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**XTHERM®, TYPE WH - MODELS 1005A-2005A  
SUGGESTED SPECIFICATIONS**

### DIVISION 23 34 36.29

### COMMERCIAL, WATER-TUBE, CONDENSING GAS DOMESTIC WATER HEATERS

1. - GENERAL
   1. SUMMARY
      1. Section includes condensing, gas-fired copper and cupronickel finned-tube, gas domestic water heaters

Specifier Note: Use as needed

* + 1. Related Sections
       1. Building Services Piping – Division 22 10 00
       2. Breeching, Chimneys, and Stacks (Venting) – Division 23 51 00
       3. Electrical – Division 23 09 33
  1. REFERENCES
     1. ANSI Z21.10.3/CSA 4.3
     2. ASME, Sections IV and VIII
     3. 2006 UMC, Section 1107.6
     4. ANSI/ASHRAE 15-1994, Section 8.13.6
     5. National Fuel Gas Code, ANSI Z223.1/NFPA 54
     6. NEC, ANSI/NFPA 70
     7. ASME CSD-1, 2018 (when required)
  2. SUBMITTALS
     1. Product data sheet (including dimensions, rated capacities, shipping weights, accessories)
     2. Wiring diagram
     3. Warranty information
     4. Installation and operating instructions
  3. QUALITY ASSURANCE
     1. Regulatory Requirements
        1. ANSI Z21.10.3/CSA 4.3
        2. Local and national air quality regulations for low NOx (0-20 PPM NOx emissions) water heaters
     2. Certifications
        1. CSA
        2. ASME HLW-Stamped and National Board registered
        3. ASME U-Stamped and National Board registered
        4. CSA-Certified – Low-Lead Compliant
        5. ISO 9001:2015
  4. WARRANTY
     1. Limited one-year parts warranty
     2. Limited five-year primary copper heat exchanger warranty, ten-year (cupronickel) warranty
     3. Limited ten-year secondary heat exchanger warranty
     4. Limited twenty-five-year thermal shock warranty

