PITTSBURG STATE UNIVERSITY HECKERT-WELLS HVAC SYSTEMS PROGRAM REPORT

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I. INTRODUCTION

A. Pittsburg State University retained the services of Brack & Associates Consulting Engineers to evaluate the existing HVAC system serving Heckert-Wells Hall and prepare a program report to serve as a design guide to upgrade the HVAC system. The catalyst for upgrading the HVAC system is mainly due to code violations related to the original HVAC system, complaints from the building users of objectionable odors permeating from lab spaces throughout the building, including administrative spaces and complaints from the building users that the existing HVAC system does not provide environmental comfort year round.

B. As part of the program report, the existing building systems will be outlined, a scope of work will be developed a project budget cost will be generated for the scope of work.

II. EXISTING CONDITIONS

A. Original Building:

1. Heckert-Wells Hall was constructed in 1982 to house the Biology and Chemistry Department. The building has approximately 65,400 s.f. total within four levels, (basement, first floor, second floor, third floor and penthouse). The building has had a few small renovation projects over the past 30 years but overall, the original systems are still in place.

B. Existing HVAC System:

1. The environmental comfort for Heckert-Wells Hall is provided via a single, 39,000 cfm air handling unit (AHU). This unit is original to the building and serves almost all spaces in the building. The AHU is designed for a minimum of 6,800 cfm outside air and utilizes a standard economizer control to allow “free” cooling, when the ambient temperature is below 55°F.
2. The AHU supplies air to terminal units located throughout the building. There are two types of terminal units, variable air volume boxes and fan terminal boxes with hot water heating coils. The VAV boxes serve interior spaces that have no heating load, while the fan terminal units serve exterior spaces that have a heating load. The VAV boxes are designed to close the box damper as required to satisfy the space temperature. The current control operation allows the damper to go fully closed. This will need to be addressed in the new design so that all spaces meet ASHRAE requirements.
3. When in cooling mode, the AHU cools the mixed air down to 55°F via its DX cooling coil and supplies this air to the terminal units located throughout the building. When in heating mode, the AHU modulates the outside air and return air to provide a 55°F supply air to the terminal units, the air unit has no heating coil. As the space temperature calls for more heating, the plenum fan draws return air from the plenum and moves it across the fan terminal unit heating water coil as required to satisfy the space temperature. The AHU system utilizes a plenum return, (including

above corridors), from all of the spaces, including laboratories, back to the unit. There is also a return path from the various rooms back to the fan terminal boxes, this is generally a transfer opening above the door to the unit located above the ceiling in the corridor.

4. The mechanical cooling requirements for the building are provided via the three, 40 ton condensing units. The condensing units are piped to the AHU DX cooling coil.

C. Existing Fume Hoods:

1. There are approximately 30-35 fume hoods and exhausted canopies located throughout the building, with the majority of these located on the first floor. A project is planned for early 2013 that will remove some of the existing fume hoods on first floor. A survey of all existing conditions and location of fume hoods shall be conducted at time of design.
2. The make-up air for the fume hoods is supplied via individual supply fans for each hood and has a direct connection to the hood. The supply fans are in-line fans that draw outside air into the building. The make-up air is conditioned in the heating mode to supply 70°F air to the space. The make-up air is not conditioned in the cooling mode.
3. The exhaust for the fume hoods is accomplished with an individual exhaust fan for each fume hood. The exhaust fans are in-line fans that are ducted to one of two exhaust plenums that have direct connect to the outside via exterior wall louvers. Each

hood is individually controlled and can be turned on and off by a switch located on the face of the hood.

D. Existing Electrical Service:

1. The electrical service for Heckert-Wells Hall is provided by Westar Energy. An underground primary feed from the Westar overhead utility lines routes to the pad mounted medium voltage transformer serving Heckert-Wells Hall. The secondary service to the building is a 277/480 Volt, 3-Phase, 4-Wire. A Main Distribution Panel Board, located in the basement, is rated at 2000 amps. The building's 120/208 Volt loads are served from three 480Volt primary transformers located throughout the building.

E. Existing Steam Service:

1. There is currently a steam service to Heckert-Wells from the campus wide steam loop. The steam is supplied at 85 psi and is reduced to 15 psi to serve a steam to water heat exchanger. The heat exchanger is rated for 2,854 MBH. The hot water generated via the heat exchanger is pumped throughout the building to the various fan powered terminal units with heating coils.
2. The steam service to Heckert-Wells is currently available based on the Physical Plant's on-off schedule. The steam is enabled, (turned on), generally in late October or early November. The actual date is determined by PSU Facilities. The steam is shut off around April each year, again on a date determined by PSU Facilities. As there is no other form of heating equipment in the

building, during interim periods in the fall and spring when steam from the physical plant is not available but the building is calling for heat, it is possible for the space temperature in the building to fall below space setpoint. As outlined in earlier paragraphs, the existing AHU delivers 55°F supply air, when in heating mode, to the terminal units. The fan terminal units serving exterior building spaces have a hot water heating coil to heat the air from the 55°F entering temperature up to a leaving air temperature necessary to satisfy the space temperature. Since there is no way to heat up this air when the steam is unavailable to the building, the system is unable to satisfy the space temperature. It is during these interim periods when steam is unavailable that the building users submit complaints about the building HVAC system.

