow to filter flow to determine the total particulate emissions produced in the test cycle.

4.2 Efficiency. The efficiency test procedure takes advantage of the fact that this type of appliance delivers heat through circulation of the heated liquid (water) from the appliance to a remote heat exchanger and back to the appliance. Measurements of the water temperature difference as it enters and exits the heat exchanger along with the measured flow rate allow for an accurate determination of the useful heat output of the appliance. The input is determined by weight of the test fuel charge, adjusted for moisture content, multiplied by the Higher Heating Value. Additional measurements of the appliance weight and temperature at the beginning and end of a test cycle are used to correct for heat stored in the appliance. Overall Efficiency (SLM) is determined using the CSA B415.1-2010 stack loss method for data quality assurance purposes.

4.3 Operation. Appliance operation is conducted on a hot-to-hot test cycle meaning that the appliance is brought to operating temperature and a coal bed is established prior to the addition of the test fuel charge and measurements are made for each test fuel charge cycle. The measurements are made under constant heat draw conditions within predetermined ranges. No attempt is made to modulate the heat demand to simulate an indoor thermostat cycling on and off in response to changes in the indoor environment. Four test categories are used. These are:

4.3.1 Category I: A heat output of 15 percent or less of Manufacturer's Rated Heat Output Capacity.

4.3.2 Category II: A heat output of 16 percent to 24 percent of Manufacturer's Rated Heat Output Capacity.

4.3.3 Category III: A heat output of 25 percent to 50 percent of Manufacturer's Rated Heat Output Capacity.

4.3.4 Category IV: Manufacturer's Rated Heat Output Capacity.

5.0 Significance and Use

5.1 The measurement of particulate matter emission rates is an important test method widely used in the practice of air pollution control.

5.1.1 These measurements, when approved by state or federal agencies, are often required for the purpose of determining compliance with regulations and statutes.

5.1.2 The measurements made before and after design modifications are necessary to demonstrate the effectiveness of design changes in reducing emissions and make this standard an important tool in manufacturers' research and development programs.

5.2 Measurement of heating efficiency provides a uniform basis for comparison of product performance that is useful to the consumer. It is also required to relate emissions produced to the useful heat production.

5.3 This is a laboratory method and is not intended to be fully representative of all actual field use. It is recognized that users of hand-fired, wood-burning equipment have a great deal of influence over the performance of any wood-burning appliance. Some compromises in realism have been made in the interest of providing a reliable and repeatable test method.

6.0 Test Equipment

6.1 Scale. A platform scale capable of weighing the appliance under test and associated parts and accessories when completely filled with water to an accuracy of ±1.0 pound (±0.5 kg).

6.2 Heat exchanger. A water-to-water heat exchanger capable of dissipating the expected heat output from the system under test.

6.3 Water Temperature Difference Measurement. A Type –T 'special limits' thermopile with a minimum of 5 pairs of junctions shall be used to measure the temperature difference in water entering and leaving the heat exchanger. The temperature difference measurement uncertainty of this type of thermopile is equal to or less than ± 0.50ºF (± 0. 25ºC). Other temperature measurement methods may be used if the temperature difference measurement uncertainty is equal to or less than. ± 0.50ºF (± 0. 25ºC).

6.4 Water flow meter. A water flow meter shall be installed in the inlet to the load side of the heat exchanger. The flow meter shall have an accuracy of ± 1 percent of measured flow.

6.4.1 Optional - Appliance side water flow meter. A water flow meter with an accuracy of ± 1 percent of the flow rate is recommended to monitor supply side water flow rate.

6.5 Optional Recirculation Pump. Circulating pump used during test to prevent stratification of liquid being heated.

6.6 Water Temperature Measurement – Thermocouples or other temperature sensors to measure the water temperature at the inlet and outlet of the load side of the heat exchanger. Must meet the calibration requirements specified in 10.1.

6.7 Wood Moisture Meter - Calibrated electrical resistance meter capable of measuring test fuel moisture to within 1 percent moisture content. Must meet the calibration requirements specified in 10.4.

6.8 Flue Gas Temperature Measurement - Must meet the requirements of CSA B415.1-2010, Clause 6.2.2.

6.9 Test Room Temperature Measurement - Must meet the requirements of CSA B415.1-2010, Clause 6.2.1.

6.10 Flue Gas Composition Measurement - Must meet the requirements of CSA B415.1-2010, Clauses 6.3.1 through 6.3.3.

7.0 Safety

7.1 These tests involve combustion of wood fuel and substantial release of heat and products of combustion. The heating system also produces large quantities of very hot water and the potential for steam production and system pressurization. Appropriate precautions must be taken to protect personnel from burn hazards and respiration of products of combustion.

8.0 Sampling, Test Specimens and Test Appliances

8.1 Test specimens shall be supplied as complete appliances including all controls and accessories necessary for installation in the test facility. A full set of specifications and design and assembly drawings shall be provided when the product is to be placed

under certification of a third-party agency. The manufacturer's written installation and operating instructions are to be used as a guide in the set-up and testing of the appliance.

9.0 Preparation of Test Equipment

9.1 The appliance is to be placed on a scale capable of weighing the appliance fully loaded with a resolution of ± 1.0 lb (0.5 kg).

9.2 The appliance shall be fitted with the type of chimney recommended or provided by the manufacturer and extending to 15 ±0.5 feet (4.6 ± 0.15 m) from the upper surface of the scale. If no flue or chimney system is recommended or provided by the manufacturer, connect the appliance to a flue of a diameter equal to the flue outlet of the appliance. The flue section from the appliance flue collar to 8 ± 0.5 feet above the scale shall be single wall stove pipe and the remainder of the flue shall be double wall insulated class A chimney.

9.3 Optional Equipment Use

9.3.1 A recirculation pump may be installed between connections at the top and bottom of the appliance to minimize thermal stratification if specified by the manufacturer. The pump shall not be installed in such a way as to change or affect the flow rate between the appliance and the heat exchanger.

9.3.2 If the manufacturer specifies that a thermal control valve or other device be installed and set to control the return water temperature to a specific set point, the valve or other device shall be installed and set per the manufacturer's written instructions.

9.4 Prior to filling the tank, weigh and record the appliance mass.

9.5 Heat Exchanger

9.5.1 Plumb the unit to a water-to-water heat exchanger with sufficient capacity to draw off heat at the maximum rate anticipated. Route hoses, electrical cables, and instrument wires in a manner that does not influence the weighing accuracy of the scale as indicated by placing dead weights on the platform and verifying the scale's accuracy.

9.5.2 Locate thermocouples to measure the water temperature at the inlet and outlet of the load side of the heat exchanger.

9.5.3 Install a thermopile meeting the requirements of 6.3 to measure the water temperature difference between the inlet and outlet of the load side of the heat exchanger.

9.5.4 Install a calibrated water flow meter in the heat exchanger load side supply line. The water flow meter is to be installed on the cooling water inlet side of the heat exchanger so that it will operate at the temperature at which it is calibrated.

9.5.5 Place the heat exchanger in a box with 2 in. (50 mm) of expanded polystyrene (EPS) foam insulation surrounding it to minimize heat losses from the heat exchanger.

9.5.6 The reported efficiency and heat output rate shall be based on measurements made on the load side of the heat exchanger.

9.5.7 Temperature instrumentation per 6.6 shall be installed in the appliance outlet and return lines. The average of the outlet and return water temperature on the supply side of the system shall be considered the average appliance temperature for calculation of heat storage in the appliance (TF_{avg} and TI_{avg}). Installation of a water flow meter in the supply side of the system is optional.

9.6 Fill the system with water. Determine the total weight of the water in the appliance when the water is circulating. Verify that the scale indicates a stable weight under operating conditions. Make sure air is purged properly.

10.0 Calibration and Standardization

10.1 Water Temperature Sensors. Temperature measuring equipment shall be calibrated before initial use and at least semi-annually thereafter. Calibrations shall be in compliance with National Institute of Standards and Technology (NIST) Monograph 175, Standard Limits of Error.10.2 Heat Exchanger Load Side Water Flow Meter.

10.2.1 The heat exchanger load side water flow meter shall be calibrated within the flow range used for the test run using NIST Traceable methods. Verify the calibration of the water flow meter before and after each test run and at least once during each test run by comparing the water flow rate indicated by the flow meter to the mass of water collected from the outlet of the heat exchanger over a timed interval. Volume of the collected water shall be determined based on the water density calculated from section 13, Eq. 8, using the water temperature measured at the flow meter. The uncertainty in the verification procedure used shall be 1 percent or less. The water flow rate determined by the collection and weighing method shall be within 1 percent of the flow rate indicated by the water flow meter.

10.3 Scales. The scales used to weigh the appliance and test fuel charge shall be calibrated using NIST Traceable methods at least once every 6 months.

10.4 Moisture Meter. The moisture meter shall be calibrated per the manufacturer’s instructions and checked before each use.

10.5 Flue Gas Analyzers – In accordance with CSA B415.1-2010, Clause 6.8.

11.0 Conditioning

11.1 Prior to testing, the noncatalytic appliance is to be operated for a minimum of 10 hours using a medium heat draw rate. Catalytic units shall be operated for a minimum of 50 hours using a medium heat draw rate. The pre-burn for the first test can be included as part of the conditioning requirement. If conditioning is included in pre-burn, then the appliance shall be aged with fuel meeting the specifications outlined in sections 12.2 with a moisture content between 19 and 25 percent on a dry basis. Operate the appliance at a medium burn rate (Category II or III) for at least 10 hours for noncatalytic appliances and 50 hours for catalytic appliances. Record and report hourly flue gas exit temperature data and the hours of operation. The aging procedure shall be conducted and documented by a testing laboratory.

12.0 Procedure

12.1 Appliance Installation. Assemble the appliance and parts in conformance with the manufacturer's written installation instructions. Clean the flue with an appropriately sized, wire chimney brush before each certification test series.

12.2 Fuel. Test fuel charge fuel shall be red (*Quercus ruba L.)* or white (*Quercus alba*) oak 19 to 25 percent moisture content on a dry basis. Piece length shall be 80 percent of the firebox depth rounded down to the nearest 1 inch (25mm) increment. For example, if the firebox depth is 46 inches (1168mm) the 4 x 4 piece length would be 36 inches (46 inches x 0.8 = 36.8 inches round down to 36 inches). Pieces are to be placed in the firebox parallel to the longest firebox dimension. For fireboxes with sloped surfaces that create a non-uniform firebox length, the piece length shall be adjusted for each layer based on 80 percent of the length at the level where the layer is placed. Pieces are to be

spaced ¾ inches (19 mm) apart on all faces. The first fuel layer may be assembled using fuel units consisting of multiple 4 x 4s consisting of single pieces with bottom and side spacers of 3 or more pieces if needed for a stable layer. The second layer may consist of fuel units consisting of no more than two pieces with spacers attached on the bottom and side. The top two layers of the fuel charge must consist of single pieces unless the fuel charge is only three layers. In that instance only the top layer must consist of single units. Three-quarter inch (19 mm) by 1.5 inch (38 mm) spacers shall be attached to the bottom of piece to maintain a ¾ inch (19 mm) separation. When a layer consists of two or more units of 4 x 4s an additional ¾ inch (19 mm) thick by 1.5 inch (38 mm) wide spacer shall be attached to the vertical face of each end of one 4 x 4, such that the ¾ inch (19 mm) space will be maintained when two 4 x 4 units or pieces are loaded side by side. In cases where a layer contains an odd number of 4 x 4s one piece shall not be attached, but shall have spacers attached in a manner that will provide for the ¾ inch (19 mm) space to be maintained. (See Figure 1). Spacers shall be attached perpendicular to the length of the 4 x 4s such that the edge of the spacer is 1 ± 0.25 inch from the end of the 4 x 4s in the previous layers. Spacers shall be red or white oak and will be attached with either nails (non-galvanized), brads or oak dowels. The use of kiln-dried wood is not allowed.

12.2.1 Using a fuel moisture meter as specified in 6.7 of the test method, determine the fuel moisture for each test fuel piece used for the test fuel load by averaging at least five fuel moisture meter readings measured parallel to the wood grain. Penetration of the moisture meter insulated electrodes for all readings shall be 1/4 the thickness of the fuel piece or 19 mm (3/4 in.), whichever is lesser. One measurement from each of three sides shall be made at approximately 3 inches from each end and the

center. Two additional measurements shall be made centered between the other three locations. Each individual moisture content reading shall be in the range of 18 to 28 percent on a dry basis. The average moisture content of each piece of test fuel shall be in the range of 19 to 25 percent. It is not required to measure the moisture content of the spacers. Moisture shall not be added to previously dried fuel pieces except by storage under high humidity conditions and temperature up to 100ºF. Fuel moisture shall be measured within four hours of using the fuel for a test.

12.2.2 Firebox Volume. Determine the firebox volume in cubic feet. Firebox volume shall include all areas accessible through the fuel loading door where firewood could reasonably be placed up to the horizontal plane defined by the top of the loading door. A drawing of the firebox showing front, side and plan views or an isometric view with interior dimensions shall be provided by the manufacturer and verified by the laboratory. Calculations for firebox volume from computer aided design (CAD) software programs are acceptable and shall be included in the test report if used. If the firebox volume is calculated by the laboratory the firebox drawings and calculations shall be included in the test report.

12.2.3 Test Fuel charge. Test fuel charges shall be determined by multiplying the firebox volume by 10 pounds (4.54 kg) per ft^3 (28L), or a higher load density as recommended by the manufacturer's printed operating instructions, of wood (as used wet weight). Select the number of pieces of standard fuel that most nearly match this target weight. This is the standard fuel charge for all tests. For example, if the firebox loading area volume is 10 ft^3 (280L) and the firebox depth is 46 inches (1168 mm), test fuel charge target is 100 lbs (45 kg) minimum and the piece length is 36 inches (914 mm). If 8

- 4 x 4s, 36 inches long weigh 105 lbs (48 kg), use 8 pieces for each test fuel charge. All test fuel charges will be of the same configuration.

12.3 Sampling Equipment. Prepare the particulate emission sampling equipment as defined by ASTM E2515-10 "Standard Test Method For Determination of Particulate Matter Emissions Collected In a Dilution Tunnel."

12.4 Appliance Startup. The appliance shall be fired with wood fuel of any species, size and moisture content at the laboratories discretion to bring it up to operating temperature. Operate the appliance until the water is heated to the upper operating control limit and has cycled at least two times. Then remove all unburned fuel, zero the scale and verify the scales accuracy using dead weights.