1. - PRODUCTS
   1. MANUFACTURER
      1. Raypak, Inc.
         1. Contact: 2151 Eastman Ave., Oxnard, CA 93030; Telephone: (805) 278-5300;   
            Fax: (805) 278-5468; Website: [www.raypak.com](http://www.raypak.com)
         2. Product: XTherm condensing water-tube domestic water heater(s)
   2. water HEATERS
      1. General
         1. The water heater(s) shall be fired with    gas at a rated input of       BTU/hr.
         2. The water heater shall have a maximum adjustable setpoint of 150ºF.
         3. The water heater(s) shall be CSA-tested and certified with a minimum thermal efficiency of 97% at full fire (99% at part load).
         4. The water heater(s) shall be ASME inspected and stamped and National Board registered for 160 PSIG maximum allowable working pressure and 210ºF maximum allowable temperature, complete with a Manufacturer's Data Report.
         5. The water heater(s) shall have a floor loading of 131 lbs. /square foot or less.
      2. Primary Heat Exchanger
         1. The primary heat exchanger shall be of a single-bank, vertical multi-pass design and shall completely enclose the combustion chamber for maximum efficiency. The tubes shall be set vertically and shall be rolled into a powder-coated, ASME water heater-quality, carbon steel tube sheet.
         2. The primary heat exchanger shall be sealed to 160 PSIG rated bronze headers with high-temperature silicone "O"-rings.
         3. The low water volume primary heat exchanger shall be explosion-proof on the waterside.
         4. The headers shall be secured to the tube sheet by stud bolts with flange nuts to permit inspection and maintenance without removal of external piping connections. A heavy gauge stainless steel slotted primary heat exchanger wrap shall ensure proper combustion gas flow across the copper or cupronickel finned tubes.
         5. The flue connection, combustion air opening, gas connection, water connections, condensate drain, and electrical connections shall be located on the rear.
         6. The primary heat exchanger shall have accessible water heater drain valves with hose bibs to drain the water section of the primary heat exchanger.
      3. Condensing Heat Exchanger
         1. The condensing heat exchanger shall be a single-bank, multi-pass design constructed of stainless steel and shall bear the ASME U stamp.
         2. The water heater(s) shall be capable of operating at inlet water temperatures as low as 50°F.
      4. Condensate Drain
         1. The water heater(s) will feature a condensate drain switch which will shut down the water heater(s) if the condensate drain is blocked.
      5. Burner
         1. The combustion chamber shall be of the sealed-combustion type employing the Raypak high-temperature radially-fired knitted burner, mounted in a vertical orientation.
         2. The burner must be capable of firing at both a complete blue flame with maximum gas and air input as well as firing infrared when gas and air are reduced. The burner must be capable of firing at 100% of rated input when supplied with 4.0” WC of inlet natural gas pressure, or 8.0” WC when supplied with propane gas, so as to maintain service under heavy demand conditions; no exceptions.
         3. The burner shall use a combustion air blower to precisely control the fuel/air mixture for maximum efficiency throughout the entire range of modulation. The combustion air blower shall operate for a pre-purge period before burner ignition and a post-purge period after burner operation to clear the combustion chamber.
         4. The blower shall infinitely vary its output in response to a Pulse Width Modulation (PWM) signal supplied directly from the VERSA IC**®** modulating temperature controller, thereby electronically and precisely adjusting the volume of air and gas supplied for combustion. Minimum fire shall be 14% of rated input (natural gas or propane gas).
      6. Ignition System
         1. The water heater(s) shall be equipped with a 100% safety shutdown.
         2. The ignition shall be Hot Surface Ignition (HSI) type with full flame rectification by remote sensing separate from the ignition source, with a three-try-for-ignition sequence, to ensure consistent operation *with single-try available as an option.*
         3. The igniter will be located to the side of the heat exchanger to protect the device from condensation during start-up.
         4. The ignition control module shall include an LED that indicates fifteen (15) individual diagnostic flash codes.
         5. An external viewing port shall be provided, permitting visual observation of burner operation.
      7. Gas Train
         1. The water heater(s) shall have a firing/leak test valve and pressure test valve as required.
         2. The water heater(s) shall have dual-seated main gas valve.
         3. Gas control trains shall have a redundant safety shut-off feature, main gas regulation, shutoff cock and plugged pressure tapping to meet the requirements of ANSI Z21.10.3/CSA 4.3.
      8. Water Heater Control
         1. The following safety controls shall be provided:
            1. High limit control with manual-reset
            2. Flow switch, mounted and wired
            3. PSIG ASME pressure relief valve, piped by the installer to an approved drain
            4. Temperature and pressure gauge (shipped loose)
         2. The water heater(s) shall be equipped with the following:
            1. VERSA IC**®** modulating temperature controller with 7” capacitive color touchscreen display
            2. Two adjustable energy-saving pump control relays (system, indirect DHW)
            3. Freeze protection
            4. Three (3) water sensors included (tank sensor is loose)
         3. 3. Each water heater shall have the ability to receive a 0-10 VDC signal from the Central Energy Management and Direct Digital Control System (EMCS) to vary the setpoint control. Each water heater shall have an alarm contact for connection to the central EMCS system.
         4. The water heater(s) shall have built-in “Cascade” function for up to eight (8) units of same or different BTUH inputs without utilizing an external controller or sequencer.
            1. The Cascade function shall include selectable modes for parallel modulation and sequential modulation with lead heater rotation and lead-lag operation.
            2. System shall be capable of leader redundancy and lead rotation every forty-eight (48) hours.
            3. Cascade function shall allow users to enable or disable alarm sharing across cascaded appliances when an alarm condition occurs.
      9. Firing Mode: Provide electronic modulating control of the gas input to the water heater.
      10. Water Heater Diagnostics
          1. Provide external LED panel displaying the following water heater status/faults:
             1. Power on – Green
             2. Call for heat – Amber
             3. Burner firing – Blue
             4. Service – Red
          2. Provide monitoring of all safeties, internal/external interlocks with fault display by a 7” touchscreen display:
             1. System status
             2. Ignition failure
             3. Condensate blockage
             4. Blower speed error
             5. Low 24 VAC
             6. Manual-reset high limit
             7. Auto-reset high limit
             8. Blocked vent
             9. Controller alarm
             10. Flow switch
             11. Sensor failure
             12. Factory option
             13. Inlet sensor (open or short)
             14. Outlet sensor (open or short)
             15. System sensor (open or short)
             16. Internal control fault
             17. ID card fault
             18. Cascade communications error

