



Department of Administration
Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

State of West Virginia Purchase Order

Order Date: 06-02-2025

CORRECT ORDER NUMBER MUST APPEAR
ON ALL PACKAGES, INVOICES, AND
SHIPPING PAPERS. QUESTIONS
CONCERNING THIS ORDER SHOULD BE
DIRECTED TO THE DEPARTMENT
CONTACT.

Order Number:	CPO 0603 0603 ADJ2500000046 1	Change Order No:	Procurement Folder:	1656274
Document Name:	Wheeling Armory Replacement and Installation Boiler		Reason for Modification:	
Document Description:	Wheeling Armory Replacement and Installation Boiler			
Procurement Type:	Central Purchase Order			
Buyer Name:	David H Pauline			
Telephone:	304-558-0067			
Email:	david.h.pauline@wv.gov			
Shipping Method:	Best Way		Effective Start Date:	
Free on Board:	FOB Dest, Freight Prepaid		Effective End Date:	

VENDOR	DEPARTMENT CONTACT																				
Vendor Customer Code: 000000202408 CASTO TECHNICAL SERVICES INC 540 LEON SULLIVAN WAY CHARLESTON WV 25301 US Vendor Contact Phone: 999-999-9999 Extension: Discount Details: <table><thead><tr><th></th><th>Discount Allowed</th><th>Discount Percentage</th><th>Discount Days</th></tr></thead><tbody><tr><td>#1</td><td>No</td><td>0.0000</td><td>0</td></tr><tr><td>#2</td><td>Not Entered</td><td></td><td></td></tr><tr><td>#3</td><td>Not Entered</td><td></td><td></td></tr><tr><td>#4</td><td>Not Entered</td><td></td><td></td></tr></tbody></table>		Discount Allowed	Discount Percentage	Discount Days	#1	No	0.0000	0	#2	Not Entered			#3	Not Entered			#4	Not Entered			Requestor Name: Dean Wingerd Requestor Phone: (304) 561-6629 Requestor Email: clauded.wingerd.nfg@army.mil 2025 FILE LOCATION _____
	Discount Allowed	Discount Percentage	Discount Days																		
#1	No	0.0000	0																		
#2	Not Entered																				
#3	Not Entered																				
#4	Not Entered																				

INVOICE TO	SHIP TO
STATE FINANCE ADJUTANT GENERALS OFFICE 1703 COONSKIN DR CHARLESTON WV 25311-1085 US	BUILDING TRADE SPECIALIST WHEELING NATIONAL GUARD ARMORY 538 GIRTYS POINT RD WHEELING WV 26003 US

CR ~~TO~~ 6-16-25

Total Order Amount: \$110,000.00

Purchasing Division's File Copy

PURCHASING DIVISION AUTHORIZATION DATE: <u>6-10-25</u> ELECTRONIC SIGNATURE ON FILE	ATTORNEY GENERAL APPROVAL AS TO FORM DATE: <u>6-10-25</u> ELECTRONIC SIGNATURE ON FILE	ENCUMBRANCE CERTIFICATION DATE: <u>6-17-25</u> ELECTRONIC SIGNATURE ON FILE
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Extended Description:

Construction Contract
(Wheeling National Guard Armory Boilers Replacement)

The Vendor Casto Technical Services, Inc., agrees to enter into this one-time construction contract with the Agency, West Virginia Army National Guard, Construction and Facilities Management Office, to provide all labor, material, tools, equipment, supplies and supervision necessary to complete the replacement of two (2) boilers Wheeling National Guard Armory, in Wheeling, WV, per the bid requirements, terms, conditions, specifications, Addendum No. 1 issued 04/17/2025, Addendum No. 2 issued 04/21/2025, Addendum No. 3 issued 4/22/2025, and the vendor's bid dated 04/23/2025 all incorporated herein by reference and made apart of hereof, per the attached documents.

Line	Commodity Code	Quantity	Unit	Unit Price	Total Price
1	72000000	0.00000		0.000000	110000.00
Service From	Service To	Manufacturer		Model No	

Commodity Line Description: Boilers Replacement

Extended Description:

See Exhibit "A" Pricing Page/Bid Form t

Labor, materials and all associated costs to replace two (2) boilers in the Wheeling National Guard Armory per the attached plans and specifications.

GENERAL TERMS AND CONDITIONS:

1. CONTRACTUAL AGREEMENT: Issuance of an Award Document signed by the Purchasing Division Director, or his designee, and approved as to form by the Attorney General's office constitutes acceptance by the State of this Contract made by and between the State of West Virginia and the Vendor. Vendor's signature on its bid, or on the Contract if the Contract is not the result of a bid solicitation, signifies Vendor's agreement to be bound by and accept the terms and conditions contained in this Contract.

2. DEFINITIONS: As used in this Solicitation/Contract, the following terms shall have the meanings attributed to them below. Additional definitions may be found in the specifications included with this Solicitation/Contract.

2.1. "Agency" or "Agencies" means the agency, board, commission, or other entity of the State of West Virginia that is identified on the first page of the Solicitation or any other public entity seeking to procure goods or services under this Contract.

2.2. "Bid" or "Proposal" means the vendors submitted response to this solicitation.

2.3. "Contract" means the binding agreement that is entered into between the State and the Vendor to provide the goods or services requested in the Solicitation.

2.4. "Director" means the Director of the West Virginia Department of Administration, Purchasing Division.

2.5. "Purchasing Division" means the West Virginia Department of Administration, Purchasing Division.

2.6. "Award Document" means the document signed by the Agency and the Purchasing Division, and approved as to form by the Attorney General, that identifies the Vendor as the contract holder.

2.7. "Solicitation" means the official notice of an opportunity to supply the State with goods or services that is published by the Purchasing Division.

2.8. "State" means the State of West Virginia and/or any of its agencies, commissions, boards, etc. as context requires.

2.9. "Vendor" or "Vendors" means any entity submitting a bid in response to the Solicitation, the entity that has been selected as the lowest responsible bidder, or the entity that has been awarded the Contract as context requires.

3. CONTRACT TERM; RENEWAL; EXTENSION: The term of this Contract shall be determined in accordance with the category that has been identified as applicable to this Contract below:

☐ **Term Contract**

Initial Contract Term: The Initial Contract Term will be for a period of _____. The Initial Contract Term becomes effective on the effective start date listed on the first page of this Contract, identified as the State of West Virginia contract cover page containing the signatures of the Purchasing Division, Attorney General, and Encumbrance clerk (or another page identified as _____), and the Initial Contract Term ends on the effective end date also shown on the first page of this Contract.

Renewal Term: This Contract may be renewed upon the mutual written consent of the Agency, and the Vendor, with approval of the Purchasing Division and the Attorney General's office (Attorney General approval is as to form only). Any request for renewal should be delivered to the Agency and then submitted to the Purchasing Division thirty (30) days prior to the expiration date of the initial contract term or appropriate renewal term. A Contract renewal shall be in accordance with the terms and conditions of the original contract. Unless otherwise specified below, renewal of this Contract is limited to _____ successive one (1) year periods or multiple renewal periods of less than one year, provided that the multiple renewal periods do not exceed the total number of months available in all renewal years combined. Automatic renewal of this Contract is prohibited. Renewals must be approved by the Vendor, Agency, Purchasing Division and Attorney General's office (Attorney General approval is as to form only)

☐ **Alternate Renewal Term** – This contract may be renewed for _____ successive _____ year periods or shorter periods provided that they do not exceed the total number of months contained in all available renewals. Automatic renewal of this Contract is prohibited. Renewals must be approved by the Vendor, Agency, Purchasing Division and Attorney General's office (Attorney General approval is as to form only)

Delivery Order Limitations: In the event that this contract permits delivery orders, a delivery order may only be issued during the time this Contract is in effect. Any delivery order issued within one year of the expiration of this Contract shall be effective for one year from the date the delivery order is issued. No delivery order may be extended beyond one year after this Contract has expired.

☒ **Fixed Period Contract:** This Contract becomes effective upon Vendor's receipt of the notice to proceed and must be completed within Ninety (90) calendar days.

☐ **Fixed Period Contract with Renewals:** This Contract becomes effective upon Vendor's receipt of the notice to proceed and part of the Contract more fully described in the attached specifications must be completed within _____ days. Upon completion of the work covered by the preceding sentence, the vendor agrees that:

☐ the contract will continue for _____ years;

☐ the contract may be renewed for _____ successive _____ year periods or shorter periods provided that they do not exceed the total number of months contained in all available renewals. Automatic renewal of this Contract is prohibited. Renewals must be approved by the Vendor, Agency, Purchasing Division and Attorney General's Office (Attorney General approval is as to form only).

☐ **One-Time Purchase:** The term of this Contract shall run from the issuance of the Award Document until all of the goods contracted for have been delivered, but in no event will this Contract extend for more than one fiscal year.

☐ **Construction/Project Oversight:** This Contract becomes effective on the effective start date listed on the first page of this Contract, identified as the State of West Virginia contract cover page containing the signatures of the Purchasing Division, Attorney General, and Encumbrance clerk (or another page identified as _____), and continues until the project for which the vendor is providing oversight is complete.

☐ **Other:** Contract Term specified in _____

4. AUTHORITY TO PROCEED: Vendor is authorized to begin performance of this contract on the date of encumbrance listed on the front page of the Award Document unless either the box for "Fixed Period Contract" or "Fixed Period Contract with Renewals" has been checked in Section 3 above. If either "Fixed Period Contract" or "Fixed Period Contract with Renewals" has been checked, Vendor must not begin work until it receives a separate notice to proceed from the State. The notice to proceed will then be incorporated into the Contract via change order to memorialize the official date that work commenced.

5. QUANTITIES: The quantities required under this Contract shall be determined in accordance with the category that has been identified as applicable to this Contract below.

☐ **Open End Contract:** Quantities listed in this Solicitation/Award Document are approximations only, based on estimates supplied by the Agency. It is understood and agreed that the Contract shall cover the quantities actually ordered for delivery during the term of the Contract, whether more or less than the quantities shown.

☐ **Service:** The scope of the service to be provided will be more clearly defined in the specifications included herewith.

☒ **Combined Service and Goods:** The scope of the service and deliverable goods to be provided will be more clearly defined in the specifications included herewith.

☐ **One-Time Purchase:** This Contract is for the purchase of a set quantity of goods that are identified in the specifications included herewith. Once those items have been delivered, no additional goods may be procured under this Contract without an appropriate change order approved by the Vendor, Agency, Purchasing Division, and Attorney General's office.

☒ **Construction:** This Contract is for construction activity more fully defined in the specifications.

6. EMERGENCY PURCHASES: The Purchasing Division Director may authorize the Agency to purchase goods or services in the open market that Vendor would otherwise provide under this Contract if those goods or services are for immediate or expedited delivery in an emergency. Emergencies shall include, but are not limited to, delays in transportation or an unanticipated increase in the volume of work. An emergency purchase in the open market, approved by the Purchasing Division Director, shall not constitute of breach of this Contract and shall not entitle the Vendor to any form of compensation or damages. This provision does not excuse the State from fulfilling its obligations under a One-Time Purchase contract.

7. REQUIRED DOCUMENTS: All of the items checked in this section must be provided to the Purchasing Division by the Vendor as specified:

☒ **LICENSE(S) / CERTIFICATIONS / PERMITS:** In addition to anything required under the Section of the General Terms and Conditions entitled Licensing, the apparent successful Vendor shall furnish proof of the following licenses, certifications, and/or permits upon request and in a form acceptable to the State. The request may be prior to or after contract award at the State's sole discretion.

☒ West Virginia Contractor's License

☐☐☐

The apparent successful Vendor shall also furnish proof of any additional licenses or certifications contained in the specifications regardless of whether or not that requirement is listed above.

8. INSURANCE: The apparent successful Vendor shall furnish proof of the insurance identified by a checkmark below prior to Contract award. The insurance coverages identified below must be maintained throughout the life of this contract. Thirty (30) days prior to the expiration of the insurance policies, Vendor shall provide the Agency with proof that the insurance mandated herein has been continued. Vendor must also provide Agency with immediate notice of any changes in its insurance policies, including but not limited to, policy cancelation, policy reduction, or change in insurers. The apparent successful Vendor shall also furnish proof of any additional insurance requirements contained in the specifications prior to Contract award regardless of whether that insurance requirement is listed in this section.

Vendor must maintain:

☒ **Commercial General Liability Insurance** in at least an amount of: \$1,000,000.00 per occurrence.

☒ **Automobile Liability Insurance** in at least an amount of: \$1,000,000.00 per occurrence.

☐ **Professional/Malpractice/Errors and Omission Insurance** in at least an amount of: _____ per occurrence. Notwithstanding the forgoing, Vendor's are not required to list the State as an additional insured for this type of policy.

☐ **Commercial Crime and Third Party Fidelity Insurance** in an amount of: _____ per occurrence.

☐ **Cyber Liability Insurance** in an amount of: _____ per occurrence.

☐ **Builders Risk Insurance** in an amount equal to 100% of the amount of the Contract.

☐ **Pollution Insurance** in an amount of: _____ per occurrence.

☐ **Aircraft Liability** in an amount of: _____ per occurrence.

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9. WORKERS' COMPENSATION INSURANCE: Vendor shall comply with laws relating to workers compensation, shall maintain workers' compensation insurance when required, and shall furnish proof of workers' compensation insurance upon request.

10. VENUE: All legal actions for damages brought by Vendor against the State shall be brought in the West Virginia Claims Commission. Other causes of action must be brought in the West Virginia court authorized by statute to exercise jurisdiction over it.

11. LIQUIDATED DAMAGES: This clause shall in no way be considered exclusive and shall not limit the State or Agency's right to pursue any other available remedy. Vendor shall pay liquidated damages in the amount specified below or as described in the specifications:

☐ _____ for _____.

☒ Liquidated Damages Contained in the Specifications.

☐ Liquidated Damages Are Not Included in this Contract.

12. ACCEPTANCE: Vendor's signature on its bid, or on the certification and signature page, constitutes an offer to the State that cannot be unilaterally withdrawn, signifies that the product or service proposed by vendor meets the mandatory requirements contained in the Solicitation for that product or service, unless otherwise indicated, and signifies acceptance of the terms and conditions contained in the Solicitation unless otherwise indicated.

13. PRICING: The pricing set forth herein is firm for the life of the Contract, unless specified elsewhere within this Solicitation/Contract by the State. A Vendor's inclusion of price adjustment provisions in its bid, without an express authorization from the State in the Solicitation to do so, may result in bid disqualification. Notwithstanding the foregoing, Vendor must extend any publicly advertised sale price to the State and invoice at the lower of the contract price or the publicly advertised sale price.

14. PAYMENT IN ARREARS: Payments for goods/services will be made in arrears only upon receipt of a proper invoice, detailing the goods/services provided or receipt of the goods/services, whichever is later. Notwithstanding the foregoing, payments for software maintenance, licenses, or subscriptions may be paid annually in advance.

15. PAYMENT METHODS: Vendor must accept payment by electronic funds transfer and P-Card. (The State of West Virginia's Purchasing Card program, administered under contract by a banking institution, processes payment for goods and services through state designated credit cards.)

16. TAXES: The Vendor shall pay any applicable sales, use, personal property or any other taxes arising out of this Contract and the transactions contemplated thereby. The State of West Virginia is exempt from federal and state taxes and will not pay or reimburse such taxes.

17. ADDITIONAL FEES: Vendor is not permitted to charge additional fees or assess additional charges that were not either expressly provided for in the solicitation published by the State of West Virginia, included in the Contract, or included in the unit price or lump sum bid amount that Vendor is required by the solicitation to provide. Including such fees or charges as notes to the solicitation may result in rejection of vendor's bid. Requesting such fees or charges be paid after the contract has been awarded may result in cancellation of the contract.

18. FUNDING: This Contract shall continue for the term stated herein, contingent upon funds being appropriated by the Legislature or otherwise being made available. In the event funds are not appropriated or otherwise made available, this Contract becomes void and of no effect beginning on July 1 of the fiscal year for which funding has not been appropriated or otherwise made available. If that occurs, the State may notify the Vendor that an alternative source of funding has been obtained and thereby avoid the automatic termination. Non-appropriation or non-funding shall not be considered an event of default.

19. CANCELLATION: The Purchasing Division Director reserves the right to cancel this Contract immediately upon written notice to the vendor if the materials or workmanship supplied do not conform to the specifications contained in the Contract. The Purchasing Division Director may also cancel any purchase or Contract upon 30 days written notice to the Vendor in accordance with West Virginia Code of State Rules § 148-1-5.2.b.

20. TIME: Time is of the essence regarding all matters of time and performance in this Contract.

21. APPLICABLE LAW: This Contract is governed by and interpreted under West Virginia law without giving effect to its choice of law principles. Any information provided in specification manuals, or any other source, verbal or written, which contradicts or violates the West Virginia Constitution, West Virginia Code, or West Virginia Code of State Rules is void and of no effect.

22. COMPLIANCE WITH LAWS: Vendor shall comply with all applicable federal, state, and local laws, regulations and ordinances. By submitting a bid, Vendor acknowledges that it has reviewed, understands, and will comply with all applicable laws, regulations, and ordinances.

SUBCONTRACTOR COMPLIANCE: Vendor shall notify all subcontractors providing commodities or services related to this Contract that as subcontractors, they too are required to comply with all applicable laws, regulations, and ordinances. Notification under this provision must occur prior to the performance of any work under the contract by the subcontractor.

23. ARBITRATION: Any references made to arbitration contained in this Contract, Vendor's bid, or in any American Institute of Architects documents pertaining to this Contract are hereby deleted, void, and of no effect.

24. MODIFICATIONS: This writing is the parties' final expression of intent. Notwithstanding anything contained in this Contract to the contrary no modification of this Contract shall be binding without mutual written consent of the Agency, and the Vendor, with approval of the Purchasing Division and the Attorney General's office (Attorney General approval is as to form only). Any change to existing contracts that adds work or changes contract cost, and were not included in the original contract, must be approved by the Purchasing Division and the Attorney General's Office (as to form) prior to the implementation of the change or commencement of work affected by the change.

25. WAIVER: The failure of either party to insist upon a strict performance of any of the terms or provision of this Contract, or to exercise any option, right, or remedy herein contained, shall not be construed as a waiver or a relinquishment for the future of such term, provision, option, right, or remedy, but the same shall continue in full force and effect. Any waiver must be expressly stated in writing and signed by the waiving party.

26. SUBSEQUENT FORMS: The terms and conditions contained in this Contract shall supersede any and all subsequent terms and conditions which may appear on any form documents submitted by Vendor to the Agency or Purchasing Division such as price lists, order forms, invoices, sales agreements, or maintenance agreements, and includes internet websites or other electronic documents. Acceptance or use of Vendor's forms does not constitute acceptance of the terms and conditions contained thereon.

27. ASSIGNMENT: Neither this Contract nor any monies due, or to become due hereunder, may be assigned by the Vendor without the express written consent of the Agency, the Purchasing Division, the Attorney General's office (as to form only), and any other government agency or office that may be required to approve such assignments.

28. WARRANTY: The Vendor expressly warrants that the goods and/or services covered by this Contract will: (a) conform to the specifications, drawings, samples, or other description furnished or specified by the Agency; (b) be merchantable and fit for the purpose intended; and (c) be free from defect in material and workmanship.

29. STATE EMPLOYEES: State employees are not permitted to utilize this Contract for personal use and the Vendor is prohibited from permitting or facilitating the same.

30. PRIVACY, SECURITY, AND CONFIDENTIALITY: The Vendor agrees that it will not disclose to anyone, directly or indirectly, any such personally identifiable information or other confidential information gained from the Agency, unless the individual who is the subject of the information consents to the disclosure in writing or the disclosure is made pursuant to the Agency's policies, procedures, and rules. Vendor further agrees to comply with the Confidentiality Policies and Information Security Accountability Requirements, set forth in www.state.wv.us/admin/purchase/privacy.

31. YOUR SUBMISSION IS A PUBLIC DOCUMENT: Vendor's entire response to the Solicitation and the resulting Contract are public documents. As public documents, they will be disclosed to the public following the bid/proposal opening or award of the contract, as required by the competitive bidding laws of West Virginia Code §§ 5A-3-1 et seq., 5-22-1 et seq., and 5G-1-1 et seq. and the Freedom of Information Act West Virginia Code §§ 29B-1-1 et seq.

DO NOT SUBMIT MATERIAL YOU CONSIDER TO BE CONFIDENTIAL, A TRADE SECRET, OR OTHERWISE NOT SUBJECT TO PUBLIC DISCLOSURE.

Submission of any bid, proposal, or other document to the Purchasing Division constitutes your explicit consent to the subsequent public disclosure of the bid, proposal, or document. The Purchasing Division will disclose any document labeled "confidential," "proprietary," "trade secret," "private," or labeled with any other claim against public disclosure of the documents, to include any "trade secrets" as defined by West Virginia Code § 47-22-1 et seq. All submissions are subject to public disclosure without notice.

32. LICENSING: In accordance with West Virginia Code of State Rules § 148-1-6.1.e, Vendor must be licensed and in good standing in accordance with any and all state and local laws and requirements by any state or local agency of West Virginia, including, but not limited to, the West Virginia Secretary of State's Office, the West Virginia Tax Department, West Virginia Insurance Commission, or any other state agency or political subdivision. Obligations related to political subdivisions may include, but are not limited to, business licensing, business and occupation taxes, inspection compliance, permitting, etc. Upon request, the Vendor must provide all necessary releases to obtain information to enable the Purchasing Division Director or the Agency to verify that the Vendor is licensed and in good standing with the above entities.

SUBCONTRACTOR COMPLIANCE: Vendor shall notify all subcontractors providing commodities or services related to this Contract that as subcontractors, they too are required to be licensed, in good standing, and up-to-date on all state and local obligations as described in this section. Obligations related to political subdivisions may include, but are not limited to, business licensing, business and occupation taxes, inspection compliance, permitting, etc. Notification under this provision must occur prior to the performance of any work under the contract by the subcontractor.

33. ANTITRUST: In submitting a bid to, signing a contract with, or accepting a Award Document from any agency of the State of West Virginia, the Vendor agrees to convey, sell, assign, or transfer to the State of West Virginia all rights, title, and interest in and to all causes of action it may now or hereafter acquire under the antitrust laws of the United States and the State of West Virginia for price fixing and/or unreasonable restraints of trade relating to the particular commodities or services purchased or acquired by the State of West Virginia. Such assignment shall be made and become effective at the time the purchasing agency tenders the initial payment to Vendor.

34. VENDOR NON-CONFLICT: Neither Vendor nor its representatives are permitted to have any interest, nor shall they acquire any interest, direct or indirect, which would compromise the performance of its services hereunder. Any such interests shall be promptly presented in detail to the Agency.

35. VENDOR RELATIONSHIP: The relationship of the Vendor to the State shall be that of an independent contractor and no principal-agent relationship or employer-employee relationship is contemplated or created by this Contract. The Vendor as an independent contractor is solely liable for the acts and omissions of its employees and agents. Vendor shall be responsible for selecting, supervising, and compensating any and all individuals employed pursuant to the terms of this Solicitation and resulting contract. Neither the Vendor, nor any employees or subcontractors of the Vendor, shall be deemed to be employees of the State for any purpose whatsoever. Vendor shall be exclusively responsible for payment of employees and contractors for all wages and salaries, taxes, withholding payments, penalties, fees, fringe benefits, professional liability insurance premiums, contributions to insurance and pension, or other deferred compensation plans, including but not limited to, Workers' Compensation and Social Security obligations, licensing fees, etc. and the filing of all necessary documents, forms, and returns pertinent to all of the foregoing.

Vendor shall hold harmless the State, and shall provide the State and Agency with a defense against any and all claims including, but not limited to, the foregoing payments, withholdings, contributions, taxes, Social Security taxes, and employer income tax returns.

36. INDEMNIFICATION: The Vendor agrees to indemnify, defend, and hold harmless the State and the Agency, their officers, and employees from and against: (1) Any claims or losses for services rendered by any subcontractor, person, or firm performing or supplying services, materials, or supplies in connection with the performance of the Contract; (2) Any claims or losses resulting to any person or entity injured or damaged by the Vendor, its officers, employees, or subcontractors by the publication, translation, reproduction, delivery, performance, use, or disposition of any data used under the Contract in a manner not authorized by the Contract, or by Federal or State statutes or regulations; and (3) Any failure of the Vendor, its officers, employees, or subcontractors to observe State and Federal laws including, but not limited to, labor and wage and hour laws.

37. NO DEBT CERTIFICATION: In accordance with West Virginia Code §§ 5A-3-10a and 5-22-1(i), the State is prohibited from awarding a contract to any bidder that owes a debt to the State or a political subdivision of the State. By submitting a bid, or entering into a contract with the State, Vendor is affirming that (1) for construction contracts, the Vendor is not in default on any monetary obligation owed to the state or a political subdivision of the state, and (2) for all other contracts, neither the Vendor nor any related party owe a debt as defined above, and neither the Vendor nor any related party are in employer default as defined in the statute cited above unless the debt or employer default is permitted under the statute.

38. CONFLICT OF INTEREST: Vendor, its officers or members or employees, shall not presently have or acquire an interest, direct or indirect, which would conflict with or compromise the performance of its obligations hereunder. Vendor shall periodically inquire of its officers, members and employees to ensure that a conflict of interest does not arise. Any conflict of interest discovered shall be promptly presented in detail to the Agency.

39. REPORTS: Vendor shall provide the Agency and/or the Purchasing Division with the following reports identified by a checked box below:

☒ Such reports as the Agency and/or the Purchasing Division may request. Requested reports may include, but are not limited to, quantities purchased, agencies utilizing the contract, total contract expenditures by agency, etc.

☐ Quarterly reports detailing the total quantity of purchases in units and dollars, along with a listing of purchases by agency. Quarterly reports should be delivered to the Purchasing Division via email at purchasing.division@wv.gov.

40. BACKGROUND CHECK: In accordance with W. Va. Code § 15-2D-3, the State reserves the right to prohibit a service provider's employees from accessing sensitive or critical information or to be present at the Capitol complex based upon results addressed from a criminal background check. Service providers should contact the West Virginia Division of Protective Services by phone at (304) 558-9911 for more information.

41. PREFERENCE FOR USE OF DOMESTIC STEEL PRODUCTS: Except when authorized by the Director of the Purchasing Division pursuant to W. Va. Code § 5A-3-56, no contractor may use or supply steel products for a State Contract Project other than those steel products made in the United States. A contractor who uses steel products in violation of this section may be subject to civil penalties pursuant to W. Va. Code § 5A-3-56. As used in this section:

- a. "State Contract Project" means any erection or construction of, or any addition to, alteration of or other improvement to any building or structure, including, but not limited to, roads or highways, or the installation of any heating or cooling or ventilating plants or other equipment, or the supply of and materials for such projects, pursuant to a contract with the State of West Virginia for which bids were solicited on or after June 6, 2001.
- b. "Steel Products" means products rolled, formed, shaped, drawn, extruded, forged, cast, fabricated or otherwise similarly processed, or processed by a combination of two or more or such operations, from steel made by the open hearth, basic oxygen, electric furnace, Bessemer or other steel making process.
- c. The Purchasing Division Director may, in writing, authorize the use of foreign steel products if:
 1. The cost for each contract item used does not exceed one tenth of one percent (.1%) of the total contract cost or two thousand five hundred dollars (\$2,500.00), whichever is greater. For the purposes of this section, the cost is the value of the steel product as delivered to the project; or
 2. The Director of the Purchasing Division determines that specified steel materials are not produced in the United States in sufficient quantity or otherwise are not reasonably available to meet contract requirements.

42. PREFERENCE FOR USE OF DOMESTIC ALUMINUM, GLASS, AND STEEL: In Accordance with W. Va. Code § 5-19-1 et seq., and W. Va. CSR § 148-10-1 et seq., for every contract or subcontract, subject to the limitations contained herein, for the construction, reconstruction, alteration, repair, improvement or maintenance of public works or for the purchase of any item of machinery or equipment to be used at sites of public works, only domestic aluminum, glass or steel products shall be supplied unless the spending officer determines, in writing, after the receipt of offers or bids, (1) that the cost of domestic aluminum, glass or steel products is unreasonable or inconsistent with the public interest of the State of West Virginia, (2) that domestic aluminum, glass or steel products are not produced in sufficient quantities to meet the contract requirements, or (3) the available domestic aluminum, glass, or steel do not meet the contract specifications. This provision only applies to public works contracts awarded in an amount more than fifty thousand dollars (\$50,000) or public works contracts that require more than ten thousand pounds of steel products.

The cost of domestic aluminum, glass, or steel products may be unreasonable if the cost is more than twenty percent (20%) of the bid or offered price for foreign made aluminum, glass, or steel products. If the domestic aluminum, glass or steel products to be supplied or produced in a “substantial labor surplus area”, as defined by the United States Department of Labor, the cost of domestic aluminum, glass, or steel products may be unreasonable if the cost is more than thirty percent (30%) of the bid or offered price for foreign made aluminum, glass, or steel products. This preference shall be applied to an item of machinery or equipment, as indicated above, when the item is a single unit of equipment or machinery manufactured primarily of aluminum, glass or steel, is part of a public works contract and has the sole purpose or of being a permanent part of a single public works project. This provision does not apply to equipment or machinery purchased by a spending unit for use by that spending unit and not as part of a single public works project.

All bids and offers including domestic aluminum, glass or steel products that exceed bid or offer prices including foreign aluminum, glass or steel products after application of the preferences provided in this provision may be reduced to a price equal to or lower than the lowest bid or offer price for foreign aluminum, glass or steel products plus the applicable preference. If the reduced bid or offer prices are made in writing and supersede the prior bid or offer prices, all bids or offers, including the reduced bid or offer prices, will be reevaluated in accordance with this rule.

43. INTERESTED PARTY SUPPLEMENTAL DISCLOSURE: W. Va. Code § 6D-1-2 requires that for contracts with an actual or estimated value of at least \$1 million, the Vendor must submit to the Agency a disclosure of interested parties prior to beginning work under this Contract. Additionally, the Vendor must submit a supplemental disclosure of interested parties reflecting any new or differing interested parties to the contract, which were not included in the original pre-work interested party disclosure, within 30 days following the completion or termination of the contract. A copy of that form is included with this solicitation or can be obtained from the WV Ethics Commission. This requirement does not apply to publicly traded companies listed on a national or international stock exchange. A more detailed definition of interested parties can be obtained from the form referenced above.

44. PROHIBITION AGAINST USED OR REFURBISHED: Unless expressly permitted in the solicitation published by the State, Vendor must provide new, unused commodities, and is prohibited from supplying used or refurbished commodities, in fulfilling its responsibilities under this Contract.

45. VOID CONTRACT CLAUSES: This Contract is subject to the provisions of West Virginia Code § 5A-3-62, which automatically voids certain contract clauses that violate State law.

46. ISRAEL BOYCOTT: Bidder understands and agrees that, pursuant to W. Va. Code § 5A-3-63, it is prohibited from engaging in a boycott of Israel during the term of this contract.

ADDITIONAL TERMS AND CONDITIONS (Construction Contracts Only)

1. CONTRACTOR'S LICENSE: Until June 15, 2021, West Virginia Code § 21-11-2, and after that date, § 30-42-2, requires that all persons desiring to perform contracting work in this state be licensed. The West Virginia Contractors Licensing Board is empowered to issue the contractor's license. Applications for a contractor's license may be made by contacting the West Virginia Contractor Licensing Board.

The apparent successful Vendor must furnish a copy of its contractor's license prior to the issuance of a contract award document.

2. BONDS: The following bonds must be submitted:

- ☒ **BID BOND:** Pursuant to the requirements contained in W. Va. Code § 5-22-1(c), All Vendors submitting a bid on a construction project shall furnish a valid bid bond in the amount of five percent (5%) of the total amount of the bid protecting the State of West Virginia. **THE BID BOND MUST BE SUBMITTED WITH THE BID OR VENDOR'S BID WILL BE DISQUALIFIED.**
- ☒ **PERFORMANCE BOND:** The apparent successful Vendor shall provide a performance bond in the amount of 100% of the contract. The performance bond must be received by the Purchasing Division prior to Contract award. (Attorney General requires use of the State approved bond forms found at: www.state.wv.us/admin/purchase/forms2.html)
- ☒ **LABOR/MATERIAL PAYMENT BOND:** The apparent successful Vendor shall provide a labor/material payment bond in the amount of 100% of the Contract value. The labor/material payment bond must be delivered to the Purchasing Division prior to Contract award. (Attorney General requires use of the State approved bond forms found at: www.state.wv.us/admin/purchase/forms2.html)
- ☒ **MAINTENANCE BOND:** The apparent successful Vendor shall provide a two (2) year maintenance bond covering the roofing system if the work impacts an existing roof. The amount of the bond must be equal to the price associated with the percentage of the project impacting the roof. The maintenance bond must be issued and delivered to the Purchasing Division prior to Contract award. (Attorney General requires use of the State approved bond forms found at: www.state.wv.us/admin/purchase/forms2.html)

At a minimum, all construction projects require a bid bond, performance bond, and labor/material payment bond. Failure on the part of the state of West Virginia to checkmark the required bonds above does not relieve the vendor from the legal requirement of providing these bonds.

In lieu of the Bid Bond, the Vendor may provide certified checks, cashier's checks, or irrevocable letters of credit. Any certified check, cashier's check, or irrevocable letter of credit provided in lieu of the bid bond must be of the same amount required of the Bid Bond and delivered with the bid.

3. DRUG-FREE WORKPLACE AFFIDAVIT: W. Va. Code § 21-1D-5 provides that any solicitation for a public improvement contract requires each Vendor that submits a bid for the work to submit an affidavit that the Vendor has a written plan for a drug-free workplace policy. If the affidavit is not submitted with the bid submission, the Purchasing Division shall promptly request by telephone and electronic mail that the low bidder and second low bidder provide the affidavit within one business day of the request. Failure to submit the affidavit within one business day of receiving the request shall result in disqualification of the bid. To comply with this law, Vendor should complete the enclosed drug-free workplace affidavit and submit the same with its bid. Failure to submit the signed and notarized drugfree workplace affidavit or a similar affidavit that fully complies with the requirements of the applicable code, within one business day of being requested to do so shall result in disqualification of Vendor's bid. Pursuant to W. Va. Code 21-1D-2(b) and (k), this provision does not apply to public improvement contracts the value of which is \$100,000 or less or temporary or emergency repairs.

3.1. DRUG-FREE WORKPLACE POLICY: Pursuant to W. Va. Code § 21-1D-4, Vendor and its subcontractors must implement and maintain a written drug-free workplace policy that complies with said article. The awarding public authority shall cancel this contract if: (1) Vendor fails to implement and maintain a written drug-free workplace policy described in the preceding paragraph, (2) Vendor fails to provide information regarding implementation of its drug-free workplace policy at the request of the public authority; or (3) Vendor provides to the public authority false information regarding the contractor's drug-free workplace policy.

Pursuant to W. Va. Code 21-1D-2(b) and (k), this provision does not apply to public improvement contracts the value of which is \$100,000 or less or temporary or emergency repairs.

4. DRUG FREE WORKPLACE REPORT: Pursuant to W. Va. Code § 21-1D-7b, no less than once per year, or upon completion of the project, every contractor shall provide a certified report to the public authority which let the contract. For contracts over \$25,000, the public authority shall be the West Virginia Purchasing Division. For contracts of \$25,000 or less, the public authority shall be the agency issuing the contract. The report shall include:

- (1) Information to show that the education and training service to the requirements of West Virginia Code § 21-1D-5 was provided;
- (2) The name of the laboratory certified by the United States Department of Health and Human Services or its successor that performs the drug tests;
- (3) The average number of employees in connection with the construction on the public improvement;
- (4) Drug test results for the following categories including the number of positive tests and the number of negative tests: (A) Pre-employment and new hires; (B) Reasonable suspicion; (C) Post-accident; and (D) Random.

Vendor should utilize the attached Certified Drug Free Workplace Report Coversheet when submitting the report required hereunder. Pursuant to W. Va. Code 21-1D-2(b) and (k), this provision does not apply to public improvement contracts the value of which is \$100,000 or less or temporary or emergency repairs.

5. AIA DOCUMENTS: All construction contracts that will be completed in conjunction with architectural services procured under Chapter 5G of the West Virginia Code will be governed by the attached AIA documents, as amended by the Supplementary Conditions for the State of West Virginia, in addition to the terms and conditions contained herein.

6. PROHIBITION AGAINST GENERAL CONDITIONS: Notwithstanding anything contained in the AIA Documents or the Supplementary Conditions, the State of West Virginia will not pay for general conditions, or winter conditions, or any other condition representing a delay in the contracts. The Vendor is expected to mitigate delay costs to the greatest extent possible and any costs associated with Delays must be specifically and concretely identified. The state will not consider an average daily rate multiplied by the number of days extended to be an acceptable charge.

7. GREEN BUILDINGS MINIMUM ENERGY STANDARDS: In accordance with § 22-29-4, all new building construction projects of public agencies that have not entered the schematic design phase prior to July 1, 2012, or any building construction project receiving state grant funds and appropriations, including public schools, that have not entered the schematic design phase prior to July 1, 2012, shall be designed and constructed complying with the ICC International Energy Conservation Code, adopted by the State Fire Commission, and the ANSI/ASHRAE/IESNA Standard 90.1-2007: Provided, That if any construction project has a commitment of federal funds to pay for a portion of such project, this provision shall only apply to the extent such standards are consistent with the federal standards.

8. LOCAL LABOR MARKET HIRING REQUIREMENT: Pursuant to West Virginia Code §21-1C-1 et seq., Employers shall hire at least seventy-five percent of employees for public improvement construction projects from the local labor market, to be rounded off, with at least two employees from outside the local labor market permissible for each employer per project.

Any employer unable to employ the minimum number of employees from the local labor market shall inform the nearest office of Workforce West Virginia of the number of qualified employees needed and provide a job description of the positions to be filled.

If, within three business days following the placing of a job order, Workforce West Virginia is unable to refer any qualified job applicants to the employer or refers less qualified job applicants than the number requested, then Workforce West Virginia shall issue a waiver to the employer stating the unavailability of applicant and shall permit the employer to fill any positions covered by the waiver from outside the local labor market. The waiver shall be in writing and shall be issued within the prescribed three days. A waiver certificate shall be sent to both the employer for its permanent project records and to the public authority.

Any employer who violates this requirement is subject to a civil penalty of \$250 per each employee less than the required threshold of seventy-five percent per day of violation after receipt of a notice of violation.

Any employer that continues to violate any provision of this article more than fourteen calendar days after receipt of a notice of violation is subject to a civil penalty of \$500 per each employee less than the required threshold of seventy-five percent per day of violation.

The following terms used in this section have the meaning shown below.

(1) The term “construction project” means any construction, reconstruction, improvement, enlargement, painting, decorating or repair of any public improvement let to contract in an amount equal to or greater than \$500,000. The term “construction project” does not include temporary or emergency repairs;

(2) The term “employee” means any person hired or permitted to perform hourly work for wages by a person, firm or corporation in the construction industry; The term “employee” does not include:(i) Bona fide employees of a public authority or individuals engaged in making temporary or emergency repairs;(ii) Bona fide independent contractors; or(iii) Salaried supervisory personnel necessary to assure efficient execution of the employee's work;

(3) The term “employer” means any person, firm or corporation employing one or more employees on any public improvement and includes all contractors and subcontractors;

(4) The term “local labor market” means every county in West Virginia and any county outside of West Virginia if any portion of that county is within fifty miles of the border of West Virginia;

(5) The term “public improvement” includes the construction of all buildings, roads, highways, bridges, streets, alleys, sewers, ditches, sewage disposal plants, waterworks, airports and all other structures that may be let to contract by a public authority, excluding improvements funded, in whole or in part, by federal funds.