12.4.1 Pre-Test Burn Cycle. Reload appliance with oak wood and allow it to burn down to the specified coal bed weight. The Pre-Test burn cycle fuel charge weight shall be within ±10 percent of the test fuel charge weight. Piece size and length shall be selected such that charcoalization is achieved by the time the fuel charge has burned down to the required coal bed weight. Pieces with a maximum thickness of approximately 2 inches have been found to be suitable. Charcoalization is a general condition of the test fuel bed evidenced by an absence of large pieces of burning wood in the coal bed and the remaining fuel pieces being brittle enough to be broken into smaller charcoal pieces with a metal poker. Manipulations to the fuel bed prior to the start of the test run are to be done to achieve charcoalization while maintaining the desired heat output rate. During the pre-test burn cycle and at least one hour prior to starting the test run, adjust water flow to the heat exchanger to establish the target heat draw for the test.

For the first test run the heat draw rate shall be equal to the manufacturer's rated heat output capacity.

12.4.1.1 Allowable Adjustments. Fuel addition or subtractions, and coal bed raking shall be kept to a minimum but are allowed up to 15 minutes prior to the start of the test run. For the purposes of this method, coal bed raking is the use of a metal tool (poker) to stir coals, break burning fuel into smaller pieces, dislodge fuel pieces from positions of poor combustion, and check for the condition of charcoalization. Record all adjustments to and additions or subtractions of fuel, and any other changes to the appliance operations that occur during pretest ignition period. During the 15-minute period prior to the start of the test run, the wood heater loading door shall not be open more than a total of 1 minute. Coal bed raking is the only adjustment allowed during this period.

12.4.2 Coal Bed Weight. The appliance is to be loaded with the test fuel charge when the coal bed weight is between 10 percent and 20 percent of the test fuel charge weight. Coals may be raked as necessary to level the coal bed but may only be raked and stirred once between 15 to 20 minutes prior to the addition of the test fuel charge.

12.5 Test Runs. For all test runs, the return water temperature to the hydronic heater must be equal to or greater than 120°F. Aquastat or other heater output control device settings that are adjustable shall be set using manufacturer specifications, either as factory set or in accordance with the owner's manual, and shall remain the same for all burn categories.

Complete a test run in each heat output rate category, as follows:

12.5.1 Test Run Start. Once the appliance is operating normally and the pretest coal bed weight has reached the target value per 12.4.2, tare the scale and load the full test charge into the appliance. Time for loading shall not exceed 5 minutes. The actual weight of the test fuel charge shall be measured and recorded within 30 minutes prior to loading. Start all sampling systems.

12.5.1.1 Record all water temperatures, differential water temperatures and water flow rates at time intervals of one minute or less.

12.5.1.2 Record particulate emissions data per the requirements of ASTM E2515.

12.5.1.3 Record data needed to determine Overall Efficiency (SLM) per the requirements of CSA B415.1-2010 Clauses 6.2.1, 6.2.2, 6.3, 8.5.7, 10.4.3 (a), 10.4.3(f), and 13.7.9.3

12.5.1.3.1 Measure and record the test room air temperature in accordance with the requirements of Clauses 6.2.1, 8.5.7 and 10.4.3 (g).

12.5.1.3.2 Measure and record the flue gas temperature in accordance with the requirements of Clauses 6.2.2, 8.5.7 and 10.4.3 (f).

12.5.1.3.3 Determine and record the Carbon Monoxide (CO) and Carbon Dioxide (CO_2) concentrations in the flue gas in accordance with Clauses 6.3, 8.5.7 and 10.4.3 (i) and (j).

12.5.1.3.4 Measure and record the test fuel weight per the requirements of Clauses 8.5.7 and 10.4.3 (h).

12.5.1.3.5 Record the test run time per the requirements of Clause 10.4.3 (a).

12.5.1.4 Monitor the average heat output rate on the load side of the heat exchanger. If the heat output rate gets close to the upper or lower limit of the target range

(±5 percent) adjust the water flow through the heat exchanger to compensate. Make changes as infrequently as possible while maintaining the target heat output rate. The first test run shall be conducted at the category IV heat output rate to validate that the appliance is capable of producing the manufacturer's rated heat output capacity.

12.5.2 Test Fuel Charge Adjustment. It is acceptable to adjust the test fuel charge (*i.e.,* reposition) once during a test run if more than 60 percent of the initial test fuel charge weight has been consumed and more than 10 minutes have elapsed without a measurable (1 lb or 0. 5 kg) weight change while the operating control is in the demand mode. The time used to make this adjustment shall be less than 60 seconds.

12.5.3 Test Run Completion. The test run is completed when the remaining weight of the test fuel charge is 0.0 lb (0.0 kg). End the test run when the scale has indicated a test fuel charge weight of 0.0 lb (0.0 kg) or less for 30 seconds.

12.5.3.1 At the end of the test run, stop the particulate sampling train and Overall Efficiency (SLM) measurements, and record the run time, and all final measurement values.

12.5.4 Heat Output Capacity Validation. The first test run must produce a heat output rate that is within 10 percent of the manufacturer's rated heat output capacity (Category IV) throughout the test run and an average heat output rate within 5 percent of the manufacturer's rated heat output capacity. If the appliance is not capable of producing a heat output within these limits, the manufacturer's rated heat output capacity is considered not validated and testing is to be terminated. In such cases, the tests may be restarted using a lower heat output capacity if requested by the manufacturer.

12.5.5 Additional Test Runs. Using the Manufacturer's Rated Heat Output Capacity as a basis, conduct a test for additional heat output categories as specified in 4.3. It is not required to run these tests in any particular order.

12.5.6 Alternative Heat Output Rate for Category I. If an appliance cannot be operated in the category I heat output range due to stopped combustion, two test runs shall be conducted at heat output rates within Category II. When this is the case, the weightings for the weighted averages indicated in Table 2 shall be the average of the category I and II weightings and shall be applied to both category II results. Appliances that are not capable of operation within Category II (<25 percent of maximum) cannot be evaluated by this test method.

12.5.6.1 Stopped Fuel Combustion. Evidence that an appliance cannot be operated at a category I heat output rate due to stopped fuel combustion shall include documentation of two or more attempts to operate the appliance in burn rate Category I and fuel combustion has stopped prior to complete consumption of the test fuel charge. Stopped fuel combustion is evidenced when an elapsed time of 60 minutes or more has occurred without a measurable (1 lb or 0.5 kg) weight change in the test fuel charge while the appliance operating control is in the demand mode. Report the evidence and the reasoning used to determine that a test in burn rate Category I cannot be achieved. For example, two unsuccessful attempts to operate at an output rate of 10 percent of the rated output capacity are not sufficient evidence that burn rate Category I cannot be achieved.

12.5.7 Appliance Overheating. Appliances shall be capable of operating in all heat output categories without overheating to be rated by this test method. Appliance overheating occurs when the rate of heat withdrawal from the appliance is lower than the

rate of heat production when the unit control is in the idle mode. This condition results in the water in the appliance continuing to increase in temperature well above the upper limit setting of the operating control. Evidence of overheating includes: 1 hour or more of appliance water temperature increase above the upper temperature set-point of the operating control, exceeding the temperature limit of a safety control device (independent from the operating control), boiling water in a non-pressurized system or activation of a pressure or temperature relief valve in a pressurized system.

12.6 Additional Test Runs. The testing laboratory may conduct more than one test run in each of the heat output categories specified in section 4.4.1. If more than one test run is conducted at a specified heat output rate, the results from at least two-thirds of the test runs in that heat output rate category shall be used in calculating the weighted average emission rate (See section 15.1.14). The measurement data and results of all test runs shall be reported regardless of which values are used in calculating the weighted average emission rate.

13.0 Calculation of Results

13.1 Nomenclature

E_T – Total particulate emissions for the full test run as determined per ASTM E2515 in grams

$E_{g/MJ}$ – Emissions rate in grams per mega joule of heat output.

$E_{lb/mmBtu\ output}$ – Emissions rate in pounds per million Btu's of heat output.

$E_{g/kg}$ – Emissions factor in grams per kilogram of dry fuel burned.

$E_{g/hr}$ – Emissions factor in grams per hour.

HHV – Higher Heating Value of fuel = 8600 Btu/lb (19.990 MJ/kg)

LHV – Lower Heating Value of fuel = 7988 Btu/lb (18.567 MJ/kg)

ΔT – Temperature difference between water entering and exiting the heat exchanger.

Q_{out} − Total heat output in BTU's (mega joules).

Q_{in} − Total heat input available in test fuel charge in BTU's (mega joules).

M − Mass flow rate of water in lb/min (kg/min).

V_i – Volume of water indicated by a totalizing flow meter at the i_{th} reading in gallons (liters).

V_f – Volumetric Flow rate of water in heat exchange system in gallons per minute (liters/min).

Θ – Total length of test run in hours

ti − Data sampling interval in minutes.

η_{del} – Delivered heating efficiency in percent.

F_i − Weighting factor for heat output category i. (See Tables 2A and 2B)

T1 – Temperature of water at the inlet on the supply side of the heat exchanger.

T2 – Temperature of the water at the outlet on the supply side of the heat exchanger.

T3–Temperature of water at the inlet to the load side of the heat exchanger.

TI_{avg} − Average temperature of the appliance and water at start of the test.

$TI_{avg} = (T1 + T2)/2$ at the start of the test, °F Eq.1

TF_{avg} – Average temperature of the appliance and water at the end of the test.

$TF_{avg} = (T1 + T2)/2$ at the end of the test, °F Eq.2

MC – Fuel moisture content in percent dry basis.

MC_i – Average moisture content of individual 4 x 4 fuel pieces in percent dry basis.

MC_{sp} – Moisture content of spacers assumed to be 10 percent dry basis.

σ – Density of water in pounds per gallon.

C_p – Specific Heat of Water in Btu /lb °-F.

C_{steel} – Specific Heat of Steel (0.1 Btu/ lb -ºF)

W_{fuel} – Fuel charge weight in pounds (kg)

W_i – Weight of individual fuel 4 x 4 pieces in pounds (kg)

W_{sp} – Weight of all spacers used in a fuel load in pounds (kg)

W_{app} – Weight of empty appliance in pounds

W_{wat}– Weight of water in supply side of the system in pounds

13.2 After the test is completed, determine the particulate emissions E_T in accordance with ASTM E2515.

13.3 Determine Average Fuel Load Moisture Content

$MC_{Ave} = [[\Sigma W_i \text{ x } MC_i] + [W_{sp} \text{ x } MC_{sp}]] \div W_{fuel}$, % Eq. 3

13.4 Determine heat input

$Q_{in} = (W_{fuel}/(1+(MC/100))) \text{ x HHV, BTU}$ Eq. 4

$Q_{in\ LHV} = (W_{fuel}/(1+(MC/100))) \text{ x LHV, BTU}$ Eq. 5

13.5 Determine heat output and efficiency

13.5.1 Determine heat output as:

Q_{out} = Σ [Heat output determined for each sampling time interval]+ Change in heat stored in the appliance.

$$Q_{out} = \left[\sum (C_{pi} \bullet \Delta T_i \bullet \dot{M}_i \bullet t_i)\right] + (W_{app} \bullet C_{Steel} + C_{pa} W_{water}) \bullet (TF_{avg} - TI_{avg}) \text{, BTU} \quad \text{Eq. 6}$$

Note: The subscript (i) indicates the parameter value for sampling time interval t_i.

M_i = Mass flow rate = gal/min x Density of Water (lb/gal) = lb/min

$M_i = V_{fi} \cdot \sigma_i$, lb/min Eq. 7

$\Sigma_i = (62.56 + (-.0003413 \times T3_i) + (-.00006225 \times T3_i^2)) 0.1337$, lbs/galEq. 8

$C_p = 1.0014 + (-.000003485 \times T3_i)$ Btu/lb-ºF Eq. 9

$C_{steel} = 0.1$ Btu/lb-ºF

$C_{pa} = 1.0014 + (-.000003485 \text{ X } (TI_{avg} + TF_{avg})/2)$, Btu/lb-ºF Eq. 10

$V_{fi} = (V_i - V_{i-1})/(t_i - t_{i-1})$, gal/min Eq. 11

Note: V_i is the total water volume at the end of interval i and V_{i-1} is the total water volume at the beginning of the time interval. This calculation is necessary when a totalizing type water meter is used.

13.5.2 Determine Heat output rate as:

Heat Output Rate = Q_{out}/Θ, BTU/hr Eq. 12

13.5.3 Determine Emission Rates and Emission Factors as:

$E_{g/MJ} = E_T/(Q_{out} \times 0.001055)$, g/MJ Eq. 13

$E_{lb/MM\ BTU\ output} = (E_T/453.59)/(Q_{output} \times 10^{-6})$, lb/MMBtu Out Eq. 14

$E_{g/kg} = E_T/(W_{fuel}/(1+MC/100))$, g/dry kg Eq, 15

$E_{g/hr} = E_T/\Theta$, g/hr Eq. 16

13.5.4 Determine delivered efficiency as:

$\eta_{del} = (Q_{out}/Q_{in}) \times 100$, % Eq. 17

$\eta_{del\ LHV} = (Q_{out}/Q_{in\ LHV}) \times 100$, % Eq. 18

13.5.5 Determine η_{SLM} - Overall Efficiency (SLM) using Stack Loss

For determination of the average overall thermal efficiency (η_{SLM}) for the test run, use the data collected over the full test run and the calculations in accordance with CSA B415.1-2010, Clause 13.7 except for 13.7.2 (e), (f), (g), and (h), use the following average fuel

properties for oak: percent C = 50.0, percent H = 6.6, percent O = 43.2, percent Ash = 0.2 percent.

13.5.5.1 Whenever the CSA B415.1-2010 overall efficiency is found to be lower than the overall efficiency based on load side measurements, as determined by Eq. 16 of this method, section 14.1.7 of the test report must include a discussion of the reasons for this result.

13.6 Weighted Average Emissions and Efficiency

13.6.1 Determine the weighted average emission rate and delivered efficiency from the individual tests in the specified heat output categories. The weighting factors (F_i) are derived from an analysis of ASHRAE Bin Data which provides details of normal building heating requirements in terms of percent of design capacity and time in a particular capacity range – or "bin" - over the course of a heating season. The values used in this method represent an average of data from several cities located in the northern United States.

