10/12/11 FINAL

EPA Hydronic Heater Program

Phase 2 Partnership Agreement
Between the
Office of Air Quality Planning and Standards,
U.S. Environmental Protection Agency
and

_____ **[Partner]**

Purpose

This Partnership Agreement (Agreement) is a commitment between [Partner] and the Office of Air Quality Planning and Standards (OAQPS), United States Environmental Protection Agency (EPA), by which Partner agrees to participate in Phase 2 of the EPA Hydronic Heater Program. The primary purpose of the Program is to promote the manufacture and sale of cleaner hydronic heaters over other hydronic heater models, unless prohibited by law or by regulation. EPA is not promoting the sale of hydronic heaters over other heating devices.

This Agreement sets out the commitments Partner agrees to make as part of its participation in this program. It does not impose any legally binding obligations on EPA, nor is EPA imposing any legally binding obligations on Partner through this Agreement.

EPA qualification under this Program does not imply state or federal regulatory certification. State regulatory programs can require independent review of hydronic heater test reports prior to being sold.

Background

In January 2007, EPA and manufacturers of outdoor wood-fired hydronic heaters (OWHH) initiated Phase 1 of the EPA Outdoor Wood-fired Hydronic Heater Program to encourage the development and market availability of new, cleaner OWHH models. As of October 15, 2008, the Phase 1 Program was terminated, and the Phase 2 Program began. The Phase 2 Program includes hydronic heaters that can burn solid biomass material other than wood (e.g., corn, pellets, etc.) in addition to OWHH. It also includes hydronic heaters that are designed for indoor use, and hydronic heaters that are equipped with heat storage units. Due to this expansion of the Program's scope, the Program name is broader in the Phase 2 Program (EPA Hydronic Heater Program) than it was in its initial phase (EPA OWHH Program).

The Program is aimed at reducing emissions from new hydronic heaters sooner than could be achieved by Federal regulation. The Phase 1 Program included an average air emission level of 0.60 pounds of fine particles per million Btu (lbs/MMBtu) heat input as a goal. This Phase 1 emission level was considered to be a first step in a two-phased program, with Phase 2 including a lower emission level, to be identified later. Twenty-one OWHH manufacturers became partners with EPA, and 10 models were qualified during the Phase 1 Program.

The Phase 1 Program was terminated and the Phase 2 Program was initiated by EPA on October 15, 2008. As of that date, hydronic heater manufacturers were invited to join/rejoin the Program by signing this Phase 2 Partnership Agreement with EPA. The Phase 2 Program includes an average air emission level of 0.32 lbs/MM Btu heat output, where no individual test run that is used in the calculation of the average exceeds 18.0 grams of fine particles per hour.

As part of the Phase 2 Program, models qualified to meet the Phase 1 average emission level (0.60 lbs/MMBtu heat input) continued to qualify until March 31, 2010. Phase 2 qualification is for year round use only. After March 31, 2010, models that achieve the 0.60 lbs/MMBtu heat input average emission level, but that do not achieve the 0.32 lbs/MMBtu heat output average emission level with 18.0 grams per hour cap are no longer considered "qualified models" under the Program.

The Model Rule developed by Northeast States for Coordinated Air Use Management (NESCAUM) includes the 0.32 lbs/MMBtu heat output emission limit with an 18 grams per hour cap as the minimum level for states and local agencies to ultimately adopt to regulate new hydronic heaters. EPA provided technical and financial support for the development of the Model Rule, which became available in January 2007 (http://www.nescaum.org/topics/outdoor-hydronic-heaters). Since then, many states have promulgated new regulations for hydronic heaters, and other states are currently developing hydronic heater regulations. Several states also regulate hydronic heaters via requirements related to fuel combustion. Also, EPA expects to finalize a federal standard for new sources in early 2013.

Definitions

For purposes of this Phase 2 Agreement:

- "hydronic heater" is a fuel-burning device which may be equipped with a heat storage unit, and which is designed to (1) burn wood or other biomass (as defined below); (2) be installed according to the manufacturer's specifications either indoors or outdoors; and (3) heat building space and/or water via the distribution, typically through pipes, of a fluid heated in the device, typically water or a water/antifreeze mixture. "Hydronic heater" for purposes of this Program does not include models that are either (1) generally too large for manufacturers' or laboratories'

scales, or (2) commercial models (i.e., models that generate 350,000 Btu/hr heat output or more). It also does not include forced air furnaces.

- "other biomass" refers to automatically fed fuels such as, but not limited to, wood pellets, shelled corn, and wood chips.

- "heat storage unit" refers to sufficient thermal storage capacity to safely accept the entire heat output of a full fuel load without heat draw-off, without overheating, and without activating any safety controls provided with the heater. For testing purposes, sufficient thermal storage must be provided by the manufacturer to allow a 4-hour carryover between firings when providing the maximum rated heat output.

- "Phase 1 qualified model" was a model that achieved an average emission level of 0.60 lbs/million Btu heat input or less for all fuel types listed in the owner's manual and/or mentioned in marketing/sales materials, as acknowledged by EPA in writing to the Partner. After March 31, 2010, Phase 1 emission level qualified models were no longer considered "qualified" under the Program, and use of Program permanent labels and hangtags for these models must be discontinued on units manufactured after that date.

- "partial heat storage" refers to a thermal storage capacity that accepts a partial fuel load or part of the heat from a full load without heat draw-off, overheating, and without activating safety controls.

- "test laboratory" is an independent third party test laboratory that is (1) accredited by a nationally recognized accrediting body to perform testing under ASTM test methods, EPA test method 28 WHH, and E2618 and E2515 under ISO-IEC Standard 17025; or (2) accredited for wood stove certification testing under the residential wood heater NSPS [40 CFR Part 60, Subpart AAA]. A test laboratory may perform testing under the Program, but may not certify model lines or perform other functions pertaining to certification (e.g., manufacturing facility inspections). EPA will consider other independent laboratories on a case by case basis if adequate justification is provided.

- "certification of conformity" is performed by a certification body after testing is complete. It indicates that the testing laboratory has conducted testing with the appropriate procedures and equipment and that the model's emissions have been demonstrated to be at or below the Program emission level. It does not mean a model is qualified by EPA or certified by a state. Only EPA can qualify models or states issue their own certifications of models after reviewing the test report.

