

January 14, 2019

Andrew Wheeler, Acting Administrator  
U.S. Environmental Protection Agency  
1200 Pennsylvania Avenue, NW  
Washington, DC 20460  
Attention: Docket ID No. EPA-HQ-OAR-2018-0195

*Re: Proposed Amendments to the Standards of Performance for New Residential Wood Heaters, New Residential Hydronic Heaters and Forced-Air Furnaces*

Dear Acting Administrator Wheeler:

The Northeast States for Coordinated Air Use Management (NESCAUM) offer the following comments on the U.S. Environmental Protection Agency (EPA) Notice of Proposed Rulemaking (NPRM), published on November 30, 2018, entitled *Standards of Performance for New Residential Wood Heaters, New Residential Hydronic Heaters and Forced-Air Furnaces* (83 FR 61574). The NPRM proposes several amendments that would delay full implementation of the 2015 New Source Performance Standards (NSPS) for these wood-burning device types.

NESCAUM is the regional association of state air pollution control agencies in Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island and Vermont.<sup>1</sup>

Wood smoke is a significant source of particulate matter (PM) in many cities, towns and villages in our states. In the NESCAUM region, air pollution from residential wood combustion has a disproportionate impact due in large part to the Northeast's colder climate and the relative abundance of wood for fuel. Residential wood combustion can contribute from 20 percent to 75 percent of ambient PM levels in many Northeast areas during cold weather.

Studies conducted by the Vermont Department of Environmental Conservation and NESCAUM have found that during the coldest and calmest winter days in Rutland, Vermont, wood smoke accounted for half or more of the measured fine particulate matter (PM2.5) pollution.<sup>2</sup> In the first two months of 2014, Rutland experienced daily PM2.5 concentrations of almost 20 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ) – nearly twice the level of the annual PM2.5 national ambient air quality standard (NAAQS) of  $12 \mu\text{g}/\text{m}^3$ . During this same period, the area also experienced maximum hourly concentrations greater than  $35 \mu\text{g}/\text{m}^3$  on more than half the days, with peak hourly concentrations exceeding  $90 \mu\text{g}/\text{m}^3$ , as reported by the Rutland PM2.5 monitoring site.<sup>3</sup> Research shows that in rural NY, greater than 90 percent of carbonaceous PM2.5 is wood smoke and winter night-time town/village peak levels can exceed

<sup>1</sup> These comments reflect the majority view of NESCAUM members. Individual member states hold some views which differ from the NESCAUM states' majority consensus position.

<sup>2</sup> Allen, G.A., P. Babich, and R. Poirot, *Evaluation of a New Approach for Real Time Assessment of Wood Smoke PM*, Paper #16, presented at the Air & Waste Management Association Visibility Specialty Conference on Regional and Global Perspectives on Haze: Causes, Consequences and Controversies. Asheville, NC (October 25-29, 2004).

<sup>3</sup> US EPA, *Air Data: Air Quality Data Collected at Outdoor Monitors Across the US*, <https://www.epa.gov/outdoor-air-quality-data>, Rutland, VT site # 50-021-0002.

100 µg/m<sup>3</sup>.<sup>4</sup> These results are consistent with studies in the Adirondacks by NESCAUM, which show significant localized pollution from wood burning that is closely associated with the higher population densities of the towns and villages.<sup>5</sup> Wood smoke issues are not isolated to mountainous areas where valley temperature inversions exacerbate the higher PM emission levels. Studies in Connecticut have found that on cold winter days when ambient concentrations of PM2.5 are elevated, observed wood smoke contributes over 50 percent of hourly PM2.5 concentrations.<sup>6</sup> Data from these efforts suggest that residential wood smoke affects public health on a daily and long-term basis in these areas.

The states in our region need the emission reductions from the sources covered by this rule to effectively protect public health and the environment from the impacts of wood smoke. Timely implementation is needed to maintain compliance with the PM2.5 NAAQS. Residential wood combustion is the largest direct source of PM2.5 emissions in the country, emitting an estimated 340,000 - 600,000 tons annually. Inhaling particulate matter can affect the lungs and heart and exacerbate health risks, including premature death in people with lung or heart disease, nonfatal heart attacks, aggravated asthma, and decreased lung function. These pollution sources are also responsible for 44 percent of all human-related polycyclic organic matter (POM) emissions and 62 percent of the polycyclic aromatic hydrocarbon (PAH) emissions, both of which have been identified as probable human carcinogens.

Under the Clean Air Act (CAA) NSPS provisions, EPA is required to review and, if improved technology has been demonstrated, revise standards every eight years. The 2015 revisions to the NSPS for residential wood burning devices were the first since 1988, even though significant technological advances had taken place over that period. No further delay in fully implementing the NSPS is acceptable or warranted. The 2020 standards, which are long overdue and supported by the record established in the 2015 rulemaking, can be substantially met by industry today.

To date, the NESCAUM states have realized only nominal emission reductions from the revised NSPS for residential wood heaters. Nearly all these devices sold in the region already met the Step 1 emission standards prior to 2015. Many of our states have enforced emission standards for hydronic heaters since as early as 2007 that are at least as stringent as the 2015 Step 1 NSPS. For the NESCAUM region, emission benefits only begin to accrue with the sale of Step 2 units.

The NPRM proposes amendments that would delay full implementation of the 2015 NSPS. The proposed changes are unnecessary and largely designed to provide economic relief for regulated entities that manufacture and sell residential wood heating appliances but failed to make timely investments in cleaner technologies. The existing rule already has a host of provisions, which NESCAUM supported, to provide flexibility and accommodate concerns that were raised by industry during the rulemaking process, including:

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<sup>4</sup> Graham, J. and P. Johnson, *Assessment of Carbonaceous PM2.5 for New York and the Region*, NYSERDA Report 08-01 (March 2008). Available at <http://www.nescaum.org/documents/assessment-of-carbonaceous-pm-2-5-for-new-york-and-the-region/>.

<sup>5</sup> Allen, G.A., P.J. Miller, L.J. Rector, M. Brauer, and J.G. Su, *Characterization of Valley Winter Woodsmoke Concentrations in Northern NY Using Highly Time-Resolved Measurements*, Aerosol and Air Quality Research, 11: 519–530 (2011), doi: 10.4209/aaqr.2011.03.0031.

<sup>6</sup> Connecticut Dept. of Environmental Protection, Bureau of Air Management, *Evaluation of Wood Smoke Contribution to Particle Matter in Connecticut* (February 7, 2011). Available at [http://www.ct.gov/deep/lib/deep/air/wood\\_stove\\_furnaces/ctdep\\_woodsmokefinalreport.pdf](http://www.ct.gov/deep/lib/deep/air/wood_stove_furnaces/ctdep_woodsmokefinalreport.pdf).

- five-year phased compliance approach with Step 1 standards in place in May 2015 and Step 2 beginning in May 2020;
- eight-month sell-through period for non-Step 1 compliant units;
- one-year delay in Step 1 emission standards for furnaces;
- automatic Step 1 certification for the 85 percent of wood heaters previously certified under the 1988 NSPS;
- automatic Step 1 certification for hydronic heaters qualified under EPA's Voluntary Program; and
- automatic Step 1 certification for forced-air furnaces independently certified (not self-tested).

Attachment 1 is a 2014 joint statement by the Hearth, Patio & Barbecue Association (HPBA), the Western States Air Resources Council (WESTAR), and NESCAUM supporting these flexibilities in advance of the rule publication.

Our comments focus on the following proposed amendments to the existing NSPS and the findings of the Supplemental Regulatory Impact Assessment (RIA) conducted for this proposal:

- (1) adding a two-year “sell-through” period for retailers to sell new hydronic heaters and forced-air furnaces that are manufactured or imported before the May 2020 compliance date and are compliant with the “Step 1” standards;
- (2) whether a sell-through period for retailers to sell new residential wood heaters is appropriate following the May 2020 compliance date;
- (3) whether the minimum pellet fuel quality requirements in the 2015 NSPS should be retained; and
- (4) the environmental impacts and industry costs associated with the proposed changes.

#### Sell-through period for retailers of new hydronic heaters and forced-air furnaces

NESCAUM opposes any sell-through period during which retailers can continue to sell newly manufactured or existing inventory of Step 1 compliant hydronic heaters and forced-air furnaces after May 2020 when the Step 2 standards come into effect. CAA §111(b)(1)(B) requires that the performance standards be effective upon promulgation of the NSPS or revisions thereof. Consequently, EPA lacks the legal authority to extend the period by which units that do not meet the Step 2 requirements can be sold after May 2020. Further, CAA §111(e) makes it unlawful to operate a new source in violation of a performance standard. Consequently, the sell-through provision could also raise legal issues under state consumer protection laws. Selling Step 1 heating devices that owners could not lawfully operate for their intended purpose may constitute consumer fraud.

The 2015 NSPS affords manufacturers five years to design, certify and manufacture Step 2 compliant units and for retailers to manage their inventories to avoid the situation this proposed amendment is intended to address. Further, states put the industry on notice more than a decade ago that they needed to address excessive emissions from hydronic heaters. NESCAUM issued a model rule for outdoor wood-fired hydronic heaters in 2007. In that same year, Vermont became the first state to regulate air pollutant emissions from these devices. Other northeast states followed suit. Maine, for example, has had rules in place since 2007 requiring wood-fired hydronic heaters to meet an emission standard of 0.06 lb/MMBtu if no setback requirements are in place. Consequently, the industry has faced more stringent standards for these devices than required by the NSPS for over 10 years. There are currently eleven hydronic heaters and two forced-air furnace models with tested emission levels that would enable them to certify to the Step 2 standards.

The five-year lead-time for Step 2 compliance provided in the 2015 NSPS is sufficient. No additional time for selling Step 1 units is acceptable or needed. In fact, the two-year sell-through will be detrimental to companies that invested resources to develop cleaner products consistent with the 2020 NSPS effective date. For example, Lamppa Manufacturing, Inc., a small company located in Minnesota, has designed, manufactured and certified a forced-air furnace model with emissions significantly below the Step 2 level (0.093 lb/MMBtu output) several years in advance of the 2020 deadline.<sup>7</sup> Such good-faith investments are undercut, and would in fact serve as a competitive penalty, if EPA follows through on this NPRM. As a precedential matter, a post-NSPS relaxation by EPA discourages future efforts by innovators like Lamppa and incentivizes other manufacturers to postpone investments in cleaner technologies in the expectation that industry inaction will be rewarded with extended compliance timelines. As with any new emission standards, it is the responsibility of the regulated industry to properly plan for future changes in standards and ensure that only compliant products are made available for sale at the time such standards go into effect.

Additionally, manufacturers who have been working diligently to develop Step 2 appliances are now able to increase the number of Step 2 units on the market. HY-C, a furnace manufacturer in St. Louis, Missouri, notified EPA on December 10, 2018 that it has now submitted a certification request for a Step 2 furnace, and the unit will be under \$2,000 at retail, a similar price for current Step 1 models.<sup>8</sup>

#### Sell-through period for retailers of residential wood heaters

NESCAUM does not support providing a sell-through period for Step 1 residential wood heaters after May 2020. The five-year period provided to manufacturers and retailers for selling Step 1 compliant units is more than sufficient given that the vast majority of devices in the market already met Step 1 standards when the 2015 NSPS was promulgated. Further, Washington State has had a 2.5 g/hr limit for catalytic wood stoves since the mid-1990s. The manufacturers of these units will have had sufficient time to redesign and upgrade their models to meet Step 2 emission limits according to the timeline in the existing rule.

In 2015, 85 percent of the stove market met the Step 1 standards and were automatically deemed certified. A review of EPA's certification database shows that there are over 95 pellet, catalytic and non-catalytic wood heater models that meet Step 2 levels, produced by 37 different manufacturers with Step 2 certification. Further, there are over 100 other models from 8 additional manufacturers representing 20 catalytic stoves, 22 non-catalytic stoves and 56 pellet stoves listed in the database as Step 1 certified with emission levels below the Step 2 standard that have not yet gone through the certification process to qualify as Step 2 compliant. These facts clearly support the viability of the current NSPS schedule for wood heaters. The technology is widely available, most manufacturers have built models that can comply with Step 2, and manufacturers and retailers have had sufficient time to plan for the orderly transition in 2020.

At the December 17, 2018 EPA hearing in Washington, DC, a representative from Hearth and Home Technologies, one of the largest stove manufacturers, testified that the company had been working on

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<sup>7</sup> Daryl Lamppa, Lamppa Manufacturing, Inc., letter to Acting U.S. EPA Administrator Andrew Wheeler (December 7, 2018).

<sup>8</sup> Email from David Walters, HY-C to A. Baumgart-Getz, U.S. EPA, *et al.*, with accompanying Step 2 certification test results (December 10, 2018) (*see* Attachment 4).

Step 2 appliances for the last 24 months.<sup>9</sup> EPA, however, proposed the rule in February 2014 (59 months ago) and promulgated the rule in February 2015 (47 months ago). This gap in time provides an example of the failure of some manufacturers to make appropriate business decisions regarding Step 2 units despite significant lead-time notice. The previously cited examples of Lamppa Manufacturing, and the experience of the HY-C Company, which spent three years developing and certifying a forced-air furnace, show what is achievable within the given timeframe. Public health and the environment should not be made to pay for poor planning and business decisions on the part of some manufacturers that have had years to prepare for this transition.

NESCAUM is also concerned that the information EPA is requesting in the NPRM regarding the economic impacts and viability of the Step 2 timeline, and the need for a sell-through period, is only available from parties regulated under the NSPS. Many of these parties will have a vested interest in the proposed sell-through provisions. It is incumbent upon EPA to identify independent or third-party information to supplement that provided by regulated companies to inform the Agency's decision.

Any non-Step 2 compliant devices sold after May 2020 will be emitting at higher rates in our communities for the lifetime of those units, which is 20 years or more. As discussed later in these comments, the adverse air quality and public health impacts of these higher emitting units are significant.

#### Pellet Fuel Standards

The EPA *List of Certified Wood Stoves* includes many models designed to burn pellets.<sup>10</sup> With increasing use of this fuel for residential home heating purposes, pellet quality and the potential impacts from its use are important. NESCAUM conducted a study for the New York State Energy Research and Development Authority (NYSERDA) and found that absent enforceable fuel quality standards, wood pellets can contain significant levels of metals and other harmful contaminants that can increase toxic emissions. For example, we analyzed commercially available pellet fuels that had high chromium, copper, arsenic, lead and mercury content.

In addition to increased emissions of toxic pollutants, inferior quality pellets can affect a device's operation, reduce combustion efficiency, and potentially damage high efficiency equipment over time. Our sampling program found commercially available pellets with ash content as high as 8 percent, which is well above the Pellet Fuels Institute (PFI) ash limit of 1 percent for "premium grade" pellets. High quality pellets save consumers money in terms of reduced fuel consumption and maintenance costs.<sup>11</sup> In NESCAUM's 2011 analysis of 132 samples representing over 100 brands of pellet fuels, 36 percent of the pellet brands exhibited levels of elevated materials (*see Attachment 3*).<sup>11</sup> Our ongoing analysis of pellet fuels has found that, to date, no pellets bearing the Pellet Fuel Institute certified fuel quality mark appear contaminated. The PFI certification program requires the use of clean wood, routine (quarterly or monthly) unannounced inspections, and annual unannounced analysis for metals.

The 2015 NSPS requires that pellets burned in residential wood pellet heaters meet minimum fuel quality criteria. NESCAUM strongly supports maintaining such requirements to protect against contaminated

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<sup>9</sup> Testimony of Jennifer Forman, Hearth and Home Technologies, at U.S. EPA Hearing, Washington, DC (December 17, 2018) (not yet published in the docket as of January 14, 2019).

<sup>10</sup> U.S. EPA, *List of Certified Wood Stoves*, available at <https://www.epa.gov/compliance/list-epa-certified-wood-stoves> (accessed January 14, 2019).

<sup>11</sup> Rector, L. et al., *Elemental Analysis of Wood Fuels*, NYSERDA Report 13-13 (June 2013). Available at [http://www.nescaum.org/documents/nyserda-rept-13-13\\_elemental\\_analysis\\_of\\_wood\\_fuel-201306.pdf](http://www.nescaum.org/documents/nyserda-rept-13-13_elemental_analysis_of_wood_fuel-201306.pdf).

pellets in the retail market, ensure efficient operations and comparable emissions from pellet-fueled devices, and provide some assurance that the pellet heater's performance in the home is consistent with the certification test. EPA currently accepts existing pellet quality standards from various third-party organizations including PFI, ENplus and CANplus, and additional organizations may apply to the Administrator for approval. The stringency and effectiveness of these programs, however, can differ markedly. The current standards could be improved by consolidating these requirements into a single standard that would apply to all suppliers and all third-party certifiers.

NESCAUM supports implementation of fuel quality standards for all pellets sold for residential use, but we support eliminating size requirements. Standards for metals, sulfur, chlorine, ash and fines content should all be retained because these are key elements to assure real world performance. Furthermore, EPA must include provisions that approved voluntary programs have mechanisms to provide appropriate oversight such that compliance assurance can be monitored, and appropriate enforcement actions are taken when deviations occur.

Pellet fuel should be certified through a quality assurance program licensed by a third-party organization approved by EPA and should meet the following minimum requirements:

- minimum annual random compliance audits, including unannounced inspection and testing activities for metals content with limits consistent with those adopted by PFI;
- monthly or quarterly testing to assure compliance with pellet standards;
- mechanisms to provide pellet sampling and inspection reports for review by the appropriate authorities;
- retention of existing metals, sulfur, chlorine, ash and fines content requirements;
- requirement for the use of clean wood fuels while prohibiting the use of any waste wood or construction or demolition waste products;
- prohibition on the use of any *de minimis* waste materials; and
- prohibition on the use of any binders that could lead to a decrease in emissions performance.

#### Costs and Environmental Impacts of Proposed Revisions to NSPS

The RIA for the 2015 NSPS demonstrated that the public health benefits of this rule outweigh the costs to industry by more than 100 to 1. At an estimated cost of \$281 for room heaters and \$74 for central heating units per ton of PM reduced, this NSPS is among the most cost-effective control strategies promulgated for this pollutant.

Similarly, by EPA's own estimates in the Supplemental RIA for this proposal,<sup>12</sup> the value of foregone air quality benefits that would occur with EPA's proposed sell-through period far exceed the projected cost to industry for complying with the existing rule. According to EPA, the cost to industry over the period of 2020 to 2022 if the proposed amendments are not enacted would be \$33.3 million (Scenario 2). Under its approach, EPA estimates cumulative foregone air pollution benefits of \$350 to \$780 million over the sell-through period under the primary modeling scenario (Scenario 2). The health benefits outweigh the compliance costs by about 11 to 23 times.

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<sup>12</sup> U.S. EPA, Memorandum to Docket EPA-HQ-OAR-2018-0195, *Supplemental Regulatory Impact Analysis (RIA) for "Standards of Performance for New Residential Wood Heaters, New Residential Hydronic Heaters and Forced-Air Furnaces"* Introduction, (November 20, 2018).

Even EPA's latest estimates, however, grossly underestimate the foregone benefits to public health of the proposed sell-through. As EPA notes in the Supplemental RIA, the analytical approach it used omitted consideration of excess pollution beyond 2022 released by the non-Step 2 units sold during the sell-through period. As these higher polluting units can remain in service for 20 years or longer, this is a major omission.

We request that the Agency explain why it elected to calculate the loss in emission benefits associated with the proposed amendments using a "truncated" sell-through period instead of evaluating excess emissions over the expected lifetime of the non-Step 2 compliant units sold under the proposed amendments. As noted above, even using its flawed methodology, EPA concludes the foregone environmental benefits greatly outweigh the cost to industry.

A fuller accounting beyond the truncated period used by EPA would increase the already large benefits relative to compliance costs significantly. To properly account for the lost public health benefits of the proposed amendments to the rule, EPA must include consideration of emissions that will occur for the full lifetime of the non-Step 2 compliant units. Using the accepted practice of considering the full emission impacts over the useful lifetime of the source provides a more transparent and realistic accounting of the foregone health benefits (*i.e.*, increased health costs) attributable to the proposed amendments.

Table 1 shows the comparative cumulative industry costs and foregone public health benefits as calculated using EPA's analytical method under Scenarios 2 and 3 during the sell-through period (present value discounted to 2016, 3% discount rate) where we have extended the time period for the cumulative foregone public health benefits over an assumed 20-year wood heater useful life (2020-2039).<sup>13</sup> We hold constant the foregone health benefits EPA estimated for the year 2022 across all remaining years of the 20-year device useful life. For the extended years, we apply a 3 percent discount rate in the same manner as EPA did to estimate cumulative benefits occurring only during the truncated sell-through period. By more appropriately accounting for excess PM2.5 emissions resulting from heaters sold during the sell-through period throughout their useful lives, we estimate foregone PM2.5 benefits of \$1.9 billion to \$4.4 billion under Scenario 2 (3% discount rate). Comparing these projected lifetime foregone benefits to the additional compliance costs EPA calculates that industry would face without the relief proposed in the NPRM (\$33.3 million over 3 years) results in a foregone public health benefit to industry cost ratio from 57:1 to 132:1. Under the perhaps more likely Scenario 3, we project that foregone health benefits will outweigh industry costs by 52:1 under the low scenario and 118:1 under the high scenario.

In Table 1, we also estimate the cumulative foregone public health benefits under Scenario 2 assuming EPA also includes wood stoves in addition to central heaters during the sell-through period. We use the same methodology in estimating the present value discounted to 2016 with a 3 percent discount rate over an assumed 20-year stove useful life. Annual PM2.5 excess emissions during 2020-2022 are taken from Table A-6, Scenario 2, in the EPA Supplemental RIA, and we use the same benefit per ton values of Table A-8 for the low (Krewski, 3%) and high (LePeule, 3%) end points. Foregone benefits increase when wood stoves are included under the Scenario 2 sell-through period, ranging from \$2.6 billion to \$6.1 billion. While not presented here, we would estimate even higher foregone benefits if wood stoves are included in Scenario 3.

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<sup>13</sup> This slightly underestimates foregone benefits by omitting higher emitting units sold during the sell-through period in years 2021 and 2022 that would be replaced in years 2040 and 2041.

**Table 1. Comparative Cumulative Costs and Foregone Benefits of Proposed Sell-Through Provisions (3% Discount Rate / 2016\$ in millions)\***

Scenario	Industry Costs	Foregone Benefits	Foregone Benefits	Ratio Low	Ratio High
	(total)	(total – low)	(total – high)		
EPA Scenario 2	\$33.3 <sup>a</sup>	\$350 <sup>b</sup>	\$780 <sup>b</sup>	11:1	23:1
EPA Scenario 3	\$42.2 <sup>a</sup>	\$380 <sup>c</sup>	\$860 <sup>c</sup>	9:1	20:1
20-year Useful Life Scenario 2	\$33.3 <sup>a</sup>	\$1,900	\$4,400	57:1	132:1
20-year Useful Life Scenario 3	\$42.2 <sup>a</sup>	\$2,200	\$5,000	52:1	118:1
20-year Useful Life Scenario 2 w/stoves	\$56.0 <sup>d</sup>	\$2,600	\$6,100	46:1	109:1

\* NESCAUM estimates unless otherwise indicated. Cumulative present value in 2016 assuming 20-year useful life.

<sup>a</sup> U.S. EPA Supplemental RIA, Table 4.

<sup>b</sup> U.S. EPA Supplemental RIA, Table 9.

<sup>c</sup> U.S. EPA Supplemental RIA, Table 10.

<sup>d</sup> U.S. EPA Supplemental RIA, Table 4 and Table A-3.

All results in Table 1 use EPA’s basic underlying assumptions on both costs and benefits, other than EPA’s truncated approach in calculating cumulative foregone benefits over a wood burning device’s useful life. NESCAUM, however, is concerned that EPA has seriously understated the number of Step 1 units that could be sold during the proposed two-year sell-through period. In the Supplemental RIA, the Scenario 2 analysis assumes that sales in 2019 will decrease by 17 percent for all appliances. Those sales represent the stranded inventory, which translates into roughly 12,000 non-Step 2 stoves and 5,000 central heaters being sold during the 2020-2022 period. In its RIA, EPA provides no basis for the 17 percent figure. EPA’s Scenario 3 analysis, which assumes an increase in production rates for Step 1 appliances, only anticipates 24 percent of a single year’s inventory will be available for sale during the two-year sell-through period. Manufacturers, however, have indicated that they have at least one year of inventory in the pipeline and there are 17 more months before the production deadline. EPA’s assessment of the number of Step 1 units is inconsistent with prior manufacturers’ comments, which indicate that at least 200,000 Step 1 wood stoves and 46,000 Step 1 central heaters could be sold during the sell-through.<sup>14</sup> If EPA were to adopt the industry numbers, the foregone emission benefits will be at least an order of magnitude greater than assumed in the RIA.

EPA analysis of industry impacts is incomplete because it fails to account for the negative economic consequences for companies that have invested in Step 2 appliances.<sup>15,16</sup> EPA’s analysis of wood stoves only assessed the impact on the estimated 200,000 variable burn rate stoves sold during the two-year sell-through period. EPA failed to analyze or incorporate the emissions impact from 60,000 single burn rate

<sup>14</sup> Testimonies of Chris Neufeld, Blaze King, and John Voorhees, United States Stove Company, at EPA Hearing, Washington, DC (December 17, 2018) (not yet published in the docket as of January 14, 2019) and email in docket EPA-HQ-OAR-2018-0195 sent by Chris Neufeld, Blaze King, to Bill Wehrum, U.S. EPA (June 1, 2018).

<sup>15</sup> Scott Nichols, Tarm Biomass, comments submitted to docket EPA-HQ-OAR-2018-0195 (December 5, 2018); Daryl Lamppa, Lamppa Manufacturing, Inc., letter to Acting U.S. EPA Administrator Andrew Wheeler (December 7, 2018).

<sup>16</sup> A. Keating, *Burning a fire under furnace innovation: Impending regulations and tensions in the industry*, Planet Forward (April 26, 2018). Available at <https://www.planetforward.org/idea/burning-a-fire-under-innovation-tensions-in-the-home-furnace-industry>.

stoves and 200,000 pellet stoves. Consequently, EPA’s analysis of subpart AAA only accounts for 45 percent of the market for these appliances. A full analysis of subpart AAA impacts must be completed with notice and comment to states before rule changes can be implemented.

There are several associated environmental and economic benefits that are expected to accrue but are not monetized in the Supplemental RIA. Step 2 compliant devices will emit lower levels of volatile organic compounds, air toxics and carbon monoxide than the Step 1 units they replace. Further, the Step 2 units burn more efficiently, which will provide consumers with significant savings in fuel costs over the lifetime of the unit. Allowing the sale of non-Step 2 compliant units during the sell-through period as EPA proposes would result in a loss of these benefits over an assumed 20-year lifetime of these units.

The EPA also overstates the cost savings manufacturers would realize by minimizing “stranded inventory.” The Agency fails to acknowledge that manufacturers have multiple avenues to continue sales of these appliances beyond allowing a sell-through period. As witnessed during the transition to Step 1 requirements for subpart QQQQ appliances, some manufacturers revised the advertised use of these appliances to light commercial, which are not covered by the NSPS. While NESCAUM does not endorse such strategies, we note that Central Boiler and Hardy Heaters continue to sell uncertified units for light commercial use that they previously sold for residential applications<sup>17</sup> A YouTube video from installers highlights the industry perspective on the units after rule promulgation - <https://www.youtube.com/watch?v=H4s5uiXrWik>.<sup>18</sup> Additionally, sales of Step 1 units will still be legal outside the U.S., where many manufacturers have distribution networks. Manufacturers can offer to take back unsold inventory from retailers and use their international distribution chains to minimize issues presented by implementation of Step 2 in the U.S.

Finally, we note that according to the Office of Management and Budget’s Office of Information and Regulatory Affairs (OIRA), “Cost-benefit analysis as required by EO 12866 remains the primary analytical tool to inform specific regulatory decisions. Accordingly, except where prohibited by law, agencies must continue to assess and consider both the benefits and costs of regulatory and deregulatory actions, and issue such actions only upon a reasoned determination that benefits justify costs.”<sup>19</sup> Given that the public health and environmental benefits are far greater than the cost to industry for complying with existing timeline in the NSPS, EPA cannot justify the proposed changes according to this directive.

## Conclusion

The northeast states need timely emission reductions from the sources covered by the 2015 NSPS for residential wood heating devices to effectively protect public health and the environment from the impacts of wood smoke and maintain compliance with the PM2.5 NAAQS. Sufficient progress has been

<sup>17</sup> Attachment 2 provides manuals before and after 2015 for the Central Boiler 5036 highlighting that the units are still manufactured but with minor changes to owner’s manuals about where they can be used. Links to Hardy Heater are also provided as these are the companies who have spoken out about the need for a sell-through. A complete list of companies using the “light commercial” or “coal only” exemption to continue producing units is also attached to this comment letter.

<sup>18</sup> At minute 1:50, the spokesperson states, “After May 1<sup>st</sup>, the manufacturers can continue to build these same exact units for commercial use only.”

<sup>19</sup> White House Office of Management and Budget, Office of Information and Regulatory Affairs, *2017 Draft Report to Congress on the Benefits and Costs of Federal Regulations and Agency Compliance with the Unfunded Mandates Reform Act*, p. 51.

made by many regulated companies to demonstrate the feasibility of achieving the 2020 standards according to the schedule laid out in the 2015 NSPS. The proposed sell-through periods are unnecessary and largely designed to provide economic relief for regulated entities that failed to make timely investments in cleaner technologies. The existing rule includes a host of provisions that provide flexibility and accommodate concerns that were raised by industry during the rulemaking process.

This NSPS is among the most cost-effective control strategies promulgated for PM2.5. For central heaters, the value of foregone air quality benefits that would occur with EPA's proposed sell-through period far exceed the projected cost to industry for complying with the existing rule. If EPA were to include wood stoves in the sell-through period, even higher foregone health benefits (*i.e.*, increased health costs) will occur. NESCAUM calculates that the foregone public health benefits associated with the proposed sell-through period for central heaters would outweigh the cost to industry by 52 to 132 times. Further, the costs to industry are likely overstated and the adverse public health impacts are clearly understated.

The proposed sell-through period for non-Step 2 compliant devices will be detrimental to companies that invested resources to develop cleaner products consistent with the 2020 NSPS effective date. These good-faith investments would represent a competitive penalty to these companies if EPA provides a sell-through period and would provide an incentive to other manufacturers to postpone investments in cleaner technologies in the expectation that inaction and poor planning will be rewarded with extended compliance timelines.

The EPA does not have the legal authority under CAA §111(e) to extend the period by which units that do not meet the Step 2 requirements can be sold after May 2020. Further, it is unlawful to operate a new source in violation of a performance standard. Consequently, the sell-through provision could raise legal issues under state consumer protection laws. Selling Step 1 heating devices that owners could not lawfully operate for their intended purpose may constitute consumer fraud.

NESCAUM strongly supports maintaining the minimum pellet fuel quality criteria in the 2015 NSPS to protect against contaminated pellets in the retail market, ensure efficient operations and comparable emissions from pellet-fueled devices, and provide some assurance that the pellet heater's performance in the home is consistent with the certification test.

The 2020 standards, which are long overdue and supported by the record established in the 2015 rulemaking, can be met by industry today. States are relying on the full public health and environmental benefits from this rule to accrue in a timely fashion. The proposed weakening is neither warranted nor acceptable. It is time to fully implement this highly cost-effective rule according to the schedule laid out in the 2015 NSPS.

EPA's proposal fails to clearly articulate a legal, environmental or economic basis to move forward with the rule changes. These are well understood and basic elements that federal regulatory agencies must include to ensure informed public comment.

Finally, we note that due to the government shutdown and EPA's earlier refusal to extend the comment period for this proposal, EPA has not fully provided answers to our questions seeking greater clarification of its proposed changes and its Supplemental RIA approach. For these and all the reasons covered in our comments, NESCAUM urges EPA to abandon this proposal.

Sincerely,

A handwritten signature in blue ink, appearing to read "Paul J. Miller".

Paul J. Miller, Executive Director

cc: NESCAUM directors  
William Wehrum, EPA OAR  
Peter Tsirigotis, Mike Koerber, EPA OAQPS  
Cynthia Greene, Bob Judge, EPA R1  
Rick Ruvo, EPA R2

**Attachment 1**

**Consensus Positions of WESTAR, NESCAUM, and HPBA “Proposed Standards of Performance  
for New Residential Wood Heaters, New Residential Hydronic Heaters and Forced-Air Furnaces,  
and New Residential Masonry Heaters”**

August 18, 2014

*August 18, 2014*

**Consensus Positions of WESTAR, NESCAUM, and HPBA**  
**"Proposed Standards of Performance for New Residential Wood Heaters,**  
**New Residential Hydronic Heaters and Forced Air Furnaces, and**  
**New Residential Masonry Heaters"**  
**40 C.F.R. Part 60, 79 Fed. Reg. 6330 (Feb. 3, 2014)**

**TRANSITION FROM CRIB TO CORDWOOD TESTING**

- Goal: Wood heater emission limits should be based on tests that correlate better with actual in-use emissions than the current test. There is a common interest among the parties to transition from the current crib-based wood heater certification test to a cordwood-based certification test by first establishing appropriate and efficient test methods, then using those methods to build a robust database to inform EPA's determination of BSER for wood heaters based on cordwood testing. A related goal is to encourage manufacturers to begin to optimize devices to burn cleaner and more efficiently using cordwood, the fuel that will be used by consumers in the real world. This will provide more useful data on the best emission performance that can be expected under a revised test procedure.
- Approach: Transition to a cordwood test should not be implemented in the near-term while a new test procedure is being developed. A workgroup comprised of experts from industry, state/local air quality agencies, and EPA will develop protocols for cordwood testing that are sufficiently accurate and reproducible to reliably predict emissions from wood heaters throughout the device's burning cycle. Using the protocols established by the workgroup, a database of cordwood-based emission rates will be developed to inform the determination of BSER. All parties will agree in principle on both the approach taken to determine emissions using cordwood and the manner in which the database will be used to set emission standards. EPA should consider establishing this workgroup under the Federal Advisory Committee Act (FACA).

**COMPLIANCE SCHEDULE, INCLUDING GRANDFATHERING AND SELL THROUGH**

- Goal: There is a common interest among the parties in facilitating the development and deployment of new, cleaner wood burning devices while ensuring that economic impacts on manufacturers and retailers are mitigated.
- Approach: To achieve this goal, the parties recommend the following:
- Woodstoves
    - Upon the effective date of the rule, currently unregulated or exempt woodstoves may not be manufactured unless certified in compliance with Step 1.

- Retail sales of the currently exempt stoves and currently certified stoves, including currently certified stoves that do not meet the Step 1 emission levels, may be allowed for one year after the effective date of the regulation.
  - Certifications of units that meet the Step 1 emission levels will be extended until five years after the effective date of the regulation or when the Step 2 emission standard takes effect.
- Hydronic heaters
  - Only Step 1 compliant hydronic heaters may be manufactured after the effective date of the rule.
  - Retail sales of hydronic heaters that do not comply with Phase 2 requirements of the voluntary program, as tested using methods approved by New York should not be allowed after the effective date of the rule.
  - Models qualified under the EPA Voluntary Program and certified by New York State as of the effective date of the regulation will be deemed certified for 5 years or the effective date of any Step 2 standards, whichever is earlier.
  - Retail sales of hydronic heaters that currently comply with Phase 2 requirements of the voluntary program, as tested using methods approved by New York, may be allowed for one additional year beyond the period specified in sub-bullet three (assuming EPA's Step 1 emission rates are essentially equivalent to Phase 2 emission rates).
- Warm air furnaces
  - Whereas warm air furnaces are currently unregulated, manufacturers will be required to comply with emission standards immediately and for the first time. Accordingly, EPA's compliance schedule for these devices should require compliance as expeditiously as practicable.
  - Provide 1-year extension of the effective date for the manufacture of these units.
  - Retail sales of warm air furnaces manufactured before the effective date of the rule, that are not subsequently certified to comply with Step 1 emission levels, may be allowed for one year beyond the rule's effective date .

## **OVERSIGHT OF LAB CERTIFICATION TESTING**

**Goal**      Provide for state and federal access to witness emission tests while providing flexibility to labs to maintain a constant workload of testing

**Approach**    Labs will provide thirty days' notice of testing to states, subject to a waiver to adjust testing schedules or substitute tests of other products due to cancelled or truncated tests.

## **CERTIFICATION PROCESS**

Goal      Provide for a certification process that ensures reliable emissions testing while at the same time allows for efficient and timely processing of certification applications.

Approach    All certification data related to emissions should be publicly available.

## **DELEGATION OF ENFORCEMENT AUTHORITY**

Goal      Provide for authority to states to enforce proper use and sale of stoves at the local level, but not to delegate authority on nationwide issues. States retain authority to establish more stringent standards than required under the Federal NSPS.

Approach    Provide states with partial delegation of authority, to include: (i) enforcement of prohibitions on the installation and operation of appliances in a manner inconsistent with the installation/owner's manual; (ii) operation of catalytic appliances where the catalyst has been deactivated or removed; (iii) sale of unapproved (uncertified, non-grandfathered) models; (iv) enforcement of proper labeling, and (v) compliance with other labeling requirements. Such partial delegation shall not include: (a) decisions on certification, (b) revocation of certification, (c) standards, (d) test methods, (e) enforcing provisions governing content of owner's manuals, (f) hearings and appeals procedures, and (g) establishment of new reporting and recordkeeping requirements.

Nothing in this recommendation is intended to qualify the authority under Section 116 of the Clean Air Act, which allows the states to impose/enforce more restrictive requirements on federally regulated hearth products, is acknowledged.

**Attachment 2**  
**Central Boiler Manuals before and after May 2015**

# CLASSIC

## OUTDOOR WOOD FURNACE OWNER'S MANUAL



**CL 4030  
CL 5036  
CL 6048**

For parts and accessories, service or repairs, call your authorized Central Boiler dealer or heating contractor. Record the information below for future reference.

Model	Serial Number	Installation Date
Dealership Name	Phone Number	
Owner Name		

Tested &  
Listed By  
**O-TL**  
Portland  
Oregon USA  
OMNI-Test Laboratories, Inc.

117-S-12-2 & 117-S-16-4

**Save This Manual  
For Future Reference**  
(p/n 9000166 REV. A) - 27-Jan-14

# CLASSIC

by  
**Central Boiler, Inc.**  
20502 160th Street  
Greenbush, MN 56726  
[www.CentralBoiler.com](http://www.CentralBoiler.com)

The Central Boiler Classic models CL 4030, CL 5036 and CL 6048  
are OMNI tested and listed.

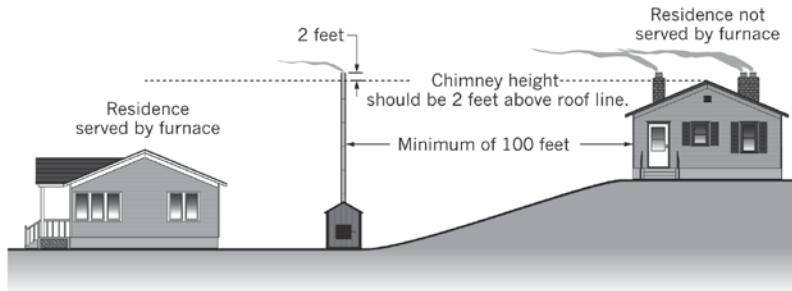
French Owner's Manual and decal set available upon request from your dealer.  
(Manuel d'installation en français et décalcomanies disponible sur  
demande auprès de votre revendeur)

Manuel d'installation en français : p/n 9000165 Décalcomanies : p/n 9408

## OUTDOOR WOOD FURNACE BEST BURN PRACTICES

1. Read and follow all operating instructions supplied by the manufacturer.
2. FUEL USED: Only those listed fuels recommended by the manufacturer of your unit. Never use the following: trash, plastics, gasoline, rubber, naphtha, household garbage, material treated with petroleum products (particle board, railroad ties and pressure treated wood), leaves, paper products, and cardboard.
3. LOADING FUEL: For a more efficient burn, pay careful attention to loading times and amounts. Follow the manufacturer's written instructions for recommended loading times and amounts.
4. STARTERS: Do not use lighter fluids, gasoline, or chemicals.
5. LOCATION: It is recommended that the unit be located with due consideration to the prevailing wind direction.
  - Furnace should be located no less than 100 feet from any residence not served by the furnace.
  - If located within 100 feet to 300 feet to any residence not served by the furnace, it is recommended that the stack be at least 2 feet higher than the peak of that residence.

