Commercial Water Heating Solution

Written Specifications

SPECIFICATION SECTION XXX

PRODUCT: LC-N

PART 1 – GENERAL

* 1. RELATED DOCUMENTS
		1. Drawings and general provisions of the Contract apply to this Section, including General and Supplementary Conditions and Division 01 Specification Sections.
	2. WORK INCLUDED
		1. Contractor shall furnish a factory packaged, factory-fabricated and -assembled, gas-fired, high efficiency condensing domestic water heater package, mounted on support structure with associated water and gas piping, trim, and accessories for generating domestic hot water. Standard package systems include either two, three, four or five water heaters along with a scale prevention system, an expansion tank, and a digital mixing valve for precise temperature control.
		2. The packaged water heating system shall be supplied complete and pre-assembled entirely by one manufacturer.
		3. The construction of the packaged system shall include commercial Brigade water heaters, an AquaSolve® scale prevention system, an expansion tank, and a digital mixing system. Acceptable manufacturers for the digital mixing station are PVI DigiTemp Jr or Powers IntelliStation Jr. The model number shall be based on the packaged system selected.

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| Model Number |
| LC-N-400-2 |
| LC-N-600-3 |
| LC-N-800-4 |
| LC-N-1000-5 |

* 1. SUBMITTALS
		1. Submit shop drawings and product data as specified. Include scope of supply, installation instructions, description of operation and standard of construction. Include mechanical layout drawings, flow schematic drawing and symbols.
		2. Submit electrical power distribution, signal, symbols, and control wiring.
		3. Submit manufacturer’s certified capacity data.
		4. Submit manufacturer’s installation, start-up, and service instructions.
	2. QUALITY ASSURANCE AND COMPLIANCE
		1. Welding:
			1. Welds for package system piping must be in accordance with ASME B31.1. Welders shall be ASME BPVC Section IX certified.
		2. Connections:
			1. Package system piping must be in accordance with ASME B1.20 for steel pipe.
			2. Steel flange fittings shall be in accordance with ASME B16.5 of Class 150 and 300.
			3. Steel butt-weld fittings shall be in accordance with ASME B16.9.
			4. Cast iron threaded fittings shall be in accordance with ASME B16.4 of Class 125 and 250.
			5. Cast iron flange fittings shall be in accordance with ASME B16.1 of Class 125 or 250
			6. Valves shall be in accordance with ASME B16.1, ASME B16.18, ASME B16.24 or ASME B16.34.
			7. Flange bolts shall be in accordance with ASTM A307 Grade B
			8. Copper fittings shall be in accordance with ASME B16.18, ASME B16.22, or ASME B16.2
			9. Press connections shall be in accordance with IAPMO PS 117
		3. Piping
			1. Copper piping shall be in accordance with ASTM B88.

* + 1. Structural frame and pipe support welders shall be AWSD1.1 certified.
		2. Reference Standards
			1. ASME B16.5: Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard
			2. ASME A112.4.14: Manually Operated Quarter-Turn Shutoff Valves for Use in Plumbing System
			3. ASME B16.34: Valves - Flanged, Threaded and Welding End
			4. ASTM A307: Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod
			5. ASTM B88: Standard Specification for Seamless Copper Water Tube
			6. ASTM B687: Stand Specification for Brass, Copper, and Chromium-Plated Pipe Nipples
			7. IAPMO PS 117: Press and Nail Connections

PART 2 – PRODUCTS

1. CONSTRUCTION
	1. Pre-packaged systems shall be constructed with commercial Brigade water heaters, an AquaSolve® scale prevention system, an expansion tank, and a digital mixing system. Acceptable manufacturers for the digital mixing station are PVI DigiTemp Jr or Powers IntelliStation Jr. The number of components packaged in a system shall be dependent on the Package Model.