- "certification body" is an independent third party test laboratory that is accredited by a nationally recognized accrediting body to perform certifications and inspections under ISO-IEC Guide 65, and ISO-IEC Standard 17020. A certification body certifies conformity with Program emission levels and performs other functions pertaining to certification (e.g., manufacturing facility inspections). A certification body may also be a test laboratory under the Program.

- "qualified model" is any Phase 2 emission level qualified model.

- "Phase 2 qualified model" is a model that achieves an average emissions level of 0.32 lbs/million Btu heat output or less using the test method referenced in this agreement for all fuel types listed in the owner's manual and/or mentioned in marketing/sales materials and did not exceed 18.0 grams/hr in any individual test run.

Qualification of Phase 2 models will end 5 years after the date of the EPA letter acknowledging qualified status and use of Program permanent labels and hangtags on these models must be discontinued for units manufactured after that date. Partner may choose to re-qualify a model per the Program qualifying process, or may seek a waiver (see Partnership Agreement Attachment 1).

General Commitments

Partner and EPA should each designate a single liaison point for Phase 2 of the Program, and should notify one another within 2 weeks of any change in liaison identity or responsibilities. All relevant correspondence, including the signed Partnership Agreement, should be sent to these designated liaisons.

Partner Commitments

The Partner commits to use its best efforts to develop, manufacture, and market one or more qualified models. To this end, the Partner agrees to:

- adhere to the terms of this Agreement, including the Program guidelines which are provided as attachments to this Agreement, i.e.

    - Qualifying Process (Attachment 1), describes the process that Partners will follow to achieve "Phase 2 emission level qualified model" status for their model(s).

    - Test Guidelines (Attachment 2), provides the methods by which models will be tested under this phase of the Program. EPA Method 28 WHH will be used for testing indoor and outdoor hydronic heaters using wood (in cribs per the method) as the fuel. Relevant sections from ASTM method E2618 will be used for testing continuously fed biomass fuels. Models

equipped with heat storage units (see definition in Background section above) will be tested per Appendix X1 and partial heat storage by Appendix X2 of ASTM method E2618, except wood in cribs will be used as the fuel rather than cordwood as specified in the method. Appendix X2 is still under development and not currently available to qualify models with partial heat storage. Partner and EPA recognize that these test guidelines are relatively new, and that issues may surface during their use. Partner and EPA agree to work together in good faith to resolve any such issues. If test method is revised, the new method should be used.

- o Guidelines for Use of Labels, Hangtags, and Outreach Materials (Attachment 3), provides format and other specifications for the qualifying labels and hangtags, and describes the appropriate use of the qualifying labels, hangtags, and outreach materials.

- o Hangtag Template (Attachment 4), provides format of Phase 2 qualified hangtag.

- test each fuel type such as wood (in cribs per EPA Method 28 WHH), corn pellets, etc. that the manufacturer's owner's manual or sales/marketing information says the model can burn for all model lines that Partner is seeking to qualify under this Program. Tests for all fuel types must indicate an emissions level of 0.32 lbs/MMBtu heat output or less and be within the 18.0 grams/hour cap limit in order to become a "qualified model" under this Program.

  The owner's manual for each qualified model should only recommend burning fuels that have been tested. Similarly, sales/marketing information for each qualified model should only recommend burning fuels that have been tested. Models qualified using heat storage must specify that heat storage must be used and provide instruction on sizing, installation, and use. If a model can be installed without heat storage, it should be tested for all 4 burn categories specified in Method 28 WHH.

  For multiple fuel continuously fed models that qualify for wood-derived fuels (e.g., pellets, chips, sawdust) via the ASTM continuously fed test method, the test for each additional fuel may be reduced from four runs to two, provided that the two runs are for the maximum burn rate and for the burn rate shown by the ASTM continuous feed test method for wood to have the highest emissions per Btu of the remaining three burn rates. If the model is not to be fueled by wood, then the manufacturer should specify which biomass fuel is the primary fuel and if the model qualifies on that fuel, then the tests for the additional fuel(s) may be reduced from four runs to two, provided that the two runs are for the maximum burn rate and for the burn rate shown by the ASTM continuous feed test method for the primary fuel to have the highest emissions per Btu of the remaining three burn rates. The results should be

reported for each run separately and as an arithmetic average (i.e., not using the year-round weightings).

- report the particulate emissions test information as listed below for each model line that Partner is seeking to qualify under this Program. Partner should provide a complete test report consisting of all test documentation listed below. Design information is the only item in the list below that is generally considered confidential business information (CBI).

    - summary check list
    - raw data
    - laboratory technician notes
    - calculations sheets
    - design information (e.g., CAD drawings, perspective drawings, operational drawings showing air, water, and smoke flow paths)
    - test results
    - certificate of conformity from a certification body

- identify information entitled to protection as CBI under 40 CFR part 2 and other applicable law. Please note that emission data, including all raw data necessary to calculate the emissions, are generally subject to disclosure to the public per Clean Air Act section 114(c). See 40 CFR section 2.301(a)(2). Note also that it is important that state regulatory agencies and the public have access to sufficient information to enable them to confirm that the test calculations were performed correctly. The test report will be rejected if the procedures for identifying CBI information, including submitting duplicate pages with CBI redacted, are not followed."

- call EPA Program liaison at least every 6 months to provide an informal status update regarding the development, manufacture, and marketing of cleaner models.

- provide sales information to the EPA Program liaison by August 15 each year. Sales data during the period from August 1-July 31 should be reported. Reports should include the following information:

    - the number of units of wood-burning Phase 2 qualified models sold; also identify how many of these units were indoor models, how many were models equipped with full heat storage, and how many models were equipped with partial heat storage;

    - the number of units of continuous feed biomass Phase 2 qualified models sold; also identify how many of these continuous feed biomass units were

indoor models, how many were models equipped with full heat storage units, and how many models were equipped with partial heat storage; and

- o the total number of hydronic heater units including Phase 2 qualified models as well as models that do not qualify under the Program.

EPA Responsibilities

EPA will undertake efforts to build awareness of the Program, maintain the credibility of the Program, and promote the benefits of cleaner burning hydronic heaters over other hydronic heaters. To this end, EPA is responsible for:

- maintaining a website where Partners and EPA can furnish information on program efforts and where key EPA and Partner contacts are identified;

- reviewing certified test reports and responding to Partner regarding qualification status of submitted models in a timely manner;

- rescinding model qualification based on additional review of the reports, raw data, and other relevant information that brings into question the validity of the qualification. Partner will be provided written notice of a proposal to rescind, and an opportunity to respond within 30 days, prior to EPA action.