9. DAVIS-BACON AND RELATED ACT WAGE RATES:

☒ The work performed under this contract is federally funded in whole, or in part. Pursuant to 2 CFR 200.317, Vendors are required to pay applicable Davis-Bacon wage rates.

☐ The work performed under this contract is not subject to Davis-Bacon wage rates.

10. SUBCONTRACTOR LIST SUBMISSION: In accordance with W. Va. Code § 5-22-1, the apparent low bidder on a contract valued at more than \$250,000.00 for the construction, alteration, decoration, painting or improvement of a new or existing building or structure shall submit a list of all subcontractors who will perform more than \$25,000.00 of work on the project including labor and materials. (This section does not apply to any other construction projects, such as highway, mine reclamation, water or sewer projects.) The subcontractor list shall be provided to the Purchasing Division within one business day of the opening of bids for review. If the apparent low bidder fails to submit the subcontractor list, the Purchasing Division shall promptly request by telephone and electronic mail that the low bidder and second low bidder provide the subcontractor list within one business day of the request. Failure to submit the subcontractor list within one business day of receiving the request shall result in disqualification of the bid.

If no subcontractors who will perform more than \$25,000.00 of work are to be used to complete the project, the apparent low bidder must make this clear on the subcontractor list, in the bid itself, or in response to the Purchasing Division's request for the subcontractor list.

a. Required Information. The subcontractor list must contain the following information:

i. Bidder's name

ii. Name of each subcontractor performing more than \$25,000 of work on the project.

iii. The license number of each subcontractor, as required by W. Va. Code § 21-11-1 et. seq.

iv. If applicable, a notation that no subcontractor will be used to perform more than \$25,000.00 of work. (This item iv. is not required if the vendor makes this clear in the bid itself or in documentation following the request for the subcontractor list.)

b. Subcontractor List Submission Form: The subcontractor list may be submitted in any form, including the attached form, as long as the required information noted above is included. If any information is missing from the bidder's subcontractor list submission, it may be obtained from other documents such as bids, emails, letters, etc. that accompany the subcontractor list submission.

c. Substitution of Subcontractor. Written approval must be obtained from the State Spending Unit before any subcontractor substitution is permitted. Substitutions are not permitted unless:

i. The subcontractor listed in the original bid has filed for bankruptcy;

ii. The subcontractor in the original bid has been debarred or suspended; or

iii. The contractor certifies in writing that the subcontractor listed in the original bid fails, is unable, or refuses to perform his subcontract.

Subcontractor List Submission (Construction Contracts Only)

Bidder's Name:



Casto Technical Service
540 Leon Sullivan Way
Charleston, WV 25301
plancaster@castotech.com



Check this box if no subcontractors will perform more than \$25,000.00 of work to complete the project.

Subcontractor Name	License Number if Required by W. Va. Code § 21-11-1 et. seq.

Attach additional pages if necessary

Revised 8/24/2023

DESIGNATED CONTACT: Vendor appoints the individual identified in this Section as the Contract Administrator and the initial point of contact for matters relating to this Contract.

(Printed Name and Title) _____

(Address) _____

(Phone Number) / (Fax Num. _____

(email address) _____



Casto Technical Service
540 Leon Sullivan Way
Charleston, WV 25301
plancaster@castotech.com

CERTIFICATION AND SIGNATURE: By signing below, or submitting documentation through wvOASIS, I certify that: I have reviewed this Solicitation/Contract in its entirety; that I understand the requirements, terms and conditions, and other information contained herein; that this bid, offer or proposal constitutes an offer to the State that cannot be unilaterally withdrawn; that the product or service proposed meets the mandatory requirements contained in the Solicitation/Contract for that product or service, unless otherwise stated herein; that the Vendor accepts the terms and conditions contained in the Solicitation, unless otherwise stated herein; that I am submitting this bid, offer or proposal for review and consideration; that this bid or offer was made without prior understanding, agreement, or connection with any entity submitting a bid or offer for the same material, supplies, equipment or services; that this bid or offer is in all respects fair and without collusion or fraud; that this Contract is accepted or entered into without any prior understanding, agreement, or connection to any other entity that could be considered a violation of law; that I am authorized by the Vendor to execute and submit this bid, offer, or proposal, or any documents related thereto on Vendor's behalf; that I am authorized to bind the vendor in a contractual relationship; and that to the best of my knowledge, the vendor has properly registered with any State agency that may require registration.

By signing below, I further certify that I understand this Contract is subject to the provisions of West Virginia Code § 5A-3-62, which automatically voids certain contract clauses that violate State law; and that pursuant to W. Va. Code 5A-3-63, the entity entering into this contract is prohibited from engaging in a boycott against Israel.

Casto Technical Services, Inc.

(Company) _____

(Signature of Authorized Representative) _____

Paul Lancaster / R&I Operations Manager/Estimator 06/03/2025

(Printed Name and Title of Authorized Representative) (Date)

304-346-0549

(Phone Number) (Fax Number)

plancaster@castotech.com

(Email Address) _____

ADDENDUM ACKNOWLEDGEMENT FORM
SOLICITATION NO.: CRFQ ADJ2500000033

Instructions: Please acknowledge receipt of all addenda issued with this solicitation by completing this addendum acknowledgment form. Check the box next to each addendum received and sign below. Failure to acknowledge addenda may result in bid disqualification.

Acknowledgment: I hereby acknowledge receipt of the following addenda and have made the necessary revisions to my proposal, plans and/or specification, etc.

Addendum Numbers Received:

(Check the box next to each addendum received)

- | | |
|--|--|
| <input checked="" type="checkbox"/> Addendum No. 1 | <input type="checkbox"/> Addendum No. 6 |
| <input checked="" type="checkbox"/> Addendum No. 2 | <input type="checkbox"/> Addendum No. 7 |
| <input type="checkbox"/> Addendum No. 3 | <input type="checkbox"/> Addendum No. 8 |
| <input type="checkbox"/> Addendum No. 4 | <input type="checkbox"/> Addendum No. 9 |
| <input type="checkbox"/> Addendum No. 5 | <input type="checkbox"/> Addendum No. 10 |

I understand that failure to confirm the receipt of addenda may be cause for rejection of this bid. I further understand that any verbal representation made or assumed to be made during any oral discussion held between Vendor's representatives and any state personnel is not binding. Only the information issued in writing and added to the specification.



Casto Technical Service
540 Leon Sullivan Way
Charleston, WV 25301
plancaster@castotech.com

Company

Authorized Signature

April 21, 2025

Date

NOTE: This addendum acknowledgment should be submitted with the bid to expedite document processing.

REQUEST FOR QUOTATION – CRFQ ADJ25*33
WVANG Wheeling Armory Boilers

GENERAL CONSTRUCTION SPECIFICATIONS (No AIA Documents)

- 1. PURPOSE AND SCOPE:** The West Virginia Purchasing Division is soliciting bids on behalf of West Virginia Army National Guard to establish a contract for the following:

The scope of work for this project is to provide and replace (2) Boilers for the Wheeling National Guard Armory, located in Wheeling, WV

The Vendor shall furnish all materials, labor, and equipment necessary to complete all Construction Services. The Vendor shall furnish any incidental work, materials, labor, and equipment that are necessary to complete the Construction Services, even if such incidental work is not explicitly included in the Project Plans.

- 2. DEFINITIONS:** The terms listed below shall have the meanings assigned to them below. Additional definitions can be found in section 2 of the General Terms and Conditions and in the Project Plans as defined below.

2.1 “Construction Services” means to provide and replace 2 Boilers for the Wheeling National Guard Armory the Project Plans.

2.2 “Pricing Page” means the pages contained in wvOASIS, attached hereto as Exhibit A, or included in the Project Plans upon which Vendor should list its proposed price for the Construction Services.

2.3 “Solicitation” means the official notice of an opportunity to supply the State with Construction Services that is published by the Purchasing Division.

2.4 “Project Plans” means documents developed by an architect, an engineer, the Agency, or another design professional, which are attached hereto as Exhibit B, that provide detailed instructions on how the Construction Services are to be performed. In the event that Project Plans contain drawings or other documents too large to attach in Exhibit B, Vendors can obtain copies in accordance with Section 9 of these Specifications.

- 3. ORDER OF PRECEDENCE:** This General Construction Specifications document will have priority over, and supersede, anything contained in the Project Plans.

- 4. QUALIFICATIONS:** Vendor, or Vendor’s staff if requirements are inherently limited to individuals rather than corporate entities; shall have the following minimum qualifications:

4.1. Experience: Vendor, or Vendor’s supervisory staff assigned to this project, must have successfully completed at least 5 (five) projects that involved work similar to that described in these specifications or the Project Plans. Compliance with this experience requirement will be determined prior to contract award by the State through references provided by the Vendor upon request, through knowledge or documentation of the Vendor’s past projects,

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through confirmation of experience requirements from the architect assisting the State in this project, or some other method that the State determines to be acceptable. Vendor must provide any documentation requested by the State to assist in confirmation of compliance with this provision. References, documentation, or other information to confirm compliance with this experience requirement may be requested after bid opening and prior to contract award.

5. **CONTRACT AWARD:** The Contract is intended to provide Agency with a purchase price for the Construction Services. The Contract will be awarded to the lowest qualified responsible bidder meeting the required specifications. If the Pricing Pages contain alternates/add-ons, the Contract will be awarded based on the grand total of the base bid and any alternates/add-ons selected.
6. **SELECTION OF ALTERNATES:** Pursuant to W. Va. Code § 5-22-1(f), any solicitation of bids shall include no more than five alternates. Alternates, if accepted, shall be accepted in the order in which they are listed on the bid form. Any unaccepted alternate contained within a bid shall expire 90 days after the date of the opening of bids for review. Determination of the lowest qualified responsible bidder shall be based on the sum of the base bid and any alternates accepted. **This project contains No Alternates.**
7. **PERFORMANCE:** Vendor shall perform the Construction Services in accordance with this document and the Project Plans.
8. **SUBSTITUTIONS:** Any substitution requests must be submitted in accordance with the official question and answer period described in the INSTRUCTIONS TO VENDORS SUBMITTING BIDS, Paragraph 4. Vendor Question Deadline. Vendors submitting substitution requests should submit product brochures and product specifications during the official question and answer period.
9. **PROJECT PLANS:** The checked box will apply to Project Plans for this solicitation.
 - x **No Additional Project Plan Documents:** There are no additional Project Plans other than those attached hereto as Exhibit B or any subsequent addenda modifying Exhibit B.

10. CONDITIONS OF THE WORK

- 10.1. **Permits:** The Vendor shall procure all necessary permits and licenses to comply with all applicable Federal, State, or Local laws, regulations and ordinances of any regulating body.
- 10.2. **Existing Conditions:** If discrepancies are discovered between the existing conditions and those noted in the specifications, Vendor must immediately notify the Agency's representative. Vendor must also immediately notify the Agency if suspected hazardous materials are encountered.

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10.3. Standard Work Hours: The standard hours of work for this Contract will be Monday through Friday from 7:30am to 4:400pm excluding holidays recognized by the State of West Virginia. Any work outside of the standard hours of work must be approved in advance at the Agency's sole discretion. Authorization of work outside of the standard hours of work will not entitle Vendor to additional compensation.

10.4. Project Closeout: Project Closeout shall include the following:

10.4.1. Final Cleanup: Vendor shall perform the final cleanup activities listed below, along with any other final cleanup activities normally associated with the work performed under this Contract, prior to final inspection:

10.4.1.1. Contractor is responsible for removing all construction debris daily.

10.4.1.2. Contractor is responsible for removing and disposing of any demolished material; off site and at the contractor's expense.

10.4.2. Final Inspection: Vendor shall participate in a final inspection with the Agency's project manager. The purpose of the final inspection will be to identify deficiencies that need to be remedied prior to Agency's final acceptance of the work. Vendor shall at all times be obligated to perform in accordance with the Contract and must take all actions necessary to ensure that work complies with requirements of Contract prior to final acceptance. Final acceptance does not waive or release Vendor from its obligation to ensure that work complies with the Contract requirements. Vendor shall submit any warranty documents to the Agency project manager at final inspection.

10.5. Payment:

10.5.1. Agency shall play flat fee as shown on the Bid Form, for all Contract Services performed and accepted under this Contract. Vendor shall accept payment in accordance with the payment procedures of the State of West Virginia.

10.5.2. Invoices shall be submitted for payment (in arrears) and must include the following information.

10.5.2.1 Invoice must include, at a minimum, invoice date, FEIN number, complete address of vendor and Contract Number.

10.5.2.2. Invoices shall be mailed to the following address:

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WV Army National Guard
Construction & Facilities Management Office
1707 Coonskin Drive
Attn: Accounts Payable
Charleston, WV 25311

11. FACILITIES ACCESS: Performance of Contract Services may require access cards and/or keys to gain entrance to Agency's facilities. In the event that access cards and/or keys are required:

11.1. Vendor must identify principal service personnel which will be issued access cards and/or keys to perform service.

11.2. Vendor will be responsible for controlling cards and keys and will pay replacement fee, if the cards or keys become lost or stolen.

11.3. Vendor shall notify Agency immediately of any lost, stolen, or missing card or key.

11.4. Anyone performing under this Contract will be subject to Agency's security protocol and procedures.

11.5. Vendor shall inform all staff of Agency's security protocol and procedures.

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12. MISCELLANEOUS:

12.1. Contract Manager: During its performance of this Contract, Vendor must designate and maintain a primary contract manager responsible for overseeing Vendor's responsibilities under this Contract. The Contract manager must be available during normal business hours to address any customer service or other issues related to this Contract. Vendor should list its Contract manager and his or her contact information below.

Contract Manager: _____
Telephone Number: _____
Fax Number: _____
Email Address: _____



Casto Technical Service
540 Leon Sullivan Way
Charleston, WV 25301
plancaster@castotech.com

- a. Liquidated Damages: Contractor shall pay liquidated damages in the amount of \$1,500.00 per day of delay, plus a one-time fixed cost of \$1,250.00 for Staff Judge Advocate review for work not completed after contract completion date. This clause shall in no way be considered exclusive and shall not limit the State or Agency's right to pursue any other available remedy.

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EXHIBIT B – PROJECT PLANS

13. GENERAL REQUIREMENTS:

13.1. Mandatory Contract Item Requirements: Contract Item must meet to exceeds the mandatory requirements listed below.

13.1.1. All work to be performed according to specifications provided in the following attachments.

13.1.1.1. Exhibit A Pricing Page

13.1.1.2. Exhibit C Scope of Work

13.1.1.3. Exhibit D Boiler Specifications.

14. PERFORMANCE: Vendor and Agency shall agree upon a schedule for performance of Contract Service and Contract Services Deliverables, unless such a schedule is already included herein by Agency.

15. TRAVEL: Vendor shall be responsible for all mileage and travel costs, including travel time, associated with performance of this Contract. Any anticipated mileage or travel costs may be included in the Vendor's bid, but such costs will not be paid by the Agency separately.

16. PROJECT SPECIFIC CONDITIONS OF THE WORK

16.1. Limits of Work

16.1.1. Work area will be limited to those spaces required for access to the jobsites.

16.1.2. Some Interior space may be utilized for temporary (overnight) storage of equipment and tools. Coordinate storage needs with the Agency Project Manager. Vendor shall take full responsibility for the storage of any supplies or equipment on the jobsite, whether inside or outside. Agency cannot guarantee availability of its employees during off- hours (evenings, holidays, weekends, etc.) to provide access to any supplies and equipment stored inside.

16.1.3. Agency facilities shall remain in use during this contract. Contractor shall work with the Trades Specialist to coordinate the temporary access to work areas and otherwise provide for the Contractor needs to complete

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work. Contractor shall minimize disruption to building work areas and loading dock access.

Contractor shall be permitted reasonable use of building utilities including power, water and sanitary sewage disposal as required for conducting the work.

Contractor shall coordinate the location of service connections or use of receptacles with the Trades Specialist to avoid overloading existing circuits.

16.2. Contractor Visitor Badges

Contractor shall provide a list of all personnel working on this project within the facility. This list shall include a copy of a valid driver's license or other legal identification and include date of birth and cell phone number. Workers shall carry valid Contractor Photo ID Badges to be worn when working in the facility. Under no circumstances shall a worker be assigned to this project without the validation first being submitted to the WV Army National Guard and approval given.

16.3. Work Restrictions

Access to the buildings shall be coordinated with the Owner. Contractor shall not leave open doors unattended and shall close doors when not in use.

These are non-smoking buildings. Smoking is not permitted within the buildings or near entrances, operable windows or outdoor air intakes.

Vendor MAY NOT block access to any fire hydrant located at jobsite.

Vendor MAY NOT block access to parking lot entrances and exits without prior approval of the Agency.

16.4. PARKING

Some parking is available on the project sites. Parking in non-designated areas is not permitted. Parking is the responsibility of the contractor. With prior approval, contractor's vehicles may be brought on-site for loading & unloading or to provide equipment necessary for conducting the work.

Use of loading dock areas or sidewalk areas for parking is strictly prohibited.

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16.5. CODES

All work is to be performed in compliance with applicable Federal and State codes including but not limited to the International Building Code, International Mechanical Code, Life Safety Code, NEC, OSHA, UL, ANSI, ASME and related standards.

16.6. SAFETY

All applicable local safety and OSHA rules and guidelines shall be met by the Contractor. Work shall be subject to verification and inspection by WV Army National Guard Safety representatives. Such verification shall not relieve the Contractor from meeting all applicable safety regulations and inspection by other agencies

16.7. HOT WORK PERMIT

Contractor shall obtain Owner's permission prior to performing any work that requires an open flame, creates sparks, use's equipment that creates combustible temperatures, or performs any work that could result in a fire hazard. Owner will review work area and issue a 'Hot Work Permit' prior to Contractor commencing work. Note that the Contractor must take proper precautions and may be required to provide a Fire Watch as a condition of the permit.

16.8. WORKMANSHIP

Contractor shall complete all work in a neat and workmanlike manner. All work shall be done using new materials in a manner that meets commercial quality standards. Work shall be neat, true, plumb and square, as applicable. Contractor shall verify all dimensions.

REQUEST FOR QUOTATION – CRFQ ADJ25*33
WVANG Wheeling Armory Boilers

EXHIBIT C

SCOPE OF WORK

WVANG Wheeling Armory Boilers

March 2025

Division 1 - General Requirements

00200 Instructions to Bidders

- **Any and all contractual documents, information and procedures distributed by, or by any other means conveyed, by WV State Purchasing or the office of; supersedes the language in this document.**

01100 Summary

The scope of work for this project is to provide and replace (2) boilers for the Wheeling Armory, located in Wheeling, WV.

Work to be performed:

1. **General:** This project shall consist of removing and replacing the existing boilers with new (2) boilers.
2. **Electrical Work:** Contractor shall inspect existing electrical circuits including existing breakers. Field verification is required before disconnecting any circuit to ensure to match the new equipment manufacturer specifications. All electrical work shall conform to the current National Electrical Code. Extend or replace electrical circuits to new equipment as necessary.
3. **Existing Boiler information:** Teledyne Laars Hydronic Boilers Model HH0850-1P-16 (These specifications are available upon request).
4. **Existing demo:** It is the contractor's responsibility to remove both boilers from the premises and discard according to all local laws.
5. **Site piping requirements:** All existing piping to be reused and extended to new equipment as necessary for a turnkey project. All new piping shall be insulated to match existing conditions. Any outdoor piping shall be insulated and jacketed weather tight.
6. **Manufacturers piping requirements:** Boiler piping shall be sized in accordance with manufactures recommendations.
7. **Boiler pumps:** Existing boiler pumps shall be removed and replaced with new and sized per manufactures recommendations. Contractor to verify prior to ordering.
8. **Boiler flue piping:** Existing exhaust piping can be reused only if it meets new boiler requirements. Contractor to verify and replace as needed to meet new boiler specifications.
9. **Boiler basis of design:** Thermal Solutions AMPL-800 800,000 BTU boiler or equal. See attached specifications.
10. **Housekeeping pads:** Pads to be extended as necessary to accommodate new boilers.
11. **Startup:** Both boilers shall have a factory startup performed and documented.

REQUEST FOR QUOTATION – CRFQ ADJ25*33
WVANG Wheeling Armory Boilers

Due to design, any contractor wishing to submit an equivalent boiler, must do so during the question period for evaluation.

Full project site cleanup is required.

01300 Administrative Requirements

PROJECT COORDINATION

- Coordinate construction activities included in Contract Documents to assure efficient and orderly installation of each part of the Work.
- Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair.
- Where necessary prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings. Prepare similar memoranda for Owner and separate Contractors where coordination of their Work is required.

ADMINISTRATIVE PROCEDURES

- Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities include, but are not limited to:
 - o Preparing of schedules.
 - o Delivering and processing submittals.
 - o Progress meetings.
 - o Project Close-out activities.

CONSERVATION

- Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

PROGRESS MEETINGS

- Contractor will conduct progress meetings at site agreed upon by the Owner/Owner's Representative at regularly scheduled intervals, generally bi-weekly.
- Progress meeting minutes are to be provided by the contractor within 3 business day of conclusion of the meeting. The meeting minutes shall be approved at the next meeting.
- The progress agenda shall include:
 - o Review and correct or approve minutes of previous progress meeting.
 - o Review and discuss old business
 - o Review and discuss new business

REQUEST FOR QUOTATION – CRFQ ADJ25*33
WVANG Wheeling Armory Boilers

- o Review and discuss contractor's issues and concerns
 - o Review and discuss owner's issues and concerns
 - o Review and discuss progress since last meeting.
 - o Review where each activity is in relation to Contractor's Construction Schedule, whether on time or ahead or behind schedule, will be determined.
 - o Contractor to present a new updated schedule at each progress meeting; to include a two week look ahead.
- Contractor shall provide meeting minutes of each progress meeting within three days after each progress meeting date. Contractor will distribute copies of minutes of meeting to the Owner.

GENERAL RESPONSIBILITIES

- The successful contractor is responsible for providing all parts, labor, equipment, and materials required to provide a finished fully functional product as described in the objectives.
- The contractor is responsible for the cost and obtaining of all required permits.
- The contractor is responsible to ensure all work is in compliance with all Federal, State, Local Municipalities, State Fire Marshall and ATEP requirements.
- Contractor is responsible for all permits; the contractor shall obtain all required permits prior to initiation of any work. The contractor shall be responsible for the associated costs or permitting.
- Contractor is responsible for field verifying all distances and quantities of materials and components necessary for completion.
- The contractor is responsible for cleaning up the work site and repairing the site to original conditions once work is completed.
- Contractor responsible for keeping the work site clean daily, free from excess debris and safety hazards.
- Contractor responsible for providing waste disposal for the project; contractor is responsible for removing all construction waste debris off site at the contractor's expense.
- All materials shall be submitted and approved by the WVARNG prior to installation.
- The West Virginia Army National Guard reserves the right to claim removed equipment from the project. A list of equipment to be retained will be provided to the contractor prior to beginning work. Contractor to make every effort to remove these items without damage.
- The contractor will provide a schedule of values broken down per line item with material and labor.
- Owner has 7 business days to review and respond to Requests for Information (RFI)'s.
- Owner has 14 business days to review and respond to contract submittals.
- Owner has 14 business days to review and respond to review drawings.

REQUEST FOR QUOTATION – CRFQ ADJ25*33
WVANG Wheeling Armory Boilers

SITE ACCESS REQUIREMENTS

- Access and general protection/security policy and procedures. This standard language is for contractor employees with an area of performance within Army controlled installation, facility, or area. Contractor and all associated sub-contractors' employees shall provide all information required for background checks to meet installation access requirements.
- Contractor is responsible for coordinating with the Owner/Owner's Representative, for access and deliveries. The Owner requires two (2) business days' notice to approve access to the facility.

01400 Quality Requirements

- The successful contractor will be required to provide a one-year warranty on all parts, labor and materials on the entire project.

01500 Temporary Facilities and Controls

- The successful contractor will be required to provide their own temporary facilities. The West Virginia Army National Guard will provide an area for the contractor to have a lay down area, and a place for a job trailer.
- The West Virginia Army National Guard will make every effort to provide electric and water for the contractor's lay down and job trailer site; however, it is not guaranteed.

01700 Execution Requirements

- Within 30 days of the government Final Acceptance of the project; the contractor shall be responsible to provide any and all field notes, as-built drawings, or any other associated records to the Owner.

Division 2 - Site Construction

02073 PARTIAL DEMOLITION FOR REMODELING

GENERAL DEMOLITION

- Review, confirm and coordinate all demolition work and full extent of Owner's requirements prior to starting demolition work.
- Deliver salvageable materials requested by Owner.
- Perform all demolition in a manner acceptable to the Owner and regulatory agencies.
- Protect and maintain conduits, drains, sewers, pipes, and wires that are to remain on the property.
- Protect existing construction indicated to remain.
- Where existing construction is damaged by demolition operations, make repairs equal to or better than condition prior to start of demolition work.

REQUEST FOR QUOTATION – CRFQ ADJ25*33
WVANG Wheeling Armory Boilers

CLEANING

- Promptly remove materials, rubbish, and debris from building and from property.

SALVAGEABLE MATERIALS

- Review with Owner at Preconstruction meeting about salvaged materials the Owner wishes to retain from building renovation project.
- Remove with care materials to be retained by Owner and store on site where directed for pickup by owner.

HANDLING

- Deliver materials and other components so they will not be damaged or deformed
- Exercise care in unloading, storing, and erecting materials to prevent bending, warping, twisting, and surface damage.
- Stack materials on platforms/pallets, covered with suitable weathertight ventilated covering.

WARRANTY

- Furnish manufacturer's written warranty covering materials installed. This warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.

PRODUCTS

- Will be in accordance with attached specifications

INSTALLATION

- General: Comply with manufacturers' instructions and recommendations for installation, as applicable to project.

AMP

Commercial High Efficiency Condensing Boilers and Water Heaters



AMP-L
399-1000 MBH



AMP
1000-4000 MBH



Maximum Capacity Minimum Space

SAVES SPACE

- Reduced footprint, zero clearance (AMP-L models)
- Stackable/rackable design doubles MBH/sq.ft. (AMP-L stackable as boiler model only)

STREAMLINES REPLACEMENT

- 3-in-1 vent connector (AMP-L models), multiple venting options
- Up to 300 equivalent ft. of venting on AMP models (200 equivalent ft. for AMP-L models)
- Simplified wiring - separate low/high voltage boards

SIMPLIFIED SPECIFICATION & INSTALLATION

- CSD-1 built-in (gas train & controls)
- Advanced Concert™ control system
 - Touchscreen with intuitive navigation and menus
 - Cascade up to 8 boilers
 - Data/event logging
- Modbus connectivity

RELIABILITY & SERVICEABILITY

- Commercial-grade water tube heat exchanger
- Easy access to all boiler service locations
- Complete control panel access: slide out (AMP-L models), external (AMP models)



THERMAL[®]
SOLUTIONS

Innovative Equipment for Hot Water Systems

AMP-L Boilers & Water Heaters



- CSD-1 compliant
- Double MBH per sq. ft.
 - Stackable, hardware included (boiler models only)
 - Zero clearance
- Fits through standard doorways
- Modbus connectivity, cascade up to 8 individual units
- Outdoor models available – no upcharge
- 3-in-1 vent connector (CPVC, PP, SS)
- Venting of up to 200 (combined) equivalent ft.
- 10:1 turndown, natural gas or LP
- Easy service and maintenance – complete service access to burner, combustion chamber, and slide-out boiler control vestibule
- Warranty: 10-year limited heat exchanger, 1-year parts & burner



PRESSURE VESSEL

- Stainless steel watertube heat exchanger
- ASME Section IV-certified, "H" Stamp
- MAWP 160 PSIG, design temp 210°F
- CSD-1 compliant

COMBUSTION

- Stainless steel pre-mix burner
- Low NOx emissions (<10 ppm);
- Full modulation, 10:1 turndown
- 4" wc to 14" wc inlet gas pressure
- 8" wc LP min
- Direct spark ignition system
- High/low gas pressure switches w/ manual reset
- Combustion air switch
- Modulating gas valve
- Variable speed combustion blower
- Air proving switch & blocked vent switch

VENTING

- CPVC, polypropylene or stainless steel materials acceptable
- Air intake – sealed combustion or room air
- Category II or IV venting
- Individual or common (engineered) venting systems

EQUIPMENT

- Concert™ control
- High limit w/ manual reset safety temperature control
- Low water cutoff w/ manual reset
- Water flow switch
- Supply & return, and water temperature sensors
- Flue gas temperature sensor
- Condensate trap
- Blocked condensate switch
- Pressure & temperature gauge
- ASME safety temperature & pressure relief valve (boilers: 50 PSI standard, 30, 60, 75, 100, 125, or 150 available - water heaters: 150 PSI standard)

ELECTRICAL

High voltage printed circuit board (PCB)

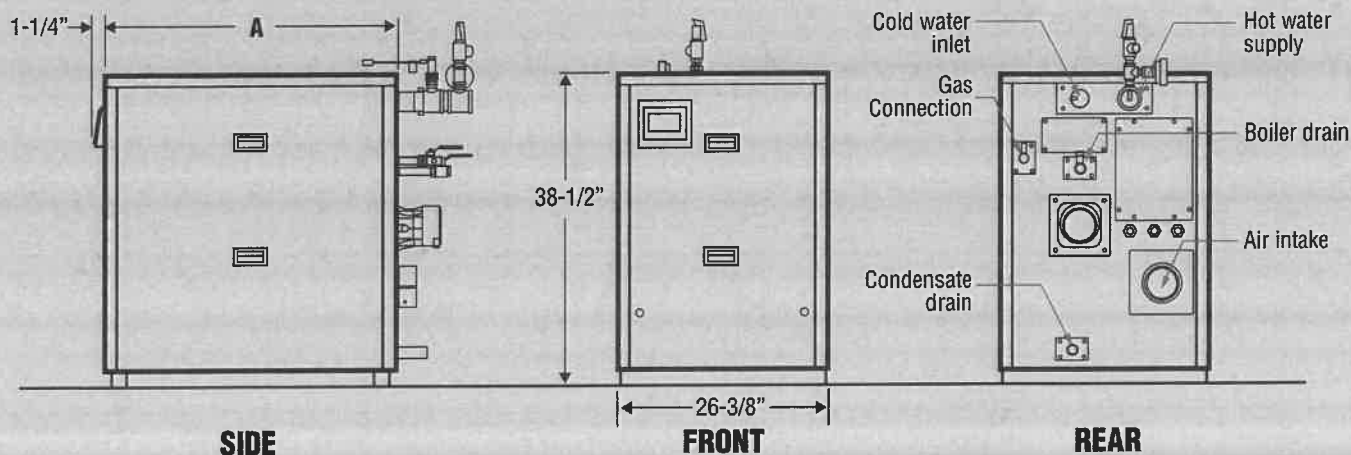
- 120 VAC / 60 Hz / 1PH power supply
- 120 VAC manual reset external limit contacts
- Three sets of pump contacts
- PCB fused connections

Printed circuit board (PCB)

- 24 VAC enable/disable sensor contacts
- 24 VAC proving switch or manual reset ext. limit contacts
- 24 to 120 VAC lockout alarm contacts
- 24 VAC EnviraCom thermostat contacts
- DHW demand contacts
- Remote header sensor contacts
- DHW tank sensor contacts
- Peer-to-peer communication contacts
- EMS interface contacts
- Remote 4-20mA contacts

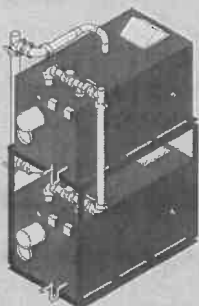
AMP-L Dimensions (Inches)

Model	A	Vent Connection	Gas Connection NPT	Supply (NPT)	Return (NPT)
AMP(W)-400	37-3/4	4	3/4	2	2
AMP(W)-500	37-3/4	4	3/4	2	2
AMP(W)-650	53-7/8	6	1	2	2
AMP(W)-800	53-7/8	6	1	2	2
AMP(W)-1000L	53-7/8	6	1	2	2



AMP Boilers & Water Heaters

- CSD-1 compliant
- 50% smaller footprint compared to competitors
- Stackable with optional racking system
- Top water connections saves space
- Modbus connectivity, cascade up to 8 individual units
- 5:1 turndown, natural gas or LP
- AL29-4C, PP, or CPVC venting, up to 300 (combined) equivalent feet
- Complete access to burner and combustion chamber for ease of service
- Warranty: 10-year limited heat exchanger, 1-year parts & burner



PRESSURE VESSEL

- Watertube stainless steel heat exchanger
- ASME Section IV-certified, "H" Stamp
- MAWP 160 PSIG & design temp 210°F
- CSD-1 compliant

COMBUSTION DESIGN

- Stainless steel pre-mix burner
- Low NOx emissions (<10 ppm)
- 4" wc to 14" wc inlet gas pressure
- 8" wc LP min
- Direct spark ignition system
- High & low gas pressure switches w/ manual reset
- Zero governor gas valve
- Variable speed combustion blower

- Air proving switch
- Blocked vent switch

VENTING

- CPVC, polypropylene or stainless steel materials acceptable
- Air intake – sealed combustion or room air
- Category II or IV venting
- Individual or common (engineered) venting systems

EQUIPMENT

- Concert™ control
- High limit w/ manual reset safety temp. control
- Low water cutoff w/ manual reset

- Water flow switch
- Supply & return water temperature sensors
- Flue gas temperature sensor
- Condensate trap
- Blocked condensate switch
- Pressure & temperature gauge
- ASME safety temperature & pressure relief valve (boilers: 50 PSI standard; 30, 60, 75, 100, 125, or 150 available – water heaters: 150 PSI standard)

ELECTRICAL

- High voltage printed circuit board (PCB)
- 120, 208 or 240 VAC / 60 Hz / 1PH power supply
- VAC manual reset external limit contacts
- Three sets of pump contacts
- PCB fused connections

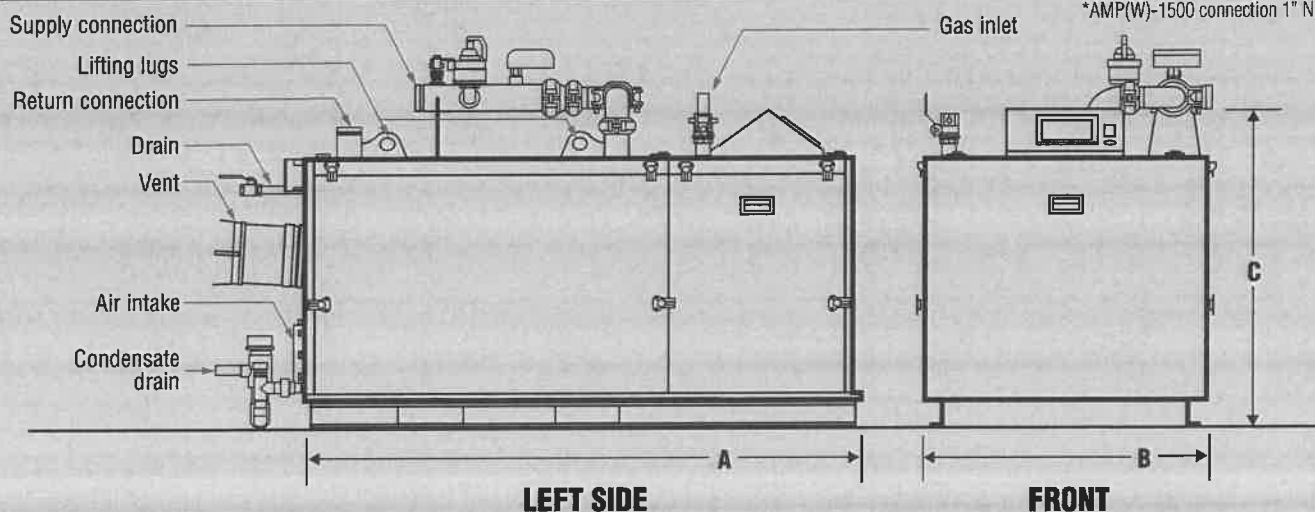
Printed Circuit Board (PCB)

- 24 VAC enable/disable sensor contacts
- 24 VAC proving switch or manual reset ext. limit contacts
- 24 to 120 VAC lockout alarm contacts
- 24 VAC EnviraCom thermostat contacts
- DHW demand contacts
- Remote header sensor contacts
- DHW tank sensor contacts
- Outdoor air sensor contacts
- Peer-to-peer communication contacts
- EMS interface contacts
- Remote 4-20mA contacts

AMP Dimensions (Inches)

Model	A	B	C	Vent Connection	Gas Connection NPT	Supply (NPT)	Return (NPT)
AMP(W)-1000	45-1/2	34-1/4	42-3/4	8	1	3	2-1/2
AMP(W)-1250	45-1/2	34-1/4	42-3/4	8	1	3	2-1/2
AMP(W)-1500	66-1/8	34-1/4	42-3/4	8	1-1/4*	3	2-1/2
AMP(W)-2000	66-1/8	34-1/4	42-3/4	8	1-1/4	3	2-1/2
AMP(W)-2500	76	46	55	10	1-1/2	4	4
AMP(W)-3000	76	46	55	10	1-1/2	4	4
AMP(W)-3500	98	46	55	10	2	4	4
AMP(W)-4000	98	46	55	10	2	4	4

*AMP(W)-1500 connection 1" NPT



AMP/AMP-L

Technical Information



AMP-L Ratings & Specifications						
Model	Input (MBH)		Gross Output (MBH)	DHW Recovery ² (GPH)	Thermal Efficiency (%)	Approx. Shipping Weight (lbs.)
	Min	Max				
AMP-400	40	399	387	—	97	460
AMPW-400 ¹	40	399	391	470	98	460
AMP-500	50	500	485	—	97	470
AMPW-500 ¹	50	500	490	588	98	470
AMP-650	65	650	631	—	97	530
AMPW-650 ¹	65	650	637	764	98	530
AMP-800	80	800	776	—	97	560
AMPW-800 ¹	80	800	784	941	98	560
AMP-1000L	100	1000	970	—	97	600
AMPW-1000L ¹	100	1000	980	1176	98	600

NOTES:

1. Water heater model
2. Based on 40°F to 140°F temperature rise

AMP Ratings & Specifications						
Model	Input (MBH)		Gross Output (MBH)	DHW Recovery ² (GPH)	Thermal Efficiency (%)	Approx. Shipping Weight (lbs.)
	Min	Max				
AMP-1000	200	1000	970	—	97	922
AMPW-1000 ¹	200	1000	980	1188	98	922
AMP-1250	250	1250	1213	—	97	922
AMPW-1250 ¹	250	1250	1225	1485	98	922
AMP-1500	300	1500	1455	—	97	1217
AMPW-1500 ¹	300	1500	1470	1782	98	1217
AMP-2000	400	2000	1940	—	97	1217
AMPW-2000 ¹	400	2000	1960	2376	98	1217
AMP-2500	500	2500	2425	—	97	2281
AMPW-2500 ¹	500	2500	2500	2970	98	2281
AMP-3000	600	3000	2910	—	97	2281
AMPW-3000 ¹	600	3000	2940	3564	98	2281
AMP-3500	700	3500	3395	—	97	2281
AMPW-3500 ¹	700	3500	3430	4158	98	2281
AMP-4000	800	4000	3395	—	97	2281
AMPW-4000 ¹	800	4000	3920	4752	98	2281

NOTES:

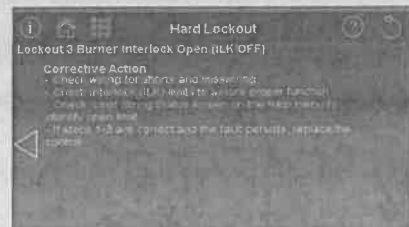
1. Water heater model
2. Based on 40°F to 140°F temperature rise



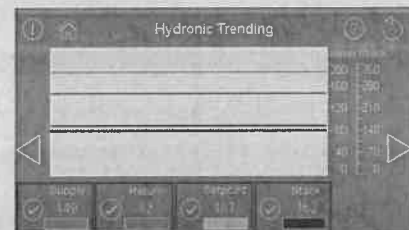
Advanced Boiler Control System



- Color touchscreen, real time readouts
- Intuitive navigation
- 3-level password protection



- Self-guided diagnostics
- Fault identification and correction
- Factory default settings
- Timed setback capability



- Time/date stamp on reports
- Stores up to 4 months of data
- Calculates cycle and run times
- Resettable



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P.O. Box 3244, Lancaster, PA 17604-3244
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Save this manual for future reference.