### Chimney Height Installation Scenario



6. Always remember to comply with all applicable state and local codes.



OUTDOOR FURNACE MANUFACTURERS CAUCUS

- Register at time of purchase for FREE 25 Year Limited Warranty -

Verify your warranty at  
[CentralBoiler.com/w25](http://CentralBoiler.com/w25)

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# INTRODUCTION

## Labeling and Terminology

The outdoor furnace and this owner's manual use the following terms and symbols to bring attention to the presence of hazards of various risk levels and important information concerning the use and maintenance of the outdoor furnace.

**DANGER:** Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

**WARNING:** Indicates presence of a hazard which can cause severe personal injury, death, or substantial property damage if ignored.

**CAUTION:** Indicates presence of a hazard which can cause minor personal injury or property damage if ignored.

**NOTE:** Indicates supplementary information worthy of particular attention relating to installation, operation, or maintenance of the outdoor furnace but is not related to a hazardous condition.

Be sure to follow all instructions and related precautions as they are meant for your safety and protection. Store this manual in a readily accessible location for future reference.

## Foreword

This manual is to be used as a guideline for installation, operation, and maintenance of the Classic Outdoor Wood Furnace. This manual is organized into six sections for easy reference.

- Section 1 – Outdoor Furnace Installation;
- Section 2 – Operating Instructions;
- Section 3 – Maintenance Instructions;
- Section 4 – Owner Serviceable Items;
- Section 5 – Troubleshooting;
- Section 6 – General Information.

Anyone owning or operating this outdoor furnace must read, fully understand, and follow all of the information in this manual.

**NOTE: In higher populated areas, extend the chimney to a height above the roofs of surrounding buildings (see Outdoor Wood Furnace Best Burn Practices illustration, inside front cover).**

**NOTE: The outdoor furnace may be connected to an existing boiler system or hot water heating system by a qualified installer only. However, the outdoor furnace must not be pressurized.**

## EPA RESOURCES

**EPA's Burnwise Program** - <http://www.epa.gov/burnwise>

**How to Use a Moisture Meter Video** - <http://www.youtube.com/watch?v=jM2WGgRcnm0>

*EPA offers tips on how to properly use a moisture meter to test firewood before using in a wood-burning stove or fireplace. Wet wood can create excessive smoke which is wasted fuel.*

**Split, Stack, Cover and Store Video** - <http://www.youtube.com/watch?v=yo1--Zrh11s>

*EPA offers four simple steps to properly dry firewood before using in a wood-burning stove or fireplace. Wet wood can create excessive smoke which is wasted fuel. Burning dry, seasoned firewood with a moisture content of 20% or less can save money and help reduce harmful air pollution.*

**Wet Wood is a Waste brochure** - <http://www.epa.gov/burnwise/pdfs/wetwoodwastebrochure.pdf>

*This tri-fold brochure provides colorful illustrations of the four easy steps to dry firewood.*

**NOTE: The warranty can be voided by operating a residential hydronic heater in a manner inconsistent with the owner's manual.**

# IMPORTANT PRECAUTIONARY INFORMATION

The information contained on pages 5-6 appears throughout this manual. Be sure to read carefully and understand these precautions before, during and after the installation, operation and maintenance of the outdoor furnace.

## CAUTION

This outdoor furnace is not intended to be the only source of heat. Should the outdoor furnace be left unattended, run out of fuel or require service, an alternate heating source in the building being heated should be in place to prevent damage caused by freezing.

## WARNING

Outdoor furnace vent cap must fit loosely on the vent opening (Fig. 1). Do not force the cap down or try to seal it tightly onto the vent pipe. Do not extend or restrict the vent pipe or opening. **DO NOT ALLOW THE OUTDOOR FURNACE TO BE PRESSURIZED.**

Fig. 1



© 2008 Central Boiler

## WARNING

Be sure the outdoor furnace is filled with water before firing. Never fire the outdoor furnace when the water level is more than 1" below the FULL mark on the sight gauge. Corrosion Inhibitor Plus™ must be added before the initial fill (see Water Quality and Maintenance).

## WARNING

The Classic Outdoor Wood Furnace is not intended or certified to be installed inside a building.

## WARNING

This outdoor wood furnace and/or chimney **must not** be installed inside or under any configuration or construction that contains combustible materials as part of the structure or configuration. The chimney is not intended or safety tested to be used or installed other than on the furnace located outside of any structure or enclosure.

## WARNING

Disconnect the electrical power to the outdoor furnace before replacing an electrical component.

## WARNING

Allow the outdoor furnace to thoroughly cool and completely clean out the firebox before draining water from the outdoor furnace. If the water in the outdoor furnace ever boils, be sure to check the water level and restore to full. If water is added, the proper level of Corrosion Inhibitor Plus™ (p/n 1650) must be maintained.

## WARNING

When cleaning the outdoor furnace, be careful not to spill any coals.

## WARNING

**ALWAYS** store ashes in a covered non-combustible container.

## WARNING

When installing a heat exchanger on an existing hot water boiler, be sure none of the existing system safety controls are disabled.

**NOTE:** Any changes to an existing boiler and/or system should be done by a qualified installer in accordance with applicable codes.

## WARNING

Do not attempt service inside the electrical control panel without first disconnecting the electrical power at the main power source.

**NOTE:** Any electrical installation should be done by a qualified installer in accordance with applicable codes.

## WARNING

Do not allow combustible materials (straw, hay or wood) near the outdoor furnace. Keep the perimeter of the outdoor furnace clear and clean.

**NOTE:** All installations and operations must be in accordance with local and state codes which may differ from the information in this manual.

# **IMPORTANT PRECAUTIONARY INFORMATION**

The information contained on pages 5-6 appears throughout this manual. Be sure to read carefully and understand these precautions before, during and after the installation, operation and maintenance of the outdoor furnace.

## **WARNING**

Maintain the following clearances from combustibles for the furnace installation:

- 18" from the back
- 6" from the sides
- 48" from the front
- 18" from the chimney inspection cover
- The foundation must be noncombustible

## **WARNING**

For fire safety, keep all combustible materials at least six feet away from the outdoor furnace, especially around the door area. Debris of wood chips and other combustibles in the loading area may be easily ignited if a hot coal is spilled out of the firebox and left unnoticed.

## **WARNING**

The firebox door must be closed and latched at all times except when filling the firebox with wood. Leaving the firebox door open may lead to a runaway fire. In the event of a runaway fire, close the firebox door.

## **WARNING**

All covers must be maintained at all times except during maintenance, inspection and service.

## **WARNING**

Use only untreated wood in the firebox. Do not burn garbage, gasoline, rubber, engine oil, naptha, plastics, treated wood or combustibles other than wood.

**NOTE:** Chloride or sulfurous gases can be generated if plastic or rubber is burned and will mix with the moisture from the wood and form sulfuric or hydrochloric acids in the firebox, creating excessive corrosion.

**NOTE:** Do not use chemicals or fluids to start the fire. Use kindling and a small amount of paper to start an initial fire.

**NOTE:** This outdoor furnace is not to be used with an automatic stoker.

## **WARNING**

When adding wood to the firebox, be careful not to get pinched between the wood and the door frame, or any part of the outdoor furnace. Use extreme care with large pieces of wood that may be difficult to handle.

**NOTE:** The sight gauge valve should always be closed, except when checking water level. Water will automatically drain from the sight gauge tube when the valve is closed. Remember that this type of valve requires only 1/4 turn to open or close.

## **WARNING**

Sulfuric acid in the test kit is a corrosive acid. Handle carefully. Carefully read and follow precautions on test chemical labels. Keep test chemicals away from children. Safely dispose of tested samples.

**NOTE:** A 40-watt appliance light bulb is recommended if replacement is necessary. Do not install a bulb in excess of 60 watts.

**NOTE:** In case of a power outage, either a generator or 12V battery with a power inverter can be used to provide electricity to operate the outdoor furnace.

# SECTION 1 – OUTDOOR FURNACE INSTALLATION

To ensure the outdoor furnace functions as designed, careful planning and proper installation are imperative. This section outlines much of the information needed to install the outdoor furnace, select water lines, install circulation pumps and connect to your existing heating system.

Be sure to read carefully and observe all of the information, not only in this section, but in the entire owner's manual.

If any installation questions arise that cannot be answered by the information in this manual, be sure to contact your dealer.

## PLANNING THE LOCATION

When selecting a suitable location, carefully consider each of the following:

- Must be installed in accordance to all applicable codes and regulations.
- Check with your insurance company to see if they have any location requirements.
- Consider prevailing winds and the direction smoke will travel.
- The shorter the distance between the outdoor furnace and building(s) being heated, the lower the cost will be for the installation of the hot supply and return water lines and insulation.
- Be sure to maintain the required clearances to combustibles and recommended maintenance clearances.
- ThermoPEX pre-insulated piping is recommended for all installations. Other types of piping should not be buried in low-lying areas with standing water or with a very high water table, or under an area of heavy vehicle traffic unless protected from excessive compression.
- If the ground at the location is unstable or subject to frost heaving, consider installing 2" closed-cell insulation beneath the front portion of the slab and the area around the slab used for walking (see Fig. 4).

### INSTALLATIONS IN MASSACHUSETTS:

1. All installation components must be products approved in the Commonwealth of Massachusetts by the Gas and Plumbing Board.
2. The maximum run of tubing from the water heater to a fan coil is 50 linear feet.
3. Persons operating this hydronic heater are responsible for operation of the hydronic heater so as not to cause a condition of air pollution as defined in 310 CMR 7.01(1).

## INSTALLATION PRECAUTIONS

A qualified installer must perform the installation of this supplementary outdoor furnace and must determine how to install it to be compatible with the existing heating source.

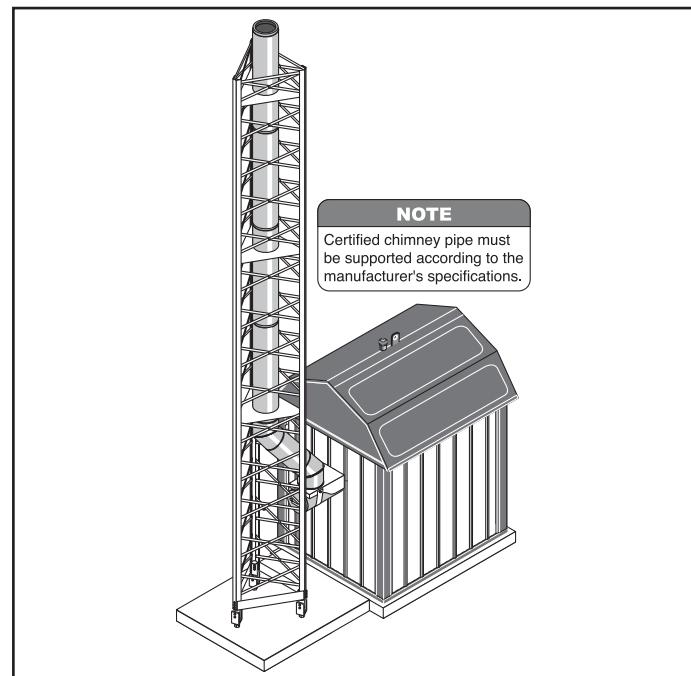
## CHIMNEY HEIGHT AND REINFORCEMENT RECOMMENDATIONS

In higher populated areas, extend the chimney to a height above the roofs of surrounding buildings. Use Central Boiler Chimney Extensions when extending the chimney. Each extension section must be secured at the connection joint with four (4) screws to stabilize the extension.

If extensions are added to the standard eight feet of chimney, the chimney should be reinforced appropriately. When adding sections of chimney, make sure that there is nothing within the fall zone of the chimney that could be damaged. If something is located within the fall zone and cannot be removed, guy wires or braces may need to be installed to prevent a falling chimney from causing damage. See Fig. 2 and 3 for chimney reinforcement recommendations.

**NOTE: If more than three 4-foot sections of chimney are used, a support (e.g., a pole, pipe or other structural support) may be installed from the ground that can withstand wind. Other reinforcement recommendations are shown in Fig. 3.**

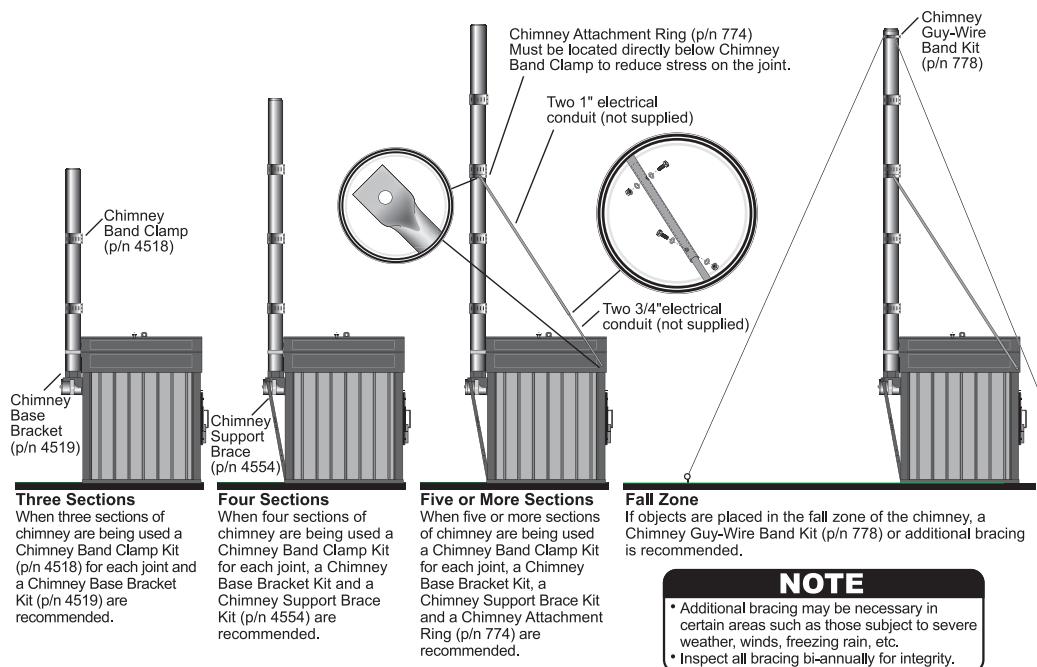
Fig. 2



**NOTE: For chimney extensions or chimney replacement, use only genuine Central Boiler chimney components. Parts are available from an authorized Central Boiler dealer.**

Fig. 3

## Chimney Reinforcement Recommendations



The installation of a spark arrester is recommended, particularly where there are dry conditions or where there is combustible material near the unit, unless the installation of a spark arrester is prohibited by local requirements. Use common sense to avoid potential fires, including exercising caution when disposing of ashes, cleaning and refueling. Keep all highly combustible materials (e.g., gasoline, propane, leaves, pine needles, etc.) away from an operating unit at all times. Take special precautions in windy conditions.

### GENERAL INSTALLATION INFORMATION

#### Foundation

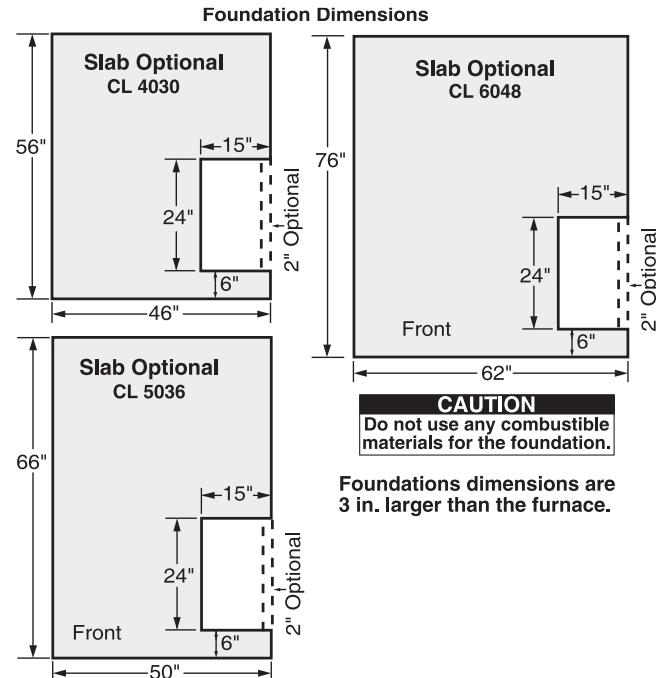
The outdoor furnace may be installed directly on **stable, level ground** without the necessity of a foundation.

If the ground is unstable, one option is to use patio blocks under the perimeter of the base. Another option is to pour a concrete foundation.

To install the furnace on a concrete foundation, refer to Fig. 4 for dimensions and for the location of the hollowed-out area for each model. A 4" to 6" thick concrete slab works well; however, a thicker slab may be used to obtain the desired door opening height.

If the area for the concrete slab is unstable and/or affected by frost heaving, consider installing 2" closed-cell insulation beneath the front portion of the slab and under the area of the ground used for walking.

Fig. 4



Outdoor furnace must be installed on a noncombustible surface or foundation that incorporates an enclosure that will prevent supply and return lines from possible exposure to sunlight, fire, or physical damage that may be caused by an occurrence outside the outdoor furnace enclosure. Foundation may consist of concrete, crushed rock, or patio blocks.

**NOTE:** The installation surface or foundation must be noncombustible. The hot supply and return lines must also be protected from possible exposure to sunlight, fire or physical damage. Foundations may consist of concrete, crushed rock or patio blocks.

## Potable Water

If the outdoor furnace is to heat potable water associated with commercial food preparation or for heating milk-house hot water, it is recommended to install a double-wall heat exchanger. Also, when filling the system with water, a backflow preventer must be installed in the line used for filling.

## Antifreeze

Most outdoor furnaces are installed without antifreeze when an existing heating system is in place and there is no anticipation of leaving the outdoor furnace unattended for extended periods of time. If the building being heated has an alternate heat source, system water may be kept from freezing by running the circulating pump(s) and drawing heat from the existing heat emitter(s).

To prevent freezing if the outdoor furnace is not fired for extended time periods or if lengthy power outages are anticipated during cold weather, a nontoxic propylene glycol boiler-type may be used in the system. Some types of antifreeze that contain various inhibitors have been known to create problems like coagulation and jelling. To prevent potential problems, **do not use** propylene glycol that is premixed with unknown inhibitors. Central Boiler Corrosion Inhibitor Plus (p/n 1650) is compatible with straight propylene glycol. It is important to use Corrosion Inhibitor Plus with straight propylene glycol for corrosion protection. If adding antifreeze to the system, it is imperative that the entire system contain at least 30% antifreeze concentration mixed with softened water to prevent bacterial growth and minimize minerals in the system. Bacterial growth is likely to occur with low antifreeze concentrations and can cause corrosion in the furnace water jacket and/or clogging of heat exchangers. To confirm the antifreeze solution is adequate, allow the pumps to circulate for at least 24 hours and then obtain a sample of the system water. Using an antifreeze tester, the solution must be protected to 0°F (-18°C) or below.

**NOTE: Be sure to adhere to all warnings and precautions on the antifreeze label.**

**NOTE: Do not use automotive or RV types of antifreeze.**

**NOTE: If using antifreeze, use Test Kit (p/n 597) when testing the treated water in the outdoor furnace (see Water Quality and Maintenance).**

## Corrosion Inhibitor Plus™

To aid in protecting the system from corrosion, it is imperative to add Central Boiler Corrosion Inhibitor Plus™ (p/n 1650). For recommended initial treatment rates, refer to Water Quality and Maintenance.

When initially filling the system (see Finalizing the Installation), add the Corrosion Inhibitor Plus™ **before adding water** to the system. Any time water is added to the system, Corrosion Inhibitor Plus™ must be added if a tested water sample indicates it is necessary (see Water Quality and Maintenance).

Corrosion Inhibitor Plus™ is composed of common materials and is biodegradable. However, in keeping with good safety and environmental practices, the supplier recommends the following if draining treated system water becomes necessary:

- You may drain the outdoor furnace to a home septic system. Central Boiler Corrosion Inhibitor Plus™ is biodegradable and can be properly treated in a residential septic system. If doing so, however, be careful not to overflow the tank.
- Do not drain the furnace in such a manner that the drain water could in any way contact surface water, stream, river, estuary (where a river meets a sea), lake, pond, ocean or other types of waters.
- Do not drain to any location within 50 feet of any water well.

## Shut-Off Valves

**Shut-off valves must be installed on each hot supply and return water line** so each line can be shut off individually for purging air from the system. Be sure all valves and fittings are metal. **Do not use plastic valves or fittings.**

## Ground Rod Kit

The outdoor furnace must be electrically bonded to ground in accordance with the requirements of the authority having jurisdiction or, in absence of such requirements, with the National Electrical Code, ANSI/NFPA 70 and/or the Canadian Electrical Code Part 1, CSA C22.1 Electrical Code.

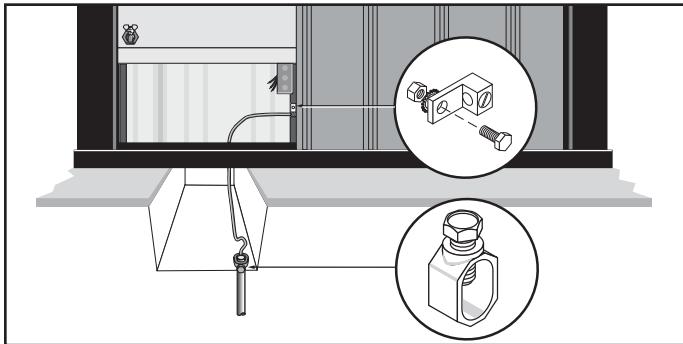
Install a Ground Rod Kit (p/n 6593) and connect it to the outdoor furnace.

1. In the water line trench near the outdoor furnace, drive the ground rod into the ground until the top of the ground rod is below the ground surface.
2. Route the ground wire from the ground rod under the outdoor furnace base and over to either a vertical brace or the frame of the outdoor furnace.

**NOTE: On some models, a 1/4" hole for the ground terminal has been pre-drilled in the outdoor furnace base. Check to see if there is an existing 1/4" hole before drilling the hole in Step 3.**

3. Drill a 1/4" hole in the brace; then secure the ground terminal with a cap screw (1/4" x 20" x 3/4"), star washer and nut. Secure the ground wire to the terminal; then secure the ground wire to the ground rod with the clamp. Tighten all hardware securely.

Fig. 5



## SUPPLY AND RETURN LINES

Determine the configuration of the supply and return lines from the outdoor furnace to where the supply and return lines will connect to the existing heating system. Central Boiler recommends using the ThermoPEX® piping system.

**ThermoPEX** is a fully assembled, pre-insulated piping system consisting of two 1" Central PEX lines or two 1-1/4" PEX lines. The two lines (one a supply and one a return line) are insulated with high-density urethane insulation and a thick, durable, waterproof, polyethylene outer jacket. One of the lines is marked with a black stripe for identification.

**NOTE: To prevent ground water from entering the house, do not use drain tile, PVC pipe with bubble wrap, or any other inferior material for insulating the water lines.**

**NOTE: If the outdoor furnace supply and return lines are not insulated properly, or if other brands of insulated piping are used, there can be excessive heat loss. This heat loss can greatly increase the fuel consumption.**

**NOTE: If it is unavoidable that the trench will run through an area of ponding water, use ThermoPEX instead of other materials. ThermoPEX should also be used for above-ground or winter installations, and if the area is likely to be affected by compaction.**

## Temporary Above Ground or Winter Installations

For temporary above ground or winter installations in which the supply and return lines can not immediately be buried underground, Central Boiler recommends using ThermoPEX. Be sure that both the insulation and the supply and return lines will not be exposed to ultraviolet rays.

The ThermoPEX black exterior jacket has UV protection but the insulation and water lines inside do not. Use a ThermoPEX termination cap at each end of the installation to protect and seal the insulation from water.

**NOTE: Bury the ThermoPEX as soon as conditions permit (e.g., once the ground has thawed).**

**NOTE: If ThermoPEX is installed temporarily above ground, provisions should be made to prevent possible risk of fire coming into contact with the ThermoPEX. ThermoPEX is constructed of materials that can burn and transfer a fire.**

## CAUTION

**If ThermoPEX is installed temporarily above ground, do not cover with combustible materials (e.g., straw, hay, leaves, etc.).**

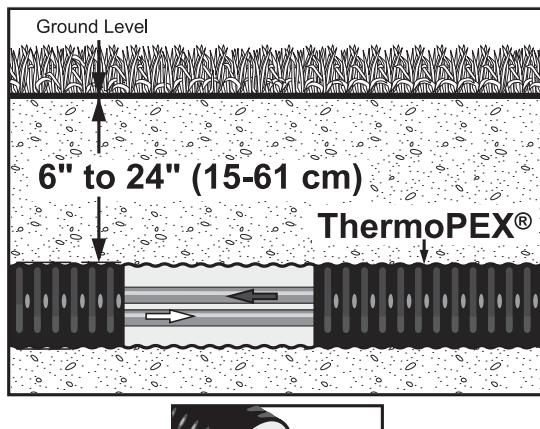
## Digging the Trench

## WARNING

**Before digging, be sure to call for utility locator service.**

The trench depth for ThermoPEX should be between 10" and 28" (25 and 71 cm).

Fig. 6



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## Underground Electric Wire

A 14-2 (two wires plus ground) underground rated wire should supply the outdoor furnace with electricity. A heavier gauge wire may be needed if the run is over 200 feet (61 meters). Check local codes and requirements. It is recommended that the incoming fuse or circuit breaker not exceed 15 amps.

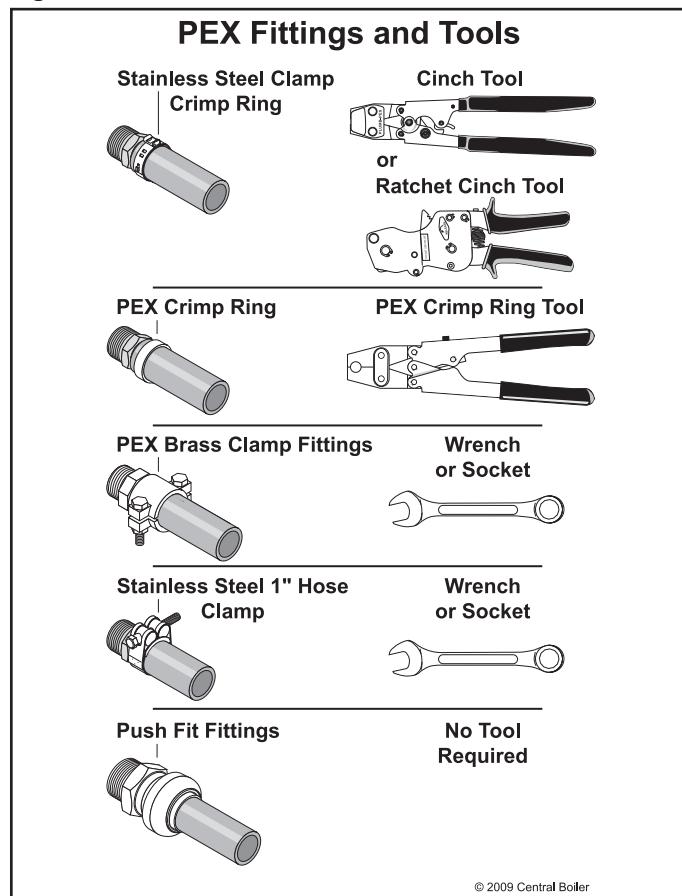
## Connecting to Existing Heating System

1. Make an entrance into the building(s) where the supply and return lines are to enter.
2. Lay the ThermoPEX assembly in the trench and feed one end into the building. Apply sealant around the supply and return lines where they enter the building.
3. Purge the supply and return lines before connecting any fittings to ensure there is no debris or foreign matter present.

**NOTE: All holes made in basement or building walls must be sealed completely to prevent water from entering the building.**

4. Close all valves on the outdoor furnace.
5. Install fittings to allow pressure-testing of both supply and return lines. Pressurize with 50 psi (3.5 kg/cm<sup>2</sup>) of air; then check after 30 minutes to see if pressure has dropped. A drop in pressure indicates a leak; repair as necessary.
6. Connect the supply and return lines to the outdoor furnace and the existing heat emitter(s). Fig. 7 shows some of the PEX fittings and tools used in making connections.

Fig. 7



## CAUTION

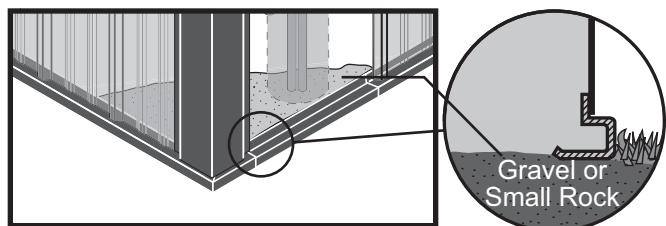
**Allow for expansion and contraction of the supply and return lines at each end. Without an allowance for expansion and contraction, the lines may kink or the fittings may be pulled apart, causing an immediate water loss from the outdoor furnace. Central PEX water lines can have an expansion and contraction rate up to .095" per each 100 ft and each 10°F (2.4 mm/30 m/5.5°C).**

7. Make sure there are no leaks in the supply and return lines; then backfill the trench.

**NOTE: Do not backfill the trench until the supply and return lines have been tested to ensure there are no leaks.**

8. Install the base trim; then, using gravel or small rock, backfill the perimeter of the ThermoPEX line enclosure to the bottom, inner edge of the base (Fig. 8). Install the siding panel.

Fig. 8



## CIRCULATION PUMPS

**NOTE: The direction of water flow is very important for the proper operation of the outdoor furnace. Installing a swing check valve in the return line can prevent possible reverse flow.**

### Water Flow

For a single building water-to-air heat exchanger system with a domestic water heater, the direction of water flow must go from the hot outlet on the outdoor furnace to the lower side fitting of the domestic water heater exchanger, to the lower fitting of the heat exchanger in the plenum of the existing furnace, and then to the return port of the outdoor furnace.

**NOTE: Some systems may have different flow patterns.**

### Access to Ports on Outdoor Furnace

The upper ports are the hot supply outlets and the lower ports are the return inlets. This configuration allows for mounting the circulation pumps on the outdoor furnace. Fig. 9 through Fig. 13 show different configurations for proper supply and return line and pump installations.

The Taco 009 is a medium flow, high head pressure pump that requires an adequate amount of pressure on the outlet side to prevent the motor from overloading.

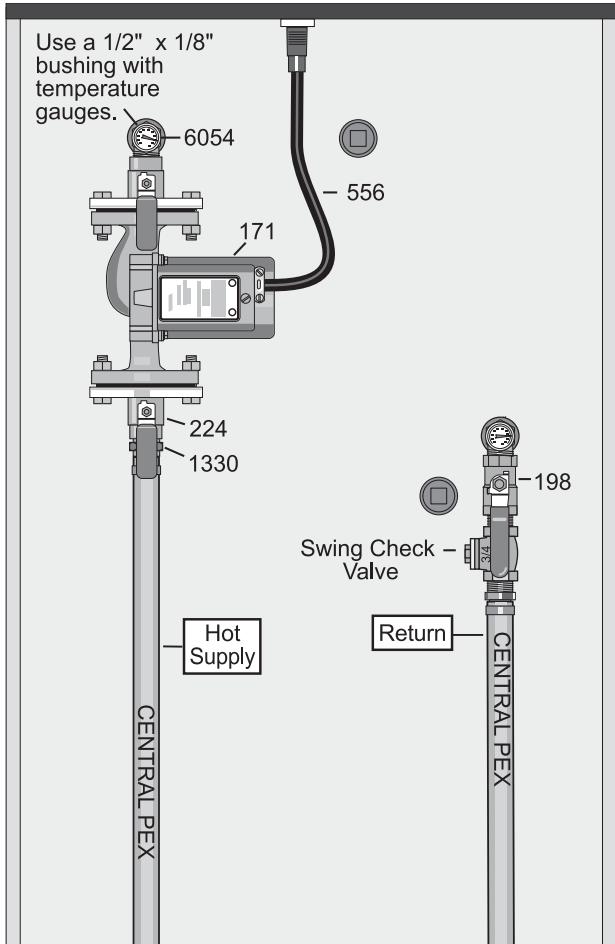
The Taco 014 is a high flow, high head pressure pump that requires an adequate amount of head pressure on the inlet side to prevent cavitation. Therefore, a Taco 014 may need to be mounted lower near the base of the furnace, and on the 1-1/4" bung.

The Taco 007 is a medium to high flow, low head pressure pump. In a very low-resistance system (e.g., short length of supply and return lines, only a flat plate heat exchanger, etc.), the 007 pump may need to be mounted lower near the base of the furnace or on the 1-1/4" bung to prevent cavitation at high water temperatures.

**NOTE: See the Hydronic Component Selection Guide (p/n 2482) for more information.**

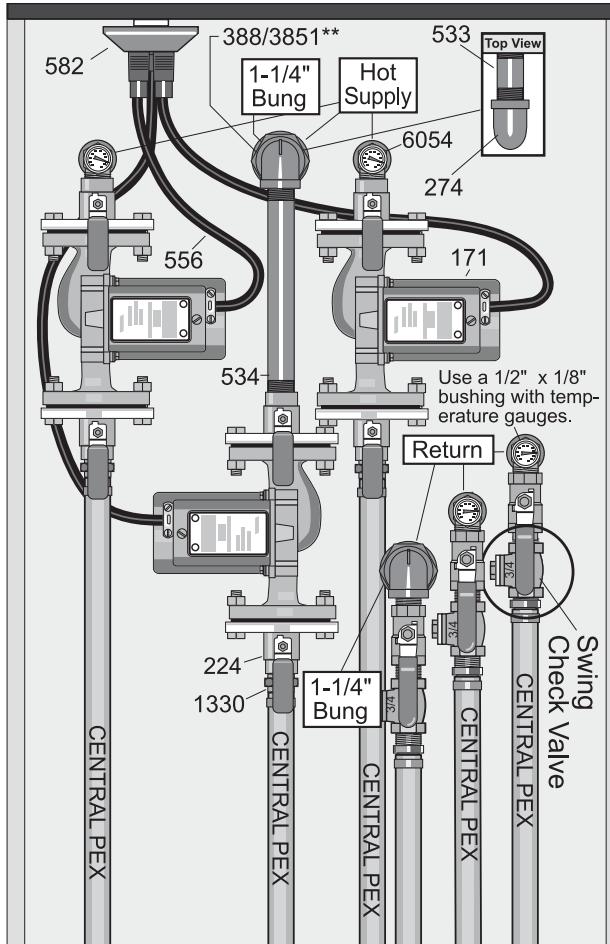
## 1 - Pump Configuration (Taco 007)

Fig. 9



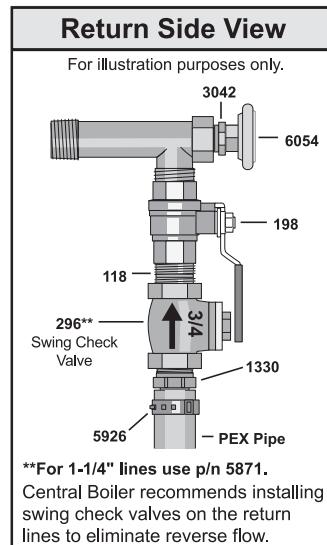
## 3- Pump Configuration (Taco 007)

Fig. 10



## 1 - Pump and 3- Pump Parts List (Taco 007)

Fig. 11



Power disconnect shuts off all power including pumps.

1 - Pump Parts List*		
Qty	p/n	Description
1	118	3/4" Close Nipple
1	171	007 Pump
2	198	3/4" Ball Valve
1	224	3/4" Isolation Flange Kits
1	296	3/4" Swing Check Valve
1	556	Power Supply Cord, 32"
2	1330	3/4" x 1" MPT to PEX
2	3042	1/2" x 1/8" Bushing
2	6054	Temperature Gauge
1	6593	Grounding Rod Kit

3 - Pump Parts List*		
Qty	p/n	Description
3	118	3/4" Close Nipple
3	171	007 Pump
3	198	3/4" Ball Valve
3	224	3/4" Isolation Flange Kits
3	274	3/4" Black 90° Street Elbow
3	296	3/4" Swing Check Valve
2	388	1-1/4" x 3/4" Bushing
1	534	3/4" x 7" Nipple
3	556	Power Supply Cord, 32"
1	582	6 Outlet Converter
6	1330	3/4" x 1" MPT to PEX
4	3042	1/2" x 1/8" Bushing
4	6054	Temperature Gauge
1	6593	Grounding Rod Kit
2	6764	3/4" x 3/4" x 1/2" Offset Tee

\*Parts and accessories sold separately.  
Pump size may vary.

### **Thermostatic Valves**

**NOTE: A 3/4" thermostatic valve with installation instructions is included with each new Classic outdoor furnace and must be installed on each set of supply and return lines or warranty can be voided.**

**NOTE: For additional thermostatic valves, or for 1-1/4" thermostatic valves, contact your authorized Central Boiler dealer.**

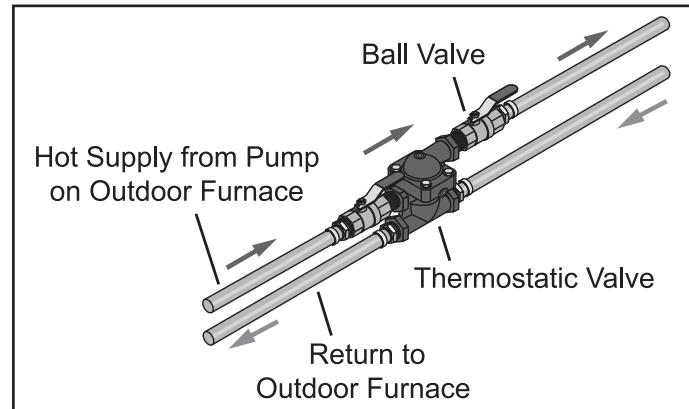
**NOTE: The thermostatic valves illustrated throughout the manual may vary from your installation. See the installation instructions provided with the thermostatic valve.**

A thermostatic valve must be installed on each set of supply and return lines in the system to maintain the outdoor furnace water temperature above 150°F (65°C). Operating the outdoor furnace with the water temperature less than 150°F (65°C) may result in more condensation in the firebox that can lead to corrosion.

**NOTE: The thermostatic valve must be installed in the building to be heated.**

It is recommended that the water temperature setpoint of the furnace be set to 185°F (85°C) to decrease the likelihood of the water falling to 150°F (65°C). As a result, the outdoor furnace will operate with a greater efficiency and require less maintenance. Failure to follow proper operating instructions may result in furnace damage.

Fig. 20



### **Thermostatic Valve Exemption**

If the system includes more than one building and one of the buildings is heated with an oil, gas or electric boiler that also serves as a backup for the other building(s) by keeping the system water temperature above 150°F (65°C) when the outdoor wood furnace is not fired, the thermostatic valve is not required.

## Direct Circulation Baseboard Installation

Baseboard heaters, as either the main source of heat or as supplements to forced-air or boiler applications are easily plumbed into the water lines from the outdoor furnace.

