

**SECTION 23 51 00
BREECHINGS, CHIMNEYS, AND STACKS**

SPEC WRITER NOTES:

1. Delete between // // if not applicable to project. Also delete any other item or paragraph not applicable in the Section and renumber the paragraphs.
2. This section does not include free-standing chimneys.
3. Provide the year of latest edition to each publication listed in Article 1.3 APPLICABLE PUBLICATIONS.

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies flue gas exhaust system and all accessories from the boiler outlet to the stack outlet to the atmosphere. Flue gas recirculation (FGR) ductwork (if required by burners furnished) is also specified.
- B. A complete listing of common acronyms and abbreviations are included in //Section 23 05 10, COMMON WORK RESULTS FOR BOILER PLANT AND STEAM GENERATION// //Section 23 05 11, COMMON WORK RESULTS FOR HVAC//.

1.2 RELATED WORK

- A. Section 01 00 00, GENERAL REQUIREMENTS.
- B. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- C. Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- D. //Section 01 91 00, GENERAL COMMISSIONING REQUIREMENTS.//
- E. //Section 05 50 00, METAL FABRICATIONS: Frames and supports.//
- F. Section 07 60 00, FLASHING AND SHEET METAL: Roof Penetrations.
- G. Section 09 91 00, PAINTING.
- H. //Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS.//
- I. //Section 23 05 10, COMMON WORK RESULTS FOR BOILER PLANT AND STEAM GENERATION.//
- J. //Section 23 05 11, COMMON WORK RESULTS FOR HVAC.//
- K. Section 23 05 51, NOISE AND VIBRATION CONTROL FOR BOILER PLANT.
- L. Section 23 05 93, TESTING, ADJUSTING, AND BALANCKING FOR HVAC: Economizer water flows.
- M. Section 23 07 11, HVAC AND BOILER PLANT INSULATION.
- N. //Section 23 08 00, COMMISSIONING OF HVAC SYSTEMS: Requirements for commissioning, systems readiness checklists, and training.//

O. //Section 23 09 11, INSTRUMENTATION AND CONTROL FOR BOILER PLANT:

Boiler Draft Control System.//

P. //Section 23 52 33, WATER-TUBE BOILERS: Economizers.//

Q. //Section 23 52 39, FIRE-TUBE BOILERS: Economizers.//

1.3 APPLICABLE PUBLICATIONS

SPEC WRITER NOTE:

1. Make material requirements agree with requirements specified in the referenced Applicable Publications. Verify and update the publication list to that which applies to the project, unless the reference applies to all mechanical systems. Publications that apply to all mechanical systems may not be specifically referenced in the body of the specification, but, shall form a part of this specification.

2. Insert the year of approved latest edition of the publications between the brackets and delete the brackets //----// if applicable this project.

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only. Where conflicts occur these specifications and the VHA standard will govern.

B. American Institute of Steel Construction (AISC):

325-//2017//.....Steel Construction Manual, 14th Edition

C. ASTM International (ASTM):

A36/A36M-//2019//.....Standard Specification for Carbon Structural Steel

A242/A242M-//2018//.....Standard Specification for High-Strength Low-Alloy Structural Steel

A307-//2016//.....Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 psi Tensile Strength

A563-//2019//.....Standard Specification for Carbon and Alloy Steel Nuts

A568/A568M-//2019//.....Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled

D. American Welding Society (AWS):

D1.1/D1.1M-//2020//.....Structural Welding Code-Steel

- E. Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS):
- SP-58-//2018//.....Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation
- F. National Fire Protection Association (NFPA):
- 31-//2016//.....Standard for the Installation of Oil-Burning Equipment
- 54-//2018//.....National Fuel Gas Code
- 211-//2019//.....Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances
- G. Underwriters Laboratories (UL):
- 103-2010 (R2012).....Standard for Factory-Built Chimneys for Residential Type and Building Heating Appliances
- 441-2010 (R2016).....Standard for Gas Vents
- 641-2010 (R2013).....Standard for Type L Low-Temperature Venting Systems
- 1738-2010 (R2017).....Standard for Venting Systems for Gas-Burning Appliances, Categories II, III, and IV

