ADDENDUM # 03
DATE: 07-08-2024

TO CONTRACT DOCUMENTS ENTITLED:

PROJECT MANUAL FOR:

Middlebush Farms – Nextgen Center of
Excellence for Influenza Research, Phase II

PROJECT NUMBER: CP230831

ADVERTISEMENT DATE: June 10, 2024

PREPARED FOR: The Curators of the University of Missouri

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Drawings and Specifications for the above noted project and the work covered thereby are herein modified as follows, and except as set forth herein, otherwise remain unchanged and in full force and effect:

GENERAL:

Questions:

Question: Grid line 1 between D and A (E) shows a 7'-2-1/2" cantilever of structure. Is this correct?
Answer: *Yes, the structure must cantilever to avoid the existing building foundation.*

Question: PEMB structure is not able to cantilever roof purlins and wall girts this distance without support at the end. Is a frame line at this location acceptable?
Answer: *A frame would not be acceptable due to likely interference with the existing foundations. The thought was that supports would cantilever from the frame along grid line D.*

Question: If frame line not acceptable what is the existing structure material at the A (E) gridline?
Answer: *The existing structure is a PEMB.*

Question: Is it possible to tie structure into the existing wall at grid line A (E)?
Answer: *The existing structure is a PEMB and likely does not have the structural capacity.*

Question: Drawing A4.10 detail 2 shows what appears to be a structural ledger CEE for PEMB purlin to rest upon. Is this correct? If so who is to provide this ledger CEE? What is the size required for this condition as well?

Answer: *This detail shows the cantilevered support from the new PEMB and would be provided by the PEMB supplier. The channel shown would be a member spanning between the cantilevered members to support the roof purlins, also provided by the PEMB supplier.*

Question: Are there to be any sprinkler lines greater than 4" diameter? If yes please indicate sizes, weights per If, and locations on the floor plan drwg.

Answer: *It is unlikely that would be a 4" or larger pipe supported by the PEMB structure, however, fire suppression is a delegated design. Until shop drawings are received, we will not know for certain. Any fire sprinkler piping that is 4" or larger can be supported from the structural ceiling.*

SPECIFICATION CHANGES:

1. Specification section 23 52 00 – Heating Boilers has been revised and reissued to include Aerco as an approved equivalent manufacturer.

Attachments:
Revised specification section 23 52 00 – Heating Boilers

END OF ADDENDUM # 03

SECTION 23 52 00 – HEATING BOILERS

1. GENERAL

1.1 SECTION INCLUDES

A. This Section includes packaged, factory-fabricated and assembled, gas-fired, fire-tube condensing boilers, trim, and accessories for space heating hot water.

1.2 REFERENCE SECTION 23 05 00 FOR THE FOLLOWING:

A. Quality assurance.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. ASME Compliance: Fabricate and label boilers to comply with ASME Boiler and Pressure Vessel Code.

D. "ASHRAE/IESNA 90.1 Compliance" Paragraph may be required to comply with Project requirements or authorities having jurisdiction. Also, LEED Prerequisite EA 2 requires compliance with ASHRAE/IESNA 90.1.

E. ASHRAE/IESNA 90.1 Compliance: Boilers shall have minimum efficiency according to "Gas and Oil Fired Boilers - Minimum Efficiency Requirements."

F. ANSI Compliance: Boilers shall be compliant with ANSI Z21.13 test standards for US and Canada.

G. CSA Compliant: Boilers shall be compliant with CSA certification.

H. References.

1. ASME Section IV
2. CAN-1.3.1-77, Industrial and Commercial Gas Fired Packaged Boilers
3. CSD-1, Controls and Safety Devices
4. XL GAPS
5. NEC, National Electric Code
6. UL-795 7th Edition
7. AHRI, BTS-2000
8. ASHRAE 90.1-2010

I. Submittals.

1. Product Data: Include performance data, operating characteristics, furnished specialties, and accessories.
2. Shop Drawings: For boilers, boiler trim, and accessories.

    a. Include plans, elevations, sections, details, and attachments to other work.
    b. Wiring Diagrams: Power, signal, and control wiring.

3. Source quality-control test reports: Indicate and interpret test results for compliance with performance requirements before shipping.
4. Field quality-control test reports: Indicate and interpret test results for compliance with performance requirements.
5. Warranty: Standard warranty specified in this Section.

