Back2Basics

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Building Program To Basis Of Design For A Renovated College Student Union New Building Project

At some point in time, most college or university building committees are given the responsibility to establish a building upgrade program to enhance their campus and attract the interest of potential future students. When completed, a Building Program (BP) will be the cornerstone for investing in an HVAC design and eventual construction of HVAC systems to meet the Building Program requirements.

For the HVAC engineer, she will take the program information and craft a Basis of Design (BofD) using the suggested BofD template on page 2 of this B2B. For this month's test, we will document the BP for a renovation of an existing student union building in Newberg, OR. On page 2 of this B2B, the reader shall complete the BofD by checking the correct boxes from the multiple choice selections based on the BP information provided and from pertinent reference documents such as local weather data design criteria for this city. The answers to the BofD can be found on the *www.esmagazine.com* web site.

The renovated building is a 21,000-sq-ft,two-story structure along with a basement for storage, mechanical room, and electrical room. The building will require a special security system that will be integrated with the HVAC system for smoke control, as well as security TV cameras at strategic locations. Existing utilities from the campus distribution systems will provide chilled water, hot water heating, domestic hot water, electrical power, telecommunication, city water, fire protection, and security systems.

Electrical, plumbing, fire protection, and security consultants will work in sync with the HVAC design team to provide a complete mechanical-electrical installation and shall be per state and local codes.

The HVAC electrical will remain 120/1/60 for motors less than .5 hp and 480/3/60 for motors .5 hp and larger. The campus central hot water system shall provide 840 MBH heating capacity to the individual room fan coil units, central air-handling unit preheat coils, and to variable air volume terminals. The HVAC central air system shall be DOAS with energy recovery from the various exhaust systems to provide ventilation to each space plus make-up air to the kitchen-cafeteria. Two addition central AHUs will have enthalpy airside economizers with chilled water cooling coils, and all three units will have MERV 8 pre-filters and MERV 14 final filters. Fan motors shall include VFD fans to provide supply air VAV to the building occupied spaces. Each room shall be capable of automatically and/or manually being commanded to unoccupied mode, along with a morning warm-up and morning cool-down sequences of operation. There is no requirement for standby capacity and no system/equipment spare capacity for BP growth.

The HVAC design of this building renovation shall be based on ASHRAE *2011 Application Handbook* chapter 7 Educational Facilities for basis of design requirements. The design engineer will draw upon the ASHRAE *Advanced Energy Design Guide* for more specific energy conservation design opportunities.

When beginning to shape the BofD, the engineer should take into account the ASHRAE recommended HVAC system analysis and selection process found in chapter 1 of its *2012 Systems and Equipment Handbook* and continue on with the BofD data collection by reviewing chapter 3 Central Cooling and Heating to determine the optimum HVAC systems for this BP.

The HVAC system will be designed for occupied-unoccupied modes of operation Sunday through Saturday, with manual override as needed. The building's hot water heating system shall be an outdoor temperature compensated system (160˚F HWS & 120˚F HWR at 23˚F outdoors and shall be off when temperature reach 60˚F). Chilled water system shall be 42˚F CHWS & 56˚F CHWR when outdoor temperature is greater than 60˚F. Occupied space shall be maintained at 70˚F with no humidity control in the heating season and 76˚F with a maximum 60% relative humidity during the air-conditioning season. Equipment room and back-of-the-room support areas will be maintained 24 hrs/day at 68˚F with no humidity control in the heating season, and 78˚F with a maximum of 65% relative humidity during the air conditioning season.

There will be a LEED Platinum certification requirement with other specialized energy/environmental program criteria based on ASHRAE-recommended school guidelines. The reader is directed to the Facility Files for the Owner's Building Program Annual Operating Budget and Operating Program.

As the design phase for this BP goes forward, the BofD should be routinely referenced and updated based on changes in the BP, as well as in response to changes and/or enhancements to the HVAC design.