1.4 SUBMITTALS

- A. Submittals, including number of required copies, shall be submitted in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Information and material submitted under this section shall be marked "SUBMITTED UNDER SECTION 23 51 00, BREECHINGS, CHIMNEYS, AND STACKS", with applicable paragraph identification.
- C. Manufacturer's Literature and Data including: Full item description and optional features and accessories. Include dimensions, weights, materials, applications, standard compliance, model numbers, size, and capacity.
- D. Design, materials, weights, construction, pressure and temperature limitations of breeching and stack systems, and flue gas recirculation system. //Structural// //Seismic// design data.//
- E. Drawings showing all components, system arrangement and dimensions.
- F. Design, construction, material specifications, allowable movements, movement forces, pressure and temperature limitations of expansion joints.

- G. Damper design, construction, pressure and temperature limitations, pressure loss at design flow, and leakage of closed damper.
- H. Support designs, locations and loads for entire assembly. //Seismic design data.//
- I. Written statement from boiler/burner manufacturer that the design of the system is satisfactory to achieve the required boiler/burner performance.
- J. Complete operating and maintenance manuals including wiring diagrams, technical data sheets, information for ordering replacement parts, and troubleshooting guide:
 - 1. Include complete list indicating all components of the systems.
 - 2. Include complete diagrams of the internal wiring for each item of equipment.
 - 3. Diagrams shall have their terminals identified to facilitate installation, operation and maintenance.
- K. //Completed System Readiness Checklist provided by the Commissioning Agent and completed by the contractor, signed by a qualified technician and dated on the date of completion, in accordance with the requirements of Section 23 08 00, COMMISSIONING OF HVAC SYSTEMS.//
- L. //Submit training plans and instructor qualifications in accordance with the requirements of Section 23 08 00, COMMISSIONING OF HVAC SYSTEMS.//

1.5 QUALITY ASSURANCE

- A. Provide scale drawings showing nominal dimensions and weight of the systems.
- B. Boiler and burner manufacturer shall review complete system from boiler flue gas outlet to stack outlet to atmosphere and advise the Government of any changes required to meet boiler and burner performance requirements. Note the altitude of plant site.
- C. If a double wall, factory-fabricated, positive pressure breeching and stack system is provided, the manufacturer shall completely engineer the entire system and provide all components. Manufacturer's representative shall provide installation instructions prior to start of construction, train the installers and certify in writing to the COR that the entire installation complies with the official standards of the manufacturer and with the project contract documents.
- D. Flue gas recirculation ductwork shall be designed and provided by the burner manufacturer.

- E. Conform to NFPA 54 and NFPA 31 for sizing, design of flue gas vents, and installation of fuel burning equipment and appliances.
- F. Components coming in contact with the products of combustion shall carry the appropriate UL or ULC listing.

1.6 AS-BUILT DOCUMENTATION

SPEC WRITER NOTE: Coordinate O&M Manual requirements with Section 01 00 00, GENERAL REQUIREMENTS. O&M manuals shall be submitted for content review as part of the close-out documents.

- A. Submit manufacturer's literature and data updated to include submittal review comments and any equipment substitutions.
- B. Submit operation and maintenance data updated to include submittal review comments, VA approved substitutions and construction revisions shall be //in electronic version on CD or DVD// inserted into a three-ring binder. All aspects of system operation and maintenance procedures, including applicable piping isometrics, wiring diagrams of all circuits, a written description of system design, control logic, and sequence of operation shall be included in the operation and maintenance manual. The operations and maintenance manual shall include troubleshooting techniques and procedures for emergency situations. Notes on all special systems or devices shall be included. A List of recommended spare parts (manufacturer, model number, and quantity) shall be furnished. Information explaining any special knowledge or tools the owner will be required to employ shall be inserted into the As-Built documentation.

SPEC WRITER NOTE: Select and edit one of the bracketed options after the paragraph below to indicate the format in which the contractor must provide record drawing files. Select the hand-marked option only when the designer has been separately contracted to provide the record drawings from the contractor's mark-ups. Select the BIM option only when a BIM model will be generated, which is typically only performed by the designer on some Design-Bid-Build projects or by the contractor on some Design-Build projects.

