

New Hearth Emission Standards

The Definitive Guide to the EPA's New Source Performance Standards for New Wood Heaters



Rick Curkeet, P.E.

Chief Engineer – Building & Hearth Products | Building Products | Intertek



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Table of Contents

Introduction2

The EPA Rule3

Step 1 Overview & Limits3

Step 2 Overview & Limits3

Products Types5

 Exemptions & Revoked Exemptions 5

 Masonry Heaters..... 5

 Wood Stoves 5

 Pellet Stoves..... 6

 Hydronic Heaters 6

 Forced Air Furnaces 6

 Utility Heaters and Single Burn Rate Appliances 7

 Fireplaces 7

Other Significant Requirements7

Variability of Testing Results8

The Importance of Third Party Testing8

Conclusion9



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Introduction

On February 4, 2015, the EPA published its final rule regarding the *New Source Performance Standards for Residential Wood Heaters* (see the next page for the EPA's published message). The rule's publication in the Federal Register is expected in early March and will be followed by a 60 day congressional review period. With the assumption that congress does not intervene, the rule will become effective in May. Additionally, there is the possibility that the EPA will make additional minor changes to the document prior to publication in the federal register.

Upon the effective date of the new rule, manufacturers of wood stoves, pellet-burning room heaters, single burn rate stoves and hydronic heaters will not be allowed to produce new appliances unless they meet the Step 1 requirements. Existing inventories of product not meeting the step one limits will be legal to sell through December 31st, 2015. Forced air furnaces will have 1 or 2 years to be brought into compliance with the Step 1 emissions limits but will be required to be supplied with work practice instructions and wood moisture meters as of the effective date of the rule.

There are significant changes between when the rule was first proposed (issued February 3rd, 2014) and the final version. One of the largest changes is through the clarification that is now provided on the requirements for the various types of covered products. This White Paper is a summary of the most significant emission requirements per the EPA's final rule. It is important to note that Intertek does not claim that this summary is comprehensive or representative of EPA's own interpretation of the regulation. The document contains specific statements and requirements that may be subject to varying interpretation and will require further clarification.

As a note, before making any decision regarding product changes, readers are urged to refer to the rule itself for further interpretation and clarification.

This paper has been produced by Intertek for consideration of our customers, partners, and friends in the solid fuel products industry.

Sincerely,

A handwritten signature in black ink, appearing to read "Rick Curkeet".

Rick Curkeet, P.E.

Chief Engineer – Building & Hearth Products

Intertek

The EPA Rule

“On February 3, 2015, the U.S. Environmental Protection Agency (EPA) strengthened its clean air standards for residential wood heaters to make new heaters significantly cleaner and improve air quality in communities where people burn wood for heat. The updates, which are based on improved wood heater technology, strengthen the emissions standards for new woodstoves, while establishing the first ever federal air standards for several types of previously unregulated new wood heaters, including outdoor and indoor wood-fired boilers (also known as hydronic heaters), and indoor wood-burning forced air furnaces. The rule will not affect existing woodstoves and other wood-burning heaters currently in use in people’s homes.”

“Final New Source Performance Standards for Residential Wood Heaters.” EPA – United States Environmental Protection Agency. EPA, 18 February 2015. Web. 25 February 2015.

The above regulation specifies emissions limits for all covered appliances using a two step approach that spans over the next five years.

Step 1 Overview & Limits

In general, Step 1 requires compliance with limits that are already being applied through state regulations or in EPA voluntary programs. Wood stoves, pellet stoves, and wood fired hydronic heaters meeting the Step 1 limits in current programs will be automatically accepted for the first five years. Forced air furnaces will be allowed one or two years depending on output capacity to be brought into compliance with the Step 1 limits. Forced air furnace manufacturers will need to include best practice instructions and operator training materials intended to promote clean burning. In addition, manufacturers are required to provide consumer wood moisture meters for their conventional models immediately upon the effective date of the rule. Table 1 on the following page (page 4) provides a summary of the specific products limits that are required to be in compliance with Step 1.