- preparing a template for hangtags for use on qualified models;

- maintaining any confidential business information (CBI) submitted to EPA under this Agreement according to 40 CFR part 2 and other applicable law (emission data cannot be withheld from disclosure, however);

- releasing aggregated sales information as appropriate, as long as CBI is not revealed;

- making various Program materials such as the Qualifying Process document, test guidelines, Guidelines for Use of Labels, Hangtags, and Outreach Materials, and any outreach materials easily accessible through the Internet (www.epa.gov/burnwise) and/or other means; and

- as appropriate, providing Partners with public recognition for their efforts as part of the Program.

Liaisons for State Regulatory Programs (Current as of 09/20/11)

Connecticut	Bob Girard, girard@po.state.ct.us
Maine	Louie Fontaine, louie.fontaine@maine.gov
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Rhode Island	Doug McVay
Vermont	Phil Etter, phil.etter@state.vt.us
Washington	Rod Tinnemore, rtin461@ecy.wa.gov

Limitations

Partner agrees not to construe, claim, or imply that its participation in the EPA Program constitutes federal government approval, acceptance, or endorsement of anything other than Partner's commitment to the Program. Partner understands its participation in the Program does not constitute federal government endorsement of Partner or its products. Partner acknowledges that under 5 CFR Section 2653.702(c), EPA may not endorse the purchase or sale of commercial products and services provided by the Partner. The Partner agrees to ensure that outreach materials describing this Agreement include statements that EPA does not endorse any particular product, service, or enterprise.

Partner understands that the activities it undertakes in connection with the Program are and not intended to provide services to the federal government. As such, Partner will not submit a claim for compensation to any federal agency.

All commitments made by EPA in this Agreement are subject to the availability of appropriated funds and budget priorities. Nothing in this Agreement, in and of itself, obligates EPA to expend appropriations or enter into any contract, assistance agreement, interagency agreement, or incur other financial obligations. This Agreement does not exempt Partner from Agency policies requiring competition for financial assistance and contracts. Any endeavor involving EPA funding will be handled in accordance with applicable laws, regulations, policies and procedures, and will be subject to separate agreements.

This Agreement does not create any right or benefit, substantive or procedural, enforceable by law or equity against the Partner or EPA, their officers or employees, or any other person. This Agreement does not direct or apply to any person outside the Partner and EPA.

Dispute Resolution

Partner and EPA will assume good faith as a general principle for resolving conflicts under the Program. Both Partner and EPA will endeavor to resolve all matters informally, so as to preserve maximum public confidence in the Program.

In the event informal channels do not produce a mutually agreeable resolution to a matter in dispute, either Partner or EPA may notify the other in writing as to the nature of the dispute, the specific corrective action sought and their intent to terminate the Agreement unless specific corrective actions sought are undertaken.

Effective Date and Duration of Agreement

This Agreement will become effective when signed by both Partner and EPA, and may be amended by mutual written agreement. Partner and EPA understand that this Agreement is wholly voluntary and may be terminated in writing by either Partner or EPA at any time and for any reason with no penalty. EPA may terminate the Agreement, including the authorization to use qualifying labels and hangtags if Partner fails to act in accordance with any part of this Agreement, including its attachments. EPA reserves the right to rescind model qualification based on additional review of the reports, raw data, and other relevant information that questions the validity of the qualification Unless amended or terminated sooner, the terms of the Agreement will remain in effect until the termination of Phase 2 of the Program by EPA.

Information and Signature Page for EPA Liaison

The undersigned hereby execute this Partnership Agreement on behalf of their organization. The signatories affirm that they have the authority to execute this Agreement on behalf of Partner and EPA.

EPA Program Liaison

Name:	Amanda Aldridge
Title:	Environmental Engineer
Mailing Address:	US EPA OAQPS, Outreach and Information Division Mail Code C304-05 Research Triangle Park, NC 27711
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Partnership Agreement Signatory for EPA

Signature: _____ Date: _____

Name: _____

Title: _____

Information and Signature Page for Partner

Partner Program Liaison

Name:

Title:

Mailing Address:

Overnight Delivery Address:

Telephone:

Fax:

E-mail:

Partnership Agreement Signatory for

Signature: _____ Date: _____

Name:

Title:

Mailing Address:

City:

State: Zip Code:

Country:

Telephone:

Fax:

E-mail:

Company web site:

Qualifying Process

EPA Hydronic Heater Program, Phase 2

I. PROCESS

A. Testing should occur via use of ASTM Methods E2618 and E2515, at the "worst case" burn rates identified using the appropriate Program test method (see Attachment 2 and the ASTM methods). Testing should be conducted by a test laboratory or a certification body (see Partnership Agreement, Definitions). EPA will consider other independent accredited laboratories on a case by case basis if adequate justification is provided.

B. Testing conducted with wood (in cribs) as the fuel should occur via use of EPA Method 28 WHH (Partnership Agreement Attachment 2). If the model is equipped with a heat storage unit, testing should still use cribs as specified in EPA Method 28 WHH and the heat input and heat output measurements should occur according to ASTM method E2618 entitled "Standard Test Method for Measurement of Particulate Emissions and Heating Efficiency of Outdoor Solid Fuel-fired Hydronic Heating Appliances" (ASTM method), Appendix X1, and Appendix X2 for units equipped with partial heat storage. Appendix X2 is still under development and not yet available to qualify models with partial heat storage. Testing conducted with continuously fed biomass as the fuel(s) should occur via use of the relevant section of the ASTM method.

Partner may additionally choose to test via the ASTM method using cordwood (as opposed to wood in cribs) where Partner has already determined that a model achieves a 0.32 lbs/MMBtu emission level using EPA Method 28 WHH. If EPA:

(1) is provided with adequate data for a sufficient number of models to enable it to determine the difference between testing wood-burning models via EPA Method 28 WHH and testing them via the ASTM method, and

(2) has judged this difference to be not so great as to warrant testing via only the former method, then EPA may indicate to Partner that it may test future models for which Phase 2 emission level qualification is sought via either one of the two methods, as

opposed to testing via both methods. If this occurs, EPA would notify all Partners of this change in writing.

C. After testing by a test laboratory is complete, certification of conformity with the Program emission levels will be performed by a certification body (see Partnership Agreement, Definitions). Partner will enter into and maintain a contract for certification services with a certification body.

