



MECHANICAL/ELECTRICAL SYSTEMS NARRATIVE

MECHANICAL SYSTEMS

General

The following Schematic Project Narrative describes Mechanical and Electrical work associated with the proposed renovation to the existing 135,899 square foot three story Albright Health Center which houses the majority of NKU's recreation programs and an expansion of 81,997 square foot to the Northern Kentucky University Student Recreation Center. Refer to Civil, Structural, and Architectural drawings and narratives for additional information. The project is targeting USGBC LEED Silver certification and a minimum of 7 points from EA credit 1.

The mechanical and electrical systems for the project shall be designed to be in compliance with the 2007 edition of ASHRAE 62, 2007 edition of ASHRAE 90.1 and the Kentucky Building Code.

Athletic Field

Water Service: The storage room will house the domestic water system. This space will be accessible from the exterior of the building.

Domestic Hot Water Service: Provide two 94% efficient gas fired instantaneous water heaters in the storage room.

HVAC Systems: Area to be ventilated with inline exhaust fans and heated through electric unit heaters. The building will have standalone electric controls.

Site Electrical Utilities: A new service will be provided from Duke Energy as the campus distribution does not extend to the location of the new recreational fields.

Building Electrical: A 277/480V, 400 ampere main service panel board will be provided to service the building. There will also be a transformer and 120/208V panel board to serve receptacle and equipment loads.

Lighting:

The new recreational fields will be lighted by a new sports lighting system. The fields will be illuminated to 30 FC average. The lighting in the field house will be done with t8 fluorescent lamps.

Albright Building and Recreation Center Expansion

Plumbing Systems and Fire Protection

Water Service:



The first floor mechanical room will house the domestic water and fire protection systems. This mechanical space will be accessible from the exterior of the building. The buildings sprinkler alarm valves and two full sized reduced pressure backflow preventers, installed in parallel will also be located in this room. (Considering a second location for the entrance for the expansion to assist in phasing)

Domestic Hot Water Service:

Option: 1

Provide domestic hot water through steam heat exchangers using central plant as the source.

Option: 2

A second option to provide additional energy efficiency will be evaluated to contribute to EAc1. This would consist of a series of 94% efficient gas fired instantaneous water heaters will be installed in the existing lower level mechanical room to serve the existing building. A second series of 94% efficient gas fired instantaneous water heaters will be installed in the new mechanical room adjacent to the pool room to provide domestic hot water to the expansion.

Mechanical Insulation:

Domestic Water: 1" thick fiberglass.

Fire Protection

A complete wet type fire protection system shall serve the facility. The systems shall also include complete fire pumping and standpipe systems in accordance with the Kentucky Building Code.

A fire protection zone valve with tamper and flow switch shall be provided for each zone. All sprinkler heads shall be quick response. Extended coverage heads may be utilized where possible. Semi-recessed heads shall be used in lay-in ceilings. Fully concealed heads shall be installed in drywall ceilings. Upright heads shall be utilized in areas without ceilings.

HVAC Systems

Primary Systems:

Chilled Water System:

The building is currently provided chilled water from the university's central plant. All air handling units will be provided with 15 degree delta temperature chilled water coils to increase capacity without increasing the 6" chilled water piping to the building. The remaining cooling requirements will be achieved through the geothermal well field.

Heating Water Option 1:

The building is currently provided steam from the university's central plant. The expansion will require existing steam service piping to be upsized to 4" pipe at the expansion loop #4 closest to the building. The condensate piping will also be upsized. A heat exchanger will provide hot water to the existing building, new air handling units, outside air units, reheat coils for the variable air volume terminal units and temper the geothermal loop temperature at heating peak load conditions.



Heating Water Option #2:

Replace the steam from the university’s central plant to 94% efficient condensing boilers and keep the existing steam service for redundancy. This would require two 3,000MBH condensing boilers. A heat exchanger will provide hot water to the existing building, new air handling units, outside air units, reheat coils for the variable air volume terminal units and temper the geothermal loop temperature at heating peak load conditions.