Fig. 31

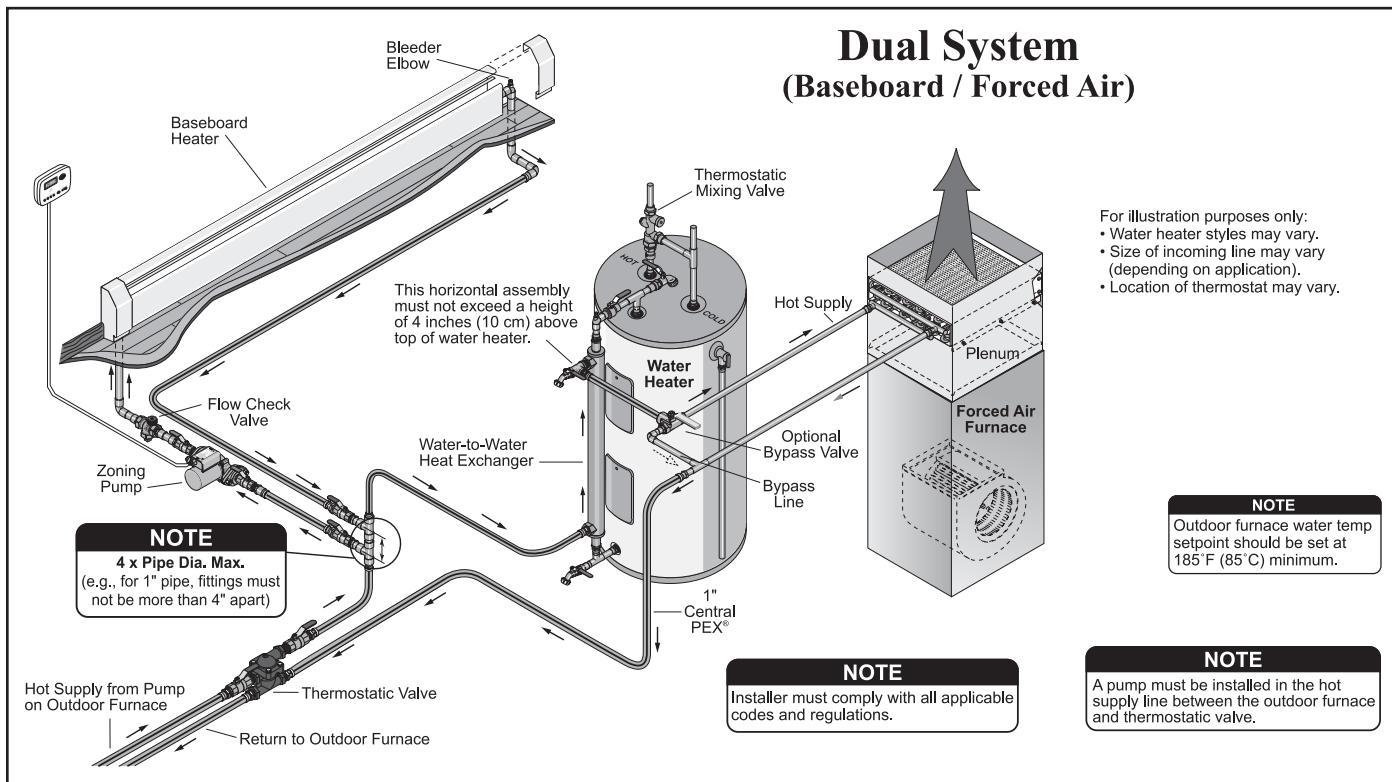


Fig. 32

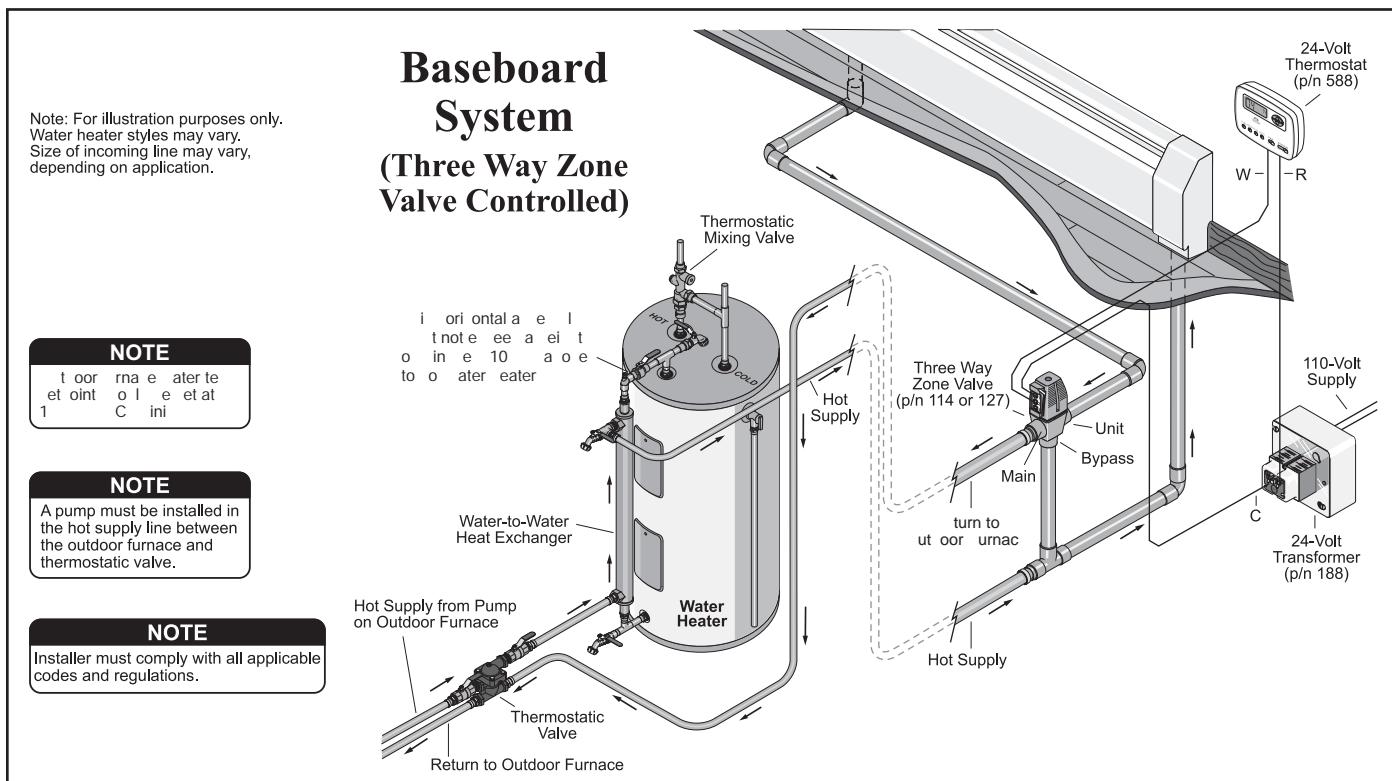


Fig. 31 and 32 illustrate direct circulation baseboard installation examples.

Fig. 34

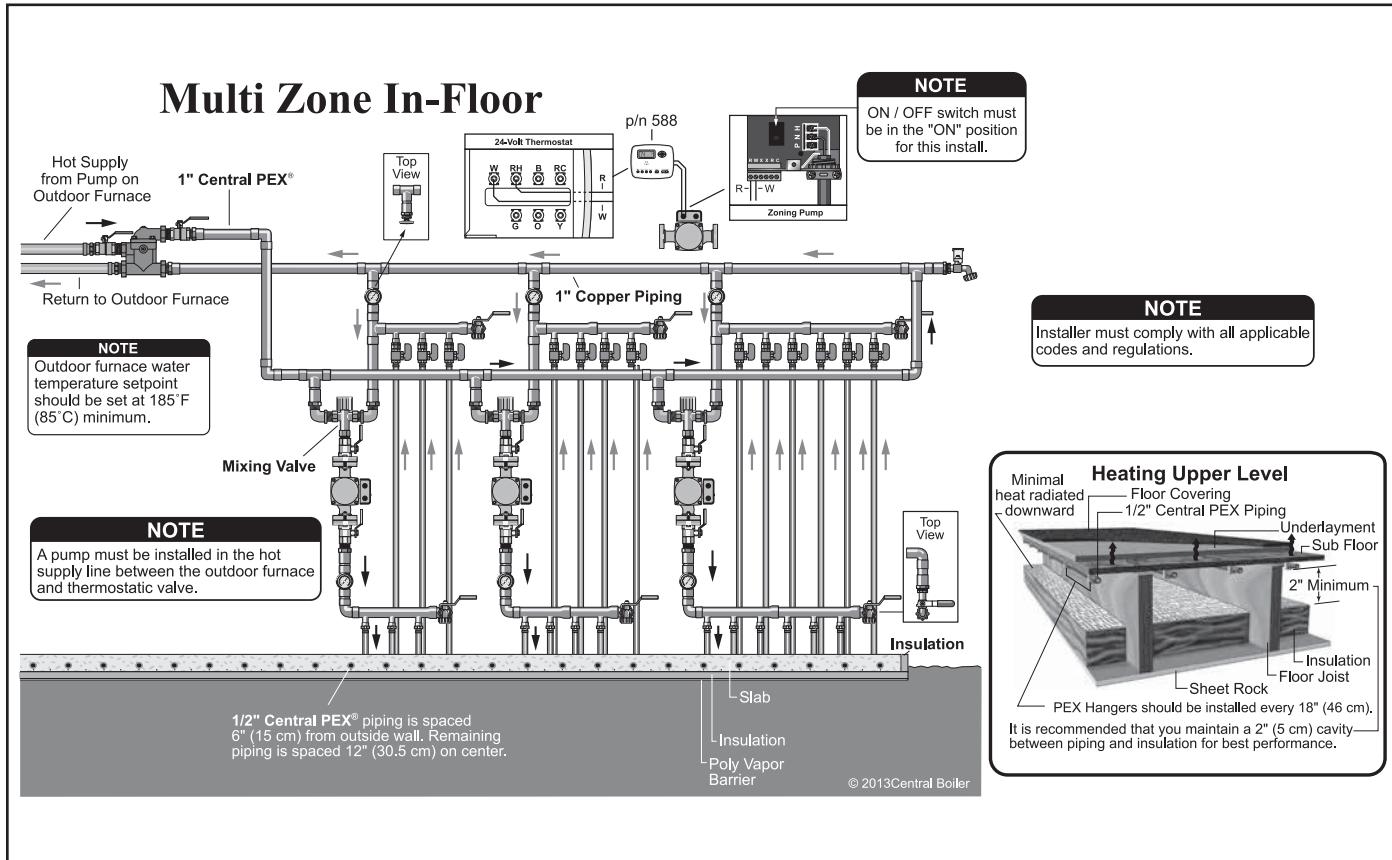
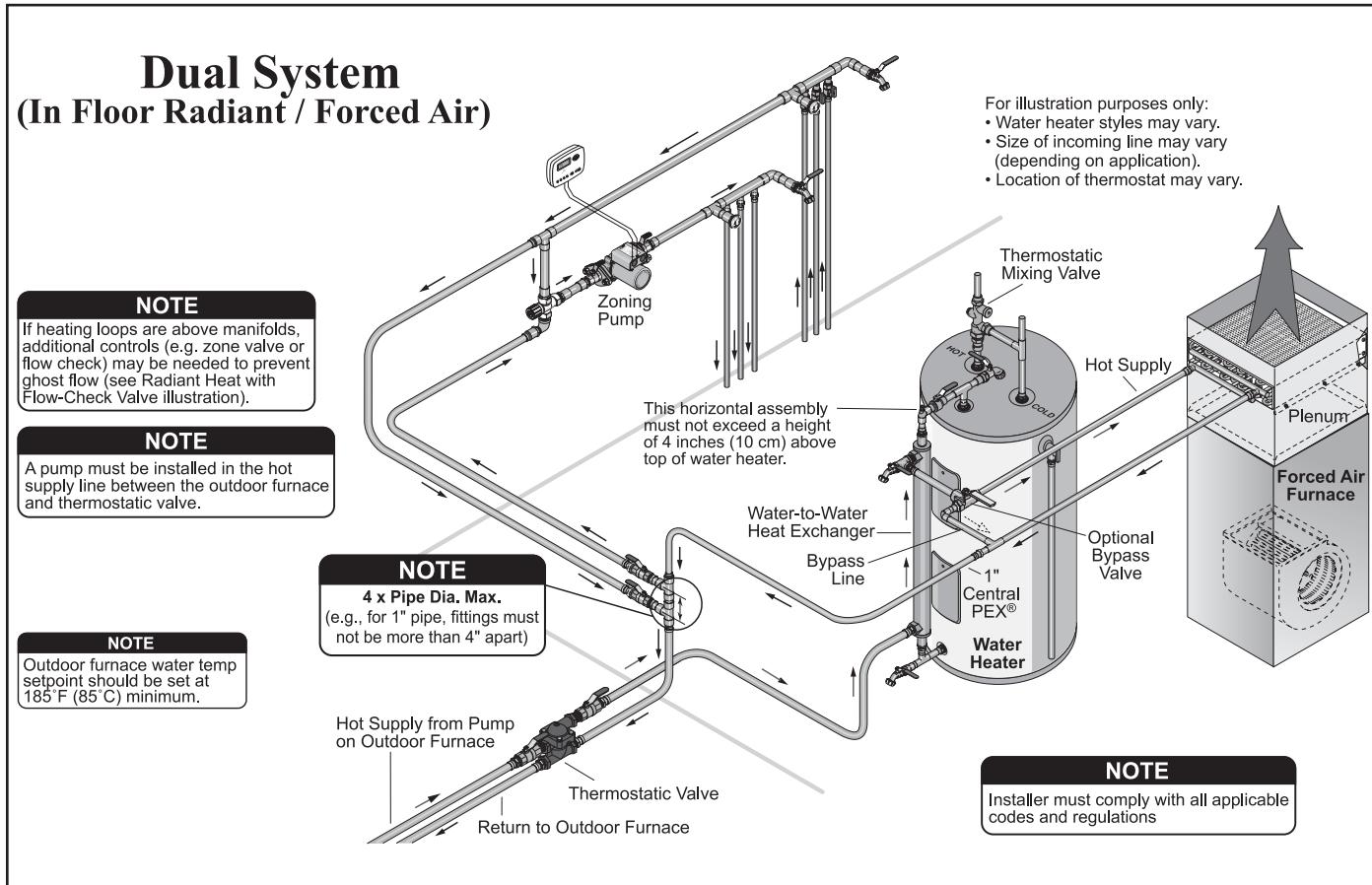
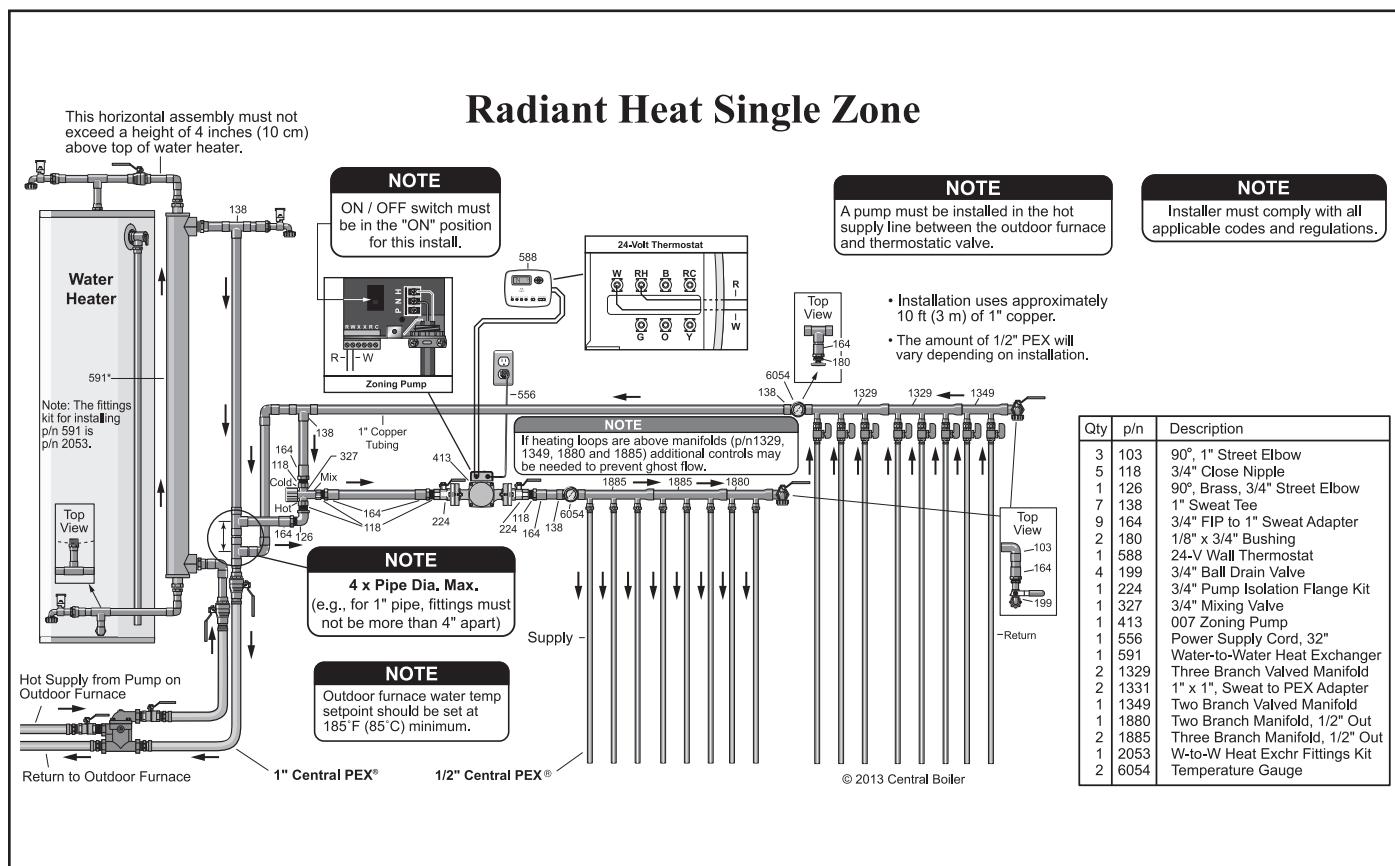


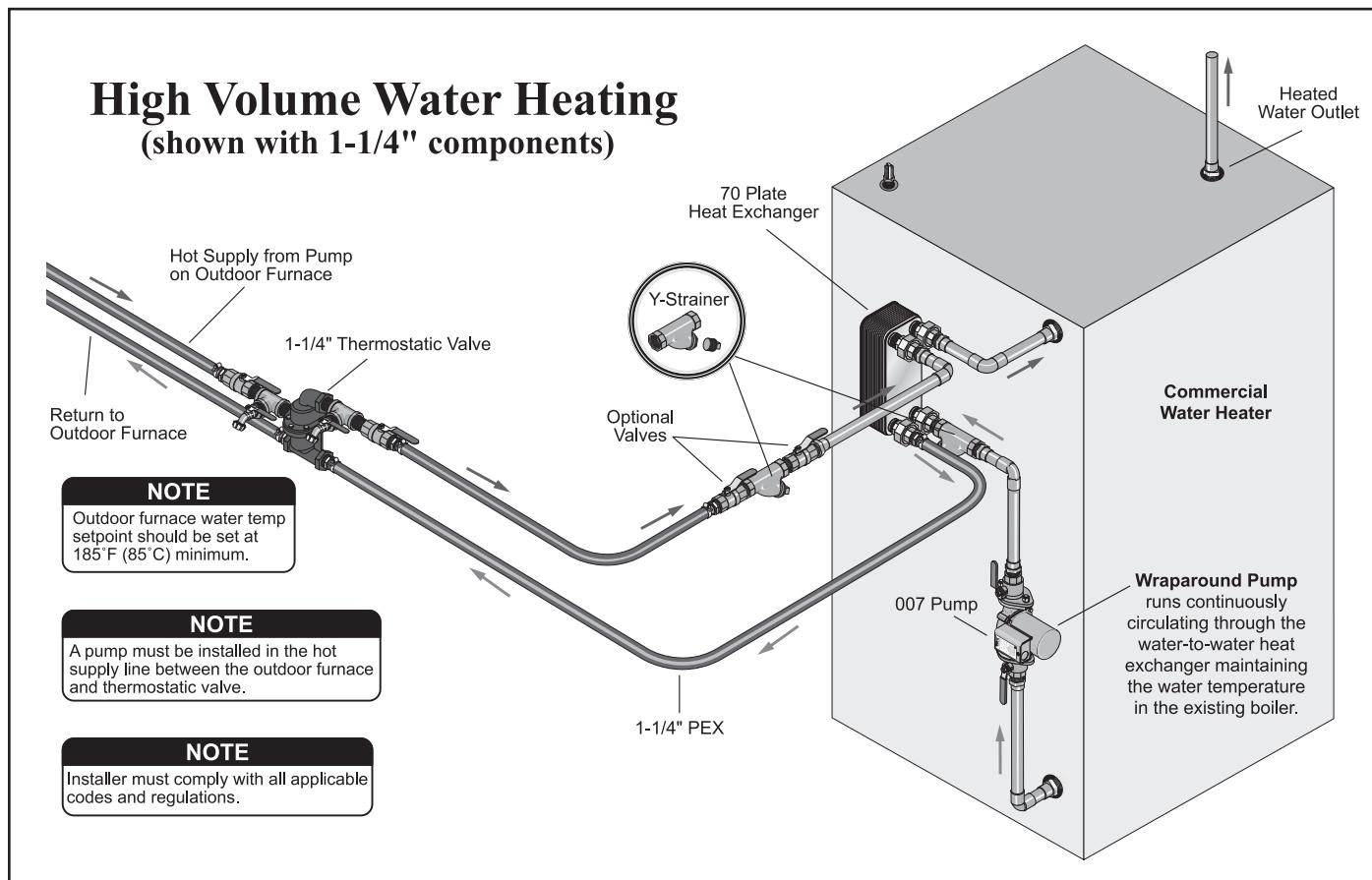
Fig. 35



**Fig. 36**



**Fig. 37**



## Pool and/or Hot Tub Heating

Valves should be installed so the heat exchanger can be isolated and bypassed when shock-treating or adding chemicals to a pool or hot tub (Fig. 38). Incorrect chemical concentrations can cause rapid corrosion to the heat exchanger. Bypassing the heat exchanger is recommended until the pH has stabilized between 7.2 and 7.8.

If the swimming pool or hot tub is salt water treated, the heat exchanger should be a shell and tube type (p/n 148, 151 or 177). See the Hydronic Component Selection Guide (p/n 2482) for more information.

### CAUTION

**Do not install a swimming pool heat exchanger inside a home or building below the level of the pool as a damaged heat exchanger may result in extensive flooding and draining of the pool.**

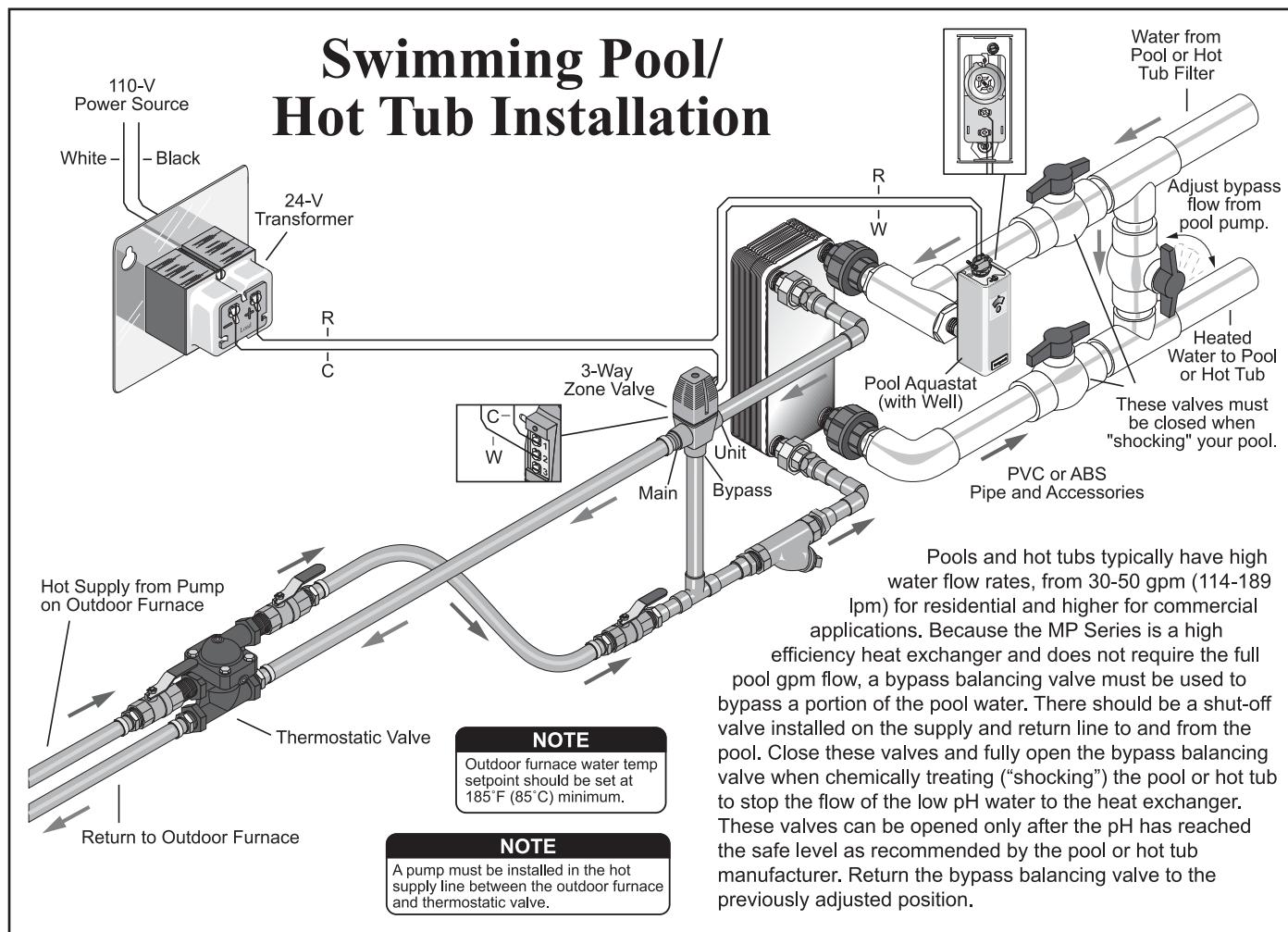
### WARNING

**Do not use automotive or ethylene glycol antifreeze in an outdoor furnace connected to a swimming pool heat exchanger as a damaged heat exchanger may cause severe personal injury, death, or substantial property damage.**

### CAUTION

**Do not operate the outdoor furnace frequently or for extended periods of time with the water temperature below 150°F (65°C) as this will result in more condensation in the firebox that can lead to corrosion.**

Fig. 38

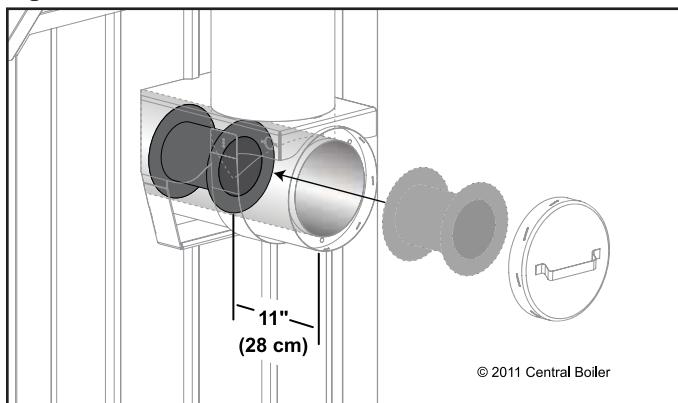


## FINALIZING THE INSTALLATION

Before firing the outdoor furnace for the first time, perform the following important steps:

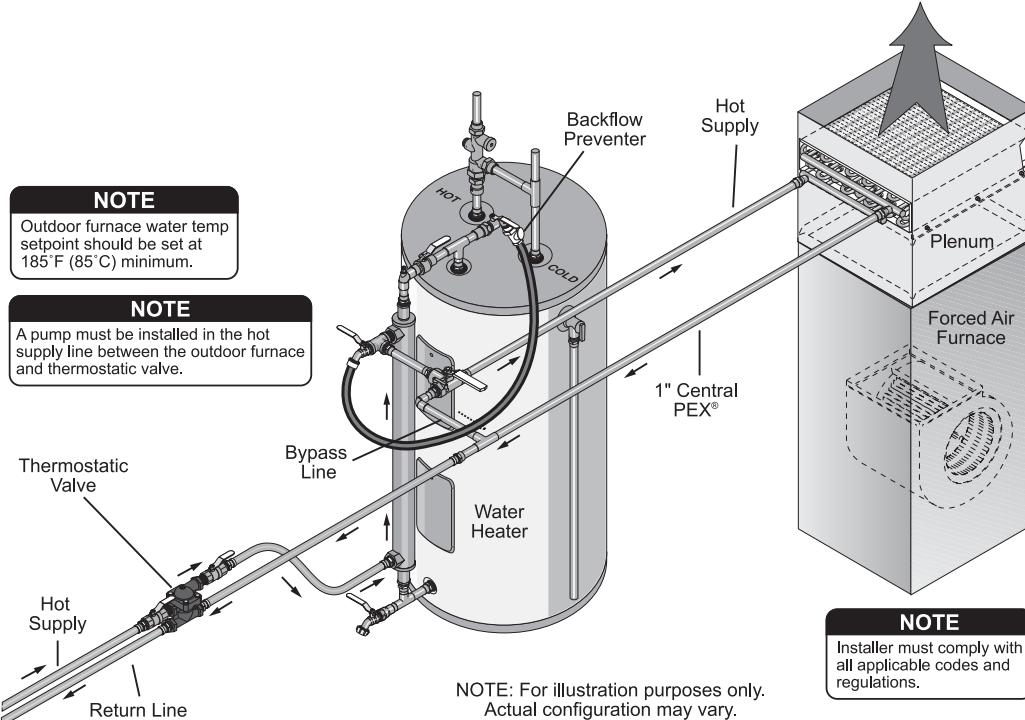
- 1. Remove the strapping securing the vent cap.** The vent cap must fit loosely over the outdoor furnace vent.
- 2. 4030 Models Only -** Remove and discard the shipping tape securing the chimney restrictor; then position the chimney restrictor about 11" in from the end of the chimney tee as shown in Fig. 39.

Fig. 39



- 3. Check for leaks.** Close the valves on the outdoor furnace before checking for leaks. Do not pressurize the outdoor furnace. Pressure-test the entire plumbing system. Apply 50 psi ( $3.5 \text{ kg/cm}^2$ ) of air pressure for thirty minutes and closely monitor for any pressure loss. Inspect all fittings and hose ends for any signs of leakage using leak detection solution (leak soap); repair as necessary.

Fig. 40



- 4. Cover Supply and Return Lines.** Backfill the trench for the supply and return lines. Enclose the area where the supply and return lines enter the outdoor furnace. Do not leave the PEX hot supply and return lines exposed to sunlight as exposure to UV rays will damage them.
- 5. Add Corrosion Inhibitor Plus™.** Add Corrosion Inhibitor Plus™ (p/n 1650) through the 2-inch vent pipe on the outdoor furnace before filling with water to immediately begin to protect the steel. Refer to Water Quality and Maintenance.
- 6. Fill with water, purge air from system and verify flow direction of the water.** See Filling Outdoor Furnace with Water and Purging Air for details.

## FILLING OUTDOOR FURNACE WITH WATER AND PURGING AIR

All air must be purged from the water lines when filling the system. Also, the circulation pump(s) must be installed in the hot supply line(s).

**NOTE:** Refer to Fig. 40 when performing these steps.

**NOTE:** If using the valve on the water heater to fill the outdoor furnace, flush the water heater to remove all sediment before filling the outdoor furnace.

**NOTE:** If the outdoor furnace is being filled with water when the temperature is below freezing, circulate the water immediately after filling to prevent freezing the water lines.

**NOTE: Be sure to fill the outdoor furnace with water of good quality (softened water, if possible). See Water Quality and Maintenance section.**

Use the following procedure to fill the outdoor furnace with water and purge the air from the system. Be sure to purge the air from each pump circuit from the outdoor furnace. All valves in the outdoor furnace system should be opened before starting this procedure.

1. Connect a hose with two female ends and a backflow preventer inline to the pressurized domestic water line. Run water into a pail or other container until clear; then connect to the system.
2. Close the valve on the hot supply line of the outdoor furnace.
3. Open the two valves that allow the pressurized domestic water to fill into the system (water will start entering the outdoor furnace through the return line).
4. Confirm the direction of the water flow through the system by feeling the temperature along the direction of the system flow at the water lines, heat exchanger and return port on the outdoor furnace. If the parts of the system in the opposite direction are changing temperature, then the supply and return lines are reversed and should be corrected.
5. Let the outdoor furnace fill through the return line for about five minutes.
6. Close the valve on the return line of the outdoor furnace (both valves will now be closed) while the water is still entering the outdoor furnace.
7. Open the valve on the hot supply line of the outdoor furnace. Confirm the flow direction on the supply side at the water-to-water heat exchanger and supply port on the outdoor furnace.
8. Fill for 5 minutes; then, if more than one pump circuit is present, close the valves and repeat the process for each pump circuit. Once all pump circuits have been purged with water, continue filling the outdoor furnace until the water level reaches one inch (2.5 cm) below the FULL mark on the sight gauge to allow for expansion of water as it heats up.
9. Close the two filling valves.
10. Open all valves on the outdoor furnace and turn on the circulation pump(s). This will allow the water to circulate throughout the outdoor furnace system when the pump(s) are operating.
- NOTE: At this point, water should not be allowed to circulate through the existing heating system.**
11. Test all piping to the dual fuel burner for leaks and repair as required. Purge all air from the piping.

12. Refer to Firing the Outdoor Furnace to start the outdoor furnace. Cycle the furnace several times to ensure proper operation. Do a functional test of each control position on the four-position switch to ensure proper operation.

## CAUTION

**Be sure the outdoor furnace is filled with water before firing. Never fire the outdoor furnace when the water level is more than 1" (2.5 cm) below the FULL mark on the sight gauge.**

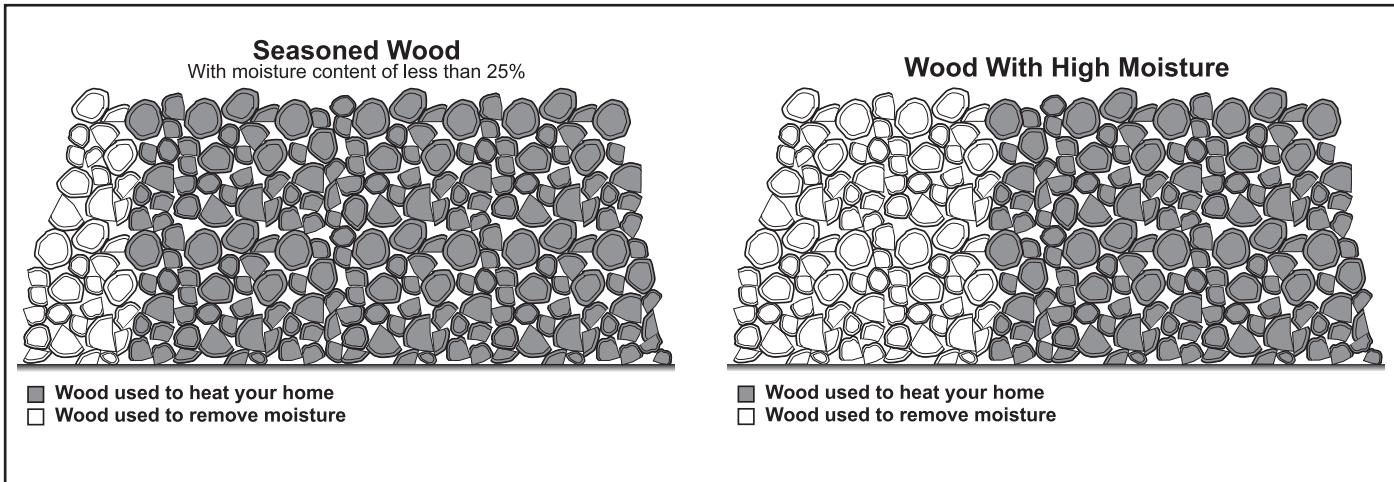
**NOTE: The sight gauge valve should always be closed except when checking water level. Water will automatically drain from the sight gauge tube. Remember that this type of valve requires only 1/4 turn to open or close.**

13. Check the system for leaks again. Inspect all fittings and hose ends for any signs of leakage; repair as necessary. It may be possible to stop a very slow leak at a hose clamp by tightening the clamp after the system has warmed up and the poly becomes more pliable. It might also be necessary to install a second hose clamp with the screw positioned on the opposite side. Release the pressure upon completion of the test.

**NOTE: It should not be necessary to add water to the outdoor furnace more frequently than once every twelve months. If it is more frequent, either there is a leak in the system or the outdoor furnace is boiling because of improper operation or maintenance (see Troubleshooting Section). Be sure to locate and repair the problem immediately. Frequently adding water can cause deterioration in the water jacket. Each time water is added, refer to Water Quality and Maintenance for water testing procedures. If indicated by test results, add Corrosion Inhibitor Plus™ as required. Deterioration due to improper operation and/or maintenance is not covered by warranty.**

## SECTION 2 – OPERATING INSTRUCTIONS

Fig. 41



### Wood Selection and Preparation

For the best results, it is best to burn seasoned split wood. However, it may be possible to burn some unsplit wood with the split wood depending on quality, size, moisture content and wood type. Properly seasoned wood contains less than 25% moisture by weight. Most wood needs to be split to dry down to 25% within a year. Wood between 4" and 8" (10 and 20 cm) in diameter works well in most cases. Pieces of wood that are too large can reduce output capacity because they burn slower.

- Seasoned wood burns more efficiently, minimizes the amount of creosote formation, reduces emissions and extends the life of the outdoor furnace.
- Maintain a quantity of smaller, drier pieces of wood for relighting the fire and for other situations when larger pieces of wood don't work as well.
- The larger the heat load on the outdoor furnace, the drier the wood needs to be in order to maintain an adequate glowing coal bed.

Following are some reasons that green, unseasoned wood should not be used:

- Green wood contains about 50% moisture by weight. Energy is required to heat the wood and evaporate the moisture - energy which could have been used to provide heat for the home. The illustration below shows that burning drier, seasoned wood provides more energy for heating your home compared with burning green, unseasoned wood that uses more energy to evaporate the moisture and provides less energy for heating your home.
- Unseasoned wood provides less heat, resulting in more condensates (moisture) in the firebox and increased wood consumption.

- Increased moisture in the firebox can result in corrosion.
- Unseasoned wood causes reduced performance, lower combustion rates and lower heat output.
- The full heating potential is unlikely to be achieved with unseasoned wood.
- Burning wood with an excessively high moisture content increases maintenance requirements and can lower the service life of the outdoor furnace.
- The higher the moisture content of the wood being burned, the harder it is to maintain a glowing coal bed because it burns more slowly.

**NOTE: Do not store wood within the outdoor furnace installation clearances or within the spaces required for fueling, ash removal and other routine maintenance operations.**

## FIRING THE FURNACE

**NOTE:** Before firing the outdoor furnace for the first time, make sure the proper amount of Corrosion Inhibitor Plus™ has been added and the water level is 1" below the full mark on the sight gauge.

### CAUTION

**Do not burn plastic, garbage, treated wood or fuels not listed for this outdoor furnace.**

The outdoor furnace is equipped with a digital temperature controller that closes the outdoor furnace damper when the water temperature reaches the controller's setting. The setting can be adjusted so the outdoor furnace will operate with a water temperature within a range of 150°F-195°F.