Step 2 Overview & Limits

The regulations in Step 2 contain substantially tighter emission limits for all the covered products. These limits are based on EPA’s determinations of Best System of Emissions Reduction (BSER). It is believed that these are likely to be challenged by the industry and may not survive the legal challenges. Table 2 on the following page (page 4) provides a summary of the specific products limits that are required to be in compliance with Step 2.

Table 1 – Summary of Step 1 Requirements

Appliance Type	Emissions Limit	Test Method	Estimated Effective Date
Wood Stove	4.5 g/hr	ASTM E2780/EPA M28	May 2015
Pellet Stove	4.5 g/hr	ASTM E2779	May 2015
Single Burn Rate Stoves	4.5 g/hr	ASTM E2780, Appendix X1	May 2015
Hydronic Heater	0.32 lb/mmBtu- Output + 18 g/hr Cap	ASTM E2618-13 EPA M28-WHH	May 2015
Hydronic with PTS	0.32 lb/mmBtu- Output	ASTM E2618-13 EPA M28-WHH-PTS EN 303-5	May 2015
Forced Air Furnaces (all)	Best Practices Instructions & Moisture Meter	N/A	May 2015
Small Forced Air Furnace (<65,000 Btu/hr)	0.93 lb/mmBtu/hr- Output	CSA B415.1-10	May 2016
Large Air Furnace (>65,000 Btu/hr)	0.93 lb/mmBtu/hr- Output	CSA B415.1-10	May 2017

Table 2 – Summary of Step 2 Requirements

Appliance Type	Emissions Limit	Test Method	Estimated Effective Date
Wood Stove (Crib)	2.0 g/hr	ASTM E2780/EPA M28	May 2020
Wood Stove (Cordwood Tests)	2.5 g/hr	TBD (ASTM Method in development)	
Pellet Stove	2.0 g/hr	ASTM E2779	May 2020
Single Burn Rate Stoves (Crib)	2.0 g/hr	ASTM E2780	May 2020
Single Burn Rate Stoves (Cordwood)	2.5 g/hr	Appendix X1.	
Hydronic Heater (Crib)	0.10 lb/mmBtu- Output at all output rates	ASTM E2618-13 EPA M28-WHH	May 2020
Hydronic Heater (Cordwood)	0.15 lb/mmBtu/hr – Output at all output rates	ASTM E2618-13	
Hydronic w/ PTS (Cordwood)	0.15 lb/mmBtu- Output	ASTM E2618-13 EPA M28-WHH-PTS	May 2020
Small Forced Air Furnace (<65,000 Btu/hr – Cordwood)	0.15 lb/mmBtu/hr- Output	CSA B415.1-10*	May 2020
Large Air Furnace (>65,000 Btu/hr – Cordwood)	0.15 lb/mmBtu/hr- Output	CSA B415.1-10*	May 2020

* With EPA revisions

Product Types

The following is a closer look at the various products that are affected by the EPA's rule.

Exemptions & Revoked Exemptions

Products exempt from rule:

- Fireplaces (masonry and factory-built)
- Coal only heating appliances
- Wood fired cook stoves (with baking ovens)
- Portable camp stoves
- Pizza ovens
- Traditional Native American bake ovens

Products that are no longer exempt from rule:

- High air-fuel ratio pellet stoves
- High burn rate (aka "single burn rate") stoves

Masonry Heaters

The EPA has not included masonry heaters in the rule, but does state that they will be added at a later date once the Masonry Heater Association completes development of calculation procedures and test methods.

Wood Stoves

The EPA has specified ASTM E2780 for testing wood stoves, but has retained the burn rate categories and weighting scheme from EPA Method 28. Thus, four test runs will be required rather than the three categories specified in E2780.

These four tests are:

- Category 1* <0.80 kg/hr *
- Category 2* 0.80-1.25kg/hr
- Category 3* 1.26-1.90kg/hr
- Category 4* >1.90kg/hr (or the air setting wide open)

** If the appliance cannot burn under 0.80 kg/hr at its lowest setting two runs must be conducted in category 2 with one of them being under 1.0 kg/hr.*

These four tests are then averaged using a weighted average formula with the major weighting on the lower burn categories.

