



**Hubbell NX700
High Efficiency Gas
Condensing Water Heater**

**Suggested
Specification**

Part I - General
Part II - Product
Part III - Installation

Project Name: _____ **Date:** _____
Location: _____
Engineer: _____
Contractor: _____ **Rep:** _____

I. GENERAL

- A. Supply and install ___ modulating and condensing water heater(s) as specified herein.
- B. Each water heater shall be factory assembled and tested. Each water heater shall be shipped complete on a factory-supplied wooden pallet, self-contained and ready for operation except for connection at the installation site of domestic water piping, fuel, electrical, combustion air, exhaust venting, condensate drainage and relief valve discharge piping.
- C. The water heater shall be capable of normal operation and full rated input with fuel gas supply pressure between 4 inches w.c. and 10.5 inches w.c. The water heater shall operate on natural gas fuel only.
- D. The water heater shall operate at a thermal efficiency of 94%, with a minimum input of 160,000 BTU/hr and a maximum input of 700,000 BTU/hr.
- E. The water heater shall be certified to the ANSI Z21.10.3 / CSA 4.3 Gas Water Heater Standard.
- F. The water heater controls shall be CSD-1 compliant.
- G. The water heater shall be certified for installation with zero clearance to combustibles, and shall be certified for closet and alcove installation when vented in accordance with the manufacturer's instructions.
- H. The water heater stainless steel heat exchanger shall be designed and constructed in compliance with the ASME Boiler and Pressure Vessel Code Section IV. A permanent nameplate bearing the "H" stamp and National Board registration number shall be attached to the heat exchanger and duplicated on the exterior of the unit in a readily viewable location.
- I. The heat exchanger limited warranty shall be five (5) years. All other parts shall have a five (5) year limited warranty covering defects in materials and workmanship. The warranty period is based from the date of installation, if the installation is registered within 6 months of installation.

II. PRODUCT

- A. Acceptable manufacturers
 - 1. The water heater shall be NX700 as manufactured by Hubbell Water Heaters.
- B. Water Heater Construction
 - 1. Heat Exchanger and Combustion Chamber
 - (a) The heat exchanger shall be constructed of 316L stainless steel, and mounted in a sealed stainless steel combustion chamber. The heat exchanger and combustion chamber assembly shall be of all-welded construction. The heat exchanger shall be rated for 160psi maximum operating pressure.
 - (b) The heat exchanger shall be accessible for inspection and cleaning via a removable burner access cover. The cover shall include a flame observation port.
 - (c) The heat exchanger shall be provided with an automatic air vent.

- (d) A built-in “U” trap shall be connected to the combustion chamber for collection and removal of condensate. The trap shall be translucent to permit visual inspection and shall be readily removable for cleaning.
2. Gas Train and Combustion System
- (a) The combustion system shall be fully modulating with a 4.4:1 turndown ratio.
 - (b) The combustion system shall contain:
 - 1) Adjustable air/gas ratio valve with integral regulator
 - 2) Mixing venturi
 - 3) Variable speed blower utilizing pulse width modulation
 - 4) Stainless steel cylindrical premix burner with woven stainless steel mesh covering
 - 5) Dual-electrode spark igniter
 - 6) Independent flame sensing electrode.
3. Venting and Combustion Air
- (a) The water heater shall be designed for venting with 6 inch diameter Schedule 40 PVC, Schedule 40 CPVC, AL29-4C stainless steel or Polypropylene pipe. Maximum exhaust vent length shall be 100 equivalent ft.
 - (b) The combustion chamber exhaust outlet shall include a factory-supplied field-installed 90 degree elbow to adapt to the 6 inch vent piping. The adapter elbow shall be constructed of AL29-4C stainless steel.
 - (c) The combustion chamber exhaust outlet shall include a ½ inch access port to permit insertion of a combustion analyzer probe. The access port shall be provided with a Viton sealing plug.
 - (d) The water heater shall be fitted with a stainless steel adapter for 4 inch diameter Schedule 40 pipe, for direct inlet of outside combustion air. Combustion air piping may be field adapted to 6 inch pipe. Maximum air intake length shall be 100 equivalent ft.
 - (e) The water heater shall be capable of using indoor air for combustion with an optional kit available from the manufacturer.
4. Cabinet
- (a) The unit internal structure shall be constructed of 16ga galvanized steel.
 - (b) The cabinet jacket shall be constructed of removable panels fabricated from 20ga steel finished with a durable factory applied coating on both sides. Removal of jacket panels shall not compromise sealing of the combustion chamber.
 - (c) The cabinet shall be provided with adjustable leveling legs.
5. Electrical
- (a) The water heater shall operate from a 120VAC/1 phase/60Hz power supply with a current draw of 12A.
 - (b) A line-voltage barrier strip shall be provided for connection of supply power and circulator pump. Pump control relays shall be sized for 1.5HP @ 120VAC.
 - (c) A low-voltage barrier strip shall be provided for connection of:
 - 1) DHW temperature sensor
 - 2) DHW Tank aquastat
 - 3) External safety limit
 - 4) Auxiliary proof
 - 5) Low gas pressure switch
 - 6) Time of day signal for night setback

