EQUIPMENT APPROVALS

	SECTION	ITEM	PROPOSED SUBSTITUTION
1.	233000 - Page 4	Grilles, Registers and Diffusers	Nailor Ind. Grilles, Registers and Diffusers

SPECIFICATIONS

Note: Revised Additions are in bold, deletions have a strikethrough.

SECTION 22 10 00 - PLUMBING PIPING AND PUMPS

1) Article 2.01: Add new paragraphs D and E plus items as follows:

D. Cast Iron DWV Pipe:
1. **Application: 1-1/2"'' and larger.**
   a. **Rain drain and overflow**
2. **Pipe: Hubless cast iron soil pipe, CISPI 301-05/ASTM A 888-05. Produced by American manufacturer only. Foreign produced piping is not allowed.**
3. **Fittings: Hubless cast iron fittings: CISPI 301-05/ASTM A 888-05.**
4. **Couplings:**
   a. **Light Duty: Standard couplings meeting CISPI 310.**
   b. **Medium Duty: No-hub couplings meeting CISPI 310 and incorporating ASTM C 564 gasket, type 304 SS corrugated shield and type 304 SS clamping bands. Two clamping bands on 1-1/2" thru 4" pipe and four bands on 6" thru 10" pipe.**
   c. **Heavy Duty: No-hub couplings meeting ASTM C 1540, and FM 1680. ASTM C 564 neoprene gasket, type 304 SS corrugated shield and type 304 SS clamping bands. Four bands on 1-1/2" thru 4" pipe and 6 bands on 5" thru 10" pipe.**
   d. **Couplings to Dissimilar Pipe in Concealed Locations: Fernco "LowFlex" or approved substitute.**
5. **Manufacturers: Cast iron pipe and fittings – AB&I, Charlotte Pipe, Tyler Pipe, or approved. All pipe shall be labeled by the manufacturer.**

E. Plastic Pipe – Drain, Waste, Vent (DWV):
1. **Application:**
   a. **Roof overflow drain piping above grade.**
2. **Pipe:**

a. Acrylonitrile-butadiene-styrene (ABS) (ASTM D3965) plastic drain, waste and vent piping (ASTM F628) and fittings (ASTM D2661) (DWV).
b. Poly(vinyl chloride) (ASTM D1784) (PVC) plastic drain, waste and vent pipe (ASTM D2665 and D1785) and fittings (ASTM D2665) (DWV).

3. Fittings: Provide fittings of the type indicated, matching piping manufacture. Where not otherwise indicated, provide fittings produced and recommended for the service indicated by the piping manufacturer.

2) Article 2.03: Add new paragraphs H as follows:

H. Master Mixing Valve: All lead free certified brass or bronze body with stainless steel parts, thermostatic master control element to fail safe upon cold water or control element failure. Provide with external union angle check stops, strainers, volume control, shutoff valves, dial thermometer. Valve location, arrangement and capacity as shown on plans. Valve shall be ASSE standard 1017 listed for 0.5 gpm minimum flow. Leonard, Lawler, Powers, or approved substitute.

SECTION 23 21 00 - HYDRONIC PIPING AND PUMPS

1) Article 2.01, C, 1, a: Remove "a" as follows and re-letter:

C. Black Steel Pipe:
1. Applications:
a. ~~Chilled water~~
~~b~~.a. Heating water

2) Article 3.04, F: Add new paragraph F as follows:

F. Replace the factory control interface/control panel of the 4 existing Hydro Therm KN Series boilers. Complete factory start-up document for each boiler and submit in O & M's.

SECTION 23 09 23 - DDC CONTROLS

1) Article 6.01, A: Add as follows

A. During all pre-installation meetings with Owner/Engineers and separate meetings pertaining to the commissioning process, the control technician attending the meetings must be the same technicians that are/will install and program the DDC system. **The**

control technician shall also meet with manufactures representative for all systems being integrated. See specification for equipment for additional requirements.