### CAUTION

**If the water in the outdoor furnace boils, be sure to check the water level and restore to full. Add Corrosion Inhibitor Plus™ (p/n 1650) as needed (see Water Quality and Maintenance).**

1. The first time you fire the outdoor furnace, place dry kindling wood near the front of the firebox. Use a small amount of paper to light fire.
2. Add larger pieces of wood to the fire but do not fill the firebox completely.
3. When the water temperature reaches the controller setting (185°F) and the damper closes, let the outdoor furnace cycle a few times to be sure it is operating properly; then add more wood.
4. After a few days of operation you will begin to learn how much wood is needed each day. If you only add the amount needed, it is easier to stir the ashes along the sides of the firebox and then to pull them forward (see Firebox Maintenance).

**NOTE: Be sure to clean and inspect the firebox as outlined in Section 3.**

### CAUTION

**Failure to clean the firebox as indicated will result in excessive corrosion.**

Periodically during the normal operation of the outdoor furnace, look at the water temperature display. It should indicate a reading that is within 10°F of the controller setting.

A reading of 212°F or above indicates either a low-water condition or a malfunctioning temperature controller or snap disc (unless the door is open or not sealing properly). If the condition persists and the water level is correct, call your dealer for service.

## FILLING THE FIREBOX

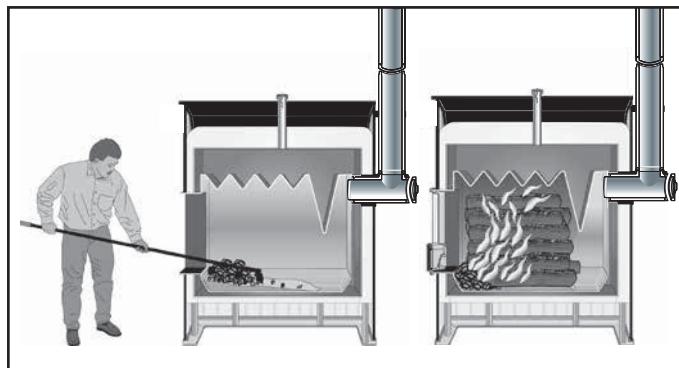
Prior to filling the firebox with wood, always pull the hot coals forward to the draft area (front and center of the firebox). With the hot coals pulled to the draft area, added wood ignites faster because combustion air is forced through the hot coals and into the newly added wood. If the coals are pushed to the back, a less efficient burn will result. If needed to extend the burn time, the outdoor furnace may be completely filled.

### WARNING

**Keep your face away and stay as far away as possible from the firebox door area when opening the door.**

1. Unlatch the door; then stay as far away as possible as the firebox door is opened as smoke and hot gases escaping through the firebox door opening could ignite. From a safe distance, observe the fuel load.
2. If necessary, clean the firebox of excess ashes and/or crusty deposits.
3. Pull the hot coals forward to the draft area (front and center) of the firebox.

**Fig. 42**



### WARNING

**Use extreme care if adding wood when wood or coals are already present. Very hot gases may be coming out of the firebox door opening.**

4. Load the firebox with wood being careful not to be pinched between the wood and any part of the outdoor furnace.

### WARNING

**When adding wood to the firebox, be careful not to get pinched between the wood and the door frame or any part of the outdoor furnace. Use extreme care with large pieces of wood that may be difficult to handle.**

- Close and secure the firebox door. **Do not use the firebox door to ram wood into the outdoor furnace. Do not operate the outdoor furnace with the firebox door open.** Combustion in the firebox cannot be controlled if the firebox door is left open or unsecured. If the firebox door is left open, an uncontrolled burn will result. To return to a controlled burn, close and secure the door.

## CLEANING AND INSPECTING WARNING

**Stay as far away as possible from the door area when opening the door.**

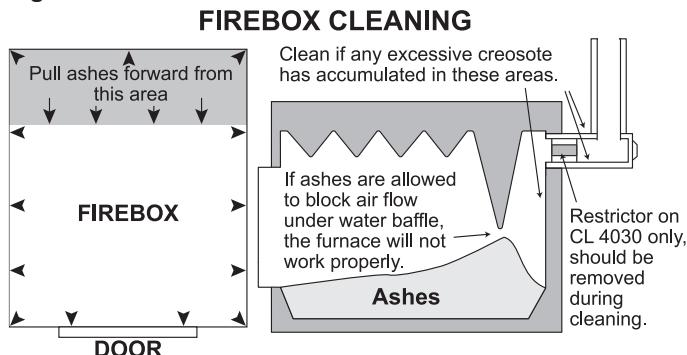
- Open the door to the firebox and if necessary, clean the front area of the firebox of excess ashes or deposits.

**NOTE: Use extreme care when accessing the firebox to clean out ashes. Hot gases could be released out of the firebox door.**

- Close and secure the firebox door. **Do not operate the outdoor furnace with the firebox door open.** Combustion in the firebox cannot be controlled if the firebox door is left open or unsecured. If the firebox door is left open, an uncontrolled burn will result. To return to a controlled burn, close and secure the door.

**NOTE: Creosote is an accumulation of combustion by-products on the surfaces of wood-burning appliances. Twice a month during the heating season, inspect for excessive creosote buildup on the firebox walls, flue and chimney. If present, the buildup should be removed for proper operation and fire safety. Creosote, if ignited in the chimney, results in an extremely hot chimney fire. In case of a chimney fire, close the firebox door.**

Fig. 43

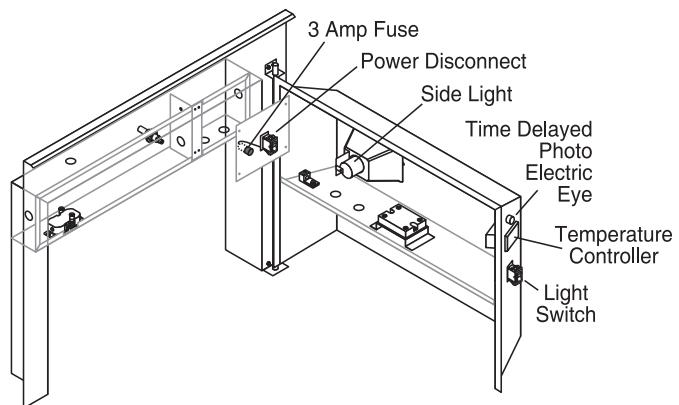


Clean corners as indicated by arrows in illustration. Pull ashes forward from the back of the firebox in shaded area. The walls of the firebox should be scraped from the ash line and below. Clean excessive creosote as necessary.

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## CONTROL LOCATIONS

Fig. 44



## ADJUSTING WATER TEMPERATURE

The high water temperature setting can be adjusted anywhere between a range from 150°F-195°F. At 10°F less than the temperature setting (10°F being the thermostatic differential), the controller will start the draft cycle by opening the damper (and activating the optional draft inducer, if so equipped). When OUT is indicated on the display, the outdoor furnace is calling for heat.

The controller has been preset at the factory to 185°F. To change the setting (because of a higher than normal heat load or cooler weather) use the following procedure.

**NOTE: To reduce condensation in the firebox, it is not recommended to set the temperature below 185°F (85°C).**

- Press the SET button on the temperature controller. "SP" will appear in the display.
- Press SET again to display the current setpoint temperature. The factory preset is 185°F.
- Press the UP or DOWN button until the desired value is displayed. This setting can only be set between 150°F and 195°F.
- Press SET to save the setting. "SP" will appear.
- To exit the programming mode, either press the SET and DOWN buttons at the same time or wait one minute and the controller will automatically exit.

# SECTION 3 – MAINTENANCE INSTRUCTIONS

## PREVENTIVE MAINTENANCE SCHEDULE

Regular maintenance and inspections can help extend the life of your outdoor furnace and prevent high-cost repairs. This table is meant to serve as a general guideline until you become acquainted with how the outdoor furnace operates with your specific application.

OPERATION	SERVICE INTERVAL							
	Or o ir t a on	top rat ion	ail	l	ont ri	mi nnual	Po t	ctio n a on
Broadcast Ashtrol in firebox.		●						3-3
Check water level.	●	●						3-1
Completely remove ash.						C	●	3-7
Inspect firebox door seal.				D			●	3-5
Inspect chimney.	●	A	●				●	3-6
Check vent cap.	●	A						3-2
Stir ash and pull toward front of firebox.			B					3-4
Scrape bottom of firebox.					●		●	3-8
Lubricate door handle.						●		3-9
Check pH and nitrite levels of water.	●				E	●	F	

NOTE: Check daily for build-up of creosote until experience shows how often cleaning is necessary.

- A When the outdoor furnace is new, daily for the first week.
- B Twice a week.
- C After one month, then midway through the heating season.
- D Weekly until interval for your application can be determined.
- E When new, after three months, then every six months thereafter.
- F Refer to **Testing Treated Water in the Outdoor Furnace**

### CAUTION

Use only genuine Central Boiler Parts and Accessories if it ever becomes necessary to replace any component of the outdoor furnace.

### ROUTINE MAINTENANCE

Routine inspections and maintenance are essential to the proper operation and longevity of the outdoor furnace. The items indicated in the preventive maintenance schedule are intended to serve as a guideline. Actual intervals between inspections and maintenance may vary depending on a number of factors, including your heat load requirements, type of wood used, and outdoor temperatures.

NOTE: Proper firebox maintenance is essential to the longevity of the outdoor furnace.

### CAUTION

Do not burn plastic, garbage, treated wood or fuels not listed for this furnace.

NOTE: Chloride or sulfurous gases can be generated if plastic or rubber is burned and will mix with the moisture from the wood to form sulfuric or hydrochloric acids in the firebox, creating excessive corrosion.

### **3-1. Water Level**

Open the sight gauge valve. The sight gauge tube will fill to indicate the level of water in the outdoor furnace. Be sure to close the sight gauge valve after checking water level. The sight gauge valve and tube will drain when the valve is closed.

### **3-2. Vent Cap**

Check that the vent cap fits loosely on the vent opening.

#### **WARNING**

**Vent cap must fit loosely on the vent opening (Fig. 1). Do not force the cap down or try to seal it tightly onto the vent pipe. Do not extend or restrict the vent pipe or opening. DO NOT ALLOW THE OUTDOOR FURNACE TO BE PRESSURIZED.**

### **3-3. Ashtrol**

Add Ashtrol to the firebox. Use a spoon as directed to broadcast the powder in the firebox, alternating the location. For example, broadcast on the fire or hot coals one day and then on the walls the next day. Ashtrol is a pH modifier that helps to neutralize acids that may form in the firebox.

### **3-4. Stir Ash**

Stir the ashes in the firebox and pull them forward to prevent the ashes from sealing in moisture on the bottom and along the edges. It is especially important to scrape the walls and the four corners at the ash line and below. If this maintenance operation is not performed as directed, deterioration can result from the moisture trapped between the ashes and the steel.

1. Remove any heavy or solidified ashes. When ashes build up to either the door frame in the front or the top of the beveled ash pan of the firebox, they should be removed. A hoe, ash rake and shovel for this procedure may be purchased from your Central Boiler dealer. Leave enough ashes and coals to relight the fire.

#### **CAUTION**

**Always wear the appropriate personal protective gear when cleaning ashes from the firebox.**

2. **Disposal of ashes** - Place ashes in a metal container with a tight-fitting metal lid. It can take many days before the ashes are completely cooled. Other waste should not be placed in this container.
3. Each time the ashes are cleaned out, inspect the door rope (see Section 3-5) to make sure it is sealing properly.

#### **WARNING**

**When cleaning the outdoor furnace, be careful not to spill any hot ash outside of the noncombustible container.**

### **3-5. Firebox Door Seal**

The firebox door rope must be in good condition to ensure an airtight seal. Look for wear spots or portions of the door rope lacking an indentation from the firebox door. The door rope should have a uniform indentation in it all the way around.

1. Open the firebox door. One way to check that the door rope is sealing all the way around the firebox door is to insert a piece of paper similar in size and shape to a dollar bill in several locations around the perimeter of the door and then to close and latch the firebox door.
2. At each location, pull on the piece of paper. If it pulls out easily, either the door rope is sealing improperly and needs to be replaced, or the firebox door needs to be adjusted.
3. Check that the damper is properly sealing when closed. Normal wear over time can create a groove or dent where the damper lid strikes the casting when closing. Replace the damper if it is not sealing properly.
4. Inspect the door casting and heat shields. If the door casting is not cracked through or broken, allowing air to leak in, the door casting should not need to be replaced. Like the damper, it is normal for heat shields to show wear over time. The heat shield should be replaced if it is no longer providing coverage of the casting beneath the heat shield.

**NOTE: If the outdoor furnace has been improperly operated with the door partially open, close the door and allow the outdoor furnace to cycle normally for 1 hour before inspecting the door for proper sealing.**

### **3-6. Chimney**

**NOTE: Creosote is an accumulation of combustion by-products on the surfaces of wood-burning appliances. Twice a month during the heating season, inspect for excessive creosote buildup on the firebox walls, flue and chimney. If present, the buildup should be removed for proper operation and fire safety. Creosote, if ignited in the chimney, results in an extremely hot chimney fire. In case of a chimney fire, close the firebox door.**

1. If the flue passageway behind the baffle becomes plugged, it must be cleaned.
2. Inspect the chimney for excessive buildup of creosote and clean, if necessary.
3. On 4030 models only, inspect the chimney restrictor for excessive buildup of creosote and clean, if necessary. Make sure the chimney restrictor is positioned 11" in from the end of the chimney tee as shown in Fig. 39.

### **3-7. Completely Remove Ash**

1. Remove all ashes from the firebox.

#### **CAUTION**

**Always wear the appropriate personal protective gear when cleaning ashes from the firebox.**

2. Use a wire brush and small scraper to clean the firebox, side walls, back wall and ash pan. Use a light to inspect for corrosion. If corrosion is present, contact your dealer. Lubricate the solenoid plunger with a light petroleum distillate (e.g., WD-40 or equivalent).
2. **Disposal of ashes** - Place ashes in a metal container with a tight-fitting metal lid. It can take many days before the ashes are completely cooled. Other waste should not be placed in this container.
3. Each time the ashes are cleaned out, inspect the door rope (see Section 3-5) to make sure it is sealing properly.

#### **WARNING**

**When cleaning the outdoor furnace, be careful not to spill any hot ash outside of the noncombustible container.**

### **3-8. Scrape Bottom of Firebox**

Scrape the bottom 12 inches of the firebox clean. Allow the fire to get very low; then move the coals to one side of the firebox.

Use a hoe to clean the other side. Move the coals to the other side and finish cleaning the firebox, leaving some ashes with the live coals. Pull the coals and ashes to the draft area (front and center of the firebox). When the furnace is filled, the coals remaining in the firebox will light the fire.

**NOTE: Regular cleaning of the firebox, particularly at the ash line and below, reduces the possibility of corrosion.**

The top of the firebox and walls of the firebox above the ash line should be scraped clean if large, thick, dry or crusty deposits are present. A thin, tar-like layer of creosote does not cause any problems in the operation of the furnace.

### **3-9. Door Handle**

Lubricate the door handle with a light petroleum distillate (e.g., WD-40 or equivalent).

## **WATER QUALITY AND MAINTENANCE**

An important part of furnace maintenance is controlling the quality of the water in the furnace. Central Boiler supplies a pH tape and a nitrite test kit with each new furnace.

### **Water Test Kits and Test Results**

It is very important to keep record of water test results (include the date, pH and nitrite level). If subsequent water tests indicate a pH that is too low and/or a nitrite level that is too high, the results should be verified using a new test kit.

The pH test strips and Permanganate Reagent each have a varying shelf life that can affect their accuracy. Test kits should be stored in a dry area at room temperature to obtain maximum accuracy over a longer period of time. The area in the access panel door where the test kit is located upon arrival from the factory is intended for shipping purposes only. The kit should be moved to an area as stated above as soon as possible after delivery.

The pH of the water in the outdoor furnace will not decrease unless fresh water is added to the furnace. The nitrite level of the water in the outdoor furnace will not increase unless Corrosion Inhibitor Plus™ is added.

For example, if a water test in the fall of the year indicates a pH of 8.5 and a nitrite level of 20 drops by nitrite test (2000 ppm) and no water or Corrosion Inhibitor Plus™ is added, a water test the following spring must indicate a pH of at least 8.5 and a nitrite level of no more than 20 drops by nitrite test (or slightly less, due to evaporation). If the test indicates a significantly lower pH level or higher nitrite level, perform another test with a new test kit to verify the results. If the results are +10% different using a new test kit, either water or Corrosion Inhibitor Plus™ has been added to the system.

If a test is conducted and verified that indicates a high pH (above 9.5) and/or nitrite level (above 30 drops), DO NOT ADD MORE CORROSION INHIBITOR PLUS™. Adding Corrosion Inhibitor Plus™ increases nitrite and pH levels. The outdoor furnace should be drained until the water in the sight gauge reaches the bottom of the sight gauge; then add fresh water until it is 1 inch below the FULL mark on the sight gauge. Circulate the water for 24 hours and test the water again.

### **Testing Supply Water**

Before filling the outdoor furnace with water, test a sample of the supply water that will be used to fill the outdoor furnace (softened water is recommended).

1. Collect a small sample of the water to be used to fill the outdoor furnace in a clean container.
2. Dip the pH test strip from the test kit in the water. Shake excess water off the test strip. Compare the color of the test strip to the chart provided to determine pH level.
3. If the pH level is between 6.5 and 8 and there are no other known water quality problems, then the outdoor furnace may be filled with this water.

4. If the water to be used to fill the outdoor furnace has a pH level of less than 6.5 or greater than 8, a sample of the water should be sent to a water quality test lab for recommended treatment, the water should be conditioned, or water should be supplied from a different source.

### **Corrosion Inhibitor Plus™ and Initial Treatment**

Central Boiler Corrosion Inhibitor Plus™ (p/n 1650) gives optimum protection when it is used to initially treat the water and is then maintained at proper levels. The initial nitrite level target is 20 drops by nitrite test, but 20 to 30 drops is acceptable. Do not exceed treatment of higher than 30 drops by nitrite test.

The recommended initial treatment rate for the outdoor furnace is specified by units. One unit of the Corrosion Inhibitor Plus™ is a 1-gallon container. The normal rate for the initial treatment is dependent on the model: CL 4030 and CL 5036 – 1 unit; CL 6048 – 2 units.

**NOTE: If the system has a larger than normal water capacity, more Corrosion Inhibitor Plus™ should be added at a recommended rate of one unit per 180 gallons of water.**

1. Remove the vent cap and add the recommended amount of Corrosion Inhibitor Plus™ through the vent pipe at the top of the outdoor furnace. Replace the vent cap.
2. Immediately fill the outdoor furnace to 1 inch below the FULL level mark on the sight gauge.
3. Start the pump(s) and circulate water for 24 hours.

### **Testing Treated Water in the Outdoor Furnace**

1. To obtain a system water sample, it will be necessary to remove the tube from the sight gauge mounting hole and bend it away from the outdoor furnace. Before collecting the sample, open the valve and drain about a quart of water from the sight gauge tube; then carefully fill the sample container without contaminating the sample. **Be sure to properly install the sight gauge tube and close the valve when finished.** The water in the sight gauge valve and tube will drain when the valve is closed.

### **CAUTION**

**The water in the sight gauge may be hot. Use caution when obtaining a sample.**

2. If no antifreeze is present in the water, use Test Kit (p/n 405). If antifreeze has been added to the water, use Test Kit (p/n 597).

3. Dip the pH test strip from the test kit in the water sample. Shake excess water off the test strip. Compare the color of the test strip to the chart provided to determine pH level. The pH of the water should now be between 8.0 and 9.5.

4. Rinse and fill the sample tube to the 25 mL mark with treated water from the outdoor furnace.

5. Add 25 drops of Sulfuric Acid (p/n 404) to the water sample and swirl to mix.

### **WARNING**

**Sulfuric Acid is a corrosive acid. Handle carefully. Carefully read and follow precautions on test chemical labels. Keep test chemicals away from children. Safely dispose of tested samples.**

6. Using the dropper, add Permanganate Reagent (p/n 403) one drop at a time, swirling the water and counting each drop, until the color changes from colorless to pink, and stays pink for at least one minute.

**NOTE: Always hold the dropper in a vertical position to ensure proper droplet size.**

7. If the nitrite level is not at least 20 drops by nitrite test, add 1/2 unit of Corrosion Inhibitor Plus™ (p/n 1650); then circulate water for 24 hours and repeat procedure, as needed, to achieve a nitrite level of at least 20 drops by nitrite test.
8. Do not exceed treatment of higher than 30 drops by the nitrite test. If the test requires more than 30 drops, dilute the water by draining water from the system until the water level just reaches the bottom of the sight gauge. Then perform steps 2-3 from Corrosion Inhibitor Plus™ and Initial Treatment and steps 1-9 from Testing Treated Water in the Outdoor Furnace.

### **CAUTION**

**Completely clean out the firebox before draining water from the outdoor furnace.**

9. After the proper nitrite level has been obtained, check pH to make sure it is between 8 and 9.5.

After initial treatment, the maintenance nitrite level target is 15 drops by nitrite test, but 15 to 30 drops is acceptable. One drop of permanganate reagent equals approximately 100 ppm.

### **System Maintenance**

The pH and nitrite levels of the water, once treated, should remain stable as long as water is not added to the outdoor furnace. If water is added to the outdoor furnace and/or system, the system water should be tested and Corrosion Inhibitor Plus™ should be added (if necessary) to maintain the recommended level of protection.

**NOTE: If there is a leak in the system or if the outdoor furnace loses water from boiling frequently, the problem should be identified and repaired immediately. Under normal operation, little or no water needs to be added. Adding water to the furnace may cause corrosion if not immediately treated with Corrosion Inhibitor Plus™ to the proper pH and nitrite levels. In addition, the amount of dissolved solids in the system (due to adding additional water) can cause problems.**

After the initial three months of operation and every six months thereafter, the pH and nitrite levels of the system water should be tested. These levels should be maintained as previously stated.

## POST HEATING SEASON MAINTENANCE

The water should be left in the outdoor furnace if the outdoor furnace is not being used for an extended period of time. Check pH and nitrite levels as described in the Water Quality and Maintenance section.

1. At the end of the heating season, clean all the ashes out of the outdoor furnace. Scrape the walls and floor of the firebox taking special care to clean at the ash line and below, especially in the corners.
2. Check behind the baffle and in the chimney flue. Clean out any excessive buildup. Any large or dry crusty deposits on the walls, baffle or heat exchanger area should be removed. A thin, tar-like coating of creosote above the ash line does not need to be scraped clean as it works like a protective coating on the metal. When cleaning the firebox, be sure to wear the appropriate personal protective gear.
3. When the furnace is clean, carefully inspect the firebox for any signs of excessive corrosion or deterioration. If any corrosion or deterioration is found, call your dealer. It is always better to do maintenance during the non-heating season.
4. After the inspection is completed, apply a thin coat of new motor oil to the firebox being sure to work oil into all corners.
5. Place a cover over the chimney to keep rain from entering the outdoor furnace. Clean and oil the chimney flue (and on 4030 models only, the chimney restrictor) to the firebox.

## Flushing the System

If the system water is brown or orange, it is an indication the Corrosion Inhibitor Plus™ level has not been maintained and corrosion is present in the water jacket. The water jacket should be thoroughly flushed and the system refilled with the proper amount of Corrosion Inhibitor Plus added. Be sure to test the system water to verify the proper amount of Corrosion Inhibitor Plus.

1. De-energize the pumps and close the supply and return valves on the outdoor furnace. Remove the inspection panel and insulation covering the drain to gain access to the drain. Remove the cap and connect a hose to the drain.

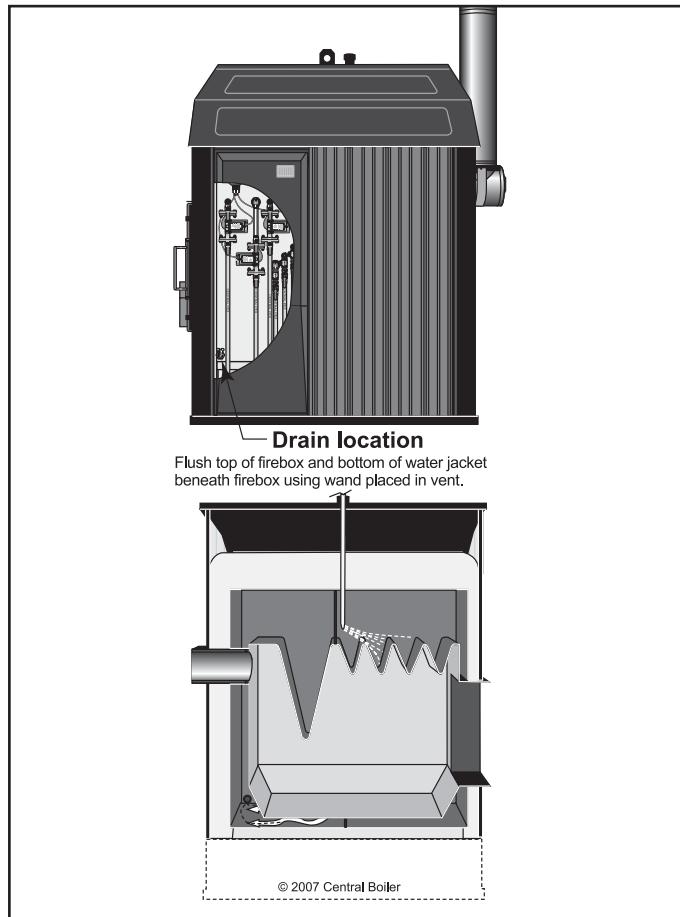
**NOTE: Refer to General Installation Information for information on draining treated system water.**

2. Open the drain to drain the system; then flush the top of the firebox and bottom of the water jacket beneath the firebox using a wand placed in the vent (Fig. 45).

## CAUTION

**Completely clean out the firebox before draining water from the outdoor furnace.**

Fig. 45



3. Close the drain valve securely and replace the cap on the drain after flushing the outdoor furnace.
4. Fill the furnace following the procedure in Water Quality and Maintenance making sure to operate the pump(s) to thoroughly mix the Corrosion Inhibitor Plus™.
5. Insulate the area using either canned urethane foam insulation or a mat of fiberglass insulation.
6. Install the inspection panel and secure with self-tapping screws.

## SECTION 4 – OWNER SERVICEABLE ITEMS

**NOTE:** If any of these items are under warranty, remember that the warranty covers only the cost of the replacement part. Labor is not covered.

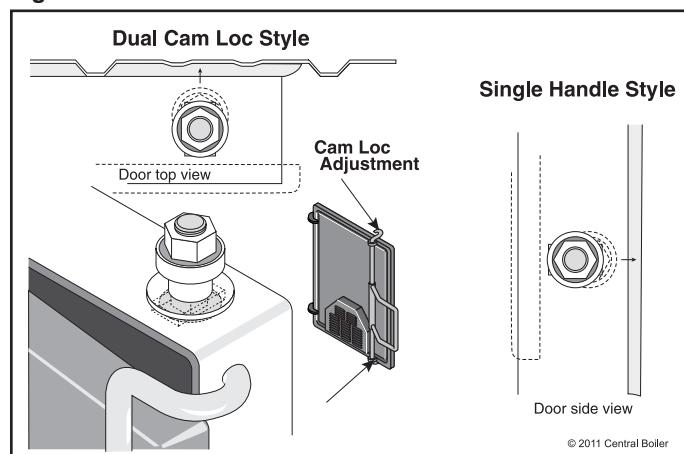
**NOTE:** Use only genuine Central Boiler parts and accessories if it ever becomes necessary to replace any component on the outdoor furnace.

### FIREBOX DOOR CAM LOC ADJUSTMENT

If the firebox door rope has been replaced and it is not sealing properly, the firebox door may need to be adjusted to close more tightly. When adjusting the firebox door, make sure it is not adjusted too tightly as damage to the firebox door, frame or door rope may result.

1. Loosen the adjustment nut (two nuts on the dual Cam Loc® style door) and slide the lock assembly in slightly toward the furnace; then tighten securely (see Fig. 46). On the dual Cam Loc doors, make sure to adjust both the top and bottom for equal pressure when latched.

Fig. 46



### FIREBOX DOOR SEAL ROPE

The firebox door seal must be in good condition to ensure an airtight seal. If replacement is necessary due to the firebox door seal becoming damaged or brittle, use the following procedure:

1. Disconnect power to the furnace. Open the firebox door.

#### WARNING

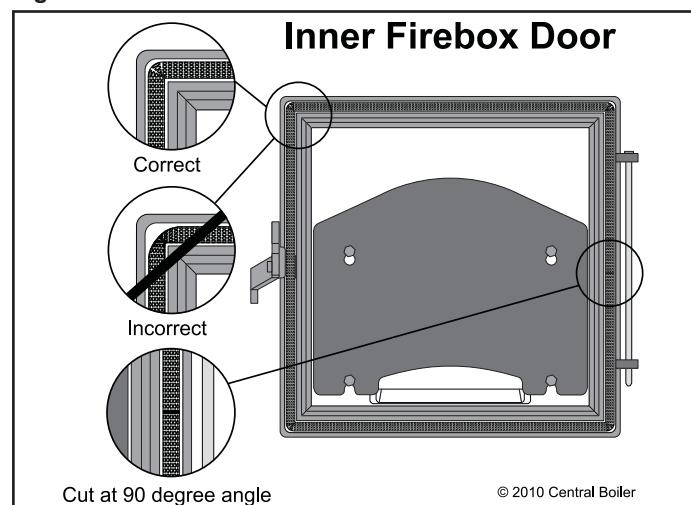
**Remove all wood, coals and ash from the firebox and allow the outdoor furnace to thoroughly cool down before performing maintenance.**

2. Using a scraper, remove the firebox door seal rope and clean any remaining silicone adhesive from the groove. Any residue left in the groove will interfere with the new seal.
4. Apply a 1/4" (6 mm) diameter bead of silicone sealant into the entire firebox door seal groove.

### Section 4 - Owner Serviceable Items

5. Starting at the center of the top side of the firebox door, insert the new door seal rope into the groove, pressing it firmly into the bead of silicone sealant. Make sure the firebox door seal rope is not stretched as it is pressed into the corners. Force the firebox door seal rope out to fill in the corners as shown in Fig. 47.

Fig. 47



6. When the seal has been pressed into the groove all the way around the firebox door, cut the end of the rope about one inch (2,5 cm) longer than required and press it tightly against the beginning end of the rope.
7. Close the firebox door.

### LIGHT BULB

A 40-watt appliance type bulb is installed in each of the fixtures on the outdoor furnace. Do not install a bulb in excess of 60 watts.

1. Disconnect power to the furnace.
2. Remove the two screws securing the clear plastic lens over the light.
3. Replace the bulb.
4. Ensure that the gasket is aligned correctly; then install the plastic cover and secure with two screws.

### SOLENOID

Before replacing the solenoid, check the following items:

- Check to be sure there is incoming power to the furnace.
- Check inside the control panel to see if the fuse has blown. If the fuse is blown, check the draft opening to be sure the linkage operates freely and that there are no obstructions to the door; then replace the fuse.

- To test the solenoid with a multimeter, turn the Power Disconnect Switch to the OFF position and refer to Testing Solenoid.
- If solenoid still does not operate, turn the Power Disconnect Switch to the OFF position and replace the solenoid (see Replacing Solenoid).

## TESTING SOLENOID

### WARNING

**Do not attempt service on the solenoid without first disconnecting the electrical power at the main power source.**

1. Remove the screws securing the draft enclosure cover; then remove the cover.

### CAUTION

**Solenoid may be hot.**

2. Carefully disconnect the two wire leads connected to the left side of the solenoid by gently pulling and moving them from side to side.
3. Using a multimeter set to Ohms, test the solenoid's resistance by touching the meter leads to the solenoid terminals.
4. If the multimeter reading is between 15 and 30 Ohms, the solenoid is good. If the multimeter reading is less than 15 Ohms or more than 30 Ohms, the solenoid is faulty and should be replaced.
5. If the solenoid is good, carefully attach the wire leads onto the solenoid terminals (white wire connected to the upper terminal).
6. Install the cover and secure with the screws.
7. Turn the Power Disconnect Switch to the ON position.

## REPLACING SOLENOID

### WARNING

**Do not attempt service on the solenoid without first disconnecting the electrical power at the main power source.**

1. Remove the screws securing the draft enclosure cover; then remove the cover.

### CAUTION

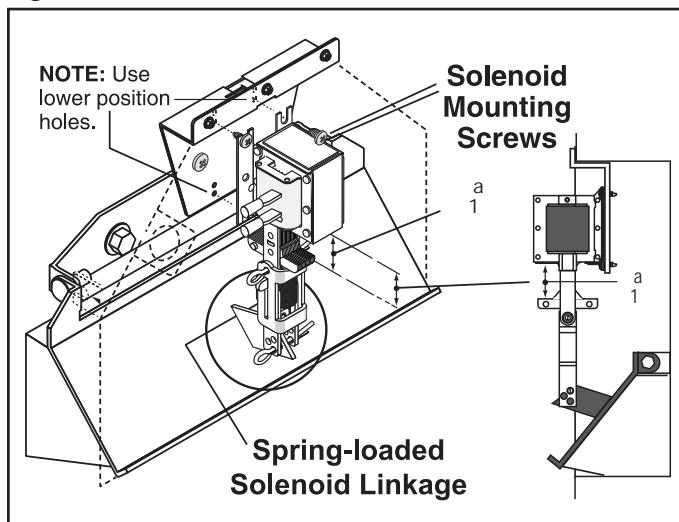
**Solenoid may be hot.**

2. Carefully disconnect the two wire leads connected to the left side of the solenoid by gently pulling and moving them from side to side.
3. Remove the top cotter key of the linkage.

4. While supporting the solenoid with your hand, remove the top two solenoid mounting screws and loosen the bottom two.
5. Lift up on the solenoid until it clears the screw heads and remove.
6. Place the new solenoid into position and lightly secure with the screws. Adjust the solenoid up or down until the solenoid plunger free length is between 15/16" and 1"; then tighten the screws securely. Connect the solenoid to the linkage with the cotter pin. Slightly spread the legs of the cotter pin. Check that the spring-loaded linkage and damper door are not binding and that the spring is not broken or missing.
7. Carefully attach the wire leads onto the solenoid terminals (white wire connected to the upper terminal).
8. Install the cover and secure with the screws.
9. Turn the Power Disconnect Switch to the ON position.

**NOTE: If the solenoid rattles during operation, the alignment between the solenoid and the lift tab is incorrect. To align the solenoid and lift tab, loosen the four solenoid mounting screws and move the solenoid until the solenoid plunger aligns with the lift tab. Secure the solenoid; then make sure it operates smoothly.**

Fig. 48



## TEMPERATURE CONTROLLER

1. Disconnect the electrical power at the main power source to the outdoor furnace; then open the control panel door. Remove the screws securing the inner door panel; then remove the panel.

## WARNING

**Do not attempt service inside the electrical control panel without first disconnecting the electrical power at the main power source.**

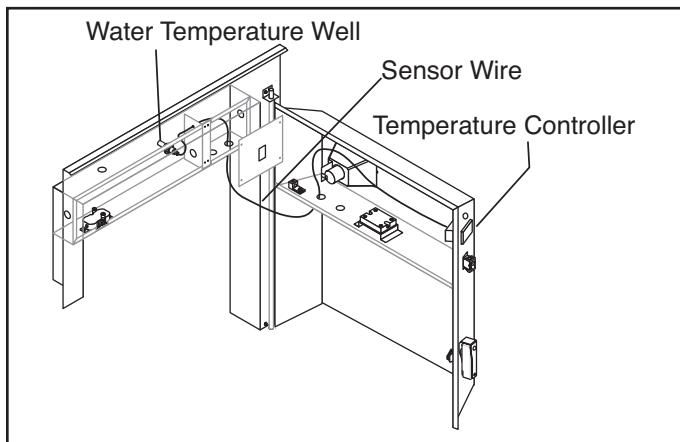
2. Carefully label each of the wires connected to the temperature controller according to the numbered connections identified on the top of the controller.
3. Using a small screwdriver, loosen the screws securing each of the wires; then pull the wires out of the controller.
4. Depress the tabs on the side of the controller mounting strap; then slide the strap off the controller. Remove the controller from the control panel.
5. Place the new gasket onto the controller. Slide the new controller into position (making sure it is positioned upward) in the control panel; then secure with the mounting strap.
6. Slide each of the labeled wires into their proper positions on the controller; then tighten each of the screws securely.
7. Place the inner door panel into position on the door and secure with the screws.
8. Close and secure the door. Connect power to the outdoor furnace.

## WATER TEMPERATURE SENSOR

### WARNING

**Do not attempt service inside the electrical control panel without first disconnecting the electrical power at the main power source.**

Fig. 49



To test the water temperature sensor using a multimeter, see Testing Water Temperature Sensor. If the sensor needs to be replaced, see Replacing Water Temperature Sensor.

## TESTING WATER TEMPERATURE SENSOR

1. Disconnect the electrical power at the main power source to the outdoor furnace; then open the control panel door. Remove the screws securing the access box panel; then remove the panel.

### WARNING

**Do not attempt service inside the electrical control panel without first disconnecting the electrical power at the main power source.**

2. Disconnect the sensor wires from the controller.
3. Using a multimeter set to Ohms, touch the meter leads to the wires disconnected from the controller. A reading of 1000 Ohms or less indicates the temperature sensor is good; a reading of more than 1000 Ohms indicates the temperature sensor is faulty and should be replaced.

## REPLACING WATER TEMPERATURE SENSOR

1. Disconnect the electrical power at the main power source to the outdoor furnace; then open the control panel door. Remove the screws securing the access box panel; then remove the panel.

### WARNING

**Do not attempt service inside the electrical control panel without first disconnecting the electrical power at the main power source.**

2. Disconnect the sensor wires from the controller.
3. Remove (by pulling) the sensor from the well.
4. Firmly press the new sensor into the well. Secure the sensor in place following the instructions provided with the new sensor.
5. Connect the sensor wires to the controller.
6. Place the access box panel into position and secure with the screws.
7. Close and secure the door. Connect power to the outdoor furnace.

## SECTION 5 – TROUBLESHOOTING

### A. OUTDOOR FURNACE DOES NOT HEAT (BUILDING IS LOSING TEMPERATURE)

1. **Out of wood** - Check firebox to see if fire is out. Add wood as necessary. Use good quality wood since poor quality wood will have very short burn times.
2. **Circulation valve(s) closed** - Be sure all valves in the system are open.
3. **Circuit breaker off** - Check the circuit breaker that supplies power to the outdoor furnace.
4. **Solenoid not operating properly** - Disconnect power to the furnace; then check the fuse in the control panel. If fuse is blown, check damper door for obstructions and for free movement. Be sure damper door works freely; then replace the fuse. Check the solenoid plunger free length. With the damper door fully closed, the correct length is between 15/16" and 1" (see Fig. 48). Adjust if necessary, but do not exceed 1". Be sure that the damper door (when activated by the solenoid) does not contact the louvered cover. Lubricate or adjust as necessary. Check that the spring-loaded linkage and damper door are not binding and that the spring is not broken or missing.
5. **Circulation pump(s) not operating** - Check that circulation pumps are operating. If not, disconnect power to the pump. Close valves at the pump. Disassemble the pump and try to turn the pump shaft. If the shaft is stuck, replace the pump cartridge. Replace only the cartridge whenever possible. If necessary, replace the pump. Follow instructions supplied with the pump.
6. **Air in system** - Check for air in the water lines or heat exchangers. If you hear a gurgling sound in a heat exchanger, air is present in the system. Shut off the pump, wait 15 seconds and start the pump. If it is necessary to force air from lines, refer to Initial Start-up Procedures.
7. **Outdoor furnace exhaust obstructed** - Check furnace exhaust for obstructions by observing the amount of smoke coming out of the chimney with the firebox door slightly ajar. If smoke seems very restricted, remove the firewood and hot coals; then check the chimney (top and bottom) and behind the baffle for obstructions. On 4030 models only, check that the chimney restrictor is not plugged with creosote and that it is positioned 11" in from the end of the chimney tee.
8. **Building(s) poorly insulated or uninsulated** - Poorly insulated or uninsulated buildings, buildings with uninsulated or poorly insulated ceilings, or a lack of proper insulation under radiant flooring can cause excessive fuel consumption and/or heating problems.