Weighted average delivered efficiency: $\eta_{avg} = \Sigma\ \eta_i \text{ x } F_i, \%$ Eq. 17

Weighted average emissions: $E_{avg} = \Sigma E_i \text{ x } F_i, \%$ Eq. 18

13.7 Average Heat Output ($Q_{out\text{-}8hr}$) and Efficiency (($\eta_{avg\text{-}8hr}$) for 8 hour burn time.

13.7.1 Units tested under this standard typically require infrequent fuelling, 8 to 12 hours intervals being typical. Rating unit's based on an Average Output sustainable over an 8 hour duration will assist consumers in appropriately sizing units to match the theoretical heat demand of their application.

13.7.2 Calculations:

$Q_{out\text{-}8hr} = X1 + \{ (8 - Y1) \text{ x } [(X2 - X1) / (Y2 - Y1)] \}, \%$ Eq. 19

$\eta_{avg\text{-}8hr} = \eta_{del1} + \{ (8 - Y1) \times [(\eta_{del2} - \eta_{del1}) / (Y2 - Y1)] \}, \%$ Eq. 20

Where:

Y1 = Test Duration just above 8 hrs

Y2 = Test Duration just below 8 hrs

X1 = Actual Load for duration Y1

X2 = Actual Load for duration Y2

η_{del1} = Average Delivered Efficiency for duration Y1

η_{del2} = Average Delivered Efficiency for duration Y2

13.7.2.1 Determine the Test Durations and Actual Load for each Category as recorded in Table 1A.

13.7.2.2 Determine the data point that has the nearest duration greater than 8 hrs. X1 = Actual Load,

Y1 = Test Duration and

η_{del1} = Average Delivered Efficiency for this data point.

13.7.2.3 Determine the data point that has the nearest duration less than 8 hrs.

X2 = Actual Load,

Y2 = Test Duration and

η_{del2} = Average Delivered Efficiency for this data point.

13.7.2.4 Example:

Category Actual Load Duration

Category Actual Load Duration ηdel

	(Btu/Hr)	(Hr)	(%)
1	15,000	10.2	70.0
2	26,000	8.4	75.5

3	50,000	6.4	80.1
4	100,000	4.7	80.9

Category 2 Duration is just above 8 hours, therefore: X1 = 26,000 BTU/hr, η_{del1} = 75.5% and Y1 = 8.4 Hrs

Category 3 Duration is just below 8 hours, therefore: X2 = 50,000 BTU/hr, η_{del2} = 80.1% and Y2 = 6.4 Hrs

$Q_{out\text{-}8hr}$ = 26,000 + {(8 - 8.4) x [(50,000 - 26,000) / (6.4 - 8.4)]}

= 30,800 BTU/hr

$\eta_{avg\text{-}8hr}$ = 75.5 + {(8 - 8.4) x [(80.1 – 75.5) / (6.4 - 8.4)]} = 76.4%

14.0 Report

14.1.1 The report shall include the following.

14.1.2 Name and location of the laboratory conducting the test.

14.1.3 A description of the appliance tested and its condition, date of receipt and dates of tests.

14.1.4 A statement that the test results apply only to the specific appliance tested.

14.1.5 A statement that the test report shall not be reproduced except in full, without the written approval of the laboratory.

14.1.6 A description of the test procedures and test equipment including a schematic or other drawing showing the location of all required test equipment. Also, a description of test fuel sourcing, handling and storage practices shall be included.

14.1.7 Details of deviations from, additions to or exclusions from the test method, and their data quality implications on the test results (if any), as well as information on specific test conditions, such as environmental conditions.

14.1.8 A list of participants and observers present for the tests.

14.1.9 Data and drawings indicating the fire box size and location of the fuel charge.

14.1.10 Drawings and calculations used to determine firebox volume.

14.1.11 Information for each test run fuel charge including piece size, moisture content, and weight.

14.1.12 All required data for each test run shall be provided in spreadsheet format. Formulae used for all calculations shall be accessible for review.

14.1.13 Test run duration for each test.

14.1.14 Calculated results for delivered efficiency at each burn rate and the weighted average Emissions reported as total emissions in grams, pounds per million Btu of delivered heat, grams per mega-joule of delivered heat, grams per kilogram of dry fuel and grams per hour. Results shall be reported for each heat output category and the weighted average.

14.1.15 Tables 1A, 1B, 1C and 2 must be used for presentation of results in test reports.

14.1.16 A statement of the estimated uncertainty of measurement of the emissions and efficiency test results.

14.1.17 Raw data, calibration records, and other relevant documentation shall be retained by the laboratory for a minimum of 7 years.

15.0 Precision and Bias

15.1 Precision—It is not possible to specify the precision of the procedure in Draft Test because the appliance operation and fueling protocols and the appliances

themselves produce variable amounts of emissions and cannot be used to determine reproducibility or repeatability of this measurement method.

15.2 Bias—No definitive information can be presented on the bias of the procedure in Draft Test Method 28 WHH for measuring solid fuel burning hydronic heater emissions because no material having an accepted reference value is available.

16.0 Keywords

16.1 Solid fuel, hydronic heating appliances, wood-burning hydronic heaters.

Table 1A. Data Summary Part A

						Θ	W_{fuel}	MC_{ave}	Q_{in}	Q_{out}
Category	Run No	Load % Capacity	Target Load	Actual Load	Act Load	Test Duration	Wood Wt	Wood Moisture	Heat Input	Heat Output
			BTU/hr	BTU/hr	% of max	hrs	lb	% DB	BTU	BTU
I		< 15% of max								
II		16-24% of max								
III		25-50% of max								
IV		Max capacity								

Table 1B. Data Summary Part B

			T2 Min	E_T	E	E	$E_{g/hr}$	$E_{g/kg}$	η_{del}	η_{SLM}
Category	Run No	Load % Capacity	Min Return Water Temp.	Total PM Emissions	PM Output Based	PM Output Based	PM Rate	PM Factor	Delivered Efficiency	Stack Loss Efficiency
			°F	g	$lb_{MMBTU\ Out}$	g/MJ	g/hr	g/kg	%	%
I		< 15% of max								
II		16-24% of max								
III		25-50% of max								
IV		Max capacity								

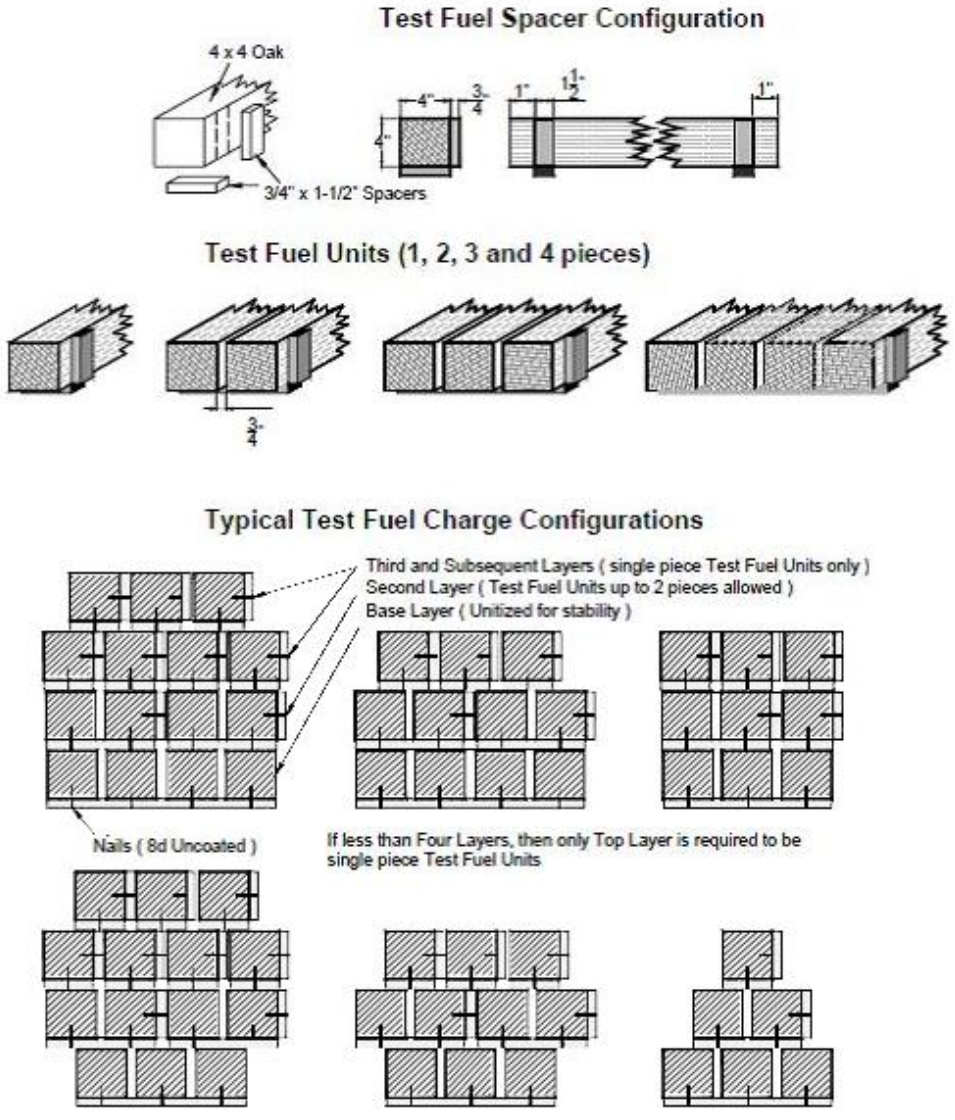
Table 1C: Hangtag Information

MANUFACTURER:			
MODEL NUMBER:			
8-HOUR OUTPUT RATING:	$Q_{out\text{-}8hr}$		BTU/HR
8-HOUR AVERAGE EFFICIENCY:	$\eta_{avg\text{-}8hr}$		**(Using higher heating value)**
			(Using lower heating value)
ANNUAL EFFICIENCY RATING:	η_{avg}		**(Using higher heating value)**
			(Using lower heating value)
PARTICLE EMISSIONS:	E_{avg}		GRAMS/HR (average)
			LBS/MILLION BTU OUTPUT

Table 2. Year Round Use Weighting

Category	Weighting Factor (F_i)	$\eta_{del,i} \times F_i$	$E_{g/MJ,i} \times F_i$	$E_{g/kg,i} \times F_i$	$E_{lb/MMBTU\ Out,i} \times F_i$	$E_{g/hr,i} \times F_i$
I	0.437					
II	0.024					
III	0.275					
IV	0.050					
Totals	1.000					

Figure 1. Typical Test Fuel Piece



Method 28WHH-PTS A Test Method for Certification of Cord Wood-Fired Hydronic Heating Appliances with Partial Thermal Storage: Measurement of Particulate Matter (PM) and Carbon Monoxide (CO) Emissions and Heating Efficiency of Wood-Fired Hydronic Heating Appliances with Partial Thermal Storage

1.0 Scope and Application

1.1 This test method applies to wood-fired hydronic heating appliances with heat storage external to the appliance. The units typically transfer heat through circulation of a liquid heat exchange media such as water or a water-antifreeze mixture. Throughout this document, the term "water" will be used to denote any of the heat transfer liquids approved for use by the manufacturer.

1.2 The test method measures PM and CO emissions and delivered heating efficiency at specified heat output rates referenced against the appliance's rated heating capacity as specified by the manufacturer and verified under this test method.

1.3 PM emissions are measured by the dilution tunnel method as specified in the EPA Method 28 WHH and the standards referenced therein with the exceptions noted in Section 12.5.9. Delivered Efficiency is measured by determining the fuel energy input and appliance output. Heat output is determined through measurement of the flow rate and temperature change of water circulated through a heat exchanger external to the appliance and the increase in energy of the external storage. Heat input is determined from the mass of dry wood fuel and its higher heating value (HHV). Delivered efficiency does not attempt to account for pipeline loss.

1.4 Products covered by this test method include both pressurized and non-pressurized hydronic heating appliances intended to be fired with wood and for which the manufacturer specifies for indoor or outdoor installation. The system, which includes the heating appliance and external storage, is commonly connected to a heat exchanger by insulated pipes and normally includes a pump to circulate heated liquid. These systems are used to heat structures such as homes, barns and greenhouses. They also provide heat for domestic hot water, spas and swimming pools.

1.5 Distinguishing features of products covered by this standard include:

1.5.1 The manufacturer specifies the application for either indoor or outdoor installation.

1.5.2 A firebox with an access door for hand loading of fuel.

1.5.3 Typically an aquastat mounted as part of the appliance that controls combustion air supply to maintain the liquid in the appliance within a predetermined temperature range provided sufficient fuel is available in the firebox. The appliance may be equipped with other devices to control combustion.

1.5.4 A chimney or vent that exhausts combustion products from the appliance.

1.5.5 A liquid storage system, typically water, which is not large enough to accept all of the heat produced when a full load of wood is burned and the storage system starts a burn cycle at 125°F.

1.5.6 The heating appliances require external thermal storage and these units will only be installed as part of a system which includes thermal storage. The manufacturer specifies the minimum amount of thermal storage required. However, the storage system

shall be large enough to ensure that the boiler (heater) does not cycle, slumber, or go into an off-mode when operated in a Category III load condition (See section 4.3).

1.6 The values stated are to be regarded as the standard whether in I-P or SI units. The values given in parentheses are for information only.

2.0 Summary of Method and References

2.1 PM and CO emissions are measured from a wood–fired hydronic heating appliance burning a prepared test fuel charge in a test facility maintained at a set of prescribed conditions. Procedures for determining heat output rates, PM and CO emissions, and efficiency and for reducing data are provided.

2.2 Referenced Documents

2.2.1 EPA Standards

2.2.1.1 Method 28 Certification and Auditing of Wood Heaters

2.2.1.2 Method 28 WHH Measurement of Particulate Emissions and Heating Efficiency of Wood-Fired Hydronic Heating Appliances and the standards referenced therein.

2.2.2 Other Standards

2.2.2.1 CAN/CSA-B415.1-2010 *Performance Testing of Solid-Fuel-Burning Heating Appliances*

3.0 Terminology

3.1 Definitions

3.1.1 Hydronic Heating – A heating system in which a heat source supplies energy to a liquid heat exchange media such as water that is circulated to a heating load and returned to the heat source through pipes.

3.1.2 Aquastat – A control device that opens or closes a circuit to control the rate of fuel consumption in response to the temperature of the heating media in the heating appliance.

3.1.3 Delivered Efficiency – The percentage of heat available in a test fuel charge that is delivered to a simulated heating load or the storage system as specified in this test method.

