A. General scope and reference material

The primary goal of this project is to replace pneumatic actuators, pneumatic valves, and to add or revise control for some processes from the pneumatic final elements to electronic final elements such as electronic valves, actuators and variable frequency drives.

This building contains a large number of systems that use pneumatic controls and pneumatic actuators through electronic to pneumatic transducers. Prior to Washington State University Facilities Services making desired revisions to floor level zone controls, air terminals and valves, it is deemed necessary to make certain the final elements on air handlers, heat exchangers and other building source service equipment are functional.

Washington State University Facilities Services had difficulty in the past insuring the pneumatic systems supplied clean dry air. The system was originally equipped with predominately Robertshaw valves and actuators which are for the most part obsolete and the valves and actuators have been exposed to contaminants. In addition, some isolation valves are not functional, third floor chiller has at least one chilled water valve that has failed and motor starters are beyond their useful life spans and need replacement.

The Departments will occupy Bustad during normal work hours. This will likely require the work to be coordinated with the Departments. A process cooling system is present in the building and will require extra work with the department that uses it along with other shutdown notices.

Bustad’s main DDC controllers are serving the new Siemens Desigo system. These controllers are readily capable of expansion for additional needs. WSU is interested in improving the operations, maintenance, and energy savings by implementing smart building strategies. Options like better equipment notification methods and even additional maintenance measurement equipment is a consideration.

Washington State University Facilities Services will provide equipment schedules, plans, TAB reports and other related information for the development of this project by the design build team. The team will be required to complete field investigation and Retro or pre-commissioning to detail the project scope.
B. Commissioning

Many systems will require pre-commissioning to assure this project meets the desired results. The commissioning agent will provide a list of potential system issues to both the Design Build Contractor and Washington State University Facilities Services for review, it is possible Washington State University Facilities group will repair selected issues. Below is a potential list of issues, listed by priority.

1. Damper banks on air-handlers, exhaust systems and relief systems.
2. Fan blowers including shafts, bearings and the fan wheels.
3. Visually inspect all water to air coils in air handlers, exhaust systems.
4. Test heat exchangers and hot water heaters to insure separation between the steam and water systems.
5. Inspect pumps, couplers, seals and the ability of the pump to deliver the required water flow.
6. Test the backup chiller systems, related valve isolation systems, pumps and the cooling tower for the ability to deliver the required cooling to the animal vivariums.
7. Final commissioning of all of the systems touched in this project is required
8. Evaluation of steam traps are required.

C. Control Valves, Isolation Valves, flow volume control devices and Dampers

1. Replace all of the building source service equipment control valves along with the isolation valves that allow for maintenance isolation of the control valves and associated equipment loads.

The flow volume control devices (Circuit setters and other.) will require evaluation and replacement as needed.

All valve proper sizing and flow characteristics verification is required.

The pneumatic valves require replacement with electronic control valves to eliminate the contaminated air supply issues.

All heating valves will fail open. Chilled water and other valves will be evaluated for fail safe action on a case by case basis.

Evaluation of the main building chilled water differential pressure de-coupler valve replacement with a spool piece is required.

2. Replace the actuator damper related equipment on building source service equipment as required.

All damper actuators require proper sizing verification.

Replace the damper actuators with electronic control valves to eliminate the
contaminated air supply issues.

All damper actuators will fail to appropriate settings related to their intended use. Mixed air intake will fail closed when the air handler is off or during a power failure. Return air dampers will fail open during the same conditions and exhaust fan dampers will fail closed with the associated exhaust fan as well.

If a supply fan or exhaust fan can be provided no relief or minimal relief through return air or other means, an interlock proving that the damper is open will be provided with the fan motor control as a mechanical system safety device.

Be aware that there are currently solenoids valves that interface between dampers and things and the motor control center.

3. Replacing damper banks are dependent upon the pre-commissioning results.

4. During pneumatically controlled actuator replacement, remove the pneumatic tubing back to the existing control panel. Even for temporary disconnection, permanent types of caps will be used and the tubing will not be bent over a number of times to serve as a plug. Remove any unused pneumatic transmitters along with associated tubing. Cap Main air for pilot positioners at least back to a 3/8 or greater main air-line. This project will decrease air leaks and not contribute to them.

5. Scale all Siemens outputs properly to the valve signal outputs. 0-10 vdc or 4-20 ma, verification is required. When sequencing two valves together, two separate signals from the controller may be used.

D. Mothballed Humidifiers.
   1. Supply fans 1, 2, 4 and 5 have unused humidifiers mounted in the ductwork before the chilled water cooling coils and that have not been used for years. They de-rate the cooling coils. These humidifiers, control tubing, and piping require removal.

   Supply fans 5, 8 and 9 have working humidifiers positioned after the cooling coils. Those humidifiers need to remain in place.

E. Motors and Variable Frequency Drives
   1. Evaluate and install variable frequency drives and motors on all supply fans, return fans and exhaust fans that are building source service equipment in the facility.

   2. Replacement of hot water heating, other pump motors and mag starters at heat exchangers and other locations is possible if bypass control systems are eliminated. If a differential pressure control is evaluated to be worthwhile to install or if another reason for the VFD and motor would make it valuable to the control system.
3. All safeties related to the motor control center like fire interfaces, proof switches or freeze-stats will be re-implemented on variable frequency drives as appropriate. Review and test Freeze-stats and replaced as necessary.

4. See Fume hood systems below.

5. See BSL-3 Lab below.

F. Heating Exchangers and Domestic Hot Water Heaters.
   1. The pre-commissioning report will list Heating Exchangers and Domestic Hot Water Heater components requiring evaluation and or replacement.

   2. Replace the control valves with electronic control valves. These valves normally fail open.

G. Fume Hood Exhaust systems
   1. The final goal of work in Bustad beyond this project is to set the building up with VAV control including fume hoods and as mentioned before, the motor control centers are dated. The fume- hood exhaust systems will be fitted with variable frequency drives and motors if motors are required.

   2. The exhaust systems are currently constant volume systems but they will be setup with static controls for future use.

H. BSL -3 Lab
   1. The BSL- 3 lab should be fitted with variable frequency drives. A damper for exhaust is located in the room and either should be replaced with control by the variable frequency drive or relocated so that issues can be solved without entering the room.

   2. Evaluate the ductwork and whole rooms to provide a safe operation. Control revisions may be required.

I. Backup Chillers for Animal Vivarium’s.
   1. The pre-commissioning report will list Backup Chillers for Animal Vivarium components requiring evaluation and or replacement.

   2. Replace the isolation control valves with electronic control valves.

   3. Evaluate the chiller wiring and control scheme.
Supplemental Facility Specific Scopes
WSU Control system final element design build project
in 807 Bustad Hall

J. Additional control systems and revisions.

1. As noted above, the project will include control systems revisions for analog signals and revisions to different equipment. Not noted are local controls on equipment like domestic Hot water heating systems, which are obsolete and require replacement.

K. Flow Balancing or TAB

1. Revision of all pumps, coils, and other devices require rebalancing to the correct flow rates. The Design/Build contractor is responsible for creating a executing the flow balancing plan.

L. Metering

2. Because we are going to be fitting pipe to replace valves and for other reasons, it would be expedient to install a chilled water energy meter. We have issues with electrical meters as well and the condensate meter may be due for replacement.

END OF SUPPLEMENTAL FACILITY SPECIFIC SCOPES