SECTION 23 09 93 - SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

1) Article 4.08: Add new as follows:

4.08 OTHER SEQUENCES

A. Retain existing sequences for replaced systems where no new operational changes are required.

B. Provide DCV to all systems noted. Operate from space sensor. See article 4.06, K-8 for sequence. **Eliminate centralized CO_2 Control System per drawings. Add zone sequence per 4.07 C to each existing terminal device per drawings. Add sensor at air handler system and sequence to operate per 4.06-K8.**

C. For new systems with multi-stage cooling or heating modify sequences for modulation/staging of units as required.

D. For new roof top package or split systems that replace package gas packs or heating and ventilation units, provide control of power exhaust fans. Fans shall modulate based on outside air damper position with a bias to maintain slight space positive pressure.

E. At split system furnaces with EC motor and two stage heat add sequence and control points to:
1. Stage fan speed from low to high based on space temperature demands. Where temperature deviates from set-point for more than 10 minutes (adj.) by more than 1.0 deg. F. increase fan speed. Otherwise operate at low speed.
2. Stage heat to maintain space temperature and minimum discharge temperature during heating mode.

F. At HVU-1 and 2 serving the Auxiliary Gym add control actuators to new relief dampers. Control dampers based on the position of the OSA dampers. Include an off-set to be confirmed by the balancer to control space pressure to a slight positive.

G. At HVU-9 (East Gym Unit) and HVU-10 (West Gym Unit) serving the Main Gym add control actuators to new relief dampers. Control dampers based on the position of the OSA dampers. Include an off-set to be confirmed by the balancer to control space pressure to a slight positive.

H. All restroom exhaust fans: Add separate schedule to operate after normal school day schedule. The intention is to allow the exhaust fans to run until 11:00 PM for custodial services. Provide on screen enable / disable function to school graphic.

I. MAU-1: Sequence to remain as is except:
1. **Install occupancy sensor in C13 team room and C16 training room. If either sensor registers an occupant and for 10 minutes following occupancy operate system in 100% OSA / 100% exhaust. Otherwise operate system as conventional heating and ventilation unit with air side economizer.**
2. **Modulate RA & exhaust damper and stage exhaust fan during schedule occupancy with no room occupants. Confirm OSA damper position at which exhaust fan should operate to maintain neutral space pressure.**

J. DAH-1: Formerly MAU-2. Alter all graphics and sequences for new unit designation. Add cooling operation to sequence. See 4.06 E and F for added sequences.

SECTION 23 30 00 - AIR DISTRIBUTION

1) Article 2.01, B: Replace B as follows:

B. ~~Acoustical Duct Lining: Line ducts with 1" thick lining (unless noted otherwise) for installation inside the building insulation envelope, and 1-1/2" for installation outside the building insulation envelope. Schuller "Linacoustic," Owens Corning "Aeroflex" Type 150, and Certainteed "ToughGard" Type 150 approved, meeting NFPA 90A and B requirements for maximum flame spread and smoke developed. Duct liner adhesive shall conform to ASTM C916.Mechanically attach lining to sheet metal duct with fasteners conforming to SMACNA Standard MF-1-1971, Schuller Grip Nails or Gramweld welding pins. Apply fire-retardant type adhesive similar to Schuller No. 44 adhesive, Benjamin Foster 81-99, Insul-Coustic 22 or 3M equivalent on all leading edges, joints and seams.~~

B. Acoustical Duct Lining:
1. **For applications with duct velocity 1000 FPM or below:**
   a. **Line ducts with 1" thick lining for installation inside the building insulation envelope, and 1-1/2" for installation outside the building insulation envelope. Schuller "Linacoustic," Gustin Bacon "Ultra-Liner," or Owens Corning "Aeroflex" approved, meeting NFPA 90A requirements for maximum flame spread and smoke developed. Mechanically attach lining to sheet metal duct with Schuller Grip Nails or Gramweld welding pins. Apply fire-retardant type adhesive similar to Schuller No. 44 adhesive, Benjamin Foster 81-99, Insul-Coustic 22 or 3M equivalent on all leading edges, joints and seams.**
2. **For applications with duct velocities of over 1000 FPM:**

a. Close cell foam insulation compliant with ASTM D1056,2B1. ASTM E84 25/50 compliant. ASTM C534, Type II compliant to Grade 1. Compliant with ASTM G21/C1338 for mold resistance and ASTM G22 for resistance to bacteria. Armaflex F.S. or equal.

