



STATE OF NEW YORK
OFFICE OF GENERAL SERVICES
DESIGN AND CONSTRUCTION GROUP
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ADDENDUM NO. 1 TO PROJECT NO. M2947

**HVAC WORK
BOILER REPLACEMENT
BUILDING NO. 11
SOUTH BEACH PSYCHIATRIC CENTER
777 SEAVIEW AVENUE
STATEN ISLAND, NEW YORK**

May 17, 2012

NOTE: This Addendum forms a part of the Contract Documents. Insert it in the Project Manual. Acknowledge receipt of this Addendum in the space provided on the Bid Form.

SPECIFICATIONS

1. SECTION 012100 ALLOWANCES: Delete Paragraph 1.04 B from the Project manual and insert the following:
 - B. The cost of providing the Work of this allowance will be paid, up to the amount specified. Costs above the allowance amount, if any, will be paid by means of a Change Order.
2. SECTION 230924 MODIFICATIONS TO DIRECT DIGITAL BUILDING CONTROL SYSTEM: Discard this Section bound in the Project Manual and substitute the attached Section entitled SEQUENCE OF OPERATION FOR HVAC CONTROLS (pages 230924-1 thru 230924-9) in the Project Manual.
3. SECTION 235223 CAST IRON BOILER: Add the following sentence to Paragraph 3.03 B:

“Video shall be provided in standard DVD format that is playable on a standalone DVD player.”

END OF ADDENDUM

James Dirolf, P.E.
Director of Design

SECTION 230924

SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

- A. The sequence of operation is hereby defined as the written manner and method by which HVAC systems and other building systems and equipment operate. This description includes automatic and manual control functions and includes operation(s) which are monitored, observed, trended, etc. and otherwise used to make decisions regarding system operation.
- B. Operating equipment, devices, and system components required for control systems are also specified in other Division 23 Sections.
- C. Input/Output (I/O) points which are required are herein defined as those hardware and software points needed to achieve the described sequence of operation, measurement, monitoring, calculating and alarming. These are as shown on the Point Lists, and as described and/or shown on the contract drawings, and as described in all specification sections. The point's requirement is cumulative in its effect so as to be more complete and inclusive than any one cited source. The points shall be monitored, displayed, adjusted, trended, and/or alarmed at the BMS front end.
- D. Adjustability of Settings: Declarations within the specifications of set points, differentials, times, alarm settings, and all other such settings are hereby understood to be adjustable at the BMS front end. Settings provided are intended as an initial operating condition for system startup and configuration unless otherwise noted. Final settings determined in conjunction with other trades, such as the Test & Air Balancing Contractor, and during system startup and calibration shall be included in final system backed-up, sequence of operations and included in the owner's manual and close-out documentation.

1.2 DEFINITIONS

- A. Refer to the plans and specifications throughout for abbreviations and other references used to define objects, systems, and operations commonly used in this section to describe the sequences of operation. Common trade abbreviations might be used without reference.

- 1. BMS: Building Management System
- 2. CAV: Constant Air Volume
- 3. DDC: Direct Digital Controls
- 4. HHL: Humidity High Limit
- 5. NSB: Night Set Back Temperature
- 6. NSU: Night Set Up Temperature

1.3 RELATED SECTIONS

- A. Division 23 Sections
- B. Division 26 Sections

1.4 SUPPLEMENTAL SUBMITTALS

- A. Sequence of Operation: Submit Shop Drawings for each of the systems being controlled shall include a written sequence of operation as it appears in these specifications. Any deviation from the written sequences shall be highlighted by the Temperature Controls Contractor (TCC) so that the A/E of Record can review, comment and respond to each change. Omission of a sequence or modification of a sequence does not relieve the TCC from providing the specified sequence.

PART 2 - PRODUCTS

- A. Not applicable to this section.

PART 3 - EXECUTION

3.1. COMBUSTION AIR CONTROL (BY BOILER OEM CONTROLS):

- A. Provide boiler room combustion air damper(s), when one of the burners on the boilers starts, the associated combustion air damper or dampers shall open as commanded by the Master Boiler Controller. When all burners are off, the damper(s) shall close. Provide an open-auto selector switch for each damper on the OEM boiler control panel to override the above operation. Burners shall not start unless the damper end switch closes, when the damper opens as monitored by the Master Boiler OEM Control Panel. Boiler contractor shall provide a signal in the boiler control panel to open the damper and shall prevent burner operation until the combustion air dampers are proven open. If the combustion air damper fails the boiler and fuel oil pumps shall be shut off.