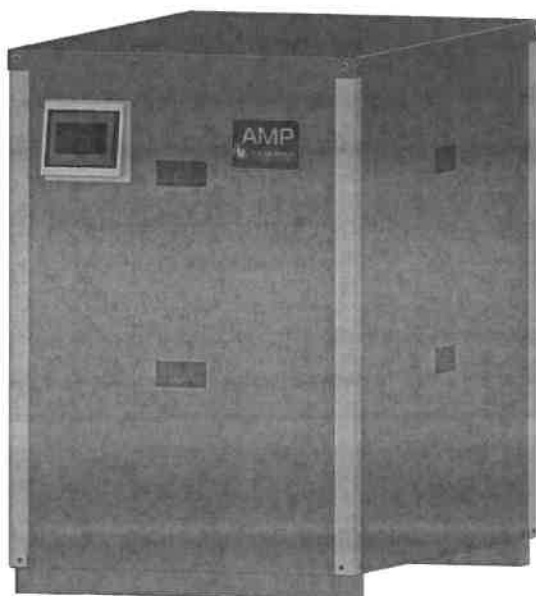


INSTALLATION, OPERATION, AND MAINTENANCE MANUAL

399-1000 MBH Hot Water Boiler Indoor/Outdoor



Intertek



Boiler Models
AMP400B
AMP500B
AMP650B
AMP800B
AMP1000LB

⚠ WARNING

WARNING: If the information in these instructions is not followed exactly, a fire or explosion may result causing property damage, personal injury or death.

⚠ DANGER

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

Installation and service must be performed by a qualified installer, service agency or the gas supplier.

Model:	Serial Number:
Installation Date:	System Type:
Heating Contractor:	Phone/Email:
Address:	

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I. Hazard Definitions

The following terms are used throughout this manual to bring attention to the presence of hazards of various risk levels, or to important information concerning product life.

It is critical all personnel read and adhere to all information contained in DANGER, WARNING, and CAUTIONS. All DANGERS, WARNINGS, and CAUTIONS are for reference and guidance purpose, and, therefore, do not substitute for strict adherence to applicable jurisdictional and professional codes and regulations.

DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in severe personal injury, death, or substantial property damage.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in moderate or minor injury, or property damage.

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in severe personal injury, death, or substantial property damage.

NOTICE

Indicates special instructions on installation, operation, or maintenance which are important but not related to personal injury hazards.

II. Read Before Proceeding

A. Local Codes

1. This unit shall be installed in accordance with those installation regulations enforced in the area where the installation is to be made. These regulations shall be carefully followed in all cases. Authorities having jurisdiction shall be consulted prior to installation.
2. This unit must be installed and serviced by a licensed electrician or certified gas supplier.
3. The City of New York requires a Licensed Master Plumber to supervise the installation of this product.
4. The Commonwealth of Massachusetts requires this product to be installed by a Licensed Plumber or Gas Fitter.

B. Warranty

1. This product has a limited warranty, a copy of which is shipped with the unit. It is the responsibility of the installing contractor to ensure all controls are correctly installed and are operating properly.
2. Factory warranty does not apply to units improperly installed or improperly operated.

3. Heat exchanger failure due to lime (scale) build-up in the heat exchanger is not covered under the manufacturer's warranty.
4. It is the responsibility of the customer to ensure water hardness level and flow rate conform to the levels listed in the water quality section.

C. Shipment Damage

1. Upon receiving the unit, inspect for signs of shipping damages. If the unit has been hit or otherwise mishandled, immediately notify the carrier.
2. Verify total number of factory supplied items as per the packing slip with received parts.

D. Connecting Gas Supply Line

1. Connect supply gas line to the appliance gas train at the rear of the appliance.

WARNING

Failure to prevent the gas line from turning could damage the gas train components on the appliance (gas valve, blower, etc.).

II. Read Before Proceeding (continued)

DANGER

This appliance **MUST NOT** be installed in any location where gasoline or flammable vapors are likely to be present or, in an environment that contains corrosive contaminants (see Table 4).

Do not block or restrict in any way the flow of combustion or ventilation air from or to the appliance.

Do not use this appliance if any part has been under water. Any appliance that has been under water must be replaced. Water damage to the unit can be extensive and present numerous safety hazards.

E. Gas Leakage (If you detect or smell gas...)

DANGER

1. Do not try to light any appliance.
2. Do not touch any electrical switch; do not use any phone in the building.
3. Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instruction.
4. If you cannot reach your gas supplier, call the fire department.

F. Maintenance

1. To avoid electrical shock, ensure all electrical connections are disconnected before attempting installation or service of electrical components or connections.
2. Lockout all electrical boxes with padlock once power is turned off.
3. To prevent severe burns, allow the appliance to cool before performing maintenance.

G. Product Identification Label

1. A nameplate, in accordance with the ASME code Section IV, is permanently attached to the heat exchanger.
2. To access the nameplate, remove front jacket panel from the appliance.

DANGER

Should overheating occur or the gas supply fail to shut off, turn off the manual gas control valve to the appliance.

H. Factory Test and Inspections

1. Prior to shipment, final air-fuel adjustments are performed by factory trained service personnel on each appliance. The factory emissions report is posted on the back of the front jacket panel as a reference for troubleshooting and maintenance.
2. In addition, the following tests and inspections are performed to ensure the appliance meets our highest safety and performance standards:
 - Operating test
 - Construction inspection
 - Electrical components inspection
 - Crating inspection.

I. Disclaimers and Local Codes

1. Installation must conform to the requirements of the authority having jurisdiction. In the absence of such requirements, installation must conform to the *National Fuel Gas Code, NFPA 54/ANSI Z223.1, and/or CSA B149.1 Natural Gas and Propane Code*. Where required by the authority having jurisdiction, the installation must conform to the *Standard for Controls and Safety Devices for Automatically Fired Boilers, ANSI/ ASME CSD-1*.
2. Installation, start-up, and maintenance of this equipment can be hazardous and requires trained, qualified installers and service personnel. Do not install, operate, service or repair any components of this equipment unless you are qualified and fully understand all requirements and procedures.
3. This instruction manual is an integral part of the product and must be retained by the person in charge of the appliance operation, service, and maintenance.

WARNING

This product can expose you to chemicals, including chromium, which are known to the state of California to cause cancer and birth defects or other reproductive harm. For more information go to: www.P65Warnings.ca.gov.

III. Product Rating, Specifications, and Dimensional Data

These boilers are condensing, high-efficiency, gas-fired, hot water boilers designed for space heating systems or indirect domestic water heating, where supply water temperature does not exceed 190°F. These boilers have special coil type stainless steel heat exchangers, constructed, tested, and stamped per Section IV of the ASME Boiler and Pressure Vessel Code, which provide maximum heat transfer and simultaneous protection against flue gas product corrosion. These boilers are not designed for use in gravity hot water space heating systems or systems containing significant amount of dissolved oxygen (swimming pool water heating, direct domestic water heating, etc.).

Table 1: Input and Output Ratings


Commercial Gas Boiler					
Boiler Model	Input (MBH)		Gross Output (MBH)	Thermal Efficiency (%)	Combustion Efficiency (%)
	Min.	Max.			
400	40	399	387	97	97
500	50	500	485	97	97
650	65	650	631	97	97
800	80	800	776	97	97
1000L	100	999	969	97	97
¹ Ratings shown are for installations at sea level and elevations up to 2000 ft. at minimum vent length. For high altitude installations above 2000 ft. see APPENDIX C					

Table 2: General Specifications

Specification	Boiler Models				
	400	500	650	800	1000L
Fuel	NG or LP	NG or LP	NG or LP	NG or LP	NG or LP
Max. Water Temp. (°F) ¹	210	210	210	210	210
Max. Working Pres. (psi)	160	160	160	160	160
Pressure Relief Valve Options (psi)	30, 50, 60, 75, 100, 125, 150				
Water Vol. (gal)	3.8	4.3	5.6	6.6	8.1
Heat Transfer Area (sq. ft.)	34.8	39.1	52.2	60.9	75.4
Approx. Shipping Weight (lb)	460	470	530	560	600
¹ Appliance will go into hard lockout if temperature exceeds 200 °F.					

Table 3: Appliance Connection Sizes

Dimensions (in.)	Model				
	400	500	650	800	1000L
Gas Inlet	3/4	3/4	1	1	1
Water Outlet Pipe (FNPT)	2	2	2	2	2
Water Inlet Pipe (MNPT)	2	2	2	2	2
Air Intake	4	4	6	6	6
Vent Outlet	4	4	6	6	6
Condensate Drain (PVC)	1	1	1	1	1
Drain Line (FNPT)	3/4	3/4	3/4	3/4	3/4
Electrical Conduit Holes	7/8	7/8	7/8	7/8	7/8

III. Product Rating, Specifications, and Dimensional Data (continued)

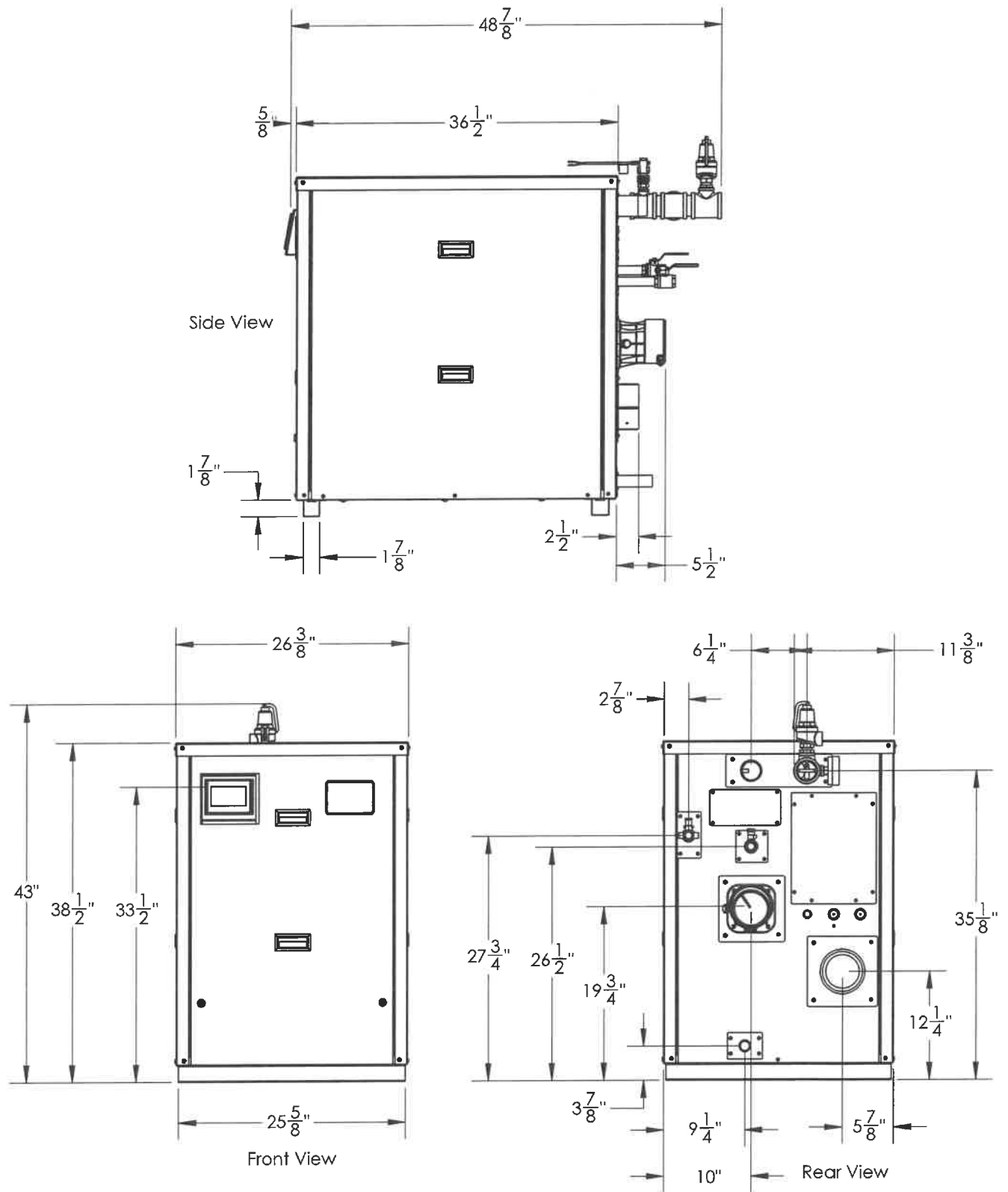


Figure 1: 400-500 Dimensions

III. Product Rating, Specifications, and Dimensional Data (continued)

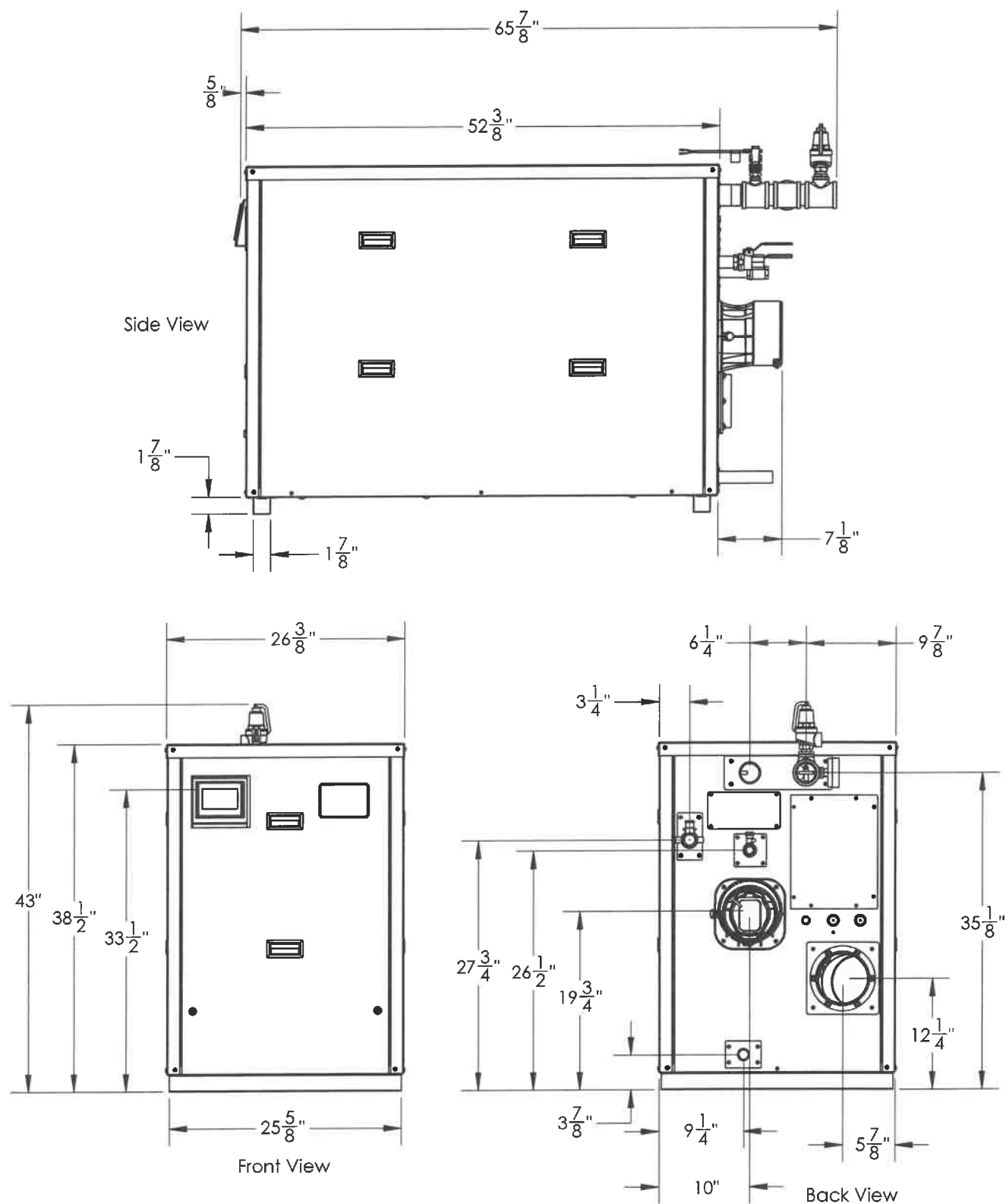


Figure 2: 650-1000L Dimensions

IV. Unpacking The Shipping Crate

A. Unpacking and Inspection

1. Move appliance to approximate installation location.
2. Remove all crate fasteners.
3. Lift and remove outside container.
4. Remove lag screws securing base to the pallet.
5. Account for all loose shipped items.
6. The appliance can be moved to its permanent location via a fork lift, pallet jack, or dolly.
7. The appliance can be lifted from the base using a fork lift inserted from the side.

B. Check Equipment

1. Upon receiving the equipment, check for signs of shipment damage.
2. Pay particular attention to parts accompanying the appliance which may show signs of being hit or otherwise mishandled.
3. Verify total number of pieces shown on packing slip with those actually received. In case there is damage or a shortage, immediately notify the carrier.
4. Verify model size and whether the appliance is supplied with indoor or outdoor trim. See Figure 3.
 - a. Outdoor trim has one louvered side panel, front panel with a display cover, and a cover for the rear intake.
 - b. Outdoor models have key latches. If no key is found tied to the outlet pipe, remove a side panel to gain access to the envelope.
5. Some parts are shipped loosely with the appliance. These parts are required to be installed on the appliance before operation.
 - a. Loose shipping parts include: Manual gas shutoff valve, water flow switch, relief valve, temperature and pressure gage, and outlet water piping as shown in Figure 15.
6. Ensure the included polypropylene vent adapter is installed in the proper orientation. The clamp screw faces down, and the test port faces right (Gas train side). See Figure 1 and Figure 2.

C. Installation and Operation Manual

1. The instruction manual enclosed with the unit is an integral part of the product and must be retained by the person in charge of the appliance. Please read the instructions contained in this manual carefully as they provide important information regarding the safe installation, use and servicing of this appliance.

WARNING

Failure to assure the lifting forks are long enough to extend at least half way through the base will result in the appliance tipping and potentially falling. This could result in personal injury, death, or substantial property damage.

Do not operate this appliance if any part has been underwater. The possible damage to a flooded appliance can be extensive and present numerous safety hazards. Any appliance that has been underwater must be replaced.

NOTICE

Do not drop, bump, or lean an object against the appliance. This could damaging the heat exchanger or other critical components.

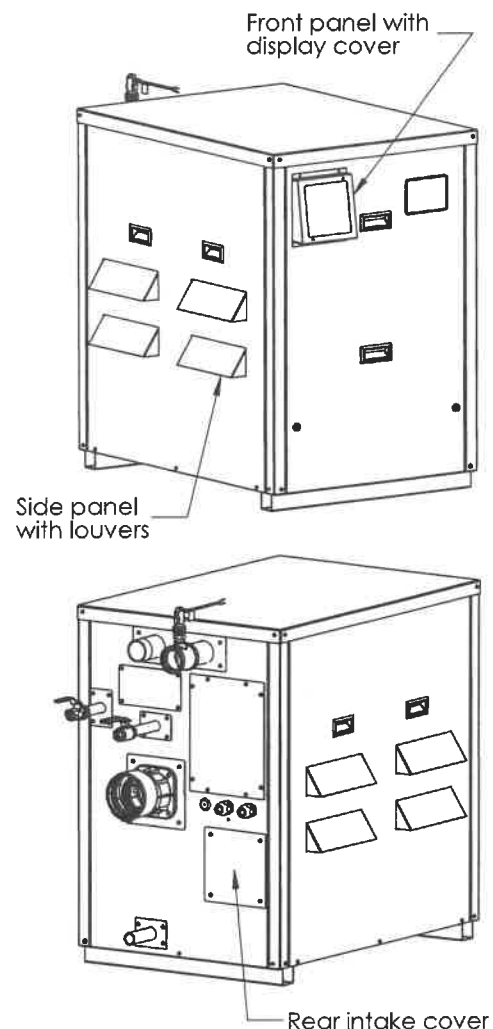


Figure 3: 400-1000L with Outdoor Trim

V. Component Identification

1. **Communication Interface (Concert™ Control)**
Digital User interface for operational control of the appliance.
2. **Main appliance control**
Receives and processes input signals from safety switches and sensors to control the appliance.
3. **Front control box**
Slide out control box designed to allow easy access to the main controls for service.
4. **Rear control box**
Houses Field connection PCBs.
5. **ON/OFF switch**
Initiates or interrupts the power to the burner.
6. **Main gas valve**
Combination air/fuel ratio and automatic safety shutoff gas valve.
7. **Gas and Air Mixer/Venturi**
High Turn-down venturi that mixes air and gas before entering the blower.
8. **Blower**
Modulating blower supplying combustion air to the appliance.
9. **Bluejet® Burner**
The high efficiency, low NOx Bluejet® Burner is mounted on the burner door.
10. **Ignition electrode**
Provides electrical spark for direct ignition of the main burner.
11. **High gas pressure switch**
Monitors supply gas pressure and shuts off the electrical control circuit when pressure rises above the setpoint (see Table 24).
12. **Low gas pressure switch**
Monitors supply gas pressure and shuts off the electrical control circuit in the event a low gas pressure condition occurs (see Table 24).
13. **Outlet/Supply**
2" Female NPT connection for hot water supply.
14. **Water flow switch**
Paddle activated switch that monitors water flow.
15. **Gas supply connection**
Connection to appliance gas train. See Table 24 for model specific pipe sizes.
16. **Inlet/Return**
2" Male NPT inlet water connection to the appliance.
17. **Hot/outlet water temperature sensor**
Dual element temperature sensor for high limit control.
18. **Cold/Inlet water temperature sensor**
Used for monitoring the inlet water temperature and temperature rise across the appliance.
19. **Low water cut off (LWCO)**
The LWCO safeguards the heat exchanger from inadequate water level. The LWCO has a manual reset button.
20. **Temperature and pressure gauge**
Provides real time outlet water temperature and pressure readings.
21. **Pressure relief valve**
Protects the heat exchanger from over pressure conditions. Various pressure settings are available.
22. **Condensate drain trap**
Drains condensate from the heat exchanger while preventing flue gases from escaping through the drain line.
23. **Minimum combustion air proving switch**
Ensures adequate combustion air is supplied to the combustion chamber for ignition.
24. **Blocked vent switch**
Interrupts the control circuit if there is a blockage in the venting system.
25. **Combustion air filter box**
Houses the washable combustion air filter.
26. **Heat Exchanger**
H stamped, 316L Stainless Steel, Condensing, water tube type heat exchanger.
27. **Heat Exchanger Drain**
3/4" NPT ball valve is provided for draining the heat exchanger.
28. **Exhaust Vent Connection**
Polypropylene adapter for connection to stainless steel, Polypropylene, or CPVC venting systems. Refer to Table 6 for model specific vent connection sizes.
29. **Condensate Drain Connection**
1" PVC pipe for condensate drain.
30. **Combustion Air Intake Connection**
4" female PVC slip provided for 400-500 models.
6" aluminum ring provided for 650-1000 models.

V. Component Identification (continued)

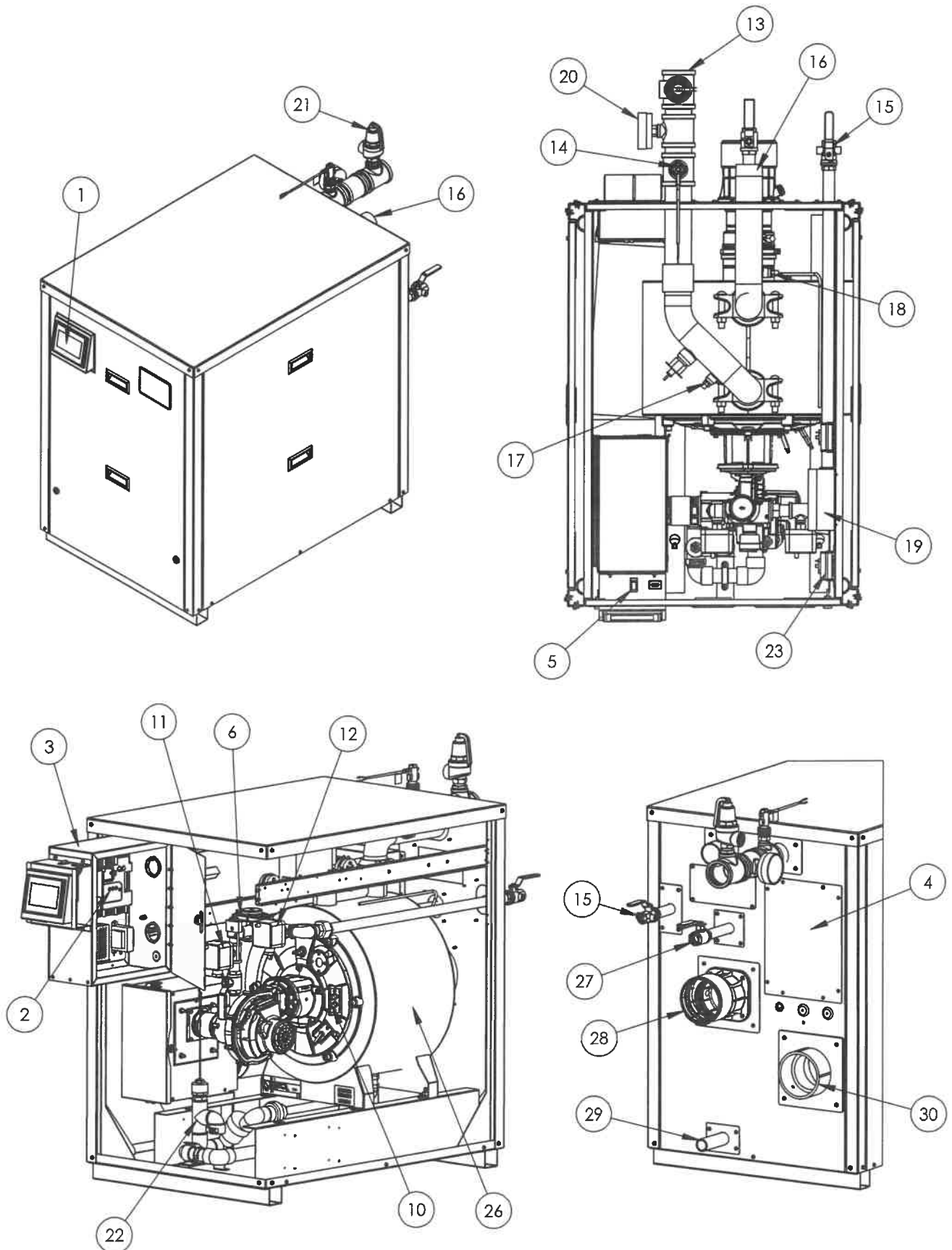


Figure 4: Component Identification

VI. Pre-Installation and Mounting

A. General

1. Installation must conform to the requirements of the authority having jurisdiction or, in the absence of such requirements, to the *National Fuel Gas Code, ANSI Z223.1/NFPA 54, and/or Natural Gas and Propane Installation Code, CAN/CSA B149.1*. Where required by the authority having jurisdiction, the installation must conform to the *Standard for Controls and Safety Devices for Automatically Fired Boilers, ANSI/ASME CSD-1*.
2. Provide clearance between appliance jacket panels and combustible material in accordance with local fire ordinance. Refer to Table 5 for recommended service clearances. Recommended service clearances may be reduced but should not be less than the clearance to combustibles.
3. Protect gas ignition system components from water (dripping, spraying, rain, etc.) during operation and service (circulator replacement, condensate trap, control replacement, etc.).
4. Provide combustion and ventilation air in accordance with applicable provisions of local building codes, or: USA - National Fuel Gas Code, ANSI Z223.1/NFPA 54, Air for Combustion and Ventilation; Canada - Natural Gas and Propane Installation Code, CAN/CSA-B149.1, Venting Systems and Air Supply for Appliances.
5. The appliance should be located so as to minimize the length of the vent system. Ensure air intake pipe termination is away from areas that may contaminate the combustion air (see Table 4). In particular, avoid areas near chemical products containing chlorines, chlorofluorocarbons, paint removers, cleaning solvents, and detergents. Avoid areas containing saw dust, loose insulation fibers, dry wall dust etc.
6. This appliance must not be installed in a room under negative pressure. An equipment room under negative pressure conditions could deplete the combustion air supply to the appliance and cause leakage of flue gas from the venting system.

WARNING

Apply supplied silicone lubricant to the gasket inside the vent connector. Failure to apply lubricant could result in flue gas leaks or gasket deterioration.

Adequate combustion and ventilation air must be provided to assure proper combustion. Install combustion air intake using the methods in this manual.

Installation of this appliance should be undertaken only by trained and skilled personnel from a qualified service agency. Follow these instructions exactly. Improper installation, adjustment, service, or maintenance can cause personal injury, death, or substantial property damage.

Do not change or modify any accessories or parts or jump-out any safety limit devices.

DANGER

This appliance includes a combustion air filter. Ensure filter is installed at all times of operation. Inspect and clean filter according to the maintenance section of this manual.

Avoid operating this appliance in an environment where sawdust, loose insulation fibers, dry wall dust, etc. are present. If operated under these conditions, The burner must be inspected for clogged ports, and replaced if needed.

NOTICE

Due to the low water content of the appliance, mis-sizing with regard to the heating or hot water system load will result in excessive cycling and accelerated component failure.

The manufacturer DOES NOT warrant failures caused by mis-sized appliance applications. DO NOT oversize the appliance to the system. Multiple unit installations greatly reduce the likelihood of oversizing.

Ensure all labels on the product are fully visible at all times for the purpose of maintenance and inspections.

The installer must verify that at least one carbon monoxide alarm has been installed within a residential living space or home following the alarm manufacturer's instructions and applicable local codes before putting the appliance into operation.

VI. Pre-Installation and Mounting (continued)

Table 4: Corrosive Combustion Air Contaminants

Contaminants to Avoid:
Spray cans containing chlorofluorocarbons (CFC's)
Permanent wave solutions
Chlorinated waxes/cleaners
Chlorine-based swimming pool chemicals
Calcium chloride used for thawing
Sodium chloride used for water softening
Refrigerant leaks
Paint or varnish removers
Hydrochloric acid/muriatic acid
Cements and glues
Anti-static fabric softeners used in clothes dryers
Chlorine-type bleaches, detergents, and cleaning solvents found in household laundry rooms.
Adhesives used to fasten building products and other similar products
Excessive dust and dirt
Areas likely to have contaminants:
Dry cleaning/laundry areas and establishments
Swimming pools
Metal fabrication plants
Beauty shops
Refrigeration repair shops
Photo processing plants
Auto body shops
Plastic manufacturing plants
Furniture refinishing areas and establishments
New building construction
Remodeling areas
Garages with workshops

B. Appliance Mounting

1. Intended for installation in an area with a floor drain, or in a suitable drain pan to prevent any leaks or temperature and pressure relief valve discharge resulting in property damage.
2. This appliance is not intended to support external piping or venting. All external piping and venting must be supported independently of the appliance.
3. This appliance must be installed on a level surface to prevent condensate from backing up inside the heat exchanger.
4. Provide adequate space for condensate piping, condensate pump, or neutralizer kit.

5. An elevated base/pad is required when the floor is not level or in areas where water could accumulate around the appliance. The base must be able to support the weight of the appliance, water, and all additional system components.
 - a. This appliance is listed for installation on combustible flooring. Acceptable flooring includes a level metal or wooden base capable of holding the weight of the appliance, water, and additional components. The base shall extend beyond the edges of the appliance by at least 3 inches (76.2 mm) in any direction. Never install directly on carpeted flooring.
 - b. For closet or alcove installation, the base shall cover the entire floor of the closet/alcove.
6. Secure the appliance to its location using the 5/8" anchoring holes on the feet of the base

C. Outdoor Installation

1. The outdoor trim of this appliance is intended for installation only in warm climates.
2. Install on a level permanent platform that keeps the appliance free from standing water.
3. Three sides around the appliance must be open. The louvered side of the appliance must be clear of obstructions.
4. When installing under an overhang, conform to local codes.

CAUTION

For installation and operation only in climates where the ambient temperature will not be less than 32 °F (0 °C). Do not install in climates where condensate can freeze.

Appliance must be protected from standing water. Install on a level platform.

Do not install this appliance under an overhang less than 3 feet from its top. The area under the overhang must be open on 3 sides.

Never install directly on carpeted flooring.

VI. Pre-Installation and Mounting (continued)

D. 400-1000L Stacking

1. The 400-1000L models may be installed in a stacked configuration.
 - a. One 400 or 500 model can be mounted on the top of another 400 or 500 model.
 - b. One 650, 800, or 1000L model can be mounted on the top of another 650, 800, or 1000L model.
2. Lifting the appliance for stacking.
 - a. Lifting with a forklift: Place forks center of the base from the side.

WARNING

Failure to center the lifting forks under the base of the appliance could result in personal injury, death, or substantial property damage.

- b. Lifting with a crane: Remove top panel to access the lifting lugs of the heat exchanger.
3. Each appliance is shipped with a brace and screws for stacking. If needed, order stacking brace kit (PN: 111405-01)
 - a. Follow all previous instructions for mounting the bottom appliance.

- b. Use the included screws to secure the brace as shown in Figure 5.

4. The included outdoor venting kit will not work in a stacked configuration. It is the installers responsibility to provide adequate venting for stacked outdoor models.

5. The display bracket on the top appliance can be rotated for a better viewing angle of the Concert display.

- a. Remove the front panel and disconnect the wire harnesses going to the display and the On/Off switch.
 - b. Remove the 4 nuts holding the display bracket.
 - c. Unscrews the clamps holding the display onto the display bracket to rotate the display 180°.
 - d. Reinstall the display, reinstall the display bracket (Concert logo right side up), and connect the wire harnesses.

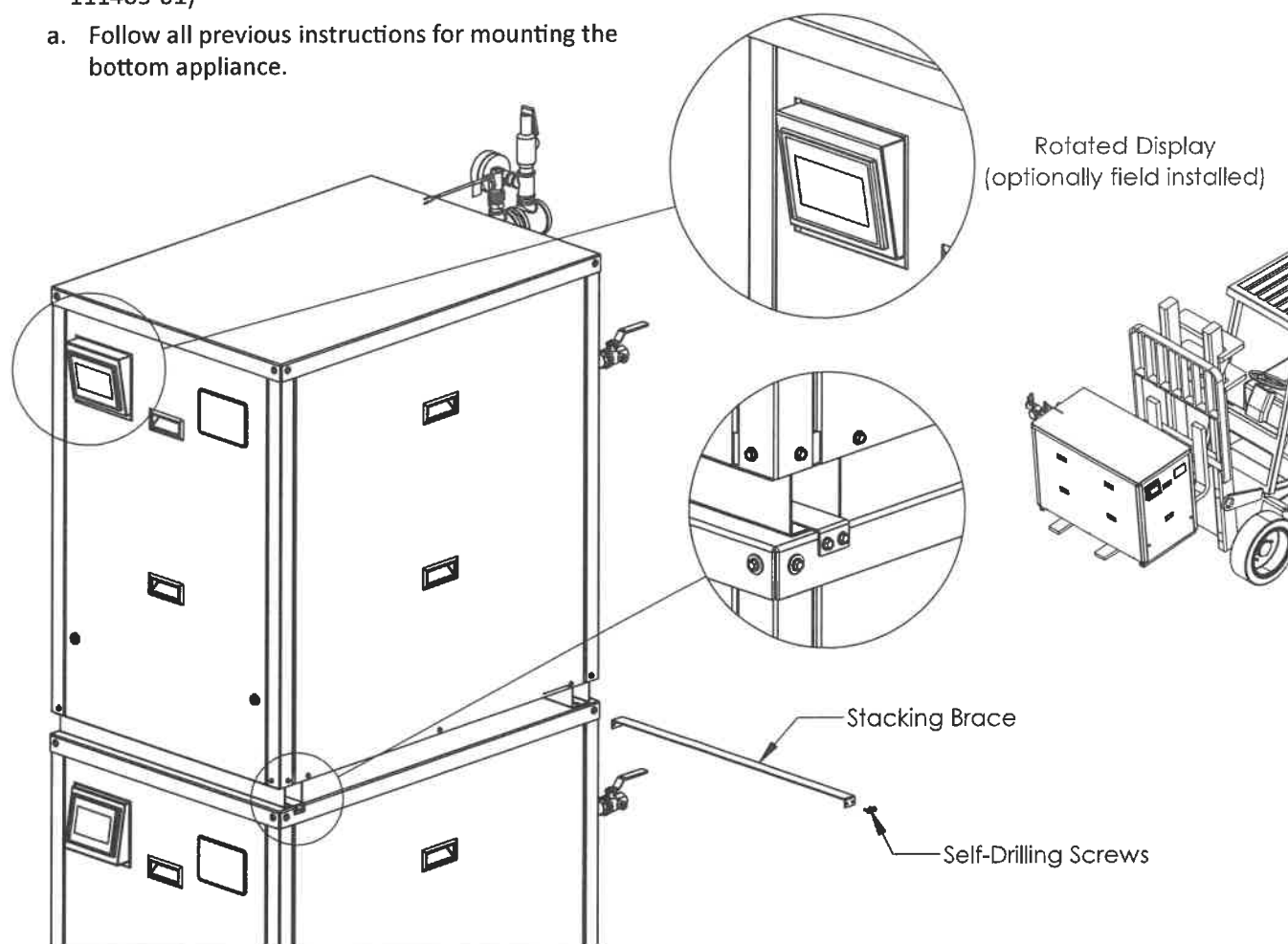


Figure 5: 400-1000L Stacking Brackets and Display Rotation

VI. Pre-Installation and Mounting (continued)

E. Clearances

1. This appliance is listed for 0" clearance to combustible materials. The clearances for serviceability are found in Table 5.
2. Minimum clearances from combustible or noncombustible construction, 0" sides, 0" back, 0" top.
3. It is the installers responsibility to provide enough clearance for servicing the appliance in the installed location.

F. Clearances (French)

1. Dégagements minimaux à assurer entre les parois de l'appareil et les constructions combustibles ou incombustibles : 0 po (côtés), 0 po (arrière) et 0 po (dessus).
2. Installation dans une garde-robe : assurer un dégagement de 24 po devant l'appareil.

