

Procurement Services

INVITATION FOR BIDS CCK-2581.0-1-24 UK Grain & Forage Center of Excellence Rebuild ADDENDUM #01 09/21/2023

IMPORTANT: BID AND ADDENDUM MUST BE RECEIVED BY: 10/05/2023 @ 3:00 P.M. LEXINGTON, KY TIME

Bidder must acknowledge receipt of this and any addendum as stated in the Invitation for Bids.

ITEM #1: CLARIFICATIONS AND MODIFICATIONS TO THE ADVERTISEMENT

• Please refer to and incorporate into your bid the attached information from JRA Architects.

OFFICIAL APPROVAL UNIVERSITY OF KENTUCKY

SIGNATURE

Ken Scott 09/21/2023

Contracting Officer / (859) 257-9102

Typed or Printed Name

University of Kentucky Purchasing Division 322 Peterson Service Building Lexington, KY 40506-0005

An Equal Opportunity University

FOR THE PROJECT TITLED:

UK GRAIN CENTER OF EXCELLENCE REBUILD AT PRINCETON, KY PROJECT # 2581.0 CCK-2581.0-1-24 University of Kentucky Lexington, Kentucky

To: Prospective Bidders

From: JRA Architects 3225 Summit Square Place, Suite 200 Lexington, KY 40509

Project Contact: D. Robert Deal, AIA, LEED AP

The Addendum will form a part of the Contract Documents and modifies the original Bidding Documents dated August 2023.

Bidders must acknowledge receipt of this Addendum in the space provided on the Form of Proposal. Failure to do so may subject the bidder to disqualification.

Bidding Documents, including the Drawings and Specifications, are amended as described herein. Please note page size

ARCHITECTURAL ITEMS:

ITEM NO. 1.01

Refer to Specification Section 096813 – "Tile Carpeting". Note that basis of design for carpet uses soybean.

ITEM NO. 1.02

Issue Specification Section 098433 – "Sound Absorbing Wall Units". Note that basis for the backing panel is made with soybean.

ITEM NO. 1.03

Issue Specification Section 012100 – "Allowances". See Allowance #1. Add to Specification

ITEM NO. 1.03

Refer to Equipment Schedule on drawings and Specification 102800 - "Toilet Accessories".

- Toilet Paper Dispenser will be Contractor Furnished Contractor Installed.
- Paper Towel Dispensers and Soap Dispensers will be Owner Furnished Owner Installed.

ITEM NO. 1.04

Refer to Sheet A-181 – "Roof Plan". Remove "Provide 07 5700 – Coated Foam Roof in lieu of EPDM at Roof Types 1 and 3. Project will only be an EPDM Roof. Refer to Spec Section 075323 for information.

ITEM NO. 1.05

Reissue Specification 004100 – "Form of Proposal". Document removes reference to Coated Foam Roofing Alternate. There is no alternate for this.

Refer to Sheet A-405 – "Enlarged Pre-Plant/Post-Harvest Lab" and A-406 – "Plant Animal Interface Lab". Remove Tank Holders in these labs C128 and C130, they are not needed.



ITEM NO. 1.07 Refer to Sheet A-412 – "Enlarged Instrument Lab" . Add Tank Holder as shown below.



ITEM NO. 1.08

Refer to Drawing Set, "Specialties & Equipment Schedule".

- Remove T8 Grab Bar 18" from schedule. 18" grab bar is used in the set T1.
- Remove T7 Horizontal Soap Dispenser from Schedule. Owner would like to use the Vertical Hillard Lyon, UK Standard at all soap dispensing locations. These are now OFOI. See attached A-421 – "Enlarged Restroom & Interior Elevations" sheet showing the change in tags.

10 2800 - TOILET ACCESSORY								
T1	GRAB BAR SET: 36" BACK, 42" SIDE, 18" VERT	Х						
T2	AMBULATORY GRAB BAR SET: (2) 36" SIDE	Х						
T4	TOILET PAPER DISPENSER - SINGLE ROLL	Х						
T5	SANITARY NAPKIN DISPOSAL - PARTITION MTD	Х						
T6	SANITARY NAPKIN DISPOSAL - RECESSED	Х						
T8	SOAP DISPENSER - SURFACE MTD, VERT			Х	COORD W/ UK STANDARDS			
Т9	FRAMED MIRROR - 24" x 36"	Х						
T10	FRAMELESS MIRROR	Х			SEE INT. ELEV. FOR SIZE			
T11	BABY CHANGING STATION	Х			20" X 36"			
T14	UTILITY SHELF	Х						
T15	DISPENSER, PAPER TOWEL, SURFACE MTD			Х	COORD W/ UK STANDARDS			
T16	SANITARY NAPKIN DISPOSAL - SURFACE MTD	Х						
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Reissue Sheet A-403 - "Enlarged Growth Chamber". Revised Casework wall.

ITEM NO. 1.10

Refer to Sheet A-621 - "Room Finish Schedule".

- C115 & C117 Dry Lab Storage flooring to be SC-1
- C132 & C134 Lab flooring to be EP-1.



Refer to Sheet A-355 – "Wall Sections – Area A". Add sheathing to close off exposed rigid insulation.



ITEM NO. 1.12

Refer to Sheet A-356 – "Wall Sections – Area A". Add sheathing to close off exposed rigid insulation.



ITEM NO. 1.13

Refer to Sheet A-357 – "Wall Sections – Area A". Add z-furring and sheathing to close off exposed rigid insulation.



Refer to Sheet A-374 – "Wall Sections – Area B". Continue brick to bottom of joist to close off exposed rigid insulation.



ITEM NO. 1.15

Refer to Sheet A-381 – "Wall Sections – Area C". Add z-furring and sheathing to close off exposed rigid insulation.



Refer to Sheet A-382 – "Wall Sections – Area C. Add z-furring and sheathing to close off exposed rigid insulation.



ITEM NO. 1.17

Issue Specification Section - "Ground Set Flag Poles".

CIVIL/SITE ITEMS:

ITEM NO. 1.18

Refer to Sheet C-200 "Development Plan" & Sheet C-802 "Site Details".

- Add Brick Sign Wall near Sandlick Road Entrance. See Detail 6, Sheet C-802.
- Provide Dimensional Style lettering as shown on sign. Refer to specification.

ITEM NO. 1.19

Refer to Sheet C-200 "Development Plan", Sheet C-300 "Dimensional Plan", Sheet C-400 "Overall Grading Plan", & Sheet C-402 "Enlarged Grading Plan".

• Add section of sidewalk to Staff Entrance.

ITEM NO. 1.20

Refer to Sheet C-200 "Development Plan", Sheet C-300 "Dimensional Plan", Sheet C-400 "Overall Grading Plan", Sheet C-403 "Enlarged Grading Plan", Sheet C-404 "Enlarged Grading Plan", & Sheet C-700 Utility Plan.

• Revise location of Transformer/Generator Pad and add 8" compacted DGA adjacent to pad.

ITEM NO. 1.21

Refer to Sheet C-700 Utility Plan.

- Revise Plan Title from "Site Proposed Development Plan" to "Utility Plan".
- Revise Sheet Name from "Proposed Utility Plan" to "Utility Plan".

Refer to Sheet C-200 "Development Plan" & Sheet C-802 "Site Details".

• Add Key Note 39 on Sheet C-200 - Flag Pole Foundation. See Detail 7, Sheet C-802.