D. A "Quality Control Plan" for assuring that units within a model line accurately reflect emission-critical components of the model line design, and design drawings for the model line will be included as attachments to the application to the certification body for certification of conformity. The design drawings should be submitted to the certification body in electronic format. Partner should clearly indicate information in the application that is Confidential Business Information (CBI). The certification body will determine whether the test report shows that the model emits 0.32 lbs/MMBtu output or less and is less than 18.0 g/hr for any individual run, and the "Quality Control Plan" is adequate to assure that units within the model line accurately reflect emission-critical components of the model line design.

E. The Partner should contract with the certification body to submit the certification of conformity, test report, and all supporting documentation to EPA for potential qualification under the Program. Supporting documentation includes summary check list, raw data, laboratory technician notes, calculation sheets, design information and test results. The recommended format for these materials is available upon request from the EPA Program liaison. Partner should also send a laboratory statement that the test was performed according to EPA Method 28 WHH (for most wood-fired models, including indoor models) or ASTM method for models fueled by continuously fed biomass and models equipped with a heat storage unit. Partner should also include the following statement:

> The model meets the Phase 2 emission level of 0.32 lbs/MMBtu heat output weighted average and the 18.0 g/hr cap limit using Table 2, EPA Method 28 WHH or ASTM method for continuously fed biomass or models equipped with heat storage units.

Phase 2 models will not be qualified for heating season use only; they will only qualify for year round use.

F. EPA will review Partner's submission for completeness and to determine if it contains any discrepancies.

G. EPA's Outreach and Information Division intends to respond to Partner in writing and in a timely manner regarding the qualification status of submitted model(s) once it has received a complete submission and all errors have been corrected.

H. If EPA acknowledges in its response that the model meets the Program Phase 2 emission level, the model will be considered a "Phase 2 qualified model." Partner may choose to affix the Phase 2 emission level qualifying label and/or hangtag to pre-sale units in accordance with the Guidelines for Use of Label, Hangtag, and Outreach Materials for 5 years (with the option of re-qualification). If EPA's response identifies a problem with Partner's submission, EPA and Partner will work together to determine next steps, which may involve retesting. Partner should not begin to use the qualifying labels and/or hangtags until EPA acknowledges that the model meets the Phase 2 emission level.

I. Partner agrees to use Program qualifying labels and hangtags only as described in the Guidelines for Use of Label, Hangtag, and Outreach Materials (Partnership Agreement Attachment 3).

J. Partner agrees to allow EPA access (with advance notice) to its manufacturing facility. EPA may compare units offered for sale with the unit that was tested to ensure that no design changes affecting emissions have occurred since testing, and/or may inspect the manufacturing process.

K. Qualification of Phase 2 emission level qualified models will end 5 years after the date of the EPA letter acknowledging qualified status. Partner may choose to re-qualify the model per the Program qualifying process, or may seek a waiver. To request a waiver of re-qualification, Partner should state in writing that, since the model's original qualification under the EPA Hydronic Heater Program, the model has not undergone any modifications that have the potential to increase emissions. Modifications that have the potential to increase emissions may include, among other things, changes in firebox dimensions, airflow rates, airflow direction, heat output, and pressure differential through the unit. In addition, Partner should send updated design drawings along with its waiver request. As appropriate, EPA will approve waiver requests in writing. The granting of such a waiver by EPA would not relieve Partner of its other commitments under the Partnership Agreement.

II. TEST REPORT FORMAT

A. The EPA Program liaison will provide guidance regarding test report format upon request. The report can be submitted using compact disc (CD), digital versatile disc (DVD), or any other EPA-approved electronic format.

B. When the Partner is ready for EPA verification of their test results, they should provide two CD versions of the test report to EPA. The first CD version should contain the entire test report including any confidential business information (CBI) and should be labeled CBI. The second CD should contain the entire report with all CBI redacted. There should not be any CBI markings in the non-CBI version. In the first CD, Partner should clearly indicate the specific language or material that is CBI rather than assert a general CBI claim for the entire report. Clean Air Act 114(c) indicates that emission data generally will not be protected [see 40 CFR section 2, 301(a)(2)], whereas information which would divulge methods or processes entitled to protection as trade secrets will be protected. The test report will be rejected if the procedures for identifying CBI information, including the submission of a second CD with CBI redacted, are not followed.

C. Once verification is complete and all errors have been corrected, Partner should provide to the EPA liaison a CBI CD and a non-CBI (redacted CD) of the revised, complete test report if any changes were made to the original test report during the verification process.

III. AUDITS TO ASSURE CONFORMITY WITH QUALITY CONTROL PLANS

A. In conformity with ISO-IEC Guide 65 and ISO-EC Standard 17020, the certification body will periodically conduct audits to assure that the manufacturer's "Quality Control Plan" is being implemented satisfactorily.

B. The certification body will prepare a report for each audit that will fully document the results of the audit, and Partner will authorize and request the certification body to submit a copy of all such reports to EPA. Deviations from the manufacturer's Quality Control Plan will be identified in the audit report. The report will specify the corrective actions that need to be taken to address each identified deficiency.

C. Partner will promptly report to the certification body and to EPA its responses to any deficiencies identified in an audit report.

D. Serious deficiencies, or failure to implement corrective actions, may result in revocation of certification by the certification body and/or qualification by EPA. Partner should promptly discontinue use of Program labels on units manufactured after notification from the certification body of revocation of certification or from EPA of revocation of qualification, whichever is received first. Partner will authorize and request the certification body to submit a copy of any revocations of certification to EPA.

E. If a model is manufactured outside the U.S., quality control plans will be accepted from the original manufacturer. The plan must be in English.

IV. DISCONTINUATION OR MODIFICATION OF QUALIFIED MODELS

A. Partner is responsible for promptly informing EPA and its certification body when any of its qualified models is discontinued or modified in a manner that has the potential to increase emissions (for example, changes in firebox dimensions, airflow rates, airflow direction, heat output, or pressure differential through the unit), and thus potentially alter its ability to meet the applicable Program emissions level.