Pellet Stoves

The testing protocol for determining the emissions of pellet stoves has also changed from the process utilized over the last 25 years. Currently, pellet stoves are required to be tested in the same burn categories as wood stoves. The burn rate of many pellet stoves is determined by the electronic controls built into the appliance. Because of this, attaining all four burn rate categories has been a challenge during lab testing. Therefore, the test method uses the settings built into each model of pellet stove to determine the burn rates to be tested. Since those cannot be changed by the consumer, the emissions emitted by the stove in the lab setting will mimic what is occurring in the consumer setting. The new ASTM E2779 method also uses an integrated single test and changing the feed rate during the test. This simplifies the testing procedures and reduces the costs of testing. For units designed to burn multiple fuel types such as wood pellets, corn or other bio-fuels, the EPA will not require additional testing as they have no data upon which to base emissions limits for fuels other than wood pellets.

Hydronic Heaters

The EPA has included its own versions of test methods for hydronic heaters as well as ASTM E2618 and EN 303-5. There is essentially no difference between ASTM E2618 and EPA Method 28 WHH except for the use of cordwood in ASTM E2618 versus 4x4 oak cribs in M28 WHH. It is expected that the EPA will accept appliances meeting the Step 1 limits when tested with cordwood or cribs at the manufacturer's option, but this still needs to be clarified.

The standard EN 303-5 can only be used for Step 1 compliance for systems that incorporate partial heat storage. The emissions measurement requires adding the organic compounds to the particulate (dust) measurement. The EPA has also included its own test method for partial thermal storage hydronic heaters (M28 WHH-PTS) which have been found to contain serious deficiencies. Adjustments to this method that would be needed would essentially make it identical to the ASTM E2618-13 Annex A2 procedure. It is expected that the EPA will determine the ASTM version is equivalent to EPA's version.

There is a significant amount of concern regarding the inclusion of EN 303-5 as an acceptable emissions measurement test method since the procedures are vastly different than the ASTM and the EPA methods and there is no correlation or equivalency between these methods.

Forced Air Furnaces

Forced air furnaces will be tested per CSA B415.1-2010. This is a cordwood test method. For Step 1, third-party certification of compliance with CSA B415.1 is all that is required. However, Step 2 includes a requirement that modifies the output rate categories and weighting from those specified in CSA B415.1 to match those in EPA Method 28 WHH. This could be quite devastating in that many smaller furnaces would be required to operate at burn rates significantly lower than any other type of wood burning appliance. For example, a furnace with an output capacity of 60,000 Btu/hr would need to be tested at < 9,000 Btu/hr output which implies a burn rate of around 0.5- 0.6 kg/hr.

Utility Heaters and Single Burn Rate Appliances

Stoves which were previously exempt on the basis of a minimum burn rate of over 5 kg/hr will no longer be exempt. However, small light weight “camp stoves” which are not intended for permanent installation or home heating remain exempt. Other stove types which have limited or no user burn rate controls will be required to be tested for emissions and will have to meet the same limits as other wood stoves. Although no specific test method for single burn rate stoves has been specified it seems clear that ASTM E2780 Appendix X1 will apply for testing single burn rate appliances.

Fireplaces

Currently, low mass fireplaces can be tested and qualified under the EPA's voluntary partnership program. The manufacturer can test under the ASTM E2558 standard. The current Phase 2 number is 5.1 g/kg to qualify. But, since this is a voluntary program, many local air shed managers have not supported this program. The rule does not mention this program and it is unclear if it will continue.