Geothermal System:

A geothermal wellfield will be located on the south side of the building in a grassy area. The driller will install approximately 70 wells on 20 foot centers at a depth of 400 foot. The fully grouted bores are 6” in diameter and will include a factory made DR-9, 1-1/4” U-tube. The circuits will be piped with horizontal piping at a depth of 4 feet. The wellfield vault will have 7 circuits each containing 10 wells. Flushing and air purging of the wellfield will be accomplished in this location. The mains will enter a chase in the pool storage room 166.

Water to water heat pumps will be used for heating the pool area through pool dehumidification air handling unit hot water coils. A heat exchanger will supplement the pool water heating requirements from the geothermal loop water to water heat pumps. The primary heating for the pool water will be from the building hot water loop.

All geothermal piping interior of the building will be HDPE piping with fusion welded joints and fittings for 3” and larger piping and copper type L with soldered joints and fitting for 2-1/2” piping and smaller. All geothermal copper piping interior of the building shall be insulated with 1” thick fiberglass insulation with an all service jacket. Valve tags and charts shall be provided for every valve 1” and larger within the facility.

Building Schedules:

SCHOOL IN SESSION

<u>Day</u>	<u>CRC Building</u>	<u>CRC Pool</u>
Sunday	12:00-9:00pm	12:00-6:00pm
Monday	6:30am - 11:00pm	11am-6:30pm & 8:30-10:30pm
Tuesday	6:30am - 11:00pm	6:30am-6:30pm
Wednesday	6:30am - 11:00pm	11am-6:30pm & 8:30-10:30pm
Thursday	6:30am - 11:00pm	6:30am-6:30pm
Friday	6:30am - 9pm	11am-6:30pm
Saturday	8:00am-4:00pm	11:00am-3:00pm

SUMMER SESSION

<u>Day</u>	<u>CRC Building</u>	<u>CRC Pool</u>
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Sunday	12-4pm	12-4pm
Monday - Thursday	6:30am-8pm	11am-2pm & 3:30-6:30pm
Friday	6:30am-7pm	11am-2pm & 3:30-6:30pm
Saturday	9am-4pm	11am-3pm

Design Temperature Setpoints:

Occupied Cooling Setpoint: 72 degrees
Occupied Heating Setpoint: 70 degrees
Unoccupied Cooling Setpoint: 75 degrees
Unoccupied Heating Setpoint: 65 degrees

Dedicated Outside Air Systems:

The renovation and expansion will have VAV type double wall modular air-handling units to provide AHSRAE 62.1-2007 code required ventilation to the facility. The air-handling units will include 30% efficient Merv 8 filter banks, a hydronic coil and energy recovery wheel. Due to the code required amount of fresh air for these spaces, the energy recovery wheel is provided to conserve energy, reduce the central plant capacity requirements, wellfield size and control humidity.

The temperature controls will fully integrate to the existing TAC-VISTA front end system in the Physical Plant. The building control system specified herein shall communicate with the TAC-VISTA system via LON protocol. The outside air handling units will be schedule during the occupied hours only. When the building is unoccupied the air handling unit will be off.

The VAV ventilation terminal units will be interlocked to the space occupancy sensor and when the area is unoccupied according to the occupancy sensors between 6am and 12pm the ventilation CFM will be reduced to the minimum based on squared footage requirements.

Outside Air Unit #1 First/ Second Floor Renovated Area:

The approximately 7,000 CFM dedicated outside air unit in the existing first floor mechanical room will serve the existing 1st and 2nd floors with locker room exhaust and general exhaust from the 1st floor and 2nd floors ducted through an energy recovery wheel to maintain building pressure. The outside air will be ducted to the return plenum of a new variable air volume air handling unit that will be located in the same lower level mechanical room. The exhaust and outside air will utilize the existing chase to the roof and roof penetrations.