- 7) 4-20mA signal from external control for burner modulation
 - 8) Alarm signal to a building automation system
 - 9) EIA-485 communication for Lead-Lag cascade control.
- (d) A factory wired on-off switch shall be provided.
- (e) Factory wiring shall permit field installation of a high gas pressure switch.
- (f) A factory installed and wired flow switch shall be provided with the water heater.
6. Controls
- (a) The water heater control system shall operate on 24VAC provided by an internal 75VA transformer.
- (b) The integrated microprocessor-based controller shall incorporate all operational and safety control functions, including:
- 1) Burner spark ignition
 - 2) Flame detection and supervision
 - 3) Burner firing rate modulation
 - 4) High temperature limit (UL353 rated)
 - 5) Meets the following CSD-1 requirements:
 - (i) CS-300 requirements as Primary Safety Control
 - (ii) CW-400 requirements as Temperature Operation Control
 - (iii) CW-400 requirements as a Temperature High Limit Control.
- (c) The controller shall incorporate a proportional-integral-derivative (PID) algorithm for domestic hot water.
- (d) The controller shall provide:
- 1) Operation of Domestic Hot Water Pump.
 - 2) Manual firing rate control, adjustable between minimum and maximum firing rate.
 - 3) Pump exercise for 10 seconds at 24 hour intervals
 - 4) Freeze protection to operate the water heater and pump and fire the burner at minimum modulation when the temperature falls below 38°F
 - 5) Field setting of the following:
 - Domestic hot water (DHW) setpoint from 60°F to 195°F
 - Time of Day (TOD) setpoint for DHW
 - DHW pump overrun time from 0 to 10 seconds
 - DHW pump start delay from 0 to 5 seconds
 - DHW modulation source (inlet or outlet water temperature)
 - Lead and lag selection method (sequence order or measured runtime)
 - Lead rotation time from 0 to 960 hours
 - Slave order priority method (equalize runtime, use first or use last)
 - Anti short-cycle interval from 0 to 60 minutes
 - Temperature units, °F or °C.
- (e) The control system shall include a built-in color touchscreen display to permit monitoring of unit operation and field adjustment of control parameters. The control shall support three (3) levels of password-protected access permission: User (no password), Installer, and OEM. The display shall be capable of showing:
- 1) Heat demand source
 - 2) Burner state
 - 3) Demanded firing rate in RPM
 - 4) Actual blower RPM
 - 5) Current setpoint
 - 6) Heat exchanger entering water temperature

