SECTION 235216 - CONDENSING BOILERS

This Section uses the term "Architect." Change this term to match that used to identify the design professional as defined in the General and Supplementary Conditions.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

1. GENERAL
   * + 1. RELATED DOCUMENTS

Retain or delete this article in all Sections of Project Manual.

* + - * 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
      1. SUMMARY
         1. Section includes gas-fired, [**pulse-combustion**] [**fire-tube**] [**water-tube**] [**floor-mounted**] [**wall-hung**] condensing boilers, trim, and accessories for generating hot water.
      2. CLOSEOUT SUBMITTALS
         1. Operation and Maintenance Data: For boilers to include in emergency, operation, and maintenance manuals.
      3. WARRANTY

When warranties are required, verify with Director’s Representative counsel that warranties stated in this article are not less than remedies available to Director’s Representative under prevailing local laws. Coordinate with Section 016000 "Product Requirements." See discussion about warranties in "Warranties" Article in the Evaluations.

* + - * 1. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of boilers that fail in materials or workmanship within specified warranty period. Where "prorated" is indicated, the boiler manufacturer will cover the indicated percentage of cost of replacement parts. With "prorated" type, covered cost decreases as age of equipment increases.

Verify available warranties and warranty periods for units and components.

Warranty Period for Pulse-Combustion Boilers:

Heat Exchanger Damaged by Thermal Shock: [**10**] <**Insert number**> years from date of Substantial Completion.

Flue-Gas Condensate Corrosion of Heat Exchanger: [**Prorated Year 0 to 7 - 100 percent; Year 8 - 50 percent; Year 9 - 30 percent; Year 10 - 20 percent**] [**Nonprorated**] for [**10**] <**Insert number**> years from date of Substantial Completion.

Warranty Period for Floor-Mounted Fire-Tube Condensing Boilers:

Heat Exchanger and Tank: Free from defects in material and workmanship.

Warranty Coverage: [**Prorated Year 0 to 5 - 100 percent; Year 6 to 7 - 50 percent; Year 8 to 9 - 30 percent; Year 10 - 10 percent**] for <**Insert number**> years from date of Substantial Completion.

Warranty Period for Wall-Hung Fire-Tube Condensing Boilers:

Heat Exchanger and Tank: Free from defects in material and workmanship.

Warranty Coverage: [**Prorated Year 0 to 5 - 100 percent; Year 6 to 7 - 50 percent; Year 8 to 9 - 30 percent; Year 10 - 10 percent**] <**Insert number**> years from date of Substantial Completion.

Warranty Period for Floor-Mounted Water-Tube Condensing Boilers:

Heat Exchanger and Tank: Free from defects in material and workmanship.

Warranty Coverage: [**Prorated Year 0 to 5 - 100 percent; Year 6 to 7 - 50 percent; Year 8 to 9 - 30 percent; Year 10- 10 percent**] <**Insert number**> years from date of Substantial Completion.

Warranty Period for Wall Hung Water-Tube Condensing Boilers:

Heat Exchanger and Tank: Free from defects in material and workmanship.

Warranty Coverage: [**Prorated Year 0 to 5 - 100 percent; Year 6 to 7 - 50 percent; Year 8 to 9 - 30 percent; Year 10- 10 percent**] <**Insert number**> years from date of Substantial Completion.

Warranty Period for Water-Jacketed Condensing Boilers:

Heat Exchanger and Tank: Free from defects in material and workmanship.

Warranty Coverage: [**Prorated Year 0 to 5 - 100 percent; Year 6 to 7 - 50 percent; Year 8 to 9 - 30 percent; Year 10 - 10 percent**] for <**Insert number**> years from date of Substantial Completion.

1. PRODUCTS

Manufacturers and products listed in SpecAgent and MasterWorks Paragraph Builder are neither recommended nor endorsed by the AIA or Deltek. Before inserting names, verify that manufacturers and products listed there comply with requirements retained or revised in descriptions and are both available and suitable for the intended applications. For definitions of terms and requirements for Contractor's product selection, see Section 016000 "Product Requirements."

* + - 1. PERFORMANCE REQUIREMENTS
         1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
         2. ASME Compliance: Fabricate and label boilers to comply with ASME Boiler and Pressure Vessel Code.

"ASHRAE/IES 90.1 Compliance" or "ASHRAE 90.2 Compliance" Paragraph below may be required to comply with Project requirements or authorities having jurisdiction and is required for sustainable design systems. Retain "ASHRAE/IES 90.1 Compliance" or "ASHRAE 90.2 Compliance" Paragraph below as appropriate for the type of building being specified.

* + - * 1. ASHRAE/IES 90.1 Compliance: Boilers shall have minimum efficiency in accordance with Table 6.8.1-6 and other requirements in Ch. 6 of ASHRAE/IES 90.1.
        2. ASHRAE 90.2 Compliance: Boilers shall have minimum efficiency in accordance with Ch. 6 of ASHRAE 90.2.

Retain first option in "DOE Compliance" Paragraph below if boiler rating exceeds 300,000 Btu/h (87.9 kW). Retain second option if boiler rating is less than or equal to 300,000 Btu/h (87.9 kW).

* + - * 1. DOE Compliance: Minimum efficiency shall comply with [**10 CFR 431, Subpart E, Appendix N**] [**10 CFR 430, Subpart B, Appendix N**].

Retain appropriate mounting for floor-mounted or wall-mounted boiler.

* + - * 1. Mounting Base: [**For securing boiler to concrete base**] [**For securing boiler to structural wall**].

Retain "Seismic Fabrication Requirements" Subparagraph below for projects in seismic areas. If retaining, also retain "Seismic Qualification Data" Paragraph in "Informational Submittals" Article.

Seismic Fabrication Requirements: Fabricate [**mounting base**] [**and**] [**wall support**] and attachment to boiler pressure vessel, accessories, and components with reinforcement strong enough to withstand seismic forces defined in Section 230548 "Vibration and Seismic Controls for HVAC" when mounting base is anchored to building structure.

* + - 1. PULSE-COMBUSTION, FIRE-TUBE CONDENSING BOILERS

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=6253) Subject to compliance with requirements, provide products by one of the following:

[IBC Technologies; a Rheem brand](http://www.specagent.com/Lookup?uid=123457195141).

[Raypak; a Rheem brand](http://www.specagent.com/Lookup?uid=123457195139).

[RIELLO](http://www.specagent.com/Lookup?uid=123457149369).

Approved equivalent.