3.2. DUAL-TEMPERATURE WATER SYSTEM (DIGITAL CONTROLS)

- A. Existing Dual temperature loop shall be re-connected to new DDC controllers as required. Existing sequences of operations programming shall be migrated from existing Honeywell DDC controllers to new as required, including but not limited to:
 - a. Secondary pumps DTP-PS1 & 2
 - b. Chilled water loop three way injection valve
 - c. Hot water loop three way injection valve
 - d. Existing chiller plant.
 - e. Please note that the existing Fuel Oil changeover System is controlled by an existing National Grid Digi Span panel. The Digi span panel shall be interfaced with front end BMS.

3.3. HOT WATER BOILER PLANT SEQUENCE OF OPERATION

- A. Parallel positioning control (linkage-less) (OEM): The parallel positioning control with air to fuel ratio controller shall include a master proportional controller which shall be connected to the load to sense the changes in load. The output of the controller shall transmit a signal simultaneously to the forced-draft damper(s) and fuel valve operators. A separate ratio-adjustment controller which has been calibrated for the system to prevent a fuel-rich mixture shall be utilized in the line to the fuel valve and shall vary the signal for the fuel flow proportionally to the air flow. This action shall change the fuel flow to establish the optimum air to fuel ratio. The parallel positioning control shall be capable of offsetting variations in pressure-drop characteristics in final control elements, fuel viscosity, air temperature, or barometric pressure. Stable burner operation shall exist when the continuous firing rate is from 25 percent to 100 percent of the maximum required firing rate. The turndown of the burner firing rate shall be made during the normal firing cycle without interruption or change of burner components. A capability for manual control shall be provided that allows a smooth transition between manual and automatic control.
- B. Modulating Direct Coupled Actuators (OEM): The parallel positioning master proportional controller shall control the combustion air dampers to maintain proper combustion as the fuel flow is varied in response to heating load. The modulating motors shall be equipped with a high-fire switch to prove that the motors have moved to the high-fire position during the pre-purge period, and with a low-fire switch to prevent burner ignition unless the modulating motors are at the low fire position. The parallel positioning control shall have external switches mounted on the driven members of the air dampers indicating high fire and low fire position during the purge period; also an external switch indicating low fire position of the fuel metering arrangement to prevent burner ignition unless both external low fire light off indicating switches are electrically closed. Also, the end switch on the sequential draft damper shall be interlocked with burner motor controls, to ensure 100% opening, prior to pre-purge.
- C. Modulating Controller (OEM): On each boiler, a modulating, combination temperature controller consisting of an analog header temperature sensor firing rate controller, On/Off Cut-In/Cut-Out controller, and Limit controller with manual reset shall modulate the burners. Varying boiler temperatures will actuate the parallel positioning master proportional controller that in turn will actuate the direct coupled actuators to maintain constant temperature. Direct coupled actuators shall modulate all combustion air dampers and all fuel valves (gas or oil).
- D. Temperature Operating Control
 - 1. A temperature operating control shall be utilized on each boiler. Operating control shall function to stop the operation of the burner when the boiler temperature reaches its cutout setting and cause the burner to start when the temperature drops to a selected lower cut-in temperature. (OEM)
 - 2. When the stand-by programming control requires a temperature control installed on the header, it shall be in addition to the control installed on the boiler. In this case, the control installed on the header shall act as the

primary operating control, and shall be set in accordance with the recommendation of the lead-lag control manufacturer. (Honeywell)

3. Temperature Limit Control: A temperature limit control on each boiler wired in series with all other control devices to the ungrounded conductor shall stop the burner and interrupt completely the power to the flame failure control if the boiler maximum temperature exceeds the high limit set point. (OEM)

E. Flame Failure Control (OEM)

1. Each burner shall be provided with a flame failure (combustion safety) programming control which will de-energize all electrically operated fuel valves and burner equipment within four seconds, and actuate a visual alarm mounted on the control panel after an operating flame failure has occurred. Automatic start up and shutdown programming shall be a part of this safety equipment.
2. Pilot and main flame shall be detected by a lead sulphide infrared or ultraviolet scanner as per burner manufacturer's recommendation. Scanner shall be so located as not to be actuated by hot refractory or other hot body.
3. Control shall provide for prepurge prior to light off, proof of pilot before main fuel valves open, proof of main flame only during run, and post purge at the end of each firing period. Control shall affect a safety shutdown prior to the opening of the main fuel valves if the presence of the pilot flame has not been proven.
4. The pre-purge cycle shall be 100% air flow and shall have a duration equivalent to a minimum of 4 air changes. The post-purge cycle shall be 15 seconds minimum (adjustable).
5. In case of electrical power supply failure, control shall recycle automatically when power is restored. In case of safety shutdown, control shall not permit recycling of the burner equipment until after the manual operation of a reset button.
6. The control shall accomplish a safe start component check during each start.