B. Discontinued models will be removed from the Program. If a modification has the potential to increase emissions, the model should be retested and the laboratory test report, including all test documentation, should be submitted to EPA. Partner should promptly discontinue use of Program qualifying labels and hangtags on units that are manufactured after a model has been modified in a manner that has the potential to increase emissions, pending EPA's response to Partner's submission. If the modified model meets the Program Phase 2 emission level, a new Phase 2 qualifying label and hangtag for that model may be generated (e.g., to reflect the date of the new EPA letter acknowledging Phase 2 qualified model status, to reflect the new results of emissions testing, etc.) If the modified model does not meet the Program Phase 2 emission level, Partner should not use the Phase 2 qualifying label and hangtag on the modified model.

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 *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 which 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 Manufacturers 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 heat output 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 *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 12.5.4.

3.1.5 Heat output rate − The average rate of energy output from the appliance during a specific test period in Btu/hr (MJ/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 (19mm) 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 ± 6mm by 100 ± 6mm] white or red oak wood piece cut to the length required.

3.1.11 Test Run – An individual emission test which encompasses the time required to consume the mass of the test fuel charge.

3.1.12 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).

3.1.13 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 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. Four test categories are used. These are:

4.3.1 Category I: A heat output of 15% or less of Manufacturer's Rated Heat Output Capacity.

4.3.2 Category II: A heat output of 16% to 24% of Manufacturer's Rated Heat Output Capacity.

4.3.3 Category III: A heat output of 25% to 50% 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 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 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 ± 0.50 ºF (± 0. 25 ºC). Other temperature measurement methods may be used if the temperature difference measurement uncertainty is equal to or less than ± 0.50 ºF (± 0. 25 ºC).

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% of measured flow.

6.4.1 Optional - Appliance side water flow meter. A water flow meter with an accuracy of ± 1% 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 2% 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, 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.

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 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% or less. The water flow rate determined by the collection and weighing method shall be within 1% 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, 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 Sections 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% moisture content on a dry basis. Piece length shall be 80% 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% of the length at the level where the layer is placed. Pieces are to be spaced ¾ inches (19mm) apart on all faces. The first fuel layer may be assembled using fuel units consisting of multiple 4 x 4's 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 (19mm) by 1- ½ inch (38mm) spacers shall be attached to the bottom of piece to maintain a ¾ inch (19mm) separation. When a layer consists of two or more units of 4 x 4's an additional ¾ inch (19mm) thick by 1.5 inch (38mm) wide spacer shall be attached to the vertical face of each end of one 4 x 4, such that the ¾ inch (19mm) 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 4's one piece shall not be attached, but shall have spacers attached in a manner that will provide for the ¾ inch (19mm) space to be maintained. (See Figure 1). Spacers shall be attached perpendicular to the length of the 4 x 4's such that the edge of the spacer is 1 ± 0.25 inch from the end of the 4 x 4's 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 % on a dry basis. The average moisture content of each piece of test fuel shall be in the range of 19 to 25%. 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 (1168mm), test fuel charge target is 100 lbs. (45kg) minimum and the piece length is 36 inches (914mm). If 8 - 4 x 4's, 36 inches long weigh 105 lbs (48kg), 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 "*Standard Test Method For Determination of Particulate Matter Emissions Collected In A Dilution Tunnel*."

12.4 Appliance Start-Up. 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% 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% and 20% 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%) 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% of the manufacturer's rated heat output capacity (Category IV). If the appliance is not capable of producing a heat output within this limit, the manufacturer's rated heat output capacity is considered not validated. In such cases, the tests may be continued using the heat output capacity as measured as the Manufacturer's Rated 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% 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% of the rated output capacity are not sufficient evidence that heat output 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 4.3. 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.

E_T – Total particulate emissions for the full test run as determined per ASTM E2515 in grams.

$E_{g/MJ}$ – Emission rate in grams per MJ of heat output.

$E_{lbs/MMBtu\ output}$ – 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 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).

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.

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 water at the inlet to the load side of the heat exchanger, °F

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% 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 -°F).

W_{fuel} – Fuel charge weight, as-fired or “wet”, 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.

$MC_{Ave} = [[\Sigma W_i \times MC_i] + [W_{sp} \times MC_{sp}]] \div W_{fuel}$, %. Eq. 3

13.4 Determine Heat Input.

$Q_{in} = (W_{fuel}/(1+(MC/100))) \times HHV$, Btu (MJ). Eq. 4

$Q_{in\ LHV}$ = (W_{fuel}/(1+(MC/100))) x LHV, Btu (MJ). 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.

$$Q_{out} = \left[\sum (C_{pi} \bullet \Delta T_i \bullet \dot{M}_i \bullet t_i)\right] + (W_{app} \bullet C_{Steel} + C_{pa} W_{water}) \bullet (TF_{avg} - TI_{avg})$$

Btu (MJ). 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

σ_i = (62.56 + (-.0003413 x $T3_i$) + (-.00006225 x $T3_i^2$)) 0.1337, lbs/gal. Eq. 8

C_p = 1.0014 + (-.000003485 x $T3_i$) Btu/lb-ºF. Eq. 9

C_{steel} = 0.1 Btu/lb-ºF.

C_{pa} = 1.0014 + (-.000003485 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 (MJ/hr). Eq. 12

13.5.3 Determine Emission Rates and Emission Factors as:

$E_{g/MJ}$ = E_T/(Q_{out} x 0.001055), g/MJ. Eq. 13

$E_{lbs/MM\ Btu\ output}$ = (E_T/453.59)/(Q_{out} x 10^{-6}), lbs/MMBtu Out.
Eq. 14

$E_{g/kg}$ = E_T/(W_{fuel}/(1+MC/100)), g/dry kg. Eq. 15

$E_{g/hr}$ = E_T/Θ, 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, 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%.

13.5.5.1 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: $\eta_{avg} = \Sigma\ \eta_i \times F_i, \%.$ Eq. 19

Weighted average emissions: $E_{avg} = \Sigma E_i \times F_i, \%.$ Eq. 20

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 units based on an Average Heat 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:

$Q_{out\text{-}8hr} = X1 + \{ (8 - Y1) \times [(X2 - X1) / (Y2 - Y1)] \}, \%.$ Eq. 21

$\eta_{avg\text{-}8hr} = \eta_{del1} + \{ (8 - Y1) \times [(\eta_{del2} - \eta_{del1}) / (Y2 - Y1)] \}$, %. Eq. 22

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. 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.

η_{del2} = Average Delivered Efficiency for this data point.

13.7.2.4 Example of Category Actual Load Duration.

Category	Actual Load (Btu/Hr)	Duration (Hr)	η_{del} (%)
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 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.

14.1.15 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 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.