G. Closet and Alcove Installation

1. Include ventilation air openings in closet installations.
2. Provide a 1" minimum clearance around water pipes.
3. Follow vent material manufacturer for vent clearances.
4. Clearances for closet or alcove Installation:
Front - 24"
Sides - 24"
Rear - 22"
Top - 20"

Table 5: 400-1000L Clearances

Minimum Clearance	Front (In.)	Rear (In.)	Right (In.)	Left (In.)	Top (In.)
Serviceability (Indoor Installation)	24	24	0*	0*	0
Serviceability (Outdoor Installation)	24	36	0*	0*	0**
To Combustible Construction	0	0	0	0	0

* Leave 24" clearance on at least one side.
** When installing under an overhang, conform to local codes.

NOTICE

This appliance is listed for zero inch clearance to combustible or noncombustible material, but installing the appliance with smaller than the clearances for serviceability will limit access for maintenance.

Consult local codes and inspectors before installing multiple appliances adjacent to each other with zero clearance.

WARNING

Closet and alcove installation can cause elevated temperatures. Follow the required clearances and use only stainless steel, CPVC, or polypropylene vent material.

Include ventilation air openings in closet installations.

Do not install directly on carpeted flooring.

H. Side by Side and 0" Clearance Installation

1. It is recommended to Install multiple units in pairs with at least 24 inches inbetween to maintain full access for servicing.

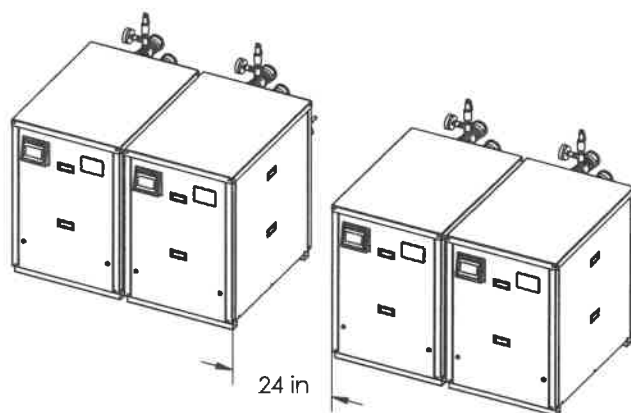


Figure 6: Side by Side installation

WARNING

Installing one appliance inbetween two others with 0" clearance may require disconnection from the system when servicing.

Outdoor appliances can only be installed side by side in pairs. Ensure louvered panels are installed on outer sides of the pair.

VII. Venting

A. General Venting Guidelines

1. Install vent system in accordance with *National Fuel Gas Code, ANSI Z223.1/NFPA 54* or *Natural Gas and Propane Installation Code, CAN/CSA B149.1* Installation Code for Canada, or, applicable provisions of local building codes.
2. This is a direct vent appliance but can also be used with indoor air for combustion.
 - a. Venting kits are available for outdoor installation.
3. Vent/combustion system materials that are approved for use with this appliance are listed in Table 9. Venting manufacturers not listed in this manual may be acceptable. It is the responsibility of the installer or vent supplier to use compatible adapters and materials.
 - a. It is recommended to consult with venting professionals and designers when determining the vent system for this appliance.
4. Enclose vent passing through occupied or unoccupied spaces above the appliance with material having a fire resistance rating at least equal to the rating of adjoining floor or ceiling.
5. For flue gas venting, have horizontal runs sloping upwards not less than ¼ inch per foot (21 mm/m) from the appliance to the vent terminal.
6. This appliance operates under conditions that permit condensation in the heat exchanger and the flue gas venting. This appliance shall be installed so as to prevent accumulation of condensate, and where necessary, have means provided for drainage of condensate.
7. If possible, slope horizontal combustion air pipe minimum 1/4 in/ft (21 mm/m) downward towards terminal. If not, slope towards the appliance.
8. It is recommended that a Carbon Monoxide detector be installed and interlocked to the appliance. Consult your local jurisdiction for additional requirements.

B. Venting Design Requirements

At the discretion of the installing contractor, the venting system can be designed by consulting with approved venting engineers or by using the equivalent length method in this manual.

1. Engineered Venting Method

Using the operating characteristics and required conditions, an individual or common venting system can be designed to ensure the reliability of the appliance(s).

WARNING

This appliance must not be installed in a room under negative pressure. These direct vent gas fired appliances are allowed a maximum leakage of 2% from the venting/combustion chamber and 8% from the air inlet portion when pressurized to operating conditions in a neutral pressure room. An equipment room under negative pressure could deplete the combustion air supply to the appliance and cause leakage of flue gas from the venting system.

Exhaust fans installed in equipment rooms can create negative pressure conditions strong enough to cause nuisance shutdowns of the appliance.

NOTICE

Common venting with other manufacturers' appliances or different models from the same manufacturer is prohibited.

It is the Responsibility of the installing contractor or venting designers to comply with national and local codes and follow best industry practices for installing vent support, drainage, and pitch.

Do not exceed maximum vent/combustion air system length.

- a. Flue gas temperatures and flow rates can be found in Table 12.
 - b. The combustion CO₂ and O₂ ranges are shown in Table 26.
 - c. The pressure at the flue outlet of the appliance at any given firing rate must be within the range of negative 0.25" W.C. to positive 0.5" W.C.
 - d. The pressure at the intake of the appliance at any given firing rate must be within the range of negative 0.3" WC to positive 0.1" WC.
 - e. **Manifolded venting** without backflow prevention can allow flue gas from one appliance to interact with the other appliances in the system. Common venting systems must be designed with backflow protection.
2. **Equivalent length method:** Do not exceed maximum vent/combustion air lengths listed in Table 6. Equivalent lengths of fittings are given in Table 7.

VII. Venting (continued)

C. Field Installation

1. A factory installed 4" PVC slip or 6" cast aluminum collar provides a means for air intake connection.
2. A factory installed Polypropylene vent adapter provides a means for vent connection.
3. Vent and combustion air intake pipe must be supported to allow uniform flow of combustion air and flue gas.
4. Plan venting system to avoid possible contact with plumbing or electrical wires. Start at the vent connector and work towards the vent termination.
5. Design the air intake system to allow 3/8" (9.5mm) of thermal expansion per 10 ft. (3m) of CPVC/ PVC pipe. Runs of 20 ft. (6.1m) or longer that are restrained at both ends must have an offset.
 - a. PVC/CPVC combustion air and vent pipe joints must be cleaned with primer and glued with cement. Follow all manufacturer instructions and drawings when preparing pipe ends for joining and using the primer and the cement.
6. Size and cut wall opening such that a minimal clearance is obtained and to allow easy insertion of vent pipe.

Table 6: Vent and Combustion Air Pipe Diameters and Maximum Lengths

Model	Combustion Air Length			Vent Length			Derate with Max Venting
	Pipe Dia. in. (mm)	Minimum eq. ft. (m)	Maximum eq. ft. (m)	Pipe Dia. in. (mm)	Minimum eq. ft. (m)	Maximum eq. ft. (m)	
400	4 (100)	0	100 (30)	4 (100)	5 (1.5)	100 (30)	4.8%
500	4 (100)	0	100 (30)	4 (100)	5 (1.5)	100 (30)	
650	6 (150)	0	100 (30)	6 (150)	5 (1.5)	100 (30)	
800	6 (150)	0	100 (30)	6 (150)	5 (1.5)	100 (30)	
1000L	6 (150)	0	100 (30)	6 (150)	5 (1.5)	100 (30)	
NOTE: Contact factory for assistance on maximum vent length applications. This table applies to all listed vent/combustion air system options. Max vent derate should be applied after altitude derate.							

Table 7: Equivalent lengths of Vent and Combustion Air Components

Diameter	4 in. (100 mm)	6 in. (150 mm)
90° Elbow (long sweep)	5 ft. (1.5 m)	8 ft. (2.4 m)
45° Elbow	2 ft. (0.6 m)	3 ft. (1 m)

Table 8: Vent and Combustion Air Equivalent Length Calculation Worksheet

Component	Combustion Air					Vent				
	Equivalent Length Per Piece	x	Quantity	=	Subtotal Equivalent Length	Equivalent Length Per Piece	x	Quantity	=	Subtotal Equivalent Length
Straight Pipe		x		=	A		x		=	D
90° Elbow		x		=	B		x		=	E
45° Elbow		x		=	C		x		=	F
	Combustion Air Total Equivalent Length			=		Vent Total Equivalent Length			=	

Notes:

1. Total equivalent length cannot exceed maximum equivalent length shown in Table 6.

2. Combustion air and vent terminations do not count towards total equivalent length.

VII. Venting (continued)

Table 9: Listed Vent Manufacturers and Materials

Make	Stainless Steel Brand	Polypropylene Brand
DuraVent	FasNSeal	PolyPro
Heat Fab	Saf-T Vent EZ Seal*	-
Z-Flex (Nova Flex Group)	Z-Vent	Z-DENS
Centrotherm	-	InnoFlue SW Rigid

Note: Included appliance connection is a 3-in-1 adapter that permits Stainless Steel, Polypropylene, or CPVC. Adapting to Z-DENS requires 4" increaser 2ZDI44 or 6" adapter 2ZDCPVC6. Adapting to InnoFlue requires 4" adapter ISAALE0404 or 6" adapter ISAALE0606

Table 10: Stainless Steel Vent Terminations

Model	Vent Diameter (in.)	Style	Heat Fab Part # Saf-T Vent	DuraVent Part # FasNSeal
400 500	4	Tee	9490TEE	FSTT4
		90° Elbow	9414TERM	-
		Straight	9492	-
		23° Elbow	-	FSBS4
650 800 1000L	6	Tee	9690TEE	FSTT6
		90° Elbow	9614TERM	-
		Straight	9692	-
		23° Elbow	-	FSBS6

Table 11: Polypropylene Vent Terminations

Model	Vent Diameter (in.)	Style	DuraVent Part # PolyPro	Centrotherm Part # InnoFlue	Z-Flex Part # Z-DENS
400 500	4	Tee	4PPS-TTBL	ISTT0420	2ZDTT4
		Elbow	4PPS-E90BC	-	2ZDE487UV
		Straight	4PPS-12BC	ISEP04	2ZDES4
		Screen	4PPS-BG	IASPP04	2ZDES4
650 800 1000L	6	Tee	6PPS-TTBC	ISTT0620	2ZDTT6
		Elbow	6PPS-E90BC	-	2ZDE687
		Straight	6PPS-12BC	-	2ZDES6
		Screen	6PPS-BG	IASPP06	2ZDES6

Table 12: Combustion Air and Flue Gas Flow Rates

Model	At Maximum Input Rate		At Minimum Input Rate	
	Flue Gas Flow, ACFM @ 35% Excess Air, 180 °F	Combustion Air, SCFM @ 35% Excess Air, 60 °F	Flue Gas Flow, ACFM @ 35% Excess Air, 180 °F	Combustion Air, SCFM @ 35% Excess Air, 60 °F
400	113	92	11	9
500	141	115	14	11
650	183	149	18	15
800	226	184	23	18
1000L	282	212	28	23

Note: Flow rates are based on the combustion of natural gas.

WARNING

Use of cellular core PVC (ASTM F891), cellular core CPVC, or Radel® (polyphenylsulfone) in non-metallic venting systems is prohibited.

Covering non-metallic vent pipe and fittings with thermal insulation is prohibited.

VII. Venting (continued)

D. Room Air for Combustion

1. If using room air for combustion (intake), install the included screen to the intake opening of the appliance.
 - a. Sizes 400-500: The included circular rodent screen can be pushed into the 4 in. PVC slip on the rear panel.
 - b. Sizes 650-1000L: Remove the 6 screws holding the 6 in. aluminum collar and gasket to the rear panel. Use the same screws to install the included mesh screen covering the intake opening.

E. PVC Venting

1. When venting with PVC material, the CPVC vent kit must be connected to the vent adapter of the appliance. PVC can be installed downstream all the CPVC vent kit material. The CPVC vent kit includes a 30 in. long Sch. 40 pipe and a 90° Sch. 80 elbow.
 - a. 4 in. CPVC vent kit, sizes 400-500: 111569-01
 - b. 6 in. CPVC vent kit, sizes 650-1000L: 111569-02
2. Apply supplied silicone lubricant to gasket inside vent connector. The grease will prevent gasket rupture when inserting vent pipe and gasket deterioration due to condensate exposure.
3. The 30 in. long CPVC straight pipe may be cut to accommodate desired vent configuration provided both pieces are used in conjunction with the CPVC 90° Elbow before any PVC components are used. Ensure that the CPVC 90° Elbow is the first elbow used in the vent system as it exits the appliance.

F. Venting for Outdoor Installation

1. The outdoor models ships from the factory with an outdoor venting kit. Kits use DuraVent FasNSeal stainless steel vent pieces.
 - a. 4" outdoor vent kit: 110644-01
 - b. 6" outdoor vent kit: 110645-01
2. The louvered side panel on outdoor models is used as the combustion air intake for the appliance.
 - a. Keep louvered panel clear from obstructions. This panel can be placed on either side of the appliance.
3. Condensate from the drain cap should be routed with the condensate drain from the appliance.

CAUTION

Use all CPVC vent kit components for vent piping near the appliance before transitioning to Schedule 40 PVC pipe (ASTM 2665) components for remainder of vent system.

Do not exceed maximum vent/combustion air system length.

It is the Responsibility of the installing contractor or venting designers to comply with national and local codes and follow best industry practices for installing vent support, drainage, and pitch.

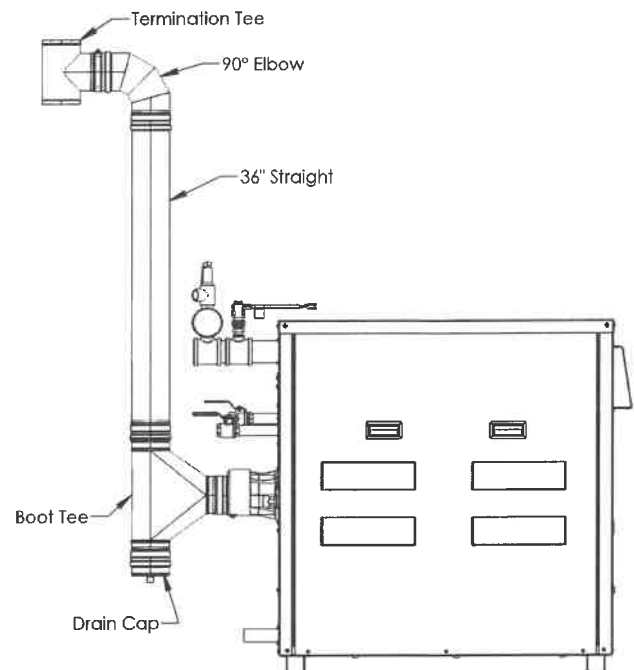


Figure 7: Outdoor Venting Installation

NOTICE

The outdoor vent system requires field installed support. Do not rely on the vent adapter of the appliance to hold the vent material

The outdoor vent kit may be shipped separately from the appliance.

VII. Venting (continued)

G. General Termination

1. Use only listed vent/combustion air terminals.
2. Follow the termination configurations shown in Table 13, and see Table 16 for acceptable termination components.
3. Maintain correct clearance and orientation between vent and combustion air terminals.
 - a. The required spacing between vent and combustion air terminals is to prevent flue gas recirculation. Recirculation of flue gas products into the combustion air supply can cause damage to property or the appliance.
 - b. When installed on the same wall, locate vent terminal 4 vent pipe diameters above the combustion air terminal. The snorkel configuration can be used when penetrations are at the same height.
4. Locate bottom of vent and combustion air terminals at least 12 in. (300 mm) [18 in. (460 mm) in Canada] above the normal snow line and at least 12 in. (300 mm) above grade level.
5. Do not install vent terminal directly above windows or doors.
6. Locate bottom of vent terminal at least 3 ft. (900 mm) above any forced air inlet located within 10 ft. (3.0 m).

Table 13: Recommended Venting Configurations and Material Options

Vent & Intake Materials	Vent Option		Penetration Through Structure	Termination	Parts Table	Reference Figure		
Two Pipe Stainless Steel vent Galvanized Steel or PVC intake	1	Intake	Horizontal Sidewall	90° elbow	Table 10	Figure 9		
		Vent	Horizontal Sidewall	Tee or 45° elbow				
	2	Intake	Horizontal Sidewall	90° elbow		Table 10	-	
		Vent	Vertical Roof	Tee or straight				
	3	Intake	Vertical Roof	Tee or 2 90° elbows			Table 10	Figure 10 Figure 11
		Vent	Vertical Roof	Tee or straight				
Two Pipe Polypropylene vent Galvanized Steel or PVC intake	4	Intake	Horizontal Sidewall	90° elbow	Table 11			Figure 9
		Vent	Horizontal Sidewall	Tee or 45° elbow				
	5	Intake	Horizontal Sidewall	90° elbow		Table 11		-
		Vent	Vertical Roof	Tee or straight				
	6	Intake	Vertical Roof	Tee or 2 90° elbows			Table 11	Figure 10 Figure 11
		Vent	Vertical Roof	Tee or straight				
Two Pipe CPVC vent Galvanized Steel or PVC intake	7	Intake	Horizontal Sidewall	90° elbow	-			Figure 9
		Vent	Horizontal Sidewall	Tee or 45° elbow				
	8	Intake	Horizontal Sidewall	90° elbow		-		-
		Vent	Vertical Roof	Tee or straight				
	9	Intake	Vertical Roof	Tee or 2 90° elbows			-	Figure 10 Figure 11
		Vent	Vertical Roof	Tee or straight				
SS, PP, or CPVC vent Room air intake	10	Vent	Horizontal Sidewall	Tee or 45° Elbow	Table 10 Table 11			-
	11	Vent	Vertical Roof	Tee or straight				
NOTICE	1. It is recommended to use tees for both intake and vent terminations in extra windy locations. 2. All terminations shall have bird screens. 3. All non-metallic venting exposed to sunlight shall be UV resistant.							

VII. Venting (continued)

7. If window and/or air inlet is within 4 ft. (1.2 m) of an inside corner, maintain at least 6 ft. (1.8 m) spacing between terminal and adjoining wall of inside corner.
8. Locate bottom of vent terminal at least 7 ft. (2.1 m) above a public walkway.
9. Maintain minimum clearance of at least 4 ft. (1.2 m) [3 ft. (900 mm) in Canada] horizontally between vent terminal and gas meters, electric meters, regulators, and relief equipment. Do not install vent terminal above or below this equipment.
10. Do not locate the vent terminal under decks or similar structures.
11. Top of terminal must be at least 24 in. (600 mm) below ventilated eaves, soffits, and other overhangs. In no case may the overhang exceed 48 in. (1200 mm). Where permitted by the authority having jurisdiction and local experience, the terminal may be located closer to unventilated soffits. The minimum vertical separation depends upon the depth of the soffit.
12. For multiple appliance installations with vertical roof terminals, separate vent pipes may be piped through a common conduit or chase so that one roof penetration may be made. Maintain recommended separations of terminations after penetration.
13. Maintain minimum 24 in. (610 mm) horizontal spacing between vent terminal and a building corner.
14. Under certain conditions, water in the flue gas may condense, and possibly freeze, on objects around the terminal including on the structure itself. If these objects are subject to damage by flue gas condensate, they should be moved or protected.
15. If possible, install the vent and combustion air terminals on a wall away from the prevailing wind. Reliable operation of this product cannot be guaranteed if terminals are subjected to winds in excess of 40 mph (64 km/hr).
16. Do not locate combustion air terminal in areas that might contain combustion air contaminants, such as near swimming pools.

WARNING

Use of cellular core PVC (ASTM F891), cellular core CPVC, or Radel® (polyphenylsulfone) in non-metallic venting systems is prohibited.

Covering non-metallic vent pipe and fittings with thermal insulation is prohibited.

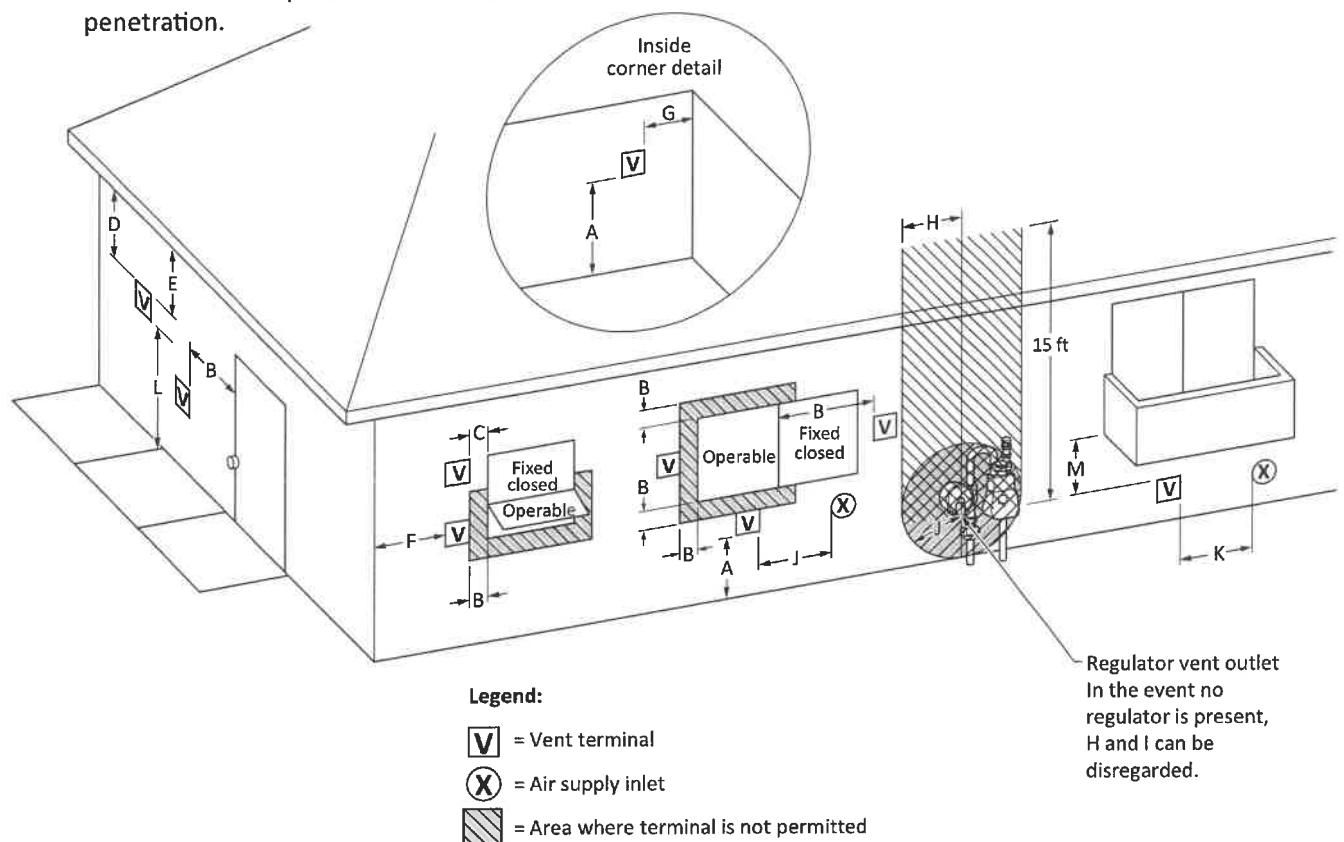


Figure 8: Vent Terminal Clearances

VII. Venting (continued)

Table 14: Direct Vent Terminal Clearances

		Canadian Installations ¹	US Installations ²
A	Clearance above grade, veranda, porch, deck, or balcony	18 in. (46 cm)	12 in (30 cm)
B	Clearance to window or door that may be opened	6 in (15 cm) for appliances ≤ 10,000 Btuh (3 kW), 12 in (30 cm) for appliances > 10,000 Btuh (3 kW) and ≤ 100,000 Btuh (30 kW), 36 in (91 cm) for appliances >100,000 Btuh (30 kW)	6 in (15 cm) for appliances ≤ 10,000 Btuh (3 kW), 9 in (23 cm) for appliances > 10,000 Btuh (3 kW) and ≤ 50,000 Btuh (15 kW), 12 in (30 cm) for appliances > 50,000 Btuh (15 kW)
C	Clearance to permanently closed window	*	*
D	Vertical clearance to ventilated soffit located above the terminal within a horizontal distance of 2 ft (61 cm) from the center line of the terminal.	*	*
E	Clearance to unventilated soffit	*	*
F	Clearance to outside corner	*	*
G	Clearance to inside corner	*	*
H	Clearance to each side of center line extended above meter/regulator assembly	3 ft (91 cm) within a height of 15 ft (4.6 m)	*
I	Clearance to service regulator vent outlet	3 ft (91 cm)	*
J	Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other appliance	6 in (15 cm) for appliances ≤ 10,000 Btuh (3 kW), 12 in (30 cm) for appliances > 10,000 Btuh (3 kW) and ≤ 100,000 Btuh (30 kW), 36 in (91 cm) for appliances >100,000 Btuh (30 kW)	6 in (15 cm) for appliances ≤ 10,000 Btuh (3 kW), 9 in (23 cm) for appliances > 10,000 Btuh (3 kW) and ≤ 50,000 Btuh (15 kW), 12 in (30 cm) for appliances > 50,000 Btuh (15 kW)
K	Clearance to a mechanical air supply inlet	6 ft (1.83 m)	3 ft (91 cm) above if within 10 ft (3 m) horizontally
L	Clearance above paved sidewalk or paved driveway located on public property	7 ft (2.13 m) †	7 ft (2.13 m) for mechanical draft systems (Category I appliances). Vents for Category II and IV appliances cannot be located above public walkways or other areas where condensate or vapor can cause a nuisance or hazard*
M	Clearance under veranda, porch deck, or balcony	12 in (30 cm) ‡	*

NOTICE

* Clearance in accordance with local codes and the requirements of the gas supplier.

† A vent shall not terminate directly above a sidewalk or paved driveway that is located between two single family dwellings and serves both dwellings.

‡ Permitted only if veranda, porch, deck, or balcony is fully open on a minimum of two sides beneath the floor.

Notes:

1) In accordance with the current CSA B149.1, Natural Gas and Propane Installation Code

2) In accordance with the current ANSI Z223.1/NFPA 54, National Fuel Gas Code

3) If locally adopted installation codes specify clearances different than those illustrated, then the most stringent clearance shall prevail.

VII. Venting (continued)

Table 15: Other than Direct Vent Terminal Clearances

		Canadian Installations ¹	US Installations ²
A	Clearance above grade, veranda, porch, deck, or balcony	18 in (46 cm)	12 in (30 cm)
B	Clearance to window or door that may be opened	6 in (15 cm) for appliances ≤ 10,000 Btuh (3 kW), 12 in (30 cm) for appliances > 10,000 Btuh (3 kW) and ≤ 100,000 Btuh (30 kW), 36 in (91 cm) for appliances >100,000 Btuh (30 kW)	4 ft (1.2 m) below or to side of opening; 1 ft (300 mm) above opening
C	Clearance to permanently closed window	*	*
D	Vertical clearance to ventilated soffit located above the terminal within a horizontal distance of 2 ft (61 cm) from the center line of the terminal.	*	*
E	Clearance to unventilated soffit	*	*
F	Clearance to outside corner	*	*
G	Clearance to inside corner	*	*
H	Clearance to each side of center line extended above meter/regulator assembly	3 ft (91 cm) within a height 15 ft (4.6 m)	*
I	Clearance to service regulator vent outlet	3 ft (91 cm)	*
J	Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other appliance	6 in (15 cm) for appliances ≤ 10,000 Btuh (3 kW), 12 in (30 cm) for appliances > 10,000 Btuh (3 kW) and ≤ 100,000 Btuh (30 kW), 36 in (91 cm) for appliances >100,000 Btuh (30 kW)	4 ft (1.2 m) below or to side of opening; 1 ft (300 mm) above opening
K	Clearance to a mechanical air supply inlet	6 ft (1.83 m)	3 ft (91 cm) above if within 10 ft (3 m) horizontally
L	Clearance above paved sidewalk or paved driveway located on public property	7 ft (2.13 m) †	7 ft (2.13 m) for mechanical draft systems (Category I appliances). Vents for Category II and IV appliances cannot be located above public walkways or other areas where condensate or vapor can cause a nuisance or hazard
M	Clearance under veranda, porch deck, or balcony	12 in (30 cm) ‡	*

NOTICE

* Clearance in accordance with local codes and the requirements of the gas supplier.

† A vent shall not terminate directly above a sidewalk or paved driveway that is located between two single family dwellings and serves both dwellings.

‡ Permitted only if veranda, porch, deck, or balcony is fully open on a minimum of two sides beneath the floor.

Notes:

1) In accordance with the current CSA B149.1, Natural Gas and Propane Installation Code

2) In accordance with the current ANSI Z223.1/NFPA 54, National Fuel Gas Code

3) If locally adopted installation codes specify clearances different than those illustrated, then the most stringent clearance shall prevail.

VII. Venting (continued)

H. Vent and Combustion Air Terminations

1. Vent Piping

- a. Install fire stops where vent passes through floors, ceilings or framed walls. The fire stop must close the opening between the vent pipe and the structure.
- b. Whenever possible, install vent straight through the roof.
- c. Size roof opening to maintain minimum clearance of 1 in. (25 mm) from combustible materials.
- d. Extend vent pipe to maintain minimum vertical distance for expected snow accumulation. Provide brace as required.
- e. Install storm collar on vent pipe immediately above flashing. Apply Dow Corning Silastic 732 RTV Sealant or equivalent between vent pipe and storm collar to provide weather-tight seal.

2. Combustion Air Piping

- a. If possible, locate combustion air termination in the same roof location as the vent termination to prevent nuisance shutdowns. Alternatively, this appliance may be installed with a vertical roof vent terminal and sidewall combustion air terminal.
- b. Size roof opening to allow easy insertion of combustion air piping and allow proper installation of flashing and storm collar to prevent moisture from entering the structure.
- c. Use appropriately designed vent flash when passing through roofs. Follow flashing manufacturers' instructions for installation.
- d. Extend combustion air pipe to maintain minimum vertical and horizontal distance of 12 in (300 mm) from roof surface or from the maximum snow level.

CAUTION

Intermittent shutdowns can occur when the vent terminals are subject to winds above 40 mph.

The required spacing between vent and combustion air terminals is to prevent flue gas recirculation. Recirculation of flue gas products into the combustion air supply can cause damage to property or the appliance.

NOTICE

Methods of securing and sealing terminals to the outside wall must not restrain the thermal expansion of the vent pipe.

Exterior run should be included in equivalent vent/combustion air lengths.

Vertical Venting and combustion air roof penetrations (where applicable) require the use of roof flashing and storm collar, which are not supplied with appliance, to prevent moisture from entering the structure.

Examine all components for possible shipping damage prior to installation.

All condensate that forms in vent must be able to drain back to the heat exchanger or a boot tee with a drain.

The venting system must be free to expand and contract and must be supported in accordance with installation instructions included by the original component manufacturers, whenever applicable. Polypropylene pipe sections must not be fully inserted. Leave 1/4 to 5/8 in. (6 mm to 16 mm) per joint to allow for thermal expansion.

WARNING

Failure to vent this appliance in accordance with these instructions could cause products of combustion to enter the building resulting in severe personal injury, death, or substantial property damage.

Do not locate vent termination under a deck, or where exposed to prevailing winds.

Do not locate combustion air termination where volatile vapors or other chemicals are present. Severe corrosion and failure will result.

Do not interchange vent systems or materials unless otherwise specified.






Do not apply thermal insulation to vent pipe or fittings.

Do not use a barometric damper or draft hood with this appliance.

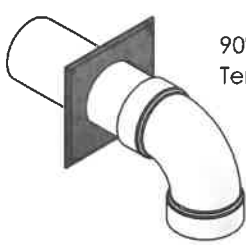

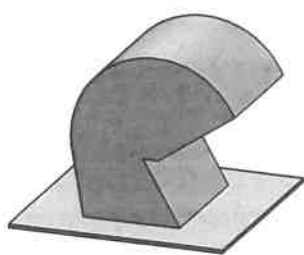
VII. Venting (continued)

Table 16: Table of Acceptable Terminations

Flue Gas Vent Terminations

Sidewall	Roof
 <p>Tee Termination Vertical Run</p>	 <p>Straight Termination</p>
 <p>20°-45° Elbow Terminated Downward</p>	 <p>Tee Termination Vertical Run</p>
	 <p>Velocity Cone</p>

Combustion Air Intake Terminations

Sidewall	Roof
 <p>90° Elbow Terminated Downward</p>	 <p>Two 90° Elbows Terminated Downward</p>
	 <p>Gooseneck</p>

Notes:

Do not use Louvers for direct vent systems
 One appliance per gooseneck termination
 Vent and intake piping must not share the same gooseneck
 All terminations should have Bird/Rodent Screens
 Do not use rain caps, Rain will drain through boot tee or condensate drain

VII. Venting (continued)

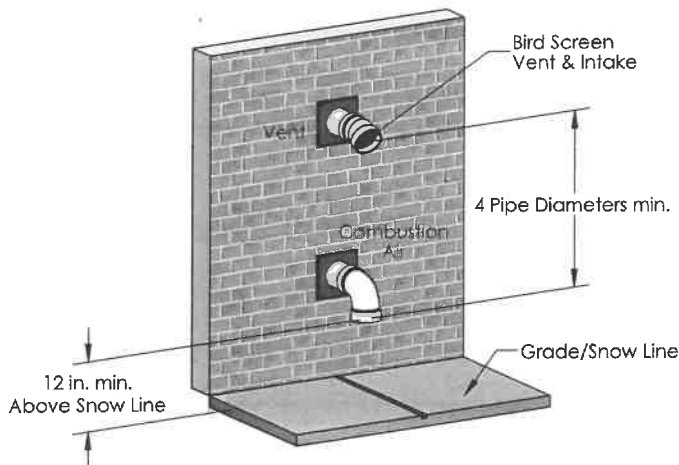


Figure 9: Horizontal Sidewall Termination

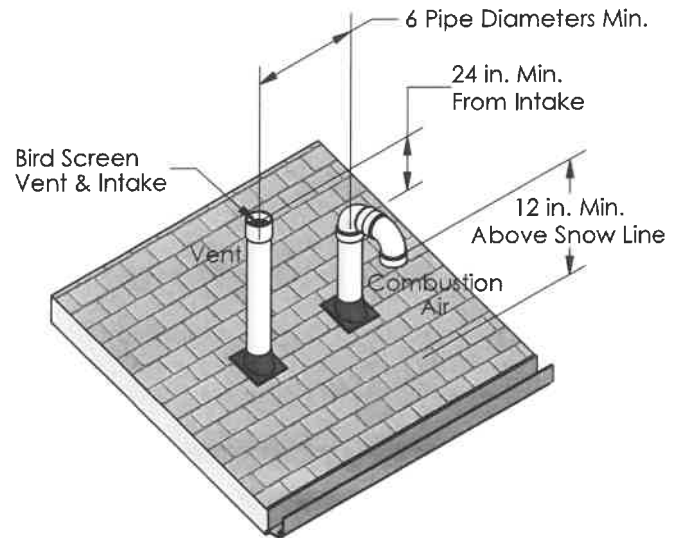


Figure 10: Sloped Roof Termination

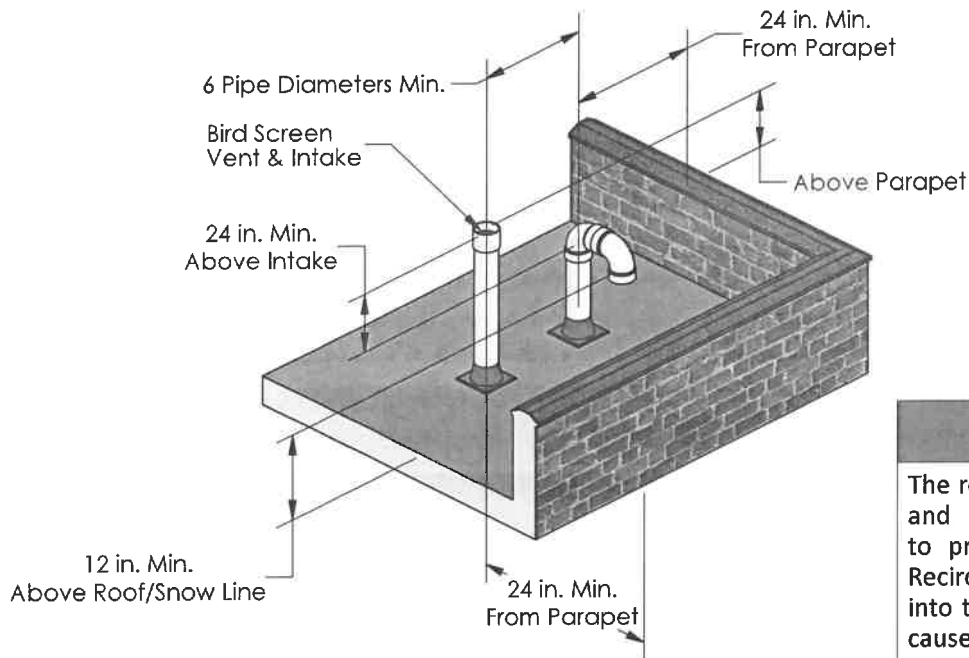


Figure 11: Flat Roof Vent Terminations

⚠ WARNING

The required spacing between vent and combustion air terminals is to prevent flue gas recirculation. Recirculation of flue gas products into the combustion air supply can cause damage to property or the appliance.

Notes:

1. All terminations must have bird/rodent screens.
2. If Possible, Install Sidewall venting on a wall away from prevailing wind.
3. For roof terminations, install vent terminal downstream of prevailing winds relative to intake terminal.
4. It is recommended to use tee terminations with a vertical run in extra windy areas.

⚠ CAUTION

Installing multiple vent terminations too close together may result in combustion product water vapor condensation on building surfaces where vent terminations are placed, causing subsequent frost damage. To avoid/minimize frost damage, extend the distance from building surfaces to vent termination end and increase the horizontal distance between adjacent vent terminations.

VII. Venting (continued)

I. Multiple Appliance Terminations

1. Vent Piping Terminations

- a. Multiple appliance vent terminations are shown in Figure 12.
- b. Each individual appliance must have its own vent pipe and vent terminal unless a common venting system is used following the guidelines of the "Engineered Venting Method" section in this manual.
- c. For horizontal sidewall terminations, maintain at least 6 pipe diameters minimum horizontal distance between any adjacent individual vent terminations. Additional horizontal spacing between any adjacent individual vent terminations as well as extending the distance from building surfaces to vent termination end are recommended to avoid frost damage to building surfaces where vent terminations are placed.
- d. Multiple individual vertical vent pipes may be piped through a common conduit or chase so that one roof penetration may be made.
- e. For vertical roof terminations, maintain at least 6 pipe diameters minimum horizontal distance between adjacent individual appliance vent terminations.

2. Combustion Air Piping

- a. Multiple appliance combustion air terminations are shown in Figure 12.
- b. Each individual appliance must have its own combustion air pipe and terminal when using category IV venting.

! WARNING

Moisture and ice may form on the surface around vent termination.
To prevent deterioration, surface must be in good repair (sealed, painted, etc.).
Do not allow low spots in the vent where condensate may pool.
Use specified vent and combustion air pipe diameters.
All vent and combustion air piping must be sealed and airtight.
Alteration of the appliance vent connection is prohibited.

! WARNING

The joint between the terminal and the last piece of pipe must be outside of the building.