9. **Supply and return lines installed incorrectly** - Make sure the hot supply water line is connected to the correct fitting on the outdoor furnace and heat exchanger.
10. **Circulation pump(s) installed backwards** - Check that pump flow direction is correct. If not, shut off power to pump. If the flow is not in the correct direction, disconnect pump from water line and reverse pump mounting to correct flow direction. If the pump is not mounted on the outdoor furnace, check for proper pump mounting location (see Fig. 17-18).
11. **Underground supply and return lines insulated poorly** - Heat loss from poorly insulated underground supply and return lines is often indicated by an unusually high amount of snow melting above the lines when the ground temperature is 10° F or colder.
12. **Supply and return lines uninsulated** - Uninsulated supply and return lines in areas that are not intended to be heated (unheated crawl spaces, under mobile homes, etc.) may cause excessive heat loss. Insulate the supply and return lines.
13. **Poor water quality** - Water with high amounts of solids, sand or dirt can create deposits inside the wall of heat exchanger components, reducing the amount of heat output. If this condition is suspected, contact your Central Boiler dealer.

### B. OUTDOOR FURNACE IS OVERHEATING

1. **Air entering through the door** - Make sure the firebox door is properly latched and check the condition of the door rope. If it is not sealing properly (indicated by a uniform indentation in the rope), replace the rope. If door does not close tightly, adjust using the appropriate procedure (see Owner Serviceable Items).
2. **Air entering through the damper** - Check to be sure the damper is operating correctly as explained in section A.4. Be sure the damper closes all the way and that no obstructions are present. The damper can wear a groove or the bracket can loosen over time. If that is the case, the damper may need replacement and/or the bracket may need to be adjusted and tightened.

If the solenoid is sticking, lubricate with silicone spray or a light petroleum distillate (WD-40 or equivalent). Check linkage for binding, or for a missing or broken spring.

**NOTE: If the water in the outdoor furnace boils, identify the cause and correct immediately. The outdoor furnace will not typically be damaged by boiling unless it reduces the water level more than 1" below the full mark on the sight gauge. If water boils, restore water level to full and add Corrosion Inhibitor Plus™ as needed. If water is added frequently it will cause deterioration in the water jacket which will reduce the life of the outdoor furnace.**

3. **Temperature controller set incorrectly** - The temperature controller should not be set above 195°F.
4. **Water is not circulating** - The pump should run continuously and water needs to circulate continuously through the supply and return lines to keep water temperature uniform in the outdoor furnace.
5. **Circulation valve(s) closed** - Be sure the proper valves in the system are open to allow circulation.

#### **C. SOLENOID DOES NOT OPERATE**

1. **Fuse blown** - Check the fuse. Check damper and solenoid area for obstructions or damage. Be sure the damper door operates properly; then replace the fuse.
2. **Solenoid not operating properly** - Solenoid may be damaged. If so, be sure to check the linkage for free movement and for creosote buildup between the damper door and draft opening. Replace the solenoid if burned out or stuck in the open position. Check that the spring-loaded linkage and damper door are not binding and that the spring is not broken or missing. The solenoid is an owner serviceable item (see instructions for replacement in Section 4).

#### **D. FREQUENT PUMP TROUBLE OR POOR WATER CIRCULATION**

1. **Pump mounted incorrectly** - If the pump is not mounted on the outdoor furnace, it must be mounted at a minimum of four feet lower than either the top water level in the outdoor furnace or the highest point of the hot supply lines (see Fig. 19).
2. **Deposits in water lines/heat exchanger walls** - If water high in silica or other mineral content has been used, material deposits may build up on the insides of the supply and return lines and on the heat exchanger walls. If this occurs, the system will need to be drained and then cleaned using Sludge Conditioner (p/n 166). The system must then be refilled with the proper amount of Corrosion Inhibitor Plus™ (p/n 1650) and fresh water.

3. **Water will not circulate** - If the system has been drained and refilled, or if the system has been opened for any reason (e.g., replacement of pump, adding heat exchangers, repairing a leak), the system must be purged (see Initial Start-up Procedures).

4. **Poor water quality** - Water with high amounts of solids, sand or dirt can cause frequent pump failure. Use softened and/or filtered water.

#### **E. ERRATIC TEMPERATURE READING ON GAUGE**

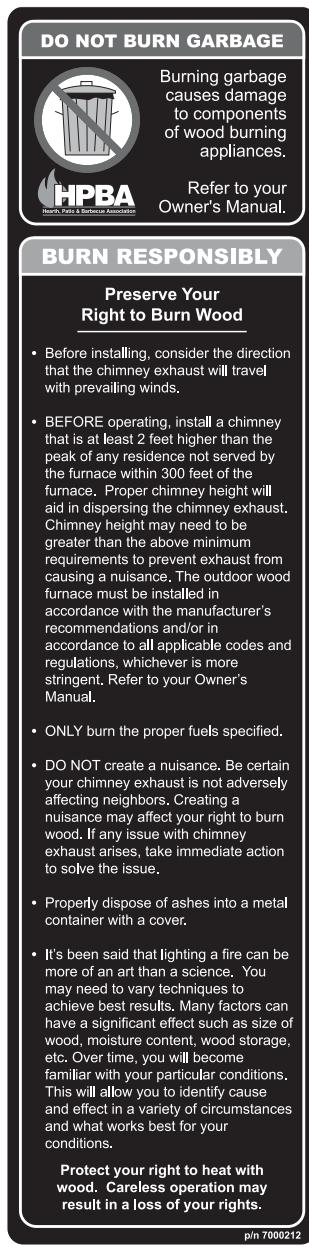
1. **Return water too cold** - Water circulation may be too slow. The return water should be no more than 20°F-25°F less than the hot supply water. If the water returning to the outdoor furnace is too cold, it may cause erratic temperature readings. Check for partial air lock or install larger pump.

#### **F. BURNING AN EXCESSIVE AMOUNT OF WOOD**

1. **High volume water heating** - High volume water heating (e.g., car wash, swimming pool, etc.) will require high wood consumption.
2. **Excessive heat loss** - See items 9-12 of Outdoor Furnace Does Not Heat.
3. **Air entering through door** - See item 1 of Outdoor Furnace is Overheating.
4. **Excessive draft** - If a very tall extension is added to the chimney, the increased draw through the draft may cause excessive wood consumption. Decreasing the draft opening may increase efficiency and reduce wood consumption.
5. **Supply and return line heat loss** - If supply and return lines are buried in a wet, low-lying area, there may be a large heat loss which would greatly increase wood consumption.
6. **High heat demand** - Concrete slabs (with radiant heat) that are poorly insulated or are exposed to water or cold outside temperatures will require increased wood consumption (see Hydronic Installations section). Bringing a concrete slab up to temperature the first time will take a considerable amount of time and wood; once warm, wood consumption will be reduced if the concrete slab and building are insulated properly. The following will also have a high heat demand: poorly insulated buildings, buildings with large amounts of glass windows/doors, buildings with overhead doors, greenhouses, uninsulated crawl spaces, outdoor air infiltration and air leaking through foundation.

# SECTION 6 – GENERAL INFORMATION

*Make note of these precautionary statements also found on the furnace.*



# CLASSIC

## OUTDOOR WOOD FURNACE OWNER'S MANUAL



**CL 4030  
CL 5036  
CL 6048**

For parts and accessories, service or repairs, call your authorized Central Boiler dealer or heating contractor. Record the information below for future reference.

Model	Serial Number	Installation Date
Dealership Name	Phone Number	
Owner Name		

Tested &  
Listed By  
**O-T-L**  
Portland  
Oregon USA  
OMNI-Test Laboratories, Inc.  
117-S-12-2 & 117-S-16-4

**IN THE U.S., THIS APPLIANCE  
IS FOR NON-RESIDENTIAL  
APPLICATIONS ONLY**

**Save This Manual  
For Future Reference**  
(p/n 9000313 REV. A) - 28-MAY-2015

# CLASSIC

by  
**Central Boiler, Inc.**  
20502 160th Street  
Greenbush, MN 56726  
[www.CentralBoiler.com](http://www.CentralBoiler.com)

The Central Boiler Classic models CL 4030, CL 5036 and CL 6048  
are OMNI tested and listed.

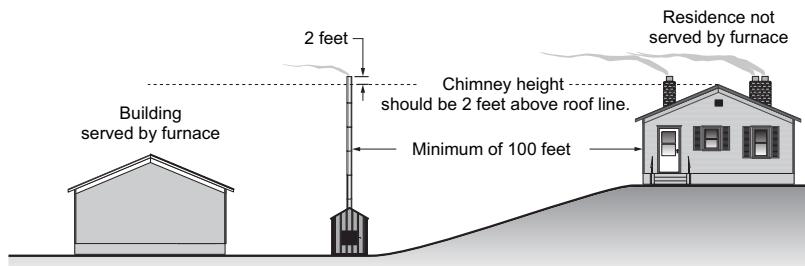
French Owner's Manual and decal set available upon request from your dealer.  
(Manuel d'installation en français et décalcomanies disponible sur  
demande auprès de votre revendeur)

Manuel d'installation en français : p/n 9000165 Décalcomanies : p/n 9408

## OUTDOOR WOOD FURNACE BEST BURN PRACTICES

1. Read and follow all operating instructions supplied by the manufacturer.
2. FUEL USED: Only those listed fuels recommended by the manufacturer of your unit. Never use the following: trash, plastics, gasoline, rubber, naphtha, garbage, material treated with petroleum products (particle board, railroad ties and pressure treated wood), leaves, paper products, and cardboard.
3. LOADING FUEL: For a more efficient burn, pay careful attention to loading times and amounts. Follow the manufacturer's written instructions for recommended loading times and amounts.
4. STARTERS: Do not use lighter fluids, gasoline, or chemicals.
5. LOCATION: It is recommended that the unit be located with due consideration to the prevailing wind direction.
  - Furnace should be located no less than 100 feet from any residence not served by the furnace.
  - If located within 100 feet to 300 feet to any residence not served by the furnace, it is recommended that the stack be at least 2 feet higher than the peak of that residence.

### Chimney Height Installation Scenario



6. Always remember to comply with all applicable state and local codes.



OUTDOOR FURNACE MANUFACTURERS CAUCUS

- Register at time of purchase for FREE 25 Year Limited Warranty -

Verify your warranty at  
[CentralBoiler.com/w25](http://CentralBoiler.com/w25)

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# INTRODUCTION

## Labeling and Terminology

The outdoor furnace and this owner's manual use the following terms and symbols to bring attention to the presence of hazards of various risk levels and important information concerning the use and maintenance of the outdoor furnace.

**DANGER:** Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

**WARNING:** Indicates presence of a hazard which can cause severe personal injury, death, or substantial property damage if ignored.

**CAUTION:** Indicates presence of a hazard which can cause minor personal injury or property damage if ignored.

**NOTE:** Indicates supplementary information worthy of particular attention relating to installation, operation, or maintenance of the outdoor furnace but is not related to a hazardous condition.

Be sure to follow all instructions and related precautions as they are meant for your safety and protection. Store this manual in a readily accessible location for future reference.

## Foreword

This manual is to be used as a guideline for installation, operation, and maintenance of the Classic Outdoor Wood Furnace. This manual is organized into six sections for easy reference.

- Section 1 – Outdoor Furnace Installation;
- Section 2 – Operating Instructions;
- Section 3 – Maintenance Instructions;
- Section 4 – Owner Serviceable Items;
- Section 5 – Troubleshooting;
- Section 6 – General Information.

Anyone owning or operating this outdoor furnace must read, fully understand, and follow all of the information in this manual.

**NOTE: In higher populated areas, extend the chimney to a height above the roofs of surrounding buildings (see Outdoor Wood Furnace Best Burn Practices illustration, inside front cover).**

**NOTE: The outdoor furnace may be connected to an existing boiler system or hot water heating system by a qualified installer only. However, the outdoor furnace must not be pressurized.**

## EPA RESOURCES

**EPA's Burnwise Program** - <http://www.epa.gov/burnwise>

**How to Use a Moisture Meter Video** - <http://www.youtube.com/watch?v=jM2WGgRcnm0>

*EPA offers tips on how to properly use a moisture meter to test firewood before using in a wood-burning stove or fireplace. Wet wood can create excessive smoke which is wasted fuel.*

**Split, Stack, Cover and Store Video** - <http://www.youtube.com/watch?v=yo1--Zrh11s>

*EPA offers four simple steps to properly dry firewood before using in a wood-burning stove or fireplace. Wet wood can create excessive smoke which is wasted fuel. Burning dry, seasoned firewood with a moisture content of 20% or less can save money and help reduce harmful air pollution.*

**Wet Wood is a Waste brochure** - <http://www.epa.gov/burnwise/pdfs/wetwoodwastebrochure.pdf>

*This tri-fold brochure provides colorful illustrations of the four easy steps to dry firewood.*

**NOTE: The warranty can be voided by operating a hydronic heater in a manner inconsistent with the owner's manual.**

# IMPORTANT PRECAUTIONARY INFORMATION

The information contained on pages 5-6 appears throughout this manual. Be sure to read carefully and understand these precautions before, during and after the installation, operation and maintenance of the outdoor furnace.

## CAUTION

This outdoor furnace is not intended to be the only source of heat. Should the outdoor furnace be left unattended, run out of fuel or require service, an alternate heating source in the building being heated should be in place to prevent damage caused by freezing.

## WARNING

Outdoor furnace vent cap must fit loosely on the vent opening (Fig. 1). Do not force the cap down or try to seal it tightly onto the vent pipe. Do not extend or restrict the vent pipe or opening. **DO NOT ALLOW THE OUTDOOR FURNACE TO BE PRESSURIZED.**

Fig. 1



© 2008 Central Boiler

## WARNING

Be sure the outdoor furnace is filled with water before firing. Never fire the outdoor furnace when the water level is more than 1" below the FULL mark on the sight gauge. Corrosion Inhibitor Plus™ must be added before the initial fill (see Water Quality and Maintenance).

## WARNING

The Classic Outdoor Wood Furnace is not intended or certified to be installed inside a building.

## WARNING

This outdoor wood furnace and/or chimney **must not** be installed inside or under any configuration or construction that contains combustible materials as part of the structure or configuration. The chimney is not intended or safety tested to be used or installed other than on the furnace located outside of any structure or enclosure.

## WARNING

Disconnect the electrical power to the outdoor furnace before replacing an electrical component.

## WARNING

Allow the outdoor furnace to thoroughly cool and completely clean out the firebox before draining water from the outdoor furnace. If the water in the outdoor furnace ever boils, be sure to check the water level and restore to full. If water is added, the proper level of Corrosion Inhibitor Plus™ (p/n 1650) must be maintained.

## WARNING

When cleaning the outdoor furnace, be careful not to spill any coals.

## WARNING

**ALWAYS** store ashes in a covered non-combustible container.

## WARNING

When installing a heat exchanger on an existing hot water boiler, be sure none of the existing system safety controls are disabled.

**NOTE:** Any changes to an existing boiler and/or system should be done by a qualified installer in accordance with applicable codes.

## WARNING

Do not attempt service inside the electrical control panel without first disconnecting the electrical power at the main power source.

**NOTE:** Any electrical installation should be done by a qualified installer in accordance with applicable codes.

## WARNING

Do not allow combustible materials (straw, hay or wood) near the outdoor furnace. Keep the perimeter of the outdoor furnace clear and clean.

**NOTE:** All installations and operations must be in accordance with local and state codes which may differ from the information in this manual.

# **IMPORTANT PRECAUTIONARY INFORMATION**

The information contained on pages 5-6 appears throughout this manual. Be sure to read carefully and understand these precautions before, during and after the installation, operation and maintenance of the outdoor furnace.

## **WARNING**

Maintain the following clearances from combustibles for the furnace installation:

- 18" from the back
- 6" from the sides
- 48" from the front
- 18" from the chimney inspection cover
- The foundation must be noncombustible

## **WARNING**

For fire safety, keep all combustible materials at least six feet away from the outdoor furnace, especially around the door area. Debris of wood chips and other combustibles in the loading area may be easily ignited if a hot coal is spilled out of the firebox and left unnoticed.

## **WARNING**

The firebox door must be closed and latched at all times except when filling the firebox with wood. Leaving the firebox door open may lead to a runaway fire. In the event of a runaway fire, close the firebox door.

## **WARNING**

All covers must be maintained at all times except during maintenance, inspection and service.

## **WARNING**

Use only untreated wood in the firebox. Do not burn garbage, gasoline, rubber, engine oil, naptha, plastics, treated wood or combustibles other than wood.

**NOTE:** Chloride or sulfurous gases can be generated if plastic or rubber is burned and will mix with the moisture from the wood and form sulfuric or hydrochloric acids in the firebox, creating excessive corrosion.

**NOTE:** Do not use chemicals or fluids to start the fire. Use kindling and a small amount of paper to start an initial fire.

**NOTE:** This outdoor furnace is not to be used with an automatic stoker.

## **WARNING**

When adding wood to the firebox, be careful not to get pinched between the wood and the door frame, or any part of the outdoor furnace. Use extreme care with large pieces of wood that may be difficult to handle.

**NOTE:** The sight gauge valve should always be closed, except when checking water level. Water will automatically drain from the sight gauge tube when the valve is closed. Remember that this type of valve requires only 1/4 turn to open or close.

## **WARNING**

Sulfuric acid in the test kit is a corrosive acid. Handle carefully. Carefully read and follow precautions on test chemical labels. Keep test chemicals away from children. Safely dispose of tested samples.

**NOTE:** A 40-watt appliance light bulb is recommended if replacement is necessary. Do not install a bulb in excess of 60 watts.

**NOTE:** In case of a power outage, either a generator or 12V battery with a power inverter can be used to provide electricity to operate the outdoor furnace.

# SECTION 1 – OUTDOOR FURNACE INSTALLATION

To ensure the outdoor furnace functions as designed, careful planning and proper installation are imperative. This section outlines much of the information needed to install the outdoor furnace, select water lines, install circulation pumps and connect to your existing heating system.

Be sure to read carefully and observe all of the information, not only in this section, but in the entire owner's manual.

If any installation questions arise that cannot be answered by the information in this manual, be sure to contact your dealer.

## PLANNING THE LOCATION

When selecting a suitable location, carefully consider each of the following:

- Must be installed in accordance to all applicable codes and regulations.
- Check with your insurance company to see if they have any location requirements.
- Consider prevailing winds and the direction smoke will travel.
- The shorter the distance between the outdoor furnace and building(s) being heated, the lower the cost will be for the installation of the hot supply and return water lines and insulation.
- Be sure to maintain the required clearances to combustibles and recommended maintenance clearances.
- ThermoPEX pre-insulated piping is recommended for all installations. Other types of piping should not be buried in low-lying areas with standing water or with a very high water table, or under an area of heavy vehicle traffic unless protected from excessive compression.
- If the ground at the location is unstable or subject to frost heaving, consider installing 2" closed-cell insulation beneath the front portion of the slab and the area around the slab used for walking (see Fig. 4).

### INSTALLATIONS IN MASSACHUSETTS:

1. All installation components must be products approved in the Commonwealth of Massachusetts by the Gas and Plumbing Board.
2. The maximum run of tubing from the water heater to a fan coil is 50 linear feet.
3. Persons operating this hydronic heater are responsible for operation of the hydronic heater so as not to cause a condition of air pollution as defined in 310 CMR 7.01(1).

## INSTALLATION PRECAUTIONS

A qualified installer must perform the installation of this supplementary outdoor furnace and must determine how to install it to be compatible with the existing heating source.

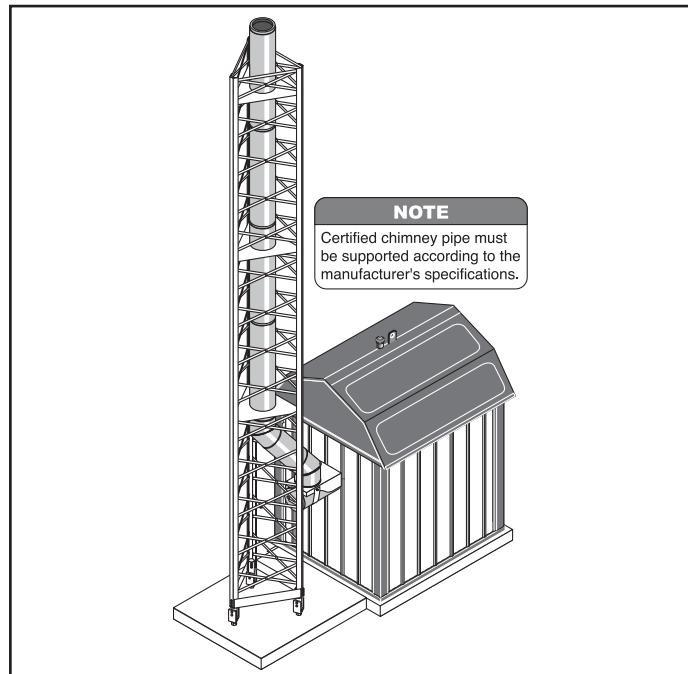
## CHIMNEY HEIGHT AND REINFORCEMENT RECOMMENDATIONS

In higher populated areas, extend the chimney to a height above the roofs of surrounding buildings. Use Central Boiler Chimney Extensions when extending the chimney. Each extension section must be secured at the connection joint with four (4) screws to stabilize the extension.

If extensions are added to the standard eight feet of chimney, the chimney should be reinforced appropriately. When adding sections of chimney, make sure that there is nothing within the fall zone of the chimney that could be damaged. If something is located within the fall zone and cannot be removed, guy wires or braces may need to be installed to prevent a falling chimney from causing damage. See Fig. 2 and 3 for chimney reinforcement recommendations.

**NOTE: If more than three 4-foot sections of chimney are used, a support (e.g., a pole, pipe or other structural support) may be installed from the ground that can withstand wind. Other reinforcement recommendations are shown in Fig. 3.**

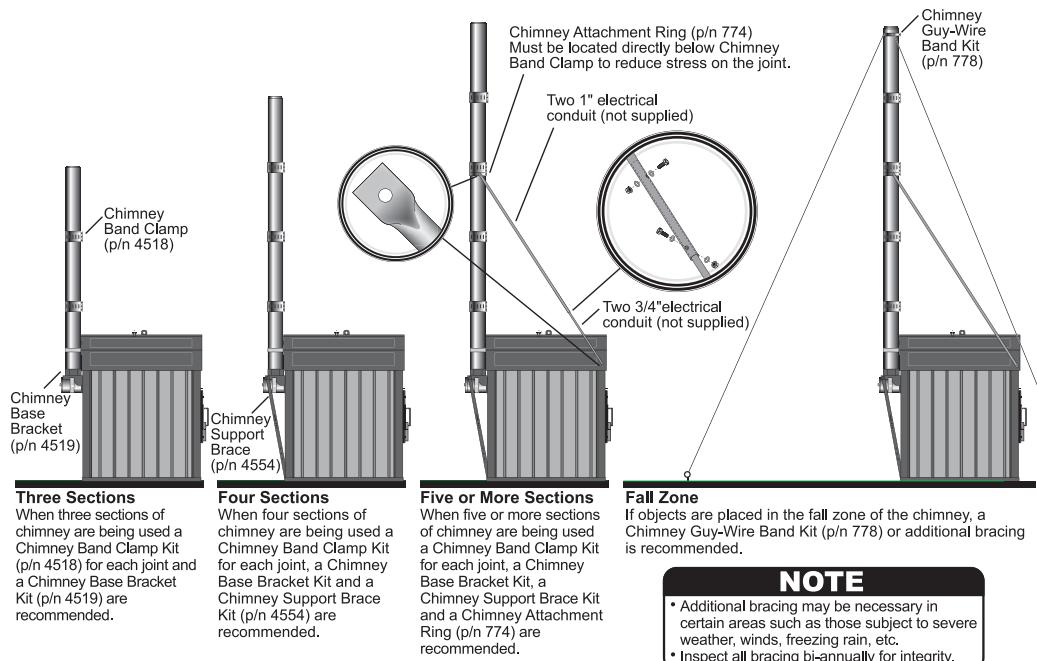
Fig. 2



**NOTE: For chimney extensions or chimney replacement, use only genuine Central Boiler chimney components. Parts are available from an authorized Central Boiler dealer.**

Fig. 3

## Chimney Reinforcement Recommendations



The installation of a spark arrester is recommended, particularly where there are dry conditions or where there is combustible material near the unit, unless the installation of a spark arrester is prohibited by local requirements. Use common sense to avoid potential fires, including exercising caution when disposing of ashes, cleaning and refueling. Keep all highly combustible materials (e.g., gasoline, propane, leaves, pine needles, etc.) away from an operating unit at all times. Take special precautions in windy conditions.

### GENERAL INSTALLATION INFORMATION

#### Foundation

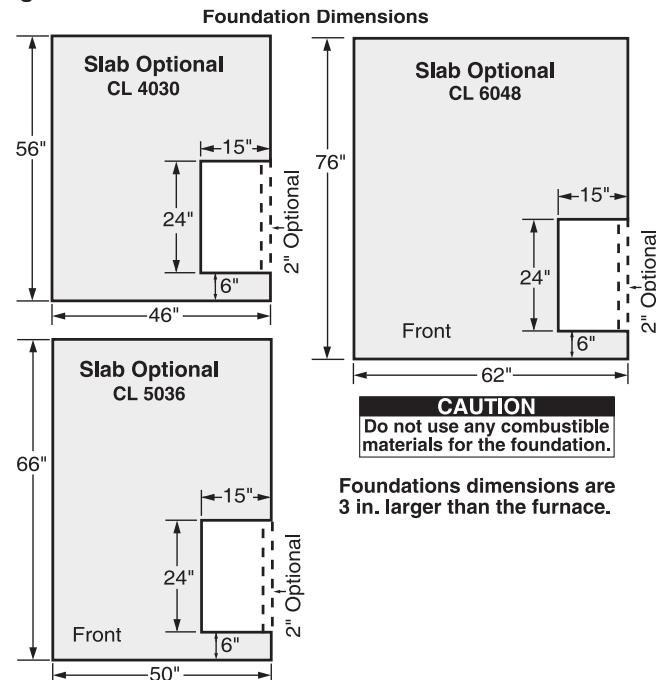
The outdoor furnace may be installed directly on **stable, level ground** without the necessity of a foundation.

If the ground is unstable, one option is to use patio blocks under the perimeter of the base. Another option is to pour a concrete foundation.

To install the furnace on a concrete foundation, refer to Fig. 4 for dimensions and for the location of the hollowed-out area for each model. A 4" to 6" thick concrete slab works well; however, a thicker slab may be used to obtain the desired door opening height.

If the area for the concrete slab is unstable and/or affected by frost heaving, consider installing 2" closed-cell insulation beneath the front portion of the slab and under the area of the ground used for walking.

Fig. 4



Outdoor furnace must be installed on a noncombustible surface or foundation that incorporates an enclosure that will prevent supply and return lines from possible exposure to sunlight, fire, or physical damage that may be caused by an occurrence outside the outdoor furnace enclosure. Foundation may consist of concrete, crushed rock, or patio blocks.

**NOTE:** The installation surface or foundation must be noncombustible. The hot supply and return lines must also be protected from possible exposure to sunlight, fire or physical damage. Foundations may consist of concrete, crushed rock or patio blocks.

## Potable Water

If the outdoor furnace is to heat potable water associated with commercial food preparation or for heating milk-house hot water, it is recommended to install a double-wall heat exchanger. Also, when filling the system with water, a backflow preventer must be installed in the line used for filling.

## Antifreeze

Most outdoor furnaces are installed without antifreeze when an existing heating system is in place and there is no anticipation of leaving the outdoor furnace unattended for extended periods of time. If the building being heated has an alternate heat source, system water may be kept from freezing by running the circulating pump(s) and drawing heat from the existing heat emitter(s).

To prevent freezing if the outdoor furnace is not fired for extended time periods or if lengthy power outages are anticipated during cold weather, a nontoxic propylene glycol boiler-type may be used in the system. Some types of antifreeze that contain various inhibitors have been known to create problems like coagulation and jelling. To prevent potential problems, **do not use** propylene glycol that is premixed with unknown inhibitors. Central Boiler Corrosion Inhibitor Plus (p/n 1650) is compatible with straight propylene glycol. It is important to use Corrosion Inhibitor Plus with straight propylene glycol for corrosion protection. If adding antifreeze to the system, it is imperative that the entire system contain at least 30% antifreeze concentration mixed with softened water to prevent bacterial growth and minimize minerals in the system. Bacterial growth is likely to occur with low antifreeze concentrations and can cause corrosion in the furnace water jacket and/or clogging of heat exchangers. To confirm the antifreeze solution is adequate, allow the pumps to circulate for at least 24 hours and then obtain a sample of the system water. Using an antifreeze tester, the solution must be protected to 0°F (-18°C) or below.

**NOTE: Be sure to adhere to all warnings and precautions on the antifreeze label.**

**NOTE: Do not use automotive or RV types of antifreeze.**

**NOTE: If using antifreeze, use Test Kit (p/n 597) when testing the treated water in the outdoor furnace (see Water Quality and Maintenance).**

## Corrosion Inhibitor Plus™

To aid in protecting the system from corrosion, it is imperative to add Central Boiler Corrosion Inhibitor Plus™ (p/n 1650). For recommended initial treatment rates, refer to Water Quality and Maintenance.

When initially filling the system (see Finalizing the Installation), add the Corrosion Inhibitor Plus™ **before adding water** to the system. Any time water is added to the system, Corrosion Inhibitor Plus™ must be added if a tested water sample indicates it is necessary (see Water Quality and Maintenance).

Corrosion Inhibitor Plus™ is composed of common materials and is biodegradable. However, in keeping with good safety and environmental practices, the supplier recommends the following if draining treated system water becomes necessary:

- You may drain the outdoor furnace to a septic system. Central Boiler Corrosion Inhibitor Plus™ is biodegradable and can be properly treated in a septic system. If doing so, however, be careful not to overflow the tank.
- Do not drain the furnace in such a manner that the drain water could in any way contact surface water, stream, river, estuary (where a river meets a sea), lake, pond, ocean or other types of waters.
- Do not drain to any location within 50 feet of any water well.

## Shut-Off Valves

**Shut-off valves must be installed on each hot supply and return water line** so each line can be shut off individually for purging air from the system. Be sure all valves and fittings are metal. **Do not use plastic valves or fittings.**

## Ground Rod Kit

The outdoor furnace must be electrically bonded to ground in accordance with the requirements of the authority having jurisdiction or, in absence of such requirements, with the National Electrical Code, ANSI/NFPA 70 and/or the Canadian Electrical Code Part 1, CSA C22.1 Electrical Code.

Install a Ground Rod Kit (p/n 6593) and connect it to the outdoor furnace.

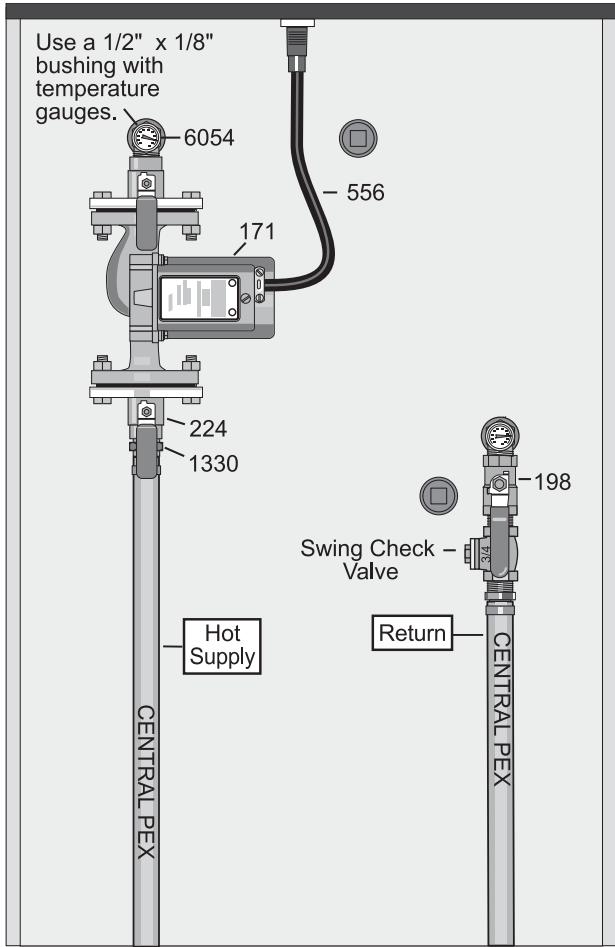
1. In the water line trench near the outdoor furnace, drive the ground rod into the ground until the top of the ground rod is below the ground surface.
2. Route the ground wire from the ground rod under the outdoor furnace base and over to either a vertical brace or the frame of the outdoor furnace.

**NOTE: On some models, a 1/4" hole for the ground terminal has been pre-drilled in the outdoor furnace base. Check to see if there is an existing 1/4" hole before drilling the hole in Step 3.**

3. Drill a 1/4" hole in the brace; then secure the ground terminal with a cap screw (1/4" x 20" x 3/4"), star washer and nut. Secure the ground wire to the terminal; then secure the ground wire to the ground rod with the clamp. Tighten all hardware securely.

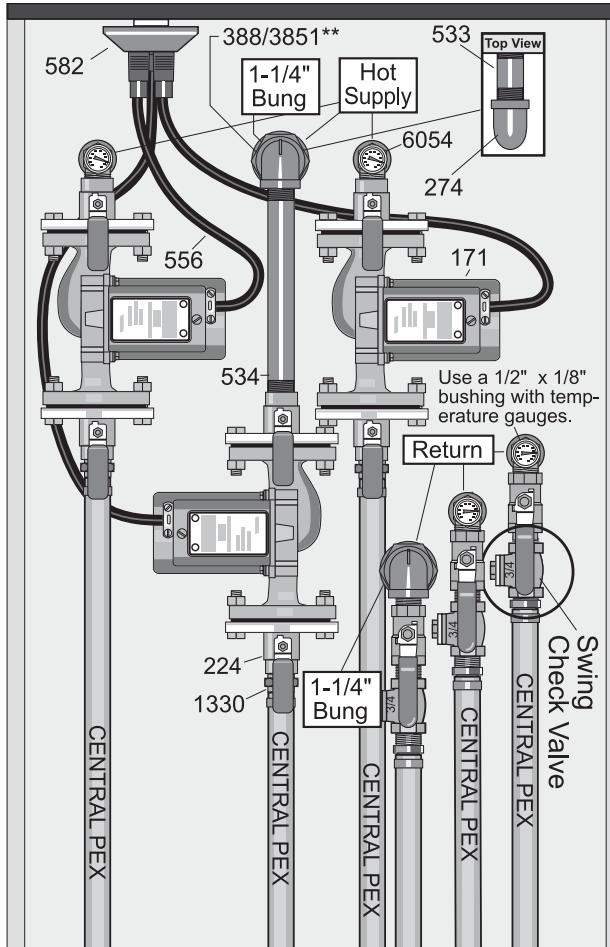
## 1 - Pump Configuration (Taco 007)

Fig. 9



## 3- Pump Configuration (Taco 007)

Fig. 10



## 1 - Pump and 3- Pump Parts List (Taco 007)

Fig. 11

Return Side View			1 - Pump Parts List*		
Qty	p/n	Description	Qty	p/n	Description
For illustration purposes only.			1	118	3/4" Close Nipple
	3042		1	171	007 Pump
	6054		2	198	3/4" Ball Valve
	198		1	224	3/4" Isolation Flange Kits
	118		1	296	3/4" Swing Check Valve
	296**	Swing Check Valve	1	556	Power Supply Cord, 32"
	3/4"		2	1330	3/4" x 1" MPT to PEX
	5926	PEX Pipe	2	3042	1/2" x 1/8" Bushing
			2	6054	Temperature Gauge
			1	6593	Grounding Rod Kit

3 - Pump Parts List*		
Qty	p/n	Description
3	118	3/4" Close Nipple
3	171	007 Pump
3	198	3/4" Ball Valve
3	224	3/4" Isolation Flange Kits
3	274	3/4" Black 90° Street Elbow
3	296	3/4" Swing Check Valve
2	388	1-1/4" x 3/4" Bushing
1	534	3/4" x 7" Nipple
3	556	Power Supply Cord, 32"
1	582	6 Outlet Converter
6	1330	3/4" x 1" MPT to PEX
4	3042	1/2" x 1/8" Bushing
4	6054	Temperature Gauge
1	6593	Grounding Rod Kit
2	6764	3/4" x 3/4" x 1/2" Offset Tee

\*\*For 1-1/4" lines use p/n 5871.  
Central Boiler recommends installing swing check valves on the return lines to eliminate reverse flow.

Power disconnect shuts off all power including pumps.

\*Parts and accessories sold separately.  
Pump size may vary.

### **Thermostatic Valves**

**NOTE: A 3/4" thermostatic valve with installation instructions is included with each new Classic outdoor furnace and must be installed on each set of supply and return lines or warranty can be voided.**

**NOTE: For additional thermostatic valves, or for 1-1/4" thermostatic valves, contact your authorized Central Boiler dealer.**

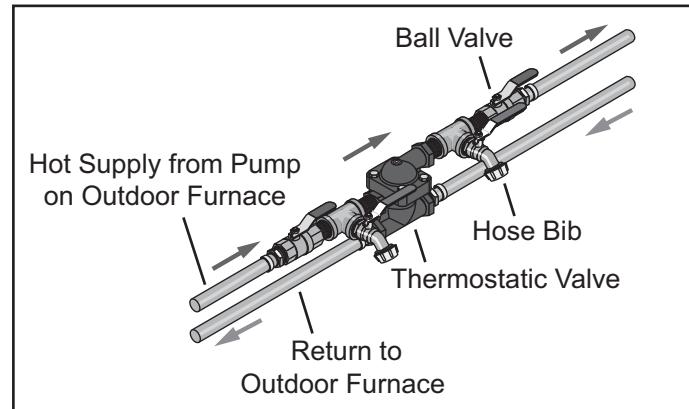
**NOTE: The thermostatic valves illustrated throughout the manual may vary from your installation. See the installation instructions provided with the thermostatic valve.**

A thermostatic valve must be installed on each set of supply and return lines in the system to maintain the outdoor furnace water temperature above 150°F (65°C). Operating the outdoor furnace with the water temperature less than 150°F (65°C) may result in more condensation in the firebox that can lead to corrosion.

**NOTE: The thermostatic valve must be installed in the building to be heated.**

It is recommended that the water temperature setpoint of the furnace be set to 185°F (85°C) to decrease the likelihood of the water falling to 150°F (65°C). As a result, the outdoor furnace will operate with a greater efficiency and require less maintenance. Failure to follow proper operating instructions may result in furnace damage.

Fig. 20



### **Thermostatic Valve Exemption**

If the system includes more than one building and one of the buildings is heated with an oil, gas or electric boiler that also serves as a backup for the other building(s) by keeping the system water temperature above 150°F (65°C) when the outdoor wood furnace is not fired, the thermostatic valve is not required.