3.1.4 Emission factor – the emission of a pollutant expressed in mass per unit of energy (typically) output from the boiler/heater

3.1.5 Emission index – the emission of a pollutant expressed in mass per unit mass of fuel used

3.1.6 Emission rate – the emission of a pollutant expressed in mass per unit time

3.1.7 Manufacturer's Rated Heat Output Capacity −The value in Btu/hr (MJ/hr) that the manufacturer specifies that a particular model of hydronic heating appliance is capable of supplying at its design capacity as verified by testing, in accordance with section 12.5.4.

3.1.8 Heat output rate − The average rate of energy output from the appliance during a specific test period in Btu/hr (MJ/hr)

3.1.9 Firebox − The chamber in the appliance in which the test fuel charge is placed and combusted.

3.1.10 NIST – National Institute of Standards and Technology

3.1.11 Test fuel charge − The collection of test fuel placed in the appliance at the start of the emission test run.

3.1.12 Test Run – An individual emission test which encompasses the time required to consume the mass of the test fuel charge. The time of the test run also considers the time for the energy to be drawn from the thermal storage.

3.1.13 Test Run Under “Cold-to-Cold” Condition – under this test condition the test fuel is added into an empty chamber along with kindling and ignition materials (paper). The boiler/heater at the start of this test is typically 125º to 130º F.

3.1.14 Test Run Under “Hot-to-Hot” Condition – under this test condition the test fuel is added onto a still-burning bed of charcoals produced in a pre-burn period. The boiler/heater water is near its operating control limit at the start of the test.

3.1.15 Overall Efficiency, also known as Stack Loss Efficiency – The efficiency for each test run as determined using the CSA B415.1-2010 Stack Loss Method (SLM).

3.1.16 Phases of a Burn Cycle. The “startup phase” is defined as the period from the start of the test until 15 percent of the test fuel charge is consumed. The “steady state phase” is defined as the period from the end of the startup phase to a point at which 80 percent of the test fuel charge is consumed. The “end phase” is defined as the time from the end of the steady state period to the end of the test.

3.1.17 Thermopile - A device consisting of a number of thermocouples connected in series, used for measuring differential temperature.

3.1.18 Slumber Mode – This is a mode in which the temperature of the water in the boiler/heater has exceeded the operating control limit and the control has changed the boiler/heater fan speed, dampers, and/or other operating parameters to minimize the heat output of the boiler/heater.

4.0 Summary of Test Method

4.1 Dilution Tunnel. Emissions are determined using the “dilution tunnel” method specified in EPA Method 28 WHH and the standards referenced therein. The flow rate in the dilution tunnel is maintained at a constant level throughout the test cycle and accurately measured. Samples of the dilution tunnel flow stream are extracted at a constant flow rate and drawn through high efficiency filters. The filters are dried and weighed before and after the test to determine the emissions collected and this value is multiplied by the ratio of tunnel flow to filter flow to determine the total particulate emissions produced in the test cycle.

4.2 Efficiency. The efficiency test procedure takes advantage of the fact that this type of system delivers heat through circulation of the heated liquid (water) from the system to a remote heat exchanger (*e.g.* baseboard radiators in a room) and back to the system. Measurements of the cooling water temperature difference as it enters and exits the test system heat exchanger along with the measured flow rate allow for an accurate determination of the useful heat output of the appliance. Also included in the heat output is the change in the energy content in the storage system during a test run. Energy input to the appliance during the test run is determined by weight of the test fuel charge, adjusted for moisture content, multiplied by the Higher Heating Value. Additional measurements of the appliance weight and temperature at the beginning and end of a test cycle are used to correct for heat stored in the appliance. Overall Efficiency (SLM) is determined using the CSA B415.1-2010 stack loss method for data quality assurance purposes.

4.3 Operation. Four test categories are defined for use in this method. These are:

4.3.1 Category I: A heat output of 15 percent or less of Manufacturer's Rated Heat Output Capacity.

4.3.2 Category II: A heat output of 16 percent to 24 percent of Manufacturer's Rated Heat Output Capacity.

4.3.3 Category III: A heat output of 25 percent to 50 percent of Manufacturer's Rated Heat Output Capacity.

4.3.4 Category IV: Manufacturer's Rated Heat Output Capacity. These heat output categories refer to the output from the system by way of the load heat exchanger installed for the test. The output from just the boiler/heater part of the system may be higher for all or part of a test, as part of this boiler/heater output goes to storage.
For the Category III and IV runs, appliance operation is conducted on a hot-to-hot test cycle meaning that the appliance is brought to operating temperature and a coal bed is established prior to the addition of the test fuel charge and measurements are made for each test fuel charge cycle. The measurements are made under constant heat draw conditions within pre-determined ranges. No attempt is made to modulate the heat demand to simulate an indoor thermostat cycling on and off in response to changes in the indoor environment.

For the Category I and II runs, the unit is tested with a "cold start." At the manufacturer's option, the Category II and III runs may be waived and it may be assumed that the particulate emission values and efficiency values determined in the startup, steady-state, and end phases of Category I are applicable in Categories II and III for the purpose of determining the annual averages in lb/MMBtu and g/MJ (See section 13). For

the annual average in g/hr, the length of time for stored heat to be drawn from thermal storage shall be determined for the test load requirements of the respective Category.

All test operations and measurements shall be conducted by personnel of the laboratory responsible for the submission of the test report.

5.0 Significance and Use

5.1 The measurement of particulate matter emission and CO rates is an important test method widely used in the practice of air pollution control.

5.1.1 These measurements, when approved by state or federal agencies, are often required for the purpose of determining compliance with regulations and statutes.

5.1.2 The measurements made before and after design modifications are necessary to demonstrate the effectiveness of design changes in reducing emissions and make this standard an important tool in manufacturer's research and development programs.

5.2 Measurement of heating efficiency provides a uniform basis for comparison of product performance that is useful to the consumer. It is also required to relate emissions produced to the useful heat production.

5.3 This is a laboratory method and is not intended to be fully representative of all actual field use. It is recognized that users of hand-fired, wood-burning equipment have a great deal of influence over the performance of any wood-burning appliance. Some compromises in realism have been made in the interest of providing a reliable and repeatable test method.

6.0 Test Equipment

6.1 Scale. A platform scale capable of weighing the boiler/heater under test and associated parts and accessories when completely filled with water to an accuracy of ± 1.0 pound (± 0.5 kg) and a readout resolution of ± 0.2 pound (± 0.1 kg).

6.2 Heat Exchanger. A water-to-water heat exchanger capable of dissipating the expected heat output from the system under test.

6.3 Water Temperature Difference Measurement. A Type –T 'special limits' thermopile with a minimum of 5 pairs of junctions shall be used to measure the temperature difference in water entering and leaving the heat exchanger. The temperature difference measurement uncertainty of this type of thermopile is equal to or less than ± 0.50ºF (± 0.25ºC). Other temperature measurement methods may be used if the temperature difference measurement uncertainty is equal to or less than ± 0.50ºF (± 0.25ºC). This measurement uncertainty shall include the temperature sensor, sensor well arrangement, piping arrangements, lead wire, and measurement / recording system. The response time of the temperature measurement system shall be less than half of the time interval at which temperature measurements are recorded.

6.4 Water Flow Meter. A water flow meter shall be installed in the inlet to the load side of the heat exchanger. The flow meter shall have an accuracy of ± 1 percent of measured flow.

6.4.1 Optional - Appliance side water flow meter. A water flow meter with an accuracy of ± 1 percent of the flow rate is recommended to monitor supply side water flow rate.

6.5 Optional Recirculation Pump. Circulating pump used during test to prevent stratification, in the boiler/heater, of liquid being heated.

6.6 Water Temperature Measurement – Thermocouples or other temperature sensors to measure the water temperature at the inlet and outlet of the load side of the heat exchanger must meet the calibration requirements specified in 10.1 of this method.

6.7 Lab Scale – For measuring the moisture content of wood slices as part of the overall wood moisture determination. Accuracy of ± 0.01 pounds.

6.8 Flue Gas Temperature Measurement – Must meet the requirements of CSA B415.1-2010, Clause 6.2.2.

6.9 Test Room Temperature Measurement – Must meet the requirements of CSA B415.1-2010, Clause 6.2.1.

6.10 Flue Gas Composition Measurement – Must meet the requirements of CSA B415.1-2010, Clauses 6.3.1 through 6.3.3.

6.11 Dilution Tunnel CO Measurement – In parallel with the flue gas composition measurements, the CO concentration in the dilution tunnel shall also be measured and reported at time intervals not to exceed one minute. This analyzer shall meet the zero and span drift requirements of CSA B415.1-2012. In addition the measurement repeatability shall be better than ±15 ppm over the range of CO levels observed in the dilution tunnel.

7.0 Safety

7.1 These tests involve combustion of wood fuel and substantial release of heat and products of combustion. The heating system also produces large quantities of very hot water and the potential for steam production and system pressurization. Appropriate precautions must be taken to protect personnel from burn hazards and respiration of products of combustion.

8.0 Sampling, Test Specimens and Test Appliances

8.1 Test specimens shall be supplied as complete appliances, as described in marketing materials, including all controls and accessories necessary for installation in the test facility. A full set of specifications, installation and operating instructions, and design and assembly drawings shall be provided when the product is to be placed under certification of a third-party agency. The manufacturer's written installation and operating instructions are to be used as a guide in the set-up and testing of the appliance and shall be part of the test record.

8.2 The size, connection arrangement, and control arrangement for the thermal storage shall be as specified in the manufacturer's documentation. It is not necessary to use the specific storage system that the boiler/heater will be marketed with. However, the capacity of the system used in the test cannot be greater than that specified as the minimum allowable for the boiler/heater.

8.3 All system control settings shall be the as-shipped, default settings. These default settings shall be the same as those communicated in a document to the installer or end user. These control settings and the documentation of the control settings as to be provided to the installer or end user shall be part of the test record.

8.4 Where the manufacturer defines several alternatives for the connection and loading arrangement, one shall be defined in the appliance documentation as the default or standard installation. It is expected that this will be the configuration for use with a simple baseboard heating system. This is the configuration to be followed for these tests. The manufacturer's documentation shall define the other arrangements as optional or alternative arrangements.

9.0 Preparation of Test Equipment

9.1 The appliance is to be placed on a scale capable of weighing the appliance fully loaded with a resolution of ± 0.2 lb (0.1 kg).

9.2 The appliance shall be fitted with the type of chimney recommended or provided by the manufacturer and extending to 15 ± 0.5 feet (4.6 ± 0.15 m) from the upper surface of the scale. If no flue or chimney system is recommended or provided by the manufacturer, connect the appliance to a flue of a diameter equal to the flue outlet of the appliance. The flue section from the appliance flue collar to 8 ± 0.5 feet above the scale shall be single wall stove pipe and the remainder of the flue shall be double wall insulated class A chimney.

9.3 Optional Equipment Use

9.3.1 A recirculation pump may be installed between connections at the top and bottom of the appliance to minimize thermal stratification if specified by the manufacturer. The pump shall not be installed in such a way as to change or affect the flow rate between the appliance and the heat exchanger.

9.3.2 If the manufacturer specifies that a thermal control valve or other device be installed and set to control the return water temperature to a specific set point, the valve or other device shall be installed and set per the manufacturer's written instructions.

9.4 Prior to filling the boiler/heater with water, weigh and record the appliance mass.

9.5 Heat Exchanger

9.5.1 Plumb the unit to a water-to-water heat exchanger with sufficient capacity to draw off heat at the maximum rate anticipated. Route hoses and electrical cables and

instrument wires in a manner that does not influence the weighing accuracy of the scale as indicated by placing dead weights on the platform and verifying the scale's accuracy.

9.5.2 Locate thermocouples to measure the water temperature at the inlet and outlet of the load side of the heat exchanger.

9.5.3 Install a thermopile (or equivalent instrumentation) meeting the requirements of section 6.3 to measure the water temperature difference between the inlet and outlet of the load side of the heat exchanger

9.5.4 Install a calibrated water flow meter in the heat exchanger load side supply line. The water flow meter is to be installed on the cooling water inlet side of the heat exchanger so that it will operate at the temperature at which it is calibrated.

9.5.5 Place the heat exchanger in a box with 2 in. (50 mm) of expanded polystyrene (EPS) foam insulation surrounding it to minimize heat losses from the heat exchanger.

9.5.6 The reported efficiency and heat output rate shall be based on measurements made on the load side of the heat exchanger.

9.5.7 Temperature instrumentation per section 6.6 shall be installed in the appliance outlet and return lines. The average of the outlet and return water temperature on the supply side of the system shall be considered the average appliance temperature for calculation of heat storage in the appliance (TF_{avg} and TI_{avg}). Installation of a water flow meter in the supply side of the system is optional.

9.6 Storage Tank. The storage tank shall include a destratification pump as illustrated in Figure 1. The pump will draw from the bottom of the tank and return to the top as illustrated. Temperature sensors (TS1 and TS2 in Figure 1) shall be included to

measure the temperature in the recirculation loop. The valve plan in Figure 1 allows the tank recirculation loop to operate and the boiler/heater-to-heat exchanger loop to operate at the same time but in isolation. This would typically be done before the start of a test or following completion of a test to determine the end of test average tank temperature. The nominal flow rate in the storage tank recirculation loop can be estimated based on pump manufacturer's performance curves and any significant restriction in the recirculation loop.

9.7 Fill the system with water. Determine the total weight of the water in the appliance when the water is circulating. Verify that the scale indicates a stable weight under operating conditions. Make sure air is purged properly.

10.0 Calibration and Standardization

10.1 Water Temperature Sensors. Temperature measuring equipment shall be calibrated before initial use and at least semi-annually thereafter. Calibrations shall be in compliance with National Institute of Standards and Technology (NIST) Monograph 175, Standard Limits of Error.

10.2 Heat Exchanger Load Side Water Flow Meter.

10.2.1 The heat exchanger load side water flow meter shall be calibrated within the flow range used for the test run using NIST-traceable methods. Verify the calibration of the water flow meter before and after each test run and at least once during each test run by comparing the water flow rate indicated by the flow meter to the mass of water collected from the outlet of the heat exchanger over a timed interval. Volume of the collected water shall be determined based on the water density calculated from section 13, Eq. 12, using the water temperature measured at the flow meter. The uncertainty in

the verification procedure used shall be 1 percent or less. The water flow rate determined by the collection and weighing method shall be within 1 percent of the flow rate indicated by the water flow meter.

10.3 Scales. The scales used to weigh the appliance and test fuel charge shall be calibrated using NIST-traceable methods at least once every 6 months.

