NCB-H High-Efficiency Condensing Combination Boiler

Engineering Specification

1. General Requirements

a. Project scope

i. Supply and install ____ (qty) high-efficiency condensing Combination Boiler(s), sealed combustion, modulating, and power vented that use either outside or inside air for combustion.

b. Acceptable manufacturers

i. The Combination Boiler shall be a Navien NCB-H ____ as basis of design with an input rating of ____ Btu/hr. and an output of ____ Btu/hr. It shall be capable of operating on either natural gas (NG) or propane (LP) with the following performance:

Navien Combination Boiler Space Heating Ratings			**Other Specifications**					
Model Number	Heating Input BTU/H		Heating Capacity BTU/H	Rating Water BTU/H	AFUE (%)	Water Pressure	Connection Size (Supply, Return)	Water Volume
	Min	Max						
NCB-190/060H	11,000	60,000	56,000	49,000	95.0	12-30 psi	1" NPT	1.5 gallons
NCB-190/080H	11,000	80,000	74,000	64,000	95.0			
NCB-240/110H	13,000	11,000	102,000	89,000	95.0			
NCB-240/130H	13,000	130,000	120,000	104,000	95.0			
NCB-250/150H	14,000	150,000	138,000	120,000	95.0			

Navien Combination Boiler Domestic Hot Water Ratings			**Other Specifications**				
Model Number	Heating Input BTU/H		Water Pressure	Minimum Flow Rate	Flow Rate 45°F (25°C) Temp Rise	DHW Inlet Connection Size	DHW Outlet Connection Size
	Min	Max					
NCB-190/060H	10,700	160,000	15-150 PSI	0.5 GPM (1.9 L/m)	3.7 GPM (14.0 L/m)	3/4" NPT	3/4" NPT
NCB-190/080H	10,700	160,000					
NCB-240/110H	13,300	199,900			4.7 GPM (17.8 L/m)		
NCB-240/130H	13,300	199,900					
NCB-250/150H	14,000	210,000			4.9 GPM (18.5 L.m)		

ii. The Combination Boiler shall have a minimum 5.5 to 1 turndown ratio with the full modulation range between the maximum and the minimum output levels.
iii. The Combination Boiler shall be capable of operating on natural gas (NG) or propane (LP) gas. The normal operation of the Combination Boiler with natural gas pressure shall be between 3.5 inches of W.C. and 10.5 inches of W.C. The normal operation of the Combination Boiler with propane gas pressure shall be between 8.0 inches of W.C. and 13.5 inches of W.C.

c. Installation
    i. The Combination Boiler shall be installed according to Navien's installation and operation manual.

2. Required Certifications

a. The boiler shall be certified and listed by C.S.A. International under the latest edition of the ANSI Z21.13 for the U.S. and CSA 4.9 for Canada.
b. The boiler shall bear the ASME "H" stamp for 30 psi maximum working pressure and shall be National Board listed.
c. The boiler's AFUE shall be verified by the Hydronics Institute of AHRI and listed in the AHRI Certification Directory.
d. The boiler shall be certified for low NOx sub 14 ng/J or 20 PPM at 3% O_2 and shall be listed in the South Coast Air Quality Management District directory.
e. The boiler controls shall be certified by CSA, UL, or equivalent.
f. The boiler shall have CRN registrations
g. All electrical components shall be certified by CSA, UL, or equivalent.

3. Product Design

a. Enclosure
    i. The enclosure shall be constructed of cold-rolled carbon steel, primed and painted on both sides.
    ii. The maximum Combination Boiler dimensions shall be: 17.3 in. (width) x 12.8 in. (depth) x 29.3 in. (height).
    iii. The maximum Combination Boiler weight shall be 96 lbs (44 kg).

b. Heat exchanger and combustion components
    i. The primary and secondary heat exchangers shall be constructed of stainless steel material and engineered to attain the highest level of heat transfer in a compact design. To accomplish this, the heating water shall flow through a series of tubes (secondary heat exchanger) and finned tubes (primary heat exchanger), designed to maximize the heat transfer area.
    ii. The DHW flat plate heat exchanger installed inside the combination boiler shall be constructed of stainless steel material
    iii. The heat exchanger shall be able to operate with a 35% mixture of propylene glycol without significant loss of performance.
    iv. The burner shall be a premix design made with stainless steel and a woven metal fiber covering mesh to provide a wide range of modulating firing rates. The burner and flame observation port shall be provided for visual inspection during boiler operation. The burner flame shall be ignited by direct spark ignition and monitored by the flame sensor.
    v. The negative pressure regulating gas valve shall use the fan venturi effect to pull the gas through the valve in the correct ratio to inlet air.
    vi. The boiler shall be equipped with a variable speed blower capable of modulating the boiler firing rate from 100% down to 20% and providing smooth operation throughout the entire operating range.