2) Article 2.03, C: Revise as follows:

C. Manufacturers: Carnes, Krueger, Titus, Price, **Nailor, Metalaire,** and Tuttle & Bailey are accepted substitutes where only Titus model numbers are listed. Where other manufacturer's products are listed and/or "accepted substitute" is indicated, only the products or an accepted substitute for that item shall be provided.

3) Article 2.06: Add new article as follows:

2.06 EXHAUST FANS

A. Roof Mounted Exhaust Fan (Direct Drive): Curb mounted on roof; vertical shaft, direct driven, open BI wheel as shown on Drawings with EC motor; bird screen; weatherproof aluminum housing for mounting on square base; capacity as indicated on Drawings. Motor located outside the air stream. Casing to be easily removed for service. Motor and fan assembly to be mounted on rubber vibration isolators unless noted otherwise. Provide with 2-postion motorized damper with the same interior frame size as the duct connection to the fan. Provide damper with actuator. Actuator shall be Belimo only. Provide single point J-Box to operate fan and damper together. Provide disconnect switch at fan with NEMA rating per code. Greenheck, Soler & Palau, Jen Fan, Carnes, Acme, PennBarry, Cook, Twin City or approved.

4) Article 3.03, F,4: Add new item 4 as follows:

4. Where duct velocities exceed 1000 FPM fiberglass liner is not allowed. Use double wall or neoprene liner per these specifications.

SECTION 23 74 00 - CENTRAL STATION HVAC UNITS

1) Article 2.01, Q, 1: Replace Q, 1 as follows:

Q. Roof Curbs

1. A prefabricated seismically rated 12-gauge galvanized steel, mounting curb, designed and manufactured by the unit manufacturer, shall be provided for field assembly on the roof decking prior to unit shipment. The roof curb shall be a full

perimeter type with complete perimeter support of the air handling section and rail support of the condensing section. Supply and return opening duct frames shall be provided as part of the curb structure allowing duct connections to be made directly to the curb prior to unit arrival. The curb shall be a minimum of 16" high and include a nominal 2" x 4" wood nailing strip. Gasket shall be provided for field mounting between the unit base and roof curb.

Q. Roof Curbs: Provide with seismically rated non-plenum isolation curb approved by manufacturer for all units.

1. Curb Mounted Spring Isolation Base:

a. Rooftop equipment shall be mounted on an integrated spring and weather seal curb arrangement that fits under the equipment to be isolated and over the curb. Top and bottom members shall be of extruded aluminum and shall be connected by a flexible, water-proof neoprene membrane with counter flashing protection/cover. The aluminum members shall seal against the equipment and against the curb with continuous closed cell neoprene sponge.

b. Springs shall be cadmium plated and shall have a deflection as required by drawings with 50% additional travel to solid. Spring diameters shall be no less than 0.8 of the spring height at rated load. Wind resistance shall be provided by means of resilient snubbers in the corners with a minimum clearance of 1/4" so as not to interfere with the spring action except in high winds.

c. Curb shall be seismically rated for seismic zone where building is located.

d. Submittals shall include spring deflections, spring diameters, compressed spring height and solid spring height, seal material details and the design configuration of the entire base arrangement.

e. Vibrex, Thycurb, Amber Booth, Mason, Kinetics Noise Control.

2. Where required, provide perimeter angle and cross members to support two layers of 5/8" sheet rock. Install two layers of 5/8" weatherproof sheet rock with staggered joints on the perimeter angle and cross members provided with the vibration isolator bases. Apply sheet rock around all ductwork above the roof and caulk all joints and seams. Provide additional acoustical materials as recommended by acoustical engineer.