10.4 Flue Gas Analyzers – In accordance with CSA B415.1-2010, Clause 6.8.

11.0 Conditioning

11.1 Prior to testing, a non-catalytic appliance is to be operated for a minimum of 10 hours using a medium heat draw rate. Catalytic units shall be operated for a minimum of 50 hours using a medium heat draw rate. The pre-burn for the first test can be included as part of the conditioning requirement. If conditioning is included in pre-burn, then the appliance shall be aged with fuel meeting the specifications outlined in section 12.2 with a moisture content between 19 and 25 percent on a dry basis. Operate the appliance at a medium heat output rate (Category II or III) for at least 10 hours for non-catalytic appliances and 50 hours for catalytic appliances. Record and report hourly flue gas exit temperature data and the hours of operation. The aging procedure shall be conducted and documented by a testing laboratory.

12.0 Procedure

12.1 Appliance Installation. Assemble the appliance and parts in conformance with the manufacturer's written installation instructions. Clean the flue with an appropriately sized, wire chimney brush before each certification test series.

12.2 Fuel. Test fuel charge fuel shall be red (*Quercus ruba L.) or* white (*Quercus Alba*) oak 19 to 25 percent moisture content on a dry basis. Piece length shall be 80 percent of

the firebox depth rounded down to the nearest 1 inch (25mm) increment. For example, if the firebox depth is 46 inches (1168mm) the piece length would be 36 inches (46 inches x 0.8 = 36.8 inches round down to 36 inches). Pieces are to be placed in the firebox parallel to the longest firebox dimension. For fireboxes with sloped surfaces that create a non-uniform firebox length, the piece length shall be adjusted for each layer based on 80 percent of the length at the level where the layer is placed. The test fuel shall be cord wood with cross section dimensions and weight limits as defined in CSA B415.1-2010, section 8.3, Table 4. The use of dimensional lumber is not allowed.

12.2.1 Select three pieces of cord wood from the same batch of wood as the test fuel and the same weight as the average weight of the pieces in the test load ± 1.0 lb. From each of these three pieces, cut three slices. Each slice shall be ½ inch to ¾ inch thick. One slice shall be cut across the center of the length of the piece. The other two slices shall be cut half way between the center and the end. Immediately measure the mass of each piece in pounds. Dry each slice in an oven at 220°F for 24 hours or until no further weight change occurs. The slices shall be arranged in the oven so as to provide separation between faces. Remove from the oven and measure the mass of each piece again as soon as practical in pounds.

The moisture content of each slice, on a dry basis shall be calculated as:

$$MC_{slice} = \frac{100 \cdot (W_{SliceWet} - W_{SliceDry})}{W_{SliceDry}}$$

Where:

$W_{SliceWet}$ = weight of the slice before drying in pounds

$W_{SliceDry}$ = weight of the slice after drying in pounds

MC_{Slice} = moisture content of the slice in % dry basis

The average moisture content of the entire test load (MC) shall be determined using Eq. 6. Each individual slice shall have a moisture content in the range of 18 percent to 28 percent on a dry basis. The average moisture content for the test fuel load shall be in the range of 19 percent to 25 percent. Moisture shall not be added to previously dried fuel pieces except by storage under high humidity conditions and temperature up to 100ºF. Fuel moisture measurement shall begin within four hours of using the fuel batch for a test. Use of a pin-type meter to estimate the moisture content prior to a test is recommended.

12.2.2 Firebox Volume. Determine the firebox volume in cubic feet. Firebox volume shall include all areas accessible through the fuel loading door where firewood could reasonably be placed up to the horizontal plane defined by the top of the loading door. A drawing of the firebox showing front, side and plan views or an isometric view with interior dimensions shall be provided by the manufacturer and verified by the laboratory. Calculations for firebox volume from computer aided design (CAD) software programs are acceptable and shall be included in the test report if used. If the firebox volume is calculated by the laboratory the firebox drawings and calculations shall be included in the test report.

12.2.3 Test Fuel charge. Test fuel charges shall be determined by multiplying the firebox volume by 10 pounds (4.54 kg) per ft^3 (28L), or a higher load density as recommended by the manufacturer's printed operating instructions, of wood (as used wet weight). Select the number of pieces of cord wood that most nearly match this target

weight. However, the test fuel charge cannot be less than the target of 10 pounds (4.54 kg) per ft^3 (28L).

12.3 Sampling Equipment. Prepare the particulate emission sampling equipment as defined by EPA Method 28 WHH and the standards referenced therein.

12.4 Appliance Startup. The appliance shall be fired with wood fuel of any species, size and moisture content at the laboratories discretion to bring it up to operating temperature. Operate the appliance until the water is heated to the upper operating control limit and has cycled at least two times. Then remove all unburned fuel, zero the scale and verify the scales accuracy using dead weights.

12.4.1 Startup Procedure for Category III and IV test runs, “hot-to-hot”

12.4.1.1 Pre-Test Burn Cycle. Following appliance startup (section 12.4), reload appliance with oak cord wood and allow it to burn down to the specified coal bed weight. The pre-test burn cycle fuel charge weight shall be within ±10 percent of the test fuel charge weight. Piece size and length shall be selected such that charcoalization is achieved by the time the fuel charge has burned down to the required coal bed weight. Pieces with a maximum thickness of approximately 2 inches have been found to be suitable. Charcoalization is a general condition of the test fuel bed evidenced by an absence of large pieces of burning wood in the coal bed and the remaining fuel pieces being brittle enough to be broken into smaller charcoal pieces with a metal poker. Manipulations to the fuel bed prior to the start of the test run are to be done to achieve charcoalization while maintaining the desired heat output rate. During the pre-test burn cycle and at least one hour prior to starting the test run, adjust water flow to the heat

exchanger to establish the target heat draw for the test. For the first test run the heat draw rate shall be equal to the manufacturer's rated heat output capacity.

12.4.1.2 Allowable Adjustments. Fuel addition or subtractions, and coal bed raking shall be kept to a minimum but are allowed up to 15 minutes prior to the start of the test run. For the purposes of this method, coal bed raking is the use of a metal tool (poker) to stir coals, break burning fuel into smaller pieces, dislodge fuel pieces from positions of poor combustion, and check for the condition of charcoalization. Record all adjustments to and additions or subtractions of fuel, and any other changes to the appliance operations that occur during pretest ignition period. During the 15-minute period prior to the start of the test run, the wood heater loading door shall not be open more than a total of 1 minute. Coal bed raking is the only adjustment allowed during this period.

12.4.1.3 Coal Bed Weight. The appliance is to be loaded with the test fuel charge when the coal bed weight is between 10 percent and 20 percent of the test fuel charge weight. Coals may be raked as necessary to level the coal bed but may only be raked and stirred once between 15 to 20 minutes prior to the addition of the test fuel charge.

12.4.1.4 Storage. The Category III and IV test runs may be done either with or without the thermal storage. If thermal storage is used the initial temperature of the storage must be 125°F or greater at the start of the test. The storage may be heated during the pre-test burn cycle or it may be heated by external means. If thermal storage is used, prior to the start of the test run, the storage tank destratification pump, shown in Figure 1, shall be operated until the total volume pumped exceeds 1.5 times the tank volume and the difference between the temperature at the top and bottom of the storage tank (TS_1 and

TS_2) is less than 1°F. These two temperatures shall then be recorded to determine the starting average tank temperature. The total volume pumped may be based on the nominal flow rate of the destratification pump (See section 9.6). If the Category III and IV runs are done with storage, it is recognized that during the last hour of the pre-burn cycle the storage tank must be mixed to achieve a uniform starting temperature and cannot receive heat from the boiler/heater during this time. During this time period the boiler/heater might cycle or go into a steady reduced output mode. (Note – this would happen, for example, in a Category IV run if the actual maximum output of the boiler/heater exceed the manufacturer's rated output.) A second storage tank may be used temporarily to enable the boiler/heater to operate during this last hour of the pre-burn period as it will during the test period. The temperature of this second storage tank is not used in the calculations but the return water to the boiler/heater (after mixing device if used) must be 125°F or greater.

12.4.2 Startup Procedure for Category I and II test runs, "cold-to-cold."

12.4.2.1 Initial Temperatures. This test shall be started with both the boiler/heater and the storage at a minimum temperature of 125°F. The boiler/heater maximum temperature at the start of this test shall be 135°F. The boiler/heater and storage may be heated through a pre-burn or it may be heated by external means.

12.4.2.2 Firebox Condition at Test Start. Prior to the start of this test remove all ash and charcoal from the combustion chamber(s). The loading of the test fuel and kindling should follow the manufacturer's recommendations, subject to the following constraints: Up to 10 percent kindling and paper may be used which is in addition to the

fuel load. Further, up to 10 percent of the fuel load (*i.e.,* included in the 10 lb/ft^3) may be smaller than the main fuel. This startup fuel shall still be larger than 2 inches.

12.4.2.3 Storage. The Category I and II test runs shall be done with thermal storage. The initial temperature of the storage must be 125°F or greater at the start of the test. The storage may be heated during the pre-test burn cycle or it may be heated by external means. Prior to the start of the test run, the storage tank destratification pump, shown in Figure 1, shall be operated until the total volume pumped exceeds 1.5 times the tank volume and the difference between the temperature at the top and bottom of the storage tank (TS_1 and TS_2) is less than 1°F. These two temperatures shall then be recorded to determine the starting average tank temperature. The total volume pumped may be based on the nominal flow rate of the destratification pump (See section 9.6).

12.5 Test Runs. For all test runs, the return water temperature to the hydronic heater must be equal to or greater than 120°F (this is lower than the initial tank temperature to allow for any pipeline losses). Where the storage system is used, flow of water from the boiler/heater shall be divided between the storage tank and the heat exchanger such that the temperature change of the circulating water across the heat exchanger shall be 30 ± 5°F, averaged over the entire test run. This is typically adjusted using the system valves.

Complete a test run in each heat output rate category, as follows:

12.5.1 Test Run Start. For Category III and IV runs: once the appliance is operating normally and the pretest coal bed weight has reached the target value per 12.4.1, tare the scale and load the full test charge into the appliance. Time for loading

shall not exceed 5 minutes. The actual weight of the test fuel charge shall be measured and recorded within 30 minutes prior to loading. Start all sampling systems.

For Category I and II runs: once the appliance has reached the starting temperature, tare the scale and load the full test charge, including kindling into the appliance. The actual weight of the test fuel charge shall be measured and recorded within 30 minutes prior to loading. Light the fire following the manufacturer's written normal startup procedure. Start all sampling systems.

12.5.1.1 Record all water temperatures, differential water temperatures and water flow rates at time intervals of one minute or less.

12.5.1.2 Record particulate emissions data per the requirements of EPA Method 28 WHH and the standards referenced therein.

12.5.1.3 Record data needed to determine Overall Efficiency (SLM) per the requirements of CSA B415.1-2010 Clauses 6.2.1, 6.2.2, 6.3, 8.5.7, 10.4.3 (a), 10.4.3(f), and 13.7.9.3

12.5.1.3.1 Measure and record the test room air temperature in accordance with the requirements of Clauses 6.2.1, 8.5.7 and 10.4.3 (g).

12.5.1.3.2 Measure and record the flue gas temperature in accordance with the requirements of Clauses 6.2.2, 8.5.7 and 10.4.3 (f).

12.5.1.3.3 Determine and record the Carbon Monoxide (CO) and Carbon Dioxide (CO_2) concentrations in the flue gas in accordance with Clauses 6.3, 8.5.7 and 10.4.3 (i) and (j).

12.5.1.3.4 Measure and record the test fuel weight per the requirements of Clauses 8.5.7 and 10.4.3 (h).

12.5.1.3.5 Record the test run time per the requirements of Clause 10.4.3 (a).

12.5.1.3.6 Record and document all settings and adjustments, if any, made to the boiler/heater as recommended/required by manufacturer's instruction manual for different combustion conditions or heat loads. These may include temperature setpoints, under and over-fire air adjustment, or other adjustments that could be made by an operator to optimize or alter combustion. All such settings shall be included in the report for each test run.

12.5.1.4 Monitor the average heat output rate on the load side of the heat exchanger based on water temperatures and flow. If the heat output rate over a 10 minute averaging period gets close to the upper or lower limit of the target range (± 5 percent), adjust the water flow through the heat exchanger to compensate. Make changes as infrequently as possible while maintaining the target heat output rate. The first test run shall be conducted at the category IV heat output rate to validate that the appliance is capable of producing the manufacturer's rated heat output capacity.

12.5.2 Test Fuel Charge Adjustment. It is acceptable to adjust the test fuel charge (*i.e.,* reposition) once during a test run if more than 60 percent of the initial test fuel charge weight has been consumed and more than 10 minutes have elapsed without a measurable (1 lb or 0.5 kg) weight change while the operating control is in the demand mode. The time used to make this adjustment shall be less than 60 seconds.

12.5.3 Test Run Completion. For the Category III and IV, "hot-to-hot" test runs, the test run is completed when the remaining weight of the test fuel charge is 0.0 lb (0.0 kg). ($W_{FuelBurned} = W_{fuel}$) End the test run when the scale has indicated a test fuel charge weight of 0.0 lb (0.0 kg) or less for 30 seconds.

For the Category I and II "cold-to-cold" test runs, the test run is completed; and the end of a test is defined at the first occurrence of any one of the following:

(a) The remaining weight of the test fuel charge is less than 1 percent of the total test fuel weight ($W_{FuelBurned} > 0.99 \cdot W_{fuel}$);

(b) The automatic control system on the boiler/heater switches to an off mode. In this case the boiler/heater fan (if used) is typically stopped, and all air flow dampers are closed by the control system. Note that this off mode cannot be an "overheat" or emergency shutdown which typically requires a manual reset; or

(c) If the boiler/heater does not have an automatic off mode: After 90 percent of the fuel load has been consumed and the scale has indicated a rate of change of the test fuel charge of less than 1.0 lb/hr for a period of 10 minutes or longer. Note - this is not considered "stopped fuel combustion," See section 12.5.6.1.

12.5.3.1 At the end of the test run, stop the particulate sampling train and Overall Efficiency (SLM) measurements, and record the run time, and all final measurement values.

12.5.3.2 At the end of the test run, continue to operate the storage tank destratification pump until the total volume pumped exceeds 1.5 times the tank volume. The maximum average of the top and bottom temperatures measured after this time may be taken as the average tank temperature at the end of the tests (TFSavg, See section 13.1). The total volume pumped may be based on the nominal flow rate of the destratification pump (See section 9.6).