- C. The installing contractor shall maintain as-built drawings of each completed phase for verification; and, shall provide the complete set at the time of final systems certification testing. Should the installing contractor engage the testing company to provide as-built or

any portion thereof, it shall not be deemed a conflict of interest or breach of the 'third party testing company' requirement. Provide record drawings as follows:

1. //Red-lined, hand-marked drawings are to be provided, with one paper copy and a scanned PDF version of the hand-marked drawings provided on CD or DVD.//
 2. //As-built drawings are to be provided, with a copy of them on AutoCAD version // // provided on CD or DVD. The CAD drawings shall use multiple line layers with a separate individual layer for each system.//
 3. //As-built drawings are to be provided, with a copy of them in three-dimensional Building Information Modeling (BIM) software version // // provided on CD or DVD.//
- D. The as-built drawings shall indicate the location and type of all lockout/tagout points for all energy sources for all equipment and pumps to include breaker location and numbers, valve tag numbers, etc. Coordinate lockout/tagout procedures and practices with local VA requirements.
- E. Certification documentation shall be provided to COR 21 working days prior to submitting the request for final inspection. The documentation shall include all test results, the names of individuals performing work for the testing agency on this project, detailed procedures followed for all tests, and provide documentation/certification that all results of tests were within limits specified. Test results shall contain written sequence of test procedure with written test results annotated at each step along with the expected outcome or setpoint. The results shall include all readings, including but not limited to data on device (make, model and performance characteristics), normal pressures, switch ranges, trip points, amp readings, and calibration data to include equipment serial numbers or individual identifications, etc.

PART 2 - PRODUCTS

2.1 BREECHING, STACKS, FGR DUCTWORK

SPEC WRITER NOTES:

1. Coordinate the breeching and stack design (diameter and height) with the draft requirements of the boiler/burner. The contract drawings must show breeching and stacks in plan

and sections and show diameters and heights.

2. The stack height must be sufficient to avoid flue gas being entrained into the boiler room make-up air or impinging on nearby buildings.
3. Where multiple boilers are connected to a common breeching and stack, the design should be based on boilers operating at the required steam output to serve peak load conditions plus a standby boiler in the pre-purge cycle. In this situation, the media in the breeching and stack is a mixture of hot flue gas and relatively cool purge air.

- A. Refer to drawings for arrangement and dimensions, except FGR ductwork shall be designed by the burner manufacturer. FGR ductwork construction, material and gauge thickness shall be the same as in the main chimney/stack. Connections to boilers and economizers must comply with the written recommendations of the boiler and economizer manufacturers. Ninety-degree tee sections are prohibited. Intersections must be made with lateral tees.

SPEC WRITER NOTE: Add wind-loading information. Edit out seismic requirements in non-seismic zones.

- B. Service: Design for continuous 315 degrees C (600 degrees F), 12 kPa (50 inches WC) positive and negative internal pressure, for a wind-loading for outside stacks of // // . //Design system and supports for seismic loads in accordance with Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS.//

SPEC WRITER NOTES:

1. Only UL-listed pre-engineered double-wall systems should be utilized in the building beyond the perimeter of the boiler plant.
2. Select pre-engineered, pre-fabricated double-wall system (paragraph C) or custom-designed single wall system (paragraph D) for the boiler plant. Design details for the custom-designed single wall system must be shown on the drawings.

- C. Pre-engineered, Pre-Fabricated, Double-Wall System:

1. Complete factory-built system, all components and installation engineered and provided by manufacturer of system.

SPEC WRITER NOTE: Allow air space with no insulation on outside stack only if the stack gas cooling and consequent reduction in draft will allow specified burner performance.

2. Provide double wall metal stacks, tested to UL 103 and UL 641, and UL-listed, for use with building heating equipment, in compliance with NFPA 211.
3. Corrosion-resistant steel, double-wall, circular cross section, positive pressure, blanket insulation between walls. //For stack sections outside the building, air space with no insulation between walls is allowed.//
4. Factory-built standard sections, connected in the field with joining system designed and provided by system manufacturer. Designed to be pressure and vacuum-tight, no deformation, at the service conditions specified.
5. System manufacturer's engineered support system, attached to structural members of the building, with expansion joints between rigid supports. Thermal expansion shall be handled by expansion joints and variable spring hangers. Thermal expansion and weight of system shall not impose loads in excess of that allowed by manufacturer of boiler, economizer, or any other equipment, or exceed capabilities of building structure. Spring hangers shall conform to MSS SP-58, Type 51, and variable spring.