F. Low Fire Hold Aquastat (OEM):

1. A low fire hold minimum temperature aquastat shall limit burner modulation to prevent boiler from modulating to high fire until water temperature reaches 140o F.

G. Night Setback (Honeywell):

1. DDC controller linked to boiler-burner controls; night and unoccupied times (weekends / holidays) shall be programmed via BACnet/IP or MSTP, as determined by Honeywell, to operate in a setback mode. The

clock shall have overriding capability. During the occupied times, the header temperature controls the burner firing. An outdoor temperature sensor (set at 40 F) in series with a space thermostat (with temperature set back at 55 F) in the coldest room will determine the burner operation during the unoccupied hours. The header temperature limiting control device shall always be functional.

H. Stand-by Boiler Programming Control (For Future Boiler) (Honeywell)

1. A stand-by programming control shall sequence automatically the firing of stand-by boilers whenever active boiler fails either as sensed by an alarm condition or failure to maintain water temperature set point and shall alternate the enabled boiler on a monthly schedule (adjustable at the BMS front end).

I. Sequence Of Operation For Damper Breeching (OEM)

1. During the period when there is no call for burner operation by the boiler temperature operating control, the breeching damper shall be maintained in the safe closed position. Safe closed position shall be understood to mean that the damper blade shafts have been rotated approximately 70° from the fully open position.
2. When the boiler temperature operating control calls for burner operation, the following sequence of operation shall take place:
 - a. On call for heat: outdoor air intake damper, combustion air at burner and sequence draft damper shall prove open, prior to pre-purge.
 - b. Sequence draft damper shall be driven to full open position during pre-purge.
 - c. For ignition, the sequence draft damper shall move to safe starting position. When the fuel valve opens, draft damper control is placed under automatic draft control.
 - d. During normal burner shutdown, the draft damper is driven open for post purge and is closed at the end of purging.
 - e. Safety burner shutdown shall cause the draft damper to remain where it was at the moment of shutdown until flame safeguard is reset.
 - f. Breeching damper shall move to safe starting position, which shall be adjustable in the field. On call for heat operation, the sequential draft damper cycle shall be initiated; on proving open, damper purge cycle shall start. Forced draft fan shall start. After pre-purge, safe starting draft must be proven in combustion chamber before light off can take place.
 - g. Forced draft fan shall be controlled through auxiliary fan relay in burner control panel.
 - h. As soon as safe starting draft is established, the flame failure control

shall go through normal sequence of pilot ignition, pilot proving, main flame ignition and proving. When main flame is proved, draft controller shall modulate to maintain constant combustion chamber draft, within .01" W.C. of adjustable setting (as recommended by boiler manufacturer), regardless of firing rate or atmospheric conditions.

- i. When boiler temperature operating control is satisfied, flame failure control shall de-energize the fuel solenoid valve, shutting off main flame. Forced draft fan shall continue to run for 15 second (minimum) Post Purge Period. During this period, breeching damper shall remain open to permit venting of gases. After completion of post purge period, breeching damper shall move to safe closed position.
- j. At any time during an operating cycle, if the draft in the combustion chamber should fail for any reason, a signal light in the draft controller shall so indicate and if draft is not re-established within 5 to 7 seconds, the burner shall be shut down.
- k. In case of flame or power failure or any emergency, burner shall shut down and breeching damper shall open fully and remain open. Burner and fan motors shall shut down with burner lockout. Draft sequence controller shall recycle after manual reset of flame failure control.

J. General (Honeywell):

1. Control of the boiler and burner management systems is accomplished by Boiler Factory provided programmable logic controllers (PLC) and single loop controllers (SLC) being furnished by the respective vendors. Appropriate submittals and design documents for details and sequences of operations shall be provided by the vendor supplying the boiler and burner control management system.

2. Monitoring of the boiler plant equipment over the local operating BACNet network shall be accomplished using a Boiler Factory provided communications gateway. The gateway shall include communications cards and software drivers that import:
 - a. The burner management information from that system's PLC/SLC protocol
 - b. The combustion management information from that system's protocol or other non- BACNet protocol, to BACNet..
 - c. Changes in the above systems and propagates them throughout the gateway upon changes of state or elapsed time.
 - d. The points that are to be monitored and displayed at the BMS are listed below.
 - e. Monitoring of the boiler plant equipment over the local operating network (BACNet) is accomplished through hardwired relays and/or auxiliary contacts as described below.
 - f. The BACnet standard shall either be BACnet/IP or BACnet MSTP as determined by Honeywell

K. Boilers and Primary Hot Water Pumps (OEM Controlled)

1. The quantity of primary pumps shall exceed the quantity of boilers by one, allowing one primary pump to function as a spare. System is currently designed with one (1) boiler sized to handle 100% of the load and Two (2) primary hot water pumps (one stand-by). A future stand-by boiler will be provided in the future. Provide all required programming to allow the control of the second boiler (which will be disabled until such time the boiler is installed).