MEP ITEMS:

ITEM NO. 1.23

Refer to specifications, section 201300 – Pipe, Pipe Fittings:

- Refer to Page 5:
 - Part G Hydronic Piping:
 - This section shall apply to chilled water piping as well.
 - Victaulic fittings shall be allowed as an alternate to welded piping.
- Refer to Page 7:
 - Section P, Acid Waste (Lab Waste) and Vent Piping Below Slab and grade or Above Slab shall be as follows:
 - (1) Below slab piping, Schedule 40 non-flame retardent polypropylene pipe conforming to ASTM D4101 with joints made in accordance with the Kentucky Plumbing Code. Below grade piping shall be installed with fusion joint fittings.
 - (2) Above slab, pipe in non-plenum area: Schedule 40 flame retardant polypropylene pipe conforming to ASTM D4101 with joints made in accordance with the Kentucky Plumbing Code. Piping shall be installed with fusion joints within concealed spaces and with mechanical joints in accessible areas. All mechanical couplings below casework or exposed shall have the clamp edges smoothed or covered to keep sharp edges from cutting people
 - (3) Piping shall be protected from sunlight in accordance with the manufacturer's recommendations.
 - (4) Acceptable manufacturers of acid waste and vent piping materials above slab: Enfield (Ipex), Orion, or G.F. Sloane.
 - Refer to Page 8:
 - Section Q Laboratory Deionized Water Piping: This section shall apply to all RO Piping on the project. All pipe, fittings and ball valves in the reverse osmosis water system shall be manufactured from a polyvinyl chloride (PVC) compound which meets the requirements of Type 1, Grade 1 PVC as outline in ASTM D01784. Pipe shall be Schedule 80 and joints may be threaded and/or welded to withstand system pressures up to 150 psi. All socket type connections shall be joined with PVC solvent cement complying with ASTM-D-2564.

ITEM NO. 1.24

Insert the following specification 201330 – Heat Transfer Fluid **SECTION 201330 - HEAT TRANSFER FLUID**

- 1. GENERAL
 - A. The Contractor's attention is directed to the General and Special Conditions, General Requirements-Mechanical and to all other Contract Documents as they apply to this branch of the work. Attention is

also directed to all other sections of the Contract Documents which affect the work of this section and which are hereby made a part of the work specified herein.

- B. The work under this section shall be closely coordinated with work involved with cleaning and flushing the system.
- C. For Glycol water systems, there shall be no dedicated connected fill system to allow for possible dilution of solution. Provide makeup packaged unit as specified.
- D. The contractor shall provide placard in the building at the point of fill with the total system volume. Placard for new glycol water system should be posted adjacent to glycol makeup system in mechanical room.
- E. WATER CLEANING REQUIREMENTS: UK STANDARD
 - (1) This standard applies to all water systems.
 - (2) Provide flushing and drain connections for complete flushing and drainage of the entire system.
 - (3) Remove strainers, open all valves and continuously flush the system with clean domestic water until all foreign matter is removed.
 - (4) Fill and vent the system, adding one pound trisodium phosphate for each fifty gallons of water.
 - (5) Circulate this solution for four hours, then drain and flush the system with clean domestic water.
 - (6) Replace the strainers and fill the system with clean water, circulate for one hour and test for alkalinity. If the system pH is below 7, add trisodium phosphate until the pH reads 7-8.
 - (7) Fill the system using water.
- 2. HEAT TRANSFER FLUID
 - A. The following levels of chemicals are to be maintained in the respective systems:
 - (1) Chilled water systems: Provide per University of Kentucky standards.
 - (2) Heating hot water 200 ppm of Molybdate
 - (3) Glycol systems 40% propylene glycol Kescofrost or equal concentrated propylene glycol based heat transfer fluid formulated to protect both ferrous and nonferrous metals. Must contain buffers to extend the life of propylene glycol component by resisting fluid oxidation. Flashpoint 218 deg. F; Boiling point 370 deg. F; Melting point -4 deg. F; % Solubility in water 100%; Appearance/Odor: Clear colorless to pale yellow liquid with characteristic glycol odor; Lower Flammability Limit: 2.6%(V) estimated; Upper flammability limit: 12.5% (V) Estimated; Specifi Gravity at 77 deg. F: 1.05; pH: 9 to 11.
 - B. The contractor doing the project work is to use the same vendor, product brands and chemical mixtures as the Medical Center to maintain consistency of material in the systems.
 - C. The fluid shall not exceed the following National Fire Protection Association (NFPA) Hazardous Material Rating Codes:

Health:		0
Flammability:	3	
Reactivity:		0

- D. The heat transfer fluid shall be handled in strict accordance with US Department of Transportation Regulations, NFPA Standards, and all local and state codes and regulations.
- E. All scale, rust, sediment, pipe dope, etc., must be removed from the system. The piping system must be thoroughly cleaned before introducing the heat transfer fluid into the system.

3. SYSTEMS

A. The heat transfer fluid shall be used to charge the glycol water energy recovery system.

4. PROCEDURE

The following procedure is to be used on any system outlined above.

- A. Outage is scheduled with the Physical Plant Division Medical Center (PPDMC) using the standard outage procedure.
- B. A pre-test is conducted on the system to determine the chemical content prior to the work to establish an existing baseline. If this outage and work will be an extended period of time with the affected work portion being isolated from the remainder of the system, then this pre-test should occur approximately 48 hours prior to the refilling of the system. This pre-test should have the involvement of the PPDMC Preventative Maintenance Manager or his designee to agree on the baseline.
- C. Outage is initiated by PPDMC and the contractor does the required work (additions, modifications or repairs) to the affected system.
- D. Upon completion of the work, the contractor is to clean and flush the affected piping systems per the procedure outlined in the project specifications.
- E. When the system is adequately cleaned and flushed, the contractor is responsible for refilling the section of the affected piping with water and appropriate chemicals to meet the required levels noted above.
- F. After the outage section is filled, the affected area will be opened up back into the overall system by PPDMC.
- G. The system will be allowed to operate normally and circulate throughout the system for 48 hours.
- H. The chemical levels will be tested in the mechanical room that contains the system equipment and also in the area where the work was completed. This test is to confirm that the chemical has been adequately dispersed throughout the system and meets the required chemical levels. This testing is also done in conjunction with the PPDMC PM Manager or designee for agreement on the chemical level.
- I. Should the test not meet the desired level, then additional chemicals should be added by the contractor and steps 7 through 9 repeated until the level is satisfactory.

5. SUBMITTALS

A. Before introducing the heat transfer fluid into any system, submit manufacturer's data sheets to the Engineer for review.

END OF SECTION 201330

ITEM NO. 1.25

Refer to specifications, section 203100 – Testing, Balancing:

- Clarification: All Test and Balance to be a sub to the successful Mechanical Contractor.
- Page 2: Part 3.A: In addition to specified testing, for heating water, chilled water, and energy recovery water systems, provide purge and cleaning of system prior to startup of each water loop once installed

with the assistance of a third party chemical treatment contractor. The engineer shall be contacted to witness flush and purge of each system a minimum of 2 weeks in advance for scheduling purposes. Upon placing each system into service, the contractor shall include a minimum 2 year service contract with water treatment company in his bid for maintenance and chemical balance of each system throughout the course of the warranty period and beyond.

- Page 3: Add part b to number (1) as follows: Provide assistance to controls contractor to set and
 optimize differential pressure setpoint for each VAV air handling unit and rooftop unit. Refer to control
 drawings for additional requirements.
- Page 3: Add part a to number (4) as follows: Provide assistance to controls contractor to set and optimize OA bypass damper for each fume hood exhaust fan system as well as setting discharge velocity setting and fan VFD speed. Refer to control drawings for additional requirements.
- Page 3: Add part a to number (5) as follows: Provide assistance to controls contractor to set and optimize water pressure setpoint within heating water system. Refer to control drawings for additional requirements.
- Page 3: Add part a to number (7) as follows: Provide assistance to controls contractor to set and optimize water pressure setpoint within chilled water system. Refer to control drawings for additional requirements.
- Page 3: Add part a to number (8) as follows: Provide assistance to controls contractor to set and optimize water pressure setpoint within Energy Recovery water system. Refer to control drawings for additional requirements.
- Page 4: Add Item (10) as follows: Provide ASHRAE 110 testing for all fume hoods.
- Page 4: Add Item (11) as follows: Provide support for controls contractor to set all static pressure setpoints and optimize as required. Review control drawings for additional requirements.
- Pages 4, 5; Section 4: Building Air Tightness Test: Omit Section 4 Building Air Tightness Test shall not be required for this project.
- Page 4: Add item (12) as follows: Provide field pressure testing of AHU-01 (Laboratory Air Handling Unit) as follows:
 - The TAB contractor shall provide a witnessed field leak test on all units. The cabinet shall be tested at the unit's design operating static pressure 8" of differential static pressure across the cabinet exterior walls) for both the high and low pressure sides. Cabinet leakage shall not exceed a Leakage Class rating as defined by ANSI/ASHRAE Standard 111. All supply and return air openings shall be sealed. The air shall then be pumped into the unit until the appropriate operating pressures are achieved. Air flow measurements shall be performed in compliance with AMCA Standard 210. A written test report shall be prepared by the test and balance contractor and issued to the Owner/engineer for review.
- Insert the following Section on Duct Pressure Testing (Will Be Required as specified below). It is the intent of this section to insure the ductwork installed has minimal air leakage.