Other Significant Requirements

- EPA Method 5H will not be allowed for emissions measurement.
- The so called method 5G to 5H adjustment has been eliminated.
- All tests will require a “first hour” emission rate to be measured and reported.
- All tests will require measurement and reporting of CO emissions rates.
- All tests will require determination of heating efficiency (either delivered heat for central heating or overall efficiency (per CSA B415.1-10) for room heaters.
- Products determined to comply with requirements will be required to be covered under an ISO/IEC 17065 accredited third-party certification program. This will require a minimum of one unannounced audit per year at the manufacturing location.
- Complete test reports and supporting data will be required to be submitted to EPA for review and certification by the EPA.
- Manufacturers will be required to post their test reports and non-CBI data on their websites so it is publicly available.
- All compliance test units will need to be sealed by the laboratory and retained by the manufacturer.
- Manufacturers are required to notify EPA of planned certification tests 30 days in advance.
- The EPA has defined “unseasoned wood” as having a moisture content of 20% or more (whether this is dry or wet basis is not stated). This is inconsistent with the test methods which typically specify testing with wood at a moisture content of 19 to 25% (dry basis).

Variability of Testing Results – The Elephant in the Room

Analysis of existing data has shown that the entire emissions testing and certification process is subject to a substantial problem with precision. Essentially, the evidence demonstrates that emissions test results cannot be reliably replicated within a range that is roughly equal to or even greater than the Step 1 emissions limits (3 to 4 g/hr). (A free report on the variability of the EPA Proficiency Test results is available upon request. Please contact icenter@intertek.com to request one.)

The EPA did not address this issue in the final rule other than to state that the precision might “be no better than 1.0 g/hr.” The proposed regulations simply assume that the high variability will be dealt with by manufacturers and laboratories. But if it cannot be, and much of the observed variability is inherent in wood burning appliances, it will certainly increase the cost and time required to obtain certifications.

For example, even if a wood stove is readily able to produce emissions rates of 2 g/hr or less, there is significant probability that any single test program will result in an emissions rate as much as 3 or 4 g/hr higher (i.e. 5 or 6 g/hr). In such a case, manufacturers may find that they need to try several times to get an official certification test result that meets the emissions limit. Unfortunately the EPA has chosen to ignore the reality that the test process does not appear to be able to reliably distinguish emissions performance differences of several grams per hour. Indeed, it will take some very good luck in addition to high quality testing to obtain acceptable results. A possible means of reducing this risk is for designers to focus R&D efforts on getting repeatable results and not simply a low number.

Understanding the Role of Third Party Testing

In the North American hearth products industry, wood burning equipment has long been required by building codes to be certified by independent third-party certification bodies to safety standards that reduce the risk fire and injury. It is a natural extension of this process to include emissions and efficiency performance certification following the well-established safety certification model. The EPA rule has included provisions for third-party certification which will provide a systematic verification that production appliances remain in compliance with the design specification established in the qualification test process.

While the EPA has retained its role as the final product approval entity, third-party certification agencies will perform the function of production surveillance and verification. Accredited third-party safety and performance testing organizations, like Intertek, can help take the guess-work out of the all-important process of testing and the pursuit and successful achievement of compliance. Their possession of and investment in the highest-tech and most precise and capital-intensive testing equipment ensures consistent testing procedures and accurate results, while their demonstrated expertise in the unique

details and current requirements of all industry certification programs and initiatives assures manufacturers of the utmost in quality coverage and representation.

Conclusion

The EPA's latest *New Source Performance Standards for Residential Wood Heaters* will surely have an effect on the wood-fired hearth industry. Although the impact of meeting Step 1 requirements is near-immediate, many manufacturers have or will have the ability to meet the requirements due to their ability to meet current state or EPA voluntary regulations. On the other hand, the impact of Step 2 will be much more severe for manufacturers and it is expected that industry action may require the EPA to revisit the current regulation.

While there are no guarantees, it is safe to say that the book is not closed on the latest rule. With many manufacturers unsure if it is feasible to meet Step 2 requirements, the industry is buzzing and demanding to be heard. For updates of significance to this rule, please visit our hearth products page (www.intertek.com/building/markets/hearth-testing) or connect with Intertek utilizing the information in the "Contact Us" section below. As a dedicated partner to the industry, we can help guide you through the complexities of the changes and testing procedures required.

Contact Us

Our laboratories are staffed with experts and equipped with state-of-the-art instruments able to certify to both emissions and safety standards. If you would like to connect with an expert to answer your technical questions or obtain a quote for a new testing project, contact Intertek at 1-800-WORLD.LAB or icenter@intertek.com.

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