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| Model | Brigade Water Heaters | AquaSolve® | Digital Mixing | Package Dry Weight [lbs] |
| LC-N-400-2 | 2 | 1 | 1 | 2000 |
| LC-N-600-3 | 3 | 1 | 1 | 2550 |
| LC-N-800-4 | 4 | 1 | 1 | 3500 |
| LC-N-1000-5 | 5 | 1 | 1 | 4100 |

1. COMPONENTS
	1. WATER HEATERS
		1. Individual water heaters shall have an input of 199,000 BTU and have 25 gallons of storage capacity. Water heaters shall have a thermal efficiency of 96% based on DOE 10 CFR 431 testing per ANSI Z21.10.3.
		2. Individual units shall be ETL listed to ANSI Z.21.10.3, CSA 4.3, and NSF/ANSI 372 for low lead. Heaters shall meet thermal efficiency and standby heat loss requirements of the latest version of the ASHRAE 90.1 standard requirements. The water heaters shall also be ENERGY STAR® certified.
		3. The water heater shall be a vertical fire tube, water heater shall be suitable for a working pressure of 150 psi and shall be pressure tested at 1-1/2 times working pressure.
		4. Water heater shall be a single-pass, down-fired, fire tube design contained within an integral storage tank.
		5. Tank, combustion chamber and fire tubes shall be unlined. Lined or plated water heaters shall not be acceptable.
		6. Tanks, combustion chambers and fire tubes shall be constructed from phase balanced austenitic and ferritic duplex steel with a chemical structure containing a minimum of 21% chromium to prevent corrosion and mill certified per ASTM A 923 Methods A to ensure that the product is free of detrimental chemical precipitation that affects corrosion resistance. The material selected shall be tested and certified to pass stress chloride cracking test protocols as defined in ISO 3651-2and ASTM G123 – 00 (2005) “Standard Test Method for Evaluating Stress-Corrosion Cracking of Stainless Alloys with Different Nickel Content in Boiling Acidified Sodium Chloride Solution.”
		7. Tanks shall be welded utilizing joint designs to minimize volume of weld deposit and heat input. All heat affected zones (HAZ) shall be processed after welding to ensure the HAZ corrosion resistance is consistent with the mill condition base metal chemical composition. Weld procedures (amperage, volts, welding speed, filler metals and shielding gases) utilized shall result in a narrow range of austenite-ferrite microstructure content consistent with phase balanced objectives for welds, HAZ and the base metal.
		8. All internal and external tank surfaces shall undergo full immersion passivation and pickling processing to meet critical temperature, duration and chemical concentration controls required to complete corrosion resistance restoration of pressure vessel surfaces. Other passivation and pickling methods are not accepted. Immersion passivation and pickling certification documents are required and shall be provided with each product.
		9. Materials shall meet ASME Section II material requirements and be accepted by NSF 61 for municipal potable water systems. Storage tank materials shall contain more than 80% post-consumer recycled materials and be 100% recyclable.
		10. All water contacting tank surfaces shall be non-porous and exhibit 0% water absorption.
		11. All tank connections/fittings shall be non-ferrous or stainless steel.
		12. To preserve thermal efficiency, the water heaters shall not use or require a circulator piped from the hot water outlet to the cold-water inlet of the heater for the purpose of temperature control during normal operation. Connection for a building return circulation line shall be made to a dedicated hot return fitting at the center of the storage vessel and not the cold inlet piping. Connection to a sidearm tank, if used, shall be made to a dedicated hot return fitting at the center of the storage vessel and not the cold inlet piping.