12.5.3.3 For the Category I and II test runs, there is a need to determine the energy content of the unburned fuel remaining in the chamber if the remaining mass in

the chamber is greater than 1 percent of the test fuel weight. Following the completion of the test, as soon as safely practical, this remaining fuel is removed from the chamber, separated from the remaining ash and weighed. This separation could be implemented with a slotted “scoop” or similar tool. A ¼ inch opening size in the separation tool shall be used to separate the ash and charcoal. This separated char is assigned a heating value of 12,500 Btu/lb.

12.5.4 Heat Output Capacity Validation. The first test run must produce a heat output rate that is within 10 percent of the manufacturer’s rated heat output capacity (Category IV) throughout the test run and an average heat output rate within 5 percent of the manufacturer’s rated heat output capacity. If the appliance is not capable of producing a heat output within these limits, the manufacturer’s rated heat output capacity is considered not validated and testing is to be terminated. In such cases, the tests may be restarted using a lower heat output capacity if requested by the manufacturer. Alternatively, during the Category IV run, if the rated output cannot be maintained for a 15 minute interval, the manufacturer may elect to reduce the rated output to match the test and complete the Category IV run on this basis. The target outputs for Cat I, II, and III shall then be recalculated based on this change in rated output capacity.

12.5.5 Additional Test Runs. Using the Manufacturer’s Rated Heat Output Capacity as a basis, conduct a test for additional heat output categories as specified in 4.3. It is not required to run these tests in any particular order.

12.5.6 Alternative Heat Output Rate for Category I. If an appliance cannot be operated in the Category I heat output range due to stopped combustion, two test runs shall be conducted at heat output rates within Category II. When this is the case, the

weightings for the weighted averages indicated in section 15.1.14 shall be the average of the Category I and II weighting's and shall be applied to both Category II results. Appliances that are not capable of operation within Category II (<25 percent of maximum) cannot be evaluated by this test method.

12.5.6.1 Stopped Fuel Combustion. Evidence that an appliance cannot be operated at a Category I heat output rate due to stopped fuel combustion shall include documentation of two or more attempts to operate the appliance in heat output rate Category I and fuel combustion has stopped prior to complete consumption of the test fuel charge. Stopped fuel combustion is evidenced when an elapsed time of 60 minutes or more has occurred without a measurable (1 lb or 0.5 kg) weight change in the test fuel charge while the appliance operating control is in the demand mode. Report the evidence and the reasoning used to determine that a test in heat output rate Category I cannot be achieved. For example, two unsuccessful attempts to operate at an output rate of 10 percent of the rated output capacity are not sufficient evidence that heat output rate Category I cannot be achieved.

12.5.7 Appliance Overheating. Appliances with their associated thermal storage shall be capable of operating in all heat output categories without overheating to be rated by this test method. Appliance overheating occurs when the rate of heat withdrawal from the appliance is lower than the rate of heat production when the unit control is in the idle mode. This condition results in the water in the appliance continuing to increase in temperature well above the upper limit setting of the operating control. Evidence of overheating includes: 1 hour or more of appliance water temperature increase above the upper temperature set-point of the operating control, exceeding the temperature limit of a

safety control device (independent from the operating control – typically requires manual reset), boiling water in a non-pressurized system or activation of a pressure or temperature relief valve in a pressurized system.

12.5.8 Option to Eliminate Tests in Category II and III. Following successful completion of a test run in Category I, the manufacturer may eliminate the Cat II and III tests. For the purpose of calculating the annual averages for particulates and efficiency, the values obtained in the Category I run shall be assumed to apply also to Category II and Category III. It is envisioned that this option would be applicable to systems which have sufficient thermal storage such that the fuel load in the Cat I test can be completely consumed without the system reaching its upper operating temperature limit. In this case the boiler/heater would likely be operating at maximum thermal output during the entire test and this output rate may be higher than the Manufacturer's Rated Heat Output Capacity. The Category II and III runs would then be the same as the Category I run. It may be assumed that the particulate emission values and efficiency values determined in the startup, steady-state, and end phases of Category I are applicable in Categories II and III, for the purpose of determining the annual averages in lb/MMBtu and g/MJ (See section 13). For the annual average in g/hr, the length of time for stored heat to be drawn from thermal storage shall be determined for the test load requirements of the respective Category.

12.5.9 Modification to Measurement Procedure in EPA Method 28 WHH to Determine Emissions Separately During the Startup, Steady-State and End Phases. With one of the two particulate sampling trains used, filter changes shall be made at the end of the startup phase and the steady state phase (See section 3.0). This shall be done to

determine the particulate emission rate and particulate emission index for the startup, steady state, and end phases individually. For this one train, the particulates measured during each of these three phases shall be added together to also determine the particulate emissions for the whole run.

12.5.10 Modification to Measurement Procedure in EPA Method 28 WHH and the standards referenced therein on Averaging Period for Determination of Efficiency by the Stack Loss Method. The methods currently defined in Method 28 WHH allow averaging over 10 minute time periods for flue gas temperature, flue gas CO_2, and flue gas CO for the determination of the efficiency with the Stack Loss Method. However, under some cycling conditions the "on" period may be short relative to this 10 minute period. For this reason, during cycling operation the averaging period for these parameters may not be longer than the burner on period divided by 10. The averaging period need not be shorter than one minute. During the off period, under cycling operation, averaging periods as specified in EPA Method 28 WHH and the standards referenced therein may be used. Where short averaging times are used, however, the averaging period for fuel consumption may still be at 10 minutes. This average wood consumption rate shall be applied to all of the smaller time intervals included.

12.6 Additional Test Runs. The testing laboratory may conduct more than one test run in each of the heat output categories specified in section 4.3. If more than one test run is conducted at a specified heat output rate, the results from at least two-thirds of the test runs in that heat output rate category shall be used in calculating the weighted average emission rate. The measurement data and results of all test runs shall be reported regardless of which values are used in calculating the weighted average emission rate.

13.0 Calculation of Results

13.1 Nomenclature.

CO_s – Carbon monoxide measured in the dilution tunnel at arbitrary time in ppm dry basis.

$CO_{g/min}$ – Carbon monoxide emission rate in g/min.

CO_T – Total carbon monoxide emission for the full test run in grams.

$CO_{\_1}$ – Startup period carbon monoxide emissions in grams.

$CO_{\_2}$ – Steady-state period carbon monoxide emission in grams.

$CO_{\_3}$ – End period carbon monoxide emission in grams.

E_T – Total particulate emissions for the full test run as determined per EPA Method 28 WHH and the standards referenced therein in grams.

E_1 = Startup period particulate emissions in grams.

E_2 = Steady-state period particulate emissions in grams.

E_3 = End period particulate emissions in grams.

$E_{1\_g/kg}$ = Startup period particulate emission index in grams per kg fuel.

$E_{2\_g/kg}$ = Steady-state period particulate emission index in grams per kg fuel.

$E_{3\_g/kg}$ = End period particulate emission index in grams per kg fuel.

$E_{1\_g/hr}$ = Startup period particulate emission rate in grams per hour.

$E_{2\_g/hr}$ = Steady-state period particulate emission rate in grams per hour.

$E_{3\_g/hr}$ = End period particulate emission rate in grams per hour.

$E_{g/MJ}$ – Emission rate in grams per MJ of heat output.

$E_{lb/mmBtu\ output}$ – Emissions rate in pounds per million Btu's of heat output.

$E_{g/kg}$ – Emissions factor in grams per kilogram of dry fuel burned.

$E_{g/hr}$ – Emission factor in grams per hour.

HHV – Higher Heating Value of fuel = 8600 Btu/lb (19.990 MJ/kg).

LHV – Lower Heating Value of fuel = 7988 Btu/lb (18.567 MJ/kg).

ΔT – Temperature difference between cooling water entering and exiting the heat exchanger.

Q_{out} − Total heat output in Btu's (MJ).

Q_{in} − Total heat input available in test fuel charge in Btu's (MJ).

Q_{std} – Volumetric flow rate in dilution tunnel in dscfm.

M − Mass flow rate of water in lb/min (kg/min).

V_i – Volume of water indicated by a totalizing flow meter at the i_{th} reading in gallons (liters).

V_f – Volumetric flow rate of water in heat exchange system in gallons per minute (liters/min).

Θ – Total length of burn period in hours ($\Theta_1 + \Theta_2 + \Theta_3$).

Θ_1 – Length of time of the startup period in hours.

Θ_2 – Length of time of the steady state period in hours.

Θ_3 – Length of time of the end period in hours.

Θ_4 – Length of time for stored heat to be used following a burn period in hours.

t_i − Data sampling interval in minutes.

η_{del} – Delivered heating efficiency in percent.

F_i − Weighting factor for heat output category i. See Table 2.

T1 – Temperature of water at the inlet on the supply side of the heat exchanger, °F.

T2 – Temperature of the water at the outlet on the supply side of the heat exchanger, °F.

T3 – Temperature of cooling water at the inlet to the load side of the heat exchanger, °F.

T4 – Temperature of cooling water at the outlet of the load side of the heat exchanger, °F.

T5 – Temperature of the hot water supply as it leaves the boiler/heater, °F.

T6 – Temperature of return water as it enters the boiler/heater, °F.

T7 – Temperature in the boiler/heater optional destratification loop at the top of the boiler/heater, °F.

T8 – Temperature in the boiler/heater optional destratification loop at the bottom of the boiler/heater, °F.

TI_{avg} − Average temperature of the appliance and water at start of the test.

TI_{avg} − (T5 + T6)/2 at the start of the test, °F. Eq. 1

TF_{avg} – Average temperature of the appliance and water at the end of the test.

TF_{avg} − (T5 + T6)/2 at the end of the test, °F. Eq. 2

TIS_1 − Temperature at the inlet to the storage system at the start of the test.

TIS_2 − Temperature at the outlet from the storage system at the start of the test.

TFS_1 − Temperature at the inlet to the storage system at the end of the test.

TFS_2 − Temperature at the outlet from the storage system at the end of the test.

TIS_{avg} − Average temperature of the storage system at the start of the test.

TIS_{avg} − (TIS_1 + TIS_2)/2 at the end of the test. Eq. 3

TFS_{avg} − Average temperature of the storage system at the end of the test.

TFS_{avg} − (TFS_1 + TFS_2)/2. Eq. 4

MC – Fuel moisture content in percent dry basis.

σ – Density of water in pounds per gallon.

$\sigma_{Initial}$ – Density of water in the boiler/heater system at the start of the test in pounds per gallons.

$\sigma_{boiler/heater}$ – Density of water in the boiler/heater system at arbitrary time during the test in pounds per gallon.

C_p – Specific heat of water in Btu /lb °-F.

C_{steel} – Specific heat of steel (0.1 Btu/ lb -ºF).

$V_{boiler/heater}$ – total volume of water in the boiler/heater system on the weight scale in gallons.

W_{fuel} – Fuel charge weight, as-fired or "wet", in pounds (kg).

W_{fuel_1} – Fuel consumed during the startup period in pounds (kg).

W_{fuel_2} – Fuel consumed during the steady state period in pounds (kg).

W_{fuel_3} – Fuel consumed during the end period in pounds (kg).

$W_{FuelBurned}$ – Weight of fuel that has been burned from the start of the test to an arbitrary time, including the needed correction for the change in density and weight of the water in the boiler/heater system on the scale in pounds (kg).

$W_{RemainingFuel}$ – weight of unburned fuel separated from the ash at the end of a test. Useful only for Cat I and Cat II tests.

W_{app} – Weight of empty appliance in pounds (kg).

W_{wat} – Weight of water in supply side of the system in pounds (kg).

$W_{ScaleInitial}$ – weight reading on the scale at the start of the test, just after the test load has been added in pounds (kg).

W_{Scale} – Reading of the weight scale at arbitrary time during the test run in pounds (kg).

$W_{StorageTank}$ – Weight of the storage tank empty in pounds (kg).

$W_{WaterStorage}$ − Weight of the water in the storage tank at TIS_{avg} in pounds (kg).

13.2 After the test is completed, determine the particulate emissions ET in accordance with EPA Method 28 WHH and the standards referenced therein.

13.3 Determination of the weight of fuel that has been burned at arbitrary time

For the purpose of tracking the consumption of the test fuel load during a test run the following may be used to calculate the weight of fuel that burned since the start of the test:

$$W_{FuelBurned} = (W_{ScaleInitial} - W_{Scale}) + V_{Boiler/heater} \cdot (\sigma_{Initial} - \sigma_{boiler/heater}) \quad \text{Eq. 5}$$

Water density, σ, is calculated using Equation 12.

13.4 Determine Average Fuel Load Moisture Content.

$$MC = \frac{\sum W_{SliceWet\_i} - MC_{Slice\_i}}{\sum W_{SliceWet\_i}} \quad \text{Eq. 6}$$

13.5 Determine heat input.

$Q_{in} = (W_{fuel}/(1+(MC/100))) \times HHV$, Btu (MJ). Eq. 7

$Q_{in\ LHV} = (W_{fuel}/(1+(MC/100))) \times LHV$, Btu (MJ). Eq. 8

13.5.1 Correction to Q_{in} for the Category I and II tests, where there is greater than 1 percent of the test fuel charge in the chamber at the end of the test period.

$$Q_{InCorrected} = Q_{in} - W_{Remaining} \cdot 12{,}500 \frac{Btu}{lb} \quad \text{Eq. 9}$$

13.6 Determine heat output, efficiency, and emissions

13.6.1 Determine heat output as:

Q_{out} = Σ [Heat output determined for each sampling time interval] + Change in heat stored in the appliance + Change in heat in storage tank.

$$Qout = \Sigma[C_{pi} \cdot \Delta T_i \cdot M_i \cdot t_i] + (W_{app} \cdot C_{steel} + W_{water} \cdot C_{pa}) \cdot (TF_{avg} - TI_{avg})$$

$$+ (W_{StorageTank} \cdot C_{steel} + W_{WaterStorage} \cdot C_{pa}) \cdot (TFS_{avg} - TIS_{avg}) \text{ Btu (MJ)} \quad \text{Eq. 10}$$

Note: The subscript (i) indicates the parameter value for sampling time interval t_i.

M_i = Mass flow rate = gal/min x Density of Water (lb/gal) = lb/min.

$M_i = V_{fi} \cdot \sigma_i$, lb/min. Eq. 11

$\sigma_i = (62.56 + (-.0003413 \times T3_i) + (-.00006225 \times T3_i^2)) 0.1337$, lbs/gal. Eq. 12

$C_p = 1.0014 + (-.000003485 \times T3_i)$ Btu/lb-ºF. Eq. 13

$C_{steel} = 0.1$ Btu/lb-ºF.