* + - * 1. Description: Factory-fabricated, -assembled, and -tested, pulse-combustion condensing boiler with heat exchanger sealed pressure tight, built on a steel base, including insulated jacket; flue-gas vent; combustion-air intake connections; water supply, return, and condensate drain connections; and controls.
        2. Combustion Chamber: [**Type 316L stainless steel**] [**Carbon steel**].

Retain first option in "Heat Exchangers" Paragraph below if boiler operates at less than 140 deg F (60 deg C) return-water temperature.

* + - * 1. Heat Exchangers: [**Type 316L stainless steel**] [**Carbon steel**].
        2. Pressure Vessel: Carbon steel with welded heads and tube connections.
        3. Exhaust Decoupler: Fiberglass composite material in a corrosion-resistant steel box.
        4. Burner: [**Natural**] [**Propane**] gas, self-aspirating and self-venting after initial start.
        5. Blower: Centrifugal fan to operate only during start of each burner sequence.

Default motor characteristics are specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

Motors: Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

Motor Sizes: Large enough so driven load will not require motor to operate in service factor range above 1.0.

* + - * 1. Gas Train: Combination gas valve with manual shutoff and pressure regulator.
        2. Ignition: Direct-spark ignition with transformer and 100 percent main-valve shutoff with electronic flame supervision.
        3. Casing:

Jacket: Sheet metal, with snap-in or interlocking closures.

Control Compartment Enclosure: NEMA 250, Type 1A.

Finish: [**Baked-enamel**] [**Powder-coated**] [**Stainless steel**] protective finish.

Insulation: Minimum 2-inch- (50-mm-) thick, mineral-fiber insulation surrounding heat exchanger.

Combustion-Air Connection: Inlet duct collar and sheet metal closure over burner compartment.

* + - * 1. Mufflers: Carbon-steel intake muffler and stainless steel exhaust.
        2. Condensate Trap: Cast-iron body with stainless steel internal parts.

If Project has more than one type or configuration of boiler, delete "Capacities and Characteristics" Paragraph below and schedule boilers on Drawings.

* + - * 1. Capacities and Characteristics:

Design Water-Pressure Rating: [**15 psig (104 kPa)**] [**150 psig (1035 kPa)**] <**Insert pressure rating**>.

Safety Relief Valve Setting: <**Insert psig (kPa)**>.

Entering-Water Temperature: <**Insert deg F (deg C)**>.

Leaving-Water Temperature: <**Insert deg F (deg C)**>.

Design Water Flow Rate: <**Insert gpm (L/s)**>.

Design Pressure Drop: <**Insert psig (kPa)**>.

Retain "Minimum Efficiency AFUE," "Minimum Thermal Efficiency," or "Minimum Combustion Efficiency" Subparagraph below. Specify standing or intermittent pilot with minimum AFUE. Sustainable design systems require compliance with ASHRAE/IES 90.1 or ASHRAE 90.2 and may require efficiency in excess of minimum efficiency required by ASHRAE/IES 90.1 or ASHRAE 90.2.

Minimum Efficiency AFUE: <**Insert number**> percent.

Minimum Thermal Efficiency: <**Insert number**> percent.

Minimum Combustion Efficiency: <**Insert number**> percent.

Retain "AGA Input" or "Gas Input" Subparagraph below.

AGA Input: <**Insert MBh (kW)**>.

Consider actual Btu content of fuel source if retaining "Gas Input" Subparagraph below. Contact fuel supplier and boiler manufacturers to determine impact. Add text indicating Btu content of fuel if applicable.

Gas Input: <**Insert cfh (mL/s)**>.

Retain "AGA Output Capacity," "DOE Output Capacity," or "Equivalent Direct Radiation" Subparagraph below for rating methods.

AGA Output Capacity: <**Insert MBh (kW)**>.

DOE Output Capacity: <**Insert MBh (kW)**>.

Equivalent Direct Radiation: <**Insert EDR (kW)**>.

Electrical Characteristics:

Volts: [**115**] [**208**] [**230**] [**460**] <**Insert number**> V.

Phase: [**Single**] [**Three**].

Hertz: [**50**] [**60**] <**Insert number**> Hz.

Full-Load Amperes: <**Insert number**> A.

Minimum Circuit Ampacity: <**Insert number**> A.

Maximum Overcurrent Protection: <**Insert number**> A.

* + - 1. FLOOR-MOUNTED, FORCED-DRAFT, FIRE-TUBE CONDENSING BOILERS

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=13549) Subject to compliance with requirements, provide products by one of the following:

Aerco Condensing Boilers

Lochinvar Condensing Boilers

[Bosch Thermotechnology Corp](http://www.specagent.com/Lookup?uid=123457140123).

[IBC Technologies; a Rheem brand](http://www.specagent.com/Lookup?uid=123457197304).

[Patterson-Kelley](http://www.specagent.com/Lookup?uid=123457209690).

[Raypak; a Rheem brand](http://www.specagent.com/Lookup?uid=123457196832).

Approved equivalent.

* + - * 1. Description: Factory-fabricated, -assembled, and -tested, fire-tube, forced-draft, condensing boiler with heat exchanger sealed pressure tight, built on a steel base, including insulated jacket; flue-gas vent; combustion-air intake connections; water supply, return, and condensate drain connections; and controls. Units are to be for water-heating service only.
        2. Primary Heat Exchanger: Corrosion-resistant [**Type 316 stainless steel**] [**cast iron**] [**or**] [**aluminum**].
        3. Secondary Heat Exchanger: Corrosion-resistant [**Type 316 stainless steel**] [**cast iron**] [**or**] [**aluminum**].
        4. Combustion Chamber and Flue Pipes: Corrosion-resistant [**stainless steel**] [**or**] [**aluminum**].
        5. Pressure Vessel: Carbon steel with welded heads and tube connections.
        6. Burner: [**Natural gas**] [**Propane**] [**Dual fuel (gas and propane)**] [**Dual fuel (gas and No. 2 fuel oil)**], forced draft.
        7. Blower: Centrifugal fan to operate during each burner-firing sequence and to prepurge and postpurge the combustion chamber.

Default motor characteristics are specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

Motors: Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

Motor Sizes: Large enough so driven load will not require motor to operate in service factor range above 1.0.

* + - * 1. Gas Train: Combination gas valve with manual shutoff and pressure regulator.
        2. Ignition: Direct-spark ignition or silicone carbide hot-surface ignition with 100 percent main-valve shutoff and electronic flame supervision.
        3. Casing:

Jacket: [**Sheet metal**] [**Plastic**], with snap-in or interlocking closures.

Control Compartment Enclosures: NEMA 250, Type 1A.

If retaining second option in "Jacket" Subparagraph above, delete "Finish" Subparagraph below.