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}	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	lbs/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. Hang Tag Information

MANUFACTURER:			
MODEL NUMBER:			
8-HOUR OUTPUT RATING:	$Q_{out-8hr}$		Btu/hr
8-HOUR AVERAGE EFFICIENCY:	$\eta_{avg-8hr}$		**(Using higher heating value)**
			(Using lower heating value)
ANNUAL EFFICIENCY RATING:	ηavg		**(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)	$\eta_{del,i} \times F_i$	$E_{g/MJ,i} \times F_i$	$E_{g/kg,i} \times F_i$	$E_{slbs/MMBtu\ Out,i} \times F_i$	$E_{g/hr,i} \times F_i$
I	0.437					
II	0.238					
III	0.275					
IV	0.050					
Totals	1.000					

Figure 1. Typical Test Fuel Piece

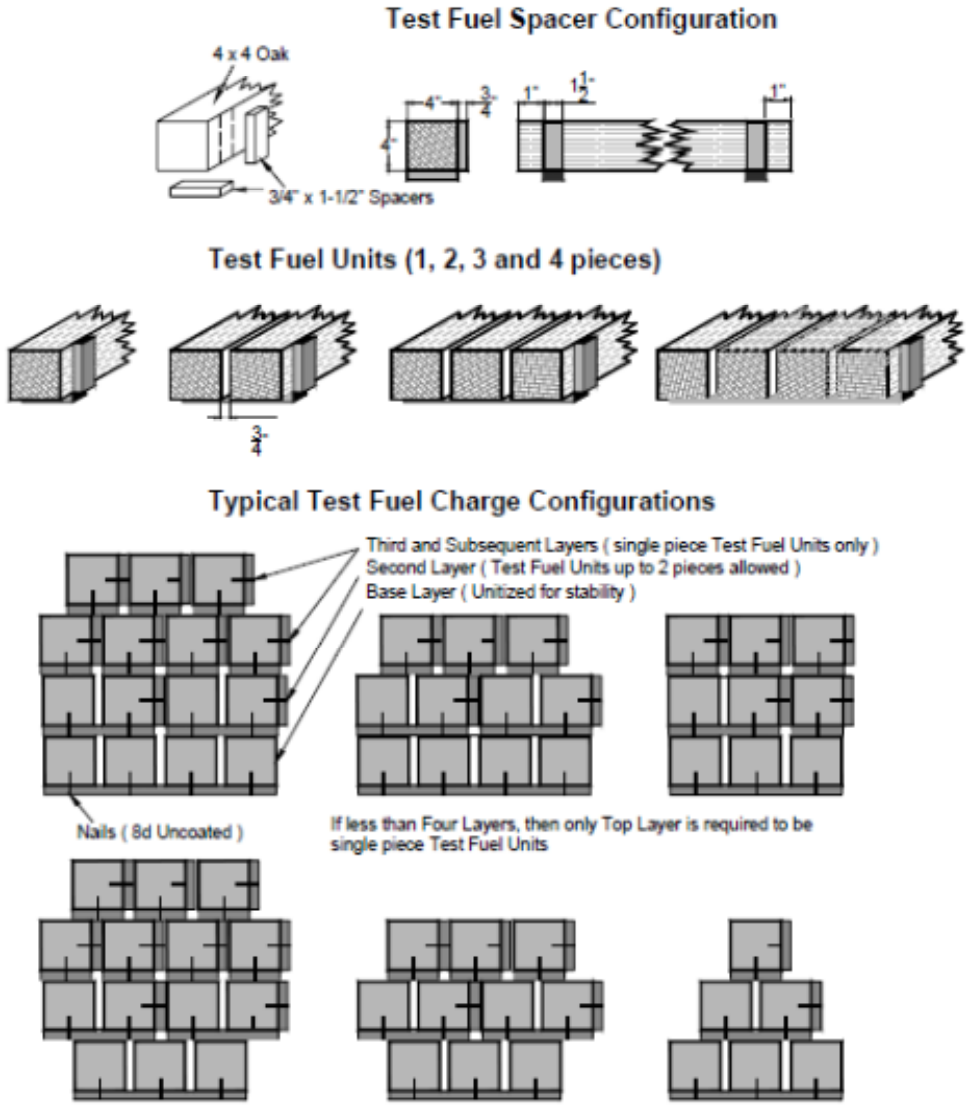
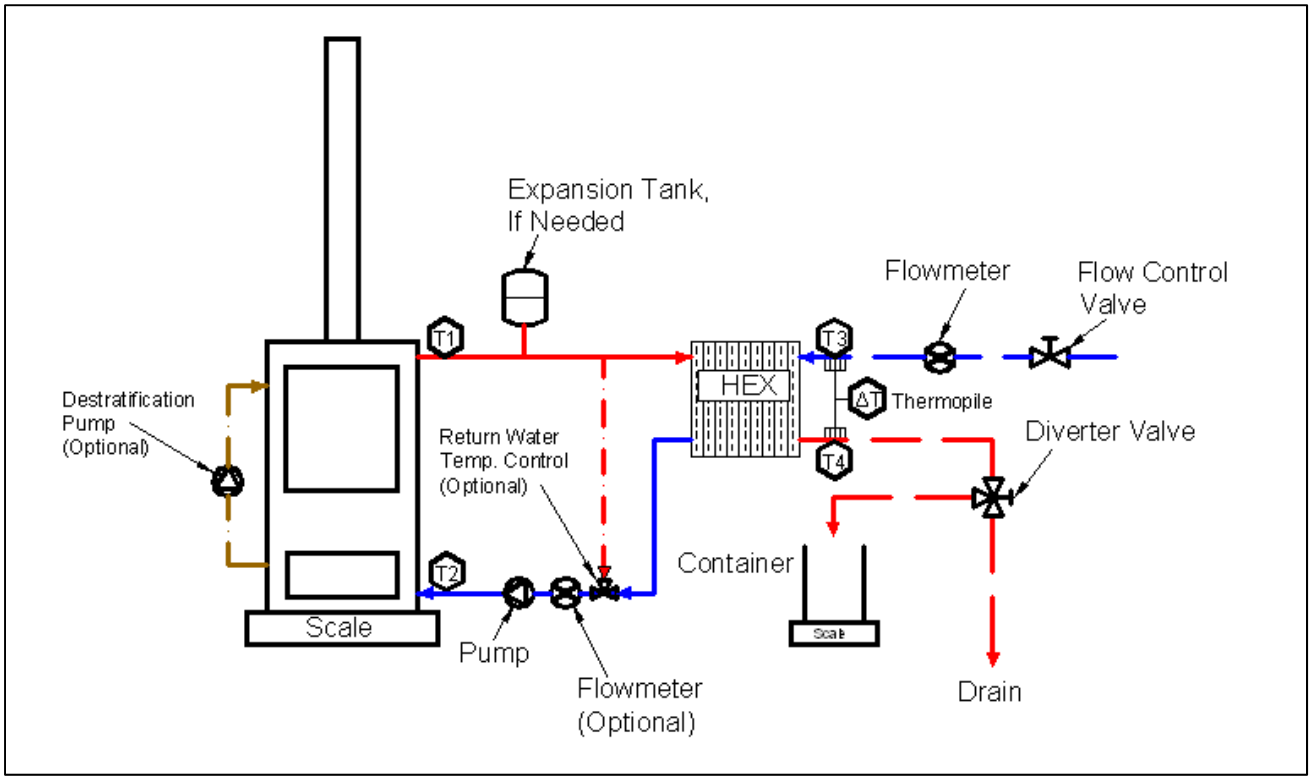