III. CODES and REGULATIONS:

A. The following is a list of codes currently used on State of Kansas projects, (as of the date this report was written). This list is not intended to be all inclusive of all codes and regulations applicable to the program scope and should be verified with regards to latest adopted edition.

International Building Code, 2006 Edition

International Fire Code, 2006 Edition

International Mechanical Code, 2006 Edition

International Plumbing Code, 2006 Edition

International Energy Conservation Code, 2006 Edition

NFPA 70 – National Electric Code, 2005 Edition

ASHRAE 90.1 – 2007

IV. Program Scope:

A. Design a new 100% outside air make-up system with a roof mounted air unit(s) that will provide both make-up air for the lab spaces and environmental conditioning of these spaces. Coordinate with owner on operations to be conducted in each lab space to determine appropriate make-up air quantities.

B. The remaining administrative and general use spaces shall continue to be served from the existing AHU located in the basement. The return air for the AHU shall be reviewed and revised to prevent any laboratory air from being returned to the unit as well rectifying the return air paths in the plenums above corridors. Provide a variable frequency drive, (VFD) for the existing AHU. Currently the existing AHU is operating as a variable airflow unit, but has no means for actually controlling the speed of the fan. The fan merely follows the fan curve to try and meet the required airflow of the system as dictated by the terminal units, (VAV boxes and Fan Terminal units).

C. Review fume hoods throughout the building with the owner to verify that all of the existing fume hoods are still required. All existing fume hoods that remain will be replaced with new fume hoods.

D. Design a new exhaust fan system to serve the laboratory spaces and hoods. The exhaust fan system shall have a redundant fan and the spaces shall be ducted via a common duct system.

E. Design the heating system for the new make-up air unit. Provide a study of the available capacity of the steam line currently serving Heckert-Wells. Consider alternatives to campus steam for building heating medium such as gas fired duct heaters or gas-fired boilers. Determine if campus steam plant operation can be altered to allow building to maintain control year round or if the building is better served by a standalone heating system to serve building when campus steam is not available.

F. System shall be designed with heat recovery capabilities to reduce energy usage of the overall system and comply with the Kansas Energy Code.

G. New terminal units shall be provided to replace the existing VAV boxes and fan terminal units. The new VAV boxes to replace the existing, remaining shall be provided with hot water heating coils so that the boxes can maintain ventilation airflow at all times to meet ASHRAE requirements. The new fan-powered terminal units shall be series boxes with hot water heating coil to allow the box to be supplied with primary air from the existing AHU and meet ASHRAE ventilation requirements.

H. The exhaust system shall provide for redundant exhaust fans.

I. Evaluate the existing electrical service for Heckert-Wells. Provide electrical distribution to the new mechanical equipment as required.

J. A generator shall be designed for the project to serve the exhaust system. The existing life safety equipment and systems in the building shall be reviewed and an evaluation made as to whether it is effective to place these loads on the new generator.

V. ALTERNATES:

A. Alternate #1, Demand Control Ventilation:

1. The alternate shall provide for the evaluation and design of a demand control ventilation (DCV) system for the labs. A system that incorporates DCV will increase the budget cost, however the DCV will generate greater energy savings than a conventional system. This work shall be included in a project alternate so that the additional cost of this work can be quantified and evaluated by the owner. This cost is not reflected in the program budget.

VI. APPENDIX

Appendix “A” – Project Budget Cost

Appendix “B” – Project Schedule

APPENDIX “A”

BUDGET COST

PROJECT BUDGET

CONSTRUCTION COSTS	
Mechanical, Electrical and General Constrcution Costs	2651000
Subtotal - Construction Costs	**$2,651,000**
NON-CONTRACTOR CONSTRUCTION COSTS	
Abatement of Fume Hood Contaiminated with Hazardous Materials	25000
Subtotal - Non-Contractor Construction Costs	**$25,000**
MISCELLANEOUS COSTS	
Fees - Consultants and State Agencies	310000
Printing and Shipping of Bid Documents	2000
Construction Testing and Balancing	30000
Bidding and Construction Contingency	135000
Subtotal - Miscellaneous Costs	**$477,000**
Total Estimated Project Cost	**$3,153,000**

APPENDIX “B”

PROJECT SCHEDULE

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Program Submission to Board of Regents	Dec 2012
Program and FY 2013 Funding Approval (BOR & Legislature)	Jan 2013
Advertising for RFPs and Shortlisting of Consultants	Feb 2013
Interview and Selection of Consultants	Mar 2013
Fee Negotiations and Processing of Consultant Contract	Apr 2013
Program Review and Preliminary Design (6 weeks)	May 2013
Design Development (8 weeks)	Jul 2013
Construction Documents (12 weeks)	Oct 2013
Bidding Process (4 weeks)	Jan 2014
Contract Execution and Awarding (6 weeks)	Mar 2014
Project Construction (6 months)	Jun 2014 - Nov 2014