Finish: [**Baked-enamel**] [**Powder-coated**] [**Stainless steel**] protective finish.

Insulation: Minimum 2-inch- (50-mm-) thick, [**mineral-fiber**] [**polyurethane-foam**] insulation surrounding the heat exchanger.

Combustion-Air Connections: Inlet and vent duct collars.

If Project has more than one type or configuration of boiler, delete "Capacities and Characteristics" Paragraph below and schedule boilers on Drawings.

* + - * 1. Capacities and Characteristics:

Heating Medium: Hot water.

Design Water-Pressure Rating: [**160 psig (1100 kPa)**] <**Insert value**>.

Safety Relief Valve Setting: <**Insert psig (kPa)**>.

Entering-Water Temperature: <**Insert deg F (deg C)**>.

Leaving-Water Temperature: <**Insert deg F (deg C)**>.

Design Water Flow Rate: <**Insert gpm (L/s)**>.

Minimum Water Flow Rate: <**Insert gpm (L/s)**>.

Design Pressure Drop: <**Insert psig (kPa)**>.

Retain "Minimum Efficiency AFUE," "Minimum Thermal Efficiency," or "Minimum Combustion Efficiency" Subparagraph below. Specify standing or intermittent pilot with minimum AFUE. Sustainable design systems require compliance with ASHRAE/IES 90.1 or ASHRAE 90.2 and may require efficiency in excess of minimum efficiency required by ASHRAE/IES 90.1 or ASHRAE 90.2.

Minimum Efficiency AFUE: <**Insert number**> percent.

Minimum Thermal Efficiency: <**Insert number**> percent.

Minimum Combustion Efficiency: <**Insert number**> percent.

Retain "AGA Input" or "Gas Input" Subparagraph below.

AGA Input: <**Insert MBh (kW)**>.

Consider actual Btu content of fuel source if retaining "Gas Input" Subparagraph below. Contact fuel supplier and boiler manufacturers to determine impact. Add text indicating Btu content of fuel if applicable.

Gas Input: <**Insert cfh (mL/s)**>.

Retain "AGA Output Capacity," "DOE Output Capacity," or "Equivalent Direct Radiation" Subparagraph below for rating methods.

AGA Output Capacity: <**Insert MBh (kW)**>.

DOE Output Capacity: <**Insert MBh (kW)**>.

Equivalent Direct Radiation: <**Insert EDR (kW)**>.

Electrical Characteristics:

Volts: [**115**] [**208**] [**230**] [**460**] <**Insert number**> V.

Phase: [**Single**] [**Three**].

Hertz: [**50**] [**60**] <**Insert number**> Hz.

Full-Load Amperes: <**Insert number**> A.

Minimum Circuit Ampacity: <**Insert number**> A.

Maximum Overcurrent Protection: <**Insert number**> A.

* + - 1. WALL-HUNG, FORCED-DRAFT, FIRE-TUBE CONDENSING BOILERS

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=13550) Subject to compliance with requirements, provide products by one of the following:

Aerco Condensing Boilers

Lochinvar Condensing Boilers

[IBC Technologies; a Rheem brand](http://www.specagent.com/Lookup?uid=123457197303).

[Laars Heating Systems Company; a subsidiary of Bradford White Corporation](http://www.specagent.com/Lookup?uid=123457140153).

Approved equivalent.

* + - * 1. Description: Factory-fabricated, -assembled, and -tested, fire-tube, forced-draft, condensing boiler with heat exchanger sealed pressure tight, built on a steel base, including insulated jacket; flue-gas vent; combustion-air intake connections; water supply, return, and condensate drain connections; and controls. Units are to be for water-heating service only.
        2. Heat Exchanger: Corrosion-resistant [**Type 316 stainless steel**].
        3. Fire Tubes: Corrosion-resistant [**Type 316 stainless steel**] [**or**] [**aluminum core**].
        4. Combustion Chamber and Flue Pipes: Corrosion-resistant [**stainless steel**] [**or**] [**aluminum**].
        5. Burner: [**Natural gas**] [**Propane**], forced draft.
        6. Blower: Centrifugal fan to operate during each burner-firing sequence and to prepurge and postpurge the combustion chamber.

Default motor characteristics are specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

Motors: Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

Motor Sizes: Large enough so driven load will not require motor to operate in service factor range above 1.0.

* + - * 1. Gas Train: Combination gas valve with manual shutoff and pressure regulator.
        2. Ignition: Direct-spark ignition or silicone carbide hot-surface ignition with 100 percent main-valve shutoff and electronic flame supervision.

Retain "Integral Circulator" Paragraph below if boiler requires continuous circulation and this is not provided by hot water piping system.

* + - * 1. Integral Circulator: Cast-iron body and stainless steel impeller sized for minimum flow required in heat exchanger.
        2. Casing:

Jacket: [**Sheet metal**] [**Plastic**], with snap-in or interlocking closures.

Control Compartment Enclosures: NEMA 250, Type 1A.

If retaining second option in "Jacket" Subparagraph above, delete "Finish" Subparagraph below.

Finish: [**Baked-enamel**] [**Powder-coated**] [**Stainless steel**] protective finish.

Insulation: Minimum 2-inch- (50-mm-) thick, [**mineral-fiber**] [**polyurethane-foam**] insulation surrounding the heat exchanger.

Combustion-Air Connections: Inlet and vent duct collars.

If Project has more than one type or configuration of boiler, delete "Capacities and Characteristics" Paragraph below and schedule boilers on Drawings.

* + - * 1. Capacities and Characteristics:

Heating Medium: Hot water.

Design Water-Pressure Rating: [**160 psig (1100 kPa)**] <**Insert value**>.

Safety Relief Valve Setting: <**Insert psig (kPa)**>.

Entering-Water Temperature: <**Insert deg F (deg C)**>.

Leaving-Water Temperature: <**Insert deg F (deg C)**>.

Design Water Flow Rate: <**Insert gpm (L/s)**>.

Minimum Water Flow Rate: <**Insert gpm (L/s)**>.

Design Pressure Drop: <**Insert psig (kPa)**>.

Retain "Minimum Efficiency AFUE," "Minimum Thermal Efficiency," or "Minimum Combustion Efficiency" Subparagraph below. Specify standing or intermittent pilot with minimum AFUE. Sustainable design systems require compliance with ASHRAE/IES 90.1 or ASHRAE 90.2 and may require efficiency in excess of minimum efficiency required by ASHRAE/IES 90.1 or ASHRAE 90.2.

Minimum Efficiency AFUE: <**Insert number**> percent.

Minimum Thermal Efficiency: <**Insert number**> percent.