J. Operation and maintenance manuals.

K. Project record documents.

1. Complete parts list
2. Certified startup and combustion test record

L. Delivery, storage, and handling.

1. Handle boiler components and equipment carefully to prevent damage, breaking, and scoring. Do not install damaged components; replace with new.
2. Store boiler sections and equipment in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.
3. Comply with manufacturer's rigging and moving instructions for unloading boilers, and moving them to final location.

M. Regulatory requirements

N. Coordination:

1. Mechanical contractor shall coordinate the size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete reinforcement and formwork requirements are specified in Division 03.

O. Warranty:

1. Standard Warranty: Boilers shall include manufacturer's standard form in which manufacturer agrees to repair or replace components of boilers that fail in materials or workmanship within specified warranty period.

a. Warranty Period for Fire-Tube Condensing Boilers:

1) Heat Exchanger, Pressure Vessel and Condensation Collection Basin shall carry a 10 year limited warranty against defects in materials or workmanship and failure due to thermal shock.
2) All other components shall carry a one year warranty from date of boiler start up.

2. PRODUCTS

2.1 BOILERS

A. Manufacturers:

1. Lochinvar Knight FTXL Boiler as specified on Drawings or approved equivalent.
2. Aerco BMK750 is an approved equivalent.

B. Construction:

1. Description: Boiler shall be natural gas fired, fully condensing, and fire tube design. The boiler shall be factory-fabricated, factory-assembled, and factory-tested, fire-tube condensing boiler with heat exchanger sealed pressure tight, built on a steel base; including insulated jacket; flue-gas vent; combustion-air intake connections; water supply, return, and condensate drain connections; and controls.
2. Heat Exchanger: The heater exchanger shall bear the ASME “H” stamp for 160 psi working pressure and shall be National Board listed. The heat exchanger shall be constructed of a fully welded stainless steel and of fire tube design. The heat exchanger shall be designed for a single-pass water flow to limit the water side pressure drop. Cast iron, aluminum, or condensing copper tube boilers will not be accepted.
3. Efficiency: Boilers shall have an AHRI certified minimum thermal efficiency of 97 percent.
4. Condensate Collection Basin: Fully welded stainless steel and shall include a stainless steel combustion analyzer test port.
5. Pressure Vessel: The pressure vessel shall be in accordance with ASME Section IV pressure vessel code. The pressure vessel shall be designed for a single-pass water flow to limit the water side pressure drop. The pressure vessel shall contain a volume of water no less than:

Model	Water Content
FTX400	13 gallons
FTX500	12 gallons
FTX600	12 gallons
FTX725	17 gallons
FTX850	16 gallons
FTX1000	19 gallons

6. Burner: Natural gas, forced draft single burner premix design. The burner shall be high temperature stainless steel with a woven Fecralloy outer covering to provide modulating firing rates. The burner shall be capable of the stated gas train turndown without loss of combustion efficiency.
7. Blower: Boiler shall be equipped with a pulse width modulating blower system to precisely control the fuel/air mixture to provide modulating boiler firing rates for maximum efficiency. The burner firing sequence of operation shall include pre-purge, firing, modulation, and post-purge operation.

    a. Motors: Comply with requirements specified in Division 23 Section "Electrical Requirements for Mechanical Equipment."

8. Gas Train: The boiler shall be supplied with a negative pressure regulation gas train and shall be capable of the following minimum turndowns:

Model	Turndown	Minimum Input	Maximum Input
FTX400	10:1	40,000	400,000
FTX500	10:1	50,000	500,000
FTX600	7:1	85,700	600,000
FTX725	7:1	103,500	725,000
FTX850	7:1	121,500	850,000
FTX1000	10:1	99,900	999,000

9. Ignition: Spark ignition with 100 percent main-valve shutoff with electronic flame supervision.
10. Casing:

    a. Jacket: Heavy gauge primed and painted steel jacket with snap-in closures.
    b. Control Compartment Enclosures: NEMA 250, Type 1A.
    c. If retaining second option in "Jacket" Subparagraph above, delete first subparagraph below.
    d. Insulation: Minimum ½ inch thick, mineral fiber insulation surrounding the heat exchanger.
    e. Combustion-Air Connections: Inlet and vent duct collars.

11. Characteristics and Capacities:

a. Heating Medium: Hot water.
b. Design Water Pressure Rating: 160 psi working pressure.
c. Safety Relief Valve Setting: 50 psig
d. Minimum Water Flow Rate:

Model	Minimum Flow
FTX400	10 gpm
FTX500	12 gpm
FTX600	15 gpm
FTX725	18 gpm
FTX850	21 gpm
FTX1000	30 gpm

C. Trim

1. Safety Relief Valve:

a. Size and Capacity: 50 lb.
b. Description: Fully enclosed steel spring with adjustable pressure range and positive shutoff; factory set and sealed.