SPEC WRITER NOTE: Specify UL-listing and clearances to combustibles and non-combustibles only if necessary because of the location of the stack or breeching.

6. //UL-listed for // // mm (// // inches) clearance to combustible materials and // // mm (// // inches) clearance to non-combustible materials.//

SPEC WRITER NOTE: Specify 304 stainless steel for natural gas and No. 2 oil burner fuels. Specify 316 stainless on heavy fuel oil (No. 4).

7. Inner Wall: Stainless steel, Type //304// //316//, 0.89 mm (0.035 inch) minimum thickness for diameters 900 mm (36 inches) and smaller and 1.2 mm (0.047 inches) minimum thickness for diameters greater than 900 mm (36 inches) and 1200 mm (48 inches) and less.

8. Outer Wall: Aluminized or galvanized steel except //304// //316// stainless steel outside of building, 0.6 mm (0.024 inch) minimum thickness for inner wall diameter 800 mm (31-1/2 inches) and less, 0.89 mm (0.035 inch) minimum thickness for inner wall diameter over 800 mm (31-1/2 inches) and 1200 mm (48 inches) and less.
 9. //Uninsulated Air Space between Inner and Outer Walls (Outside the Building Only): 25 mm (1 inch) minimum.//
 10. Insulation Between Walls: Fiberglass or mineral wool, 315 degrees C (600 degrees F). Minimum thickness 50 mm (2 inches).
 11. Bands for Joining Sections: Same material as section being joined. Utilize sealant provided by system manufacturer.
 12. Roof and wall penetrations shall be manufacturer's standard ventilated thimble. Conform to Section 07 60 00, FLASHING AND SHEET METAL.
 13. Stack Outlet: Provide as shown, double cone rain cap or other type termination designed by manufacturer of the stack system.
 14. Drain Section: Provide inside building below roof to drain rain water from stack. Extend drain pipe to floor drain.
 15. Guys: Provide stack guy wires above roof, with spring-loaded tensioners, in accordance with printed instructions of stack manufacturer.
- D. Custom-Designed, Field-Fabricated, Steel Single Wall System:
1. Breeching and stack walls, carbon steel, ASTM A568/A568M, thickness 3.4 mm (0.134 inch).
 2. Fabricate in welded sections with angle terminations for bolted connection of sections. Shapes and plate shall be ASTM A36/A36M.
 3. Welding shall comply with AWS D1.1/D1.1M.
 4. Comply with AISC 325. Design to be pressure and vacuum-tight, no deformation, at the service conditions specified.
 5. Provide 3.2 mm (1/8 inch) thick high temperature, non-asbestos gaskets between sections.
 6. Heavy hex ASTM A307 Grade B machine bolts. Heavy hex ASTM A563 Grade C nuts. Provide washers under bolts and nuts. Bolts, nuts, and washers shall be cadmium plated.
 7. Provide angle clips for attachment of insulation.
 8. Roof penetrations shall conform to Section 07 60 00, FLASHING AND SHEET METAL.

9. Rain cap shall be double cone arrangement, welded, supported by angles.
10. Support with rigid and spring supports attached to the building structure. Supports shall be designed to completely support the system without overloading the connecting equipment or the building structure. Thermal expansion shall be accommodated by expansion joints and MSS SP-58, Type 51 variable spring hangers (if necessary).
11. Provide guy wires on stacks with spring-loaded tensioners as shown on the drawings.
12. Clean all surfaces of rust, mill scale, and apply prime coat of heat and corrosion resistant paint. Apply finish coats of heat and corrosion-resistant paint to all exposed uninsulated surfaces. Select paint system compatible with maximum surface temperature. Refer to Section 09 91 00, PAINTING.

SPEC WRITER NOTE: Provide outlet dampers and draft control system only on boilers that are connected to a common breeching and tall stack or chimney.