Minimum Combustion Efficiency: <**Insert number**> percent.

Retain "AGA Input" or "Gas Input" Subparagraph below.

AGA Input: <**Insert MBh (kW)**>.

Consider actual Btu content of fuel source if retaining "Gas Input" Subparagraph below. Contact fuel supplier and boiler manufacturers to determine impact. Add text indicating Btu content of fuel if applicable.

Gas Input: <**Insert cfh (mL/s)**>.

Retain "AGA Output Capacity," "DOE Output Capacity," or "Equivalent Direct Radiation" Subparagraph below for rating methods.

AGA Output Capacity: <**Insert MBh (kW)**>.

DOE Output Capacity: <**Insert MBh (kW)**>.

Equivalent Direct Radiation: <**Insert EDR (kW)**>.

Electrical Characteristics:

Volts: [**115**] [**208**] [**230**] [**460**] <**Insert number**> V.

Phase: [**Single**] [**Three**].

Hertz: [**50**] [**60**] <**Insert number**> Hz.

Full-Load Amperes: <**Insert number**> A.

Minimum Circuit Ampacity: <**Insert number**> A.

Maximum Overcurrent Protection: <**Insert number**> A.

* + - 1. FLOOR-MOUNTED, WATER-TUBE CONDENSING BOILERS

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=13551) Subject to compliance with requirements, provide products by one of the following:

[Bosch Thermotechnology](http://www.specagent.com/Lookup?uid=123457140156).

[Laars Heating Systems Company; a subsidiary of Bradford White Corporation](http://www.specagent.com/Lookup?uid=123457140138).

[Patterson-Kelley](http://www.specagent.com/Lookup?uid=123457206800).

Approved equivalent.

* + - * 1. Description: Factory-fabricated, -assembled, and -tested, water-tube, forced-draft, condensing boiler with heat exchanger sealed pressure tight, built on a steel base, including insulated jacket; flue-gas vent; combustion-air intake connections; water supply, return, and condensate drain connections; and controls. Units are to be for water-heating service only.
        2. Heat Exchanger: Stainless steel primary and secondary heat exchangers.
        3. Combustion Chamber: Stainless steel, sealed.
        4. Burner: [**Natural**] [**Propane**] gas, forced draft drawing from gas-premixing valve.
        5. Blower: Centrifugal fan to operate during each burner-firing sequence and to prepurge and postpurge the combustion chamber.

Default motor characteristics are specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

Motors: Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

Motor Sizes: Large enough so driven load will not require motor to operate in service factor range above 1.0.

* + - * 1. Gas Train: Combination gas valve with manual shutoff and pressure regulator.
        2. Ignition: Direct-spark ignition or silicone carbide hot-surface ignition with 100 percent main-valve shutoff and electronic flame supervision.

Retain "Integral Circulator" Paragraph below if boiler requires continuous circulation and this is not provided by hot water piping system.

* + - * 1. Integral Circulator: Cast-iron body and stainless steel impeller sized for minimum flow required in heat exchanger.
        2. Casing:

Jacket: Sheet metal, with snap-in or interlocking closures.

Control Compartment Enclosures: NEMA 250, Type 1A.

Finish: [**Baked-enamel**] [**Powder-coated**] [**Stainless steel**] protective finish.

Insulation: Minimum [**1-inch- (25-mm-)**] [**2-inch- (50-mm-)**] thick, mineral-fiber insulation surrounding the heat exchanger.

Combustion-Air Connections: Inlet and vent duct collars.

If Project has more than one type or configuration of boiler, delete "Capacities and Characteristics" Paragraph below and schedule boilers on Drawings.

* + - * 1. Capacities and Characteristics:

Heating Medium: Hot water.

Design Water-Pressure Rating: [**160 psig (1100 kPa)**] <**Insert value**>.

Safety Relief Valve Setting: <**Insert psig (kPa)**>.

Entering-Water Temperature: <**Insert deg F (deg C)**>.

Leaving-Water Temperature: <**Insert deg F (deg C)**>.

Design Water Flow Rate: <**Insert gpm (L/s)**>.

Minimum Water Flow Rate: <**Insert gpm (L/s)**>.

Design Pressure Drop: <**Insert psig (kPa)**>.

Fuel: [**Natural gas**] [**Propane**] [**Dual fuel (gas and propane)**].

Retain "Minimum Efficiency AFUE," "Minimum Thermal Efficiency," or "Minimum Combustion Efficiency" Subparagraph below. Specify standing or intermittent pilot with minimum AFUE. Sustainable design systems require compliance with ASHRAE/IES 90.1 or ASHRAE 90.2 and may require efficiency in excess of minimum efficiency required by ASHRAE/IES 90.1 or ASHRAE 90.2.

Minimum Efficiency AFUE: <**Insert number**> percent.

Minimum Thermal Efficiency: <**Insert number**> percent.

Minimum Combustion Efficiency: <**Insert number**> percent.

Retain "AGA Input" or "Gas Input" Subparagraph below.

AGA Input: <**Insert MBh (kW)**>.

Consider actual Btu content of fuel source if retaining "Gas Input" Subparagraph below. Contact fuel supplier and boiler manufacturers to determine impact. Add text indicating Btu content of fuel if applicable.

Gas Input: <**Insert cfh (mL/s)**>.

Retain "AGA Output Capacity" or "DOE Output Capacity" Subparagraph below for rating methods.

AGA Output Capacity: <**Insert MBh (kW)**>.

DOE Output Capacity: <**Insert MBh (kW)**>.

Electrical Characteristics:

Volts: [**115**] [**208**] [**230**] [**460**] <**Insert number**> V.

Phase: [**Single**] [**Three**].

Hertz: [**50**] [**60**] <**Insert number**> Hz.

Full-Load Amperes: <**Insert number**> A.

Minimum Circuit Ampacity: <**Insert number**> A.

Maximum Overcurrent Protection: <**Insert number**> A.

* + - 1. WALL HUNG, WATER-TUBE CONDENSING BOILERS

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=13552) Subject to compliance with requirements, provide products by one of the following:

[Heat Transfer Products, Inc](http://www.specagent.com/Lookup?uid=123457140166).

[Hydrotherm, Inc./Mestek, Inc](http://www.specagent.com/Lookup?uid=123457140167).

[Laars Heating Systems Company; a subsidiary of Bradford White Corporation](http://www.specagent.com/Lookup?uid=123457140142).

Approved equivalent.

