PART 1 - GENERAL

1.1 SUMMARY

a. Section includes control sequence guidelines for building control systems. The project will develop the required sequence of operations. This section provides Stanford’s desired theory of operation for key processes.

b. Related Sections:
   1). 25 00 00 Integrated Automation

1.2 REFERENCES

a. Refer to 25 00 00 Integrated Automation

1.3 DEFINITIONS

a. Refer to 25 06 11 Integrated Automation Definitions

1.4 SYSTEM DESCRIPTION

a. Refer to 25 00 00 Integrated Automation

1.5 SUBMITTALS

a. Refer to 25 00 00 Integrated Automation

1.6 QUALITY ASSURANCE

a. Refer to 25 00 00 Integrated Automation

PART 2 - PRODUCTS

2.1 NOT USED

PART 3 - EXECUTION

3.1 UTILITY HOT WATER TO BUILDING HEATING HOT WATER INTERFACE

A. Heating Hot Water temperature set point shall be reset based upon outside air or other Owner approved demand based reset input.

B. Heating Hot Water temperature set point shall be reset as needed to always be at least 5 deg F below the actual Utility Hot Water supply temperature.
   1. Unless the Heating Hot Water system is scheduled off, the Utility Hot Water control valve shall have an automated means of periodically passing enough flow during low demand periods to ensure that the Utility Hot Water supply temperature sensor is reliably exposed to warm water. This prevents the associated length of pipe from cooling below the desired building-side Heating Hot Water set point.

C. The Utility Hot Water return temperature should be kept as low as possible through control and monitoring all applicable systems.
3.2 AIR HANDLING UNIT
A. Include supply static pressure reset based on VAV requests
B. Include supply temperature reset based on VAV requests. Supply temperature sequence shall initiate when static pressure sequence has reached its minimum value.
C. Include optimal start sequence.
D. Include economizer sequences such as damper sequencing, and economizer set point offset from supply air set point.
E. Include freeze protection for chilled water coil.
F. Use of hot water coil as pre-heat only (55° fixed set point)

3.3 VARIABLE AIR VOLUME WITH RE-HEAT
A. Include box minimum flow set point
B. Include heating max and cooling max flow
C. Cooling PI loop to reset actual flow set point
D. Heating PI loop to reset supply air temp set point and min/max heating flow
E. Effective room set point shall be the combination of center set point +/- thermostat adjustment and global offsets.
F. Room temperature, damper and valve requests multiplied by zone priority with be summed together with similar rooms to generate resets to serving air handlers.

3.4 CHILLED WATER SYSTEM – SERVING AHU’S AND FAN COIL UNITS
A. Background
   1. The campus central energy facility (CEF) provides chilled water to buildings at 44°F and maintains a distribution differential pressure of at least 12 psid at each building. (Many buildings receive higher DP based upon proximity to distribution mains. Please consult with Stanford’s Energy Operations team for building specific estimates.) Utility differential pressure to the building is normally adequate to provide design flow to all coils. A booster pump is located in the mechanical room of the building to provide additional pressure. A control valve (normally closed) and the booster pump (normally off) will be used to provide the required chilled water demand to the building. Reference drawing MS-10, Utility Chilled Water Primary Interface.

B. Differential Pressure Control – Normal Operations
   1. The main chilled water control valve is modulated to maintain the required pressure differential set point between the building supply and return lines. This pressure set point shall be determined during the test and balance of the building. When the main control valve is 100% open for five minutes (Adj.), the Chilled Water Pump (CWP) shall be enabled. The VFD controlling the speed of CWP shall be modulated to maintain the differential pressure at 25 psi (Adj.). When the VFD speed is less than 50% of full speed (Adj.) and CW interface valve is less than 95%, the pump shuts off and pressure differential control reverts back to the main control valve. If CWP is commanded to operate and the pump differential pressure switch indicates no Pump DP, an alarm will be raised.

C. Maximize Chilled Water Return Temperature by Reducing Flow (Pump Off)
   1. While maintaining the differential pressure with the valve, the system will control the return temperature at 58°F (adj.). If the chilled water return temperature drops below 58°F (Adj.), the controls will reset down the differential pressure set point to a minimum of 5 psi (Adj.). If the return temperature rises above 58°F (Adj.), the controls will reset up the differential pressure set point to
the maximum set point (Adj.). The minimum and maximum set points shall be determined during the test and balance of the building.

D. Maximize Chilled Water Return Temperature (Pump On)

1. When the pump is on controlling the differential pressure of the system at 25 psi (Adj.), the controls will modulate the chilled water interface valve to control the return temperature at 58°F (Adj.). If the chilled water return temperature drops below 58°F (Adj.), the controls will reset up the mixed temperature set point to 52°F (Adj.). If the return temperature rises above 58°F (Adj.), the controls will reset down the mixed temperature set point to min of 44°F (Adj.). The pump shall shut down normally when the software senses that load in the field decreases. When the pump is off the control valve operates under Normal Operation sequence above.

E. Maximize Chilled Water Return Temperature by Recirculating the Return Chilled Water

1. If the return temperature drops below 54°F (Adj.), the controls shall start CWP and ramp up the speed to maintain the differential pressure set point of 25 psi (Adj.). The controls shall reset the mixed temp controller set point to maintain the chilled water return temperature above 58°F (Adj.), using the Pump on Sequence above. If the return water temperature is greater than or equal to 60°F (Adj.), the pump is turned off and the control shall revert to normal operation.

END OF SECTION