2.2 BOILER OUTLET DAMPERS AND ACCESSORIES

- A. Type: Multi-blade, opposed horizontal blades, automatically controlled. Open-shut operation. Also, modulating operation on systems requiring automatic draft control. Locate at the outlets of the //boilers// //economizers//. //Boiler outlet draft control is specified in Section 23 09 11, INSTRUMENTATION AND CONTROL FOR BOILER PLANT.//
- B. Service: Design for 315 degrees C (600 degrees F), 1.2 kPa (5 inches WG) positive and negative pressure. Maximum leakage, when closed, shall be ten percent of maximum required flow. Maximum pressure loss at maximum boiler steam output, 0.01 kPa (0.04 inches WC).
- C. Construction:
 1. Blades: ASTM A242/A242M carbon steel, air foil, dowed to shafts.
 2. Shafts: Stainless steel. Provide seals at casing penetrations.
 3. Bearings: External to flow stream, carbon, self-contained, bushing, packing-gland assemblies, self-lubricating.
 4. Linkages: Control arms dowed to shafts. All control arms linked to drive motor. External to flow stream. All steel construction.
- D. Accessories:
 1. Interlock Switch Mounting: Rigid mounting located to allow switch to sense damper linkage position. Switch is connected to burner control

system specified in Section 23 09 11, INSTRUMENTATION AND CONTROL FOR BOILER PLANT.

2. Damper Drive Unit: Electric type that shall operate damper without overload. Provide 100 percent duty cycle maintenance-free motors that never overheat or burnout under stalled conditions. Constant speed coordinated with the controlled process so that performance parameters remain within requirements. For systems without draft control, the drive unit shall automatically open damper 90 degrees on boiler purge and firing cycle; close damper on boiler shut down. For systems with draft control, the drive unit shall automatically open damper 90 degrees on boiler purge cycle, position damper as required for proper burner ignition, modulate damper during boiler firing to maintain constant outlet draft, close damper on boiler shut down.

2.3 EXPANSION JOINTS

- A. Provide sufficient types, quantities, and locations of expansion joints to completely absorb all thermal expansion of the system without imposing excessive loads on equipment or building structure. Fabric joints shall be used on single-wall stack and breeching system. On factory-fabricated double wall stack or breeching system, use slip-type, bellows-type, or fabric expansion joints engineered by designer of the stack and breeching system.
- B. Service: Design for 300 degrees C (572 degrees F), 5 kPa (20 inches WC) positive and negative internal pressure, continuous duty.
- C. Construction, Fabric Joints:
 1. Fabric: High strength, designed for dewpoint service.
 2. Internal Baffles: Carbon steel with stiffeners. Designed to protect interior surfaces of fabric from wiping action of the flue gases.
 3. Welded frame, 6 mm (1/4 inch) thick ASTM A568/A568M steel with 100 mm (4 inch) minimum flange height, flat-belt design, fabricated by expansion joint manufacturer. Fabric element bolting, 10 mm (3/8 inch) diameter, 150 mm (6 inch) maximum centers.
- D. Construction, Factory-Fabricated Double-Wall System Joints:
 1. Materials: Same as factory-fabricated breeching system.
 2. Packing Gland: High temperature rating. Provide seal between sliding and fixed portions of joint.

2.4 ACCESSORIES

- A. Drains: Provide threaded pipe connection to allow drainage at all low points and drain connections in stack and breeching systems. Slope piping system to the drain. Pipe size shall be 25 mm (1 inch) minimum.
- B. Instrument Ports: Locate on individual stack or breeching serving each boiler. Locate in non-turbulent zone within 3600 mm (12 feet) of boiler room floor between boiler and economizer (when economizer is provided) or locate accessible from platform. Provide separate ports for the following:
 - 1. Flue gas oxygen //NOx// analyzer: Coordinate with analyzer furnished.
 - 2. Opacity monitor (if required): Coordinate with sensor furnished. Locate downstream from oxygen //NOx// analyzer.
 - 3. Stack temperature sensor: Coordinate with sensor furnished.
 - 4. Draft gauge: 25 mm (1 inch) diameter coupling, plugged.
 - 5. Test instruments: 25 mm (1 inch) diameter coupling, plugged.
- C. Access Doors: Bolted, gasketed, insulated, with handles. Provide where shown. Minimum opening 400 mm x 400 mm (16 inches x 16 inches).