$C_{pa} = 1.0014 + (-.000003485 \text{ X } (TI_{avg} + TF_{avg})/2)$, Btu/lb-ºF. Eq. 14

$V_{fi} = (V_i - V_{i-1})/(t_i - t_{i-1})$, gal/min. Eq. 15

Note: V_i is the total water volume at the end of interval i and V_{i-1} is the total water volume at the beginning of the time interval. This calculation is necessary when a totalizing type water meter is used.

13.6.2 Determine Heat Output Rate Over Burn Period ($\Theta_1 + \Theta_2 + \Theta_3$) as:

Heat Output Rate = Q_{out}/Θ, Btu/hr (MJ/hr). Eq. 16

13.6.3 Determine Emission Rates and Emission Factors as:

$E_{g/MJ} = E_T/(Q_{out} \times 0.001055)$, g/MJ. Eq. 17

$E_{lb/MM\ Btu\ output} = (E_T/453.59)/(Q_{out} \times 10^{-6})$, lb/MMBtu Out. Eq. 18

$E_{g/kg} = E_T/(W_{fuel}/(1+MC/100))$, g/dry kg. Eq. 19

$E_{g/hr} = E_T/(\Theta_1 + \Theta_2 + \Theta_3 + \Theta_4)$, g/hr. Eq. 20

$\Theta_4 = (W_{StorageTank} \cdot C_{steel} + W_{WaterStorage} \cdot C_{pa}) \cdot (TFS_{avg} - TIS_{avg})/(Q_{out}/\Theta)$ Eq. 21

If thermal storage is not used in a Category III or IV run, then $\Theta_4 = 0$

$E_{1\_g/kg} = E_1/(W_{fuel\_1}/(1+MC/100))$, g/dry kg

$E_{2\_g/kg} = E_2/(W_{fuel\_2}/(1+MC/100))$, g/dry kg

$E_{3\_g/kg} = E_3/(W_{fuel\_3}/(1+MC/100))$, g/dry kg

$E_{1\_g/hr} = E_1/\Theta_1$, g/hr

$E_{2\_g/hr} = E_2/\Theta_2$, g/hr

$E_{3\_g/hr} = E_3/\Theta_3$, g/hr

13.6.4 Determine delivered efficiency as:

$\eta_{del} = (Q_{out}/Q_{InCorrected})$ x 100, %. Eq. 22

$\eta_{del\ LHV} = (Q_{out}/Q_{in\ LHV})$ x 100, %. Eq. 23

13.6.5 Determine η_{SLM} - Overall Efficiency, also known as Stack Loss Efficiency, using Stack Loss Method (SLM).

For determination of the average overall thermal efficiency (η_{SLM}) for the test run, use the data collected over the full test run and the calculations in accordance with CSA B415.1-2010, Clause 13.7 except for 13.7.2 (e), (f), (g), and (h), use the following average fuel properties for oak: %C = 50.0, %H = 6.6, %O = 43.2, %Ash = 0.2.

13.6.5.1 Whenever the CSA B415.1-2010 overall efficiency is found to be lower than the overall efficiency based on load side measurements, as determined by Eq. 22 of this method, section 14.1.7 of the test report must include a discussion of the reasons for this result. For a test where the CSA B415.1-2010 overall efficiency SLM is less than 2 percentage points lower than the overall efficiency based on load side measurements, the efficiency based on load side measurements shall be considered invalid. *[Note on the rationale for the 2 percentage points limit. The SLM method does not include boiler/heater jacket losses and, for this reason, should provide an efficiency which is actually higher than the efficiency based on the energy input and output measurements or "delivered efficiency." A delivered efficiency that is higher than the efficiency based on the SLM could be considered suspect. A delivered efficiency greater than 2 percentage points higher than the efficiency based on the SLM, then, clearly indicates a measurement error.]*

13.6.6 Carbon Monoxide Emissions

For each minute of the test period, the carbon monoxide emission rate shall be calculated as:

$CO_{g/min} = Q_{std} \cdot CO_s \cdot 3.298\text{x}10^{-5}$ Eq. 24

Total CO emissions for each of the three test periods ($CO_{\_1}$, $CO_{\_2}$, $CO_{\_3}$) shall be calculated as the sum of the emission rates for each of the 1 minute intervals.

Total CO emission for the test run, CO_T, shall be calculated as the sum of $CO_{\_1}$, $CO_{\_2}$, and $CO_{\_3}$.

13.7 Weighted Average Emissions and Efficiency.

13.7.1 Determine the weighted average emission rate and delivered efficiency from the individual tests in the specified heat output categories. The weighting factors (F_i) are derived from an analysis of ASHRAE Bin Data which provides details of normal building heating requirements in terms of percent of design capacity and time in a particular capacity range – or "bin" - over the course of a heating season. The values used in this method represent an average of data from several cities located in the northern United States.

Weighted average delivered efficiency: $\eta_{avg} = \Sigma\, \eta_i \text{ x } F_i$, %. Eq. 25

Weighted average emissions: $E_{avg} = \Sigma\, E_i \text{ x } F_i$, % Eq. 26

If, as discussed in section 12.5.8, the option to eliminate tests in Category II and III is elected, the values of efficiency and particulate emission rate as measured in Category I, shall be assigned also to Category II and III for the purpose of determining the annual averages.

14.0 Report

14.1.1 The report shall include the following:

14.1.2 Name and location of the laboratory conducting the test.

14.1.3 A description of the appliance tested and its condition, date of receipt and dates of tests.

14.1.4 A description of the minimum amount of external thermal storage that is required for use with this system. This shall be specified both in terms of volume in gallons and stored energy content in Btu with a storage temperature ranging from 125°F to the manufacturer's specified setpoint temperature.

14.1.5. A statement that the test results apply only to the specific appliance tested.

14.1.6 A statement that the test report shall not be reproduced except in full, without the written approval of the laboratory.

14.1.7 A description of the test procedures and test equipment including a schematic or other drawing showing the location of all required test equipment. Also, a description of test fuel sourcing, handling and storage practices shall be included.

14.1.8 Details of deviations from, additions to or exclusions from the test method, and their data quality implications on the test results (if any), as well as information on specific test conditions, such as environmental conditions.

14.1.9 A list of participants and their roles and observers present for the tests.

14.1.10 Data and drawings indicating the fire box size and location of the fuel charge.

14.1.11 Drawings and calculations used to determine firebox volume.

14.1.12 Information for each test run fuel charge including piece size, moisture content and weight.

14.1.13 All required data and applicable blanks for each test run shall be provided in spreadsheet format both in the printed report and in a computer file such that the data can be easily analyzed and calculations easily verified. Formulas used for all calculations shall be accessible for review.

14.1.14 For each test run, Θ_1,Θ_2, Θ_3, the total CO and particulate emission for each of these three periods, and Θ_4.

14.1.15 Calculated results for delivered efficiency at each heat output rate and the weighted average emissions reported as total emissions in grams, pounds per million Btu of delivered heat, grams per MJ of delivered heat, grams per kilogram of dry fuel and grams per hour. Results shall be reported for each heat output category and the weighted average.

14.1.16 Tables 1A, 1B, 1C, 1D, 1E and 2 must be used for presentation of results in test reports.

14.1.17 A statement of the estimated uncertainty of measurement of the emissions and efficiency test results.

14.1.18 A plot of CO emission rate in grams/minute vs. time, based on 1 minute averages, for the entire test period, for each run.

14.1.19 A plot of estimated boiler/heater energy release rate in Btu/hr based on 10 minute averages, for the entire test period, for each run. This will be calculated from the fuel used, the wood heating value and moisture content, and the SLM efficiency during each 10 minute period.

14.1.20 Raw data, calibration records, and other relevant documentation shall be retained by the laboratory for a minimum of 7 years.

15.0 Precision and Bias

15.1 Precision − It is not possible to specify the precision of the procedure in this test method because the appliance operation and fueling protocols and the appliances themselves produce variable amounts of emissions and cannot be used to determine reproducibility or repeatability of this test method.

15.2 Bias − No definitive information can be presented on the bias of the procedure in this test method for measuring solid fuel burning hydronic heater emissions because no material having an accepted reference value is available.

16.0 Keywords

16.1 Solid fuel, hydronic heating appliances, wood-burning hydronic heaters, partial thermal storage.

Table 1A. Data Summary Part A

						Θ	W_{fuel}	MC_{ave}	Q_{in}	Q_{out}
Category	Run No	Load % Capacity	Target Load	Actual Load	Actual Load	Test Duration	Wood Weight as-fired	Wood Moisture	Heat Input	Heat Output
		Btu/hr	Btu/ hr	% of max	hrs	lb	%DB	Btu	Btu	
I		< 15% of max								
II		16-24% of max								
III		25-50% of max								
IV		Max capacity								

Table 1B. Data Summary Part B

			T2 Min	E_T	E	E	$E_{g/hr}$	$E_{g/kg}$	η_{del}	H_{SLM}
Category	Run No	Load % Capacity	Min Return Water Temp.	Total PM Emissions	PM Output Based	PM Output Based	PM Rate	PM Factor	Delivered Efficiency	Stack Loss Efficiency
			°F	g	lb/MMBtu Out	g/MJ	g/hr	g/kg	%	%
I		< 15% of max								
II		16-24% of max								
III		25-50% of max								
IV		Max capacity								

Table 1C. Data Summary Part C

			Θ_1	Θ_2	Θ_3	$CO_{\_1}$	$CO_{\_2}$	$CO_{\_3}$	CO_T
Category	Run No	Load % Capacity	Startup Time.	Steady State Time	End Time	Startup CO emission	Steady State CO emission	End CO emission	Total CO emission
			min	min	min	g	g	g	g
I		< 15% of max							
II		16-24% of max							
III		25-50% of max							
IV		Max capacity							

Table 1D. Data Summary Part D

			E_1	E_2	E_3	$E_{1\_g/kg}$	$E_{2\_g/kg}$	$E_{3\_g/kg}$
Category	Run No	Load % Capacity	Startup PM	Steady State PM	End PM	Startup PM emission index	Steady State PM emission index	End PM emission index
			g	g	g	g/kg fuel	g/kg fuel	g/kg fuel
I		< 15% of max						
II		16-24% of max						
III		25-50% of max						
IV		Max capacity						

Table 1E: Label Summary Information

MANUFACTURER:			
MODEL NUMBER:			
ANNUAL EFFICIENCY RATING:	η_{avg}		**(Using higher heating value)**
PARTICLE EMISSIONS:	E_{avg}		GRAMS/HR (average)
			LBS/MILLION Btu/hr OUTPUT

Table 2. Annual Weighting

Category	Weighting Factor (F_i)	$\eta_{del,i} \times F_i$	$E_{g/MJ,i} \times F_i$	$E_{g/kg,i} \times F_i$	$E_{lb/MMBtu\ Out,i} \times F_i$	$E_{g/hr,i} \times F_i$
I	0.437					
II	0.238					
III	0.275					
IV	0.050					
Totals	1.000					