Outside Air Unit #2 Third Floor Renovated Area:

The approximately 6,000 CFM dedicated outside air unit in the third floor mechanical room will serve the third floor with general exhaust from third floor ducted through an energy recovery wheel to maintain building pressure. The outside air will be ducted to the return plenum of a new roof mounted variable air volume air handling unit that will be located on the roof above the existing mechanical room.

Outside Air Unit #3 Existing Gym and Expansion:



The approximately 15,000 CFM dedicated outside air unit in the new lower mechanical room adjacent Gym will serve the Gym and Fitness with locker room exhaust and general exhaust from through an energy recovery wheel to maintain building pressure. The outside air will be ducted directly to the space and to the heat pump returns on select zones. All zones will have single wall foil face insulation VAV or CAV terminal units to provide fresh air directly to the space decoupled from the heating and cooling requirements. Occupancy sensors will control the demand for ventilation to the large spaces

Outside Air Unit #4 New Gym and Expansion:

The approximately 10,000 CFM dedicated outside air unit in the new mechanical room 224 will serve the Gym and Fitness with general exhaust from through an energy recovery wheel to maintain building pressure. The outside air will be ducted directly to the space and to the heat pump returns on select zones. All zones will have single wall foil face insulation VAV or CAV terminal units to provide fresh air directly to the space decoupled from the heating and cooling requirements. Occupancy sensors will control the demand for ventilation to the large spaces

Outside Air Unit #5 MAC, Racquetball, Bouldering and Fitness Renovations:

The approximately 5,000 CFM dedicated outside air unit in the new mechanical room 223 will serve the MAC, Racquetball, Bouldering and Fitness with general exhaust from through an energy recovery wheel to maintain building pressure. The outside air will be ducted directly to the space. All zones will have single wall foil face insulation VAV or CAV terminal units to provide fresh air directly to the space decoupled from the heating and cooling requirements. Occupancy sensors will control the demand for ventilation to the large spaces

Outside Air Unit #6 Admin and Main Entry Lobby:

The approximately 4,000 CFM Renewaire dedicated outside air unit in the new administration area will serve the 2nd floor administration offices. The outside air will be ducted to the return plenum at the administration area.

Heating and Air Conditioning Systems:

The HVAC system will consist of six VAV air handling units, water to air heat pumps and two pool dehumidification units. The units will have a field mounted variable frequency drive, DDC controls, economizer, return fans, and 16" curb and installed on 6" concrete pad as required.

Air handling unit zone control will be accomplished with variable air volume boxes with hot water heat. Each VAV box will have packaged DDC control system. The temperature controls will fully integrate to the existing TAC-VISTA front end system in the Physical Plant. The building control system specified herein shall communicate with the TAC-VISTA system via LON protocol.

The VAV terminal units and geothermal heat pumps will be interlocked to the space occupancy sensor and when the area is unoccupied according to the occupancy sensors between 6am and 12pm the zone temperature will be allowed to drift 3 degrees until occupancy has been sensed in the space.

Air Handling Unit #1: Renovated Area: First/ Second Floor



Space temperature will be maintained by an approximately 34,000 CFM air handling unit located in the lower level mechanical room 121. The air handling unit will be connected to existing return plenum. The all interior lined and corridor ductwork is to be replaced. New VAV terminal units with hot water reheat will be installed at existing locations and ducted to the existing diffusers. The existing zoning will remain unchanged. All terminal units will have DDC controls.

Air Handling Unit #2: Renovated Area: Third Floor

Space temperature will be maintained by an approximately 32,000 CFM air handling unit located in the lower level mechanical room 121. The air handling unit will be connected to existing return plenum. The all interior lined and corridor ductwork is to be replaced. New VAV terminal units with hot water reheat will be installed at existing locations and ducted to the existing diffusers. The existing zoning will remain unchanged. All terminal units will have DDC controls.