2.5 TYPE B DOUBLE WALL GAS VENTS

- A. Fabrication: Inner pipe of sheet aluminum, and outer pipe of galvanized sheet steel, tested in compliance with UL 441.

2.6 DOUBLE WALL VENTING FOR CONDENSING APPLIANCES

SPEC WRITER NOTE: CPVC/PVC pipe is only recommended for a maximum temperature up to 82 degrees C (180 degrees F) and has disadvantages regarding thermal expansion and potential cracking or joint failure, so it is prohibited on VA projects.

- A. CPVC and PVC materials are prohibited even if approved for use by the boiler manufacturer.
- B. The condensing appliance vent shall be double-wall construction for use with Category II natural draft appliances and Category III or IV positive pressure appliances.
- C. Maximum temperature shall not exceed 288 degrees C (550 degrees F).
- D. Vent shall be listed for an internal static pressure of 1.5 kPa (6 inch w.g.) and tested to 3.7 kPa (15 inch w.g.) for diameters 150 to 900 mm (6 to 36 inches) and tested to 2.5 kPa (10 inch w.g.) for diameters 75 to 125 mm (3 to 5 inches).

- E. Vent shall be constructed of Super-Ferritic stainless-steel material tested to UL 1738, 0.38 mm (0.015 inch) thickness for diameters 75 to 300 mm (3 to 12 inches), 0.6 mm (0.024 inch) thickness for diameters 355 to 600 mm (14 to 24 inches), and 0.89 mm (0.035 inch) thickness for diameters 660 to 900 mm (26 to 36 inches).
- F. Outer casing shall be constructed of aluminized steel, type 430, 304, 316 stainless steel of 0.45 mm (0.018 inch) thickness for diameters 75 to 300 mm (3 to 12 inches), 0.6 mm (0.024 inch) thickness for diameters 355 to 600 mm (14 to 24 inches), and 0.89 mm (0.035 inch) thickness for diameters 660 to 900 mm (26 to 36 inches).

2.7 SINGLE WALL VENTING FOR CONDENSING APPLIANCES

SPEC WRITER NOTE: CPVC/PVC pipe is only recommended for a maximum temperature up to 82 degrees C (180 degrees F) and has disadvantages regarding thermal expansion and potential cracking or joint failure, so it is prohibited on VA projects.

- A. CPVC and PVC materials are prohibited even if approved for use by the boiler manufacturer.
- B. The condensing appliance vent shall be single-wall construction for use with Category II natural draft appliances and Category III or IV positive pressure appliances.
- C. Maximum temperature shall not exceed 288 degrees C (550 degrees F).
- D. Vent shall be listed for an internal static pressure of 1.5 kPa (6 inch w.g.) and tested to 3.7 kPa (15 inch w.g.) for diameters 150 to 900 mm (6 to 36 inches) and tested to 2.5 kPa (10 inch w.g.) for diameters 75 to 125 mm (3 to 5 inches).
- E. Vent shall be constructed of Super-Ferritic stainless-steel material tested to UL 1738, 0.38 mm (0.015 inch) thickness for diameters 75 to 300 mm (3 to 12 inches), 0.6 mm (0.024 inch) thickness for diameters 355 to 600 mm (14 to 24 inches), and 0.89 mm (0.035 inch) thickness for diameters 660 to 900 mm (26 to 36 inches).

PART 3 - EXECUTION

3.1 GENERAL

- A. If an installation is unsatisfactory to the COR, the Contractor shall correct the installation at no additional cost or time to the Government.

SPEC WRITER NOTE: Select one of the two following paragraphs, depending on the type of system specified.