c. Built-in DHW (Domestic Hot Water Module) shall include the following:
    i. Integrated pump with maximum hot water output 4.9 GPM at 77 deg F delta T
    ii. Flow adjustment valve
    iii. Mixing valve
    iv. 3-way valve with easy access from the front of the unit with motor attached using a clip for tool-less removal
    v. Stainless steel flat plate heat exchanger

d. Venting and combustion air configurations
    i. The boiler shall be capable of using either outside air (direct vent system) or inside air (non-direct vent system using single pipe) for combustion. Inlet and outlet of the vent system shall be connected to either through-the-roof or sidewall terminations and shall be tested for unbalanced (different pressure zones) locations.
    ii. Air intake acceptable venting materials include PVC, CPVC, PP, and SS. Total equivalent vent length shall be up to 65 ft. using 2” pipe and up to 150 ft. using 3” pipe.

iii. Exhaust (flue gases) shall be vented using PVC Schedule 40 (solid core), CPVC Schedule 40 or 80 (solid core), SS and approved polypropylene as referenced in the boiler installation manual. Total equivalent vent length shall be up to 65 ft. using 2" pipe and up to 150 ft. using 3" pipe.
iv. Common venting flue gases shall use Category IV approved materials. Maximum of eight (8) units including one (1) NCB-H Combination Boiler and seven (7) NPE tankless water heaters can be connected to a common vent with the use of the Common Vent Backflow Damper Collar Kit.

e. Electrical
   i. The main power supply shall be 110-120 VAC, 60 Hz, three phase and shall not exceed 15 Amps. The Combination Boiler shall be supplied with a factory-installed 3-pronged (grounded) plug.
   ii. The Combination Boiler terminal strip shall be equipped with 120 VAC power for 3 zone pumps, 24 VAC power for 3 zone valves, 3 thermostats, LWCO, Navien SmartZone zone pump controller, universal supply/return temperature sensors, outdoor air temperature sensor, alarm contacts, DHW tank, air handler interrupt, and cascading control for up to 16 Units (1 Combination Boiler and up to 15 NPE tankless water heaters).

f. Controls shall be certified and furnished with the following features:
   i. Backlit Control panel with LCD type display, clear language text, Select Mode buttons and Command Dial to select and view information
   ii. Operating temperature limit with 194 deg F maximum Combination Boiler water temperature set point
   iii. High temperature limit control preset at 200 deg F and equipped with manual reset
   iv. Low water cut off (LWCO) with manual reset
   v. ASME certified pressure relief valve set to 30 PSIG provided as standard
   vi. Flue gas, supply and return water temperature sensors
   vii. Built-in freeze protection
   viii. Warm Weather Shutdown
   ix. 4 pump contacts (Combination Boiler, zone1/DHW, zone2 and zone 3/system)
   x. Fully customizable outdoor temperature reset curve provided along with an outdoor temperature sensor for field installation
   xi. One (1) Combination Boiler and up to fifteen (15) NPE tankless water heaters system including lead/lag cascading capability and main Combination Boiler rotation functionality

xii. Alarm contacts indicating manual reset lockouts on flame failure, high temperature limits, high pressure limits, low water cut off limits and air pressure limits
xiii. Flame sensor rod
xiv. Alarms, errors and operating status
xv. Control capability to communicate with NaviLink to control temperatures remotely, access usage data and receive diagnostic notifications

4. Warranty

a. The heat exchanger shall have ten (10) year limited warranty for residential applications.
b. All other parts of the boiler shall have five (5) year warranty for residential applications covering defects in materials and workmanship.
c. The labor warranty shall be one (1) year.
d. The warranty period shall be based on the date of manufacture or the date of installation (whichever period is longer).

5. Manuals

a. Complete set of documents including product brochure, installation manual, user manual, wiring diagrams, piping diagrams, controls sequences, engineering specification, submittals and warranties shall be submitted for approval at least seven days before the bid date.