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BASIS OF DESIGN – RENOVATED COLLEGE STUDENT UNION BUILDING PROJECT

Date: June 2014 Project Name: Student Union Building Renovation Project #: 2014-06 Prepared By: Reader Revision date:_____

BUILDING

❑ New Construction ❑ Renovation ❑ Addition square feet:_____ ❑_____ No. of floors below grade:____ No. of floors at and above grade:_____

UTILITIES

Electrical: ❑ New ❑ Upgrade ❑ Existing **Gas:** ❑ New ❑ Upgrade ❑ Existing **Steam:** ❑ New ❑ Upgrade ❑ Existing **Chilled Water:** ❑ New ❑ Upgrade ❑ Existing

Hot Water: ❑ New ❑ Upgrade ❑ Existing

Services from Utility for: ❑ Electric ❑ Gas ❑ District energy steam ❑ Existing

Campus Power Plant: ❑ Electric ❑ Gas ❑ Steam ❑ CHWS ❑ CWS ❑ Hot Water ❑ None

UTILITY DESIGN PARAMETERS

Electrical: ❑ 120/1/60 ❑ 208/3/60 ❑ 277/3/60 ❑ 480/3/60 ❑ ___/3/60

Emergency Power: ❑ New ❑ Diesel oil ❑ Gas ❑ Existing ❑ None **Gas:** ❑ Design parameters by plumbing engineer

Steam Pressure: ❑ Low @ __psig ❑ Medium @ __psig ❑ High @ __psig ❑ High @ __psig

Chilled Water Temperature: ❑ CHWS @ 42˚F ❑ CHWR @ 56˚F ❑ None

Condenser Water Temperature: ❑ CWS @ 85˚F ❑ CWR @ 95˚F ❑ None

Hot Water Temperature: ❑ HWS @ 160˚F & HWR @ 120˚F when 23˚F OAT and HWS @ 90˚F & HWR 70˚F when OAT is 60˚F ❑ Fixed HWS @ 160˚F & HWR @120˚F ❑ None

ASHRAE APPLICATION HANDBOOK

ASHRAE 2011 Handbook: Chapter { } **ASHRAE 2012 Handbook:** Chapter { } { } { }

OWNER MECHANICAL DESIGN PARAMETERS

Equipment Location: ❑ On floor being served ❑ In central equipment room(s) ❑_____ ❑ In penthouse ❑ On-Roof ❑ Away from building ❑ _____

Maintenance Outside Occupied Space: ❑ Yes serving primary HVAC equipment ❑ No

Redundancy: ❑ For Boiler ❑ N+1 ❑ N+N ❑ No

Equipment/System Expansion: ❑ Increase equipment size by 15% ❑ No

Indoor Air Quality at: ❑ MERV rating of { } for pre-filters MERV rating of { } for final filters

Acoustic & Vibration Criteria: ❑ Design parameters by acoustic consultant ❑ None

Specialty Room(s): ❑ *(List Room)* ❑ None

Occpancy Schedule: ❑ 24-7-365 ❑ Occupied/Unoccupied with manual over-ride *(List Hours of Occupancy)*

DESIGN CRITERIA

Outdoor Dry Bulb & Wet Bulb:___˚F Heating season ____˚F/___˚F Cooling season

Public/Common Area, Classrooms, Multi-purpose room, Cafeteria, Administration Space: ❑ Occupied period ❑ Unoccupied period ❑ Warm-up & cool down
Set Points: ___˚F Heating Season & ___˚F Cooling season 60%RH Space pressure: {+} {-} {=}

Mechanical & Electrical Space and Back of the House Area: ❑ Occupied period ❑ Unoccupied period ❑ Warm-up & cool down ❑_____
Set Points: ___˚F Heating season and ___˚F Cooling season <65%RH cooling season

ENERGY & ENVIRONMENT CRITERIA

LEED Certification: ❑ Yes ❑ No ❑ Other certification *(List the Program)*

Annual Operating Budget: ❑ Energy budget ❑ Organization structure ❑ Outsource operation & maintenance ❑ Building only

Refer To The Facility Files For Additional Operation & Maintenance Design Criteria

SPECIAL CONDITIONS & REQUIREMENTS

_____

_____

_____

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