Figure 1. Schematic of Equipment Test Setup

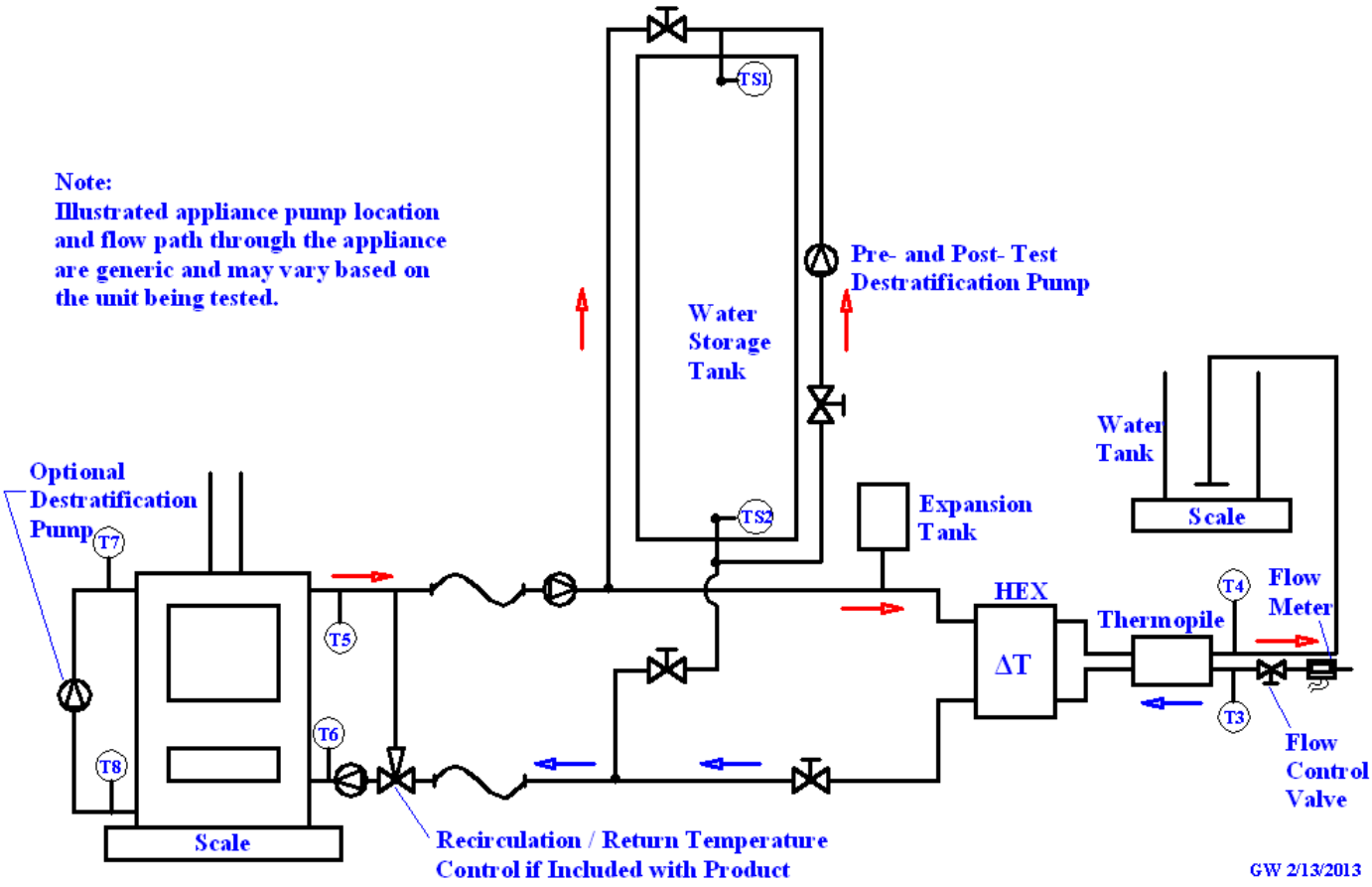
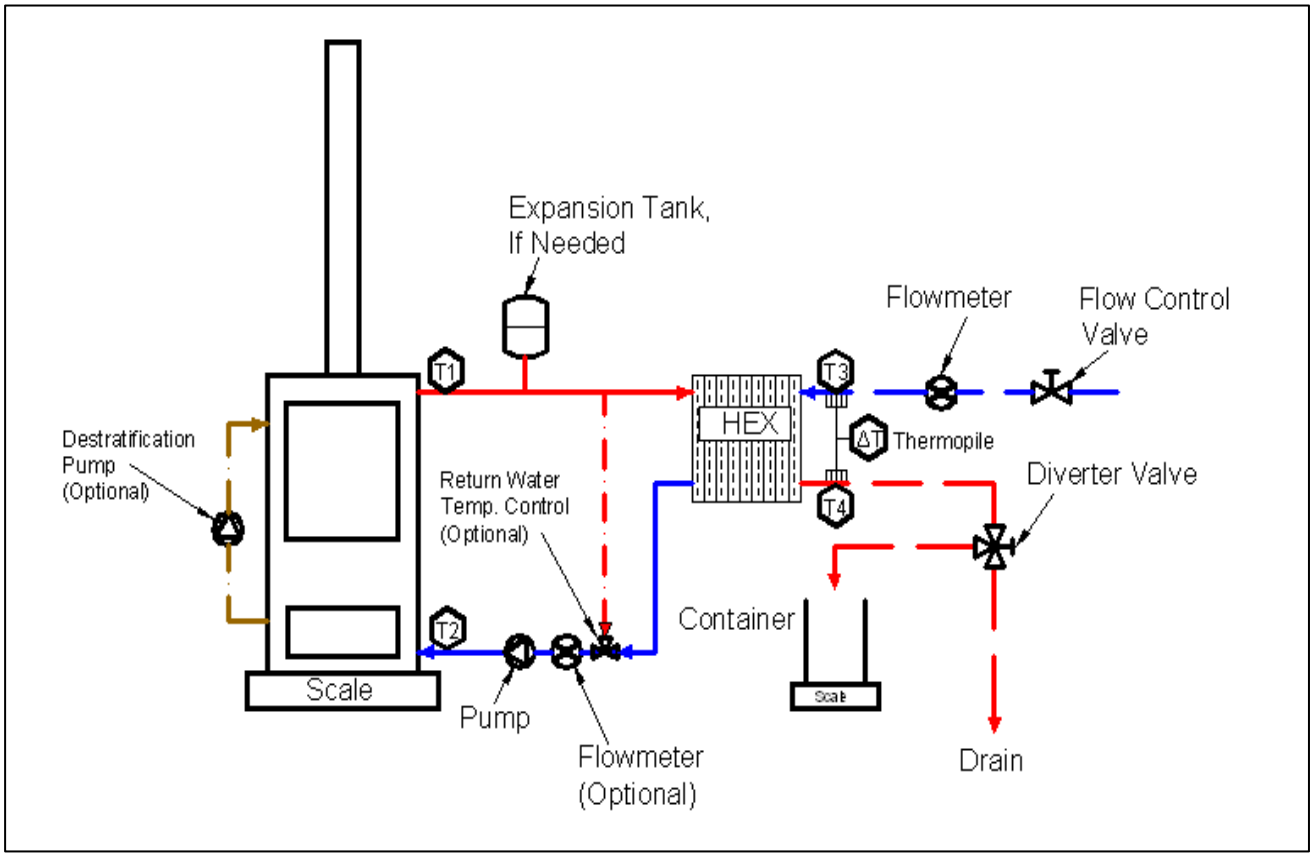


Figure 2. Schematic of Test Equipment Set-up



Note: Illustrated appliance pump location and flow path through the appliance.

7. Revise Appendix I to Part 60 to read as follows:

Appendix I to Part 60—Owner's Manuals for Wood-Burning Heaters Subject to Subparts AAA, QQQQ, and RRRR of Part 60

1. Introduction

The purpose of this appendix is to provide specific instructions to manufacturers for compliance with the owner's manual provisions of subparts AAA, QQQQ, and RRRR of this part.

2. Instructions for Preparation of Wood Heater Owner's Manuals

2.1 Introduction

Although the owner's manuals do not require premarket approval, EPA will monitor the contents to ensure that sufficient information is included to provide heater operation and maintenance information affecting emissions to consumers. The purpose of this section is to provide instructions to manufacturers for compliance with the owner's manual provisions of § 60.536(f) of subpart AAA that applies to wood heaters, § 60.5478(f) of subpart QQQQ that applies to hydronic heaters and forced-air furnaces, and § 60.5490(g) of subpart RRRR that applies to masonry heaters. A checklist of topics and illustrative language is provided as instructions. Owner's manuals should be tailored to specific wood heater models, as appropriate.

2.2 Topics Required To Be Addressed in Owner's Manual

(a) Wood heater description and compliance status;

(b) Tamper warning;

(c) Catalyst information and warranty (if catalyst equipped);

(d) Fuel selection;

(e) Achieving and maintaining catalyst light-off (if catalyst equipped);

(f) Catalyst monitoring (if catalyst equipped);

(g) Troubleshooting catalytic equipped heaters (if catalyst equipped);

(h) Catalyst replacement (if catalyst equipped);

(i) Wood heater operation and maintenance; and

(j) Wood heater installation: achieving proper draft.

2.3 Sample Text/Descriptions

(a) The following are example texts and/or further descriptions illustrating the topics identified above. Although the regulation requires manufacturers to address (where

applicable) the ten topics identified above, the exact language is not specified. Manuals should be written specific to the model and design of the wood heater. The following instructions are composed of generic descriptions and texts.

(b) If manufacturers choose to use the language provided in the example, the portion in italics should be revised as appropriate. Any manufacturer electing to use the EPA example language will be considered to be in compliance with owner's manual requirements provided that the particular language is printed in full with only such changes as are necessary to ensure accuracy.

Example language is not provided for certain topics, since these areas are generally heater specific. For these topics, manufacturers should develop text that is specific to the operation and maintenance of their particular products.

2.3.1 Wood Heater Description and Compliance Status

Owner's Manuals must include:

(a) Manufacturer and model;

(b) Compliance status (exempt, 1990 std., 2015 std., etc.); and

(c) Heat output range.

Exhibit 1—Example Text covering (a), (b), and (c) above:

“This manual describes the installation and operation of the Brand X, Model 0 catalytic equipped wood heater. This heater meets the U.S. Environmental Protection Agency's emission limits for wood heaters sold after January 1, 2015. Under specific test conditions this heater has been shown to deliver heat at rates ranging from 8,000 to 35,000 Btu/hr.”

2.3.2 Tamper Warning

The following statement must be included in the owner's manual for catalyst-equipped units:

“This wood heater contains a catalytic combustor, which needs periodic inspection and replacement for proper operation. It is against the law to operate this wood heater in a manner inconsistent with operating instructions in this manual, or if the catalytic element is deactivated or removed.”

2.3.3 Catalyst Information

The following information must be included with or supplied in the owner's and warranty manuals:

(a) Catalyst manufacturer and model;

(b) Catalyst warranty details; and

(c) Instructions for warranty claims.

Exhibit 2—Example Text covering (a), (b), and (c):

“The combustor supplied with this heater is a Brand Z, Long Life Combustor. Consult the catalytic combustor warranty also supplied with this wood heater. Warranty claims should be addressed to:

Stove or Catalyst Manufacturer_____

Address_____

Phone #_____”

2.3.3.1 This section should also provide clear instructions on how to exercise the warranty (how to package for return shipment, etc.).

2.3.4 Fuel Selection

Owner's manuals must include:

(a) Instructions on acceptable fuels; and

(b) Warning against inappropriate fuels.

Exhibit 3—Example Text covering (a) and (b):

"This heater is designed to burn natural wood only. Higher efficiencies and lower emissions generally result when burning air dried seasoned hardwoods, as compared to softwoods or to green or freshly cut hardwoods.

DO NOT BURN:

• Treated Wood

• Coal

• Garbage

• Cardboard

• Solvents

• Colored Paper

• Trash

Burning treated wood, garbage, solvents, colored paper or trash may result in release of toxic fumes and may poison or render ineffective the catalytic combustor. Burning coal, cardboard, or loose paper can produce soot, or large flakes of char or fly ash that can coat the combustor, causing smoke spillage into the room, and rendering the combustor ineffective."

2.3.5 Achieving and Maintaining Catalyst Light-Off

Owner's manuals must describe in detail proper procedures for:

(a) Operation of catalyst bypass (stove specific),

(b) Achieving catalyst light-off from a cold start, and

(c) Achieving catalyst light-off when refueling.

2.3.5.1 No example text is supplied for describing operation of catalyst bypass mechanisms (Item (a) above) since these are typically stove-specific. Manufacturers must provide instructions specific to their model describing:

(1) Bypass position during startup;

(2) Bypass position during normal operation; and

(3) Bypass position during reloading.

Exhibit 4—Example Text for Item (b):

"The temperature in the stove and the gases entering the combustor must be raised to between 500° to 700°F for catalytic activity to be initiated. During the startup of a cold stove, a medium to high firing rate must be maintained for about 20 minutes. This ensures that the stove, catalyst, and fuel are all stabilized at proper operating temperatures. Even though it is possible to have gas temperatures reach 600°F within 2 to 3 minutes after a fire is started, if the fire is allowed to die down immediately it may go out or the combustor may stop working. Once the combustor starts working, heat generated in it by burning the smoke will keep it working."

Exhibit 5—Example Text for Item (c):

"REFUELING: During the refueling and rekindling of a cool fire, or a fire that has burned down to the charcoal phase, operate the stove at a medium to high firing rate for about 10 minutes to ensure that the catalyst reaches approximately 600°F."

2.3.6 Catalyst Monitoring

Owner's manuals must include:

(a) Recommendation to visually inspect combustor at least three times during the heating season;

(b) Discussion on expected combustor temperatures for monitor-equipped units; and

(c) Suggested monitoring and inspection techniques.

Exhibit 6—Example Text covering (a), (b) and (c):

"It is important to periodically monitor the operation of the catalytic combustor to ensure that it is functioning properly and to determine when it needs to be replaced. A non-functioning combustor will result in a loss of heating efficiency, and an increase in creosote and emissions. Following is a list of items that should be checked on a periodic basis:

• Combustors should be visually inspected at least three times during the heating season to determine if physical degradation has occurred. Actual removal of the combustor is not recommended unless more detailed inspection is warranted because of decreased performance. If any of these conditions exists, refer to Catalyst Troubleshooting section of this owner's manual.

• This catalytic heater is equipped with a temperature probe to monitor catalyst operation. Properly functioning combustors typically maintain temperatures in excess of 500°F, and often reach temperatures in excess of 1,000°F. If catalyst temperatures are not in excess of 500°F, refer to Catalyst Troubleshooting section of this owner's manual.

• You can get an indication of whether the catalyst is working by comparing the amount of smoke leaving the chimney when the smoke is going through the combustor and

catalyst light-off has been achieved, to the amount of smoke leaving the chimney when the smoke is not routed through the combustor (bypass mode).

Step 1—Light stove in accordance with instructions in 3.3.5.

Step 2—With smoke routed through the catalyst, go outside and observe the emissions leaving the chimney.

Step 3—Engage the bypass mechanism and again observe the emissions leaving the chimney.

Significantly more smoke should be seen when the exhaust is not routed through the combustor (bypass mode). Be careful not to confuse smoke with steam from wet wood."

2.3.7 Catalyst Troubleshooting

The owner's manual must provide clear descriptions of symptoms and remedies to common combustor problems. It is recommended that photographs of catalyst peeling, plugging, thermal cracking, mechanical cracking, and masking be included in the manual to aid the consumer in identifying problems and to provide direction for corrective action.

2.3.8 Catalyst Replacement

The owner's manual must provide clear step-by-step instructions on how to remove and replace the catalytic combustor. The section should include diagrams and/or photographs.

2.3.9 Wood Heater Operation and Maintenance

Owner's manual must include:

(a) Recommendations about building and maintaining a fire;

(b) Instruction on proper use of air controls;

(c) Ash removal and disposal;

(d) Instruction on gasket replacement; and

(e) Warning against overfiring.

2.3.9.1 No example text is supplied for (a), (b), and (d) since these items are model specific. Manufacturers should provide detailed instructions on building and maintaining a fire including selection of fuel pieces, fuel quantity, and stacking arrangement. Manufacturers should also provide instruction on proper air settings (both primary and secondary) for attaining minimum and maximum heat outputs and any special instructions for operating thermostatic controls. Step-by-step instructions on inspection and replacement of gaskets should also be included. Manufacturers should provide diagrams and/or photographs to assist the consumer. Gasket type and size should be specified.

Exhibit 7—Example Text for Item (c):

"Whenever ashes get 3 to 4 inches deep in your firebox or ash pan, and when the fire has burned down and cooled, remove excess ashes. Leave an ash bed approximately 1 inch deep on the firebox bottom to help maintain a hot charcoal bed."

"Ashes should be placed in a metal container with a tight-fitting lid. The closed container of ashes should be placed on a noncombustible floor or on the ground, away from all combustible materials, pending final disposal. The ashes should be retained in the closed container until all cinders have thoroughly cooled."

Exhibit 8—Example Text covering Item (e):

"DO NOT OVERFIRE THIS HEATER"

"Attempts to achieve heat output rates that exceed heater design specifications can result in permanent damage to the heater and to the catalytic combustor if so equipped."

2.3.10 Wood Heater Installation: Achieving Proper Draft

Owner's manual must include:

(a) Importance of proper draft;

(b) Conditions indicating inadequate draft; and

(c) Conditions indicating excessive draft.

Exhibit 9—Example Text for Item (a):

"Draft is the force which moves air from the appliance up through the chimney. The amount of draft in your chimney depends on the length of the chimney, local geography, nearby obstructions, and other factors. Too much draft may cause excessive temperatures in the appliance and may damage the catalytic combustor. Inadequate draft may cause backpuffing into the room and 'plugging' of the chimney or the catalyst."

Exhibit 10—Example Text for Item (b):

"Inadequate draft will cause the appliance to leak smoke into the room through appliance and chimney connector joints."

Exhibit 11—Example Text for Item (c):

"An uncontrollable burn or a glowing red stove part or chimney connector indicates excessive draft."

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