Air Handling Unit #3: Expansion Area: Main Entry, Administration and Fitness:

Space temperature will be maintained by an approximately 10,000 CFM air handling unit located in the lower level mechanical room 247. Capacity will be designed for future conversion of the upper administration to a fitness zone. All systems will be fully ducted.

Air Handling Unit #4: Expansion Area: Weigh/ Fitness 171, Stretching 172/178, Medium Studio 174, Social Area 161,

Space temperature will be maintained by an approximately 15,000 CFM air handling unit located in the lower level mechanical room 208. All systems will be fully ducted.

Air Handling Unit #5: Renovated Area: MAC, Racquetball, Bouldering and Fitness

Space temperature will be maintained by an approximately 20,000 CFM air handling unit located in the lower level mechanical room 247. Capacity will be designed for future conversion of the upper administration to a fitness zone. All systems will be fully ducted.

Air Handling Unit #6: Expansion Area: Weight Fitness 241, Studio 175/218, Training Lab 199, Personal Trainer 198, Social Area 249:

Space temperature will be maintained by an approximately 10,000 CFM air handling unit located in the lower level mechanical room 216. Capacity will be designed for future conversion of the upper administration to a fitness zone. All systems will be fully ducted.

Natorium Dehumidification Unit: Expansion Area: Natatorium,

The existing Model NE-028-NB-153 Seresco dehumidification unit will be relocated to the roof of the new natatorium. The unit is R-22 refrigerant. Supplementary peak load unit will be installed in the pool equipment room. Both units will be used to condition the space maintaining a space temperature of 2 degrees above water temperature. Design temperature will be a space temperature of 81-87 degrees Fahrenheit and 60% humidity



The hot water coil for the units will be served by a X MBH water to water heat pump. The water to water heat pump will also provide supplemental heating for the pool to maintain water temperature 83 degrees F and spa temperature of 104 degrees F.

Geothermal Heat Pumps #1 and 2: Renovated Area: Gymnasium Quad and Running Track

The gymnasiums' court space and running track temperature will be maintained by four 10 ton heat pumps. It will be ducted to round double wall ducts in the space. A return air louvers will be on the lower level low in the space improving air circulation. The area will have low velocity, high volume fans to enhance air circulation and allow for higher occupied cooling setpoints of 75 degrees. The fans will also assist in space heating by reducing the stratified air layer in the heating mode and automatically operate when the outside air is below 40 degrees. A button will be provided at the check-in to enable the fans to the space for a 1 hour period. When the fans are enabled the setpoint will automatically reset to 75 degrees in the cooling mode. All systems will be fully ducted.

Geothermal Heat Pumps #3 and 4: Expansion Area: Gymnasium

The gymnasiums' court space temperature will be maintained by two 10 ton heat pumps. It will be ducted to round double wall ducts in the space. A return air louvers will be on the lower level low in the space improving air circulation. The area will have low velocity, high volume fans to enhance air circulation and allow for higher occupied cooling setpoints of 75 degrees. The fans will also assist in space heating by reducing the stratified air layer in the heating mode and automatically operate when the outside air is below 40 degrees. A button will be provided at the check-in to enable the fans to the space for a 1 hour period. When the fans are enabled the setpoint will automatically reset to 75 degrees in the cooling mode. All systems will be fully ducted.

Geothermal Heat Pumps: Expansion Area: Locker Rooms, Pool Offices, Fitness 234, Social Area 267, Weight/Fitness 237/ 235, and Intramural Storage 205,

Space temperature will be maintained by a dedicated geothermal heat pump. All systems will be fully ducted.

Natatorium Area:

The existing Seresco rooftop packaged pool dehumidification unit will be relocated to the Natatorium Roof. A plan for replacement of the R-22 refrigerant to R-407C shall be developed. A new approximately 20,000 CFM split pool dehumidification air handling unit shall be installed in the pool equipment room with the remote condensers located on the roof. The unit shall be air cooled with R-410A or R-407C.