The vent for this appliance shall not terminate:

1. Over public walkways; or
2. Near soffit vents or crawl space vents or other areas where condensate or vapor could create a nuisance or hazard or cause property damage; or
3. Where condensate vapor could cause damage or could be detrimental to the operation of regulators, pressure relief valves, or other equipment.

- c. Individual appliance sidewall terminals must be placed at least 12 in. (300 mm) [18 in. (460 mm) in Canada] above the ground plus the expected snow accumulation.
- d. Do not exceed the maximum combustion air pipe length for an individual appliance as listed in Table 6.
- e. If possible, locate the vent and combustion air terminals for each appliance on the same wall to prevent nuisance shutdowns. If not, each appliance may be installed with a roof vent terminal and sidewall combustion air terminal.

J. Terminal Installation

1. Use the terminal connections supplied by the venting manufacturer. Follow manufacturer's instructions to attach the terminal to the vent system.
2. For PVC/CPVC terminals, apply a heavy bead of silicone to the male end of the terminal before inserting it into the last piece of pipe. Orient the terminal so that the seam in the terminal is at 12:00. Smooth the silicone over the seam between the terminal and the last piece of pipe, applying additional silicone if necessary to ensure a tight seal. Allow the silicone to cure per the silicone manufacturer's instructions before operating the appliance.
3. Install Bird/Rodent screens in the terminals. Use a screen having 1/2 in. x 1/2 in. (13 mm x 13 mm) mesh.
4. Adhere to the minimum and maximum wall thickness specified by the manufacturer of the wall penetration assembly.

VII. Venting (continued)

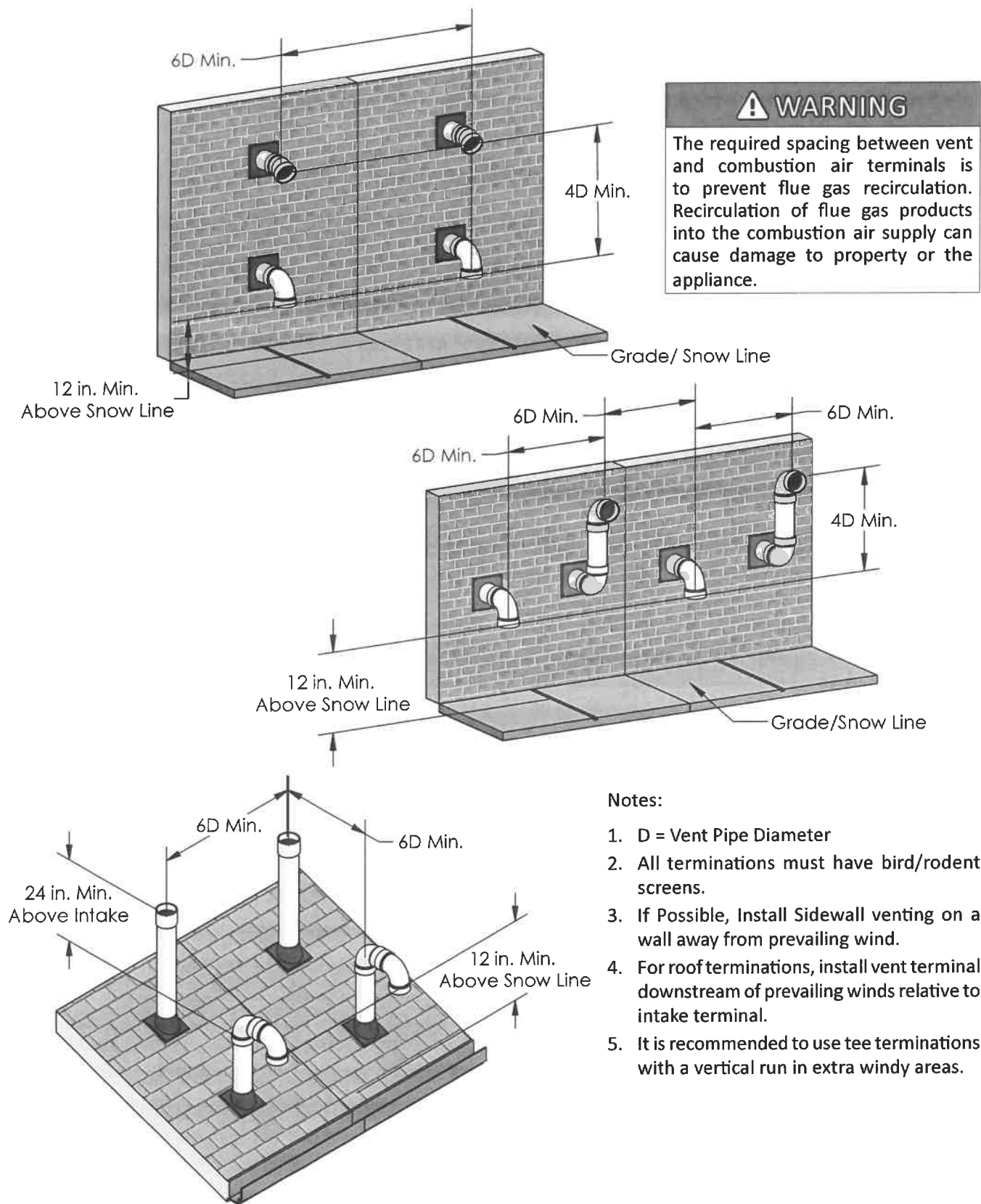


Figure 12: Multiple Appliance Direct Vent Termination

VII. Venting (continued)

K. Polypropylene Venting

1. Running Flexible Polypropylene Vent (Liner) Through Unused Chimney Chase
 - a. It is the responsibility of the installing contractor to procure polypropylene vent system pipe and related components.
 - b. All listed polypropylene vent system manufacturers must comply with the requirements of *ULC-S636-08* 'Standard for Type BH Gas Venting Systems'. For Canadian installation, polypropylene vent must be listed as a *ULC-S636* approved system.
 - c. Flexible polypropylene pipe must be treated carefully and stored at temperatures higher than 41 degrees F.
 - d. When flexible polypropylene pipe (liner) is used for combustion air supply, the pipe (liner) can be installed in a vertical or horizontal position.
 - e. Follow manufacturer instructions regarding application/listing, permits, minimum clearances to combustibles, and installation details (proper joint assembly, pipe support and routing, gasket and fitting installation, optional tooling availability/usage, routing through masonry chimney for combustion product venting or, combination of combustion product venting and combustion air supply).
 - f. When using a masonry chimney as a passageway for flexible polypropylene pipe, the chase must be structurally sound and free of any debris or obstructions.
 - g. To prevent condensate pooling and damage to vent, offsets (bend) cannot exceed 45°. Multiple offsets are allowed in a chase.
2. Pressure drop for flexible polypropylene line is 20 % greater than from rigid pipe. Multiply measured flexible polypropylene liner length by 1.2 to obtain equivalent length.
3. Maximum equivalent vent length of flexible polypropylene liner is 48 ft. (14.6 m).

L. Optional Room Air for Combustion

1. General Guidelines
 - a. Room air is optional for commercial applications. Follow the requirements in this section when air for combustion is supplied from the boiler room.
 - b. Avoid combustion air contaminants in the boiler room. Permanently remove any contaminants found in the boiler room. If contaminants cannot be removed, do not use room air for combustion.

WARNING

Asphyxiation Hazard. Vent systems made by listed PP vent system manufacturers rely on gaskets for proper sealing. When this type of vent system is used, take the following precautions:

Make sure that gasket is in position and undamaged in the female end of the pipe.

Make sure that both male and female pipes are free of damage prior to assembly.

Only cut vent pipe as permitted by the vent manufacturer in accordance with their instructions. When pipe is cut, the cut end must be square and carefully deburred prior to assembly.

Use locking band clamps at all vent pipe joints.

Flexible polypropylene vent must be installed only in an unused chimney. A chimney, either single or multiple flue type, is considered unused when one of the flues is being used for any appliance venting, or When one of the multiple flues is being used for appliance venting. The flexible vent installation is not permitted through any of the adjacent flues.

Do not bend or attempt to install flexible pipe if it has been stored at ambient temperature below 41 F. This will cause material to become brittle and will lead to cracks, resulting in flue gas leaks.

Do not install flexible polypropylene pipe at an angle greater than 45 degrees from vertical when used for combustion product venting. Failure to do so will result in improper condensate drainage and possible subsequent vent pipe blockage.

2. Outdoor Openings to Boiler Room

- a. Provide combustion and ventilation air to the boiler room or enclosure. Follow the National fuel Gas Code, *ANSI Z223.1*, or, in Canada, *Installation Code for Gas Burning Appliances and Equipment, CSA Standard B149 Code* as well as all applicable local codes. Use one of the following methods.

WARNING

This appliance must not be installed in a room under negative pressure. An equipment room under negative pressure could deplete the combustion air supply to the appliance and cause leakage of flue gas from the venting system.

VII. Venting (continued)

NOTICE

Pressure drop for flexible polypropylene line is 20 % greater than from rigid pipe. Multiply measured flexible polypropylene liner length by 1.2 to obtain equivalent length.

Maximum equivalent vent length of flexible polypropylene liner is 48 ft. (14.6 m).

Installation of a polypropylene vent system should adhere to the vent manufacturer's installation instructions supplied with the vent system.

⚠ WARNING

DO NOT mix vent systems of different types or manufacturers. Failure to comply could result in severe personal injury, death, or substantial property damage.

DO NOT connect venting to a chimney flue that is servicing a separate appliance designed to burn solid fuel.

DO NOT use chimney for Combustion air intake.

DO NOT insulate polypropylene vent pipes. Excessive heat could cause premature vent pipe failure.

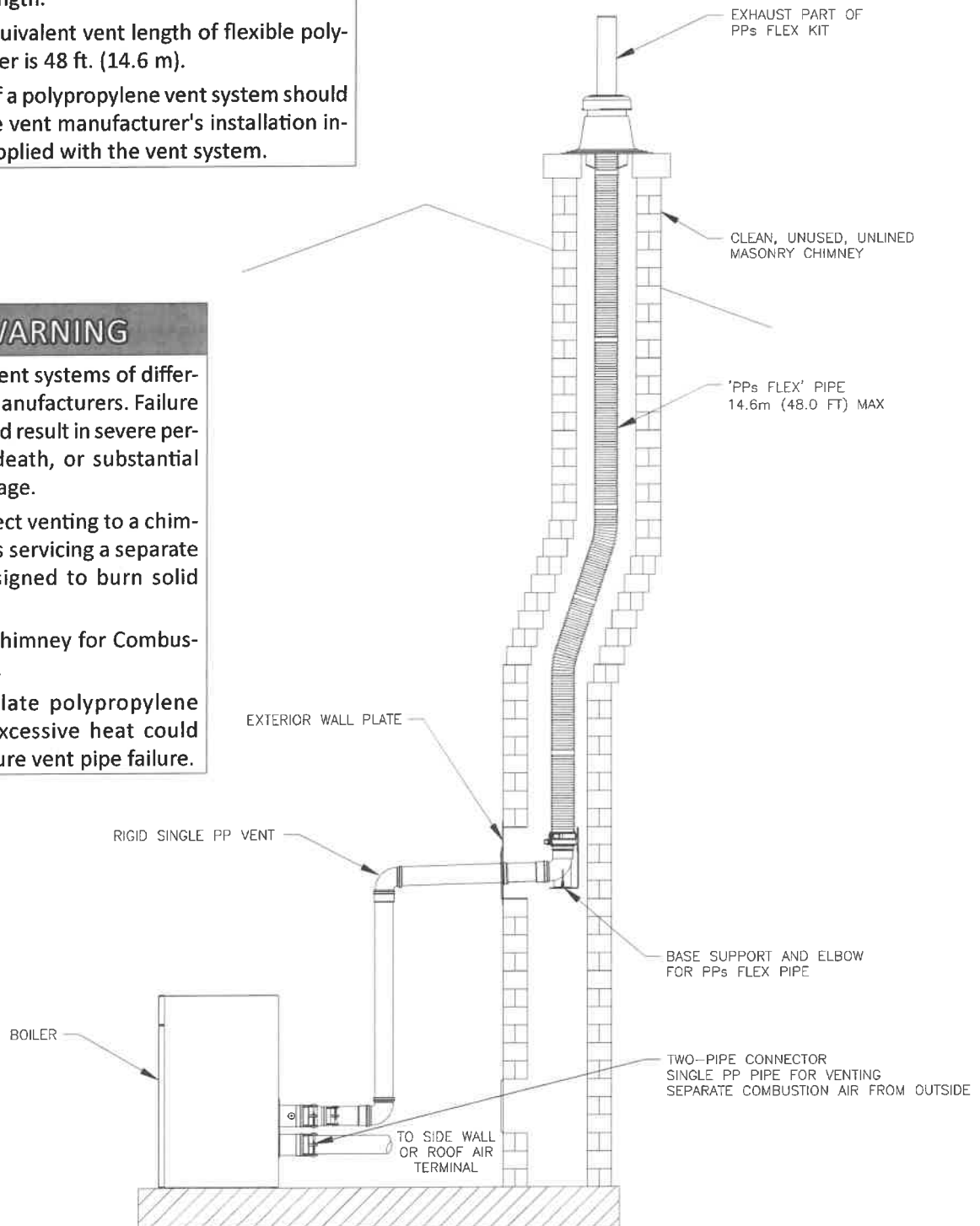


Figure 13: Flexible Vent in Masonry Chimney with Separate Combustion Air Intake

VII. Venting (continued)

- b. Natural gas and propane installation code specifies venting systems and air supply for appliances. Air supply shall be provided when either an appliance or a combination of appliances has a total input exceeding 400,000 Btu/h.
 - c. Air supply is defined as combustion air, excess air, flue gas dilution air, primary air, secondary air, and ventilation air. The air supply requirements below are a summation of Clause 8.4 specific to this gas appliance.
3. Air Supply Requirements for Appliances having an input exceeding 400 MBH:
- a. Ventilation Air: an opening for ventilation air at the highest point that opens to the outdoors shall provide Ventilation of the space. The cross sectional area of this opening shall be at least 10% of the area required for combustion air, but in no case shall the cross-sectional area be less than 10 in² (6500 mm²).
 - b. Combustion Air: For combustion air where the air supply is provided by natural airflow from outdoors, in addition to the opening for ventilation air, there shall be permanent opening having a total cross-sectional free area of not less than 1 in² for each 30,000 BTU/hr. (70 mm² for each kW) of the total rated input of the appliance(s). The location of the opening(s) shall not interfere with the openings for ventilation air. Please refer to the codes listed above for combustion air openings when natural draft, fan assisted or power draft assisted equipment are in the space.
- c. When an air supply duct is used to supply combustion air, its discharge opening shall be located where there is no possibility of cold air affecting steam/water lines or other temperature sensitive equipment.
4. Combustion Air Supply Dampers, Louvers, and Grilles
- a. The free area of the combustion air supply opening shall be calculated by subtracting the blockage area of all fixed louvers, grilles or screens from the gross area of the opening.
 - b. Openings in a fixed louver, grille, or screen shall have no dimension smaller than ¼" (6 mm).
 - c. No manually operated dampers or manually operated adjustable louvers are permitted.
 - d. Motorized dampers or Louvers shall be interlocked so the burner(s) cannot operate unless the damper or louver is in the fully open position.
5. Mechanical Combustion Air Supply
- a. When combustion air is supplied by mechanical means, an airflow sensing device shall be installed and wired into the safety limit circuit of the primary safety control to shut off the gas in the event of an air supply failure.
6. Appliance Venting
- a. This appliance is listed as Category IV venting and requires special venting systems as previously described.
 - i. Venting for Category IV appliances shall be as specified or furnished by the manufacturer of the listed appliance.
 - ii. A special venting system shall be installed in accordance with the terms of its listing and the vent manufacturers certified installation manual.
 - iii. A flue gas vent or a vent connector shall not be installed inside either a duct or a shaft used for return air, hot air, ventilating air, or combustion air.
 - iv. An appliance that operates at a positive vent pressure shall not be connected to a venting system serving any other appliance. This appliance operates at a positive vent pressure.
 - v. A factory-built chimney used for venting an appliance shall be certified.

WARNING

Sources of combustion air contaminants, including chlorines, chlorofluorocarbons (CFC's), petroleum distillates, detergents, volatile vapors or other chemicals must not be present in the boiler room. If any of these contaminants are present, severe corrosion and failure will result.

Asphyxiation Hazard. Common manifold venting requires special considerations. Follow the instructions in this manual

The manufacturer takes no responsibility for vent systems that create issues and or affect the performance of the appliance.

Improper Installation of a Category II vent system resulting in positive pressure in the vent system can result in flue gas spillage and carbon monoxide emissions, causing personal injury, death or substantial property damage.

VII. Venting (continued)

M. Removing Existing Appliance

When an existing appliance is removed from a common venting system, the common venting system is likely to be too large for proper venting of the remaining appliances. At the time of removal of an existing appliance, the following steps should be performed with each appliance remaining connected to the common venting system. Make sure the appliances are not in operation while carrying out these steps.

1. Seal any unused openings in the common venting system.
2. Visually inspect the venting system for proper size and horizontal pitch and ensure there is no blockage or restriction, leakage, corrosion, or other deficiencies which could cause an unsafe condition.
3. Insofar as is practical, close all exterior doors and windows, and all doors between the space where the appliances connect to the common venting system and other spaces of the building. Turn on any exhaust fans, such as range-hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.
4. Place in operation the appliance being inspected. Follow the Lighting (or Operating) Instructions. Adjust thermostat so appliance will operate continuously.
5. Test for spillage at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle, or smoke from a cigarette, cigar or pipe.
6. After it has been determined that each appliance connected to the common venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas burning appliance to their previous conditions of use.
7. Any improper operation of the common venting system should be corrected so the installation conforms with the *National Fuel Gas Code, ANSI Z223.1/NFPA 54* and/or the *Natural Gas and Propane Installation Code, CAN/CSA B149.1*. Resizing of any portion of the common venting system, should be done in accordance with the *National Fuel Gas Code, ANSI Z223.1/NFPA 54* and/or the *Natural Gas and Propane Installation Code, CAN/CSA B149.1*.

NOTICE

Please note that the information provided in this manual relative to the Canadian Standard is not meant to be all-inclusive. Reading the entire Standard is strongly suggested. The final approval of all system designs must be acceptable to the authority having jurisdiction.

VII. Venting (continued)

N. Special Installation Requirements for Massachusetts

1. For all sidewall horizontally vented gas fueled equipment installed in every dwelling, building or structure used in whole or in part for residential purposes and where the sidewall exhaust vent termination is less than seven (7) feet above grade, the following requirements shall be satisfied:
 - a. If there is no carbon monoxide detector with an alarm already installed in compliance with the most current edition of NFPA 720, NFPA 70 and the Massachusetts State Building Code in the residential unit served by the sidewall horizontally vented gas fueled equipment, a battery operated carbon monoxide detector with an alarm shall be installed in compliance with the most current edition of NFPA 720, NFPA 70 and the Massachusetts State Building Code.
 - b. In addition to the above requirements, if there is not one already present, a carbon monoxide detector with an alarm and a battery back-up shall be installed and located in accordance with the installation requirements supplied with the detector on the floor level where the gas equipment is installed. The carbon monoxide detector with an alarm shall comply with 527 CMR, ANSI/UL 2034 Standards or CSA 6.19 and the most current edition of NFPA 720. In the event that the requirements of this subdivision can not be met at the time of the completion of the installation of the equipment, the installer shall have a period of thirty (30) days to comply with this requirement; provided, however, that during said thirty (30) day period, a battery operated carbon monoxide detector with an alarm shall be installed in compliance with the most current edition of NFPA 720, NFPA 70 and the Massachusetts State Building Code. In the event that the sidewall horizontally vented gas fueled equipment is installed in a crawl space or an attic, the carbon monoxide detector may be installed on the next adjacent habitable floor level. Such detector may be a battery operated carbon monoxide detector with an alarm and shall be installed in compliance with the most current edition of NFPA 720, NFPA 70 and the Massachusetts State Building Code.
 - c. A metal or plastic identification plate shall be permanently mounted to the exterior of the building at a minimum height of eight (8) feet above grade directly in line with the exhaust vent terminal for the horizontally vented gas fueled heating appliance or equipment. The sign shall read, in print size no less than one-half (1/2) inch in size, "GAS VENT DIRECTLY BELOW. KEEP CLEAR OF ALL OBSTRUCTIONS".
 - d. A final inspection by the state or local gas inspector of the sidewall horizontally vented equipment shall not be performed until proof is provided that the state or local electrical inspector having jurisdiction has granted a permit for installation of carbon monoxide detectors and alarms as required above.
2. EXEMPTIONS: The following equipment is exempt from 248 CMR 5.08(2)(a) 1 through 4:
 - a. The equipment listed in Chapter 10 entitled "Equipment Not Required To Be Vented" in the most current edition of NFPA 54 as adopted by the Board; and
 - b. Product Approved sidewall horizontally vented gas fueled equipment installed in a room or structure separate from the dwelling, building or structure used in whole or in part for residential purposes.
3. When the manufacturer of Product Approved sidewall horizontally vented gas equipment provides a venting system design or venting system components with the equipment, the instructions for installation of the equipment and the venting system shall include:
 - a. A complete parts list for the venting system design or venting system; and
 - b. Detailed instructions for the installation of the venting system design or the venting system components.
4. When the manufacturer of a Product Approved sidewall horizontally vented gas fueled equipment does not provide the parts for venting flue gases, but identifies "special venting systems", the following shall be satisfied:
 - a. The referenced "special venting system" instructions shall be included with the appliance or equipment installation instructions; and
 - b. The "special venting systems" shall be Product Approved by the Board, and the instructions for that system shall include a parts list and detailed installation instructions.
5. A copy of all installation instructions for all Product Approved sidewall horizontally vented gas fueled equipment, all venting instructions, all parts lists for venting instructions, and/or all venting design instructions shall remain with the appliance or equipment at the completion of the installation.

VIII. Condensate Disposal

A. Condensate trap

1. The condensate trap is located inside the appliance jacket behind the front door panel.
 - a. The flue gas trap prevents flue gases from escaping into the boiler room.
 - b. The float switch interrupts the limit string in the event the drainage of the condensate is blocked.

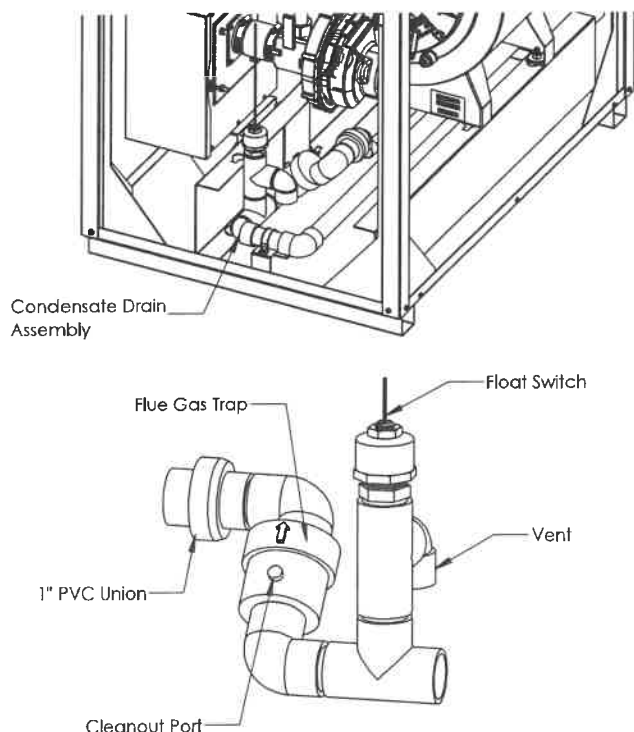


Figure 14: Condensate Drain Assembly

2. The condensate line exits out the back of the appliance through a 1" PVC pipe.
3. Note the following when disposing of the condensate:
 - a. Condensate is slightly acidic, typical pH around 3.5 - 4.5. Do not route the drain line through areas that could be damaged by leaking condensate.
 - b. Do not route or terminate the condensate drain line in areas subject to freezing temperatures.
 - c. If the point of condensate disposal is above the trap, a condensate pump is required to move the condensate to the drain. Select a condensate pump approved for use with condensing appliance—and equipped with an overflow switch.

NOTICE

Do not crimp condensate drain lines or reduce drain line inner diameter size, unless adapting to a neutralizer kit.

Do not manifold condensate drains and vent drains together.

Consult local authorities regarding disposal of flue gas condensate into the public waste water system.

Do not use metallic pipe or fittings for condensate drain lines.

- d. Do not attempt to substitute another trap for one provided with the appliance.
- e. Slope condensate drain pipe at least 1/8" per foot in the direction of discharge.

B. Condensate Neutralizer Installation

1. Some jurisdictions may require that the condensate be neutralized before being disposed of. Follow local codes pertaining to condensate disposal.
2. A condensate neutralizer kit is available from factory as optional equipment. Refer to Table 17 for size specific part number. Follow local codes and instructions enclosed with the kit for condensate neutralizer installation.
3. Limestone chips will get coated by neutral salts (product of chemical reaction between limestone and acidic condensate) and lose neutralizing effectiveness over time. Therefore, periodic condensate neutralizer maintenance and limestone chip replacement are required for proper neutralization of the condensate.

Table 17: Condensate Neutralizer Kit

Model	Condensate Neutralizer Kit, PN	Condensate Neutralizer, Refill Kits, PN
400	107860-08	107886-09
500	107860-08	107886-09
650	107860-09	107886-10
800	107860-09	107886-10
1000L	107860-06	107886-06

VIII. Condensate disposal (continued)

C. Common Condensate pump/Sump

1. A common condensate pump/sump may be used. Run separate piping from each condensate drain to the sump. A common drain may be used to discharge condensate from the sump.
2. If a common sump is used, individual drain lines should be constructed, using material listed above, such that one drain cannot back feed into another drain.
3. Do not manifold condensate and vent drains together.

NOTICE

Flue gas condensate is corrosive. Route condensate drain line in a manner such that any condensate leakage will not cause property damage.

If the condensate line is obstructed in any way, the float switch will prevent the appliance from firing.

Some jurisdictions may require that condensate be neutralized prior to disposal.

The condensate drain trap should be flushed with clean water as part of the appliance maintenance schedule to remove any debris that might have accumulated.

IX. Water Piping

These boilers are designed to operate in a closed loop pressurized system. Minimum pressure in the boiler must be 14.5 psi (100 kpa). Proper operation requires a piping system that can provide sufficient water flow through the boiler and meet the water quality requirements.

A. General Piping Guidelines

Suggested piping configurations are shown in diagram form in section "Water Piping Diagrams". The following steps are general guidelines for installing this boiler in space heating systems. The installer is responsible for complying with local codes.

1. Primary/Secondary piping is the recommended piping configuration. Isolate the appliance from the system using closely spaced tees (12 inches or 4 pipe diameter) and size a circulation pump that ensures sufficient flow is maintained through the boiler.
 - a. The flow rate through the primary loop is maintained by the installer provided circulator.
 - b. Other piping configurations may be used. However, it is the responsibility of the installer to size circulator(s) that could overcome the heat exchanger and system pressure drops.
 - c. Inadequate flow through the boiler can cause high limit shutdowns, hot spots, and localized boiling which could severely damage the heat exchanger.
2. A pressure relief valve is included and installed by factory.
3. When piping the appliance to the system, do not install an elbow closer than 5 pipe diameters from the flow switch.

WARNING

Failure to properly pipe appliance may result in improper operation and damage.

Install the appliance so that the gas ignition system components are protected from water (dripping, spraying, rain, etc.) during appliance operation and service (circulatory replacement, cleaning, etc.).

Contamination of the water by corrosive chemicals will cause corrosion of the steel components, and can lead to appliance failure. The manufacturer's Standard Warranty does not cover problems caused by contamination of supply water.

Failure to maintain the flow through the appliance within the specified limits could result in erratic operation or premature failure.

The circulator shall be sized properly based on the pressure drop of the entire loop and the desired temperature rise.

Maintain 1" (24mm) clearance around all uninsulated hot water pipes.

IX. Water Piping (continued)

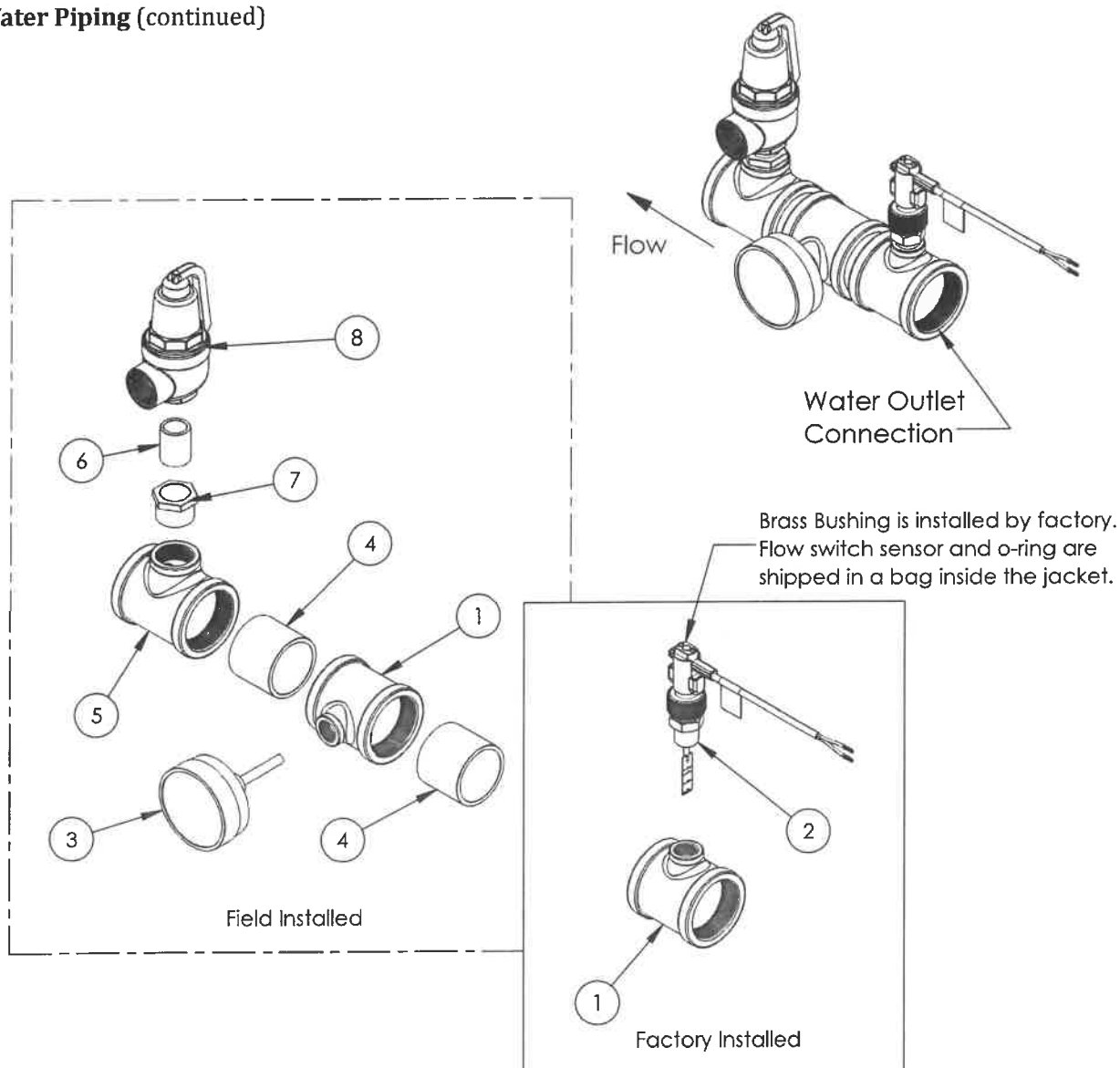


Figure 15: Relief Valve Package Assembly

B. Factory Supplied Relief Valve Package

1. The relief valve, T&P gauge, and required fittings ship loose with the appliance. These parts must be installed to the outlet as shown in Figure 15.
2. When piping the appliance to the system, do not install an elbow closer than 5 pipe diameters from the flow switch.

Table 18: Outlet Piping Parts

Item no.	Description
1	2" X 2" X 1/2" reducing tee
2	Flow Switch
3	T & P Gauge
4	2" pipe nipple, close
5	2" X 2" X 1" reducing tee
6	3/4" pipe nipple, close
7	1" x 3/4" Hex Bushing
8	Pressure relief Valve

IX. Water Piping (continued)

C. Standard Piping Components

1. Pressure relief Valve (Required)

- a. The pressure relief valve must be installed with spindle in vertical position. Installation of the pressure relief valve must comply with ASME Boiler and Pressure Vessel Code, Section IV.
- b. If the pressure relief valve is to be replaced, the replacement valve must have a relief capacity equal or exceeding the minimum relief valve capacity shown on the heat exchanger ASME plate. Also, when replacing the pressure relief valve, verify the temperature and pressure gauge meets ASME requirements for the replacement pressure relief valve.
- c. Pipe the pressure relief valve discharge to a location where hot water or steam will not create hazard or property damage if the valve discharges. The end of the discharge pipe must terminate in an untreated pipe.
- d. If the pressure relief valve is not piped to a drain, it must terminate at least 6 in. (150mm) above the floor. Do not run pressure relief valve discharge pipe through an area prone to freezing. The termination of discharge piping must be in an area where it will not become plugged by debris.

2. Drain Valves

A factory installed 3/4" NPT drain valve and connection is provided with the unit.

3. Flow Switch (Factory Supplied)

This appliance is CSD-1 compliant and equipped with water flow switch and reset low water cut out box. A flow switch is required for forced circulation coil-type water boilers to prevent overheating and the heat exchanger failure in accordance with requirements of ASME Boiler and Pressure Vessel Code, Section IV, and ANSI/ASME CSD-1 "Controls and Safety Devices for Automatically Fired Boilers".

4. Circulator Pump (Required)

Near boiler pump is required to maintain minimum flow requirements for proper operation of the boiler. It is the responsibility of the installer to size and install near boiler pump(s). Refer to Table 19 for boiler specific head losses.

5. Expansion Tank (Required)

If this appliance is replacing an existing appliance with no other changes in the system, the old expansion tank can generally be reused. If the expansion tank must be replaced, consult the expansion tank manufacturer's literature for proper sizing.

WARNING

Scald Hazard. Pressure relief valve discharge shall be piped in such a way to prevent or eliminate potential burn risk.

DO NOT pipe in any area where freezing could occur.

DO NOT install any shut-off valves, plugs, caps, or reducers in the discharge piping.

Discharge line shall be installed to allow complete drainage of both the valve and the line.

Consult local codes for proper discharge pipe arrangement.

Observe a minimum of 1/2 inch (12 mm) clearance around all uninsulated hot water piping.

6. Fill Valve (Required)

Either manual (recommended) or automatic fill valve may be used.

NOTICE

If automatic refill is employed, a water meter must be added to evaluate the makeup water volume taken after initial fill and eliminate any water leakage as early as possible.

7. Automatic Air Vent (Required)

At least one automatic air vent is required. Manual vents will usually be required in other parts of the system to remove air during initial fill.

8. Y-strainer (Recommended)

A Y-strainer or equivalent strainer removes heating system debris from the hydronic systems and protects the heat exchanger. Install the strainer in the cold water connection piping between the tank and the appliance.

9. Isolation Valves (Recommended)

Isolation valves are useful for servicing and stopping water flow in the case of failure. Full port ball valves are required.

10. Flow Control Valve (Strongly Recommended)

The flow control valve prevents flow through the system unless the circulator is operating. Flow control valves are used to prevent gravity circulation in circulator zone systems through zones that are not calling for heat.

IX. Water Piping (continued)

D. Water Quality

1. The water directly in contact with the appliance must meet the requirements in this section. Failure to adhere to the water treatment requirements in this manual can cause damage not covered by warranty to the appliance, pumps, or other components in the system.
2. It will be necessary to gain knowledge of the impurities dissolved in the water and consult with a qualified industrial water treatment professional to establish a treatment plan. In addition, a periodic testing/sampling plan should be developed.
3. To minimize corrosion and scale effects, adhere to the water quality requirements in Table B1.
 - a. If the water hardness is higher than 160 ppm (9 gpg), a water softener must be used.
 - b. Water with a hardness of less than 50 ppm (3 gpg) can have a pH level that is corrosive.
4. Total Dissolved Solids (TDS) contribute to scale buildup. If the TDS or combined water hardness and TDS exceeds 450 ppm, the water needs to be heated indirectly.

CAUTION

This appliance's heat exchanger is made from stainless steel tubular double coil having relatively narrow waterways. Once filled with water, it will be subject to the effects of corrosion. Failure to take the following precautions to minimize corrosion, and overheating could result in severe product damage.

Before connecting the appliance, insure the system is free of impurities, grease, sediment, construction dust, sand copper dust, and flux. Flush the system thoroughly and repeatedly, if needed.

Scale deposit is made up of lime scale contained in most distributed water and settles over the warmest surfaces of the heat exchanger causing subsequent overheating and eventual failure.

Scale can form from high water hardness and slow water velocities. Failure to maintain the recommended water hardness and flow rate will result in a buildup of scale inside the heat exchanger.

Water temperatures over 140 °F (60 °C) greatly increase the affects of corrosive chemicals.

Chlorine and Chloride have different levels of corrosion effects on stainless steel. It is recommended for chlorine (Cl₂) levels to be below 5ppm and chloride (Cl⁻) levels to be below 150 ppm for 316 stainless steel.

Table B1: Water Quality Requirements

Quality Parameter	Min.	Max.
Water Hardness (gpg)	3	9
Total Dissolved Solids (ppm)	100	450
Chlorine (ppm)	-	5
Chloride (ppm)	-	150
pH (cold)	7.5	9.5
pH (systems with aluminum)	7.5	8.5

Note: 1 grain per gallon = 17.1 ppm

- a. The TDS (in ppm) is determined by measuring the electrical conductivity (μS/cm) of the water and multiplying by a conversion factor (typically 0.65 for drinking water).
5. Chlorine and Chloride can be very corrosive to stainless steel. Ensure the level of chlorine is less than 5 ppm and the level of chloride is less than 150 ppm.

WARNING

This appliance is **not** designed for the heating of swimming pool water.

6. Before connecting the appliance, insure the system is free of impurities, grease, sediment, construction dust, and any other contaminants.
 - a. Flush the system thoroughly and repeatedly, if needed.

IX. Water Piping (continued)

E. Oxygen Contamination

1. Continuous addition of make-up water will constantly add oxygen to the system and lead to corrosion. Black oxide sludge (magnetite, Fe_3O_4) forms as a result of continuous electrolytic corrosion in any system unprotected by an inhibitor.
2. To minimize oxygen presence in the system, all system leaks must be repaired immediately. DO NOT connect the boiler to radiant tubing without an oxygen barrier.
3. There are many possible causes of oxygen contamination such as:
 - a. Addition of excessive make-up water as a result of system leak
 - b. Absorption through open tanks and fittings.
 - c. Oxygen permeable materials in the distribution system.
4. In order to insure long product life, oxygen sources must be eliminated. This could be accomplished by taking the following measures:
 - a. Repairing system leaks to eliminate the need for addition of make-up water.

- b. Eliminate and/or repair fittings which allow oxygen absorption.
- c. Use of non-permeable materials in the distribution system.
- d. Isolating the boiler from the system water using an indirect heat exchanger.
- e. Using properly designed air elimination devices in water piping.