*Specifier Note: The remaining items in this section are options. Delete those that are not being specified..*

* + - * 1. Auto-reset high limit (optional)
        2. Low water cut-off (optional)
        3. High gas pressure switch (optional)
        4. Low gas pressure switch (optional)
    1. Combustion Chamber: The combustion chamber wrapper shall not require insulation to reduce standby radiation losses.
    2. Cabinet
       1. The corrosion-resistant galvanized-steel jackets shall be finished with a baked-on powder coat, suitable for outdoor installation, applied prior to assembly for complete coverage, and shall incorporate louvers in the outer panels to divert air past heated surfaces.
       2. The water heater(s), if located on a combustible floor, shall not require a separate combustible floor base.
       3. The water heater(s) shall connect both the combustion air and flue products through the back of the unit.
       4. The heater shall have as standard an internal combustion air filter rated to MERV (>95% arrestance).
    3. Water Heater Pump – Heater equipped with factory-packaged pump system.
    4. Cold Water Protection System
       1. The water heater(s) shall be configured with an automatic cold water protection proportional bypass system that ensures the heater primary heat exchanger will experience inlet temperatures in excess of 120ºF in less than 7 minutes to avoid damaging condensation.
       2. The cold-water protection system shall be configured with a variable-flow injection system that is controlled by VERSA IC**®** control system that diverts the correct amount of heated outlet water directly into the heater loop to maintain the required minimum inlet temperature. The VERSA IC**®** control temperature sensor shall be located in the inlet header of the primary heat exchanger.

Specifier Note: The remaining item(s) in this section are options. Delete those that are not being specified.