Geothermal Heat Pumps:

Each heat pump will include integral disconnect. Each heat pump will have a dedicated circulating pump that will cycle on when the compressor cycles on, the circulating pump or valve shall be powered through the heat pump unit. Flexible stainless steel braided hoses shall be used at the connection of each unit.



The hose kits shall include shut-off valves on each the supply and return and a strainer on the supply hose. Each heat pumps shall have an exterior mounted filter racks to allow one standard filter size. One spare filter shall be provided for each piece of equipment. Also, spare compressors, fans and pumps shall be provided for 10% of the equipment.

Geothermal Pumping:

The geothermal system is to have decentralized pumping. The dedicated pump will be located adjacent to each geothermal heat pump. The dedicated pump will provide flow to the heat pump when the compressor is running,

Building Automation System:

A web-based DDC controls system shall be provided for the entire building and associated systems. The BAS shall also interface with the building lighting controls, and switch gear / electric metering. BTUH metering shall be provided for the central geothermal system. The temperature controls will fully integrate to the existing TAC-VISTA front end system in the Physical Plant. The building control system specified herein shall communicate with the TAC-VISTA system via LON protocol

General Mechanical:

Ductwork/Sheetmetal: All ductwork shall be galvanized steel constructed to SMACNA's standards. All ductwork joints shall have a sealer applied as dictated by system duct pressure.

Test and Balance: All HVAC air distribution systems shall be balanced to AABC standards.

Mechanical Insulation: Supply Air and Return Air Ductwork: 2" thick fiberglass ductwrap, 0.75 pound per cubic foot. All exterior ductwork shall be insulated with 2" rigid fiberglass duct board with aluminum.

ELECTRICAL SYSTEMS NARRATIVE

Site Utilities:

The existing 13.8KV electrical service to the building substation and 2,500A service will need to be upgraded. A new 13.8KV service will be routed around the exterior of the building to the rear of the facility to a new exterior rated 13.8kv switchgear and transformer. There will be recreational athletics and sports lighting for the new fields.

Building Electrical:

A 277/480V, 4000 amp main service switchboard will be provided in the Main Electrical Room to service the building. This new service will then back feed the existing electrical distribution for the building and the new electrical distribution which will consist of 277/480V panel boards located throughout the facility to serve mechanical equipment and lighting systems. 120/208V panel boards will be located throughout the facility to serve receptacle and equipment loads.

The existing facility electrical distribution system does not have any ground wiring installed, and is to be rectified under this project. The existing panel interiors will need to be retrofitted with a ground buss and ground wiring will need to be provided for the entire branch wiring in the existing facility.



Building Emergency Electrical:

A 300KW/277/480V, generator will be install adjacent to the site service transformer. A life safety and equipment transfer switches will be located in the Main Emergency Electrical Room.

Photovoltaic (PV) Ready:

Space will be provided adjacent to the site service transformer for a PV inverter. Empty conduits will be installed between the main service switchboard and the future inverter location. Main service switchboard will be provided with a connection point before the main circuit breaker for the future PV system inverter connection.

Systems:

Telecommunications Systems and Specialty A/V Systems will be provided by the University. All systems will be coordinated with University IT and A/V Staff. Power connections and System raceways will be provided to include back boxes, conduit, wiring and cable tray routed through the corridors. Fire-rated plywood backboard and approved ground bar will be provided at all telecommunications wiring closets.

Fire Alarm System:

A new addressable microprocessor based Fire Alarm Control Panel and addressable devices will be provided per NFPA requirements.

Lighting Controls:

Controls will be provided to meet IECC requirements. Common area lighting and exterior lighting will be controlled through the web-based DDC control system. Enclosed offices, storage rooms, etc. will have stand alone occupancy sensors. Day lighting controls will be utilized in actively day lit spaces.

Lighting:

The common areas, locker rooms and offices will be illuminated with “super” T8 lamps and NEMA premium programmed start ballasts in high efficient light fixtures. High volume spaces, such as gymnasiums, will be illuminated with T5HO fluorescent high bays.