Air leakage testing shall be accomplished by an AABC or NEBB certified company. Refer to the Test & Balance specifications.

It is the intent to test all ductwork. The duct systems which will require testing are as follows:

All supply air duct systems

All return air duct systems.

All exhaust air duct systems (Including Fume Hood/Hazardous/Radiological exhaust as well as furnace, dirt grinder exhaust, etc.)

Do not insulate the supply air systems prior to testing.

The maximum allowable supply air leakage rate is 2.5% the systems design CFM when the ductwork is pressurized to 3.5" WG (Therefore, if a supply air system is tested, and the supply air fan rated capacity is 10,000 CFM, the allowable leakage is 250 CFM.) The maximum

allowable return air and exhaust air leakage rate is 2.5% of the system design when the ductwork is pressurized to 1.50"WG.

The entire supply air ductwork system shall be tested with some exceptions. On VAV systems, the high velocity ductwork upstream of the VAV boxes shall only be tested. Cap the duct at the inlet to the VAV box. On low velocity reheat system, all ductwork upstream of the hot water reheat coil shall be tested. The air volume damper and access door upstream of the reheat coil shall be included in the tested system.

All return and exhaust air sheet metal ductwork associated with the system shall be tested. Flexible ductwork shall not be tested. Cap the main duct prior to the central equipment fan connection. Also cap the branch ducts which serve the diffusers, after the round branch air volume with sheet metal caps. Seal caps well to damper to avoid air loss at this location. This air loss, from the caps, is included in the noted leakage rate.

The noted allowable leakage rate is the total allowable. It shall include leakage associated with the following:

All ductwork as described in above paragraphs. Access doors Volume dampers Relief air doors Smoke dampers Fire dampers Fire smoke dampers End caps used to seal ducts

If any duct system fails a test, the contractor shall reseal the system. It shall then be retested until the duct system meets the leakage allotment at no additional cost to the owner.

Carefully select the ductwork construction requirements and the type of duct sealant to be used as required to meet the leakage allowances. The sheet metal duct pressure classification is a minimum only. The contractor shall select the appropriate sheet metal pressure classification, duct sealant class and duct sealant materials to meet the project air leakage allowances.

A duct pre-installation conference shall be held prior to the installation of the ductwork. Present should be the owner's representative, engineer, Test & Balance Contractor, General Contractor, Mechanical Contractor, Sheet Metal Contractor, Insulation Contractor and the manufacturer's representative of the duct sealant to be used. At this meeting, the contractor shall advise all of the duct materials and sealant materials to be used to meet the air leakage allowances.

Whenever the systems are being leak tested by the Test & Balance Contractor, a representative from the Mechanical Contractor shall be present to assist.

ITEM NO. 1.26

Refer to specifications, section 210100 - Fire Protection System:

- Refer to Page 8:
 - o Insert section as follows for required IT pre-action Fire Protection System:
 - Preaction System

- Provide a Single Interlocked Preaction cabinet with electric release containing all hydraulic and electrical components required for the control of a preaction system. The cabinet shall include the following:
 - Self-contained unit (with control panel) in sturdy free-standing 14 gauge steel cabinet, measuring:
 - 71"x36"x20" (180x91x51cm) for 1 ½", 2" & 3" systems
 - o 71"x46"x24" (180x117x61cm) for 4" & 6" systems
 - Textured rust proof coating, inside and outside, fire red, oven baked polyester powder on phosphate base.
 - Two locked access doors to reduce front area required for opening, easily removable without tools to allow easy installation & servicing.
 - Individual access doors for the hydraulic and electrical sections and the emergency release (unlocked) with a neoprene gasket to avoid vibrations.
 - Deluge Valve, complete with Schedule 40 galvanized steel trim rated at 250 psi.
 - Integrated control panel, with emergency batteries in a top enclosure including a sprinklers storage rack.
 - Field wiring terminal strips integrated with the cabinet for connection of field wiring for detection system, audible devices, auxiliary contacts and power supply for air compressor.
 - Pressure gauges to indicate water supply pressure, priming water pressure and air pressure of the system.
 - Release trim with solenoid valve and each supervisory device required.
 - Schedule 40 steel pipe header with grooved ends to be connected to supply water.
 - Schedule 40 steel pipe drain manifold of 2" diameter for drain connections. Open drain cups in the cabinet and multiple drain manifolds will not be accepted.
- The cabinet assembly must be pre-assembled, pre-wired and factory tested under ISO-9001 conditions. It shall also be c-UL-us Listed, FM and MEA Approved as an assembled unit.
- Complete and functioning system shall meet all applicable codes, as listed below:
 - NFPA 13 (Installation of Sprinkler Systems)
 - NFPA 25 (Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems)

- NFPA 72 (Standard for the Installation, Maintenance, and Use of Protective Signaling Systems)
- NFPA 72E (Standard on Automatic Fire Detectors)
- KBC (Kentucky Building Code)
- National Building Code
- National Fire Code
- National Electrical Code
- Provide a complete electrical detection system including: system tubing, wiring, smoke detectors, signaling devices and connections to auxiliary functions. Provide detection and alarm indicating devices (24 Vdc bell, horn or strobe) to be compatible with the release control panel. A bell or a horn should be provided near the cabinet.
- Provide an internal air compressor as required for supervisory air. The air supply must be regulated and of the proper size in order to be able to restore normal system air pressure within 30 minutes. Size compressor as required for specific project. 208 VAC,3 Phase, 60Hz. Air compressor and supervisory trim shall be factory installed inside the cabinet and adjusted for the required configuration.
- Sprinkler heads for the preaction system shall be as allowed by NFPA 13 for preactions systems and as specified in these specifications.
- The installation of the Preaction system must meet all established standards and be according to all applicable laws, regulations and codes. The proper operation and coordination for the system's installation, including the automatic sprinkler system, detection system, signaling system and initial start-ups are all under the responsibility of the contractor.
- The contractor must plan and organize a training session of at least two hours for the building maintenance staff, in the presence of building owner or his representative. The training session must include the normal operation, emergency procedures and system maintenance.
- Testing and Verifications of the system shall be as follows:
 - Hydrostatic tests must be performed on the entire sprinkler piping system, as required by NFPA 13.
 - In addition to the standard hydrostatic test, an air pressure leakage test at 40 psi (2.8 bars) shall be conducted for 24 hours. Any leakage that results in a loss of pressure in excess of 1 1/2 psi (0.1 bar) during the 24 hours shall be corrected.
 - A drain test using the auxiliary drain valve fully open (drain located on water supply side, deluge valve inlet) must be performed to make sure that no back

pressure in drain piping exists, which could affect the proper operation of the preaction system.

- An air supply test must be performed, to confirm that normal air pressure can be restored within 30 minutes.
- The verification of the fire alarm system must be done in accordance with the NFPA 72.
- An inspection report and a certificate must be supplied to the engineer at the completion of the project. All tests results shall be registered in a booklet to be included with the inspection report.
- Acceptable Manufacturers: Reliable, Viking or Fire Flex.

