

# VRF SYSTEM DATACOM ROOM EXPANSION USING INTEGRATED PROJECT DELIVERY

This month's B2B will focus on an existing datacom room located within a 50,000-square-foot medical records office building. The existing datacom room is being expanded from 10,000 square feet to 12,000 square feet. This existing interior room has a class A1 environment and shall remain class A1 with the expansion project. The room shall remain at 78°F +/- 2°F and 40% rh +/- 5 percent.

The existing building's central chilled water plant is not adequate to accommodate the increased chilled water demand, so a VRF system will be added to serve the additional cooling loads within the room. Ten VRF indoor units with a single outdoor VRF unit will serve this new computer room expansion space based on the distribution of the ceiling-mounted equipment. Two VRF units will be providing standby capacity should an existing computer room air-handling (CRAH) unit or two VRF units fail or are shut off for routine maintenance.

For reference, the design engineer is directed to *2015 ASHRAE Handbook — HVAC Applications*, Chapter 19 (Data Centers and Telecommunication Facilities), and Chapters 36-43 (Building Operation and Management).

The project delivery method shall be integrated project delivery (IPD) based on *2015 ASHRAE Handbook — HVAC Applications*, Chapter 58 (Integrated Building Design). The IPD team shall include the owner, building facility manager, owner representative, air-balancing consultant, and VRF system commissioning agent. The IPD team will also include the HVAC consultant engineer, who will serve as the design team leader, as well as architect, electrical, plumbing, telecommunication, fire protection, and security sub-consultants; a general contractor; and HVAC, electrical, and telecommunication sub-contractors. The building manager and her O&M staff will also participate in the IPD process beginning at the conceptual phase.

For this month's HVAC application, 10 5-ton VRF units will be installed within the datacom room, and each unit will be furnished with its own refrigerant cooling coil. While these units have heating capacity, it's not anticipated that heating will be required. Supply air discharge shall be a combination of hot-aisle and rack-based containment with a ceiling return grille in the back of each unit. VRF coils shall be connected to the outside 50-ton refrigeration compressor unit located directly above the datacom room. Each unit shall be furnished with 1-inch MERV-13 filters. Outdoor air ventilation to the room shall continue to be provided by an existing direct outside air system located on the roof and distributed to the room providing minimum ventilation.

480/3/60 electrical power will be connected to the unit via pre-wired automatic control panels on each unit to the building manager's office BMS. The controls shall include a BACnet communication protocol. The office building's BMS technician programmer shall install a control logic panel with a VRF unit control interface to the existing CRAH units. Internet access to each control panel will be included for

remote control troubleshooting of the unit, which includes its alarms and safety signals.

The units shall be furnished with all required isolation valves, expansion valves, pressure gage taps, strainers, safety controls, and alarms. The HVAC subcontractor shall rig the outdoor compressor unit in place, field install the associated refrigerant piping and drain piping, and install pipe insulation. This subcontractor shall also be responsible for installing the 10 VRF indoor units working closely with the datacom manager to locate these units strategically within the room expansion as well as locating four VRF units at the ceiling within the existing space. Discharge supply air nozzles shall be installed to direct the air to the area it serves.

The IPD team shall begin to come together at Phase 2 Project Initiative and include the owner, facility manager, owner representative, design team leader (HVAC consultant engineer), architect, and general contractor. The remaining IPD team members will be brought on board at Phase 3 Concept Development.

The IPD team shall produce Concept Documents and Design Documents (drawings and specifications). Phase 5, Construction Preparation; Phase 6, Construction; Phase 7, Owner Acceptance; and Phase 8, Use, Operate, and Maintain shall follow. The IPD team shall complete a commissioning of the VRF system based on the equipment manufacturer's startup and commissioning of the refrigeration system. The O&M personnel will review the documents beginning with the concept development phase and observe equipment startup, air balancing, and commissioning system demonstration.

## The IPD team's general contractor shall include the following during the shop drawing submittal phase:

- Equipment submittals - VRF unit fan curves - Startup sheet - Troubleshooting sheets - O&M manuals, parts, and lubricants
- The ATC and energy management submittal, including one complete ATC submittal that integrates the manufacturer's VRF unit's furnished ATC into an integrated overall ATC submittal for the existing BMS record documents.

## The IPD owner representative shall provide third-party commissioning and testing, adjusting, and balancing (CxTAB) services as following:

- TAB system flow diagram of entire (new and existing) CRAH and VRF system with cfm and static pressure indicated at each piece of equipment. TAB flow diagrams shall also be completed for air distribution cfm at hot-aisle and rack-based containment and return air.
- Commissioning functional performance test of VRF systems (startup, electrical, refrigeration, and air functional performance test sequence of operation).

Refer to The Facility File for additional information pertaining to completing the B2B test. **ES**



The design engineer shall check off the boxes from the list of company’s standardized field observation checklists below that she will need to upload on to her tablet computer prior to heading out to the construction site to complete her final HVAC inspection and punchlist. These checklists will be touchscreen type. When the engineer returns to the office or she 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. 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)*

- Owner  Owner Representative  IPD Lead Engineer
- Construction Manager  General Contractor  Design-Build Contractor  Building Manager  HVAC Subcontractor
- ATC Subcontractor  Architect  Electrical Subcontractor
- Plumbing Subcontractor  Fire Protection Subcontractor
- Telecommunication Subcontractor  State Energy Department
- ASHRAE  Piping Subcontractor  Sheet Metal Subcontractor
- Third-Party CxTAB Consultant  Third-Party TAB Consultant
- Equipment Manufacturers  Building Inspector
- Others: *(insert list)* \_\_\_\_\_

**HVAC CONTRACT SPECIFICATION CHECKLIST**

- Division 1 Project Closeout  Telecommunication Equipment
- Owner Furnished Equipment  Structural  Electrical
- Plumbing  Fire Protection  HVAC  Infection Control  ATC
- VRF Outdoor Units  VRF Indoor Units  Pumps  Chillers
- Fans  Air Handlers  Terminal Units  Refrigerant Piping System  Sheet Metal Distribution  TAB  Commissioning
- Others: \_\_\_\_\_

**HVAC CONTRACT DRAWING INSTALLATION CHECKLIST**

- Owner Furnished Equipment  Structural  Electrical
- Plumbing  Fire Protection  HVAC  Infection Control
- ATC  VRF Outdoor Units  VRF Indoor Units  Pumps
- Chillers  Fans  Air Handlers  Terminal Units  Refrigerant Piping System  Sheet Metal Distribution  TAB
- Commissioning  Others: \_\_\_\_\_

**HVAC STARTUP CHECKLIST**

- Owner Furnished Equipment  Structural  Electrical
- Plumbing  Fire Protection  HVAC  Infection Control  ATC
- VRF Outdoor Units  VRF Indoor Units  Pumps  Chillers
- Fans  Air Handlers  Terminal Units  Refrigerant Piping System  Sheet Metal Distribution  TAB  Commissioning
- Others: \_\_\_\_\_

**COMMISSIONING FPT (Functional Performance Test)**

- Owner Furnished Equipment  Structural  Electrical
- Plumbing  Fire Protection  HVAC System  Infection Control System  ATC System  VRF Systems  Heating System  Chilled Water System  Condenser Water System  Pumps  Chillers
- Fans  Air Handlers  Terminal Units  Refrigerant Piping System  Sheet Metal Distribution  Equipment Room
- Others: \_\_\_\_\_