## Pressurized Water System Installations

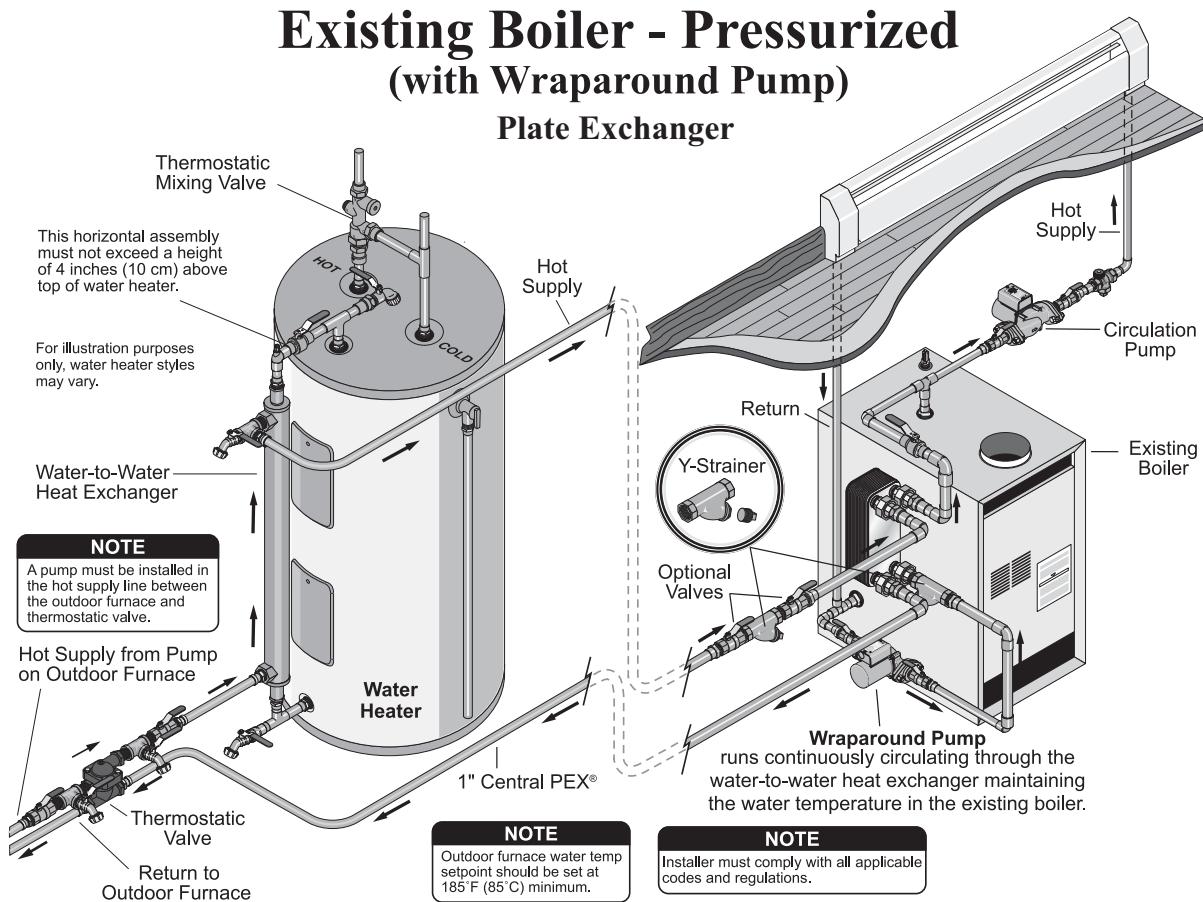
### Water-to-Water Heat Transfer System

To keep the existing system pressurized, a plate exchanger or tube & shell water-to-water heat exchanger installed in the return line of the existing system may be used (see Fig. 28 and 29). The water from the existing system passes through the heat exchanger when the thermostat calls for heat. The water from the outdoor furnace circulates through the other side of the heat exchanger continuously.

It may be necessary to lower the water temperature at which the burner in the existing boiler starts to a setting that prevents the burner in the existing boiler from cycling on when the outdoor furnace is heating the building. Another option is to install a thermostatically controlled interlock switch that prevents the burner in the existing boiler from operating when the water temperature in the outdoor furnace is above 150°F.

Water-to-water heat exchangers will produce transfer temperatures approximately 20°F less than the outdoor furnace water temperature; therefore if the outdoor furnace water temperature is 185°F, it will produce approximately 165°F of water temperature transfer. The temperature controller on the outdoor furnace may be adjusted to allow the outdoor furnace to reach water temperatures up to 195°F. Each system will vary in water temperature transfer depending upon the heat load of the existing heating system.

Fig. 29



The addition of a wraparound pump with a water-to-water heat exchanger (see Fig. 29) may increase heat transfer by allowing circulation continuously through the existing boiler and heat exchanger. This will maintain the maximum temperature in the heat exchanger for heat transfer to the existing boiler. Note the water flows in opposite directions through the heat exchanger.

With this type of installation, the exchange temperature may be more than 165°F and may eliminate the need for additional baseboard heaters, panel radiators or heat exchangers.

When installing water-to-water heat exchangers, be sure to flush any rust particles or sediments out of the existing boiler and install a Y-strainer as illustrated in Fig. 29. Also be sure to add Corrosion Inhibitor Plus™ (p/n 1650).

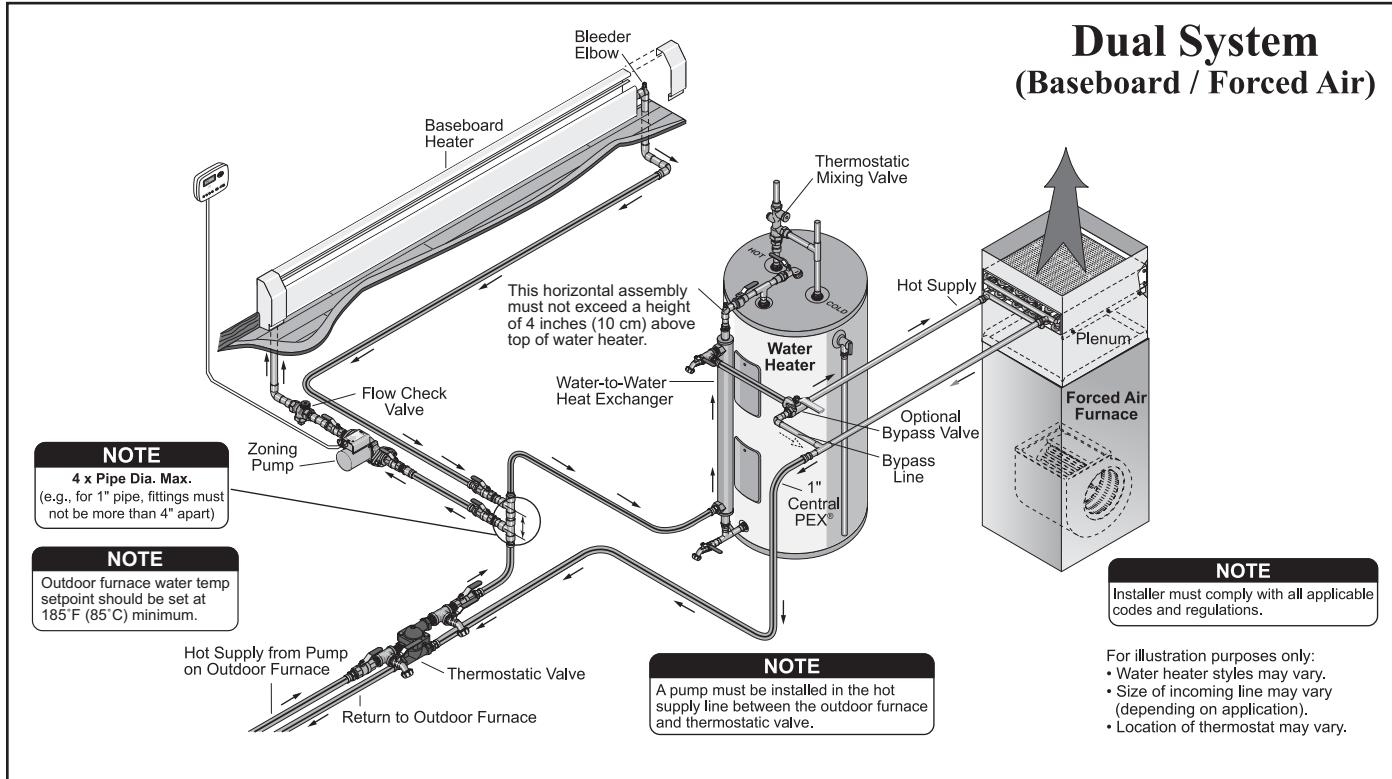
A Taco 007 or 014 pump can be used as a wraparound pump when a plate exchanger is installed. A Taco 009 or 014 pump should be used when a shell and tube heat exchanger (i.e., p/n 148, 151 or 177) is installed.

**NOTE: See the Hydronic Component Selection Guide (p/n 2482) for more detailed information.**

## Direct Circulation Baseboard Installation

Baseboard heaters, as either the main source of heat or as supplements to forced-air or boiler applications are easily plumbed into the water lines from the outdoor furnace.

**Fig. 31**



**Fig. 32**

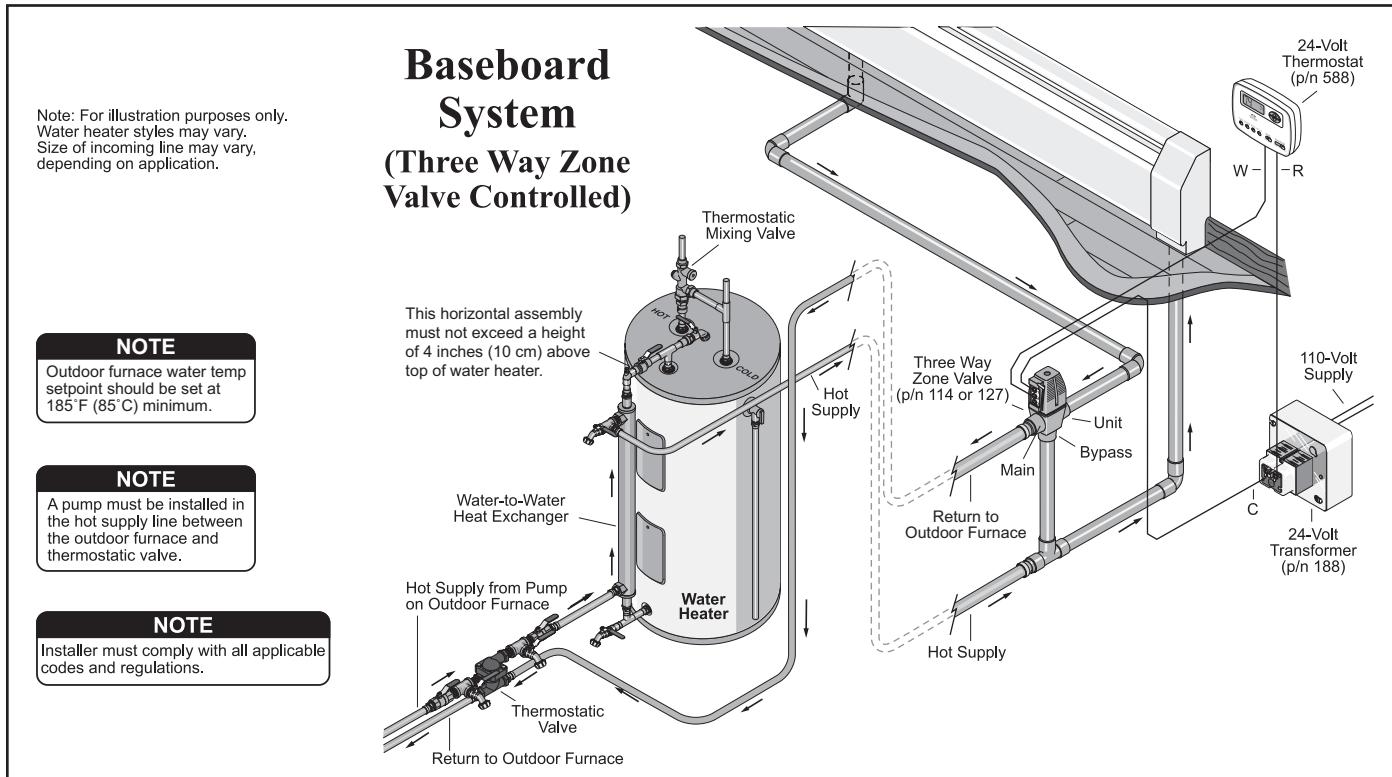


Fig. 31 and 32 illustrate direct circulation baseboard installation examples.

Fig. 34

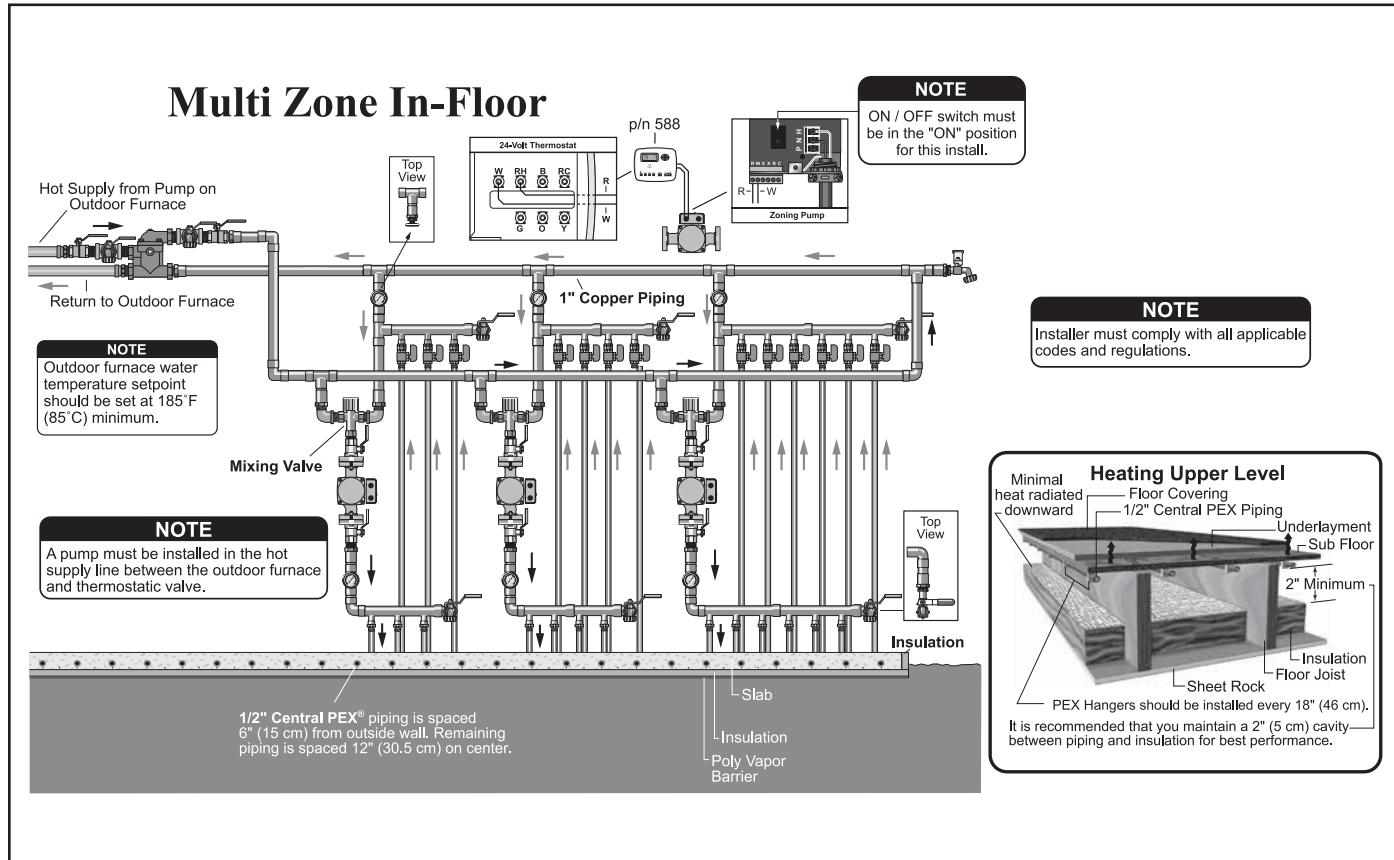
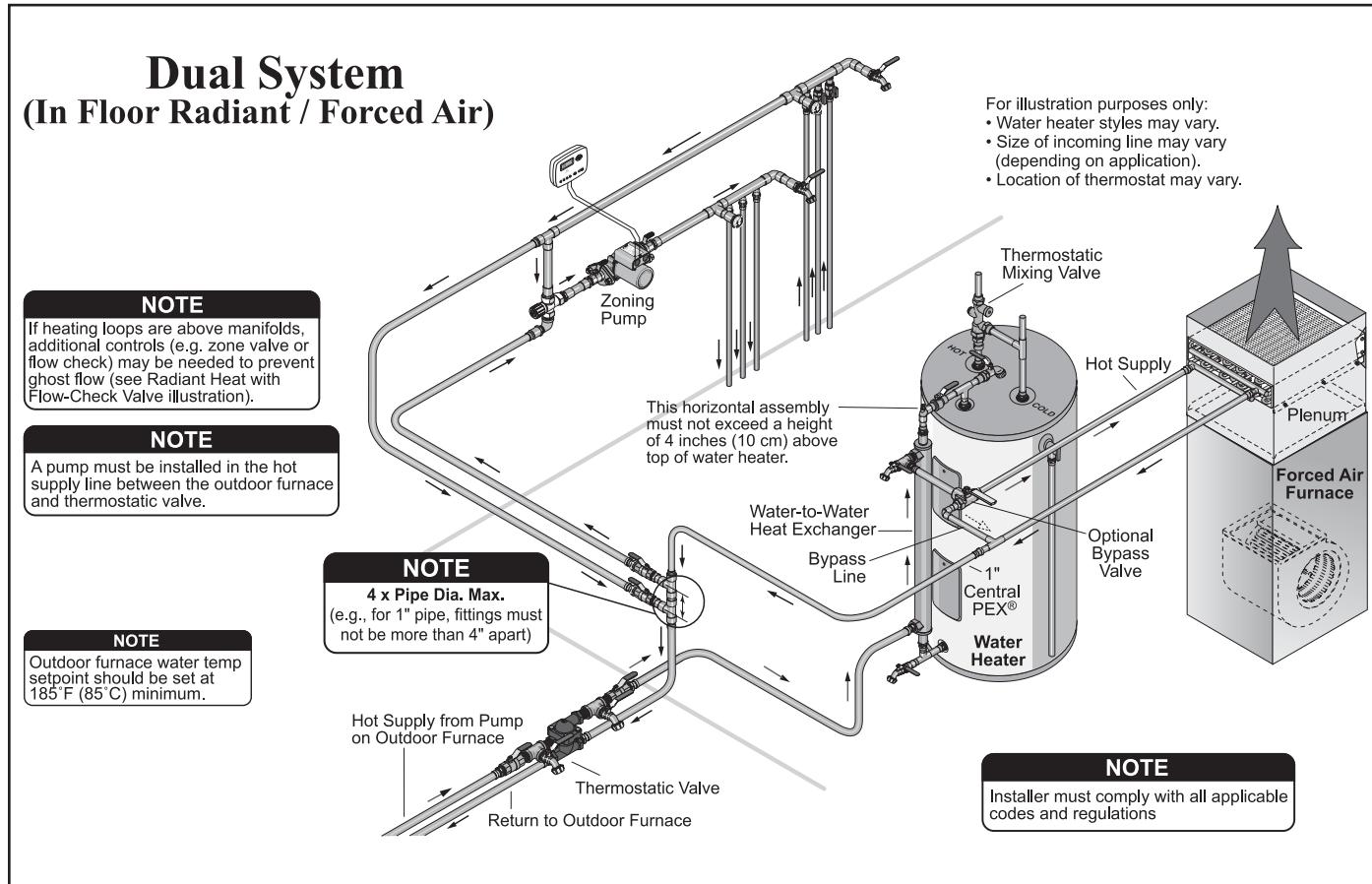
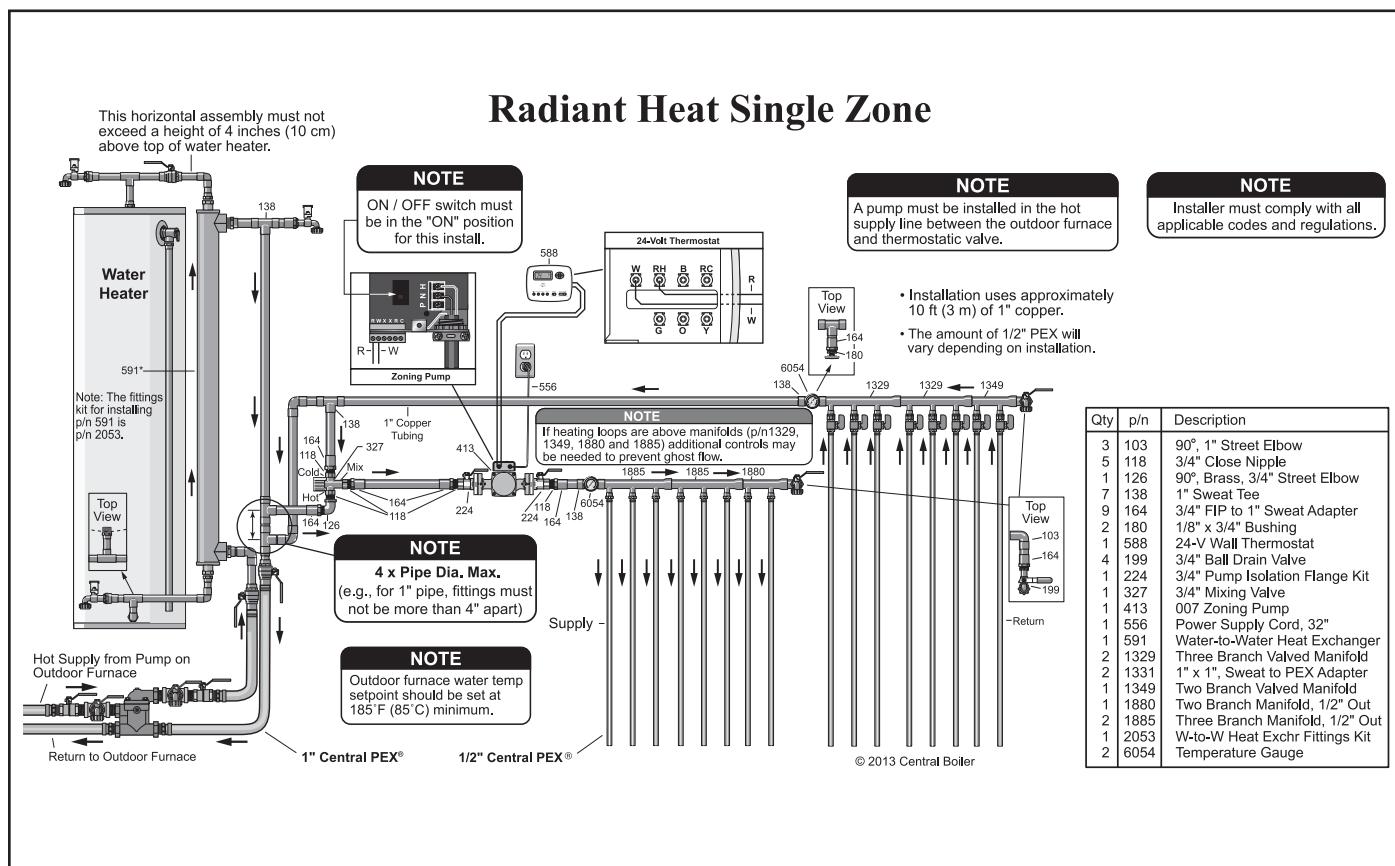


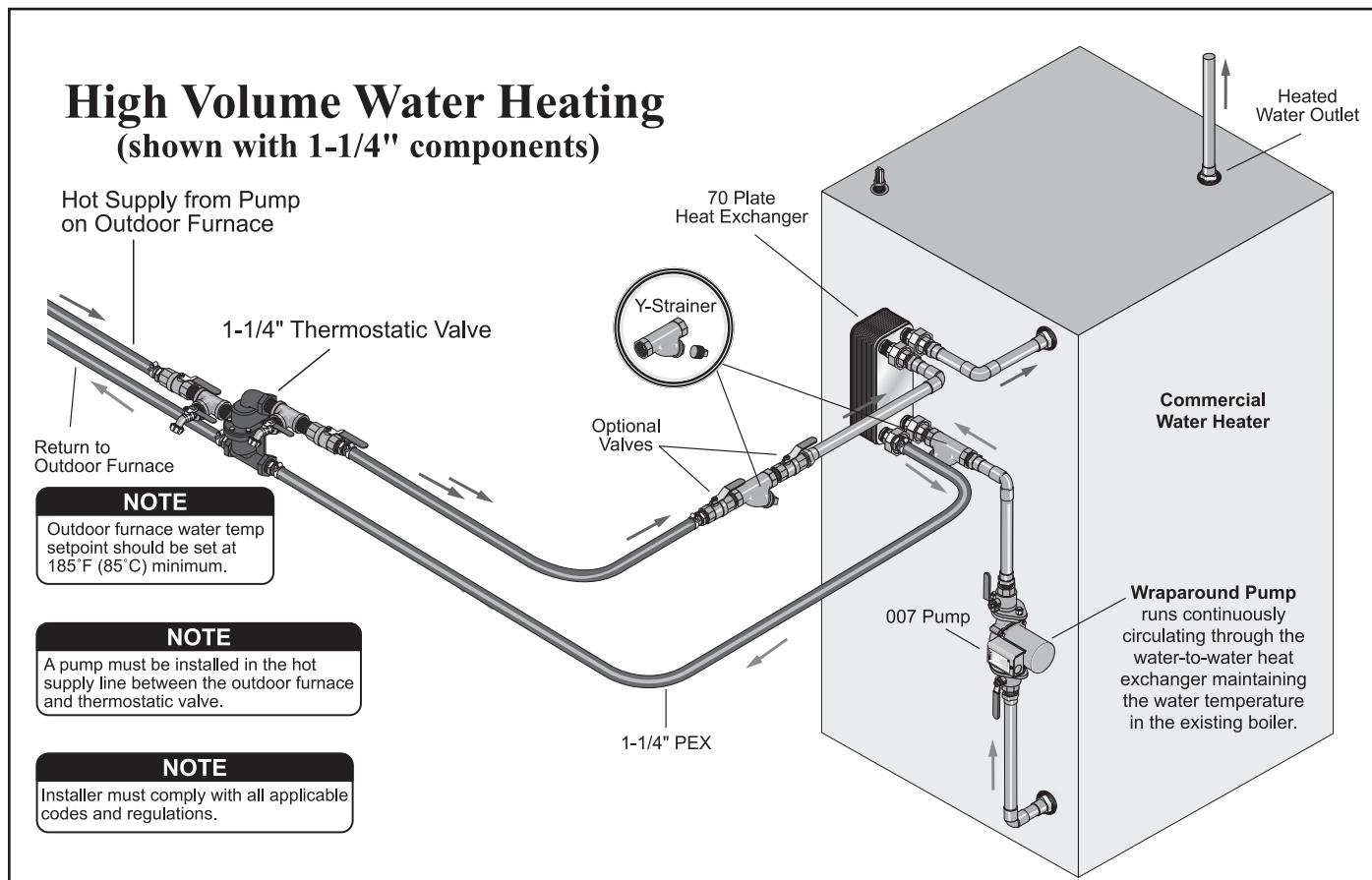
Fig. 35



**Fig. 36**



**Fig. 37**



## Pool and/or Hot Tub Heating

Valves should be installed so the heat exchanger can be isolated and bypassed when shock-treating or adding chemicals to a pool or hot tub (Fig. 38). Incorrect chemical concentrations can cause rapid corrosion to the heat exchanger. Bypassing the heat exchanger is recommended until the pH has stabilized between 7.2 and 7.8.

If the swimming pool or hot tub is salt water treated, the heat exchanger should be a shell and tube type (p/n 148, 151 or 177). See the Hydronic Component Selection Guide (p/n 2482) for more information.

### CAUTION

**Do not install a swimming pool heat exchanger inside a building below the level of the pool as a damaged heat exchanger may result in extensive flooding and draining of the pool.**

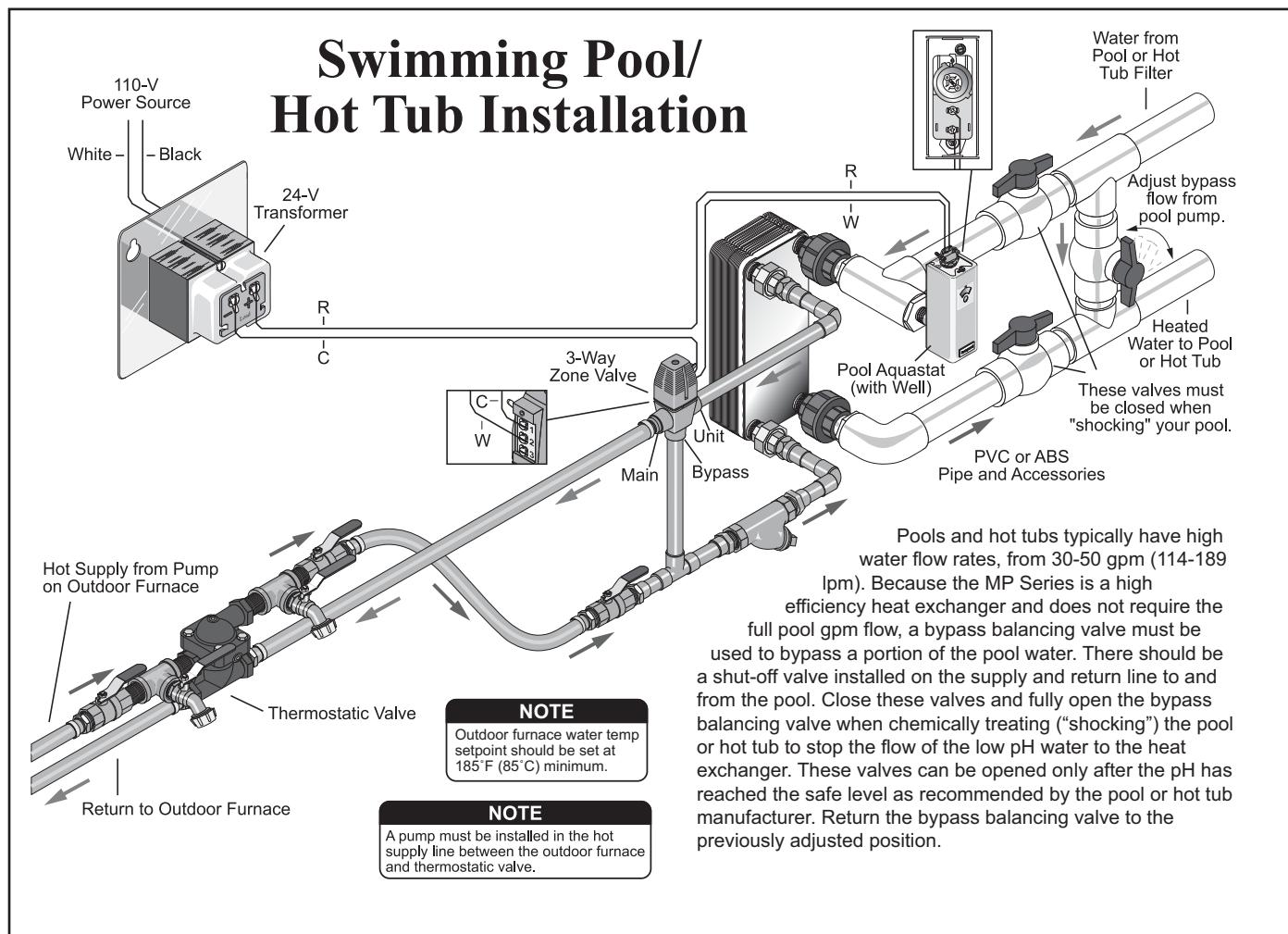
### WARNING

**Do not use automotive or ethylene glycol antifreeze in an outdoor furnace connected to a swimming pool heat exchanger as a damaged heat exchanger may cause severe personal injury, death, or substantial property damage.**

### CAUTION

**Do not operate the outdoor furnace frequently or for extended periods of time with the water temperature below 150°F (65°C) as this will result in more condensation in the firebox that can lead to corrosion.**

Fig. 38



**NOTE: Be sure to fill the outdoor furnace with water of good quality (softened water, if possible). See Water Quality and Maintenance section.**

Use the procedure in this section to fill the outdoor furnace with water and purge the air from the system. All valves in the outdoor furnace system that allow circulation through each circuit should be open before starting. Perform this procedure on each pump circuit from the outdoor furnace.

**NOTE: Add Corrosion Inhibitor Plus™ (p/n 1650) through the 2-inch vent pipe on the outdoor furnace before filling with water to immediately begin to protect the steel.**

1. Connect the male end of garden hose A to valve #1 using the backflow preventer and two 3/4" female hose x 3/4" male pipe adapters (p/n 4928). Connect the female end of the garden hose to valve #2.
2. Close the valves on the hot supply and return lines of the outdoor furnace.
3. Close valve #4 and valve #5.
4. Open valve #1 and valve #2. This step begins filling the system with domestic water and purging the hot supply line and thermostatic valve.
5. Remove cap from valve #3 and open valve #3 slightly to purge air from valve body. Close valve #3 when air is purged.
6. Open valve #5.
7. Open the valve on the hot supply line of the outdoor furnace for 5 minutes; then close the valve. Water will purge air from the hot supply line. The valve and attached fittings on the outdoor furnace will become cold as water starts filling into outdoor furnace.
8. Close valve #5, #1 and #2.
9. Move hose A from valve #2 to valve #3.
10. Open valves #1, #3 and #4.

**NOTE: Skip to Step 12 if your system does not have a seasonal manual bypass valve (valve #6 shown in Fig. 40).**

11. Valve #6 (seasonal manual bypass valve) should be positioned to direct water through the heat exchanger first.
12. Open the valve on the return line of the outdoor furnace.

**NOTE: Skip to Step 14 if your system does not have a seasonal manual bypass valve (valve #6 shown in Fig. 40).**

13. As soon as the valve on the return line of the outdoor furnace is opened, turn valve #6 to the bypass direction for 30 seconds; then turn valve #6 back to previous position.

**NOTE: The heat exchanger manifold (lower manifold first) and fittings will become cold as water flows through the heat exchanger to the outdoor furnace.**

14. Allow outdoor furnace to fill until the water reaches the full mark.
15. Close valves #1 and #3. Disconnect hose A and replace caps on valves #1, #2 and #3.
16. Open the valve on the hot supply line of the outdoor furnace and valve #5.

**NOTE: The valves on the hot supply and return lines of the outdoor furnace, and valves #4 and #5 should all be open, allowing the pump to circulate heated water in the system. Start pump.**

**NOTE: If there are multiple circuits connected to the outdoor furnace, repeat the process for each circuit.**

17. Refer to Firing the Outdoor Furnace to fire up the outdoor furnace.

## CAUTION

**Be sure the outdoor furnace is filled with water before firing. Never fire the outdoor furnace when the water level is more than 1" (2.5 cm) below the FULL mark on the sight gauge.**

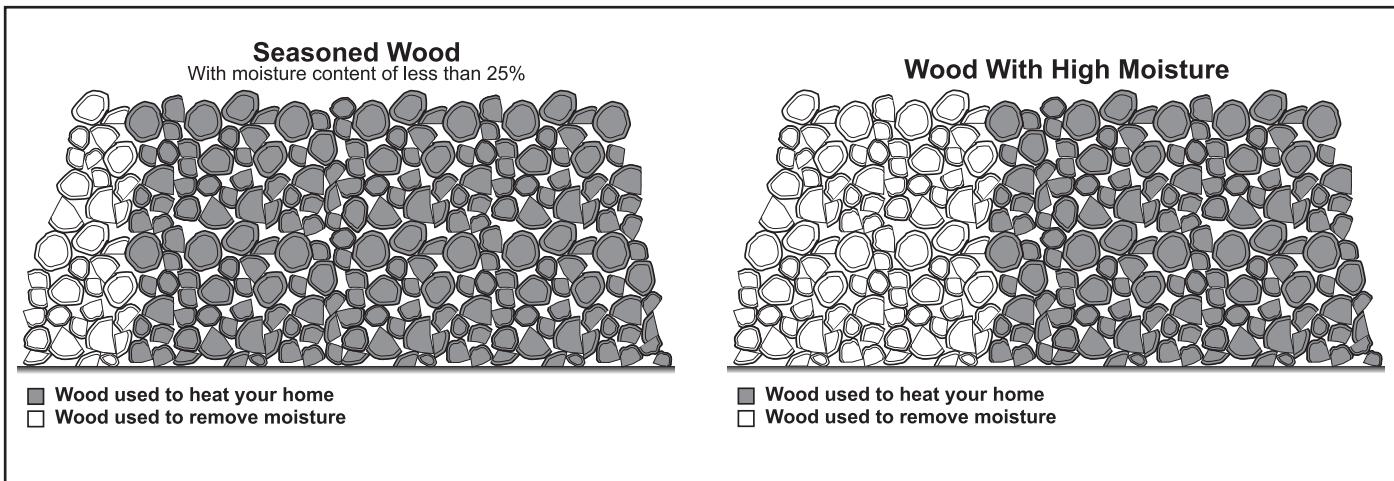
**NOTE: The sight gauge valve should always be closed except when checking water level. Water will automatically drain from the sight gauge tube. Remember that this type of valve requires only 1/4 turn to open or close.**

18. Check the system for leaks again. Inspect all fittings and hose ends for any signs of leakage; repair as necessary. It may be possible to stop a very slow leak at a hose clamp by tightening the clamp after the system has warmed up and the poly becomes more pliable. It might also be necessary to install a second hose clamp with the screw positioned on the opposite side. Release the pressure upon completion of the test.

**NOTE: It should not be necessary to add water to the outdoor furnace more frequently than once every twelve months. If it is more frequent, either there is a leak in the system or the outdoor furnace is boiling because of improper operation or maintenance (see Troubleshooting Section). Be sure to locate and repair the problem immediately. Frequently adding water can cause deterioration in the water jacket. Each time water is added, refer to Water Quality and Maintenance for water testing procedures. If indicated by test results, add Corrosion Inhibitor Plus™ as required. Deterioration due to improper operation and/or maintenance is not covered by warranty.**

## SECTION 2 – OPERATING INSTRUCTIONS

Fig. 41



### Wood Selection and Preparation

For the best results, it is best to burn seasoned split wood. However, it may be possible to burn some unsplit wood with the split wood depending on quality, size, moisture content and wood type. Properly seasoned wood contains less than 25% moisture by weight. Most wood needs to be split to dry down to 25% within a year. Wood between 4" and 8" (10 and 20 cm) in diameter works well in most cases. Pieces of wood that are too large can reduce output capacity because they burn slower.

- Seasoned wood burns more efficiently, minimizes the amount of creosote formation, reduces emissions and extends the life of the outdoor furnace.
- Maintain a quantity of smaller, drier pieces of wood for relighting the fire and for other situations when larger pieces of wood don't work as well.
- The larger the heat load on the outdoor furnace, the drier the wood needs to be in order to maintain an adequate glowing coal bed.

Following are some reasons that green, unseasoned wood should not be used:

- Green wood contains about 50% moisture by weight. Energy is required to heat the wood and evaporate the moisture - energy which could have been used to provide heat for the building. The illustration below shows that burning drier, seasoned wood provides more energy for heating compared with burning green, unseasoned wood that uses more energy to evaporate the moisture and provides less energy for heating.
- Unseasoned wood provides less heat, resulting in more condensates (moisture) in the firebox and increased wood consumption.
- Increased moisture in the firebox can result in corrosion.

- Unseasoned wood causes reduced performance, lower combustion rates and lower heat output.
- The full heating potential is unlikely to be achieved with unseasoned wood.
- Burning wood with an excessively high moisture content increases maintenance requirements and can lower the service life of the outdoor furnace.
- The higher the moisture content of the wood being burned, the harder it is to maintain a glowing coal bed because it burns more slowly.