ITEM NO. 1.27

Refer to specifications, section 220200 - Plumbing Equipment:

- Refer to Page 2:
 - Carbon Tank: Revise tank material to fiberglass reinforced polyethylene and carbon volume to 1.4 cubic ft.
- Refer to page 9:

• Storage Tank: Revise storage tank to be 100 gallons.

- Refer to page 10:
 - Repressurization Pump: In lieu of repressurization pump, provide Grunfos model CM3-3 recirculating pump with 17 GPM at 42 PSI for constant recirculation of RO water through lab facility. 115/1.

ITEM NO. 1.28

Refer to specifications, section 230200 – HVAC Equipment:

- Insert the following specification for air cooled chillers:
 - GENERAL
 - SUMMARY
 - Section includes design, performance criteria, refrigerants, controls, and installation requirements for air-cooled scroll compressor chillers.
 - REFERENCES
 - Comply with applicable Standards/Codes of AHRI 550/590, ANSI/ASHRAE 15, ETL, cETL, NEC, and OSHA as adopted by the State.
 - Units shall meet the efficiency standards of the current version of ASHRAE Standard 90.1, and FEMP standard 2012.
 - SUBMITTALS
 - Submit shop drawings and product data in accordance with the specifications.
 - Submittals shall include the following:
 - Dimensioned plan and elevation view drawings, required clearances, and location of all field connections
 - Summary of all auxiliary utility requirements such as electricity, water, etc. Summary shall indicate quality and quantity of each required utility.
 - Single line schematic drawing of the field power hookup requirements, indicating all items that are furnished.
 - Schematic diagram of control system indicating points for field interface/connection.
 - Diagram shall fully delineate field and factory wiring.

- Installation and operating manuals.
- QUALITY ASSURANCE
 - Qualifications: Equipment manufacturer must specialize in the manufacture of the products specified and have five years experience with the type of equipment and refrigerant offered.
 - Regulatory Requirements: Comply with the codes and standards specified.
 - Chiller manufacturer plant must be ISO Registered.
- DELIVERY AND HANDLING
 - Chiller shall be delivered to the job site completely assembled and charged with refrigerant and oil by the manufacturer.
 - Comply with the manufacturer's instructions for rigging and handling equipment.
- WARRANTY
 - Standard Warranty (Domestic): The refrigeration equipment manufacturer's guarantee shall be for a period of one year from date of equipment start-up but not more than 18 months from shipment. The guarantee shall provide for repair or replacement due to failure by material and workmanship that prove defective within the above period, excluding refrigerant.
 - 1st Year Labor Warranty: Entire unit
 - Extended Compressor Warranty: Four (4) years extended compressor warranty, parts only.
- MAINTENANCE
 - Maintenance of the chillers shall be the responsibility of the owner and performed in accordance with the manufacturer's instructions.
- PRODUCTS
 - ACCEPTABLE MANUFACTURERS
 - Refer to schedule on drawings.
 - UNIT DESCRIPTION
 - Provide and install as shown on the plans factory-assembled, factory-charged aircooled scroll compressor packaged chillers in the quantity specified. Each chiller shall consist of hermetic tandem scroll compressor sets (total four compressors), brazed plate evaporator, air-cooled condenser section, microprocessor-based control system and all components necessary for controlled unit operation.
 - ESIGN REQUIREMENTS
 - Flow Range: The chiller shall have the ability to support variable flow range down to 40% of nominal design (based on AHRI conditions).
 - Operating Range: The chiller shall have the ability to control leaving chilled fluid temperature from 15F to 65F.
 - General: Provide a complete scroll compressor packaged chiller as specified herein and as shown on the drawings. The unit shall be in accordance with the standards referenced in section 1.02 and any local codes in effect.
 - Performance: Refer to the schedule of performance on the drawings. The chiller shall be capable of stable operation to a minimum percentage of full load (without hot gas bypass) of 25%. Performance shall be in accordance with AHRI Standard 550/590.
 - Acoustics: Sound pressure levels for the unit shall not exceed the following specified levels. All manufacturers shall provide the necessary sound treatment (parts and labor) to meet these levels if required. Sound data shall be provided with the quotation. Test shall be in accordance with AHRI Standard 370.

	Sound Pressure (at 30 feet)										
63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	Overall dBA	75% Load dBA	50% Load dBA	25% Load dBA
	Sound Power										
63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	Overall dBA	75% Load dBA	50% Load dBA	25% Load dBA

• CHILLER COMPONENTS

- Compressor
 - The compressors shall be sealed hermetic, scroll type with crankcase oil heater and suction strainer. The compressor motor shall be refrigerant gas cooled, high torque, hermetic induction type, two-pole, with inherent thermal protection on all three phases and shall be mounted on RIS vibration isolator pads. The compressors shall be equipped with an internal module providing compressor protection and communication capability.
- Evaporator
 - The evaporator shall be a compact, high efficiency, dual circuit, brazed plate-to-plate type heat exchanger consisting of parallel stainless steel plates. Vent and drain connections shall be provided in the inlet and outlet chilled water piping by the installing contractor.
 - The evaporator shall be protected with an external, electric resistance heater plate. The evaporator and suction piping to the compressors shall be insulated with 3/4" (19 mm) thick CFC and HCFC-free closed-cell flexible elastomeric foam insulation material with 100% adhesive coverage. The insulation shall have an additional outer protective layer of 3mm thick PE embossed film to provide superior damage resistance. Insulation without the protective outer film shall not be acceptable. UV resistance level shall meet or exceed a rating of 'Good' in accordance with the UNI ISO 4892 2/94 testing method. This combination of a heater plate and insulation shall provide freeze protection down to -20°F (-29°C) ambient air temperature.
 - The water-side maximum design pressure shall be rated at a minimum of 435 psig (3000 kPa). Evaporators shall be designed and constructed according to, and listed by Underwriters Laboratories (UL).
- Condenser
 - Condenser fans shall be propeller type arranged for vertical air discharge and individually driven by direct-drive fan motors. The fans shall be equipped with a heavy-gauge vinyl-coated fan guard. Fan motors shall be TEAO type with permanently lubricated ball bearings, inherent overload protection, three-phase, direct-drive, 1140 rpm. Each fan section shall be partitioned to avoid cross circulation.
 - Coil shall be microchannel design and shall have a series of flat tubes containing multiple, parallel flow microchannels layered between the refrigerant manifolds. Tubes shall be 9153 aluminum alloy. Tubes made of 3102 alloy or other alloys of lower corrosion resistance shall not be accepted. Coils shall consist of a two-pass arrangement. Each condenser coil shall be factory leak tested with high-pressure air under water. Coils

shall withstand 1000+ hour acidified synthetic sea water fog (SWAAT) test (ASTM G85-02) at 120°F (49°C) with 0% fin loss and develop no leaks.