Figure 2. Schematic of Test Equipment Set-up



Note: Illustrated appliance pump location and flow path through the appliance are generic and may vary based on the unit being tested.

Guidelines for Use of Label, Hangtag, And Outreach Materials

EPA Hydronic Heater Program, Phase 2

I. PURPOSE

The primary purpose of these Guidelines, which are part of the EPA Hydronic Heater Program (Program) Phase 2 Partnership Agreement (Agreement), is to ensure Program-wide consistency with regard to content, use, appearance, placement, and other matters related to Program qualifying labels and hangtags. Consistent representation of information and appearance of these items are important in order to maximize consumers' recognition of the Program. In addition, it will help build consumer confidence in the Program and will facilitate comparison of available hydronic heater models. These Guidelines also are intended to minimize misstatements in public communications about the Program and misuse of qualifying labels, hangtags, and outreach materials.

II. GENERAL COMMITMENTS

Partner agrees to use Program qualifying labels, hangtags, and outreach materials only in the manner specified in these Guidelines and only on or with reference to qualified models (see Definitions section of main Partnership Agreement document).

Partner agrees not to imply that EPA endorses a particular model, product, service, or company. Partner also agrees not to use the EPA logo or seal.

Partner also agrees not to misuse Program qualifying labels, hangtags, and outreach materials, or misrepresent the Program or Partner's model(s) qualified status under the Program. EPA may terminate the Partnership Agreement, including the authorization to use the qualifying labels and hangtags, if Partner fails to act in accordance with the Agreement, which includes these Guidelines.

EPA intends to provide any new or revised guidance on labels, hangtags, or outreach materials to Partner in draft, and to give Partner an opportunity to comment prior to the guidance being issued in final form. EPA may delete or caveat information that EPA determines to be erroneous, questionable, or misleading. The final decision on the content of EPA documents will be made by the Agency.

III. QUALIFYING LABELS AND HANGTAGS

A. Qualifying Label

Once EPA acknowledges in writing that Partner's model is a "Phase 2 emission level qualified model," Partner may elect to attach Program qualifying labels to the model. Partner agrees to generate qualifying labels based on the following guidance, thus ensuring that the appearance and content of the labels are consistent across all qualified models.

The qualifying label lists:

(1) month and year of manufacture of the individual unit;

(2) model number or name;

(3) serial number;

(4) date of EPA letter acknowledging qualified model status (described in Partnership Agreement Attachment 1, Qualifying Process, section H);

(5) the following statement:

"Qualified at EPA Phase 2 Emission Level Until [fill in date]." This date is 5 years after EPA's letter acknowledging the model's qualified status.

(6) thermal output rating in MMBtu/hr;

(7) result of emissions testing in grams/hour;

(8) result of average emissions testing expressed in terms of lbs/MMBtu heat output for Phase 2 emission level qualified models;

(9) overall input/output efficiency (percentage).

All of the preceding information should be printed in the same font and size.

In addition, the qualifying label should include the following statement :

> The U.S. Environmental Protection Agency has determined, based on test results from _____, an independent accredited laboratory, that this model line meets the U.S. EPA Hydronic Heater Program Phase 2 emission level. To minimize smoke, always operate your hydronic heater in accordance with the manufacturer's instructions found in the owner's manual. Additional information about EPA's Program is available at: www.epa.gov/burnwise/participation.html.

The qualifying label should be approximately 7 inches high by 6 inches wide, give or take an inch in either direction, with font sized to fit this space. "U.S. Environmental Protection Agency" and "EPA" should be no larger than the other lettering in the statement portion of the label.

The qualifying label should be affixed in a readily visible location on the exterior of the unit or, if there are no flat surfaces in a readily visible location on the exterior of the unit, the qualifying label may be affixed to the interior surface of the outer door to the unit. The label should be made of a neutral colored material [i.e., similar to the color(s) used for required safety labels such as those conveying Underwriters Laboratories (UL) or Canadian Standards Association (CSA) information] expected to last the lifetime of the unit, and should present the EPA statement (above) in a manner that is likely to remain legible for the lifetime of the unit.

The qualifying label text and hangtag should not be used on or in connection with advertising or other materials featuring hydronic heater models that are not qualified under the EPA Hydronic Heater Program.

B. Hangtag

Partner may also elect to attach Program hangtags to its qualified model(s). EPA will send a hangtag template to Partner along with EPA's letter acknowledging a model's qualified status under the Program. Partner agrees to generate hangtags via use of the template without modification, thus ensuring that the appearance (font type, size, and color; background color; label size; spacing) and the general content of the hangtags are consistent across all qualified models in the Program. The EPA Program Liaison is available to assist with use of the template.

Hangtags should be printed on a durable waterproof substrate such as 70 or 90 pound waterproof bond paper, and should measure 5 inches wide by 8 inches long. All hangtags should be printed in black ink. The entire template should appear on one side of the label (i.e. the text should not carry over to the other side), although Partner may choose to print the entire template on each side. The Phase 2 background color is white, with PMS 131 orange features.

The hangtag should not be used on or in connection with advertising or other materials featuring models that are not qualified under the EPA Hydronic Heater Program. See Attachment 4 for an example of a Phase 2 hangtag.