2. Pressure Gage: Minimum 3-1/2 inch diameter. Gage shall have normal operating pressure about 50 percent of full range.
3. Drain Valves: Minimum NPS 3/4 or nozzle size with hose-end connection.
4. Condensate Neutralization Kit: Factory supplied condensate trap with condensate trip sensor, high capacity condensate receiver prefilled with appropriate medium.

D. Controls

1. Refer to Division 23 Section "Instrumentation and Control for HVAC."
2. Boiler controls shall feature a standard, factory installed multi-color graphic LCD screen display with navigation dial and includes the following standard features:

a. Con-X-Us capable: Boiler shall have the ability to communicate remotely using the optional Con-X-Us software via a wireless or Ethernet connection.
b. Password Security: Boiler shall have a different password security code for the User and the Installer to access adjustable parameters.
c. Ramp delay: Boiler may be programmed to limit the firing rate based on six limits steps and six time intervals.
d. PC port connection: Boiler shall have a PC port allowing the connection of PC boiler software.
e. Maintenance reminder: Boiler shall have the ability to display a yellow colored, customizable maintenance notification screen. All notifications are adjustable by

the installer based upon months of installation, hours of operation, and number of boiler cycles.

f. English Error codes: Boiler shall have a user interface that displays a red error screen with fault codes that are displayed in English and include a date and time stamp for ease of servicing.

g. Anti-cycling control: Boiler shall have the ability to set a time delay after a heating demand is satisfied allowing the boiler to block a new call for heat. The boiler will display an anti-cycling blocking on the screen until the time has elapsed or the water temperature drops below the anti-cycling differential parameter. The anti-cycling control parameter is adjustable by the installer.

h. Isolation valve control: Boiler shall have the ability to control a 2-way motorized control valve. Boiler shall also be able to force a fixed number of valves to always be energized regardless of the number of boilers that are firing.

i. BMS integration with 0-10V DC input: The Control shall allow an option to Enable and control set point temperature or control firing rate by sending the boiler a 0-10V input signal.

j. Data logging: Boiler shall have non-volatile data logging memory including last 10 lockouts, space heat run hours, domestic hot water run hours and ignition attempts. All data should be visible on the boiler screen.

3. The boiler shall have a built in Cascade controller to sequence and rotate lead boiler to ensure equal runtime while maintaining modulation of up to 8 boilers of different btu inputs without utilization of an external controller. The factory installed, internal cascade controller shall include:

a. Lead lag: The Control module shall allow only one boiler to fire at the beginning of a call for heat. Once the lead boiler is in full fire and the control calculates that additional heat is required it will call on an additional boiler as needed.

b. Efficiency optimization: The Control module shall allow multiple boilers to simultaneously fire at minimum firing rate in lieu of Lead/Lag.

c. Front end loading: The Control module shall allow the cascading and functional control of several non condensing Lochinvar products alongside the Knight FTXL.

d. Rotation of lead boiler: The Control module shall change the lead boiler every hour for the first 24 hours after initializing the Cascade. Following that, the leader will be changed once every 24 hours.

4. Boiler operating controls shall include the following devices and features:

a. Set-Point Adjust: Set points shall be fully adjustable by the installer.

b. Sequence of Operation: Factory installed controller to modulate burner firing rate to maintain system water temperature in response to call for heat.

5. Burner Operating Controls: To maintain safe operating conditions, burner safety controls limit burner operation and include:

a. High Temperature Limit: Automatic and manual reset stops burner if operating conditions rise above maximum boiler design temperature. Limit switch to be manually reset on the control interface.
b. Low-Water Cutoff Switch: Electronic probe shall prevent burner operation on low water. Cutoff switch shall be manually reset on the control interface.
c. Blocked Inlet Safety Switch: Manual-reset pressure switch field mounted on boiler combustion-air inlet.
d. High and Low Gas Pressure Switches: Pressure switches shall prevent burner operation on low or high gas pressure. Pressure switches to be manually reset on the control interface.
e. Blocked Drain Switch: Blocked drain switch shall prevent burner operation when tripped. Switch to be manually reset on the control interface.
f. Low air pressure switch: Pressure switches shall prevent burner operation on low air pressure. Switch to be manually reset on the control interface.
g. Audible Alarm: Factory mounted on control panel with silence switch; shall sound alarm for any lockout conditions.