- Refrigerant Circuit
 - Each of the two refrigerant circuits shall include a replaceable-core refrigerant filter-drier, sight glass with moisture indicator, liquid line solenoid valve (no exceptions), expansion valve, and insulated suction line.
- Construction
 - Unit formed sheet metal components shall be painted using a corrosion resistant paint system, for aesthetics and long-term durability. Paint system will include a base primer with a high-quality polyester resin topcoat. Painted galvanized parts shall be G60 or greater and finished, unabraded panel surfaces shall be capable to be exposed to an ASTM B117 salt spray environment and exhibit no visible red rust at a minimum of 3,000 hours exposure. Finished, abraded surfaces shall be tested per ASTM D1654, having a mean scribe creepage not exceeding 1/16" at 1,000 hours minimum exposure to an ASTM B117 salt spray environment.
- Control System
 - A centrally located weatherproof control panel shall contain the field power connection points, control interlock terminals, and control system. Box shall be designed in accordance with NEMA 3R rating. Power and starting components shall include factory circuit breaker for fan motors and control circuit, individual contactors for each fan motor, solid-state compressor three-phase motor overload protection, inherent fan motor overload protection and two power blocks (one per circuit) for connection to remote, contractor supplied disconnect switches. Hinged access doors shall be lockable. Barrier panels or separate enclosures are required to protect against accidental contact with line voltage when accessing the control system.
 - Shall include optional single-point connection to a non-fused disconnect switch with through-the-door handle and compressor circuit breakers.
- Unit Controller
 - An advanced DDC microprocessor unit controller with a 5-line by 22character liquid crystal display provides the operating and protection functions. The controller shall take preemptive limiting action in case of high discharge pressure or low evaporator pressure. The controller shall contain the following features as a minimum:
 - The unit shall be protected in two ways: (1) by alarms that shut the unit down and require manual reset to restore unit operation and (2) by limit alarms that reduce unit operation in response to some out-of-limit condition. Shut down alarms shall activate an alarm signal.
 - Shutdown Alarms
 - No evaporator water flow (auto-restart)
 - o Sensor failures
 - Low evaporator pressure
 - Evaporator freeze protection
 - High condenser pressure
 - Outside ambient temperature (auto-restart)

- Motor protection system
- Phase voltage protection (Optional)
- Limit Alarms
 - Condenser pressure stage down, unloads unit at high discharge pressures.
 - Low ambient lockout, shuts off unit at low ambient temperatures.
 - Low evaporator pressure hold, holds stage #1 until pressure rises.
 - Low evaporator pressure unload, shuts off one compressor.
- Unit Enable Section
 - o Enables unit operation from either local keypad, digital input, or BAS
- Unit Mode Selection
 - Selects standard cooling, ice, glycol, or test operation mode
- Analog Inputs:
 - Reset of leaving water temperature, 4-20 mA\
 - o Current Limit
- Digital Inputs
 - Unit off switch
 - Remote start/stop
 - Flow switch
 - \circ ~ lce mode switch, converts operation and setpoints for ice production
 - $\circ \quad \text{Motor protection} \quad$
- Digital Outputs
 - Shutdown alarm; field wired, activates on an alarm condition, off when alarm is cleared
 - \circ Evaporator pump; field wired, starts pump when unit is set to start
- Condenser fan control The unit controller shall provide control of condenser fans based on compressor discharge pressure.
- Building Automation System (BAS) Interface
 - Factory mounted DDC controller(s) shall support operation on a BACnet®, network via one of the data link / physical layers listed below as specified by the successful Building Automation System (BAS) supplier.
 - BACnet MS/TP master (Clause 9)
 - o BACnet IP, (Annex J)
 - BACnet ISO 8802-3, (Ethernet)
 - All communication from the chiller unit controller as specified in the points list shall be via standard BACnet objects. Proprietary BACnet objects shall not be allowed. BACnet communications shall conform to the BACnet protocol (ANSI/ASHRAE135-2001). A BACnet Protocol Implementation Conformance Statement (PICS) shall be provided along with the unit submittal.
- OPTIONS AND ACCESSORIES
 - The following options are to be included:
 - Low Ambient Control: Fan VFD allows unit operation from 32°F down to -10°F (-23.3 C).
 - BAS interface module to provide interface with the BACnet MSTP protocol.
 - The following accessories, if selected, are to be included:

- Spring vibration isolators for field installation
- o Rubber-in-shear vibration isolators for field installation
- \circ $\;$ Factory-mounted thermal dispersion type flow switch
- Field-mounted, paddle type, chilled water flow switch field wired to the control panel
- Wye strainer, to be installed at the evaporator inlet and sized for the design flow rate , with perforation diameter of 0.063" with blowdown valve and Victaulic couplings (factory mounted or field installed)
- o 115V GFI convenience outlet
- EXECUTION
 - INSTALLATION
 - Install in strict accordance with manufacturer's requirements, shop drawings, and contract documents.
 - Adjust and level chiller in alignment on supports.
 - Coordinate electrical installation with electrical contractor.
 - Coordinate controls with control contractor.
 - Install a field-supplied or optional manufacturer-supplied strainer in the chilled water return line at the evaporator inlet that meets manufacturer perforation size specifications.
 - START-UP
 - Provide testing and starting of machine, and instruct the Owner in its proper operation and maintenance.
- Insert the following specification for heat trace:
 - Chemelex, "Auto-Trace, Self-Limiting Heating" Model 8BTV-CT or approved equivalent. The heat tape shall have a cross-linked polymer core with copper bus wire so that the heater output increases as the jacket temperature drops. Heat output shall be 8.0 watts per foot at 50 degrees F. surface temperature. The heat tape shall be installed as recommended by the manufacturer along the entire length of all exterior piping subject to freezing and where indicated on the drawings. All valves shall be wrapped additionally 2 foot of heat tape. Provide two tracings on each pipe, and each of the two fed from a different circuit. Heat tape electrical characteristics shall be as indicated on the electrical plans. Provide with power connection kits and end caps. Heat tape shall be placed in operation at the electrical circuit breaker. Normally power shall remain active to the heat tape. Provide heat trace with control panel which has a dry-contact alarm for monitoring by BAS.
- Insert the following specification for packaged rooftop air handling units:
 - REFERENCES
 - AFBMA 9 Load Ratings and Fatigue Life for Ball Bearings.
 - AMCA 99 Standards Handbook.
 - AMCA 210 Laboratory Methods of Testing Fans for Rating Purposes.
 - AMCA 300 Test Code for Sound Rating Air Moving Devices.
 - AMCA 500 Test Methods for Louver, Dampers, and Shutters.
 - AHRI Standard 340/360- Unitary Large Equipment
 - AHRI Standard 920 DOAS
 - AHRI Standard 1060 Rating Air-to-Air Heat Exchangers for Energy Recovery Ventilation Equipment
 - ASTMB117 Standard Practice for Operating Salt Spray Apparatus
 - NEMA MG1 Motors and Generators.

- NFPA 70 National Electrical Code.
- UL 723 Test for Surface Burning Characteristics of Building Materials.
- UL 900 Test Performance of Air Filter Units.
- UL 1995 Standard for Heating and Cooling Equipment.
- UL 94 Test for Flammability of Plastic Materials for Parts in Devices and Appliances.
- BC 2000, 2003 International Building Code.
- NFPA 90A Standard for the Installation of Air Conditioning and Ventilating Systems.
- NFPA 5000 Building Construction and Safety Code.
- ASHRAE 90.1 Energy Code.
- ASHRAE Std. 111 Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems
- SUBMITTALS
 - Shop Drawings: Indicate assembly, unit dimensions, weight loading, required clearances, construction details, field connection details, electrical characteristics and connection requirements.
 - Product Data:
 - Provide literature that indicates dimensions, weights, capacities, ratings, and electrical characteristics and connection requirements.
 - Provide data on filter media, filter performance, filter assembly, and filter frames.
 - Provide computer generated fan curves with specified operating point clearly plotted.
 - Manufacturers must clearly define any exceptions made to Plans and Specifications. Any deviations in layout, arrangement, or efficiency shall be submitted to the consulting engineer prior to bid date. Acceptance of deviation (s) from specifications shall be in the form of written approval from the consulting engineer.
- OPERATION AND MAINTANENCE DATA
 - Maintenance Data: Provide instructions for installation, maintenance and service
- QUALIFICATIONS
 - Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience, who issues complete catalog data on total product.
 - Certify Packaged Rooftop Performance in accordance with AHRI 340/360 Standards
 - Product Energy Efficiency Compliant with ASHRAE 90.1 minimum energy efficiency requirements
 - Startup must be done by trained personnel experienced with rooftop equipment.
 - Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters and remote controls are in place, bearings lubricated, and manufacturers' installation instructions have been followed.
- DELIVERY, STORAGE, HANDLING
 - Deliver, store, protect and handle products to site.
 - Handle carefully to avoid damage to components, enclosures, and finish

Store in a clean, dry place to protect from weather and construction traffic.