IV. COMMENCEMENT AND DISCONTINUATION OF USE OF LABEL, HANGTAG

Partner agrees that use of Program qualifying labels and/or hangtags on a model would begin no sooner than Partner's receipt of EPA's written acknowledgment that the model is a qualified model. For example, Partner would not simply begin to use qualifying labels and/or hangtags once it signs an EPA Hydronic Heater Program Phase 2 Partnership Agreement.

Partner agrees to promptly discontinue use of Program labels and hangtags on all units manufactured after the date on which any of the following occurs:

(1) termination of Partner's Partnership Agreement with EPA by either Partner or EPA;

(2) termination of this Phase 2 Program;

(3) qualification of a Phase 2 emission level qualified model has ended (5 years after the date of the EPA letter acknowledging qualified status), and requalification of the model has not yet occurred or a waiver has not yet been granted;

(4) any change is made to a qualified model that has the potential to increase emissions;

(5) EPA determines that the qualification or information on the labels, hangtags, or outreach materials is based on false, erroneous, misleading, or questionable information.

Also, Partner agrees not to use Program labels and hangtags on units manufactured after December 31, 2008 where qualification of the model was based on the ASTM cordwood test method exemption.

When any change that has the potential to increase emissions is made to a qualified model, Partner should promptly notify the EPA Program liaison and discontinue use of qualifying labels and hangtags with respect to any unit that incorporates the change. Partner will conduct new testing and submit the laboratory report and associated documentation to EPA per the Program Qualifying Process (Partnership Agreement Attachment 1). After receiving written acknowledgment from EPA that the modified model is a qualified model, partner may resume use of qualifying labels and hangtags.

V. MODIFICATION OF LABEL, HANGTAG TEMPLATES

The goals of the Program will be best served by having consistent, easy to read qualifying labels and hangtags. However, should modification of the templates for these materials be called for, the Agency would distribute revised guidance or a new template to Partner as soon as possible.

Partner should begin to use the revised templates for qualifying labels within a reasonable time after receiving them for qualified model units which do not already bear a qualifying label at the time the revised guidance is received. For those qualified model units that already have labels affixed at the time a revised template is received, EPA suggests that Partner exchange existing labels for the newer version. Whether to follow this suggestion would be left to Partner's discretion.

If a revision to the templates for hangtags is made, Partner would begin to use the new templates on all qualified model units manufactured after receipt of the new templates within a reasonable time. Failure to implement label and hangtag modifications as described in this paragraph may result in Partner being dropped from the Program.

VI. OUTREACH MATERIALS

A. Owner's Manual Statement

Partner agrees to include in the owner's manual for qualified model(s) the following information:

(1) The model's proper thermal output capacity for matching with a building's thermal demands;

(2) Proper installation information;

(3) Operation and maintenance information, including:

- fuel loading procedures, and recommendations on fuel use and selection;

- a statement indicating that the following are among the materials/substances that should not be used as fuel in a hydronic heater:

- trash
- plastics
- gasoline
- rubber
- naphtha
- household garbage
- material treated with petroleum products (particleboard, railroad ties and pressure treated wood)
- leaves
- paper products
- cardboard

- proper fire starting procedures;
- proper use of air controls;
  - air inlet or combustion blower tube should not be restricted by debris (creosote, ash, etc.)
  - flame baffle/flue should not be restricted by debris
  - chimney should not be restricted by debris
  - door seal provides air-tight seal when shut
- ash removal procedures;
- for catalytic models, information pertaining to maintaining catalyst performance, maintenance procedures, procedures for determining catalyst failure or deterioration, procedures for replacement, and warranty rights.

(4) A statement indicating that the person(s) operating a hydronic heater must comply with all applicable laws or other requirements, such as state laws or regulations and local ordinances.

(5) Statements indicating that the person(s) operating a hydronic heater is/are responsible for operation in a manner that does not create a public or private nuisance condition. The manufacturer's distance and stack height recommendations and the requirements in any applicable laws or other requirements may not always be adequate to prevent nuisance conditions due to terrain or other factors.

B. Other Outreach Materials

EPA may offer Program outreach materials to Partner. If Partner would like to use these materials, they agree to adhere to any guidelines and/or use any templates EPA provides. Failure to do so may result in Partner being dropped from the Program. Partners are welcome to submit suggestions to the EPA liaison for the Program at any time regarding additional EPA-generated outreach materials that they believe would enhance the effectiveness of the Program.

VII. PROGRAM COMMUNICATIONS

A. General

To maximize consumer confidence in the Program, Partner agrees not to misrepresent the Program or Partner's model(s) qualification status in the Program. Partner will not create misleading statements that imply or suggest that EPA endorses a particular model, or that suggest that EPA endorses heating with hydronic heaters over other appliances. The Program name, qualifying label, hangtag, and other related items should not be used in a manner that would imply EPA endorsement of a company, products, or services. Consequently, the EPA logo cannot be used in any manner in connection with the Program.

B. Suggested Wording

EPA recommends use of the terminology in the left column in communications about the Program:

CORRECT WORDING	INCORRECT WORDING
QUALIFIED MODEL STATUS • EPA Hydronic Heater Program qualified	QUALIFIED MODEL STATUS • EPA Hydronic Heater Program compliant model • EPA Hydronic Heater Program rated model
TEST METHODS AND EMISSION LEVELS • EPA Hydronic Heater Program guidelines • EPA Hydronic Heater Program test methods • Model has met the EPA Hydronic Heater Program Phase 2 emission level • EPA qualified model	TEST METHODS AND EMISSION LEVELS • EPA Hydronic Heater Program standards • EPA-certified model • EPA-endorsed model • EPA-approved model
PARTNERS • Company X, an EPA Hydronic Heater Program Phase 2 Partner • A company/manufacturer participating in Phase 2 of the EPA Hydronic Heater Program	PARTNERS • Company X, a company endorsed by EPA • An EPA-approved hydronic heater manufacturer

C. Websites

Partner may not include the EPA logo on their website, but may link its company website to the EPA Hydronic Heater Program website (www.epa.gov/burnwise/participation.html).

D. Education of Employees and Others about Program

Partner agrees to provide information about the Program to its employees, and to persons or entities that participate in the development, manufacture, marketing, sales/distribution, and service of qualified models. In addition, Partner agrees to take steps to encourage these persons or entities to act in accordance with the Partnership Agreement.

Phase 2 Hangtag Template