NOTICE

The manufacturer's Standard Warranty does not cover boiler failure caused by oxygen contamination of boiler water or scale build-up.

⚠ WARNING

When using Glycol products, all Glycol manufacturers' requirements, including rust inhibitors, must be adhered to. Maximum 50 % Glycol.

Do not use ethylene glycol in systems that can come in contact with domestic hot water, such as indirect water heaters.

Table B2: Corrosion/Scale Inhibitors and Removal Agents

Producers	Fernox	Sentinel	Sotin	ADEY
Inhibitors	Protector F1/Alphi 11	X100, X500	Sotin 212	MC1+
Noise reducer	-	X200	-	-
Universal Cleaner	Restorer	X300	-	-
Sludge remover	Protector F1, Cleaner F3	X400	Sotin 212	-
Antifreeze	Alphi 11	X500	-	-
Tightness	-	Leak Sealer F4	-	-

Table B3: Water Treatment Types

Treatment Type	Preventive	Corrective
Protector F1	X	
X100	X	X
X200	X	
X300		
X400		X
X500	X	X
Alphi 11	X	
Leaker Sealer F4	X	
Sotin 212		X
MC1+	X	

Table B4: Flow Rates for Glycol Systems

System Glycol Concentration (%)	Increase Flow, (%)
50	24
30	14

Note: Total system water volume includes expansion tank(s) and reservoirs.

IX. Water Piping (continued)

F. Temperature Rise and Heat Exchanger Head Loss

1. This heat exchanger adds pressure drop to the system which must be accounted for in the design of the piping configuration and pump selection.
2. The system should be designed to maintain the operating water flow rate shown in Table 19. Exceeding the maximum water flow rates can cause pipe erosion, component damage, and decreased performance.
 - a. Maintaining sufficient flow through the heat exchanger will help prevent the buildup of scale.

Table 19: Temperature rise, flow rate, and head loss

Boiler Model	Maximum MBH		Recommended Range						Maximum Flow		Minimum Flow	
			20 °F ΔT		30 °F ΔT		40 °F ΔT		15 °F ΔT		50 °F ΔT	
	Input	Output	GPM	Head Loss (ft)	GPM	Head Loss (ft)	GPM	Head Loss (ft)	GPM	Head Loss (ft)	GPM	Head Loss (ft)
400	399	387	39	12.4	26	6.2	19	3.8	52	20.3	16	2.6
500	500	485	49	13.7	32	6.7	24	4.1	65	22.7	19	2.7
650	650	631	63	11.8	42	6.1	32	3.8	84	18.8	25	2.6
800	800	776	78	12.8	52	7.0	39	4.6	103	19.7	31	3.3
1000L	999	969	97	14.6	65	7.2	49	4.4	129	24	39	3.0

Flow Rate = Output×1000/(500×ΔT), where flow rate is in GPM, output is in MBH, and ΔT is in °F.
 Temperature rise limit is 55 °F
 Temperature rise (delta) limit of 55 °F

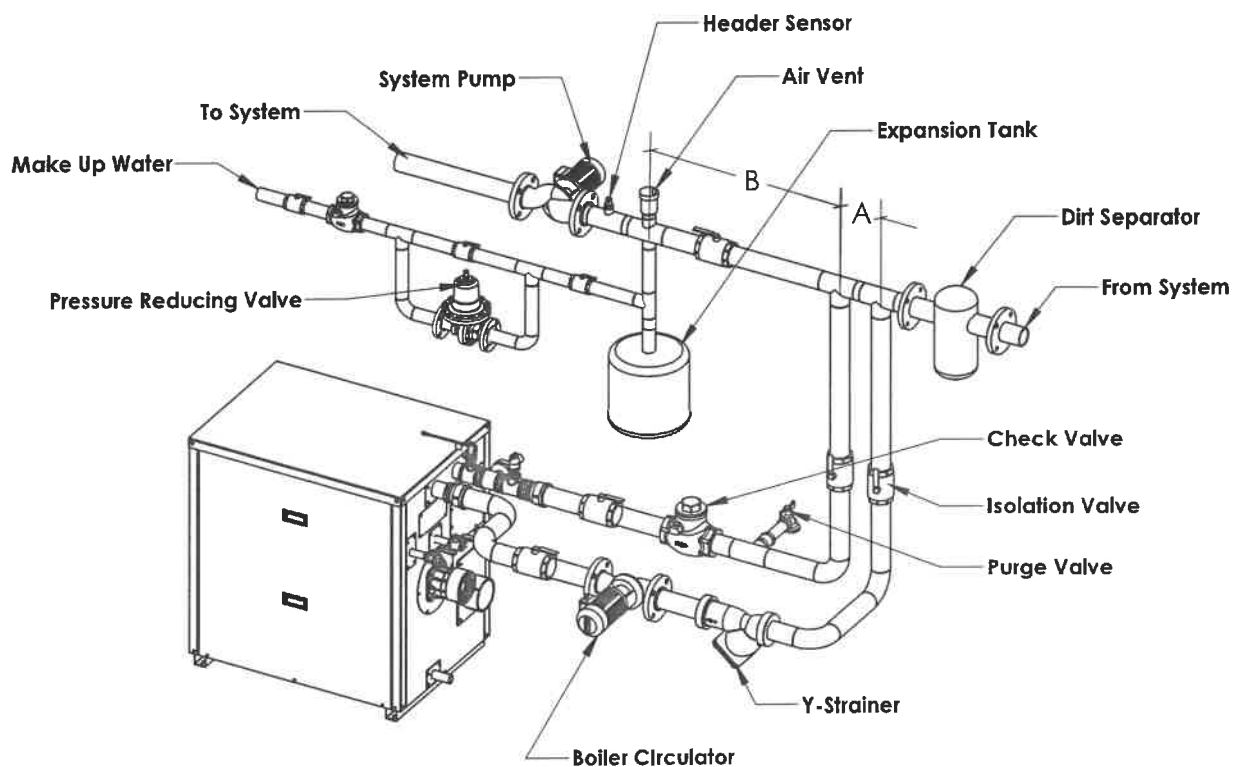
Table B5: Pipe size and Total Head Loss for Boiler Pump Sizing

Model	Nominal Pipe Size (in)	Temperature Rise (°F)	Flow Rate (GPM)	Heat Ex. loss (ft of head)	Total Loss (ft of head)
400	2	20	39	12	15
		30	26	6	7
500	2	20	49	14	17
		30	32	7	8
650	2	20	63	12	17
		30	42	6	9
800	2	20	78	13	21
		30	52	7	11
1000	2.5	20	97	15	21
		30	65	7	10

NOTE: The total loss includes 20 ft of pipe, 6 elbows, and 2 Valves.

X. Water Piping Diagrams

Figure 16: Single Boiler, Primary/Secondary Piping



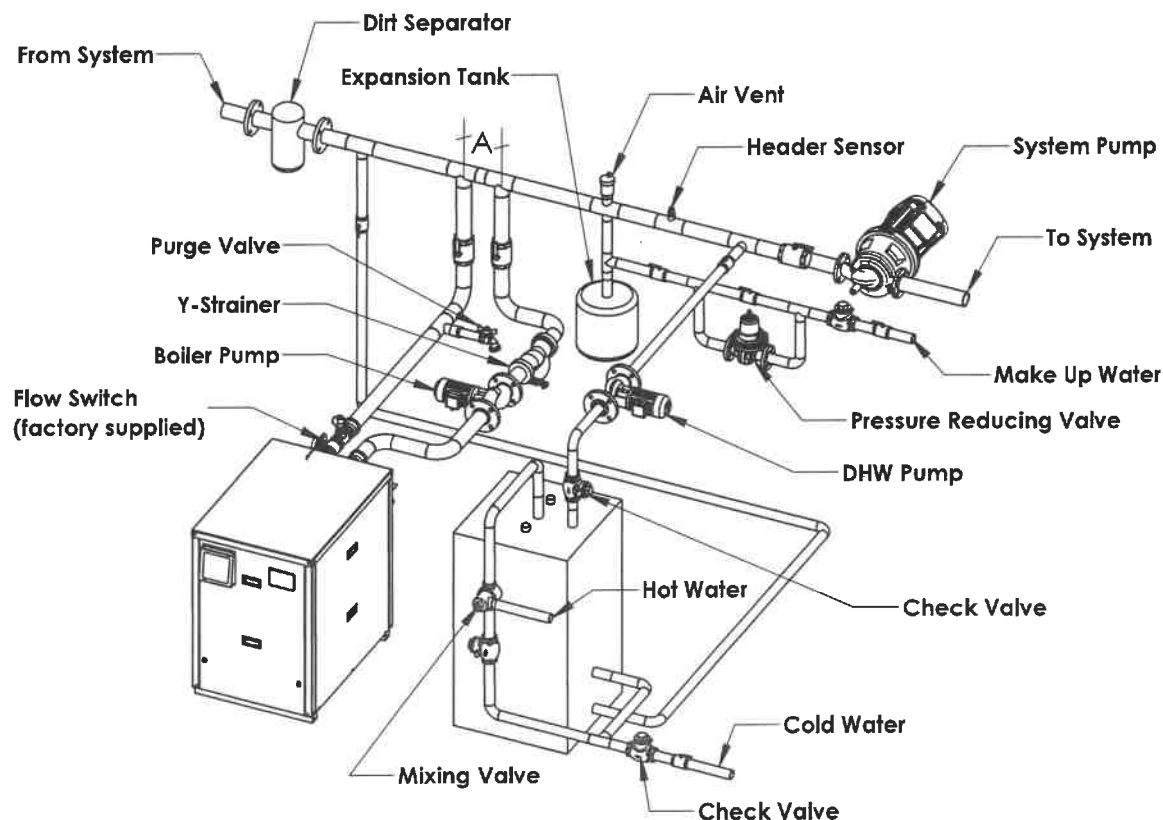
- A. No more than 12 inches or 4 pipe diameters
- B. At least 18" of straight pipe for conventional air scoop



1. These are suggested piping configurations. It is the installer's responsibility to conform to local codes and ordinances for additional requirements.
2. Pressure relief valve rating shall not exceed pressure rating of any component in the system.
3. Some piping components cannot be supported by the piping. Refer to the manufacturers' installation instructions.
4. It is the installer's responsibility to select piping configurations that provide the proper flow rates and performance.

X. Water Piping Diagrams (continued)

Figure 17: Single Boiler with Indirect Domestic Water Heater



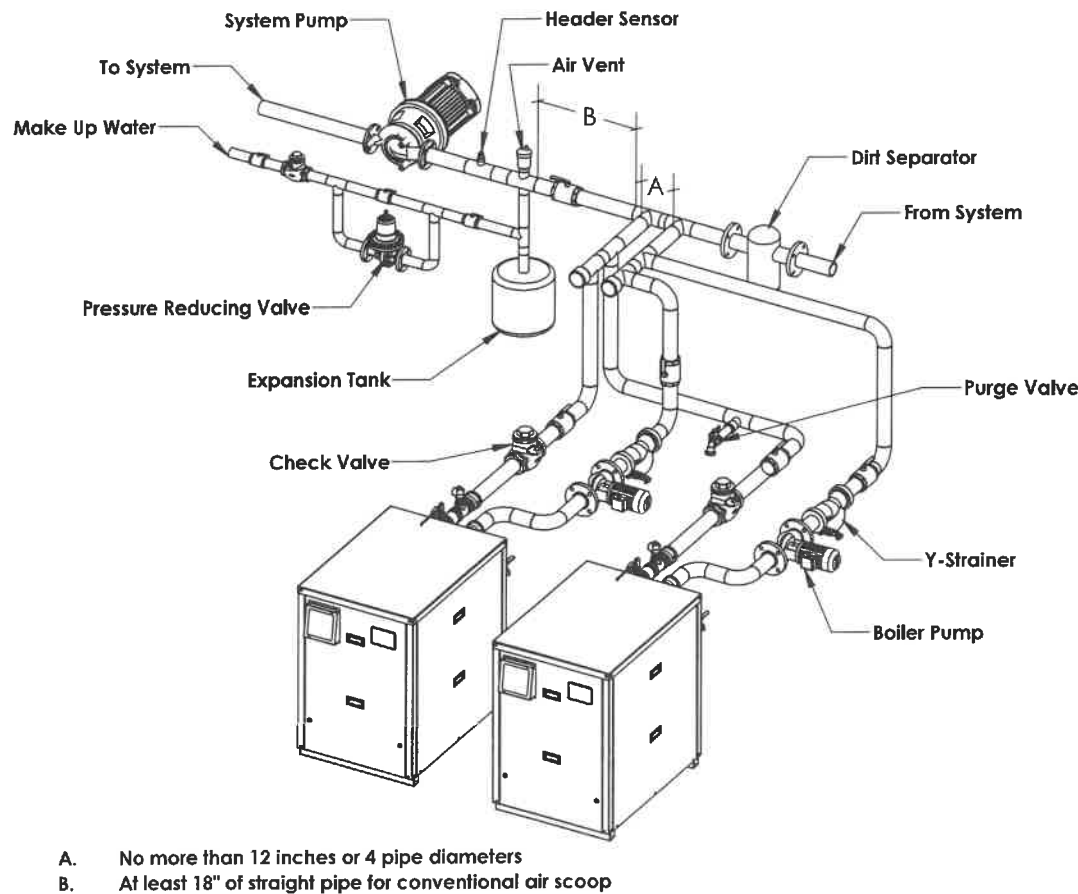
A. No more than 12 inches or 4 pipe diameters



1. These are suggested piping configurations. It is the installer's responsibility to conform to local codes and ordinances for additional requirements.
2. Pressure relief valve rating shall not exceed pressure rating of any component in the system.
3. Some piping components cannot be supported by the piping. Refer to the manufacturers' installation instructions.
4. It is the installer's responsibility to select piping configurations that provide the proper flow rates and performance.
5. Erosion could occur if common piping is undersized.

X. Water Piping Diagrams (continued)

Figure 18: Multiple Boiler, Primary/Secondary with Common Header Piping



- A. No more than 12 inches or 4 pipe diameters
- B. At least 18" of straight pipe for conventional air scoop

Required Common Piping Sizes for Multiple Appliances

Model	Number of Appliances				
	2	3	4	5	6
400	2.5	4	4	5	5
500	3	4	5	5	6
650	4	5	5	6	6
800	4	5	6	6	8
1000L	4	5	6	8	8

Note: Nominal (NPS) pipe sizes are noted. Based on 20°F temperature rise.



CAUTION

1. These are suggested piping configurations. It is the installer's responsibility to conform to local codes and ordinances for additional requirements.
2. Pressure relief valve rating shall not exceed pressure rating of any component in the system.
3. Some piping components cannot be supported by the piping. Refer to the manufacturers' installation instructions.
4. It is the installer's responsibility to select piping configurations that provide the proper flow rates and performance.
5. Erosion could occur if common piping is undersized.

X. Water Piping Diagrams (continued)

Figure 19: Stacked Boilers Hydraulic separator

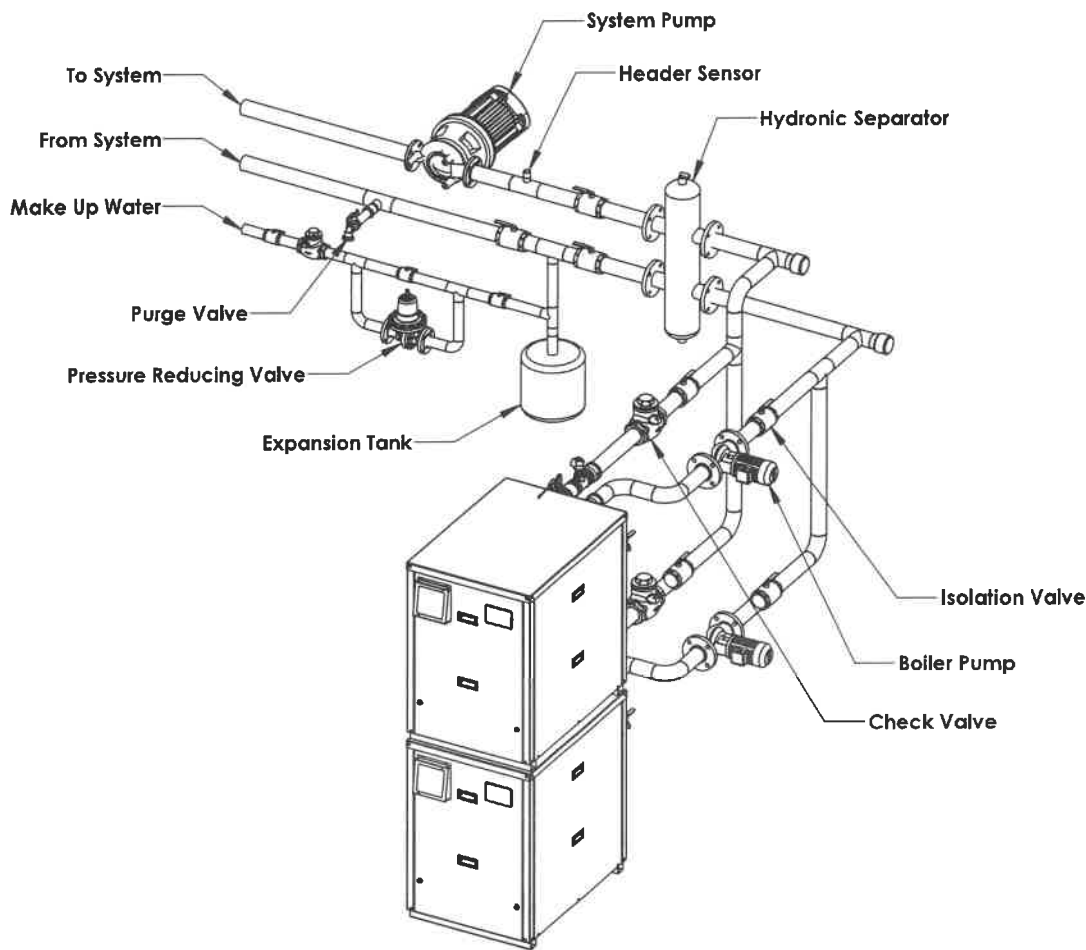


Table 20: Required Common Piping Sizes for Multiple Appliances

Model	Number of Appliances				
	2	3	4	5	6
400	2.5	4	4	5	5
500	3	4	5	5	6
650	4	5	5	6	6
800	4	5	6	6	8
1000L	4	5	6	8	8

Note: Nominal (NPS) pipe sizes are noted. Based on 20°F temperature rise.



1. These are suggested piping configurations. It is the installer's responsibility to conform to local codes and ordinances for additional requirements.
2. Pressure relief valve rating shall not exceed pressure rating of any component in the system.
3. Some piping components cannot be supported by the piping. Refer to the manufacturers' installation instructions.
4. It is the installer's responsibility to select piping configurations that provide the proper flow rates and performance.

XI. Gas Piping

A. Guidelines and Requirements

All installation must conform to the *National Fuel Gas Code ANSI Z223.1/NFPA54*, and/or local codes. In Canada, installation must conform to the latest edition of *CSA B149.1 National Gas and Propane Gas Installation Code*, and/or local codes.

Safe operation of the appliance requires properly sized gas supply piping. Design gas piping system to provide adequate gas supply to the appliance. Account for existing and expected future gas utilization equipments such as boilers and cooking equipment.

1. First verify that the appliance is supplied with the type of gas specified on the rating plate.
2. Account for pressure drop from the point of delivery to the appliance. The maximum allowable system pressure is ½ psig (14 in. wc). Refer to Table 24 for model specific gas pressures and gas connection sizes.
3. If the gas supply pressure is higher than 14 in. wc, An additional field supplied pressure regulator will be required.
4. For length of piping and number of fittings refer to and Table 21 for maximum capacity of Schedule 40 pipe. Table 22 lists equivalent pipe length for standard fittings.
5. Gas piping systems for gas specific gravity of 0.60 can be sized directly from Table 21 unless authority having jurisdiction specifies a gravity factor be applied. For other specific gravities, apply gravity factor from Table 23. If exact specific gravity is not shown choose next higher value.
6. The appliance and its gas connection must be leak tested before placing it in operation.
7. To protect the gas valve when testing over 1/2 psig (3.4 kPa), the appliance and its individual shutoff valve must be disconnected from gas supply piping. For testing at 1/2 psig (3.4 kPa) or less, isolate the appliance from gas supply piping by closing the manual shutoff valve on the appliance.
8. Locate leaks using approved combustible gas non-corrosive leak detector solution.
9. The incoming gas pressure can be measured at the pressure tapping on the manual ball valve.
10. If the high or low gas pressure switch tripped, it must be manually reset before the appliance can be restarted. (See Figure 21)
11. Gas piping shall be supported by fixed hangers or stands and not by the appliance.

12. Purge all air from gas lines.

13. Install manual shutoff valve in accordance with state and local requirements.

14. All threaded joints should be coated with piping compound resistant to action of liquefied petroleum gas.

B. Field Connecting Gas Supply

1. A manual shutoff valve is shipped loose with the appliance and should be installed as shown in Figure 20 with a sediment trap.
 - a. The manual shutoff valve includes tappings for testing supply gas pressure to the appliance.

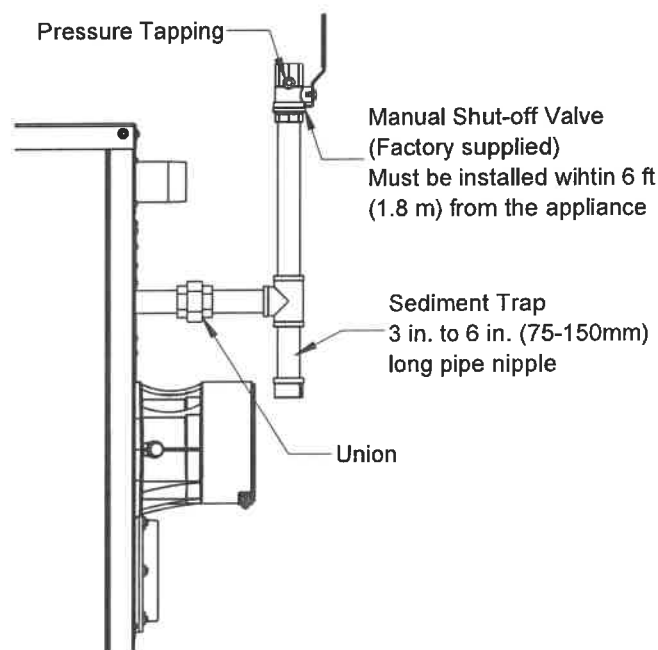


Figure 20: 400-1000L Gas Connection

NOTICE

The high and low gas pressure switches incorporate a vent limiter as per UL 353 and limits the escape of gas to less than 1.0 CFH at 7 PSI if the internal diaphragm ruptures.

Locate the field supplied gas pressure regulator a minimum of 10 ft from the appliance with no more than 1 elbow in-between.

XI. Gas Piping (continued)

Table 21: Maximum capacity of schedule 40 black pipe in CFH*

Natural Gas, Inlet Pressure 14.0 in wc (3.4 kPa) or less; 0.5 in wc (0.12 kPa) Pressure Drop											
Nominal Pipe Size (In)	Inside Diameter (In)	Length of Pipe (Ft)									
		10	20	30	40	50	60	70	80	90	100
½	0.622	172	118	95	81	72	65	60	56	52	50
¾	0.824	360	247	199	170	151	137	126	117	110	104
1	1.049	678	466	374	320	284	257	237	220	207	195
1¼	1.380	1390	957	768	657	583	528	486	452	424	400
1½	1.610	2090	1430	1150	985	873	791	728	677	635	600
2	2.067	4020	2760	2220	1900	1680	1520	1400	1300	1220	1160
2½	2.469	6400	4400	3530	3020	2680	2430	2230	2080	1950	1840
3	3.068	11300	7780	6250	5350	4740	4290	3950	3674	3450	3260

*1 CFH of Natural Gas is approximately equal to 1 MBH; contact your gas suppliers for the actual heating value of your gas.

Propane Gas, Inlet Pressure 11.0 in wc (2.7 kPa); 0.5 in wc (0.12 kPa) Pressure Drop											
Nominal Pipe Size (In)	Inside Diameter (In)	Length of Pipe (Ft)									
		10	20	30	40	50	60	70	80	90	100
½	0.622	116	80	64	55	48	44	40	38	35	33
¾	0.824	242	166	134	114	101	92	85	79	74	70
1	1.049	456	314	252	215	191	173	159	148	139	131
1¼	1.380	937	644	517	442	392	355	327	304	285	269
1½	1.610	1403	964	775	663	588	532	490	456	427	404
2	2.067	2703	1858	1492	1277	1131	1025	943	877	823	778
2½	2.469	4308	2961	2377	2035	1803	1634	1503	1399	1312	1239
3	3.068	7615	5234	4203	3567	3188	2889	2658	2472	2320	2191

*1 CFH of LP gas is approximately equal to 2.5 MBH; contact your gas supplier for the actual heating value of your gas.

Table 22: Equivalent Lengths of Standard Pipe Fittings & Valves (ft)

Nominal Pipe Size	Inside Diameter (in)	Valves (Screwed) - Fully Open				Screwed Fittings				
		Gate	Globe	Angle	Swing Check	45° Elbow	90° Elbow	180 Close Return Bend	90 Tee Flow Through Run	90 Tee, Flow Through Branch
½	0.622	0.4	17.3	8.7	4.3	0.7	1.6	3.5	1.6	3.1
¾	0.824	0.5	22.9	11.4	5.7	1.0	2.1	4.6	2.1	4.1
1	1.049	0.6	29.1	14.6	7.3	1.2	2.6	5.8	2.6	5.2
1¼	1.38	0.8	38.3	19.1	9.6	1.6	3.5	7.7	3.5	6.9
1½	1.61	0.9	44.7	22.4	11.2	1.9	4.0	9.0	4.0	8.0
2	2.067	1.2	57.4	28.7	14.4	2.4	5.2	11.5	5.2	10.3
2½	2.469	1.4	68.5	34.3	17.1	2.9	6.2	13.7	6.2	12.3
3	3.068	1.8	85.2	42.6	21.3	3.6	7.7	17.1	7.7	15.3

XI. Gas Piping (continued)

Table 23: Specific Gravity Correction Factors

Specific Gravity	Correction Factor	Specific Gravity	Correction Factor
0.60	1.00	0.90	0.82
0.65	0.96	1.0	0.78
0.70	0.93	1.10	0.74
0.75	0.90	1.20	0.71
0.80	0.87	1.30	0.68
0.85	0.81	1.40	0.66

C. Gas Pressure Switches

1. This appliance is equipped with a high and low gas pressure switch to comply with CSD-1 standards.
 - a. The gas pressure switches will trip if the incoming gas pressure passes the switches' set point. A tripped switch is indicated on the appliance display. A Manual reset is required to reset the switch and resume operation.

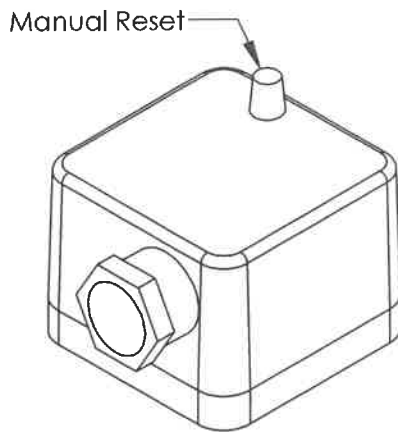


Figure 21: High/Low Gas Pressure Switch

! WARNING

Failure to properly pipe gas supply to appliance may result in improper operation and damage. Always assure gas piping is absolutely leak free and of the proper size and type for the connected load.

An additional gas pressure regulator may be needed. Consult gas supplier.

Failure to use proper thread compounds on all gas connections may result in leaks of flammable gas.

Gas supply to appliance and system must be completely shut off prior to installing or servicing the gas piping.

Do not use matches, candles, or other open flame ignition source to check for leaks.

Use two wrenches when tightening gas piping at the appliance, use one wrench to prevent the gas train from turning.

Failure to support the connection pipe could damage safety components.

Ensure that the high gas pressure regulator is at least 10 feet (3 m) upstream of the appliance.

NOTICE

Use lock-up type gas pressure regulator when low and high gas pressure switches are installed. Older or non-lock-up type regulators may result in nuisance lockouts on gas pressure drops or spikes.

This appliance and all other appliances must be firing at maximum capacity to properly measure the inlet gas pressure.

Table 24: Inlet Gas Pressures and Pipe Size

Model	Inlet Size (In.)	Min. Gas Pres. (In. W.C.)		Max. Gas Pres. (In. W.C.)		High Gas Pressure Switch ¹ (In. W.C.)	Low Gas Pressure Switch ¹ (In. W.C.)
		Natural	Propane	Natural	Propane		
400	3/4	4	8	14	14	1	Natural: 3 LP: 7
500	3/4						
650	1						
800	1						
1000L	1						

¹ Factory default high and low gas pressure switch setpoint.

XII. Electrical

A. General.

Install wiring and electrically ground the appliance in accordance with authority having jurisdiction or, in the absence of such requirements, follow the *National Electrical Code*, NFPA 70, and/or *Canadian Electrical Code* Part 1, CSA C22.1.

1. A separate electrical circuit must be run from the main electrical service with an over-current device/disconnect in the circuit. A service switch is recommended and may be required by some local jurisdictions. Install the service switch in the line voltage "Hot" leg of the power supply. Locate the service switch such that the appliance can be shut-off without exposing personnel to danger in the event of an emergency.

B. Power Requirements

1. Nominal appliance current draw is provided in Table 25. These values are for planning purposes only and represent the appliance's maximum power consumption.

Table 25: Electrical Ratings

Model	Voltage	Phase	Hz	Appliance Amperage
400	120	1	60	7
500				7
650				8
800				8
1000L				8

C. Appliance Wiring

1. Connect to the field wiring PCB's inside the rear control box.
 - a. Low voltage PCB has connections for the tank sensor, external limits, Alarm, 4-20 mA, etc. One 24V fuse and spare are provided. See Figure 23.
 - b. 120 VAC PCB (Figure 22) has connections for line voltage and pumps. Do not exceed 5.6A total pump current draw (system + DHW + boiler pumps). One 6.3A slow-blow pump fuse and spare are provided.

DANGER

Electrical Shock Hazard: Ensure all electrical connections are disconnected before attempting installation or service of electrical components or connections of the appliance or building. Lockout all electrical boxes with padlock once power is turned off.

WARNING

Electrical Shock Hazard: Failure to properly wire electrical connections on the appliance may result in serious physical harm.

Electrical power may be from more than one source. Make sure all power is off before attempting any electrical work.

Each appliance must be protected with a properly sized over-current device.

Never jump out or make inoperative any safety or operating controls.

The wiring diagrams contained in this manual are for reference purposes only. Each appliance is shipped with a wiring diagram attached to the front door. Refer to this diagram and the wiring diagram of any controls used. Read, understand and follow all wiring instructions supplied with the control.

NOTICE

All wires, wire nuts, controls etc. are installer supplied unless otherwise noted.

When making low voltage connections, make sure that no external power source is present in the thermostat or limit circuits. If such a power source is present, it could destroy the microprocessor control. One example of an external power source that could be inadvertently connected to the low voltage connections is a transformer with old thermostat wiring.

To obtain total system power consumption add all selected circulator and component current draws. Label all wires prior to servicing controls. Wiring errors can cause improper and dangerous operation. Verify Proper operation after servicing.

XII. Electrical (continued)

D. Routing Field Connections

1. Route all field connections through conduits into the rear control box.
2. Wire the Header Sensor to the terminals labeled "Header Sensor" on the low voltage PCB.
 - a. Avoid placing the sensor near potential sources of electrical noise such as transformers, power lines, and fluorescent lighting. Wire the sensor to the appliance using 22 gauge or larger wire. As with the sensor, the sensor wiring should be routed away from sources of electrical noise. Where it is impossible to avoid such noise sources, wire the sensor using a 2 conductor, *UL Type CM, AWM Style 2092, 300 Volt 60 C* shielded.

E. System and Circulation Pump Wiring

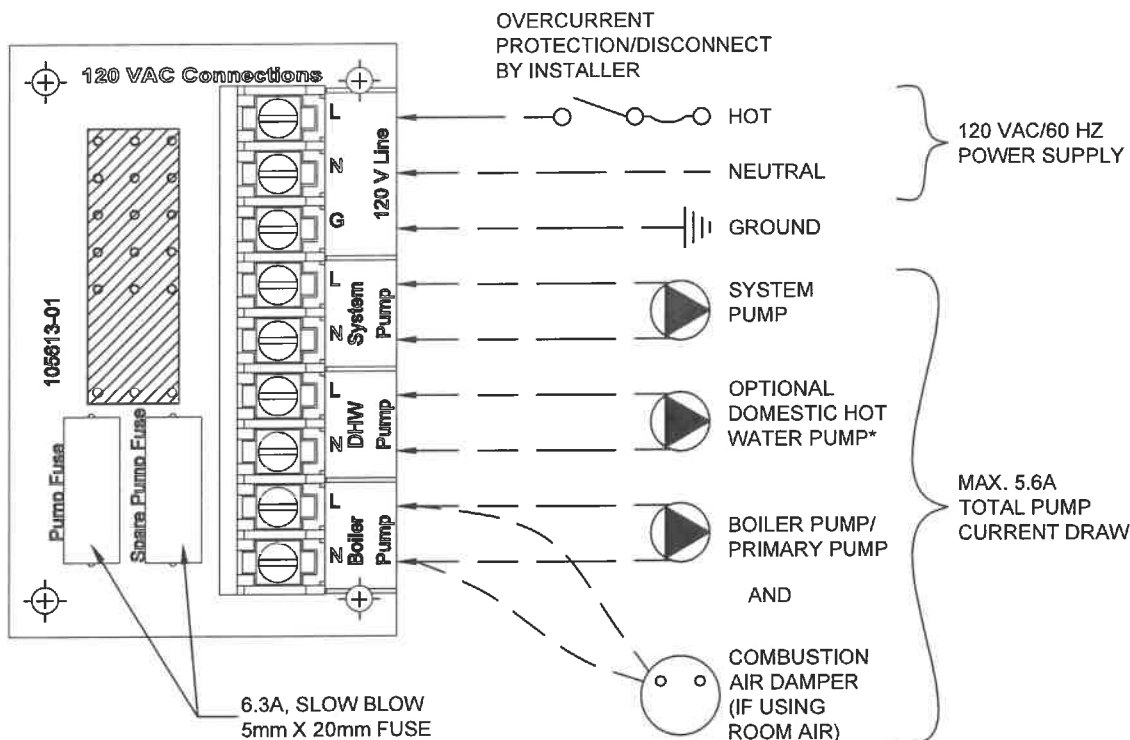
1. Do not exceed 5.6A total pump current draw (system +DHW + boiler pumps). One 6.3A slow-blow pump fuse and spare are provided.

⚠ WARNING

Appliance must be electrically grounded as required by National Electrical Code ANSI/NFPA 70-latest edition.

Caution: Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation.

- a. The system pump can be wired to "System Pump" on the 120 VAC PCB.
- b. The primary pump can be wired to "Boiler Pump" on the 120 VAC PCB.



* For indirect water heating with boiler models. Use Primary Pump for direct water heating with water heater models.