• PRODUCTS

- APPROVED MANUFACTURERS
 - See Schedule
- GENERAL DESCRIPTION
 - Each unit shall be specifically designed for outdoor rooftop application and include a weatherproof cabinet. Units shall be of a modular design with factory installed access sections available to provide maximum design flexibility.
 - Furnish unit configuration, layout, performance and electrical characteristics as shown on project plans and schedule.
 - The unit shall undergo a complete factory run test prior to shipment. The factory test shall include final test of all fan assemblies, a refrigeration circuit runtest, a unit control system operations checkout, a unit refrigerant leak test, and a final unit inspection
 - The complete unit shall be ETL listed.
 - Unit shall be completely factory assembled and shipped in one piece.
 - Unit to be shipped fully charged with R410A.
 - All units shall have decals and tags to indicate caution areas and aid unit service. Unit nameplates shall be fixed to the main control panel door. Electrical wiring diagrams shall be attached to the control panels. Installation, operating and maintenance bulletins and start-up forms shall be supplied with each unit.
 - Submittals must demonstrate that scheduled unit leaving air temperature (LAT) is met, that fan and motor heat temperature rise (TR) have been considered, and scheduled entering air temperature (EAT) equals mixed air temperature (MAT).
 Draw-thru cooling - Scheduled EAT equals cooling coil EAT and scheduled unit LAT equals cooling coil LAT plus TR.
- CABINET
 - Unit construction for all walls, doors, ceiling and floor shall be double wall with a solid galvanized steel liner with a thermal break integral to the panel construction that provides a cleanable interior, prevents conductive heat transfer through the panel, and prevents exterior condensation on the panel.
 - Unit construction for all walls, doors, ceiling and floor shall be double wall with a solid stainless steel liner with a thermal break integral to the panel construction that provides a cleanable interior, prevents conductive heat transfer through the panel and prevents exterior condensation on the panel.
 - Foam Insulation shall provide a minimum thermal resistance R-value of 13.0.
 - Unit construction shall be designed to operate at total static pressures up to 8.0 inches w.g.
 - Provide quality unit construction with performance tested in accordance with ASHRAE Std 111 – cabinet air leakage shall not exceed leak class 6 (CL = 6), at +/-6 in. w.c. casing pressure, where maximum cabinet leakage (cfm/100 ?ft?^2 of casing surface area) = CL x P^0.65.
 - Provide quality unit construction with air leakage less than 0.5% of design airflow up to 5 in. w.c..

- Provide quality unit construction with air leakage less than 1.0% of design airflow up to 8 in. w.c..
- Exterior surfaces shall be constructed of painted galvanized steel, for aesthetics and long-term durability. Paint finish will include a base primer with a high-quality polyester resin topcoat. Finished, unabraded panel surfaces shall be exposed to an ASTM B117 salt spray environment and exhibit no visible red rust at a minimum of 3,000 hours exposure. Finished, abraded surfaces shall be tested per ASTM D1654, having a mean scribe creepage not exceeding 1/16" at 1,000 hours minimum exposure to an ASTM B117 salt spray environment. Measurements of results shall be quantified using ASTM D1654 in conjunction with ASTM D610 and ASTM D714 to evaluate blister and rust ratings
- Access shall be provided to filters, dampers, cooling coils, fan sections, compressors and electrical and controls components.
- Access doors shall be provided for each critical maintenance section in order to
 provide user easy access to components. All access doors shall be mounted on full
 length stainless steel piano hinges and shall be secured by linkage and latch system
 that is operated by a single handle. The latch system shall feature a staggered
 engagement for ease of operation and a safety catch shall protect the user from
 injury in case a positive pressure door is opened while the fan is operating. Doors
 secured by multiple, mechanical fasteners are not acceptable.
- The unit base frame shall be constructed of 13 gauge pre-painted steel to prevent base rail corrosion.
- The unit base shall overhang the roof curb for positive water runoff and shall have a formed recess that seats on the roof curb gasket to provide a positive, weathertight seal. Lifting brackets shall be provided on the unit base with lifting holes to accept cable or chain hooks.
 - Service Lights
 - Service lights shall be provided throughout the air handling unit and control panel. Lights shall be turned on from a single exterior switch on the exterior of the control panel. The lights will remain powered when the unit disconnect is off.
 - Service Light enclosures shall have a minimum IP rating of 65 meaning the lights are dust tight and protected against jets of water.. The light bulbs provided are a light-emitting diode (LED) type to minimize amperage draw and shall produce 840 lumens in a warm white color.

• ACOUSTICS

- Equipment sound performance shall meet the scheduled discharge and return sound power
- Discharge Plenum sections shall be lined with a perforated acoustic liner to enhance sound attenuation.
- Discharge and Return Plenum sections shall be lined with a perforated acoustic liner to enhance sound attenuation.
- o FANS
 - All Supply, Return and Exhaust Fans shall be configured in an array with a minimum number fans specified in the schedule for each unit.
 - Redundancy

- Size all fans for N-1 per the schedule
- Each supply, exhaust, and return fan motor shall have an independent integral inverter or a dedicated variable frequency drive per motor for redundancy.
- All Fans shall be dynamically balanced as an assembly in planes as per DIN / ISO 21940 to balancing grade G 6.3 or better or provide 2" Spring isolation for each fan.
- All fans shall be provided with totally enclosed maintenance-free ball bearings and permanent lubrication. Bearings shall be selected for a minimum life in excess of 350,000 hrs (L50) at selected operating point.
- Fan airflow measuring
 - All Supply Fans shall include a factory installed flow measuring station. Airflow needs to be readable through the unit controller and building automation system.
 - All Supply and Exhaust Fans shall include a factory installed flow measuring station. Airflow needs to be readable through the unit controller and building automation system.
 - All Supply and Return Fans shall include a factory installed flow measuring station. Airflow needs to be readable through the unit controller and building automation system.
- ECM Supply Fans
 - All fans shall be a single width, single inlet (SWSI) airfoil centrifugal fan. The fan wheel shall be Class II construction with aluminum fan blades that are continuously welded to the hub plate and end rim. The fan shall be a direct drive fan mounted to the motor shaft. Belts and sheaves are not acceptable due to the additional maintenance.
 - The fan motor shall be a totally enclosed electrically commutated motor that is speed controlled by the rooftop unit controller. The motor shall include thermal overload protection and protect the motor in the case of excessive motor temperatures. The motor shall have phase failure protection and prevent the motor from operation in the event of a loss of phase. Motors shall be premium efficiency.
- ECM Return Fans
 - All fans shall be a single width, single inlet (SWSI) airfoil centrifugal fan. The fan wheel shall be Class II construction with aluminum fan blades that are continuously welded to the hub plate and end rim. The fan shall be a direct drive fan mounted to the motor shaft. Belts and sheaves are not acceptable due to the additional maintenance.
 - The fan motor shall be a totally enclosed electrically commutated motor that is speed controlled by the rooftop unit controller. The motor shall include thermal overload protection and protect the motor in the case of excessive motor temperatures. The motor shall have phase failure protection and prevent the motor from operation in the event of a loss of phase. Motors shall be premium efficiency.
 - Exhaust Fan configurations are not allowed as alternate
- ELECTRICAL
 - Unit wiring shall comply with NEC requirements and with all applicable UL standards. All electrical components shall be UL recognized where applicable. All

wiring and electrical components provided with unit shall be number and color coded and labeled according to the electrical diagram provided for easy identification.