		13. Finished vessels shall not require sacrificial or impressed current anodes and none shall be used. Water heaters or sidearm storage tanks that employ anode rods of any type shall not be acceptable.
		14. Combustion shall be provided by a premix, fan-assisted surface burner with a gas train meeting UL, ANSI and FM standards for the input specified.
		15. Burner shall be stainless steel.
		16. Gas train components shall be capable of self-proportionating gas and air to maintain optimum combustion in response to varying vent pressures, elevation, and ambient air temperatures.
		17. For each individual water heater, at 199,000 BTU input, the burner shall employ modulation with turndown of 7:1 for a minimum firing rate of 28,400 BTU/hr.
		18. Burner NOx emissions shall be less than 20 ppm when corrected to 3% oxygen.
		19. Water heaters shall be a category IV, condensing appliance and vent through PVC, CPVC, Polypropylene, or stainless steel. Water heater shall satisfy requirements for sealed combustion. Vents for inlet air and exhaust can terminate in different pressure zones.
	2. SCALE PREVENTION SYSTEM
		1. The scale prevention system shall be certified to NSF/ANSI standard 372 for Lead Free compliance.
		2. The media tank shall be constructed of a polyethylene liner with a continuous roving outer fiberglass reinforced wrapping. The tank shall be Non-ASME code with a 150 psi maximum pressure rating, 120 $°$F (48 $°$C) maximum temperature rating, and certified to NSF/ANSI Standard 44 or 61. 14” diameter tanks and larger shall have a bottom base permanently installed with industrial grade adhesive. The tanks shall come with a 4” or 2.5” top threaded port for loading media and connection of the tank head. The tank shall be designed with a safety factor of 4:1 for minimum burst pressure.
		3. The scale prevention media shall convert dissolved bicarbonate related water hardness into inactive non-scale forming nanocrystals that will not form scale on surfaces. The media shall operate in an up-flow pattern and shall not require backwashing or chemicals for regeneration. The media shall be certified to NSF/ANSI standard 61. Media within the systems shall be replaced every three years to ensure continued scale protection.
		4. The internal distributor system shall come pre-installed in the scale prevention system’s media tank(s). There shall be one upper distributor and one lower distributor screen to ensure that the media cannot be washed out of the tank regardless of flow direction. The screens of the internal distribution system shall be a slotted screen type diffuser. The slots shall be sized to not allow the scale prevention media to pass through and become present in the system's effluent water. The lower distributor shall be equipped with a downward pointing shroud to direct water to the bottom most portion of the media bed before it travels upward through the media. Screens shall be constructed of PVC.
		5. Bypass line for commissioning and maintenance shall be pre-piped on the package.
		6. Flexible plumbing shall be pre-installed upstream and downstream of the scale prevention device.
		7. Vacuum breaker shall be pre-installed.
		8. The size of the scale prevention system used shall be dependent on the package configuration.