* + 1. PVC Vent Adapter
       1. The water heater(s) shall be configured with a PVC vent adapter that allows for the use of PVC vent material when the water heater return water temperature does not exceed 150ºF. The PVC vent adapter shall be factory-mounted to the water heater flue outlet and the vent termination adapter shall be shipped loose inside of the water heater crating for field installation.
       2. The PVC vent adapter shall include a flue temperature limit mounted to the water heater flue outlet and interlocked into the water heater safety circuit.
       3. The water heater shall also have a 200ºF manual high limit factory-mounted into the water heaters outlet header and interlocked into the safety circuit of the water heater.
    2. Centrotherm™ Polypropylene Vent Adapter
       1. The water heater(s) shall be shipped with a Polypropylene vent adapter that allows for the use of polypropylene vent material when the water heater return water temperature does not exceed 190ºF. The polypropylene vent adapter shall be shipped loose for field installation to the water heater flue outlet.
       2. The polypropylene vent adapter shall include a flue temperature limit mounted to the water heater flue outlet and interlocked into the water heater safety circuit.
       3. The water heater shall also have a 200ºF manual high limit factory-mounted into the water heaters outlet header and interlocked into the safety circuit of the water heater.
  1. WATER HEATER OPERATING CONTROLS
     1. Raymote™ Connectivity
        1. The VERSA IC**®** shall include the Raymote connectivity feature to allow remote access to boiler data and to provide maintenance reminders and error notifications on iOS and Android devices or by website access.
        2. The Raymote system allows for registering of multiple devices at various locations and multiple devices in a single cascade installation. The system also allows separate Groups to be established with various levels of access and control permission to be set by the equipment owner. The Groups feature will also allow for quick and efficient troubleshooting service by Raypak’s Service Team.
        3. Raymote will provide reminders and alerts via iOS or Android notification, text, or email. All notification features are user set.
        4. The Raymote app and website will allow remote monitoring of the following:
           1. Outlet and inlet temperature monitoring
           2. Vent temperature
           3. Flow (if equipped)
           4. Blower speed
           5. Modulation percentage
           6. Flame current
           7. Run time
           8. Boiler Status
           9. Cycles
           10. Historical data
        5. The Raymote App and Website will allow remote control/adjustment of the following:
           1. Temperature setpoint
           2. Temperature differential
           3. Outdoor Reset settings
           4. Indirect setpoint
           5. Indirect differential
           6. Custom notification
           7. Full historical data reports will be available for review on the Raymote website.
        6. One (1) year of Raymote service is included with boiler/water heater purchase
     2. Tank sensor shall be shipped loose for field-installation by installing contractor. Inlet/Outlet sensors are factory-installed.
     3. Each heater shall have the ability to receive a 0-10 VDC signal from the Central Energy Management and Direct Digital Control System (EMCS) to vary the setpoint control or firing rate. Each heater shall have an alarm contact for connection to the central EMCS system.
     4. Each heater shall be equipped with Modbus communications compatibility with up to 146-points of data available.
        + 1. *B-85 Gateway – BACnet MS/TP, BACnet IP, N2 Metasys or Modbus TCP shipped loose/installed (optional – please specify shipped loose or installed)*
          2. *B-86 Gateway – LonWorks shipped loose/installed (optional – please specify shipped loose or installed)*
     5. Heater(s) shall feature an integrated VERSA IC**®** modulating digital controller, mounted and wired.
     6. The control shall have the ability to provide cascade control of up to 8-heaters as a single-system via 2-wire communication.
     7. System sensor shall be shipped loose for field installation by installing contractor. Inlet/Outlet sensors are factory-installed.
  2. DIRECT VENT
     1. The water heater(s) shall meet safety standards for direct vent equipment as noted by the 2006 Uniform Mechanical Code, section 1107.6, and ASHRAE 15-1994, section 8.13.6.
  3. SOURCE QUALITY CONTROL
     1. The water heater(s) shall be completely assembled, wired, and fire-tested prior to shipment from the factory.
     2. The water heater(s) shall be furnished with the sales order, ASME Manufacturer’s Data Report(s), inspection sheet, wiring diagram, rating plate and Installation and Operating Manual.

1. - EXECUTION
   1. INSTALLATION
      1. Must comply with:
         1. Local, state, provincial, and national codes, laws, regulations and ordinances
         2. National Fuel Gas Code, ANSI Z223.1/NFPA 54 – latest edition
         3. National Electrical Code, ANSI/NFPA 70 – latest edition
         4. Canada only: CAN/CSA B149 Installation Code and CSA C22.1 CEC Part I
         5. Manufacturer’s installation instructions, including required service clearances and venting guidelines
      2. Manufacturer’s representative to verify proper and complete installation.
   2. START-UP
      1. Shall be performed by Raypak factory-trained personnel.
      2. Test during operation and adjust if necessary:
         1. Safeties
         2. Operating Controls
         3. Static and full load gas supply pressure
         4. Gas manifold and blower air pressure
         5. Amp draw of blower
         6. Combustion analysis
      3. Submit copy of start-up report to Architect and Engineer.
   3. training
      1. Provide factory-authorized service representative to train maintenance personnel on procedures and schedules related to start-up, shut-down, troubleshooting, servicing, and preventive maintenance.
      2. Schedule training at least seven days in advance.

**END OF SECTION**