3.2 INSTALLATION - PRE-ENGINEERED, PRE-FABRICATED DOUBLE WALL SYSTEM

- A. Supports: Completely support all systems from the building structure without overloading the building structure or the connected equipment. Support system shall be engineered by the system manufacturer and shall accommodate thermal expansion. //Refer to seismic requirements in Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS.//
- B. Factory-Fabricated Stack or Breeching System:
 - 1. Install in accordance with manufacturer's printed instructions, NFPA 54 and NFPA 31.
 - 2. Deliver a copy of the instructions to the COR prior to commencing the installation.
 - 3. Representative of manufacturer shall provide field training on all installation techniques to all installers.
- C. Connect 25 mm (1 inch) minimum pipes with ball valves to breeching and stack drains. Extend to floor drain.
- D. Boiler or Economizer Outlet Dampers: Locate so that there is no restriction in the flow of flue gas recirculation (if provided).
- E. Pitch breechings with positive slope up from fuel-fired equipment to chimney or stack.

3.3 INSTALLATION - CUSTOM-DESIGNED, FIELD-FABRICATED, STEEL SINGLE WALL SYSTEM

SPEC WRITER NOTE: Verify that supports are shown on the contract drawings.

- A. Supports: Completely support all systems from the building structure without overloading the building structure or the connected equipment. Support system shall be as shown on the drawings. //Refer to seismic requirements in Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS.//
- B. Joints: Provide continuous weld between boiler outlet and connecting transition, breeching or stub stack and at connections to economizers, when recommended by manufacturer of economizer or boiler. Securely bolt all remaining joints and provide gaskets rated for service at 315 degrees C (600 degrees F).
- C. Field-Applied Insulation: Refer to Section 23 07 11, HVAC AND BOILER PLANT INSULATION.
- D. Connect 25 mm (1 inch) minimum pipes with ball valves to breeching and stack drains. Extend to floor drain.

- E. Boiler or Economizer Outlet Dampers: Locate so that there is no restriction in the flow of flue gas recirculation (if provided).
- F. Pitch breechings with positive slope up from fuel-fired equipment to chimney or stack.
- G. Install in accordance with NFPA 54 and NFPA 31.

3.4 INSTALLATION OF VENT FOR CONDENSING APPLIANCES

- A. Installation shall conform to manufacturer's installation instructions.
- B. Protect materials from accidental damage.
- C. All supports, roof or wall penetrations, terminations, appliance connectors and drain fittings required to install the vent system shall be included.
- D. Joint assembly utilizes a flange & sleeve joint connection for diameters 150 to 300 mm (6 to 24 inches). Joint assembly utilizes flanged mating surfaces for diameters 660 to 900 mm (26 to 36 inches). Manufacturer approved sealant will be used on the flange surface. Flanges are joined with a V-band secured by tightening draw bolts. Manufacturer approved sealant will be applied to the channel of the V-band prior to installation. Utilize a manufacturer approved snap-lock gasket connection for diameters 75 to 125 mm (3 to 5 inches).
- E. For double wall vents, where exposed to weather, the outer closure band shall be sealed to prevent moisture from entering the space between the walls.
- F. All parts exposed to the weather shall be protected by one (1) coat of corrosion and heat resistant base primer and one (1) coat of heat resistant paint unless constructed of 430, 304 or 316 stainless steel.
- G. Vent shall terminate in accordance with installation instructions and local codes.

3.5 STARTUP AND TESTING

- A. Perform tests as recommended by product manufacturer and listed standards and under actual or simulated operating conditions and prove full compliance with design and specified requirements. Tests of the various items of equipment shall be performed simultaneously with the system of which each item is an integral part.
- B. When any defects are detected, correct defects and repeat test at no additional cost or time to the Government.
- C. //The Commissioning Agent will observe startup and contractor testing of selected equipment. Coordinate the startup and contractor testing

schedules with COR and Commissioning Agent. Provide a minimum notice of 10 working days prior to startup and testing.//

3.6 //COMMISSIONING

- A. Provide commissioning documentation in accordance with the requirements of Section 23 08 00, COMMISSIONING OF HVAC SYSTEMS.
- B. Components provided under this section of the specification will be tested as part of a larger system.//

3.7 DEMONSTRATION AND TRAINING

- A. Provide services of manufacturer's technical representative for //4//
// // hour//s// to instruct each VA personnel responsible in operation and maintenance of the system.
- B. //Submit training plans and instructor qualifications in accordance with the requirements of Section 23 08 00, COMMISSIONING OF HVAC SYSTEMS.//

- - - E N D - - -