**NOTE: Do not store wood within the outdoor furnace installation clearances or within the spaces required for fueling, ash removal and other routine maintenance operations.**

## FIRING THE FURNACE

**NOTE:** Before firing the outdoor furnace for the first time, make sure the proper amount of Corrosion Inhibitor Plus™ has been added and the water level is 1" below the full mark on the sight gauge.

### CAUTION

**Do not burn plastic, garbage, treated wood or fuels not listed for this outdoor furnace.**

The outdoor furnace is equipped with a digital temperature controller that closes the outdoor furnace damper when the water temperature reaches the controller's setting. The setting can be adjusted so the outdoor furnace will operate with a water temperature within a range of 150°F-195°F.

### CAUTION

**If the water in the outdoor furnace boils, be sure to check the water level and restore to full. Add Corrosion Inhibitor Plus™ (p/n 1650) as needed (see Water Quality and Maintenance).**

1. The first time you fire the outdoor furnace, place dry kindling wood near the front of the firebox. Use a small amount of paper to light fire.
2. Add larger pieces of wood to the fire but do not fill the firebox completely.
3. When the water temperature reaches the controller setting (185°F) and the damper closes, let the outdoor furnace cycle a few times to be sure it is operating properly; then add more wood.
4. After a few days of operation you will begin to learn how much wood is needed each day. If you only add the amount needed, it is easier to stir the ashes along the sides of the firebox and then to pull them forward (see Firebox Maintenance).

**NOTE: Be sure to clean and inspect the firebox as outlined in Section 3.**

### CAUTION

**Failure to clean the firebox as indicated will result in excessive corrosion.**

Periodically during the normal operation of the outdoor furnace, look at the water temperature display. It should indicate a reading that is within 10°F of the controller setting.

A reading of 212°F or above indicates either a low-water condition or a malfunctioning temperature controller or snap disc (unless the door is open or not sealing properly). If the condition persists and the water level is correct, call your dealer for service.

## FILLING THE FIREBOX

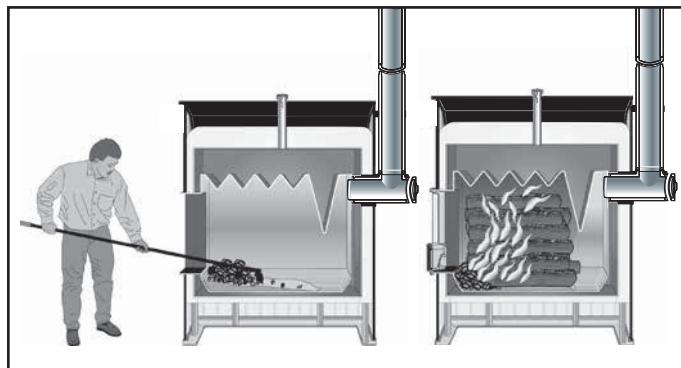
Prior to filling the firebox with wood, always pull the hot coals forward to the draft area (front and center of the firebox). With the hot coals pulled to the draft area, added wood ignites faster because combustion air is forced through the hot coals and into the newly added wood. If the coals are pushed to the back, a less efficient burn will result. If needed to extend the burn time, the outdoor furnace may be completely filled.

### WARNING

**Keep your face away and stay as far away as possible from the firebox door area when opening the door.**

1. Unlatch the door; then stay as far away as possible as the firebox door is opened as smoke and hot gases escaping through the firebox door opening could ignite. From a safe distance, observe the fuel load.
2. If necessary, clean the firebox of excess ashes and/or crusty deposits.
3. Pull the hot coals forward to the draft area (front and center) of the firebox.

**Fig. 42**



### WARNING

**Use extreme care if adding wood when wood or coals are already present. Very hot gases may be coming out of the firebox door opening.**

4. Load the firebox with wood being careful not to be pinched between the wood and any part of the outdoor furnace.

### WARNING

**When adding wood to the firebox, be careful not to get pinched between the wood and the door frame or any part of the outdoor furnace. Use extreme care with large pieces of wood that may be difficult to handle.**

# SECTION 3 – MAINTENANCE INSTRUCTIONS

## PREVENTIVE MAINTENANCE SCHEDULE

Regular maintenance and inspections can help extend the life of your outdoor furnace and prevent high-cost repairs. This table is meant to serve as a general guideline until you become acquainted with how the outdoor furnace operates with your specific application.

OPERATION	SERVICE INTERVAL							See Section Number
	Before first operation	Daily	Weekly	Monthly	Semi-Annually	Post Season		
Broadcast Ashtrol in firebox.		●						3-3
Check water level.	●	●						3-1
Completely remove ash.					C	●		3-7
Inspect firebox door seal.			D				●	3-5
Inspect chimney.	●	A	●				●	3-6
Check vent cap.	●	A						3-2
Stir ash and pull toward front of firebox.			B					3-4
Scrape bottom of firebox.				●			●	3-8
Lubricate door handle.						●		3-9
Check pH and nitrite levels of water.	●				E	●	F	

NOTE: Check daily for build-up of creosote until experience shows how often cleaning is necessary.

- [A] When the outdoor furnace is new, daily for the first week.
- [B] Twice a week.
- [C] After one month, then midway through the heating season.
- [D] Weekly until interval for your application can be determined.
- [E] When new, after three months, then every six months thereafter.
- [F] Refer to Testing Treated Water in the Outdoor Furnace

### CAUTION

Use only genuine Central Boiler Parts and Accessories if it ever becomes necessary to replace any component of the outdoor furnace.

### ROUTINE MAINTENANCE

Routine inspections and maintenance are essential to the proper operation and longevity of the outdoor furnace. The items indicated in the preventive maintenance schedule are intended to serve as a guideline. Actual intervals between inspections and maintenance may vary depending on a number of factors, including your heat load requirements, type of wood used, and outdoor temperatures.

NOTE: Proper firebox maintenance is essential to the longevity of the outdoor furnace.

### CAUTION

Do not burn plastic, garbage, treated wood or fuels not listed for this furnace.

NOTE: Chloride or sulfurous gases can be generated if plastic or rubber is burned and will mix with the moisture from the wood to form sulfuric or hydrochloric acids in the firebox, creating excessive corrosion.

### **3-1. Water Level**

Open the sight gauge valve. The sight gauge tube will fill to indicate the level of water in the outdoor furnace. Be sure to close the sight gauge valve after checking water level. The sight gauge valve and tube will drain when the valve is closed.

### **3-2. Vent Cap**

Check that the vent cap fits loosely on the vent opening.

#### **WARNING**

**Vent cap must fit loosely on the vent opening (Fig. 1). Do not force the cap down or try to seal it tightly onto the vent pipe. Do not extend or restrict the vent pipe or opening. DO NOT ALLOW THE OUTDOOR FURNACE TO BE PRESSURIZED.**

### **3-3. Ashtrol**

Add Ashtrol to the firebox. Use a spoon as directed to broadcast the powder in the firebox, alternating the location. For example, broadcast on the fire or hot coals one day and then on the walls the next day. Ashtrol is a pH modifier that helps to neutralize acids that may form in the firebox.

### **3-4. Stir Ash**

Stir the ashes in the firebox and pull them forward to prevent the ashes from sealing in moisture on the bottom and along the edges. It is especially important to scrape the walls and the four corners at the ash line and below. If this maintenance operation is not performed as directed, deterioration can result from the moisture trapped between the ashes and the steel.

1. Remove any heavy or solidified ashes. When ashes build up to either the door frame in the front or the top of the beveled ash pan of the firebox, they should be removed. A hoe, ash rake and shovel for this procedure may be purchased from your Central Boiler dealer. Leave enough ashes and coals to relight the fire.

#### **CAUTION**

**Always wear the appropriate personal protective gear when cleaning ashes from the firebox.**

2. **Disposal of ashes** - Place ashes in a metal container with a tight-fitting metal lid. It can take many days before the ashes are completely cooled. Other waste should not be placed in this container.
3. Each time the ashes are cleaned out, inspect the door rope (see Section 3-5) to make sure it is sealing properly.

#### **WARNING**

**When cleaning the outdoor furnace, be careful not to spill any hot ash outside of the noncombustible container.**

### **3-5. Firebox Door Seal**

The firebox door rope must be in good condition to ensure an airtight seal. Look for wear spots or portions of the door rope lacking an indentation from the firebox door. The door rope should have a uniform indentation in it all the way around.

1. Open the firebox door. One way to check that the door rope is sealing all the way around the firebox door is to insert a piece of paper similar in size and shape to a dollar bill in several locations around the perimeter of the door and then to close and latch the firebox door.
2. At each location, pull on the piece of paper. If it pulls out easily, either the door rope is sealing improperly and needs to be replaced, or the firebox door needs to be adjusted.
3. Check that the damper is properly sealing when closed. Normal wear over time can create a groove or dent where the damper lid strikes the casting when closing. Replace the damper if it is not sealing properly.
4. Inspect the door casting and heat shields. If the door casting is not cracked through or broken, allowing air to leak in, the door casting should not need to be replaced. Like the damper, it is normal for heat shields to show wear over time. The heat shield should be replaced if it is no longer providing coverage of the casting beneath the heat shield.

**NOTE: If the outdoor furnace has been improperly operated with the door partially open, close the door and allow the outdoor furnace to cycle normally for 1 hour before inspecting the door for proper sealing.**

### **3-6. Chimney**

**NOTE: Creosote is an accumulation of combustion by-products on the surfaces of wood-burning appliances. Twice a month during the heating season, inspect for excessive creosote buildup on the firebox walls, flue and chimney. If present, the buildup should be removed for proper operation and fire safety. Creosote, if ignited in the chimney, results in an extremely hot chimney fire. In case of a chimney fire, close the firebox door.**

1. If the flue passageway behind the baffle becomes plugged, it must be cleaned.
2. Inspect the chimney for excessive buildup of creosote and clean, if necessary.
3. On 4030 models only, inspect the chimney restrictor for excessive buildup of creosote and clean, if necessary. Make sure the chimney restrictor is positioned 11" in from the end of the chimney tee as shown in Fig. 39.

### **3-7. Completely Remove Ash**

1. Remove all ashes from the firebox.

#### **CAUTION**

**Always wear the appropriate personal protective gear when cleaning ashes from the firebox.**

2. Use a wire brush and small scraper to clean the firebox, side walls, back wall and ash pan. Use a light to inspect for corrosion. If corrosion is present, contact your dealer. Lubricate the solenoid plunger with a light petroleum distillate (e.g., WD-40 or equivalent).
2. **Disposal of ashes** - Place ashes in a metal container with a tight-fitting metal lid. It can take many days before the ashes are completely cooled. Other waste should not be placed in this container.
3. Each time the ashes are cleaned out, inspect the door rope (see Section 3-5) to make sure it is sealing properly.

#### **WARNING**

**When cleaning the outdoor furnace, be careful not to spill any hot ash outside of the noncombustible container.**

### **3-8. Scrape Bottom of Firebox**

Scrape the bottom 12 inches of the firebox clean. Allow the fire to get very low; then move the coals to one side of the firebox.

Use a hoe to clean the other side. Move the coals to the other side and finish cleaning the firebox, leaving some ashes with the live coals. Pull the coals and ashes to the draft area (front and center of the firebox). When the furnace is filled, the coals remaining in the firebox will light the fire.

**NOTE: Regular cleaning of the firebox, particularly at the ash line and below, reduces the possibility of corrosion.**

The top of the firebox and walls of the firebox above the ash line should be scraped clean if large, thick, dry or crusty deposits are present. A thin, tar-like layer of creosote does not cause any problems in the operation of the furnace.

### **3-9. Door Handle**

Lubricate the door handle with a light petroleum distillate (e.g., WD-40 or equivalent).

## **WATER QUALITY AND MAINTENANCE**

An important part of furnace maintenance is controlling the quality of the water in the furnace. Central Boiler supplies a pH tape and a nitrite test kit with each new furnace.

### **Water Test Kits and Test Results**

It is very important to keep record of water test results (include the date, pH and nitrite level). If subsequent water tests indicate a pH that is too low and/or a nitrite level that is too high, the results should be verified using a new test kit.

The pH test strips and Permanganate Reagent each have a varying shelf life that can affect their accuracy. Test kits should be stored in a dry area at room temperature to obtain maximum accuracy over a longer period of time. The area in the access panel door where the test kit is located upon arrival from the factory is intended for shipping purposes only. The kit should be moved to an area as stated above as soon as possible after delivery.

The pH of the water in the outdoor furnace will not decrease unless fresh water is added to the furnace. The nitrite level of the water in the outdoor furnace will not increase unless Corrosion Inhibitor Plus™ is added.

For example, if a water test in the fall of the year indicates a pH of 8.5 and a nitrite level of 20 drops by nitrite test (2000 ppm) and no water or Corrosion Inhibitor Plus™ is added, a water test the following spring must indicate a pH of at least 8.5 and a nitrite level of no more than 20 drops by nitrite test (or slightly less, due to evaporation). If the test indicates a significantly lower pH level or higher nitrite level, perform another test with a new test kit to verify the results. If the results are +10% different using a new test kit, either water or Corrosion Inhibitor Plus™ has been added to the system.

If a test is conducted and verified that indicates a high pH (above 9.5) and/or nitrite level (above 30 drops), DO NOT ADD MORE CORROSION INHIBITOR PLUS™. Adding Corrosion Inhibitor Plus™ increases nitrite and pH levels. The outdoor furnace should be drained until the water in the sight gauge reaches the bottom of the sight gauge; then add fresh water until it is 1 inch below the FULL mark on the sight gauge. Circulate the water for 24 hours and test the water again.

### **Testing Supply Water**

Before filling the outdoor furnace with water, test a sample of the supply water that will be used to fill the outdoor furnace (softened water is recommended).

1. Collect a small sample of the water to be used to fill the outdoor furnace in a clean container.
2. Dip the pH test strip from the test kit in the water. Shake excess water off the test strip. Compare the color of the test strip to the chart provided to determine pH level.
3. If the pH level is between 6.5 and 8 and there are no other known water quality problems, then the outdoor furnace may be filled with this water.

4. If the water to be used to fill the outdoor furnace has a pH level of less than 6.5 or greater than 8, a sample of the water should be sent to a water quality test lab for recommended treatment, the water should be conditioned, or water should be supplied from a different source.

### **Corrosion Inhibitor Plus™ and Initial Treatment**

Central Boiler Corrosion Inhibitor Plus™ (p/n 1650) gives optimum protection when it is used to initially treat the water and is then maintained at proper levels. The initial nitrite level target is 20 drops by nitrite test, but 20 to 30 drops is acceptable. Do not exceed treatment of higher than 30 drops by nitrite test.

The recommended initial treatment rate for the outdoor furnace is specified by units. One unit of the Corrosion Inhibitor Plus™ is a 1-gallon container. The normal rate for the initial treatment is dependent on the model: CL 4030 and CL 5036 – 1 unit; CL 6048 – 2 units.

**NOTE: If the system has a larger than normal water capacity, more Corrosion Inhibitor Plus™ should be added at a recommended rate of one unit per 180 gallons of water.**

1. Remove the vent cap and add the recommended amount of Corrosion Inhibitor Plus™ through the vent pipe at the top of the outdoor furnace. Replace the vent cap.
2. Immediately fill the outdoor furnace to 1 inch below the FULL level mark on the sight gauge.
3. Start the pump(s) and circulate water for 24 hours.

### **Testing Treated Water in the Outdoor Furnace**

1. To obtain a system water sample, it will be necessary to remove the tube from the sight gauge mounting hole and bend it away from the outdoor furnace. Before collecting the sample, open the valve and drain about a quart of water from the sight gauge tube; then carefully fill the sample container without contaminating the sample. **Be sure to properly install the sight gauge tube and close the valve when finished.** The water in the sight gauge valve and tube will drain when the valve is closed.

### **CAUTION**

**The water in the sight gauge may be hot. Use caution when obtaining a sample.**

2. If no antifreeze is present in the water, use Test Kit (p/n 405). If antifreeze has been added to the water, use Test Kit (p/n 597).

3. Dip the pH test strip from the test kit in the water sample. Shake excess water off the test strip. Compare the color of the test strip to the chart provided to determine pH level. The pH of the water should now be between 8.0 and 9.5.

4. Rinse and fill the sample tube to the 25 mL mark with treated water from the outdoor furnace.

5. Add 25 drops of Sulfuric Acid (p/n 404) to the water sample and swirl to mix.

### **WARNING**

**Sulfuric Acid is a corrosive acid. Handle carefully. Carefully read and follow precautions on test chemical labels. Keep test chemicals away from children. Safely dispose of tested samples.**

6. Using the dropper, add Permanganate Reagent (p/n 403) one drop at a time, swirling the water and counting each drop, until the color changes from colorless to pink, and stays pink for at least one minute.

**NOTE: Always hold the dropper in a vertical position to ensure proper droplet size.**

7. If the nitrite level is not at least 20 drops by nitrite test, add 1/2 unit of Corrosion Inhibitor Plus™ (p/n 1650); then circulate water for 24 hours and repeat procedure, as needed, to achieve a nitrite level of at least 20 drops by nitrite test.
8. Do not exceed treatment of higher than 30 drops by the nitrite test. If the test requires more than 30 drops, dilute the water by draining water from the system until the water level just reaches the bottom of the sight gauge. Then perform steps 2-3 from Corrosion Inhibitor Plus™ and Initial Treatment and steps 1-9 from Testing Treated Water in the Outdoor Furnace.

### **CAUTION**

**Completely clean out the firebox before draining water from the outdoor furnace.**

9. After the proper nitrite level has been obtained, check pH to make sure it is between 8 and 9.5.

After initial treatment, the maintenance nitrite level target is 15 drops by nitrite test, but 15 to 30 drops is acceptable. One drop of permanganate reagent equals approximately 100 ppm.

### **System Maintenance**

The pH and nitrite levels of the water, once treated, should remain stable as long as water is not added to the outdoor furnace. If water is added to the outdoor furnace and/or system, the system water should be tested and Corrosion Inhibitor Plus™ should be added (if necessary) to maintain the recommended level of protection.

- To test the solenoid with a multimeter, turn the Power Disconnect Switch to the OFF position and refer to Testing Solenoid.
- If solenoid still does not operate, turn the Power Disconnect Switch to the OFF position and replace the solenoid (see Replacing Solenoid).

## TESTING SOLENOID

### WARNING

**Do not attempt service on the solenoid without first disconnecting the electrical power at the main power source.**

1. Remove the screws securing the draft enclosure cover; then remove the cover.

### CAUTION

**Solenoid may be hot.**

2. Carefully disconnect the two wire leads connected to the left side of the solenoid by gently pulling and moving them from side to side.
3. Using a multimeter set to Ohms, test the solenoid's resistance by touching the meter leads to the solenoid terminals.
4. If the multimeter reading is between 15 and 30 Ohms, the solenoid is good. If the multimeter reading is less than 15 Ohms or more than 30 Ohms, the solenoid is faulty and should be replaced.
5. If the solenoid is good, carefully attach the wire leads onto the solenoid terminals (white wire connected to the upper terminal).
6. Install the cover and secure with the screws.
7. Turn the Power Disconnect Switch to the ON position.

## REPLACING SOLENOID

### WARNING

**Do not attempt service on the solenoid without first disconnecting the electrical power at the main power source.**

1. Remove the screws securing the draft enclosure cover; then remove the cover.

### CAUTION

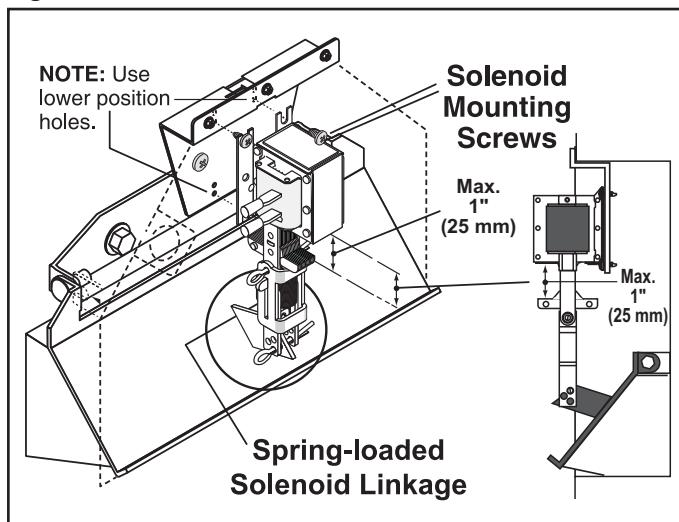
**Solenoid may be hot.**

2. Carefully disconnect the two wire leads connected to the left side of the solenoid by gently pulling and moving them from side to side.
3. Remove the top cotter key of the linkage.

4. While supporting the solenoid with your hand, remove the top two solenoid mounting screws and loosen the bottom two.
5. Lift up on the solenoid until it clears the screw heads and remove.
6. Place the new solenoid into position and lightly secure with the screws. Adjust the solenoid up or down until the solenoid plunger free length is between 15/16" and 1"; then tighten the screws securely. Connect the solenoid to the linkage with the cotter pin. Slightly spread the legs of the cotter pin. Check that the spring-loaded linkage and damper door are not binding and that the spring is not broken or missing.
7. Carefully attach the wire leads onto the solenoid terminals (white wire connected to the upper terminal).
8. Install the cover and secure with the screws.
9. Turn the Power Disconnect Switch to the ON position.

**NOTE: If the solenoid rattles during operation, the alignment between the solenoid and the lift tab is incorrect. To align the solenoid and lift tab, loosen the four solenoid mounting screws and move the solenoid until the solenoid plunger aligns with the lift tab. Secure the solenoid; then make sure it operates smoothly.**

Fig. 48



## TEMPERATURE CONTROLLER

1. Disconnect the electrical power at the main power source to the outdoor furnace; then open the control panel door. Remove the screws securing the inner door panel; then remove the panel.

## WARNING

**Do not attempt service inside the electrical control panel without first disconnecting the electrical power at the main power source.**

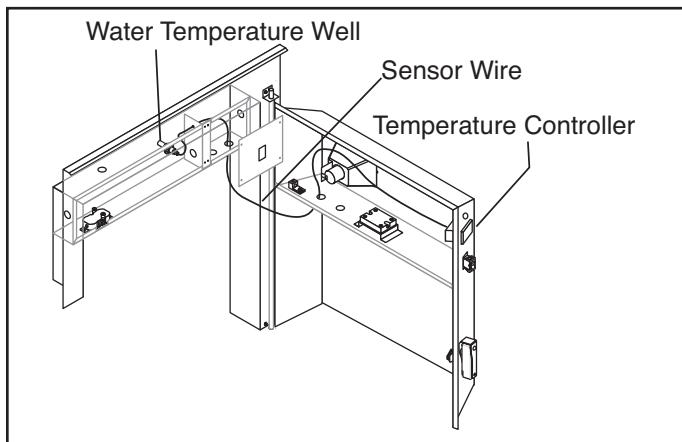
2. Carefully label each of the wires connected to the temperature controller according to the numbered connections identified on the top of the controller.
3. Using a small screwdriver, loosen the screws securing each of the wires; then pull the wires out of the controller.
4. Depress the tabs on the side of the controller mounting strap; then slide the strap off the controller. Remove the controller from the control panel.
5. Place the new gasket onto the controller. Slide the new controller into position (making sure it is positioned upward) in the control panel; then secure with the mounting strap.
6. Slide each of the labeled wires into their proper positions on the controller; then tighten each of the screws securely.
7. Place the inner door panel into position on the door and secure with the screws.
8. Close and secure the door. Connect power to the outdoor furnace.

## WATER TEMPERATURE SENSOR

### WARNING

**Do not attempt service inside the electrical control panel without first disconnecting the electrical power at the main power source.**

Fig. 49



To test the water temperature sensor using a multimeter, see Testing Water Temperature Sensor. If the sensor needs to be replaced, see Replacing Water Temperature Sensor.

## TESTING WATER TEMPERATURE SENSOR

1. Disconnect the electrical power at the main power source to the outdoor furnace; then open the control panel door. Remove the screws securing the access box panel; then remove the panel.

### WARNING

**Do not attempt service inside the electrical control panel without first disconnecting the electrical power at the main power source.**

2. Disconnect the sensor wires from the controller.
3. Using a multimeter set to Ohms, touch the meter leads to the wires disconnected from the controller. A reading of 1000 Ohms or less indicates the temperature sensor is good; a reading of more than 1000 Ohms indicates the temperature sensor is faulty and should be replaced.

## REPLACING WATER TEMPERATURE SENSOR

1. Disconnect the electrical power at the main power source to the outdoor furnace; then open the control panel door. Remove the screws securing the access box panel; then remove the panel.

### WARNING

**Do not attempt service inside the electrical control panel without first disconnecting the electrical power at the main power source.**

2. Disconnect the sensor wires from the controller.
3. Remove (by pulling) the sensor from the well.
4. Firmly press the new sensor into the well. Secure the sensor in place following the instructions provided with the new sensor.
5. Connect the sensor wires to the controller.
6. Place the access box panel into position and secure with the screws.
7. Close and secure the door. Connect power to the outdoor furnace.

## SECTION 5 – TROUBLESHOOTING

### A. OUTDOOR FURNACE DOES NOT HEAT (BUILDING IS LOSING TEMPERATURE)

1. **Out of wood** - Check firebox to see if fire is out. Add wood as necessary. Use good quality wood since poor quality wood will have very short burn times.
2. **Circulation valve(s) closed** - Be sure all valves in the system are open.
3. **Circuit breaker off** - Check the circuit breaker that supplies power to the outdoor furnace.
4. **Solenoid not operating properly** - Disconnect power to the furnace; then check the fuse in the control panel. If fuse is blown, check damper door for obstructions and for free movement. Be sure damper door works freely; then replace the fuse. Check the solenoid plunger free length. With the damper door fully closed, the correct length is between 15/16" and 1" (see Fig. 48). Adjust if necessary, but do not exceed 1". Be sure that the damper door (when activated by the solenoid) does not contact the louvered cover. Lubricate or adjust as necessary. Check that the spring-loaded linkage and damper door are not binding and that the spring is not broken or missing.
5. **Circulation pump(s) not operating** - Check that circulation pumps are operating. If not, disconnect power to the pump. Close valves at the pump. Disassemble the pump and try to turn the pump shaft. If the shaft is stuck, replace the pump cartridge. Replace only the cartridge whenever possible. If necessary, replace the pump. Follow instructions supplied with the pump.
6. **Air in system** - Check for air in the water lines or heat exchangers. If you hear a gurgling sound in a heat exchanger, air is present in the system. Shut off the pump, wait 15 seconds and start the pump. If it is necessary to force air from lines, refer to Initial Start-up Procedures.
7. **Outdoor furnace exhaust obstructed** - Check furnace exhaust for obstructions by observing the amount of smoke coming out of the chimney with the firebox door slightly ajar. If smoke seems very restricted, remove the firewood and hot coals; then check the chimney (top and bottom) and behind the baffle for obstructions. On 4030 models only, check that the chimney restrictor is not plugged with creosote and that it is positioned 11" in from the end of the chimney tee.
8. **Building(s) poorly insulated or uninsulated** - Poorly insulated or uninsulated buildings, buildings with uninsulated or poorly insulated ceilings, or a lack of proper insulation under radiant flooring can cause excessive fuel consumption and/or heating problems.

9. **Supply and return lines installed incorrectly** - Make sure the hot supply water line is connected to the correct fitting on the outdoor furnace and heat exchanger.
10. **Circulation pump(s) installed backwards** - Check that pump flow direction is correct. If not, shut off power to pump. If the flow is not in the correct direction, disconnect pump from water line and reverse pump mounting to correct flow direction. If the pump is not mounted on the outdoor furnace, check for proper pump mounting location (see Fig. 17-18).
11. **Underground supply and return lines insulated poorly** - Heat loss from poorly insulated underground supply and return lines is often indicated by an unusually high amount of snow melting above the lines when the ground temperature is 10° F or colder.
12. **Supply and return lines uninsulated** - Uninsulated supply and return lines in areas that are not intended to be heated (unheated crawl spaces, etc.) may cause excessive heat loss. Insulate the supply and return lines.
13. **Poor water quality** - Water with high amounts of solids, sand or dirt can create deposits inside the wall of heat exchanger components, reducing the amount of heat output. If this condition is suspected, contact your Central Boiler dealer.

### B. OUTDOOR FURNACE IS OVERHEATING

1. **Air entering through the door** - Make sure the firebox door is properly latched and check the condition of the door rope. If it is not sealing properly (indicated by a uniform indentation in the rope), replace the rope. If door does not close tightly, adjust using the appropriate procedure (see Owner Serviceable Items).
2. **Air entering through the damper** - Check to be sure the damper is operating correctly as explained in section A.4. Be sure the damper closes all the way and that no obstructions are present. The damper can wear a groove or the bracket can loosen over time. If that is the case, the damper may need replacement and/or the bracket may need to be adjusted and tightened.

If the solenoid is sticking, lubricate with silicone spray or a light petroleum distillate (WD-40 or equivalent). Check linkage for binding, or for a missing or broken spring.

**NOTE: If the water in the outdoor furnace boils, identify the cause and correct immediately. The outdoor furnace will not typically be damaged by boiling unless it reduces the water level more than 1" below the full mark on the sight gauge. If water boils, restore water level to full and add Corrosion Inhibitor Plus™ as needed. If water is added frequently it will cause deterioration in the water jacket which will reduce the life of the outdoor furnace.**

3. **Temperature controller set incorrectly** - The temperature controller should not be set above 195°F.
4. **Water is not circulating** - The pump should run continuously and water needs to circulate continuously through the supply and return lines to keep water temperature uniform in the outdoor furnace.
5. **Circulation valve(s) closed** - Be sure the proper valves in the system are open to allow circulation.

#### **C. SOLENOID DOES NOT OPERATE**

1. **Fuse blown** - Check the fuse. Check damper and solenoid area for obstructions or damage. Be sure the damper door operates properly; then replace the fuse.
2. **Solenoid not operating properly** - Solenoid may be damaged. If so, be sure to check the linkage for free movement and for creosote buildup between the damper door and draft opening. Replace the solenoid if burned out or stuck in the open position. Check that the spring-loaded linkage and damper door are not binding and that the spring is not broken or missing. The solenoid is an owner serviceable item (see instructions for replacement in Section 4).

#### **D. FREQUENT PUMP TROUBLE OR POOR WATER CIRCULATION**

1. **Pump mounted incorrectly** - If the pump is not mounted on the outdoor furnace, it must be mounted at a minimum of four feet lower than either the top water level in the outdoor furnace or the highest point of the hot supply lines (see Fig. 19).
2. **Deposits in water lines/heat exchanger walls** - If water high in silica or other mineral content has been used, material deposits may build up on the insides of the supply and return lines and on the heat exchanger walls. If this occurs, the system will need to be drained and then cleaned using Sludge Conditioner (p/n 166). The system must then be refilled with the proper amount of Corrosion Inhibitor Plus™ (p/n 1650) and fresh water.

3. **Water will not circulate** - If the system has been drained and refilled, or if the system has been opened for any reason (e.g., replacement of pump, adding heat exchangers, repairing a leak), the system must be purged (see Initial Start-up Procedures).

4. **Poor water quality** - Water with high amounts of solids, sand or dirt can cause frequent pump failure. Use softened and/or filtered water.

#### **E. ERRATIC TEMPERATURE READING ON GAUGE**

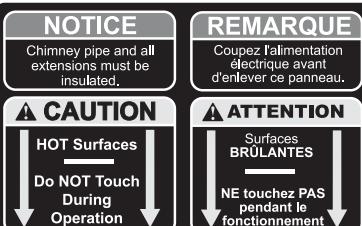
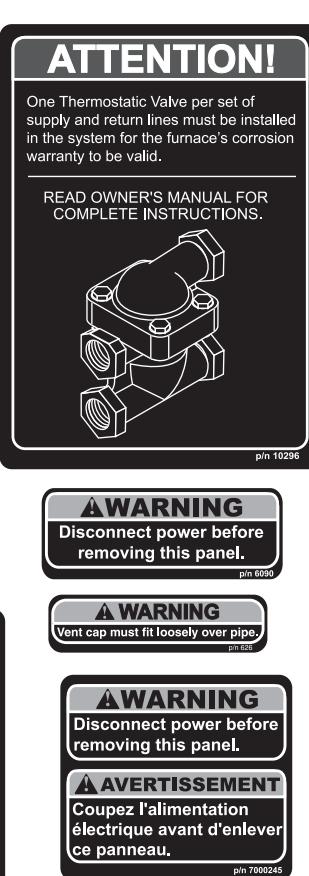
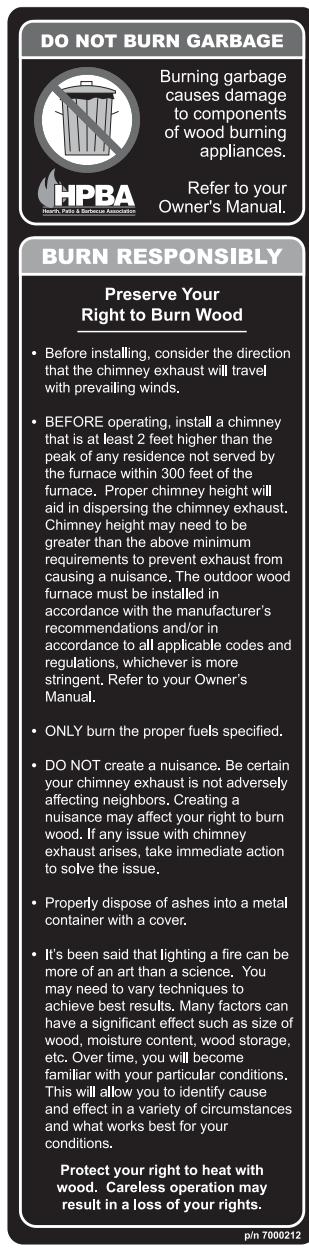
1. **Return water too cold** - Water circulation may be too slow. The return water should be no more than 20°F-25°F less than the hot supply water. If the water returning to the outdoor furnace is too cold, it may cause erratic temperature readings. Check for partial air lock or install larger pump.

#### **F. BURNING AN EXCESSIVE AMOUNT OF WOOD**

1. **High volume water heating** - High volume water heating (e.g., car wash, swimming pool, etc.) will require high wood consumption.
2. **Excessive heat loss** - See items 9-12 of Outdoor Furnace Does Not Heat.
3. **Air entering through door** - See item 1 of Outdoor Furnace is Overheating.
4. **Excessive draft** - If a very tall extension is added to the chimney, the increased draw through the draft may cause excessive wood consumption. Decreasing the draft opening may increase efficiency and reduce wood consumption.
5. **Supply and return line heat loss** - If supply and return lines are buried in a wet, low-lying area, there may be a large heat loss which would greatly increase wood consumption.
6. **High heat demand** - Concrete slabs (with radiant heat) that are poorly insulated or are exposed to water or cold outside temperatures will require increased wood consumption (see Hydronic Installations section). Bringing a concrete slab up to temperature the first time will take a considerable amount of time and wood; once warm, wood consumption will be reduced if the concrete slab and building are insulated properly. The following will also have a high heat demand: poorly insulated buildings, buildings with large amounts of glass windows/doors, buildings with overhead doors, greenhouses, uninsulated crawl spaces, outdoor air infiltration and air leaking through foundation.

# SECTION 6 – GENERAL INFORMATION

*Make note of these precautionary statements also found on the furnace.*



**Attachment 3**  
**NESCAUM Pellet Analysis Results**

# **Residential Wood Pellets: Elemental Composition, Market Analysis and Policy Implications**



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**George Allen, NESCAUM**

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Clarkson University**

**December 8, 2011**

**Residential Wood Smoke Group**

# Background

- Greater push to use biomass fuels as an alternative to fossil fuels
- Limited information on components of wood pellet fuels
- Examine the efficacy of existing standards?
- Understanding composition is important
  - enhance knowledge of potential air pollution
  - public health impact
  - efficiency benefits and trade-offs
  - potential solid waste issues

# Background

- Quantify wood pellet fuel chemical composition for fuels manufactured or available in New York State
- Assess variability of composition across/within brands
- Identify policy relevant strategies to reduce or control impacts from air emissions and/or solid waste
- Provide input into pending EPA NSPS regulation Residential Wood Heater Source Performance Standard (NSPS)

# Pellet Market

- U.S. has no regulatory pellet fuel standard but expect proposed EPA regs soon
- Pellet Fuel Institute (PFI) has voluntary standards
- All pellets found in retail outlets labeled as “Premium” wood pellets
- Until 2009, demand for pellets outstripped supply but in the last two years overproduction

# Sample Collection/Prep

- 132 40# bags obtained during winter 2010-11 in 5 NE States
- ~ 100 different brands (rest: duplicates purchased independently)
- 4 categories of analysis:
  - Basic characterization (ASTM “proximate analysis”) calorific value, moisture content, ash content
  - Ions: sulfate and chlorine by IC
  - Trace metals by ICP-MS
  - Mercury - gold trap followed by CVAA analysis

# Analysis

- What is “normal” for ions and metals pellet analysis?
  - No accepted standards (ash or wood) at this time
  - No SRM or similar reference material for wood/ash analysis
- Sample Screening for “normal” values to estimate working “benchmark” concentration for ash analysis
  - Use 95th percentile of normals as preliminary “benchmark” limit
  - 85 out of 132 samples considered “normal” (64%) based on screening of all analytes
  - Remainder, 47 samples, had outlier results
  - 20 samples (15%) elements of concern (metals, mercury)

# “Normal” Pellets

- Typically, the pellets identified as normal looked like wood



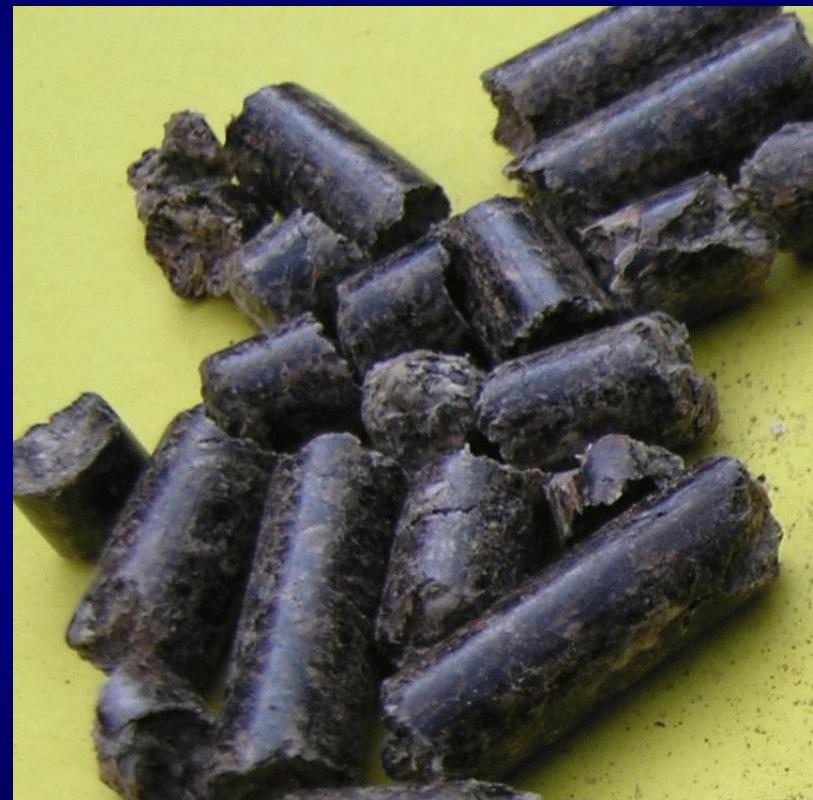
# Pellet Analysis

- This pellet exhibited high levels of:
  - Chromium
  - Copper
  - Arsenic
  - Lead
  - Mercury



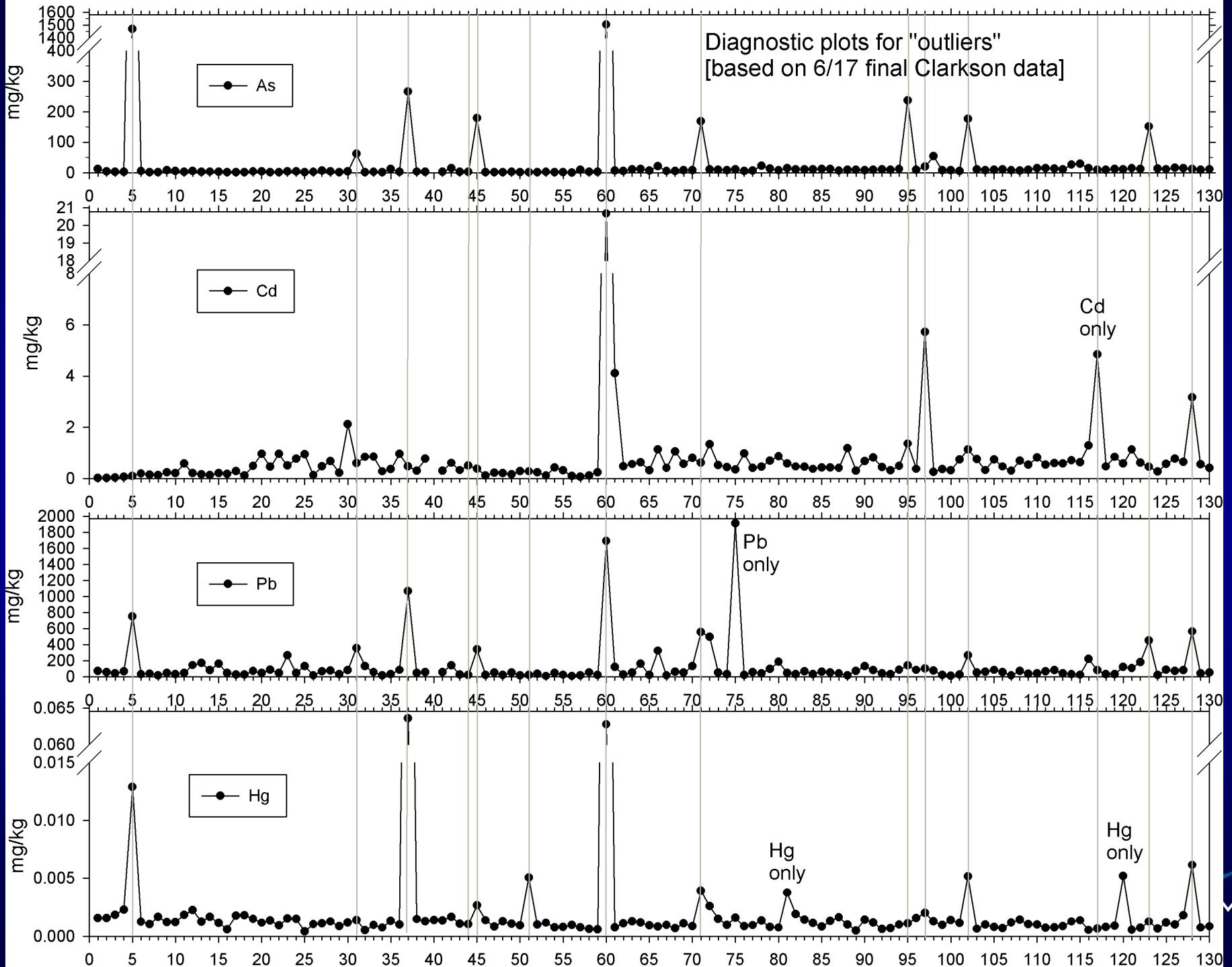
# Pellet Analysis

- This pellet almost black
  - Color could be a result of processing or of addition of black liquor
- 8% ash - PFI ash limit:  
1% for “premium grade” pellets.