* + - * 1. Description: Factory-fabricated, -assembled, and -tested, water-tube, forced-draft, condensing boiler with heat exchanger sealed pressure tight, built on a steel base, including insulated jacket; flue-gas vent; combustion-air intake connections; water supply, return, and condensate drain connections; and controls.
        2. Heat Exchanger: Stainless steel primary and secondary heat exchangers.
        3. Combustion Chamber: Stainless steel, sealed.
        4. Burner: [**Natural**] [**Propane**] gas, forced draft drawing from gas-premixing valve.
        5. Blower: Centrifugal fan to operate during each burner-firing sequence and to prepurge and postpurge the combustion chamber.

Default motor characteristics are specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

Motors: Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

Motor Sizes: Large enough so driven load will not require motor to operate in service factor range above 1.0.

* + - * 1. Gas Train: Combination gas valve with manual shutoff and pressure regulator.
        2. Ignition: Direct-spark ignition or silicone carbide hot-surface ignition with 100 percent main-valve shutoff and electronic flame supervision.

Retain "Integral Circulator" Paragraph below if boiler requires continuous circulation and this is not provided by hot water piping system.

* + - * 1. Integral Circulator: Cast-iron body and stainless steel impeller sized for minimum flow required in heat exchanger.
        2. Casing:

Jacket: Sheet metal, with snap-in or interlocking closures.

Control Compartment Enclosures: NEMA 250, Type 1A.

Finish: [**Baked-enamel**] [**Powder-coated**] [**Stainless steel**] protective finish.

Insulation: Minimum [**1-inch- (25-mm-)**] [**2-inch- (50-mm-)**] thick, mineral-fiber insulation surrounding the heat exchanger.

Combustion-Air Connections: Inlet and vent duct collars.

If Project has more than one type or configuration of boiler, delete "Capacities and Characteristics" Paragraph below and schedule boilers on Drawings.

* + - * 1. Capacities and Characteristics:

Heating Medium: Hot water.

Design Water-Pressure Rating: [**160 psig (1100 kPa)**] <**Insert value**>.

Safety Relief Valve Setting: <**Insert psig (kPa)**>.

Entering-Water Temperature: <**Insert deg F (deg C)**>.

Leaving-Water Temperature: <**Insert deg F (deg C)**>.

Design Water Flow Rate: <**Insert gpm (L/s)**>.

Minimum Water Flow Rate: <**Insert gpm (L/s)**>.

Design Pressure Drop: <**Insert psig (kPa)**>.

Fuel: [**Natural gas**] [**Propane**] [**Dual fuel (gas and propane)**].

Retain "Minimum Efficiency AFUE," "Minimum Thermal Efficiency," or "Minimum Combustion Efficiency" Subparagraph below. Specify standing or intermittent pilot with minimum AFUE. Sustainable design systems require compliance with ASHRAE/IES 90.1 and may require efficiency in excess of minimum efficiency required by ASHRAE/IES 90.1.

Minimum Efficiency AFUE: <**Insert number**> percent.

Minimum Thermal Efficiency: <**Insert number**> percent.

Minimum Combustion Efficiency: <**Insert number**> percent.

Retain "AGA Input" or "Gas Input" Subparagraph below.

AGA Input: <**Insert MBh (kW)**>.

Consider actual Btu content of fuel source if retaining "Gas Input" Subparagraph below. Contact fuel supplier and boiler manufacturers to determine impact. Add text indicating Btu content of fuel if applicable.

Gas Input: <**Insert cfh (mL/s)**>.

Retain "AGA Output Capacity" or "DOE Output Capacity" Subparagraph below for rating methods.

AGA Output Capacity: <**Insert MBh (kW)**>.

DOE Output Capacity: <**Insert MBh (kW)**>.

Electrical Characteristics:

Volts: [**115**] [**208**] [**230**] [**460**] <**Insert number**> V.

Phase: [**Single**] [**Three**].

Hertz: [**50**] [**60**] <**Insert number**> Hz.

Full-Load Amperes: <**Insert number**> A.

Minimum Circuit Ampacity: <**Insert number**> A.

Maximum Overcurrent Protection: <**Insert number**> A.

* + - 1. WATER-JACKETED CONDENSING BOILERS

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=6256) Subject to compliance with requirements, provide products by one of the following:

[Heat Transfer Products, Inc](http://www.specagent.com/Lookup?uid=123457140118).

[Hydrotherm, Inc./Mestek, Inc](http://www.specagent.com/Lookup?uid=123457140119).

[RIELLO](http://www.specagent.com/Lookup?uid=123457155854).

Approved equivalent.

* + - * 1. Description: Factory-fabricated, -assembled, and -tested, water-jacketed condensing boiler with heat exchanger sealed pressure tight, built on a steel base, including insulated jacket; flue-gas vent; water supply, return, and condensate drain connections; and controls. Units are to be for water-heating service only.
        2. Heat Exchanger: Stainless steel primary and secondary heat exchangers.
        3. Burner: [**Natural**] [**Propane**] modulating gas, forced draft; stainless steel cylinder burner.
        4. Blower: Centrifugal fan, forced draft. Include prepurge and postpurge of the combustion chamber.

Default motor characteristics are specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

Motors: Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

Motor Sizes: Large enough so driven load will not require motor to operate in service factor range above 1.0.

* + - * 1. Gas Train: Combination gas valve with manual shutoff and pressure regulator. Include 100 percent safety shutoff with electronic flame supervision.
        2. Ignition: Electric-spark ignition or silicone carbide hot-surface ignition with 100 percent main-valve shutoff with electronic flame supervision.
        3. Casing:

Jacket: Sheet metal, with snap-in or interlocking closures.

Control Compartment Enclosures: NEMA 250, Type 1A.

Finish: Powder-coated protective finish.

Insulation: Minimum 2-inch- (50-mm-) thick, mineral-fiber insulation surrounding the heat exchanger.

Combustion-Air Connections: Inlet and vent duct collars.

If Project has more than one type or configuration of boiler, delete "Capacities and Characteristics" Paragraph below and schedule boilers on Drawings.

* + - * 1. Capacities and Characteristics:

Heating Medium: Hot water.

Design Water-Pressure Rating: [**160 psig (207 kPa)**] <**Insert value**>.

Safety Relief Valve Setting: <**Insert psig (kPa)**>.

Maximum Design Temperature: 210 deg F (99 deg C).

Entering-Water Temperature: <**Insert deg F (deg C)**>.

Leaving-Water Temperature: <**Insert deg F (deg C)**>.

Design Water Flow Rate: <**Insert gpm (L/s)**>.

Design Pressure Drop: <**Insert psig (kPa)**>.