Figure 22: 120 VAC Connections PCB

XII. Electrical (continued)

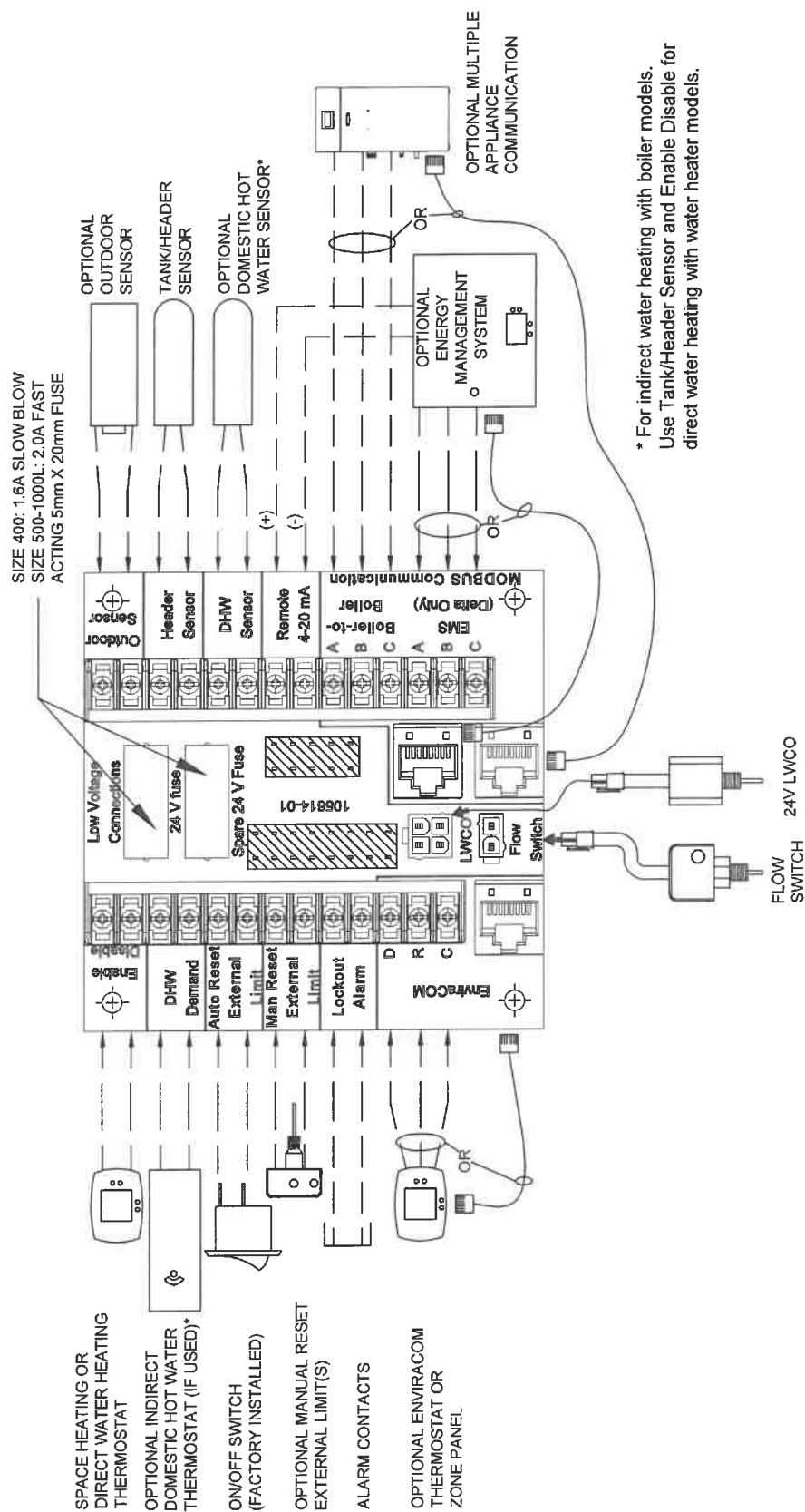


Figure 23: Low Voltage Connections PCB

XII. Electrical (continued)

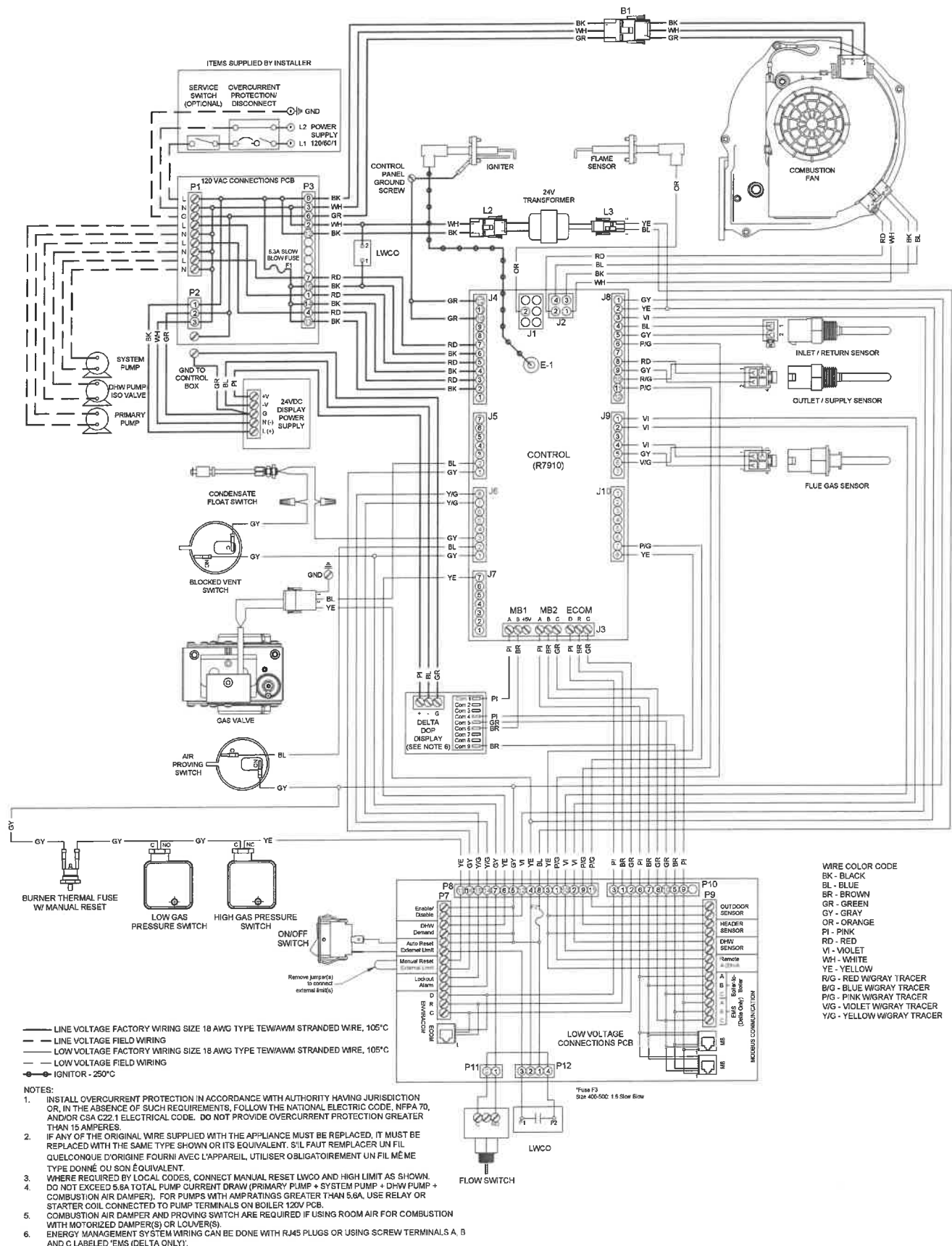


Figure 24: 400-1000L Wire Schematic

XII. Electrical (continued)

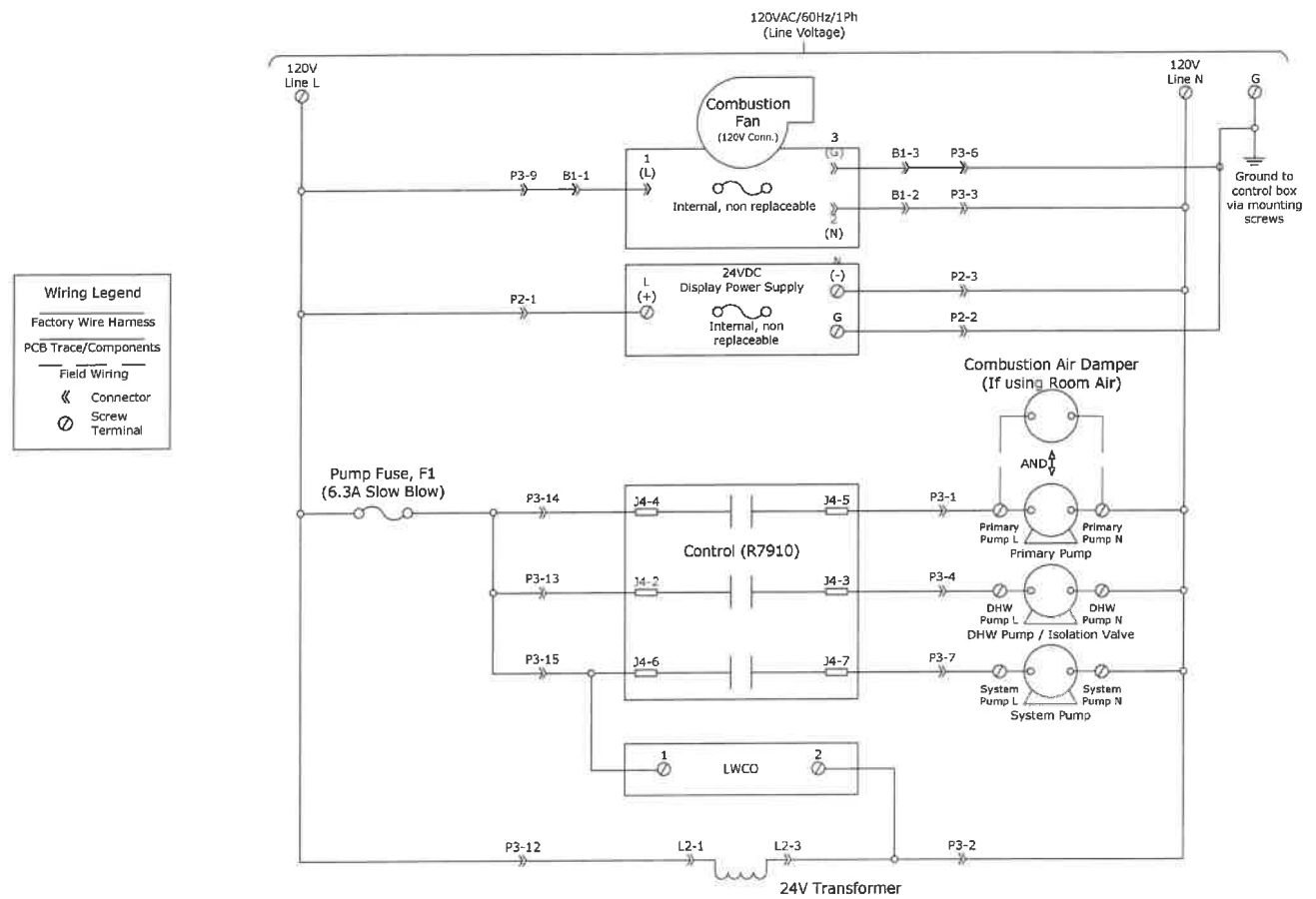
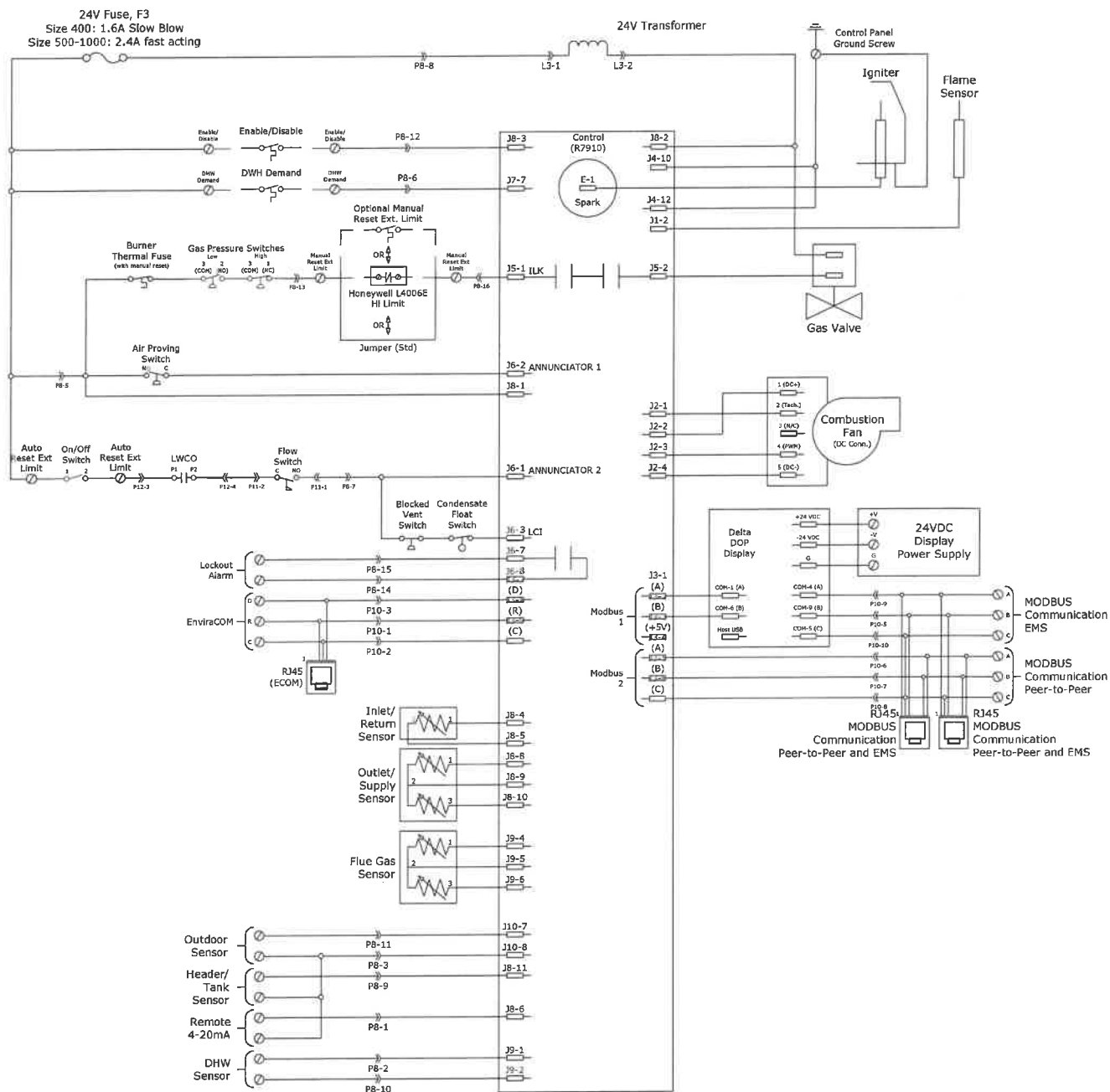


Figure 25: 400-1000L Wire Diagram

XII. Electrical (continued)



Wire Diagram (continued)

XIII. System Start-up

A. Check System Setup

1. Verify that the venting, water piping, gas piping and electrical system are installed properly. Refer to installation instructions contained in this manual.
2. Confirm all electrical, water, and gas supplies are turned off at the source and that venting is clear of obstructions.
3. Flush the system to remove sediment, flux, and other contaminants. This must be done with the appliance isolated from the system.
4. Fill the hot water system with treated water as specified in the water quality section of this manual.
 - a. Maintain at least 15 psi primary loop pressure.
5. Power the appliance. Turn on the electrical supply to the appliance and circulator at the fuse disconnect switch.
6. Power the circulator(s). Turn system circulator(s) on and purge air from the system.
7. Pressurize the fuel line.
 - a. Open the manual gas shut-off valves located upstream of the field supplied gas regulator.
 - b. Check gas piping for leaks and purge gas line of air.
 - c. Ensure the incoming gas pressure is within the min and max on the rating label. Also, ensure the setting for the high and low gas pressure switches are within the limits given in Table 24.
 - d. Reset high and low gas pressure switches by pressing the reset button.

B. Start-up

Start the appliance using "Operating Instructions" in Figure 26.

1. Allow the appliance to complete its standard startup sequence: pre-purge, pre-ignition, and drive light-off.
2. Refer to the Concert Control manual to select the desired control mode.
3. It may take a couple of ignition attempts before a flame is established. After the first ignition failure, the appliance goes into a hard lockout and a manual reset using the Concert Control is required to restart. If ignition is not achieved in three consecutive attempts, contact factory or a qualified heating service technician.

DANGER

Do not use matches, candles, or other open flame ignition sources to check for leaks.

Make sure that the area around the appliance is clear and free from combustible materials, gasoline and other flammable vapors and liquids.

WARNING

Start-up of this appliance should be undertaken only by trained and skilled personnel from a qualified service agency. Follow these instructions exactly. Improper installation, adjustment, service or maintenance can cause severe personal injury, death, or substantial property damage.

The maximum operating pressure of this appliance is 150psi (1034 kPa) with the factory installed temperature and pressure relief valve. Never exceed the maximum allowable working pressure on the heat exchanger ASME plate.

The outlet pressure for the gas valve has been factory set and requires no field adjustment. Attempting to adjust the outlet pressure may result in damage to the gas valve and cause severe personal injury, death, or substantial property damage.

Each appliance is tested at the factory and adjustments to the air fuel mixture are normally not necessary. Improper gas valve or mixture adjustments could result in severe personal injury, death, or substantial property damage.

Any gas valve adjustments (throttle and/or offset) specified herein and subsequent combustion data (%O₂, %CO₂, CO air free ppm) collection must be performed using a calibrated combustion analyzer. Failure to use combustion analyzer could result in personal injury, death, or substantial property damage.

WARNING

Failure to install the condensate drain in accordance with the instructions in this manual could cause flue gas to enter the building, resulting in severe personal injury, death, or substantial property damage.

XIII. System Start-up(continued)

FOR YOUR SAFETY READ BEFORE OPERATING/ P OUR VOTRE SECURITE LISEZ AVANT DE METTRE EN MARCHÉ

WARNING: If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

AVERTISSEMENT: *Quiconque ne respecte pas à la lettre les instructions dans la présente notice risque de déclencher un incendie ou une explosion entraînant des dommages, des blessures ou la mort.*

- A. This appliance does not have a pilot. It is equipped with an ignition device which automatically lights the burner. Do **not** try to light the burner by hand.
- B. BEFORE OPERATING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

WHAT TO DO IF YOU SMELL GAS:

- Do not try to light any appliance.
- Do not touch any electric switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

- C. Use only your hand to turn the gas control knob. Never use tools. If the knob will not turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.
- D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

- A. Cet appareil ne comporte pas de veilleuse. Il est muni d'un dispositif d'allumage qui allume automatiquement le brûleur. Ne tentez pas d'allumer le brûleur manuellement.



- B. AVANT DE FAIRE FONCTIONNER, reniflez tout autour de l'appareil pour détecter une odeur de gaz. Reniflez près du plancher, car certains gaz sont plus lourds que l'air et peuvent s'accumuler au niveau du sol.

QUE FAIRE SI VOUS SENTEZ UNE ODEUR DE GAZ:

- Ne pas tenter d'allumer d'appareil.
- Ne touchez à aucun interrupteur ; ne pas vous servir des téléphones se trouvant dans le bâtiment.
- Appelez immédiatement votre fournisseur de gaz depuis un voisin. Suivez les instructions du fournisseur.
- Si vous ne pouvez rejoindre le fournisseur, appelez le service des incendies.

- C. Ne poussez ou tournez la manette d'admission du gaz qu'à la main ; ne jamais utiliser d'outil. Si la manette reste coincée, ne pas tenter de la réparer ; appelez un technicien qualifié. Le fait de forcer la manette ou de la réparer peut déclencher une explosion ou un incendie.
- D. N'utilisez pas cet appareil s'il a été plongé dans l'eau, même partiellement. Faites inspecter l'appareil par un technicien qualifié et remplacez toute partie du système de contrôle et toute commande qui ont été plongés dans l'eau.

OPERATING INSTRUCTIONS/ INSTRUCTIONS DE FONCTIONNEMENT

1. STOP! Read safety information above on this label.
2. Set the thermostat to lowest setting.
3. Turn off all electric power to the appliance.
4. This appliance is equipped with an ignition device which automatically lights the burner. Do **not** try to light the burner by hand.
5. Turn the external boiler manual gas valve handle clockwise  to close the gas supply.
6. Wait five (5) minutes to clear out any gas. Then smell for gas, including near the floor. If you smell gas, STOP! Follow "B" in the safety information above on this label. If you don't smell gas, go to the next step.
7. Turn the external boiler manual gas valve handle counterclockwise  to open the gas supply.
8. Turn on all electric power to the appliance.
9. Set the thermostat to the desired setting.
10. If the appliance will not operate, follow the instructions "To Turn Off Gas To Appliance" and call your service technician or gas supplier.



OPEN/OUVERT




CLOSED/FERMÉ




EXTERNAL BOILER
MANUAL GAS VALVE
LA CHAUDIÈRE EXTERNE
MANUELLE DE CLAPET À GAZ

1. ARRÊTEZ ! Lisez les instructions de sécurité sur la portion supérieure cette étiquette.
2. Réglez le thermostat à la température la plus basse.
3. Coupez l'alimentation électrique de l'appareil.
4. Cet appareil est équipé de l' dispositif d'allumage qui automobile allume maticallyle brûleur. Ne tentez pas d'allumer le brûleur manuellement.
5. Tourner la chaudière externe manuelle poignée  en clapet à gaz dans le sens des aiguilles d'une montre pour fermer l'offre de gaz.
6. Attendre cinq (5) minutes pour laisser échapper tout le gaz. Reniflez tout autour de l'appareil, y compris près du plancher, pour détecter une odeur de gaz. Si vous seutez une odeur de gaz, ARRÊTEZ ! Passez à l'étape B des instructions de sécurité sur la portion supérieure de cette étiquette. S'il n'y a pas d'odeur de gaz, passez à l'étape suivante.
7. Tourner la chaudière externe manuelle compteur de poignée  en clapet à gaz ouvrir dans le sens des aiguilles d'une montre le gaz approvisionnement.
8. Mettez l'appareil sous tension.
9. Réglez le thermostat à la température désirée.
10. Si l'appareil ne se met pas en marche, suivez les instructions intitulées « Comment couper l'admission de gaz de l'appareil » et appelez un technicien qualifié ou le fournisseur de gaz.

TO TURN OFF GAS TO APPLIANCE/ COMMENT COUPER L'ADMISSION DE GAZ DE L'APPAREIL

1. Set the thermostat to lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Turn the external boiler manual gas valve handle clockwise  to close gas supply.

1. Réglez le thermostat à la température la plus basse.
2. Coupez l'alimentation électrique de l'appareil s'il faut procéder à l'entretien.
3. Tourner la chaudière externe manuelle poignée  en clapet à gaz dans le sens des aiguilles d'une montre pour fermer l'offre de gaz.

101607-03

Figure 26: Operating Instructions

XIII. System Start-up(continued)

4. Begin commissioning the appliance. Visually inspect flame via sight glass window. On high fire the flame should be stable and mostly blue. Yellow tips should not be present; but, intermittent flecks of yellow and orange in the flame are normal.
5. Test any other external limits or other controls in accordance with the manufacturer's instructions.
6. Verify O_2 (or CO_2) and CO concentration are within limits specified in Table 26. Note: the values in this table are for sea level only. For high altitude installation, above 2000 ft. consult factory.

C. Combustion Air/Fuel Adjustment

1. For high fire adjustment
 - a. Lock the appliance in high fire and allow fan speed and combustion analyzer reading to stabilize before taking combustion readings. To lock in high fire, select MAIN MENU >> OPERATION. Select lock symbol, type password and select ENTER. From the Operation screen, select Automatic / Manual Firing Rate Control >> Manual Modulation. Go back to Operation screen. Then select High Low >> High.
 - b. Once high fire rate is reached, adjust the O_2 level at high fire with all the jackets, including the front cabinet door, closed.
 - c. For appliances specified to be less than 20 ppm NOx adjust O_2 level to approximately 6.0% (Natural gas).
 - d. If high fire O_2 is too high (CO_2 is too low), decrease O_2 (increase CO_2) by turning the throttle screw counter-clockwise in 1/4 turn increments and checking the O_2 (or CO_2) after each adjustment. Refer to Figure 27 for location of throttle screw. Verify CO air free is less than 200 ppm.

- e. If high fire O_2 is too low (CO_2 is too high), increase O_2 (decrease CO_2) by turning the throttle screw clockwise in 1/4 turn increments and checking the O_2 (or CO_2) after each adjustment. Refer to Figure 27 for location of throttle screw. Verify CO air free is less than 200 ppm.
2. For low fire adjustment
 - a. Lock appliance in low fire and allow fan speed and combustion analyzer reading to stabilize before taking combustion readings. To lock in low fire, select High Low >> Low.
 - b. If low fire O_2 is too low (CO_2 is too high), increase O_2 (decrease CO_2) by turning the offset screw counter-clockwise in less than 1/8 turn increments and checking the O_2 (or CO_2) after each adjustment. Verify CO concentration is less than 200 ppm.
 - c. If low fire O_2 is too high (CO_2 is too low), decrease O_2 (increase CO_2) by turning the offset screw clockwise in 1/4 turn increments and check O_2 (or CO_2) after each adjustment. Verify CO air free is less than 200 ppm.
 - d. Verify O_2 repeatability by modulating to high and low fire three times.

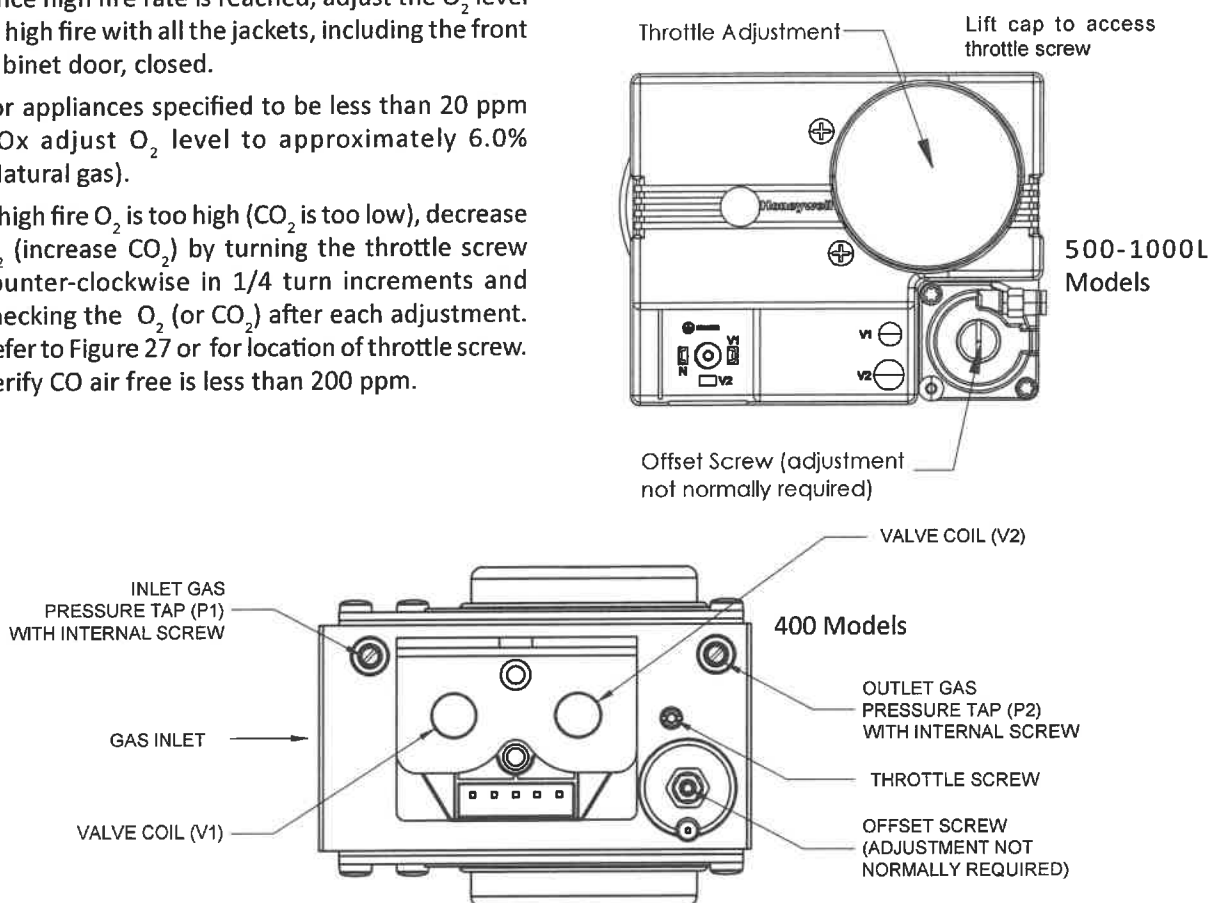


Figure 27: Gas Valve Adjustment

XIII. System Start-up(continued)

- e. Once the appliance is operating within the specified high and low fire ranges, record emissions, flue draft, and other important data.
 - f. Compare emission data to the factory emissions report posted on the back of the front jacket panel.
3. Return the appliance to Automatic Mode. From Operation screen, select Automatic / Manual Firing Rate Control >> Automatic Modulation. Select HOME to return to the Home Screen.

WARNING

Do not operate this appliance without air filter installed and front panel secured with latches and screws. Failure to comply could result in unreliable operation, minor personal injury, or property damage.

E. Field Conversion of Gas Type

This appliance is factory tested and set up for the gas type selected but can be field converted with the following steps.

WARNING

Changing gas type requires adjustment to the gas valve. Not following these instructions may result in personal injury, death, or substantial property damage.

1. Order a gas conversion kit for the model size being converted.
 - a. Gas conversion kits include a mixer and label. See Table 29 for part numbers.
 - b. Replace the old mixer with the new one.
2. Connect the new gas supply to the appliance, check for leaks, and purge the gas line in accordance with the *National Fuel Gas Code*, ANSI Z223.1/NFPA 54 and/or *Natural Gas and Propane Installation Code*, CAN/CSA B149.1 or the requirements of the authority having jurisdiction.
3. Adjust the throttle screw towards negative (-) (clockwise) all the way to the closed position. Then, open the throttle with the number of turns for the gas type and model as given in Table 28.
4. Start the appliance using the System Start-up section of these instructions. Even if the gas line has been completely purged of air, the burner may fail to ignite. If burner does not light, turn the throttle towards positive (+) counter-clockwise in 1/4 turn increments, allowing at least three tries for ignition at each setting, until ignition is achieved.

5. Use a combustion analyzer and follow the Air/Fuel adjustment instructions to set up high fire and low fire.
6. Fill out the gas conversion labels included with the appliance (Order part number 110301-01 if not included). Follow the instructions included with the label for placement.

WARNING

Asphyxiation Hazard. These instructions include a procedure for adjusting the air-fuel mixture on this boiler. This procedure requires a combustion analyzer to measure the O₂ (or CO₂) and Carbon Monoxide (CO air free) levels in flue gas. Adjusting the air-fuel mixture without a proper combustion analyzer could result in unreliable boiler operation, personal injury, or death due to carbon monoxide poisoning.

WARNING

Improper Gas valve adjustment may cause air deficiency. Operating in this condition causes dangerous levels of CO and potentially flashback.

Make sure that all adjustments at high fire are made with the throttle, not offset screw.

The throttle adjustment values shown are approximate. The final throttle setting must be found using a combustion analyzer

Table 26: Combustion O₂/CO₂ Levels

Model	Natural Gas		LP Gas	
	CO ₂ %	O ₂ %	CO ₂ %	O ₂ %
400	8.8	5.2	9.8	5.9
500	8.8	5.2	9.8	5.9
650	8.8	5.2	9.8	5.9
800	8.8	5.2	9.8	5.9
1000L	8.8	5.2	9.8	5.9

XIII. System Start-up(continued)

Table 28: Throttle Screw Starting Position

Model	Number of turns from closed
	Natural Gas/Propane Gas
400	2
500	2
650	1
800	1
1000L	1
Note: Adjust as instructed in the air/fuel commissioning (start-up) section.	

Table 29: Gas Conversion Kits

Model	Part Number	
	To Natural Gas	To LP Gas
400	111545-01	111544-01
500	111545-02	111544-02
650	111545-03	111544-03
800	111545-04	111544-04
1000L	111545-05	111544-05

Table 27: Safety Device Test

Component	Test Method(s)	After Lockout Annunciation	Actual Alarm Message
High Gas Pressure Switch	Close the manual gas valve between the gas valve and the blower. Cycle the power.	Manually reset the = Control and switch. Adjust the switch to its normal setting.	Hard Lockout. Gas Pressure Switch
Low Gas Pressure Switch	Increase the setting of the switch until the switch trips.	Manually reset the Concert Control and switch. Adjust the switch to its normal setting.	Hard Lockout. Gas Pressure Switch
Vestibule Thermal Fuse	Disconnect one wire of the thermal fuse. Cycle the power.	Re-connect wiring to the thermal fuse. Reset thermal fuse lockout.	Hard Lockout. Thermal Fuse
Blocked Condensate Switch	Disconnect one wire of the blocked condensate switch. Cycle the power.	Re-connect wire to the blocked condensate switch. Reset the blocked condensate switch lockout.	Hard Lockout. Blocked Condensate switch
Low Water Cutoff	While the appliance is running push and hold the LWCO test button until the control shuts down the main burner.	Manually reset the Concert Control and reset the LWCO by pressing the reset button.	Hard Lockout. Low Water Level.
Water Flow Switch	Reduce the water flow rate with a manual shutoff valve until the appliance shuts down.	Adjust manual valve to normal position.	Low Water Flow

F. Pump Control

Ensure the appropriate pump parameters are selected in the Pumps menu of the Concert control. Refer to the Concert Control manual for more information.

G. Check Thermostat Operation

Verify that the appliance starts and stops in response to calls for hot water. Make sure that the appropriate circulator(s) start and stop.

H. Adjust Supply Water Temperature

As shipped, the central heat and DHW setpoint is 180°F (82.2°C). If necessary, adjust this to the appropriate settings for the system to which this appliance is connected. For information on how to adjust the set point, refer to the “Setup and Tuning” section of the Concert™ Control manual.

1. For a hot water supply boiler supplying domestic hot water, at the factory setting, a mixing valve is required to control the supply water at a temperature that will not cause scalding.

I. Testing of Controls and Safety Devices

Prior to placing the appliance in operation, the installing contractor or other responsible personnel must perform safety and control device limit tests to ensure proper operation of the appliance. Refer to Table 27 for recommended method(s) of carrying out these safety limit devices tests.

IMPORTANT PRODUCT SAFETY INFORMATION REFRACTORY CERAMIC FIBER PRODUCT

WARNING

The Repair Parts list designates parts that contain refractory ceramic fibers (RCF). RCF has been classified as a possible human carcinogen. When exposed to temperature above 1805 °F, such as during direct flame contact, RCF changes into crystalline silica, a known carcinogen. When disturbed as a result of servicing or repair, these substances become airborne and, if inhaled, may be hazardous to your health.

AVOID Breathing Fiber Particulates and Dust

Precautionary Measures:

Do not remove or replace RCF parts or attempt any service or repair work involving RCF without wearing the following protective gears:

1. A National Institute for Occupational Safety and Health (NIOSH) approved respirator
 2. Long sleeved, loose fitting clothing
 3. Gloves
 4. Eye Protection
- Take steps to assure adequate ventilation
 - Wash all exposed body area gently with soap and water after contact.
 - Wash work clothes separately from other laundry and rinse washing machine after use to avoid contaminating other clothing.
 - Discard used RCF components by sealing in an airtight plastic bag. RCF and crystalline silica are not classified as hazardous wastes in the United States and Canada.

First Aid Procedures:

- If contact with eyes: Flush with water for at least 15 minutes. Seek immediate medical attention if irritation persists.
- If contact with skin: Wash affected area gently with soap and water. Seek immediate medical attention if irritation persists.
- If breathing difficulty develops: Leave the area and move to a location with clean fresh air. Seek immediate medical attention if breathing difficulties persist.
- Ingestion: Do NOT induce vomiting. Drink plenty of water. Seek immediate medical attention.

XIV. Service and Maintenance

A. General Maintenance

1. Keep the area around the appliance free from combustible materials. (Gasoline and other flammable vapors and liquids)
2. Keep the area around the combustion air inlet terminal free from contaminants.
3. Keep the boiler room ventilation orifices open and unobstructed.
4. Remove front jacket panel and check minimum and blocked vent switches for cracks and check pressure sensing line connections.
5. Vacuum any sediment and dust from the interior and components.

B. Monthly Inspection

1. Inspect the vent piping and outside air intake piping to verify they are open, unobstructed, and free of leakage or deterioration. Check screens in vent and air intake terminations to verify they are clean and free of debris.
2. Inspect the condensate drain system to verify it is leak proof, open and unobstructed. Call the service technician if the condensate drain system requires maintenance.
3. Inspect water and gas lines to verify they are free of leaks.

C. Annual Inspections and Service

In addition to the inspection listed above the following should be performed by a service technician once every year.

1. Check O₂% or CO₂% and CO using a combustion analyzer and ensure the readings are within the ranges in the System Start-up section of this manual. Adjust if necessary.
2. Water flow switch
 - a. Test the flow switch by disabling the appliance's primary loop circulator. The appliance must not start when there is no flow of water.
 - b. Remove flow switch and visually inspect paddle for deterioration.
3. Condensate tubing
 - a. Inspect flexible tubing connecting heat exchanger and PVC condensate line. Check for tears/deterioration of the tubing or corrosion on the clamps. Replace if damaged.

WARNING

Read and understand the entire manual before attempting installation, start-up, operation, or service. Installation and service must be performed only by an experienced and skilled installer or service agency.

This appliance requires regular maintenance and service to operate safely. Follow the instructions contained in this manual. Improper installation, adjustment, alteration, service, or maintenance can cause personal injury, death, or substantial property damage.

A clean and unobstructed venting system is necessary to allow noxious fumes that could cause injury or loss of life to vent safely, and will contribute toward maintaining the appliance's efficiency.

Installation is not complete unless a temperature and pressure relief valve is installed in the tapping located on the water manifold or supply piping. Refer to piping section of the manual.

If damage due to frozen pipes is a possibility, the piping system should be not left unattended in cold weather; or appropriate safeguards and alarms should be installed on the heating system to prevent damage if the appliance is inoperative.

Do not unscrew any pipe fittings nor attempt to disconnect any components on this appliance without positively assuring the water is cool and has no pressure. Always wear protective clothing and equipment when installing, starting up, or servicing this appliance to prevent scald injuries.

CAUTION

Caution: Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation.

Verify proper operation after servicing.

NOTICE

To reduce lime scale buildup and prolong the life of the appliance, closely monitor pH, chloride, total dissolved solids, and water hardness levels.

See Table 20.

XIV. Service and Maintenance (continued)

4. Igniter Electrode

- Disconnect power to the unit and remove ignition electrode from the burner door.
- Visually inspect igniter assembly (ceramic insulators, bracket, and graphite gasket) for damage. Replace igniter assembly if the electrodes are deformed or ceramic insulators are cracked.

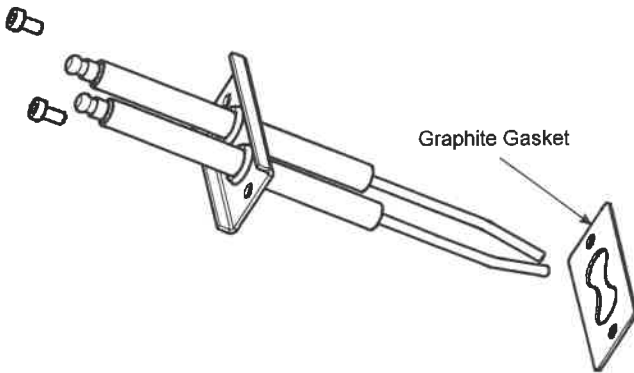


Figure 28: Ignition Electrode Assembly

- Remove any excess oxide deposits from the surface of the igniter with steel wool or emery cloth. Do not use sandpaper.
 - Install igniter as shown in Figure 28.
- ### 5. Ionization Electrode (Flame Rod)
- Disconnect power to the unit and remove flame rod from the burner door.
 - Visually inspect electrode assembly (ceramic insulator, bracket, and graphite gasket) for damage. Replace the assembly if the electrode is deformed or the ceramic insulator is cracked.
 - Remove any excess oxide deposits from the surface with steel wool or emery cloth. Do not use sandpaper.
 - Install flame rod as shown in Figure 29.

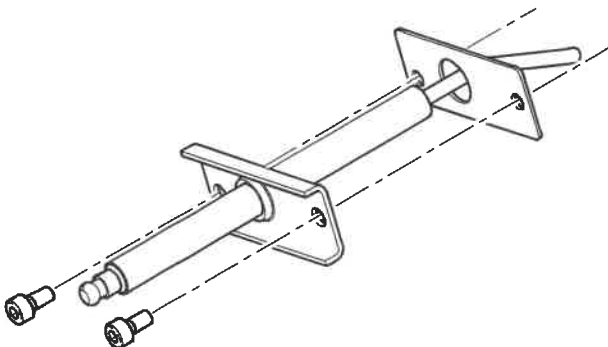


Figure 29: Flame Rod Assembly

DANGER

This appliance uses flammable gas, high voltage electricity, moving parts, and very hot water under high pressure. Ensure that all gas and electric power supplies are off and that the water temperature is cool before attempting any disassembly or service.

Do not attempt any service work if gas is present in the air around the appliance. Never modify, remove or tamper with any control device.

WARNING

This appliance contains components that become very hot when the operating. Do not touch any components unless they are cool.

This appliance contains materials of construction, products of combustion and the fuel contain alumina, silica, heavy metals, carbon monoxide, nitrogen oxides, aldehyde and/or other toxic or harmful substances which can cause death or serious injury and which are known to the state of California to cause cancer, birth defects and other reproductive harm. Always use proper safety clothing, respirators, and other safety equipment when servicing or working near the appliance.

Failure to follow all instructions in the proper order can cause personal injury or death. Read all instructions, including all those contained in component manufacturers manuals which are provided with the appliance before installing, starting up, operating, maintaining, or servicing.

All cover plates, enclosures and guards must be in place at all times.

If any controls are replaced, they must be replaced with identical models.

If any electrical wires are disconnected during service, clearly label the wires and assure that the wires are reconnected properly.

Never jump out or bypass any safety or operating control or component.

Interior of the venting system must be inspected and clean before the initial startup and should be inspected periodically for any obstructions.