2) Article 2.01, R, 1: Add to paragraph 1 as follows:

R. Package Unit Controls

1. Each package control unit shall be equipped with a microprocessor based control system. The unit control system shall include all required temperature and pressure sensors, input/output boards, main microprocessor and operator interface. All boards shall be individually replaceable for ease of service. All microprocessors, boards, and sensors shall be factory mounted, wired and tested. **System shall be BACnet compatible and integrate to BACnet BAS.**

3) Article 2.03, I: Add to item 2 as follows:

I. Outdoor/Return Air Section
   1. Unit shall be provided with an outdoor air economizer section. The economizer section shall include outdoor, return, and exhaust air dampers. The economizer operation shall be fully integral to the mechanical cooling and allow up to 100% of mechanical cooling if needed to maintain the cooling discharge air temperature. The outdoor air hood shall be factory installed and constructed from galvanized steel finished with the same durable paint finish as the main unit. The hood shall include moisture eliminator filters to drain water away from the entering air stream. The outside and return air dampers shall be sized to handle 100% of the supply air volume. The dampers shall be parallel blade design. Damper blades shall be gasketed with side seals to provide an air leakage rate of 1.5 cfm / square foot of damper area at 1" differential pressure in according with testing defined in AMCA 500. A barometric exhaust damper shall be provided to exhaust air out of the back of the unit. A bird screen shall be provided to prevent infiltration of rain and foreign materials. Exhaust damper blades shall be lined with vinyl gasketing on contact edges. Control of the dampers shall be by a factory installed direct coupled actuator. Damper actuator shall be of the modulating, spring return type. A comparative enthalpy control shall be provided to sense and compare enthalpy in both the outdoor and return air streams to determine if outdoor air is suitable for "free" cooling. If outdoor air is suitable for "free" cooling, the outdoor air dampers shall modulate in response to the unit's temperature control system.
   2. **Provide with power exhaust or return fan per schedule. Fan shall be operated by VFD or EC motor to allow modulation for space pressure control.**

4) Article 2.03, K, 15: Add item 15 as follows:

15. Provide dual circuit interfaced coils for systems with dual circuit condensing units.

5) Article 2.03, O,2: Add item 2 as follows:

2. Provide factory mounted smoke detector with auxiliary relay for addressable fire alarm system.

6) Article 2.04, B,3: Add item 3 and 4 as follows:

B. Scroll Compressors
   1. Unit shall have heavy-duty Copeland scroll compressor(s).

2. Compressors shall be isolated with resilient rubber isolators to decrease noise transmission.
3. **Lead compressor on each circuit shall be variable capacity with digital operation or with VFD operation.**
4. **Units shall contain a minimum of 2 refrigerant circuits.**

7) Article 3.02, C and E: Add and revise as follows:

C. Acoustical Protection: Install two layers of 5/8" weatherproof sheet rock with staggered joints on **the roof deck.** ~~the perimeter angle and cross members provided with the vibration isolator bases~~. Apply sheet rock around all ductwork above the roof and caulk all joints and seams. ~~Provide additional acoustical materials as recommended by acoustical engineer.~~

D. Install on vibration isolation curbs where noted on drawings.

E. All curbs shall be elevated such that no termination or hole in the roof membrane on the vertical surface is less than 12" above the horizontal.

8) Article 3.05, B: Add new paragraph as follows:

B. For integrated systems the manufacture shall provide a trained representative to renew the sequence of operations with the control contractor. The factory control system point integration document shall be annotated by factory representative and control contractor at each instance where the BAS and integrated controller share information.

DRAWINGS

Mechanical:

1. Sheets DM1.1 through M6.7. **Replace entire construction drawing set with attached**
2. **New sheet DM1.8 was added.**

Mechanical 8.5x11 drawings

Plumbing Drawings

Fire Protection Drawings

MFIA, Inc.