Retain "Minimum Efficiency AFUE," "Minimum Thermal Efficiency," or "Minimum Combustion Efficiency" Subparagraph below. Specify standing or intermittent pilot with minimum AFUE. Sustainable design systems require compliance with ASHRAE/IES 90.1 and may require efficiency in excess of minimum efficiency required by ASHRAE/IES 90.1.

Minimum Efficiency AFUE: <**Insert number**> percent.

Minimum Thermal Efficiency: <**Insert number**> percent.

Minimum Combustion Efficiency: <**Insert number**> percent.

Retain "AGA Input" or "Gas Input" Subparagraph below.

AGA Input: <**Insert MBh (kW)**>.

Consider actual Btu content of fuel source if retaining "Gas Input" Subparagraph below. Contact fuel supplier and boiler manufacturers to determine impact. Add text indicating Btu content of fuel if applicable.

Gas Input: <**Insert cfh (mL/s)**>.

Retain "AGA Output Capacity," "DOE Output Capacity," or "Equivalent Direct Radiation" Subparagraph below for rating methods.

AGA Output Capacity: <**Insert MBh (kW)**>.

DOE Output Capacity: <**Insert MBh (kW)**>.

Equivalent Direct Radiation: <**Insert EDR (kW)**>.

Consider impact of site altitude on fan and motor.

Electrical Characteristics:

Volts: [**115**] [**208**] [**230**] [**460**] <**Insert number**> V.

Phase: [**Single**] [**Three**].

Hertz: [**50**] [**60**] <**Insert number**> Hz.

Full-Load Amperes: <**Insert number**> A.

Minimum Circuit Ampacity: <**Insert number**> A.

Maximum Overcurrent Protection: <**Insert number**> A.

* + - 1. TRIM - FOR HOT-WATER BOILERS

In first paragraph below, retain first option if boiler operating pressure exceeds 160 psig (1100 kPa) or boiler temperature exceeds 250 deg F (121 deg C). Otherwise, retain second option.

* + - * 1. Include devices sized to comply with [**ASME B31.1**] [**ASME B31.9**].

Retain first option in "Aquastat Controllers" Paragraph below if using modulating or high-low firing sequence.

* + - * 1. Aquastat Controllers: Operating[**, firing rate,**] and high limit with [**manual**] [**automatic**] reset.
        2. Safety Relief Valve: ASME rated.
        3. Pressure and Temperature Gauge: Minimum 3-1/2-inch- (89-mm-) diameter, combination water-pressure and -temperature gauge. Gauges shall have operating-pressure and -temperature ranges, so normal operating range is about 50 percent of full range.
        4. High and low gas-pressure switches.
        5. Alarm bell with silence switch.
        6. Boiler Air Vent: [**Automatic**] [**Manual**].
        7. Drain Valve: Minimum NPS 3/4 (DN 20) hose-end gate valve.

Retain "Circulation Pump" Paragraph below if pump is a component of boiler. Coordinate with Section 232123 "Hydronic Pumps."

* + - * 1. Circulation Pump: Nonoverloading, in-line pump with split-capacitor motor having thermal-overload protection and lubricated bearings; designed to operate at specified boiler pressures and temperatures.
      1. CONTROLS

Retain first paragraph below if controls are specified in Section 230923 "Direct Digital Control (DDC) System for HVAC" and Section 230993.11 "Sequence of Operations for HVAC DDC."

* + - * 1. Refer to Section 230923 "Direct Digital Control (DDC) System for HVAC" and Section 230993.11 "Sequence of Operations for HVAC DDC."

Delete paragraph above and retain first two paragraphs below if controls are components of boilers. Coordinate with Section 230993.11 "Sequence of Operations for HVAC DDC."

* + - * 1. Boiler operating controls shall include the following devices and features:

Control transformer.

Set-Point Adjust: All set points shall be adjustable.

Retain one of first two subparagraphs below for operating control sequences.

Electric, factory-fabricated and [**factory-installed**] [**field-installed**] panel to [**modulate burner**] [**and**] [**control burner-firing rate**] to maintain space temperature in response to thermostat with heat anticipator located in heated space.

Include automatic, alternating-firing sequence for multiple boilers to ensure maximum system efficiency throughout the load range and to provide equal runtime for boilers.

Electric, factory-fabricated and [**factory-installed**] [**field-installed**] panel to control burner-firing rate, to reset supply-water temperature inversely with outside-air temperature. At [**0 deg F (minus 17 deg C)**] <**Insert temperature**> outside-air temperature, set supply-water temperature at [**140 deg F (60 deg C)**] <**Insert temperature**>; at [**60 deg F (15 deg C)**] <**Insert temperature**> outside-air temperature, set supply-water temperature at [**90 deg F (32 deg C)**] <**Insert temperature**>.

Include automatic, alternating-firing sequence for multiple boilers to ensure maximum system efficiency throughout the load range and to provide equal runtime for boilers.

* + - * 1. Burner Operating Controls: To maintain safe operating conditions, burner safety controls limit burner operation.

High Cutoff: [**Manual**] [**Automatic**] reset stops burner if operating conditions rise above maximum boiler design temperature.

Low-Water Cutoff Switch: Electronic probe shall prevent burner operation on low water. Cutoff switch shall be [**manual**] [**automatic**]-reset type.

Blocked Inlet Safety Switch: Manual-reset pressure switch [**factory**] [**field**] mounted on boiler combustion-air inlet.

Audible Alarm: Factory mounted on control panel with silence switch; shall sound alarm for above conditions.

Retain "Building Automation System Interface" Paragraph below if boiler controls interface with building automation system.

* + - * 1. Building Automation System Interface: Factory install hardware and software to enable building automation system to monitor, control, and display boiler status and alarms.

Retain "Hardwired Points" Subparagraph below if interface with building automation system is through hardwired points and minimal interface is required. If extensive interface is required, delete below and retain second subparagraph below.

Hardwired Points:

Monitoring: On/off status, [**common trouble alarm**] [**low-water-level alarm**] <**Insert monitoring**>.

Control: On/off operation, [**hot-water-supply temperature set-point adjustment**] <**Insert control**>.

Retain subparagraph below if extensive interface with building automation system is required and is beyond that which can be provided by hardwired points. Choose appropriate communication interface to work with specified building automation system. Coordinate selection with manufacturers. Not all manufacturers offer all type of communication interfaces.

A [**BACnet**] [**Metasys**] [**Lonworks**] <**Insert type**> communication interface with building automation system shall enable building automation system operator to remotely control and monitor the boiler from an operator workstation. All monitoring and control features, which are available at the local boiler control panel, shall also be available at the remote operator workstation through the building automation system.