2. The constant speed primary hot water pumps are not to run simultaneously. Running pump will be alternated weekly (adjustable) to ensure even wear. If one pumps fails to start stand-by pump shall be energizer
3. Should any boiler fail while in operation, its associated pump will shut off, its associated isolation valve will close, and an alarm will be initiated at the BMS, and the next pre-selected boiler in the sequence will begin a start sequence.
4. The boiler system will have the ability to be started and stopped manually by the operator at a pushbutton station located in the boiler room. Upon a command to start the lead boiler, the Boiler Factory control panel will first command the selected lead primary water pump to start. After commanding the lead primary water pump to start and receiving positive motor running indication via a motor leg current switch, the Boiler Factory control panel will open the lead boiler's isolation valves and the boiler flow switch will enable the boiler. The Boiler Factory control panel will monitor end switches on the isolation valves and will initiate the start of the lag Boiler if the isolation valve limit switch indication is not received.
5. The Boiler Factory control panel will first command the primary water pump to start. After commanding the primary water pump to start and receiving positive motor running indication via a motor leg current switch, the Boiler Factory control panel will open the boiler's isolation valves and the boiler flow switch will enable the boiler. The Boiler Factory control panel will monitor end switches on the isolation valves and will initiate the start of the next lag Boiler if the isolation valve limit switch indication is not received.
6. The primary hot water supply header temperature sensor will control the boilers to satisfy the primary hot water set point. The primary hot water supply set point will be reset from the primary hot water return header sensor based on the return water load.

L. Automatic Fuel Changeover (Honeywell):

1. Changeover of fuels shall be accomplished automatically by means of a signal from the existing Digispan Fuel Changeover Panel.
2. The changeover system controls and wiring to the burner's circuitry shall be in accordance with the specific requirements of the Gas Utility Company. The Contractor shall obtain from the Gas Utility Company their requirements for the burner gas-train and their accessories together with the approved type of outdoor thermostat required and shall also obtain approval of the Gas Utility for this portion of the installation. Changeover relay shall be mounted in the Master Control Panel.
3. A pressure switch shall be installed at the inlet of the burner train and shall be wired in series with the outdoor changeover control. The wiring schematics, necessary for the installation of this switch, shall be provided by the burner manufacturer and coordinated and approved by the Gas Utility.
4. While switching during firing from gas to oil or from oil to gas, there shall be a time delay interlock and the burners shall be so wired to go through a post purge and prepurge period before firing with the new fuel.

M. The following monitoring or control points will be monitored, adjusted and/or alarmed by the DDC Controllers to the BMS (Honeywell)

| | |
|---|---|
| Primary Hot Water Supply Temperature | System Enable/Disable |
| Primary Hot Water Return Temperature | Hot Water Supply Temperature Setpoint |
| Hot water flow (GPM) Provide Flow meter | Outside Air Temperature |
| Expansion Tank High/Low Pressure | Boiler Operational Status (each boiler) |
| Hot Water Pump Status (each pump) | System Common Fault |
| Isolation Valve Open/Close (each valve) | Isolation Valve Status (each valve) |
| Fuel Changeover Status Digi-span Panel (Gas/Oil) | Setback Mode |

All alarm points shall be broadcasted to the Security Desk Front End (Honeywell System) located at the Building 8&9 Lobby Security Area.

3.4. BREAK GLASS STATIONS: CHILLERS AND REFRIGERANT PURGE FANS.

- A. The Electrical Contractor shall provide in the locations shown on the HVAC Drawings, ASCO 1242 (minimum 2 pole) or approved equal, flush mounted break glass stations, with appropriate approved designation, for emergency shutdown of chillers, and energizing of refrigerant purge fans and make up units. All wiring to boiler, chiller, and purge fans control panels shall be by the Electrical Contractor.

3.5. TOXIC & COMBUSTIBLE GAS DETECTION SYSTEM

- A. Refer to specification section 236000.
- B. The following monitoring or control points will be monitored, adjusted and/or alarmed by the DDC Controllers to the BMS

| | |
|-------------------|---------------------------------|
| CO Alarm | CO Concentration (ppm) |
| Natural Gas Alarm | Natural Gas Concentration (ppm) |

All alarm points shall be broadcasted to the Security Desk Front End (Honeywell System) located at the Building 8&9 Lobby Security Area.