- 7) Heat exchanger exiting water temperature
 - 8) Exhaust gas temperature
 - 9) Annunciation of limit devices
- (f) The controller shall be capable of Lead-Lag staging and rotation of up to eight (8) NX series water heaters with no additional control hardware required, apart from the necessary field-supplied cabling to connect the units via terminals provided on the low-voltage barrier strip. Field configuration of Lead-Lag operation shall be accomplished through the built-in touchscreen display.
 - (g) The controller shall provide integrated communication capability using the Modbus RTU protocol over an EIA-485 interface. Communication with external third-party building management networks utilizing BACnet MS/TP, BACnet/IP, Johnson Metasys N2, or LonWorks protocol shall be accomplished with factory optional communication gateway(s). The gateway shall map factory selected internal controller data registers to (*select one*): BACnet objects, Johnson Metasys N2 data points or LonWorks SNVTs. The gateway shall:
 - a) communicate with the water heater controller(s) at 38,400 bits/second
 - b) be equipped with DIP switches for field selection of node address and protocol
 - c) auto-discover Modbus addresses of up to 8 connected water heaters.

C. Trim kit

- 1. The following shall be factory supplied with each water heater, for field installation:
 - (a) Qty. 1 – Domestic Hot Water temperature sensor, 10k thermistor
 - (b) Qty. 1 - Pressure gauge, 0-160psi
 - (c) Qty. 1 - ¾ inch NPT ASME relief valve, 150psi
 - (d) Qty. 1 - 1 inch FNPT manual gas shutoff valve
 - (e) Qty. 1 - ¾ inch NPT brass tee
 - (f) Qty. 1 - ¾ inch x ¼ inch NPT brass bushing
 - (g) Qty. 1 - 6 inch length, 6 inch CPVC Schedule 40 pipe
 - (h) Qty. 1 - 6 inch, 90 degree, AL29-4C stainless steel exhaust elbow
 - (i) Qty. 4 - 3/8-16 x 1.5 inch zinc-plated steel hex-base leveling legs with polyethylene cap
 - (j) Qty. 1 - 4 inch diameter anti-bird screen
 - (k) Qty. 2 - 6 inch diameter anti-bird screen

D. Manuals

- 1. Each water heater shall include the following manuals:
 - (a) Installation and Operating (I&O) manual
 - (b) Controller and display reference manual
 - (c) User Information Manual

III. Installation

A. Water Heater shall be installed and vented in accordance with the manufacturers' instructions.

B. Venting

- 1. The water heater shall be vented as shown on the plans and specified below:
 - (a) Venting method (*select one*):
 - 1) Sidewall Direct Vent with exterior termination of separate exhaust and combustion air pipes
 - 2) Sidewall Direct Vent with termination by manufacturer specified sidewall termination kit of separate exhaust and combustion air pipes
 - 3) Sidewall Direct Vent with termination by manufacturer specified concentric vent termination kit of separate exhaust and combustion air pipes
 - 4) Sidewall Vent with exterior termination of exhaust; combustion air drawn from interior space

- 5) Vertical Direct Vent with exterior roof-top termination of separate exhaust and combustion air pipes
 - 6) Vertical Direct Vent with termination by manufacturer specified concentric vent termination kit of separate exhaust and combustion air pipes
 - 7) Vertical Vent with exterior roof-top termination of exhaust; combustion air drawn from interior space
- (b) Exhaust venting
- 1) Foam Core pipe is not an approved exhaust vent material and shall not be used.
 - 2) Exhaust vent material shall be (*select one*):
 - (i) 6 inch Schedule 40 PVC pipe, Schedule 40 CPVC pipe, AL29-4C stainless steel pipe, or Polypropylene pipe
 - 3) Exhaust vent length shall not exceed 100 equivalent ft. of pipe including fittings
- (c) Combustion air inlet
- 1) Combustion air inlet material shall be (*select one*):
 - (i) 4 inch/6 inch Schedule 40 PVC pipe, Schedule 40 CPVC pipe
 - (ii) Interior combustion air kit specified by the water heater manufacturer
 - 2) Combustion air inlet length shall not exceed 100 equivalent ft. of pipe including fittings
 - 3) A 4 x 6 reducer shall be field-supplied if 6 inch pipe is used