* + - 1. ELECTRICAL POWER
         1. Controllers, Electrical Devices, and Wiring: Electrical devices and connections are shown on Drawings and specified in electrical Sections.
         2. Single-Point Field Power Connection: Factory-installed and -wired switches, motor controllers, transformers, and other electrical devices necessary shall provide a single-point field power connection to boiler.

House in NEMA 250, [**Type 1**] <**Insert type**> enclosure.

Wiring shall be numbered and color coded to match wiring diagram.

Install factory wiring outside of an enclosure in a [**metal**]raceway.

Field power interface shall be to [**wire lugs**] [**fused disconnect switch**] [**nonfused disconnect switch**] [**circuit breaker**].

Provide branch power circuit to each motor and to controls[**with a disconnect switch or circuit breaker**].

Provide each motor with overcurrent protection.

Retain "Venting Kits" Article below if boiler-venting kit is to be included with boiler.

* + - 1. VENTING KITS
         1. Kit: Complete system, ASTM A959, Type 29-4C stainless steel pipe, vent terminal, thimble, indoor plate, vent adapter, condensate trap and dilution tank, and sealant. Refer to contract drawings for vent sizes and layout.
         2. Combustion-Air Intake: Complete system, [**stainless steel pipe] [PVC] [GALVANIZED PIPE]**, vent terminal with screen, inlet air coupling, and sealant.

Retain "Condensate-Neutralization Units" Article below if condensate neutralizer is required but is not provided in plumbing Sections.

* + - 1. CONDENSATE-NEUTRALIZATION UNITS

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=13553) Subject to compliance with requirements, provide products by one of the following:

[SFA Saniflo USA](http://www.specagent.com/Lookup?uid=123457140171).

[Skidmore Pump](http://www.specagent.com/Lookup?uid=123457140172).

[Wessels Company](http://www.specagent.com/Lookup?uid=123457140173).

Approved equivalent.

* + - * 1. Description: Factory-fabricated and -assembled condensate-neutralizing [**capsule**] [**tank**] assembly of corrosion-resistant plastic material with threaded or flanged inlet and outlet pipe connections. Device functions to prevent acidic condensate from damaging grain system. It is to be piped to receive acidic condensate discharged from condensing boiler and neutralize it by chemical reaction with replaceable neutralizing agent. Neutralized condensate is then piped to suitable drain.
        2. [**Capsule**] [**Tank**] features:

All corrosion-resistant material.

Suitable for use on all natural gas and propane boilers.

Includes initial charge of neutralizing agent.

Neutralizing agent to be easily replaceable when exhausted.

Inlet and outlet pipe connections.

* + - * 1. Capsule Configuration:

Low-profile design for applications where boiler condensate drain is close to the floor.

Easily removed and opened for neutralizing agent replacement.

Multiple units may be used for larger capacity.

* + - * 1. Tank Configuration:

Utilized where boiler is elevated or where tank is installed in a pit with tank top flush with floor.

Top easily removed for neutralizing agent replacement.

Internal baffles to channel flow for complete neutralization.

Integral bypass to prevent condensate backflow into appliance.

Multiple units may be used for larger capacity.

* + - 1. SOURCE QUALITY CONTROL

Retain "UL Compliance" Paragraph below if boiler input rating is greater than 400,000 Btu/h (117 kW)

* + - * 1. UL Compliance: Test gas-fired boilers having input of more than 400,000 Btu/h (117 kW) for compliance with UL 795. Boilers shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction.

Retain "UL Compliance, Oil-Fired" Paragraph below if oil-fired boilers are specified in Part 2.

* + - * 1. UL Compliance, Oil-Fired: Test oil-fired boilers for compliance with UL 726. Boilers shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction.
        2. UL Compliance, Gas-Fired: Test gas-fired boilers for compliance with UL 2764. Boilers shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction.

Retain "CSA Compliance" Paragraph below for projects in Canada.

* + - * 1. CSA Compliance: Test boilers for compliance with ANSI Z21.13-2017/CSA 4.9.

Retain "Performance Testing" Paragraph below if boiler rating is less than or equal to 3000,000 Btu/h (87.9 kW).

* + - * 1. Performance Testing: Test and label boilers for efficiency to comply with AHRI 1500.
        2. Burner and Hydrostatic Test: Factory adjust burner to eliminate excess oxygen, carbon dioxide, oxides of nitrogen emissions, and carbon monoxide in flue gas and to achieve combustion efficiency; perform hydrostatic test.
        3. Test and inspect factory-assembled boilers, before shipping, in accordance with 2017 ASME Boiler and Pressure Vessel Code. Factory test boilers for safety and functionality; fill boiler with water, and fire throughout firing range, to prove operation of all safety components.

Retain paragraph below if Director’s Representative wants to witness source quality-control testing.

* + - * 1. Allow Director’s Representative access to source quality-control testing of boilers. Notify Director’s Representative 14 days in advance of testing.

1. EXECUTION
   * + 1. EXAMINATION
          1. Examine roughing-in for concrete equipment bases, anchor-bolt sizes and locations, and piping and electrical connections to verify actual locations, sizes, and other conditions affecting performance of the Work.

Final boiler locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping and electrical connections.

* + - * 1. Examine mechanical spaces for suitable conditions where boilers will be installed.
        2. Proceed with installation only after unsatisfactory conditions have been corrected.
      1. BOILER INSTALLATION
         1. Equipment Mounting:

Retain first subparagraph below to require floor-mounted equipment to be installed on cast-in-place concrete equipment bases. Retain one or both of first two subparagraphs below as appropriate for equipment being specified.

Install floor-mounted boilers on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."

Install wall-hung boilers where indicated on Drawings using suitable hangers. Comply with manufacturer's mounting instructions.

Retain one of two subparagraphs below. Retain first for projects in seismic areas; retain second for projects not in seismic areas. Indicate vibration isolation and seismic-restraint device type and minimum deflection in supported equipment schedule on Drawings.

Comply with requirements for vibration isolation and seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."

* + - * 1. Install gas-fired boilers according to NFPA 54.
        2. Assemble and install boiler trim.
        3. Install electrical devices furnished with boiler but not specified to be factory mounted.
        4. Install control wiring to field-mounted electrical devices.
      1. PIPING CONNECTIONS

Coordinate piping installations and specialty arrangements with schematics on Drawings and with requirements specified in piping systems. If Drawings are explicit enough, these requirements may be reduced or omitted.

* + - * 1. Comply with requirements for hydronic piping specified in Section 232113 "Hydronic Piping."
        2. Connect piping to boilers, except safety relief valve connections, with flexible connectors of materials suitable for service. Flexible connectors and their installation are specified in Section 232116 "Hydronic Piping Specialties."
        3. Drawings indicate general arrangement of piping, fittings, and specialties.
        4. When installing piping adjacent to boiler, allow space for service and maintenance of condensing boilers. Arrange piping for easy removal of condensing boilers.