- The unit shall be provided with a factory wired weatherproof control panel. Unit shall have a power terminal block for main power connection. A terminal board shall be provided for low voltage control wiring. Branch circuit short circuit protection, 115 volt control circuit transformer and fuse, system switches, and a high temperature sensor. Each compressor and condenser fan motor shall be furnished with contactors and inherent thermal overload protection. Supply and return fan motors shall have contactors and external overload protection. Knockouts shall be provided in the of the main control panels for field wiring entrance
- All 115-600 volt internal and external wiring between control boxes and components shall be protected from damage by dedicated electrical raceways.
- The receptacle shall be powered by a field supplied 115V source.
- Single non-fused disconnect switch shall be provided for connecting electrical power at the unit. Disconnect switches shall be mounted internal to the control panel and operated by an externally mounted handle.
- Unit SCCR Rating to be 65 kAIC. minimum
- Unit shall be provided with phase, voltage and brown out protection which shuts down all motors in the unit if the electrical phases are more than 10% out of balance on voltage or on phase reversa
- Unit shall be provided with a safety shutdown terminal for installation of field emergency input
- All electrical options shall have a +/- 10 percent voltage utilization range to protect against voltage variation.

• SAFETY OPTIONS

- Unit shall be provided with terminals for cooling interlock and heating interlock (if option is selected). Field provided unit controller must provide emergency shutdown if desired.
- COOLING COIL
 - The cooling coil section shall be installed in a a draw through configuration, upstream of the supply air fan. The coil section shall be complete with factory piped cooling coil and sloped drain pan.
 - Direct expansion (DX) cooling coils shall be fabricated of seamless 1/2" diameter high efficiency copper tubing that is mechanically expanded into high efficiency aluminum plate fins. Coils shall be a multi-row, staggered tube design with a minimum of 4 rows. All units shall have two independent refrigerant circuits and shall use an interlaced coil circuiting that keeps the full coil face active at all load conditions.
 - Each refrigeration circuit shall be equipped with a thermostatic expansion valve for control refrigerant flow control.
 - The cooling coil casing and all coil block offs shall be constructed with stainless steel to prevent corrosion.
 - The refrigerant suction lines shall be fully insulated from the expansion valves to the compressors
 - The distributor tubes shall be sleeved or coated to provide longevity and protection from leaks.

- All coils shall be factory leak tested with high pressure air under water.
- The drain pan shall be stainless steel and designed to comply with ASHRAE- 62.1 double sloped requirements drain pan shall be provided with the cooling coil. The drain pan shall extend beyond the leaving side of the coil and underneath the cooling coil connections. The drain pan shall have a minimum slope of 1/8" per foot to provide positive draining. The drain pan shall be connected to a threaded drain connection extending through the unit base. Units with stacked cooling coils shall be provided with a secondary drain pan piped to the primary drain pan.
- Insulation under the drain pan should be a closed cell structure to prevent moisture from wicking under the drain pan. Fiberglass is not allowed.
- GAS HEAT
 - The gas furnace design shall be factory installed downstream of the supply air fan in the heat section.
 - The heat exchanger shall include a 439 grade Stainless steel. Aluminized steel heat exchangers are not acceptable. The heat exchanger design shall collect condensate in a collection point and have a condensate drain.
 - The furnace will be supplied with a modulating induced draft burner. The burner shall be controlled for low fire start. The burner shall be capable of continuous modulation between 10% and 100% (10:1 control) of rated capacity.
 - The burner shall be specifically designed to burn natural gas and shall include a micro-processor based flame safeguard control, combustion air proving switch, prepurge timer and spark ignition. Status and alarm codes are available at the unit controller via a network connection and are available for BAS integration.
 - I. Provide with a 15 year gas heat exchanger warranty
- DRAW THROUGH FILTERS
 - All units shall be provided with clogged filter switches and alarm enunciation
 - Unit shall be provided with a draw-through filter section.
- OUTDOOR/RETURN AIR SECTION
 - Unit shall be provided with a Metal Mesh pre-filter in the outdoor air hood/section to prefilter large particulate to prevent early filter clogging.
 - 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. Control of the dampers shall be by a factory installed direct coupled actuator.
 - Damper actuator shall be fully modulating and spring return type. A comparative drybulb control shall be provided to sense and compare drybulb 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.

- A barometric exhaust damper shall be provided to exhaust air out of the unit. A bird screen shall be provided to prevent infiltration of rain and foreign materials.
- CONDENSING SECTION
 - All Units shall provide the Energy Efficiency specified EER and IEER per the schedule equipment or higher.
 - Condenser fans shall be direct drive, axial type designed for low tip speed and vertical air discharge. Fan blades shall be constructed of steel and riveted to a steel center hub. Condenser fan motors shall be heavy-duty, inherently protected, threephase, non-reversing type with permanently lubricated ball bearing and integral rain shield.
 - Condenser coils shall be an all aluminum design, and mounted on polymer brackets, to minimize di-electric corrosion. The aluminum tube shall be a micro channel design with high efficiency aluminum fins. Fins shall be brazed to the tubing for a direct bond. Each condenser coil shall be factory leak tested with high-pressure air under water.
 - Head Pressure Control
 - Units shall have at least one condenser fan controlled to maintain positive head pressure. SpeedTrol[™] condenser fan speed control shall be added to the last fan off on each refrigeration circuit to provide cooling operation to ambient temperatures down to 0° F. Fan speed control shall be field adjustable.
 - Each unit shall have a variable speed scroll compressor on the lead refrigeration circuit. Each compressor shall be complete with gauge ports, crankcase heater, sight-glass, anti-slug protection, motor overload protection and a time delay to prevent short cycling and simultaneous starting of compressors following a power failure. Compressors shall be isolated with resilient rubber isolators to decrease noise transmission
 - Each unit shall have two independent refrigeration circuits for redundancy. Each circuit shall be complete with a low pressure control, filter-drier, liquid moisture indicator/sight-glass, thermal expansion valve, and a manual reset high pressure safety switch. The thermal expansion valve shall be capable of modulation from 100% to 25% of its rated capacity. Sight-glasses shall be accessible for viewing without disrupting unit operation. Each circuit shall be dehydrated and factory charged with Refrigerant 410A and oil.
 - Each unit shall have at least 4 compressor stages of cooling capacity control for better part load control as required by ASHRAE 90.1-2013.
- CONTROLS
 - Each unit shall be equipped with a complete MicroTech® 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.
 - The microprocessor shall be a stand-alone DDC controller not dependent on communications with any on-site or remote PC or master control panel. The

microprocessor shall maintain existing set points and operate standalone if the unit loses either direct connect or network communications. The microprocessor memory shall be protected from voltage fluctuations as well as any extended power failures. All factory and user set schedules and control points shall be maintained in nonvolatile memory. No settings shall be lost, even during extended power shutdowns.

- The main microprocessor shall support an RS-232 direct connection to a product service tool or a modem. A communications module shall be provided for direct communication into the BAS network.
- All digital inputs and outputs shall be protected against damage from transients or wrong voltages. Each digital input and digital output shall be equipped with an LED for ease of service. All field wiring shall be terminated at a separate, clearly marked terminal strip.
- The microprocessor shall have a built-in time schedule. The schedule shall be
 programmable from the unit keypad interface. The schedule shall be maintained in
 nonvolatile memory to insure that it is not lost during a power failure. There shall be
 one start/stop per day and a separate holiday schedule. The controller shall accept
 up to sixteen holidays each with up to a 5-day duration. Each unit shall also have the
 ability to accept a time schedule via BAS network communications.
- If the unit is to be programmed with a night setback or setup function, an optional space sensor shall be provided. Space sensors shall be available to support field selectable features. Sensor options shall include Zone sensor with tenant override switch, or Zone sensor with tenant override switch and heating/cooling set point adjustment.
- WARRANTY
 - Units shall be covered under 1 year parts and labor warranty.
 - 5 year warranty required on all compressors.
- Insert the following specification for Glycol Makeup Package:

 (2) Packaged Glycol System Feeder (Heat Transfer Fluid Reservoir and Pump Assembly – GMU-1)

The contractor shall supply and install, as indicated on the plans and in the specifications, a prefabricated automatic and autonomous twin fluid make-up package for the glycol water supply and return system.

The package shall be designed to occupy a minimum amount of floorspace (no more than 30 inches in diameter), to operate on a standard 120 Volt, 60 Hz electrical circuit, and to maintain a fill pressure in the system it serves of 28 psi. The pumping assembly shall be mounted in a sturdy steel frame with legs to keep it off the floor.

