

Back 2 Basics

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New Hotel Design-Bid-Build Project

This month's B2B will focus on hotels, motels, and dormitories described in the 2015 *ASHRAE Handbook — HVAC Applications*, chapter 6. To select the optimum HVAC system for the hotel application, the designer is directed to 2016 *ASHRAE Handbook — HVAC Systems and Equipment*. More specifically, to chapter 1 (HVAC System Analysis and Selection), chapter 2 (Decentralized Cooling and Heating), chapter 5 (In-Room Terminal Systems), chapter 13 (Hydronic Heating and Cooling), and chapter 32 (Boilers).

Project delivery method shall be design-bid-build. Hotel owner will provide her own O&M and custodial staff. Owner will contract a local HVAC service contractor for the HVAC equipment using a three-year preventive maintenance quarterly service contract.

For this month's equipment selection, a system comprising three modular condensing boilers shall heat the 2-pipe heating and air conditioning. In-room terminals shall be 2-pipe fan coil units (FCUs) furnished with 1kW electric heater to extend the cooling season before heating season changeover. Each boiler unit shall be 360 MBH output, 95% thermal efficiency, Energy Star compliant, natural gas, and capable of modulating down to 20% of rate input. Hot water shall be 160°F HWS and 130°F HWR at peak heating and 110°F HWS and 80°F HWR at low load.

Furnish and install with gas train, 4-in pressure, and required gas relief vent(s). Boiler fans shall be variable speed blower system, 24 VAC control circuit and control panel, temperature and pressure gages, automatic HWS shutoff valve, temperature sensors (HWS, HWR, flue, and outdoor air), low-water flow protection, and water pressure relief valve piped to funnel floor drain adjacent to boiler. Boilers shall operate using 30% polypropylene glycol, and three unit controls shall be capable of variable speed boiler pumping to maintain constant Delta T along with lead-lag staging of units. Boiler venting shall be sidewall and not exceed 24 ft. Combustion makeup air shall be from within room via direct outdoor duct terminating at boiler.

Two-pipe hot water/chilled water distribution shall be a reverse return system to the hotel's four central AHUs' preheat coils and FCU coils. AHUs will be roof-mounted with chilled water, airside economizer, barometric relief, single-zone heating coil, and MERV 8 prefilter and MERV 11 final filter. Two roof-mounted exhaust fans will be used for exhaust. Pumping shall be primary-secondary with variable speed pumps using in-line circulators. Each pump shall be piped to include shutoff valves, strainer with blow-off valve, 2-position ATC valve, circulator, and balancing valve for fine-tuning flow. One pressure gage shall be used with individual connection and associated petcocks at pump inlet, pump outlet, and immediately after balancing valve. Each boiler shall be piped to include HWS and HWR shutoff valves, strainer with blow-off valve, 2-position

ATC valve, and circulator. One pressure gage shall be used with individual connection and associated petcocks at inlet and outlet of boiler. An air separator shall be located at each boiler along with an in-line separator and automatic water makeup connection located between the boilers and the secondary pumps. Air-cooled chiller is not part of this test.

Each terminal heating coil and heating/cooling FCU coil shall be installed with HWS and HWR shutoff valves, strainer with blow-off valve, and 2-position ATC valve. One pressure gage shall be used with individual connection and associated petcocks at inlet and outlet of coil. Piping shall be type L copper and insulation thickness per the State Energy code. Supply air ductwork shall be per SMACNA and sealed airtight and insulated per State Energy code. There shall be an exhaust air system, and all return air and exhaust air ductwork shall be per SMACNA and rated for 2-in pressure.

General contractor shall include the following shop drawing submittal data:

- Equipment submittals - Pump and fan curves - Startup sheet - Troubleshooting sheets - O&M manuals, parts, and lubricants
- ATC and energy management submittal, including one complete ATC submittal integrating manufacturer's boilers, chiller, and AHU furnished ATC with overall ATC submittal.

A 3rd-party commissioning and TAB firm shall complete the following:

- TAB system flow diagram of entire 2-pipe water system with GPM and pump heads indicated at each piece of equipment.
- TAB system flow diagram of entire supply, return, and exhaust air systems with CFMs and static pressures at each piece of equipment and at major branch runouts.
- Commissioning functional performance test of HVAC systems (heating and central air systems and HVAC interface with security system).

The hotel owner shall retain an infection control consultant for semi-annual facility assessment.

NEW HOTEL DESIGN-BID-BUILD PROJECT CONSTRUCTION PHASE ENGINEER'S PUNCHLIST

The design engineer shall check off the boxes from the list of company's standardized field observation checklists below that he will need to upload on to his tablet computer prior to heading out to the construction site to complete his final HVAC inspection and punchlist. These checklists will be touchscreen type. When the engineer returns to the office or he sends the completed checklists via the internet to the office, the completed checklists shall be automatically downloaded to the company's computer server and placed in the job folder's "Project Closeout" section of the folder. The completed checklists, along with associated digital photographs taken at the time of the field visit, will automatically be electronically sent to the following individuals and departments.

TEAM CORRESPONDENCE DIRECTORY CHECKLIST (check the appropriate boxes)

- Project Architect
- Owner Representative
- IPD Manager
- Construction Manager
- General Contractor
- Design-Build Contractor
- Facility Manager
- HVAC Subcontractor
- ATC Subcontractor
- State Energy Department
- ASHRAE
- Piping Subcontractor
- Sheet Metal Subcontractor
- 3rd-Party TAB Consultant
- 3rd-Party Commissioning Consultant
- Equipment Manufacturers
- Building Inspector
- Infection Control Consultant
- Others: (insert list) _____

HVAC CONTRACT SPECIFICATION CHECKLISTS (check the appropriate boxes)

- Division 1 Project Closeout
- Hotel Equipment
- Structural
- Electrical
- Plumbing
- Fire Protection
- HVAC
- Infection Control
- ATC
- Boilers
- Pumps
- Chillers
- Fans
- Air Handlers
- Terminal Units
- Piping System
- Sheet Metal System
- TAB
- Commissioning
- Others: (insert list) _____

HVAC CONTRACT DRAWING INSTALLATION CHECKLIST (check the appropriate boxes)

- Owner Furnished Equipment
- Structural
- Electrical
- Plumbing
- Fire Protection
- HVAC
- Infection Control
- ATC
- Boilers
- Pumps
- Chillers
- Fans
- Air Handlers
- Terminal Units
- Piping System
- Sheet Metal System
- Equipment Room
- Others: (insert list) _____

HVAC STARTUP CHECKLISTS (check the appropriate boxes)

- Owner Furnished Equipment
- Structural
- Electrical
- Plumbing
- Fire Protection
- HVAC
- Infection Control
- ATC
- Boilers
- Pumps
- Chillers
- Fans
- Air Handlers
- Terminal Units
- Piping System
- Sheet Metal System
- Equipment Room
- Others: (insert list) _____

COMMISSIONING FPT (FUNCTIONAL PERFORMANCE TEST) (check the appropriate boxes)

- Owner Furnished Equipment
- Structural
- Electrical
- Plumbing
- Fire Protection
- HVAC System
- Infection Control System
- ATC System
- Central HVAC Air Systems
- Heating System
- Air Conditioning System
- Boilers
- Pumps
- Chillers
- Fans
- Air Handlers
- Terminal Units
- Piping System
- Sheet Metal System
- Equipment Room
- Others: (insert list) _____

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