Retain one of first two paragraphs below. Retain first paragraph if Project includes condensate-neutralization unit; retain second paragraph and delete first paragraph if Project does not include condensate-neutralization unit.

* + - * 1. Install condensate drain piping to condensate-neutralization unit and from neutralization unit to nearest floor drain. Piping shall be at least full size of connection. Install piping with a minimum of 2 percent downward slope in direction of flow.
        2. Install condensate piping from equipment drain connection to nearest floor drain. Piping shall be at least full size of connection. Install piping with a minimum of 2 percent downward slope in direction of flow.
        3. Connect gas piping to boiler gas-train inlet with union. Piping shall be at least full size of gas-train connection. Provide a reducer if required.
        4. Connect hot-water piping to supply- and return-boiler tappings with shutoff valve, and union or flange at each connection.
        5. Install piping from safety relief valves to nearest floor drain.
      1. DUCT CONNECTIONS
         1. Boiler Venting:

Retain first subparagraph below and delete second subparagraph below if boiler vent and combustion-air intake venting kit is specified in "Venting Kits" Article in Part 2.

Install flue-venting kit and combustion-air intake.

Comply with all boiler manufacturer's installation instructions.

Retain first subparagraph below and delete second and third subparagraphs below if Installer is to field fabricate all boiler vent and combustion-air ducts in accordance with boiler manufacturer's instructions.

Field fabricate and install boiler vent and combustion-air intake.

Utilize vent and intake duct material, size, and configuration as indicated in boiler manufacturer's instructions and to comply with UL 1738.

Comply with all boiler manufacturer's installation instructions.

Retain first subparagraph below and delete second and third subparagraphs below if boiler-venting kit is not specified above and boiler vent is specified in Section 235123 "Gas Vents." Verify that combustion air is provided to boiler room in accordance with applicable codes.

Connect boiler vent full size to boiler connections.

Comply with requirements in Section 235123 "Gas Vents."

Comply with all boiler manufacturer's installation instructions.

* + - 1. ELECTRICAL CONNECTIONS
         1. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
         2. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
         3. Install electrical devices furnished by manufacturer, but not factory mounted, according to NFPA 70 and NECA 1.
         4. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

Nameplate shall be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."

Nameplate shall be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least [**1/2 inch (13 mm)**] <**Insert size**> high.

* + - 1. CONTROL CONNECTIONS
         1. Install control and electrical power wiring to field-mounted control devices.
         2. Connect control wiring in accordance with Section 260523 "Control-Voltage Electrical Power Cables."
         3. Install nameplate for each control connection, indicating field control panel designation and I/O control designation feeding connection.

Retain one of two subparagraphs below. First subparagraph cross-references Section 260553 "Identification for Electrical Systems" and should be retained for consistent electrical identification. Second subparagraph is an abbreviated version of the product specified in Section 260553 "Identification for Electrical Systems."

Nameplate shall be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."

Nameplate shall be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least [**1/2 inch (13 mm)**] <**Insert size**> high.

* + - 1. FIELD QUALITY CONTROL

Retain one of first four paragraphs below. Retain "Testing Agency, Director’s Representative" Paragraph below if Director’s Representative will hire an independent testing agency. Retain "Testing Agency, Contractor" Paragraph below if Contractor will hire an independent testing agency.

* + - * 1. Department of Labor Inspection: Arrange with NYS Department of Labor for Inspection of Boiler upon completion of installation.

Do not operate boilers until NYS Department of Labor inspection is made and a Certificate of Inspection is received.

Pay application and inspection fees required by NYS Department of Labor.

Preparation of boiler for inspection: Prepare boiler for internal inspection or hydrostatic pressure test on the date specified by the Department of Labor inspector.

Remove manhole and handhole plates, and washout plugs in the water column connection.

Remove grates of internally fire boilers.

Remove as directed by the NYS Department of Labor inspector, brick work and insulation.

Remove steam gage for testing if required by NYS Department of labor inspector.

Stop leaks of steam of hot water into the boiler being inspected from the other components.

Provide to the NYS Department of Labor inspector a competent person to be placed under the inspector’s supervision to disassemble, reassemble, test adjust, operate or forcible handling any part of the boiler.

* + - * 1. Provide framed glass holder for NYS Department of Labor Certificate of Inspection, and post near the boiler prior to operation of the boiler.
        2. Fasten two inch high metal identification numbers corresponding to number assigned by NYS Department of Labor Commissioner to a metal mounting plate and securely attach to the front of the boiler or front of boiler settings.
        3. Testing Agency, Director’s Representative: Director’s Representative will engage a qualified testing agency to perform tests and inspections.

Retain "Testing Agency" Paragraph below to require Contractor to hire an independent testing agency.

* + - * 1. Perform tests and inspections[**with the assistance of a Company Service Advisor**]:

Retain test requirements below with any combination of paragraphs above.

* + - * 1. Tests and Inspections:

Perform installation and startup checks in accordance with manufacturer's written instructions.

Leak Test: Hydrostatic test. Repair leaks and retest until no leaks exist.

Operational Test: Start units to confirm proper motor rotation and unit operation. Adjust air-fuel ratio and combustion.

Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

Check and adjust initial operating set points and high- and low-limit safety set points of fuel supply, water level, and water temperature.

Set field-adjustable switches and circuit-breaker trip ranges as indicated.

See Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.

* + - * 1. Boiler will be considered defective if it does not pass tests and inspections.
        2. Prepare test and inspection reports.
        3. Occupancy Adjustments: When requested within [**12 months of date of Substantial Completion**] <**Insert time period**>, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to [**two**] <**Insert number**> visits to Project during other-than-normal occupancy hours for this purpose.
      1. DEMONSTRATION
         1. [**Engage a Company Field Advisor per OGS Spec Section 014216 to train**] [**Train**] Director’s Representative's maintenance personnel to adjust, operate, and maintain boilers. [**Video record the training sessions and provide electronic copy to** Director’s Representative**.**]

Instructor shall be factory trained and certified.

Retain one of first two subparagraphs below.

Provide not less than [**two**] <**Insert number**> hours of training.

Train personnel in operation and maintenance and to obtain maximum efficiency in plant operation.

Provide instructional videos showing general operation and maintenance that are coordinated with operation and maintenance manuals.

Obtain Director’s Representative sign-off that training is complete.

Director’s Representative training shall be held at Project site.

END OF SECTION 235216