6. Building Automation System Interface:

a. Boiler shall have the ability to receive a 0-10V system from a building management system and control by the following:

1) 0-10V DC input to control Modulation or Setpoint
2) 0-10V DC input Enable/Disable signal

b. Factory installed Modbus gateway interface to enable building automation system to monitor, control, and display boiler status and alarms.

E. Electrical Power:

1. Controllers, Electrical Devices, and Wiring: Electrical devices and connections are specified in Division 26 Sections.
2. Single-Point Field Power Connection: Factory-installed and factory-wired switches, motor controllers, transformers, and other electrical devices necessary shall provide a single-point field power connection to boiler.
3. Electrical Characteristics:

a. See Drawings
b. Voltage

1) 120V / 1PH

c. Frequency: 60 Hz

F. Venting:

1. Exhaust flue must be Category IV approved CPVC, PP or stainless steel sealed vent material from one of the approved manufacturers listed in the Installation and Operation manual. Boilers exhaust vent length must be able to extend to 100 equivalent feet.
2. Intake piping must be of approved material as listed in the Installation and Operations manual. Boilers intake pipe length must be able to extend to 100 equivalent feet.
3. Boiler venting and intake piping configuration shall be installed per one of the approved venting methods shown in the Installation and Operation manual.
4. Boilers using common venting must only include like models and the optional common vent damper. Contact the factory for common vent sizing.
5. Boiler shall come standard with a flue sensor to monitor and display flue gas temperature on factory provided LCD display.
6. Refer to manufacturer's Installation and Operations manual for detailed venting instructions and approved manufacturers.

G. Source quality control

1. Burner and Hydrostatic Test: Factory adjust burner to eliminate excess oxygen, carbon dioxide, oxides of nitrogen emissions, and carbon monoxide in flue gas and to achieve combustion efficiency; perform hydrostatic test.
2. Test and inspect factory-assembled boilers, before shipping, according to ASME Boiler and Pressure Vessel Code.

3. EXECUTION

3.1 EXAMINATION

1. Before boiler installation, examine roughing-in for concrete equipment bases, anchor-bolt sizes and locations, and piping and electrical connections to verify actual locations, sizes, and other conditions affecting boiler performance, maintenance, and operations.

    a. Final boiler locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping and electrical connections.

2. Examine mechanical spaces for suitable conditions where boilers will be installed.
3. Proceed with installation only after satisfactory conditions have been verified.

3.2 BOILER INSTALLATION

A. Install equipment on 4" concrete housekeeping pad.

B. Install gas-fired boilers according to NFPA 54.

C. Assemble and install boiler trim.

D. Install electrical devices furnished with boiler but not specified to be factory mounted.

E. Install control wiring to field-mounted electrical devices.

3.3 CONNECTIONS

A. Install boilers level on concrete bases. Concrete base is specified in Division 23 Section "Common Work Results for HVAC," and concrete materials and installation requirements are specified in Division 03.

B. Install piping adjacent to boiler to allow service and maintenance.

C. Install piping from equipment drain connection to nearest floor drain. Piping shall be at least full size of connection. Provide an isolation valve if required.

D. Connect gas piping to boiler gas-train inlet with union. Piping shall be at least full size of equipment connection. Provide a reducer if required.

E. Connect hot-water piping to supply and return boiler tappings with shutoff valve and union or flange at each connection.

F. Install piping from safety relief valves to nearest floor drain.

G. Boiler Venting:

1. Install flue venting kit and combustion-air intake.
2. Connect full size to boiler connections. Comply with requirements in Division 23 Section “Breechings, Chimneys, and Stacks.

H. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

I. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and inspections:

1. Perform installation and startup checks according to manufacturer's written instructions. Complete startup form included with Boiler and return to Manufacturer as described in the instructions.
2. Leak Test: Hydrostatic test. Repair leaks and retest until no leaks exist.
3. Operational Test: Start units to confirm proper motor rotation and unit operation. Adjust air-fuel ratio and combustion.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

    a. Check and adjust initial operating set points and high- and low-limit safety set points of fuel supply, water level and water temperature.
    b. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

5. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other than normal occupancy hours for this purpose.

3.5 DEMONSTRATION

A. Engage a factory representative or a factory-authorized service representative for boiler startup. Start-up sheet shall be completed and a copy shall be sent to the Engineer and the Manufacturer. A combustion analysis shall be completed and the gas valve adjusted per the Installation and Operations manual and note in start-up report.

B. Factory representative or a factory-authorized representative shall provide Owners training to instruct maintenance personnel to adjust, operate, and maintain boilers.

END OF SECTION