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| Model | GPM | Dimensions (H x W) | Connection Size | AquaSolve® Model Number |
| LC-N-400-2 | 20 | 58” x 12” | 1” | M8410-COM |
| LC-N-600-3 | 20 | 58” x 12” | 1” | M8410-COM |
| LC-N-800-4 | 50 | 73.1” x 14” | 1” | M8414TM-COM |
| LC-N-1000-5 | 50 | 73.1” x 14” | 1” | M8414TM-COM |

* 1. EXPANSION TANK
		1. The expansion tank shall be a fixed butyl bladder type and shall meet ASME section VIII construction requirements.
		2. The expansion tank shall be certified to NSF/ANSI standard 61.
		3. The expansion tank shall be rated to have a maximum design pressure of 150 psi and a maximum design temperature of 240°F.
		4. The tank shall have a bladder integrity monitor and a charging valve connection to facilitate the on-site charging of the tank to meet system requirements.
		5. The tank shall be constructed with a built-in pressure gage.
	2. DIGITAL MIXING VALVE
		1. Temperature control system shall be controlled digitally via integrated circuit board technology designed to deliver blended water at accurate temperature selected by user as safe and appropriate for sanitary use in facility’s recirculated hot water system.
		2. System shall be listed/approved to ASSE 1017, cUPC, NSF and CSA 24/UL873.
		3. Construction shall be a lead-free design and in compliance with lead free laws.
		4. Inlet valve shall have a 1” inlet valve diameter.
		5. Digital water temperature control and monitoring system shall feature full-color 3.5” touchscreen interface capable of displaying 196 combinations of critical system data in standard or metric measurements.
		6. Temperature adjustment shall be made locally by user at the control module and shall not require a laptop computer or special software to initiate.
		7. System shall control water temperature to +/- 2°F in accordance with ASSE 1017 and during periods of low and zero demand, and maintain a consistent system "idling" temperature to mitigate "temperature creep" without the use of a manual throttling device/balancing valve. The high-speed actuator shall be located external to mixing chamber where water from valve cannot affect performance as a result of faulty o-rings or seals.
		8. System shall feature Feed Forward or Predictive Control which anticipates changes in system demand and adjusts valve pre-emptively to maintain mixed set point. Control module shall be password protected to help prevent unauthorized adjustment or tampering with settings.
		9. Control module shall integrate with building automation systems through Bacnet and Modbus protocols without the use of a separate module and feature local and remote temperature alarms.
		10. System shall feature a password protected, user-selected high-temperature sanitization mode for operation as part of a user’s safe and properly designed thermal bacteria eradication protocol.
		11. In the event of a power failure or loss of cold water, system shall close the hot water supply via an internally charged capacitor and is not reliant on batteries which must be replaced. Actuator shall also feature a manual override which can be used to set mixed outlet temperature in the event of a power loss.
		12. System shall be rated to have a maximum operating pressure of 200 psi, a maximum hot water temperature of 200 °F, a minimum hot water supply temperature of 2 °F above the set point, a minimum flow requirement of 0.5 gpm, a cold water inlet temperature range of 39 – 80 °F, and a hot water inlet temperature range of 120 – 180 °F.
	3. BASE AND PIPING
		1. The system shall be placed on a steel base, comprised of C6x10.5 steel channel, fully welded. The baseplate shall be minimum ¼” thick steel plate.
		2. Base shall include 4 lifting and tie down points for models LC-N-400-2 and LC-N-600-3, and 6 lifting and tie down points for models LC-N-800-4 and LC-N-1000-5. Tie down points shall be fully welded to package base.
		3. The dimensions of the system base shall be dependent on the model selected.

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| Model | Base Dimensions (LxW) |
| LC-N-400-2 | 82” x 60” |
| LC-N-600-3 | 102” x 60” |
| LC-N-800-4 | 154” x 60” |
| LC-N-1000-5 | 174” x 60” |

* + 1. Interconnecting piping shall be constructed of Type L – ASTM B88 seamless copper or ASTM B687 threaded brass.
		2. All interconnected piping shall employ Viega Propress, except where union connections are required.
		3. The packaged system shall be field installed with inlet, and outlet valves to allow for isolation of tank(s) and to allow for the bypass of untreated water in the event that service or media replacement be necessary.
		4. Installation of a vacuum relief valve, Watts EDP # 0556031, shall be installed on the outlet connection for any anti scale system installed above the ground floor.
		5. Included flexible plumbing shall be installed horizontally on inlet/outlet connections of the anti-scale packaged systems.

PART 3 – EXECUTION

1. INSTALLATION
	1. PIPING AND CONNECTIONS
2. All package piping shall be completed by the manufacturer prior to shipping. Connections to be made in the field include cold water make-up, high temperature supply, tempered water supply, and building recirculation.
	1. CONDENSATE
3. Low-profile condensate neutralizing tubes shall be suitable for no less than 12 months continuous operation at full condensing rate. Tubes shall be refillable.
4. Condensate traps shall be manufactured from only non-corrosive materials. Traps shall be P-type traps.
	1. VENTING
5. The exhaust vent must be UL Listed for use with Category II, III and IV appliances and compatible with positive pressure, condensing flue gas service. UL listed vents of PVC, CPVC, polypropylene, or AL29-4C stainless steel must be used with water heaters.
6. The minimum exhaust vent duct size for each water heater is three-inch diameter.
7. Water heaters shall be capable of drawing combustion air from the outdoors via a metal or PVC duct connected between the water heater and the outdoors.
8. The minimum sealed combustion air duct size for each water heater is three-inch diameter.
9. Follow guidelines specified in manufacturer’s installation manual.
10. START-UP AND TRAINING
	1. Engage a factory-authorized service representative to provide startup of the water heating packaged system, inspect components, assemblies, and equipment installations, including connections, and to assist in testing and training upon completion of the startup.
11. WARRANTY
	1. For warranty information, please refer to Lync LC-N warranty document.

END OF SECTION