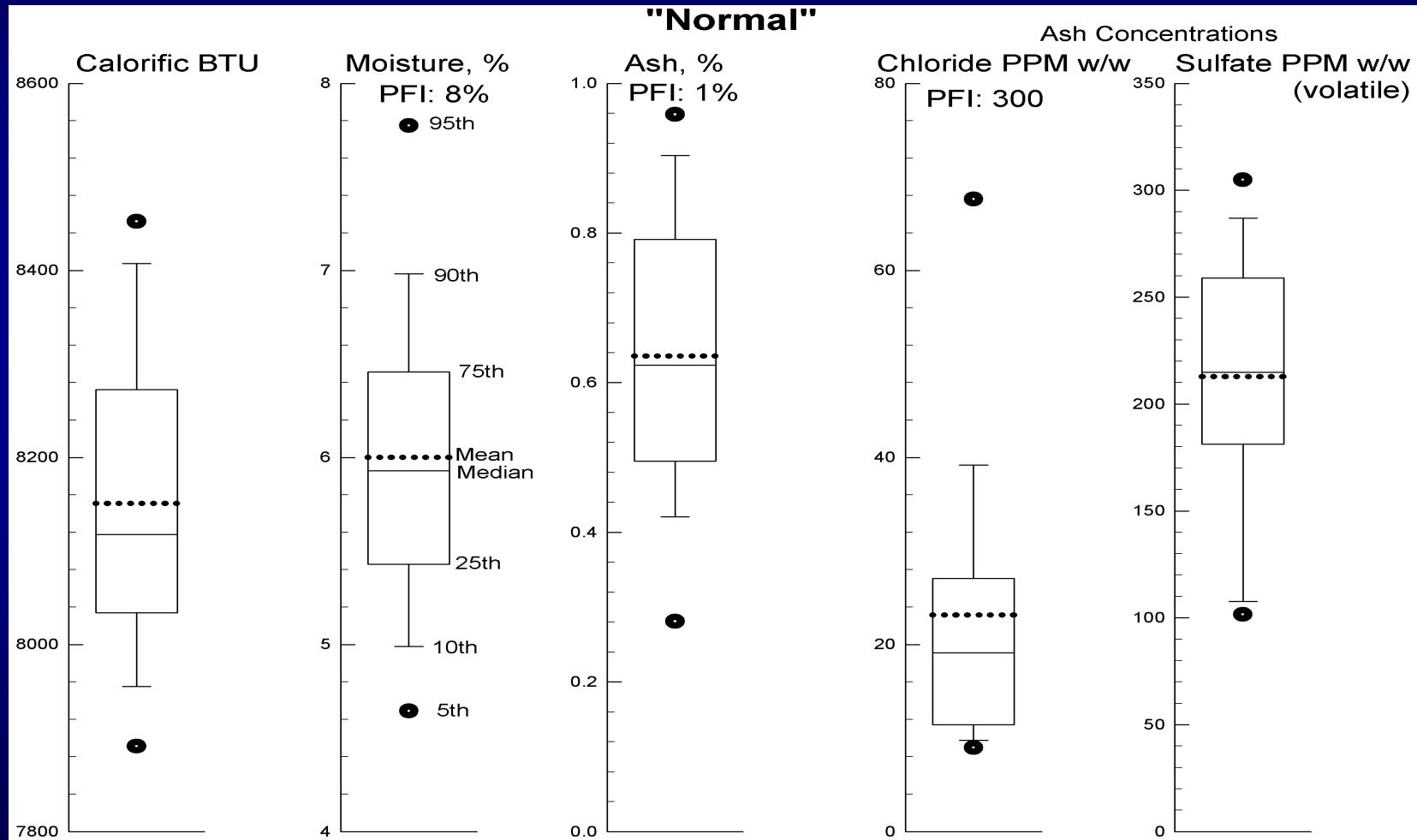


# PFI Standard

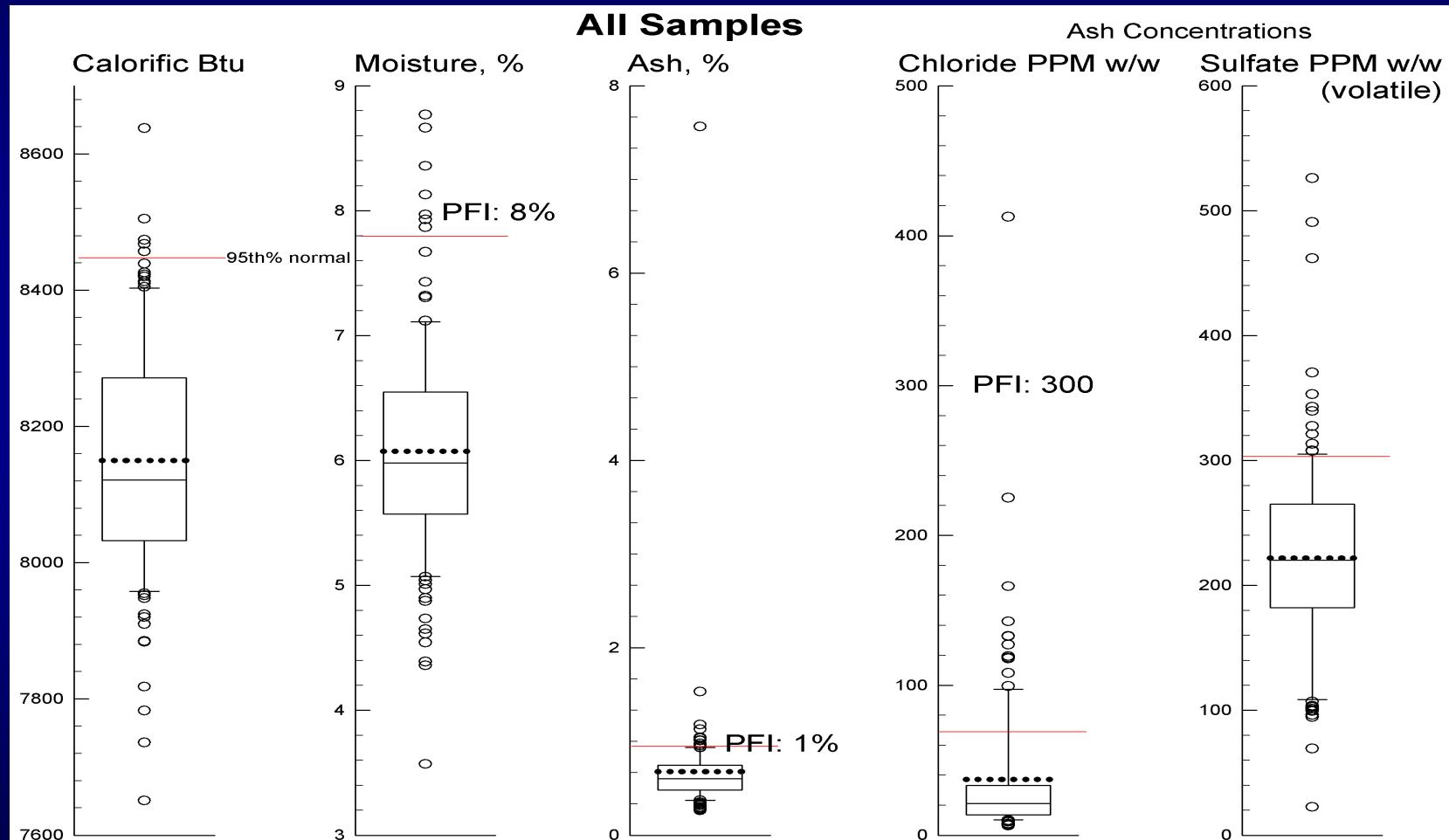
Fuel Property	PFI Premium
Normative Information - Mandatory	
Bulk Density, lb./cubic foot	40.0 - 46.0
Diameter, inches	0.230 - 0.285
Diameter, mm	5.84 - 7.25
Pellet Durability Index	≥ 96.5
Fines, % (at the mill gate)	≤ 0.50
Inorganic Ash, %	≤ 1.0
Length, % greater than 1.50 inches	≤ 1.0
Moisture, %	≤ 8.0
Chloride, ppm	≤ 300



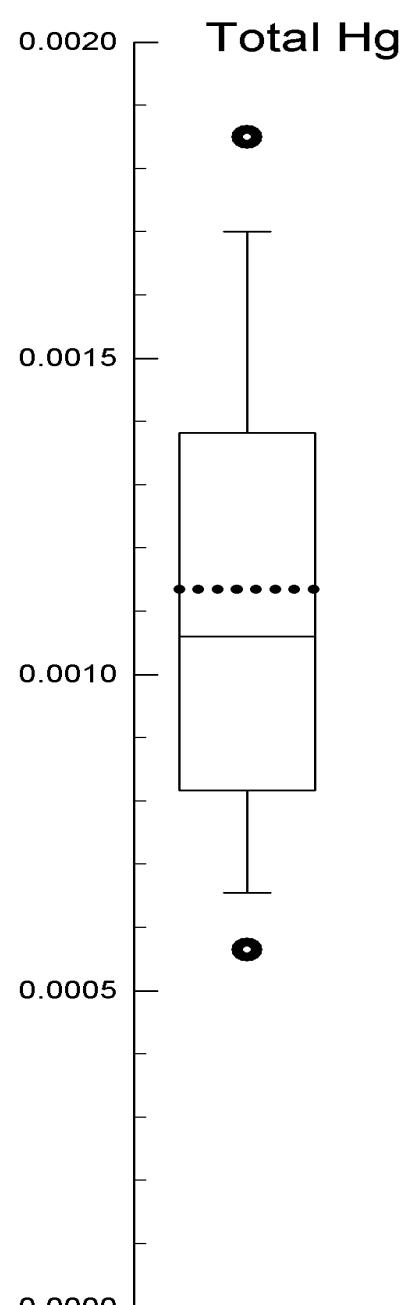
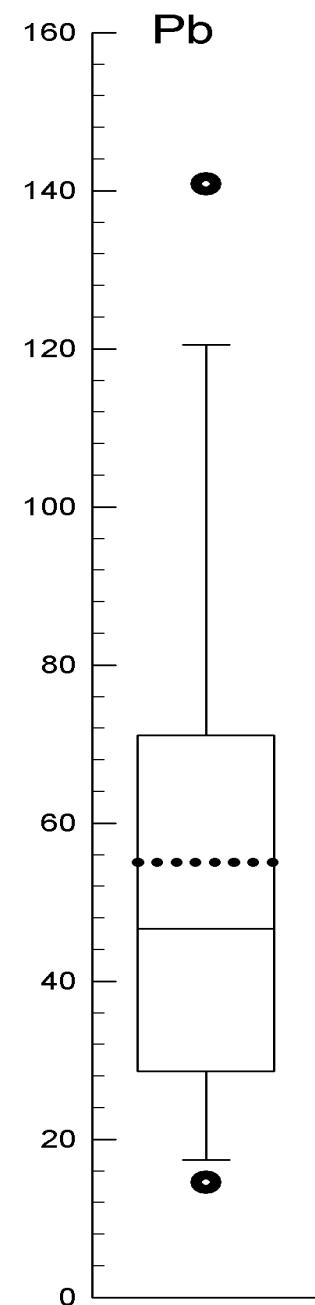
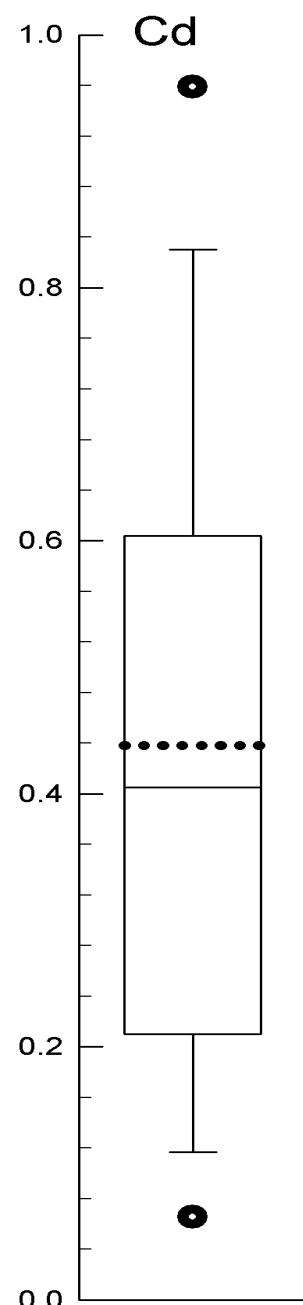
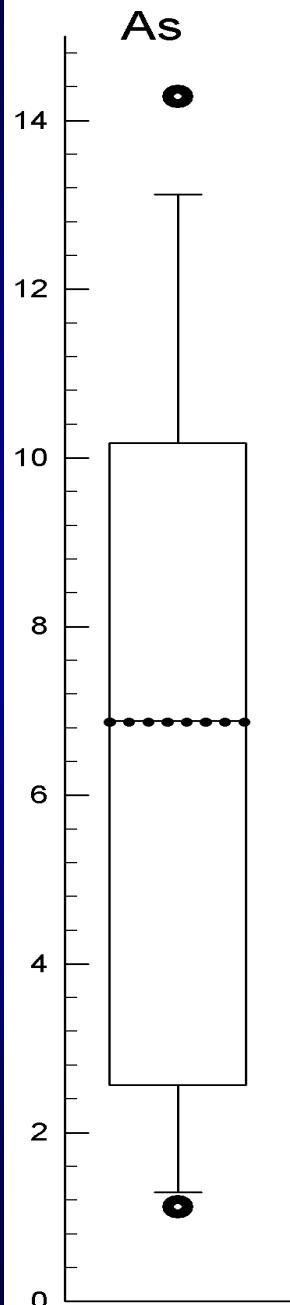
# PFI Standards Analysis – Normal Samples



# PFI Standards Analysis – All Samples

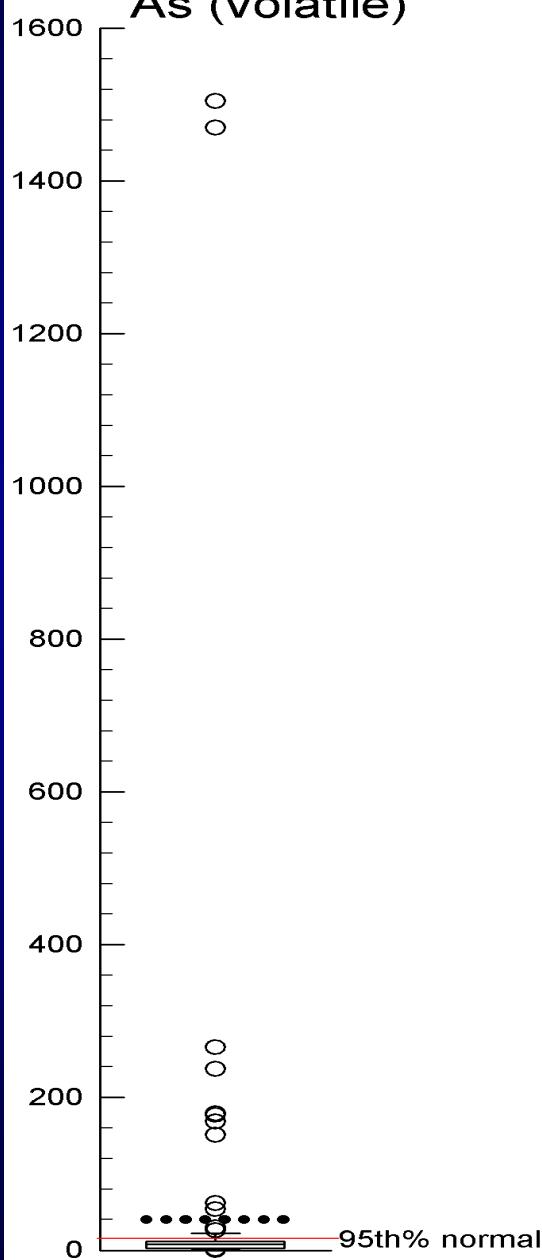


# "Normal", mg/kg, Ash Concentrations

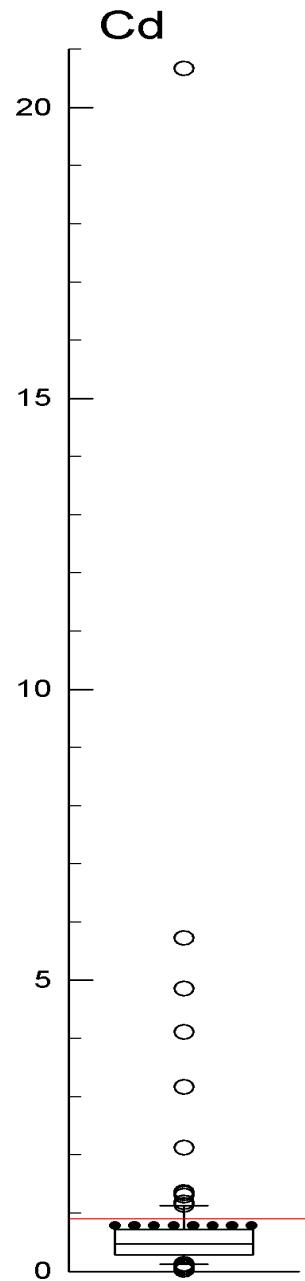


# All Samples, mg/kg, Ash Concentrations

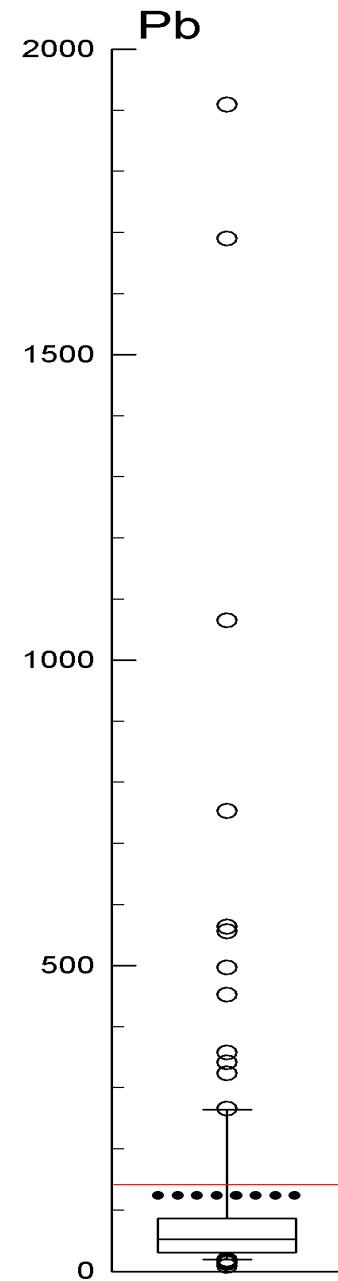
As (volatile)



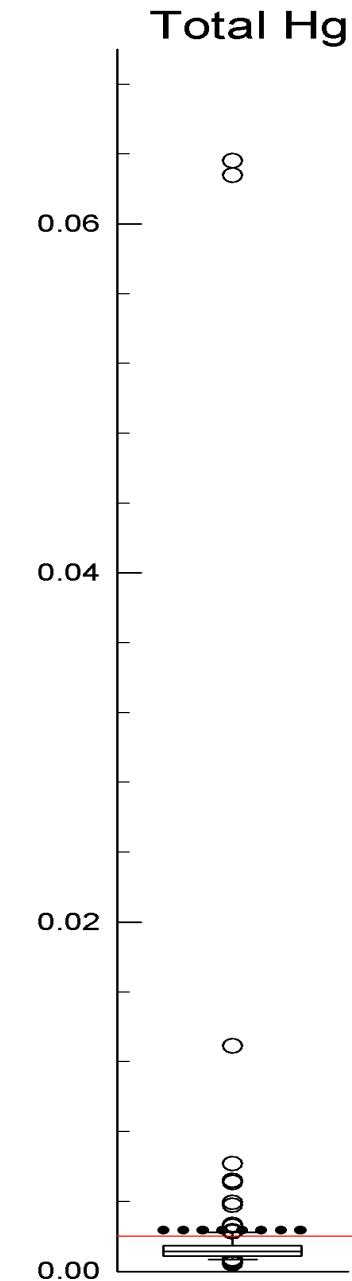
Cd



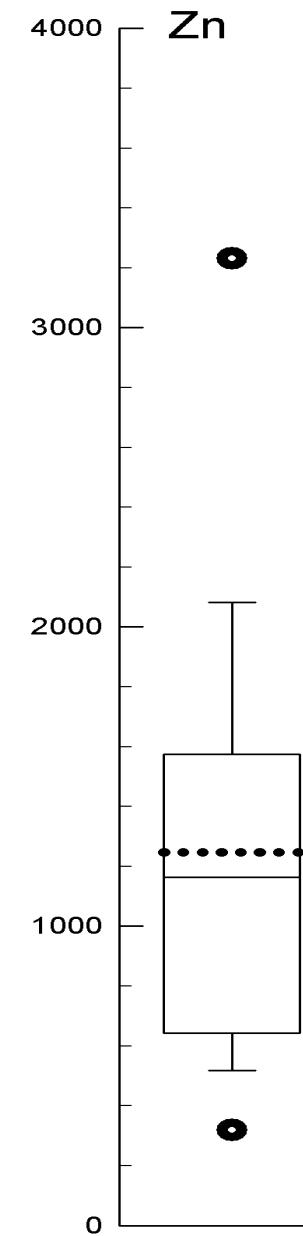
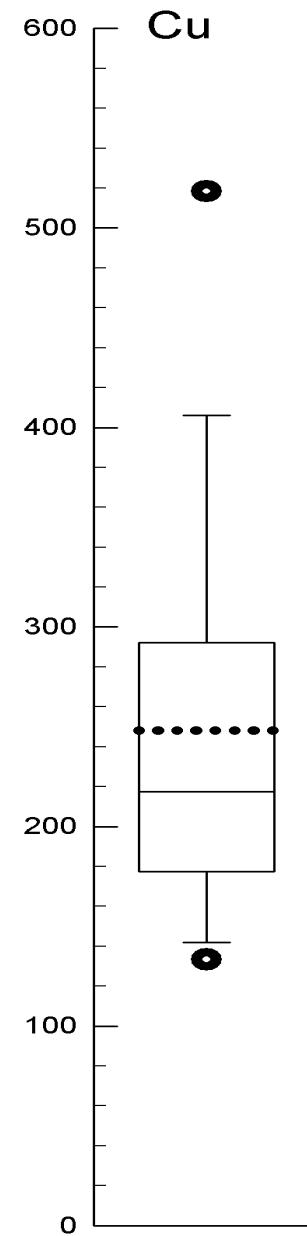
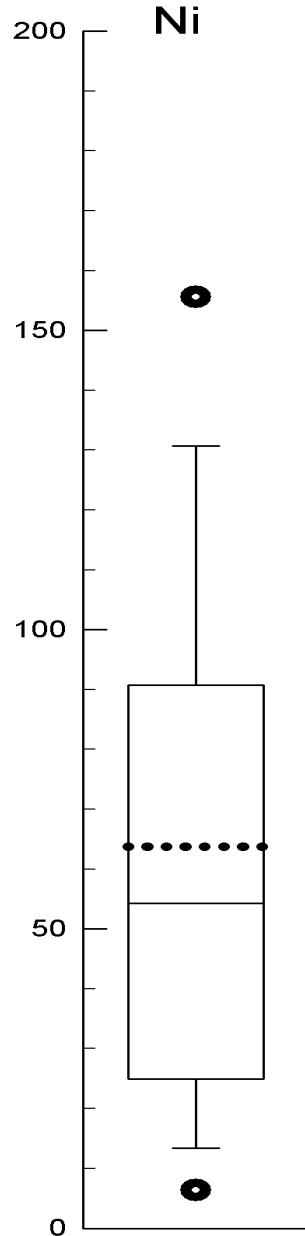
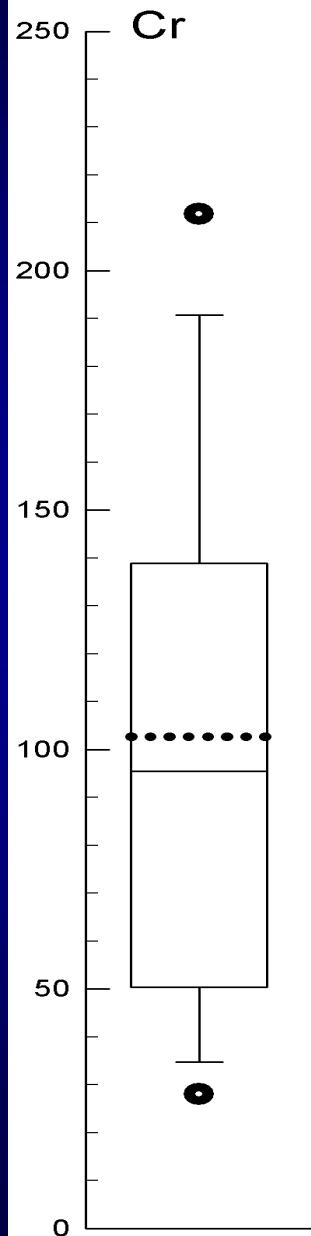
Pb



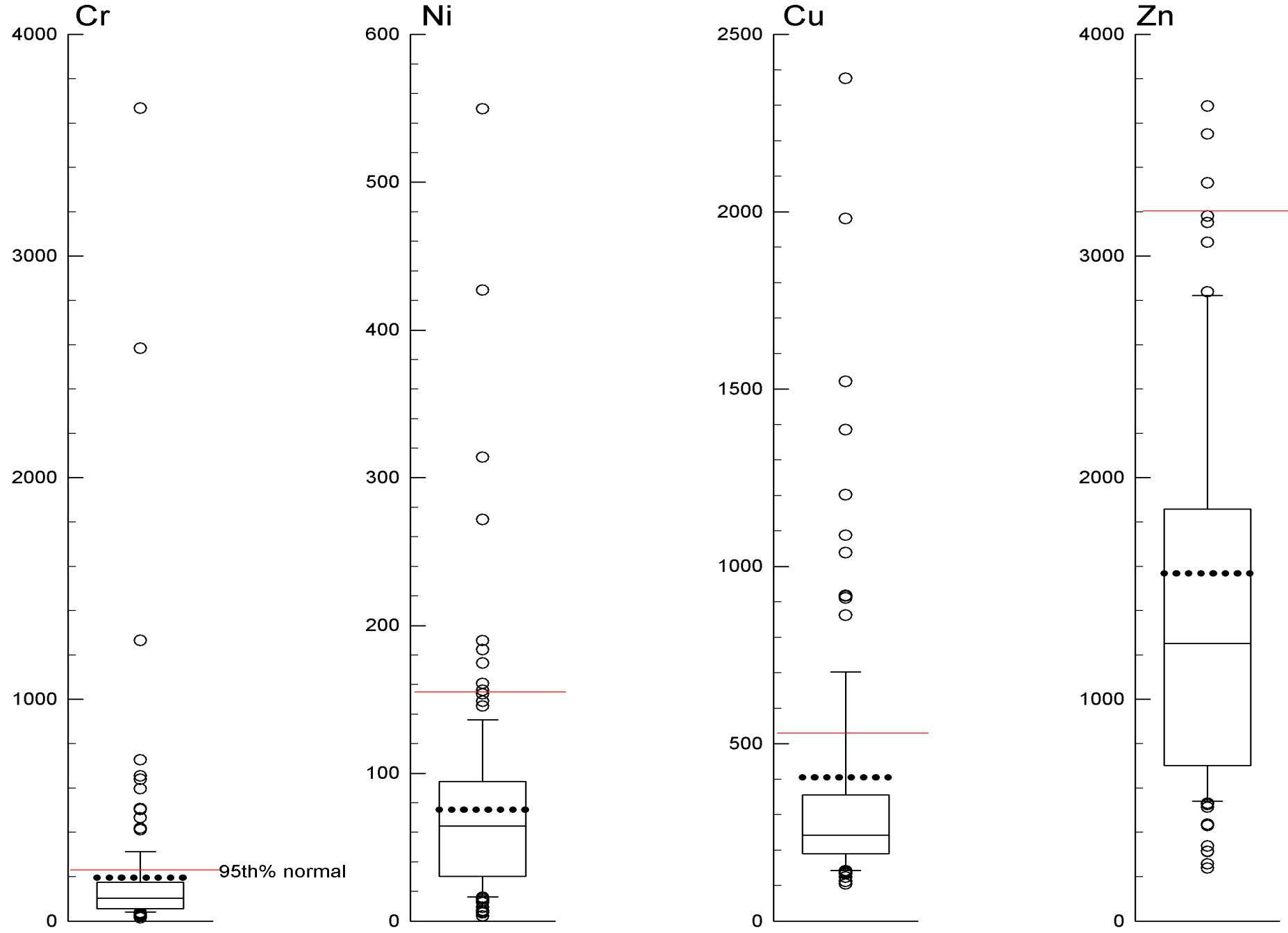
Total Hg



## "Normal", mg/kg, Ash Concentrations



# All Samples, mg/kg, Ash Concentrations



# Potential Sources of Elevated Elements

- Harvesting/processing practices
- Uptake from soluble sources
- Wood species
- Inclusion of bark
- Use of waste wood

# Initial Conclusions

- Standards that focus only on physical properties are not sufficient to identify contaminated materials
- Appropriate methods for analysis are critical in identifying elemental constituents
- Need to gain a better understanding what contributes to variability in pellets and minimize sources of contamination
- Impact of elevated elements for local exposures
- Significant policy issues remain

**Attachment 4**  
**HY-C Step 2 Wood Forced-Air Furnace Certification Test Results**

**From:** David Walters <[dwalters@hy-c.com](mailto:dwalters@hy-c.com)>  
**Sent:** Monday, December 10, 2018 2:55 PM  
**To:** [mark@hearthlabsolutions.com](mailto:mark@hearthlabsolutions.com); [kelli@clearstak.com](mailto:kelli@clearstak.com); Baumgart-Getz, Adam <[Baumgart-Getz.Adam@epa.gov](mailto:Baumgart-Getz.Adam@epa.gov)>; Lisa Rector <[lrector@nescaum.org](mailto:lrector@nescaum.org)>; George Allen <[gallen@nescaum.org](mailto:gallen@nescaum.org)>  
**Cc:** Danny Haynes <[dhaynes@hy-c.com](mailto:dhaynes@hy-c.com)>  
**Subject:** SF1000E/FC1000E

Mark, Kelli, Adam, Lisa, George:

You all asked us many tough questions about warm air furnaces, which forced us to think deeply about our units.

Just last week we submitted a Step 2 Certified 2020 WAF to Dr. Rafael Sanchez, and I thought I would share this good news with you.

By the way, this unit will retail for \$1799 or \$1899 – in the same range as our current Step 1 units.

Sincerely,

David

David Walters  
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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
RESEARCH TRIANGLE PARK, NC 27711

JUL 26 2018

OFFICE OF  
AIR QUALITY PLANNING  
AND STANDARDS

Mr. David Walters  
HY-C Company  
10950 Linpage Place  
Saint Louis, Missouri 63132

Dear Mr. Walters,

I am writing in response to your correspondence dated June 6, 2018, regarding certification testing of the Fire Chief and Shelter Furnace brand wood-fired forced-air furnaces: Models FC1000E and SF1000E. You are planning to use the cordwood option to obtain 2020 certification under 40 CFR 60, Subpart QQQQ - Standards of Performance for New Residential Hydronic Heaters and Forced Air Furnaces (Subpart QQQQ), section 60.5476(e), using the Canadian Standards Association (CSA) B415.1-10 test method, "Performance testing of solid-fuel-burning heating appliances," including thermostatically controlled warm air furnaces using cordwood as stated in section 7.2 of the CSA standard.

In your correspondence, you are requesting alternative certification testing procedures for your furnaces because they are both thermostatically-controlled with a forced combustion inducer and have the potential for extreme BTU delivery when in "call for heat" mode, thus causing a longer time to ramp down to lowest BTU delivered, after the thermostat temperature is satisfied. You also note that when operating at the lowest possible combustion rate (preset by factory) with the distribution blower in normal operating mode, these heaters will produce more delivered BTU output (measured heat and velocity delivered to home through ducting) than allowed for the Category 1 heat output rate under Subpart QQQQ, section 60.5476(e), which requires use of the "burn rate categories in Method 28 WHH for the 2020 particulate matter emission standards" (15 percent less of manufacturer's rated heat output capacity). You state that these required test method procedures will force the fire to go out and the appliance cannot maintain combustion.

To address these issues, you are requesting to use the burn rate categories of CSA Method B415.1-10 in lieu of those in Method 28 WHH with the following modifications:

- Category IV – Operate at maximum capacity with forced combustion inducer engaged during the entire test.
- Category III - Operate with the switch for inducer "on" and "off" to meet specific output range.

- Category II - Operate with the switch for inducer “on” and “off” to meet specific output range.
- Category I - Operate at the lowest delivered output that the unit is able to operate at, which may be a higher delivered output average BTU than the test method allows. Using two test runs at this low output (averaging the two runs), operating the heater at the intended lowest “real world” operational mode.

With the caveats discussed below, we approve your alternative method request for testing the Fire Chief and Shelter Furnace brand thermostatically-controlled forced air furnaces: Models FC1000E and SF1000E. As required in Subpart QQQQ, section 60.5476(c)(6), the manufacturer or approved test lab must also measure the first hour of particulate matter emissions for each test run using a separate filter in one of the two parallel sampling trains. These results must be reported separately and also included in the total particulate matter emissions per run. Also, as required in Subpart QQQQ, section 60.5476(a), the manufacturer must have the approved test laboratory measure the efficiency, heat output, and carbon monoxide emissions of the tested wood heater using CSA Method B415.1-10. For particulate matter emission concentrations, ASTM E2515-11 “Standard Test Method for Determination of Particulate Matter Emissions Collected by a Dilution Tunnel” must be used; four inch filters are acceptable. Disregard sections 8.3.1 and 8.4 in CSA Method B415.1-10 regarding the use of Douglas fir lumber in a crib wood configuration for EPA testing. However, for cordwood, you may use Douglas fir as well as the other species of wood listed in CSA Method B415.1-10. A copy of this letter must be included in each certification test report.

The FC1000 and SF1000E forced-air furnace design incorporates a low setting on its controller which is the lowest heat output (Btu/hr) setting available to the user and corresponds to the lowest burn rate to be evaluated during certification testing; this is consistent with 40 CFR part 60, Subpart QQQQ, section 60.5476, which states *“The burn rate for the low burn category must be no greater than the rate that an operator can achieve in home use and no greater than is advertised by the manufacturer or retailer.”*

The following changes to CSA Method B415.1-10 must be followed:

1. When conducting the Category I burn, operate at lowest delivered output that the unit is intended to operate; the result for the higher of the two test runs may not be greater than 15 percent higher than that for the lower test run.

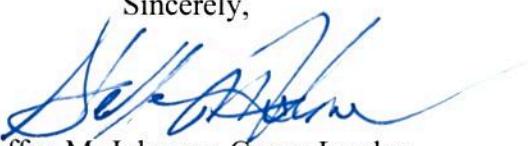
The following changes to ASTM E2515-11 must be followed:

1. Filters must be weighed in pairs to reduce weighing error propagation. See ASTM E2515-11, section 10.2.1, Analytical Procedure.
2. Sample filters must be Pall TX-40 or equivalent Teflon-coated glass fiber filters, and 47 mm, 90 mm, 100 mm, or 110 mm in diameter.

3. Only one point is allowed outside the +/- 10 percent proportionality range per test run.

If you have additional questions regarding this approval, please contact Michael Toney of my staff at 919-541-5247 or [toney.mike@epa.gov](mailto:toney.mike@epa.gov).

Sincerely,



The image shows a handwritten signature in blue ink, appearing to read "Steffan M. Johnson".

Steffan M. Johnson, Group Leader  
Measurement Technology Group

cc: Amanda Aldridge, EPA/OAQPS/OID  
Adam Baumgart-Getz, EPA/OAQPS/OID  
Rochelle Boyd, EPA/OAQPS/SPPD  
Chuck French, EPA/OAQPS/SPPD  
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