XIV. Service and Maintenance (continued)

6. Flue outlet connection
 - a. Visually inspect flue outlet gasket for damage or deterioration, replace if necessary.
 - b. Any accumulation of soot or debris should be thoroughly cleaned out.
7. Combustion air filter with air box
 - a. Undo the latches on the filter box to lift the lid and access the filter.
 - b. Clean the filter of dust and debris using compress air or water.
 - c. Replace filter if it appears damaged or deteriorated.
 - d. Reinstall filter and lid.
8. Insulations and gaskets
 - a. Visually inspect the following gaskets: flue outlet, blower, burner, and burner door.
9. Burner and Combustion Chamber
 - a. To gain access to burner and combustion chamber, first remove front jacket panel and then disconnect the gas train assembly at the union connection and the mixer connection.
 - b. Remove the filter box from the mixer.
 - c. Remove all six bolts used to fasten the burner door to the heat exchanger.
 - d. Slide the control box out.
 - e. The burner door, blower, and mixer assembly can be pulled out of the appliance jacket as shown in Figure 30.
 - f. Gently blow compressed air over the burner surface and door insulation to remove lint and debris. Replace burner if the surface shows any signs of damage due to improper handling or gas valve combustion settings.
 - i. Minor blue, yellow, and brown coloring is normal for burners recently installed.
 - ii. Some white and/or red residue is normal.
 - iii. Burners with any cracks or dents must be replaced immediately. Inspect weld seams and end cap thoroughly.
 - g. Do not use acid or alkali products or metallic brush to clean the heat exchanger coils. Follow these guidelines to clean the heat exchanger:
 - i. Spray the heat exchanger coils with white vinegar (acetic acid) and then flush it with clean water after 20 minutes.
 - ii. Do not spray burner, combustion chamber divider, or burner door insulations.

WARNING

Failure to properly secure the burner/blower/gas valve assembly to the heat exchanger could lead to personal injury, death, or substantial property damage.

Read, understand and follow all the instructions and warnings contained in ALL of the component instruction manuals.

Assure that all limits and operating controls and components are operating properly before placing the appliance back in service.

Annually inspect all vent gaskets and replace any exhibiting damage or deterioration.

NOTICE

This appliance has a limited warranty, a copy of which is included in shipping. It is the Responsibility of the installing contractor to see that all controls are correctly installed and are operating properly when the installation is complete.

Warranty does not cover damage or malfunction if the steps mentioned in this manual are not performed at the intervals specified.

Water leaks can cause severe corrosion damage immediately repair any leaks found.

- h. When reinstalling burner door, tighten M10 burner door screws to 37 ft-lb (50 nm) using 8mm hex bit.

XIV. Service and Maintenance (continued)

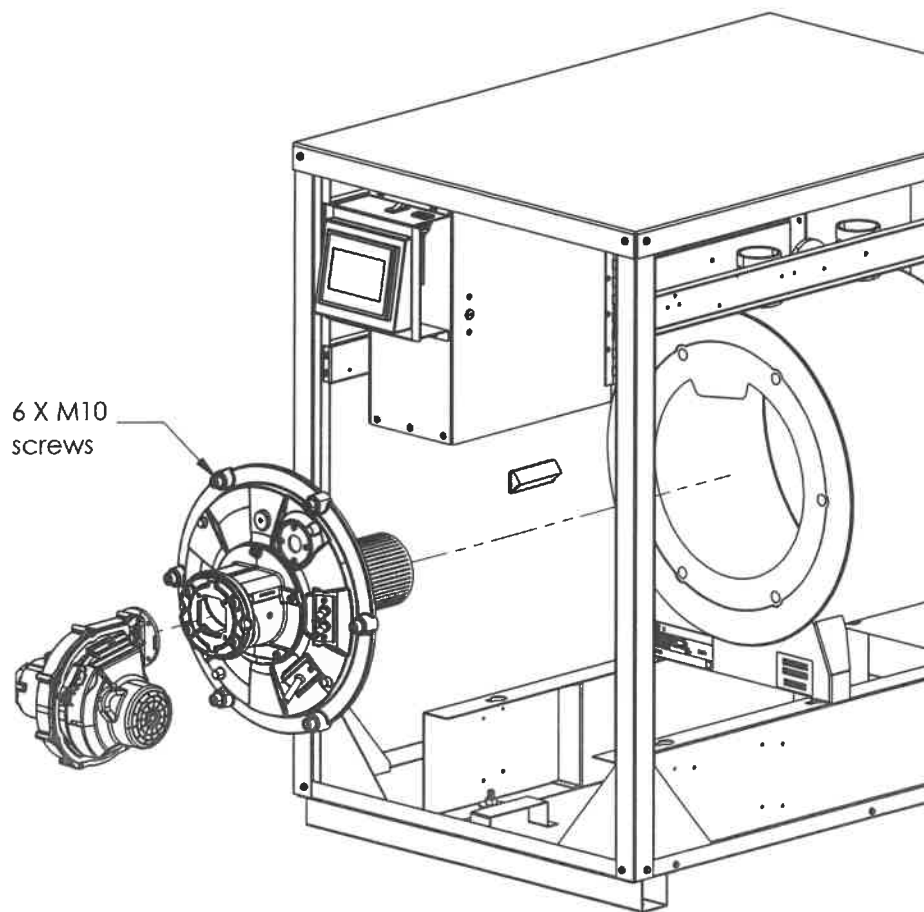


Figure 30: Burner Door Opening

D. Restarting after Prolong Shutdown

After prolonged shutdown, it is recommended that the steps in "System Start-up" and "Service and Maintenance" in this manual be performed.

E. Troubleshooting

Refer to the troubleshooting section in the Concert™ Control manual on how to navigate the Limit String Status screen which shows an active safety limit status and for an in-depth guide to all the possible lockouts as well as recommended corrective actions to restore operation.

⚠ WARNING

Operating this appliance with a cracked, dented, or otherwise damaged burner may cause flashback or further damage to the pressure vessel. Replace damaged burners immediately.

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APPENDIX C: High Altitude Installations Above 2000 ft

A. Percent Derate For Altitudes Above 2000 ft.

1. Use the derate table below for calculating the approximate input rate at the installation altitude.

Derate per 1,000 ft. of Altitude

Model	Altitude (ft)	2,001-6,000	6,001-8,000	8,001-10,100
400	NG	2.5%	No Application	
	LP	2.5%		
500	NG	2.6%		
	LP	2.6%		
650	NG	0.0%	2.0%	2.1%
	LP	0.0%	2.0%	2.7%
800	NG	2.7%	3.4%	3.4%
	LP	3.1%	3.8%	3.5%
1000L	NG	3.8%	3.4%	3.4%
	LP	3.4%	4.1%	4.1%

Notes:

1. Percentages are per 1000 ft. above sea level.
2. Venting Derate should be applied after the altitude derate.
3. Installations of 400 and 500 models above 6000 ft is not recommended.

B. Adjusting Parameters Using Display

1. Press Adjust, Modulation, then Lock.
2. Type password 86 and enter.
3. Press Unit Model and select Adjust.
4. Use the up and down arrows to scroll between different unit models. Use table below to determine correct unit model suffix for the application's altitude.

Unit Model Suffix	Altitude (ft)
-02	0-2000
-26	2001-6000
-68	6001-8000
-80	8001-10100

5. Ensure selected model has the correct fuel type. The model name will contain 'N' after the size for natural gas or 'P' for propane. Some models need no fuel specifications.
6. Confirm selection and return to the home screen. Reference the 'Setup and Tuning' section of the Concert™ Control Manual for more detail.

DANGER

These instructions include a procedure for adjusting the air-fuel mixture on this appliance. This procedure requires a combustion analyzer to measure the CO₂ (or Oxygen) and Carbon Monoxide (CO air free) levels in flue gas. Adjusting the air-fuel mixture without a proper combustion analyzer could result in unreliable operation, personal injury, or death due to carbon monoxide poisoning.

WARNING

Failure to set up the appliance in accordance with these instructions could result in high amount of Carbon Monoxide to be produced which could result in severe personal injury, death, or substantial property damage.

C. Start-up instructions

1. Follow Instructions in the Start-up section of this manual using Air-Fuel ratio ranges in this appendix.

Air-Fuel Adjustment for High Altitude Installations

		High Fire O2% Range			Low Fire O2% Range			
Model	Altitude (ft)	2,001-6,000	6,001-8,000	8,001-10,100	2,001-6,000	6,001-8,000	8,001-10,100	
400	NG	5.0-5.5	No Application		5.0-5.5	No Application		
	LP	5.7-6.1			5.5-6.0			
500	NG	5.0-5.5			5.0-5.5			5.0-5.5
	LP	5.7-6.1			5.5-6.0			5.5-6.0
650	NG	5.0-5.5	5.0-5.5	5.5-6.0	5.0-5.5	5.0-5.5	5.0-5.5	
	LP	5.8-6.1	5.8-6.2	5.9-6.3	5.7-6.1	5.5-6.0	5.5-6.0	
800	NG	5.0-5.5	5.0-5.5	5.9-6.3	5.0-5.5	5.0-5.5	5.5-6.0	
	LP	5.8-6.1	5.8-6.2	5.8-6.1	5.7-6.1	5.4-5.8	5.5-6.0	
1000L	NG	5.2-5.7	5.2-5.7	5.2-5.7	5.0-5.5	5.0-5.5	5.0-5.5	
	LP	5.7-6.1	5.6-6.0	5.8-6.2	5.7-6.1	5.5-6.0	5.5-6.0	

APPENDIX D: Default Light-off and Modulation Rates

Parameter	Model						
	400	500	650 NG	650 LP	800 NG	800 LP	1000L
Max Power MBTU	399	500	650	650	800	800	999
CH/DHW Max. Modulation Rate (RPM) ¹	8000	7800	5550	5700	6400	6400	6800
Minimum Modulation Rate (RPM)	1400	1300	1050	1100	1200	1200	1300
Light-off (RPM) ¹	3400	2200	2400	2000	2400	1900	2400
Maximum Light-off (RPM)	3600	3600	2600	2600	2600	2600	2600
Minimum Light-off (RPM)	3000	1900	1700	1700	1700	1700	2200

¹ Factory Default RPM

NOTE: To maintain rate in maximum vent length application, contact factory for assistance.

High Altitude Modulation Rates

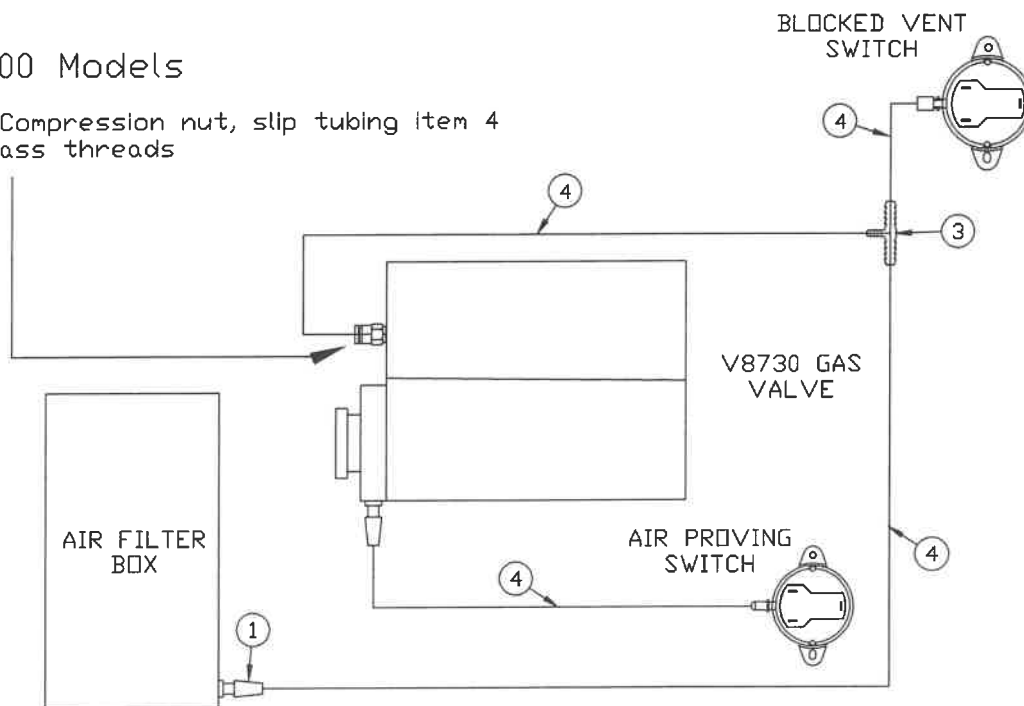
		Max. Modulation Rate (RPM)			Min. Modulation Rate (RPM)			
Model	Altitude (ft)	2,001-6,000	6,001-8,000	8,001-10,100	2,001-6,000	6,001-8,000	8,001-10,100	
400	NG	8250	No Application		1700	No Application		
	LP							
500	NG	8500						1600
	LP	8400						
650	NG	6800	6400	6400	1350	1400	1450	
	LP			5800				
800	NG	6800	6300	6300	1550	1450	1600	
	LP				1450	1550		
1000L	NG	6700	6500	6500	1550	1550	1700	
	LP		5100	6000				

APPENDIX E: Gas Valve and Pressure Switch Tubing Schematics

ITEM	PART NO.	DESCRIPTION
1	111010-01	TUBE FITTING, BULKHEAD, $\frac{1}{4}$ " NPT \times $\frac{3}{16}$ " TUBE
2	108452-01	$\frac{1}{8}$ " NPT X BARB FITTING, BRASS
3	102490-01	$\frac{5}{32}$ " BARB TEE
4	9016007	$\frac{3}{16}$ " SILICONE TUBING

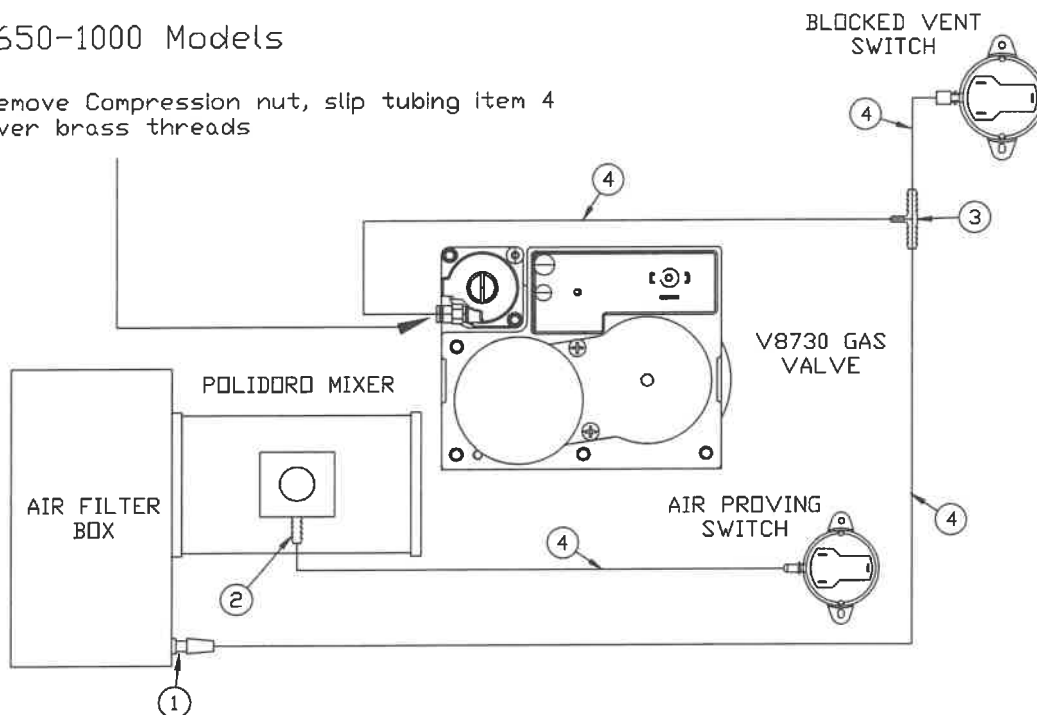
500 Models

Remove Compression nut, slip tubing item 4 over brass threads

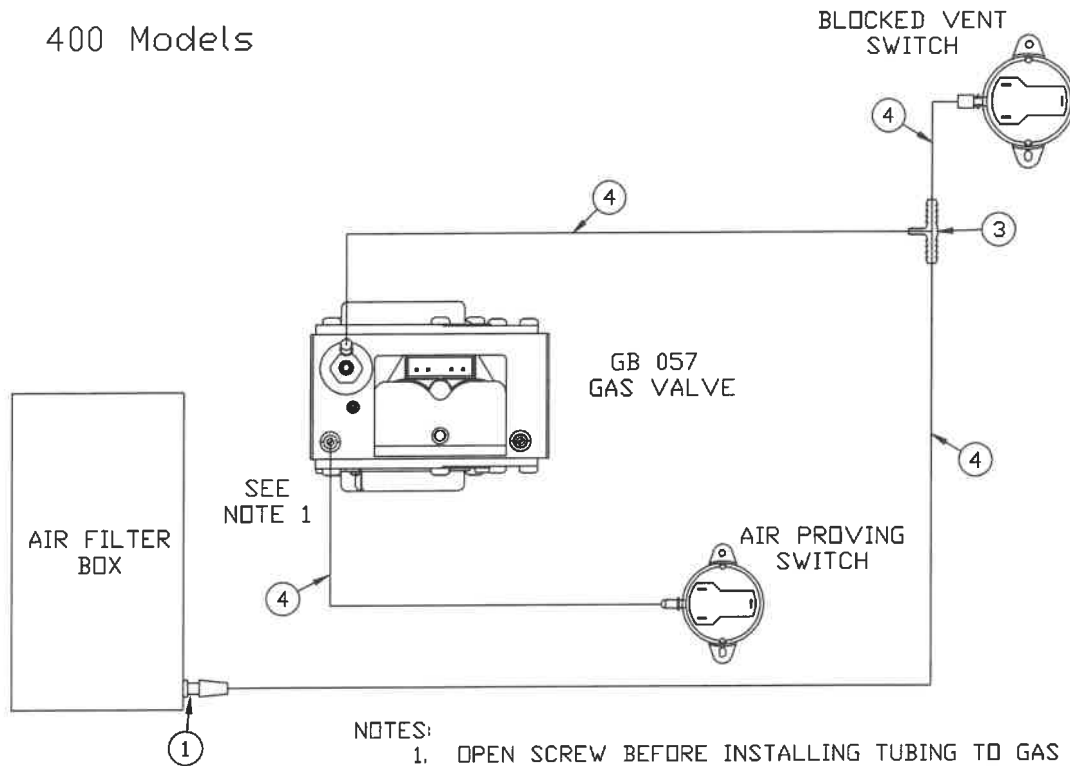


650-1000 Models

Remove Compression nut, slip tubing item 4 over brass threads



400 Models



Notes

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LIMITED WARRANTY FOR AMP COMMERCIAL CONDENSING BOILERS

Stainless Steel Heat Exchangers and Parts/Accessories

Subject to the terms and conditions set forth below, Thermal Solutions, Lancaster, Pennsylvania hereby extends the following limited warranties to the original owner of a commercial grade water boiler or Thermal Solutions supplied parts and/or accessories manufactured and shipped on or after June 1, 2019:

One Year Limited Warranty On Commercial Boilers and Parts / Accessories Supplied by Thermal Solutions

Thermal Solutions warrants to the original owner that its commercial grade stainless steel water boilers and parts/accessories comply at the time of manufacture with recognized hydronic industry standards and requirements then in effect and will be free of defects in material and workmanship under normal usage for a period of one year from the date shipment. If any part of a commercial grade boiler or any part or accessory provided by Thermal Solutions is found to be defective in material or workmanship during this one year period, Thermal Solutions will, at its option, repair or replace the defective part (not including labor).

Ten Year Heat Exchanger Warranty

Thermal Solutions warrants to the original owner that the heat exchanger of its commercial grade stainless steel boilers will remain free from defects in material, workmanship and thermal shock under normal usage per the product's installation and operation manual for the time period specified in the chart below to the original owner at the original place of installation. If a claim is made under this warranty during the "No Charge" period from the date of shipment, Thermal Solutions will, at its option, repair or replace the heat exchanger (not including labor). If a claim is made under this warranty after the expiration of the "No Charge" period from the date of shipment, Thermal Solutions will, at its option and upon payment of the pro-rated service charge set forth below, repair or replace the heat exchanger. The service charge applicable to a heat exchanger warranty claim is based upon the number of years the heat exchanger has been in service and will be determined as a percentage of the retail price of the heat exchanger model involved at the time the warranty claim is made as follows:

NOTE: If the heat exchanger involved is no longer available due to product obsolescence or redesign, the value used to establish the retail price will be the published price as set forth in Thermal Solutions Repair Parts Pricing where the heat exchanger last appeared or the current retail price of the then nearest equivalent heat exchanger, whichever is greater.

Ten Year Pressure Vessel Shell Warranty

Thermal Solutions warrants to the original owner that the pressure vessel shell assembly of its commercial grade stainless steel boilers will remain free from defects in material and workmanship under normal usage for the time period specified in the chart below to the original owner at the original place of installation. If a claim is made under this warranty during the "No Charge" period from the date of shipment, Thermal Solutions will, at its option, repair or replace the pressure vessel (not including labor). If a claim is made under this warranty after the expiration of the "No Charge" period from the date of shipment, Thermal Solutions will, at its option, repair or replace the pressure vessel.

NOTE: If the pressure vessel involved is no longer available due to product obsolescence or redesign, the value used to establish the retail price will be the published price as set forth in Thermal Solutions Repair Parts Pricing where the heat exchanger last appeared or the current retail price of the then nearest equivalent heat exchanger, whichever is greater.

Service Charge as a % of Retail Price										
Years of Service	1	2	3	4	5	6	7	8	9	10
Heat Exchanger	NO CHARGE					20	40	60	80	100
Pressure Vessel Shell	NO CHARGE									

ADDITIONAL TERMS AND CONDITIONS

1. Applicability: The limited warranties set forth above are extended only to the original owner at the original place of installation within the United States and Canada. These warranties are applicable only to boilers, parts, or accessories designated as commercial grade by Thermal Solutions and installed and used exclusively for purposes of commercial space heating or domestic hot water generation through a heat exchanger (or a combination for such purposes) and do not apply to residential grade products or industrial uses.

2. Components Manufactured by Others: Upon expiration of the one year limited warranty on commercial grade boilers, all boiler components other than heat exchangers manufactured by others but furnished by Thermal Solutions (such as circulator and controls) will be subject only to the manufacturer's warranty, if any.

3. Proper Installation: The warranties extended by Thermal Solutions are conditioned upon the installation of the commercial grade boiler, parts, and accessories in strict compliance with Thermal Solutions installation instructions. Thermal Solutions specifically disclaims liability of any kind caused by or relating to improper installation.

4. Proper Use and Maintenance: The warranties extended by Thermal Solutions conditioned upon the use of the commercial grade boiler, parts, and accessories for its intended purposes and its maintenance accordance with Thermal Solutions recommendations and hydronics industry standards. For proper installation, use and maintenance, see all applicable sections of the Installation and Operating, and Service Instructions Manual furnished with the unit.

5. This warranty does not cover the following:

a. Expenses for removal or re-installation. The owner will be responsible for the cost of removing and reinstalling the alleged defective part or its replacement and all labor and material connected therewith.

a. Expenses for shipping and handling. The owner will be responsible for the cost of transportation and handling to and from Thermal Solutions. Alleged defective part must be returned to factory for warranty determination unless authorized in writing otherwise.

b. Components that are part of the heating system but were not furnished by Thermal Solutions as part of the commercial boiler.

c. Improper burner set-up or adjustment, control settings, care or maintenance.

d. This warranty cannot be considered as a guarantee of workmanship of an installer connected with the installation of the Thermal Solutions boiler, or as imposing on Thermal Solutions liability of any nature for unsatisfactory performance as a result of faulty workmanship in the installation, which liability is expressly disclaimed.

e. Boilers, parts, or accessories installed outside the 48 contiguous United States, the State of Alaska and Canada.

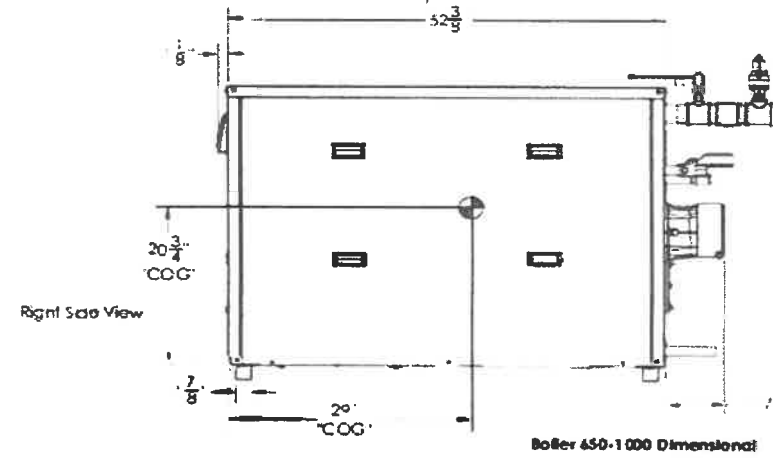
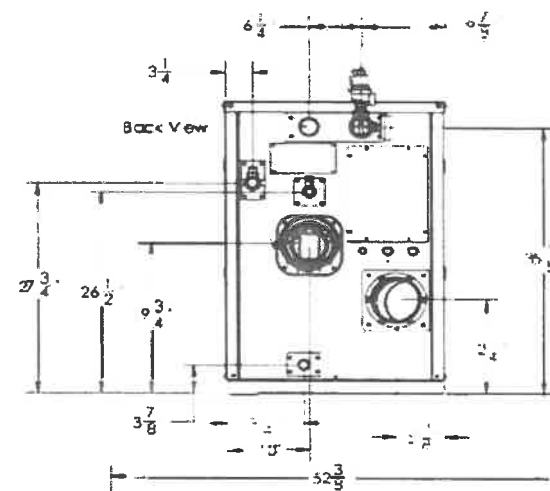
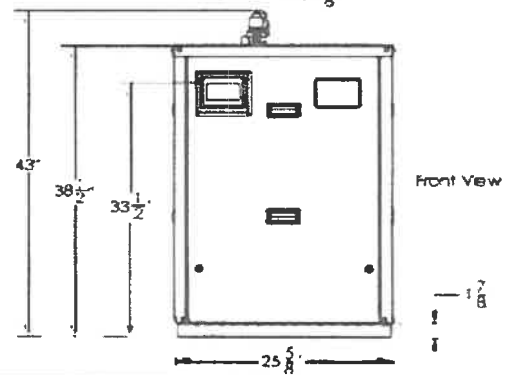
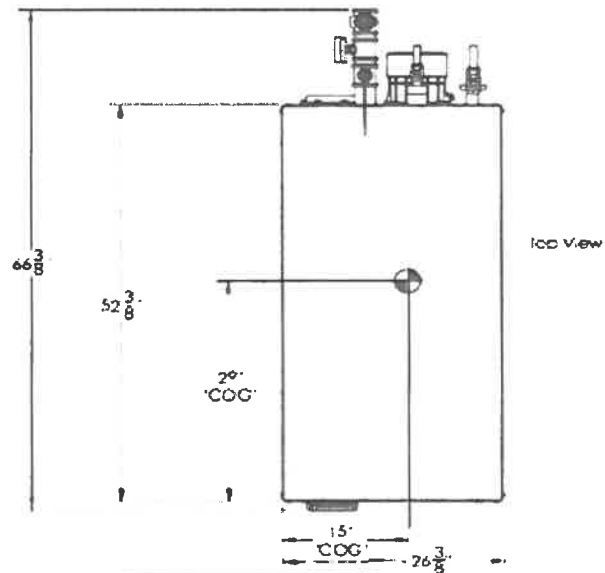
f. Damage to the boiler and/or property due to installation or operation of the boiler that is not in accordance with the boiler installation and operating instruction manual.

i. Any damage or failure of the boiler resulting from hard water, scale buildup or corrosion the heat exchanger. Any damage caused by improper fuels, fuel additives or contaminated combustion air that may cause fireside corrosion and/or clogging of the burner or heat exchanger.

j. Any damage resulting from combustion air contaminated with particulate which cause clogging of the burner or combustion chamber including but not limited to sheetrock or plasterboard particles, dirt, and dust particulate. Any damage, defects or malfunctions resulting from improper operation, maintenance, misuse, abuse, accident, negligence including but not limited to operation with insufficient water flow, improper water level, improper water chemistry, or damage from freezing.



k. Any damage caused by water side clogging due to dirty systems, corrosion products from the system, or improperly maintained water conditions.

AMP-L CONDENSING BOILERS - SUBMITTAL DATA SHEET



11	AMP-800	INNOVATIVE EQUIPMENT FOR HOT WATER SYSTEMS WWW.THERMALSOLUTIONS.COM	Updated 1/16/2025 AMPL800-20250101
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AMP-L CONDENSING BOILERS - SUBMITTAL DATA SHEET

RATINGS AND CAPACITIES		
Input - Low fire:	80,000	BTU/HR
Input - High Fire:	800,000	BTU/HR
Output - High Fire:	776,000	BTU/HR
Boiler Horsepower:	23.2	BHP
Thermal Efficiency:	97.0%	
Heating Surface:	60.9	Sq.Ft.
Water Content:	6.6	Gallons
Fuel:	Natural Gas or LP Gas	
Firing Rate:	Full Modulation	
Burner Turndown:	10:1	
Low NOx Emissions:	< 10 ppm	
Inlet Gas Pressure (NG):	4" wc	Min.
Inlet Gas Pressure (LP):	8" wc	Min.
	14" wc	Max.
Shipping Weight, Approximate:	560	lbs
ASME Section IV (Max 160 PSIG / 210°F) Setpoint range is 60-185°F Adjustable, manual reset high limit setting of ≤ 200°F. ASME H stamp MAWT is 210°F for the vessel. (For max setpoint, see Setpoint range.)		
ETL Certified to ANSI Z21.13 / CSA 4.9		
ETL Certified to UL 795 / CSA 3.1		
DIMENSIONS / CONNECTIONS		
Height:	38-1/2"	(Note 1)
Width:	26-3/8"	(Note 2)
Length:	52-3/8"	(Note 3)
Supply Connection:	2" NPT	
Return Connection:	2" NPT	
Vent / Air Intake Connections:	6"	
Condensate / Boiler Drain Connection:	1"	
Gas Connection:	1" NPT	

FLOWS AND PRESSURE DROPS		
Delta T	Flow (GPM)	r P (Ft. Hd)
20°F Δ T	78	12.8
30°F Δ T	52	7.0
40°F Δ T	39	4.6

- NOTES:** 1. Height dimension is from floor to top of jacket.
 2. Length is from jacket front to jacket rear.
 3. Dimensions shown are for reference only

AMP-L CONDENSING BOILERS - SUBMITTAL DATA SHEET

STANDARD EQUIPMENT

PRESSURE VESSEL DESIGN

Stainless Steel Heat Exchanger
 ASME Section IV Certified, "H" Stamp
 MAWP 160 PSIG & Max Temp 210°F
 Setpoint range is 60-185°F
 Adjustable, manual reset high limit setting of $\leq 200^{\circ}\text{F}$.
 ASME H stamp MAWT is 210°F for the vessel. (For max setpoint, see Setpoint range.)
 Ten Year Limited Pressure Vessel Warranty

COMBUSTION DESIGN

Stainless Steel Pre-Mix Burner
 Low NOx Emissions (< 10 ppm)
 Full Modulation, 10:1 Turndown
 Natural Gas or Propane
 4" wc (8" wc Propane) to 14" wc inlet gas pressure
 Direct Spark Ignition System
 High/Low gas pressure switches, manual reset
 Variable Speed Combustion Blower
 Blocked Vent Switch

VENTING

Category II or IV Venting
 Individual or Common (Engineered) Vent System
 Vertical or Horizontal
 3-in-1 Vent Connector: Accepts CPVC, PP or Stainless Steel
 NOTE: PVC venting requires CPVC Vent kit; Consult I&O Manual.
 Includes built-in vent gas sensor test port
 Combustion Air Intake - Sealed or Room

BOILER EQUIPMENT

Concert™ Control (24 Vac)
 High Limit Temp Control, Manual Reset
 Low water cutoff, manual reset
 Water Flow Switch
 Supply & Return Water Temperature Sensors
 Flue Gas Temperature Sensor
 Condensate trap
 Blocked Condensate Switch
 Pressure & Temperature Gauge
 ASME Relief Valve
 (Available 30, 50, 60, 75, 100, 125 or 150 psig)

ELECTRICAL DESIGN

Models 400-500:

- 120 VAC Only
 Amp Draw: 7.0 Amps

Models 650-1000L:

- 120 VAC Only
 Amp Draw: 8.0 Amps
 - PCB (Printed Circuit Board) Fused Connections
24VAC/5VDC - Low Voltage PCB
 - EMS Communications
 (Dual RJ45 Jacks for Peer-To-Peer or ModBus)
 - Boiler Options (Sensors)
 - Pumps (Boiler, DHW, System) & Auxiliary Devices

NOTE: Stacking Brace Kit (PN# 111405-01 is included with all 400-1000L models.

NOTE: OUTDOOR APPLIANCES CANNOT BE STACKED!

* Flue system material shall be capable of continuous operation at 210°F or higher and shall be certified to UL 1738 – venting system for gas-burning appliances cat II, III and IV.

OPTIONAL EQUIPMENT

- | | | |
|--|---|---|
| <input type="checkbox"/> Hydronic Kit (Boiler Circulation Pump, Pump Flange Kit and Condensate Neutralizer) | | |
| <input type="checkbox"/> External High Limit Temperature Control, Manual Reset | | |
| <input type="checkbox"/> Condensate Neutralizer | | |
| <input type="checkbox"/> Supply Header Temperature Sensor: | <input type="checkbox"/> Direct Immersion | <input type="checkbox"/> Well Immersion (with Well) |
| <input type="checkbox"/> Outdoor Air Temperature Sensor: | <input type="checkbox"/> Wired | <input type="checkbox"/> Wireless |
| <input type="checkbox"/> EMS Signal Converter Kit (Converts Energy or Building Management System 0-10v signal to 4-20mA) | | |
| <input type="checkbox"/> Motorized Isolation Valves | | |
| <input type="checkbox"/> Alarm Buzzer with Silencing Switch | | |
| <input type="checkbox"/> PVC /CPVC Vent Kit | <input type="checkbox"/> PN# 111569-02, Sizes 650-1000L | <input type="checkbox"/> PN# 111569-02, Sizes 650-1000L |
| <input type="checkbox"/> Universal Communications Gateway (BACnet, Metasys, Modbus or Lonworks) | | |
| <input type="checkbox"/> Conductor Sequencing Panel | | |

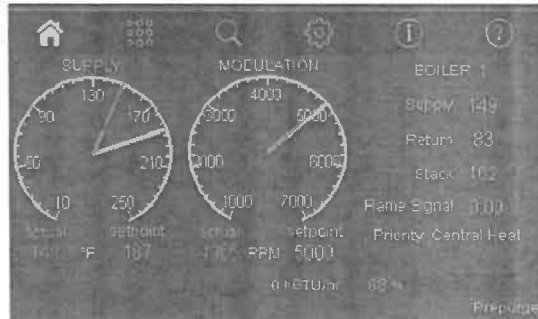
The Conductor manages multiple condensing & non-condensing, small & large heat output, new and/or existing boilers (full modulation or on-off), and steam or hot water applications. It helps improve system efficiency by selecting and modulating the right boiler to match operating conditions. The Conductor offers a single point boiler plant Energy Management System (EMS) interface including Modbus TCP/IP, Modbus RTU RS485, BACnet/IP and BACnet MSTP standard. If Lonworks needed, add for the separate Lonworks gateway.

☐ Extended Warranty

☐ 3-Year Parts ☐ 5-Year Parts ☐ 10-Year Parts ☐ 5-Year Parts/Labor ☐ 10-Year Parts/Labor

AMP-L CONDENSING BOILERS - SUBMITTAL DATA SHEET

CONCERT CONTROL FEATURES



Dashboard - Color Touchscreen Display, 4"

- Intuitive Icon Navigation
- "Quick" Setup Menus
- *Real Time BTU/H Display

Two (2) Temperature Demand Inputs

- Outdoor Air Reset Curve for Each Input
- Time of Day Setback Capability
- (Envirocom Thermostat must be installed)

Three (3) Pump Control

- Boiler Pump With On/Off or Variable Speed Control
- Domestic Hot Water (DHW) Pump
- System Pump
- Alternative Control to Combustion
 - Air Damper or Standby Loss Damper
- Pump Overrun for Heat Dissipation
- Pump Exercise
- Pump Rotor Seizing Protection

Peer-to-Peer Boiler Communications

- Multiple Size Boiler Sequencing Up to 8 Units
- *Two (2) Boiler Start/Stop Trigger
- Lead Boiler Automatic Rotation

Energy Management System (EMS) Interface

- *Firing Rate and Water Temperature Based
 - Algorithms for Multiple Boilers; loss of EMS signal defaults to local boiler settings
- 420mAdc Input/Output (010Vdc Optional Converter)
- ModBus Input/Output (BACnet or LonWorks Optional Gateway)
- Simultaneous Interface with Peer-to-Peer

USB Data Port Transfer

- Upload Settings Between Boilers
- Download Parameters for Troubleshooting
- Import Data into .CRV Formatted Files for Performance Analysis

* Unique to Concert



Energy Efficiency Enhancer

- AntiCycling Technology
- Multiplier boiler base load common rate
- Outdoor Air Temperature Reset Curve
- Warm Weather Shutdown
- Boost Temperature & Time
- Ramp Delay
- OverTemperature Safeguarding

Self-Guiding Diagnostics

- Identifies Fault
- Describes Possible Problems
- Provides Corrective Actions
- Time/Date Stamp on Alarms and Lockouts

Unmatched Archives

- Historical Trends Collects Up to 4 months Data
- Event History Up to 3000 Alarms, Lockouts and Cycle & Run Times
- Alarm Limit String Faults, Holds, Lockouts and Others
- Cycle & Run Time Boilers & Pumps
- Resettable (Lockouts/Alarms/Cycles & Run Time)

Domestic Hot Water Priority

- DHW Tank Piped With Priority in the Boiler Loop
- DHW Tank Piped as a Zone in the System With
 - the Pumps Controlled by the Concert Control
- DHW Modulation Limiting
- Status Screens
- Sensor Monitoring and Control

Other Features

- Factory Default Settings
 - Three Level Password Security
 - Frost Protection
- Contractor Contacts (Up to 3)
- Low Water Flow Safety Control & Indication
- Proportion Integral Derivative (PID) Parameters for
 - Central Heat, DWH, Sequencer and Fan

CRFQ# ADJ25*33

ALL LABOR, MATERIAL, TOOLS, EQUIPMENT, SUPPLIES AND SUPERVISION
NECESSARY TO COMPLETE REPLACEMENT OF TWO (2) BOILERS WHEELING
NATIONAL GUARD ARMORY, IN WHEELING, WV, PER THE ATTACHED
SPECIFICATIONS.

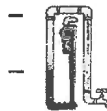
538 Girtys Point RD, Wheeling WV 26003

BID FORM

The undersigned, hereafter called the Bidder, being familiar with and understanding the bidding documents;
and being familiar with the site and all local conditions affecting the Project, hereby proposes to furnish labor,
material, equipment, supplies, and transportation to perform the work as described in the bidding documents

BIDDERS COMPANY NAME: _____

VENDOR ADDRESS: _____



Casto Technical Service
540 Leon Sullivan Way
Charleston, WV 25301
plancaster@castotech.com

TELEPHONE: _____

FAX NUMBER: _____

E-MAIL ADDRESS: _____

**CONTRACT TOTAL COST: BASE BID-CONTRACT ITEM NO.1- Provide labor & materials to
remove and dispose of two (2) Boilers and replace with new per the attached specifications.**

One Hundred Ten Thousand

(\$ 110,000.00)** (Contract bid to be written in words and numbers.)

SIGNATURE: 

DATE: April 23, 2025

NAME: Paul Lancaster

(Please Print)

TITLE: Mgr.