It shall include two paired 1.7 GPM at 70 psi pumps, a ½ horsepower motor, a magnetic starter, a pressure tank with pressure control, a priming valve, a pressure reducing valve, a shut-off valve, a pressure gauge, and a fail-safe operator that allows one pump to operate if the other pump malfunctions. It shall be connected to the system with a ½" NTP connection. It shall feature a cut-off and alarm arrangement, which will stop the pump in case of excessive pressure, or a low fluid level in the reservoir, and activate an audible (which can be silenced) and a visual alarm. A 120 Volt dry contact shall also be available for a remote alarm or connection to a building management system.

A translucent polyethylene 50 gallon reservoir, complete with lid, shall be mounted on the pumping assembly and shall include a strainer and shut-off valve. A one inch heat transfer fluid recovery line shall be piped in from the system relief valve outlet to the solution container, through the lid in such a way that the lid can be removed for filling and mixing.

The make-up package shall be Wessels GMPT Twin Glycol/Water Make-up System, Pulsafeeder DGF, or pre-approved equal.

ITEM NO. 1.29

Refer to specifications, section 231200 – Sheet Metal:

- All Fume Hood and Radiological Fume Hood exhaust ductwork as well as all connecting and downstream mains shall be constructed of 316 stainless steel with liquid tight continuous external weld of all seams.
- Ducts connected to Dust Collection Fans UEF-02, 03 shall be rated for negative pressures of 10" WC.

ITEM NO. 1.30

Refer to specifications, section 250200 – Automatic Temperature Controls:

- In addition to online access to BAS, provide separate laptop and local controls workstation for access to and work on control system from local port within mechanical room.

ITEM NO. 1.31

Refer to the drawings, Sheet FP200 for clarification around required pre-action system and re-work of pipe mains as indicated.

ITEM NO. 1.32

Refer to the drawings, Sheets P201C, P301A, P301C, P301R, P400, P401, P603, P604, and P605 for all clouded changes slightly shifting piping as required to accommodate new floor drains, roof drains, as well as other minor changes.

ITEM NO. 1.33

Refer to the drawings sheets IC100, IC101, and IC102 for minor revisions to sequences and other clouded changes.

ITEM NO. 1.34

Refer to the drawings, sheet IC103:

Refer to the Chilled Water System Control Schematic: Provide DPS point across each chiller as well
as within the mechanical room across the building supply and return piping to accomplish sequence
of control.

ITEM NO. 1.35

Refer to the drawings, sheets M201A, M201B, M201C, M201R, M301C, M800, M801, M802 for minor revisions and changes as clouded on revised sheets.

ITEM NO. 1.36

Refer to drawings T201A, T201B, T201C, and T400 for updated wireless access point layout. Various data outlet tag corrections. Electrical devices/outlets removed.

ITEM NO. 1.37

Refer to drawings ED100, EU100 and EU500. Transformer/Generator pad is to be demolished and re-poured new in the same location.

- New sheet ED100 has been added to show existing/demolition work of existing pad equipment.
- Existing utility transformer and generator are to be reinstalled on new pad.

- Sheet EU100, notes UE14, UE15, and UE16 have been modified to reflect new direction for underground conduits and equipment.
- Detail 1/EU500 has been modified to reflect new transformer/generator pad conditions.

Refer to sheet E301A for change to receptacle height in room A120.

ITEM NO. 1.39

Refer to sheet E301A – devices located on west wall have moved to accommodate wall change in room A118.

ITEM NO. 1.40

Refer to drawings E301A and T201A, room A100A2 – power and data outlets have been added to accommodate 3 workstations along the east wall. The intercom master station has moved closer to door C105-A.

ITEM NO. 1.41

Refer to sheet E101, Electrical Power Note 'F' – quantity of minimum UPS units for the sensitive lab equipment has changed from 50 to 25.

ITEM NO. 1.42

Refer to sheet E303A for clarifications on mechanical exhaust fan being fed from lighting circuits in certain rooms.

ITEM NO. 1.43

Refer to sheets T600 AND T601:

- Instructions for existing backbone fiber to SHOP building has been added.
- PoE Patch panels have been added to racks for WAPs.

ITEM NO. 1.44

Refer to sheet EU100 for instructions on existing SHOP backbone fiber re-routing to main center building has been added.

ITEM NO. 1.45

Refer to sheet E400,

- Note E37 has been modified to reflect that UPS devices will be provided for temperature control panels in each of the mechanical rooms. Duplex receptacles have been provided for each control panel in lieu of hardwire connections.
- Detail 6/E400, Enlarged Transformer Pad Plan has been deleted.

ITEM NO. 1.46

Refer to sheet EU100 for change to flag pole lighting. In-ground flood lights were removed. Connection to integrated flagpole light was added along with note UE25. Refer to Sheet EU500, light fixture BB1 has been removed from the exterior luminaire schedule.

END OF ADDENDUM NO. 1.00

004100B01

UNIVERSITY OF KENTUCKY CAPITAL CONSTRUCTION PROCUREMENT SECTION FORM OF PROPOSAL

Projec	t No. 2581.0	Project Title:	UK Grain & Forage Center of Excellence Rebuild
Purcha	asing Officer: <u>Ken</u>	Scott	
NOTE lost, ai	: The following Form on additional copy will b	of Proposal shall b be furnished upon	e followed exactly in submitting a proposal for this work. If this copy is written request to the authority issuing Contract Documents.
This P	roposal is submitted by		
Date:			(NAME AND ADDRESS OF BIDDER)
Telepł	none:		
TO:	BID CLERK UNIVERSITY OF K	ENTUCKY	INVITATION TO BID: <u>CCK-2581.0-1-24</u>
	CAPITAL CONSTR	UCTION	BID OPENING DATE: October 5, 2023, 2023
	RM. 322 SERVICE I LEXINGTON, KY. 4	BUILDING 40506-0005	TIME: 3:00 P.M. Lexington, KY Time

The Bidder, in compliance with your Invitation for Bids for the above referenced Project, having carefully examined the site of the Work, the Drawings and complete Contract Documents as defined in Article I of the General Conditions, as well as the Specifications affecting the work as prepared by the Consultant, hereby proposes to furnish all labor, materials, supplies and services required to construct the Project in accordance with the Contract Documents, within the time set forth therein, and at the price stated below without qualification.

The Bidder hereby acknowledges receipt of the following Addenda:

ADDENDUM NO	DATED
ADDENDUM NO	DATED

ADDENDUM NO._____ DATED_____ (Here insert the number and date of any Addenda issued and received. If none has been issued and received, the word NONE should be inserted.)

Contractor Report of Prior Violations of Chapters 136,139, 141, 337, 338, 341, and 342

Pursuant to KRS 45A.485, the Contractor shall, prior to the award of a Contract, reveal final determinations of any violations of the provisions of KRS Chapters 136, 139, 141, 337, 338, 341, and 342 by the Contractor that have occurred in the previous five (5) year period.

This statute also requires for the duration of the Contract established, the Contractor be in continuous compliance with the provisions of Chapters 136, 139, 141, 337, 338, 341, and 342 that apply to the Contractor's operations. The Contractor's failure to reveal a final determination of a violation of KRS Chapters 136, 139, 141, 337, 338, 341, and 342, or failure to comply with any of the above cited statutes for the duration of the Contract shall be grounds for the cancellation of the Contract, and the disqualification from eligibility for future contracts for a period of two (2) years.

The Contractor, by signing and submitting a Bid on this Invitation, agrees as required by KRS 45A.485 to submit final determinations of any violations of the provisions of KRS Chapters 136, 139, 141, 337, 338, 341, and 342 that have occurred in the previous five (5) years prior to the award of a Contract and agrees to remain in continuous compliance with the provisions of these statutes during the duration of any contract that may be established. Final determinations of any violations of these statutes, must be provided to the University by the successful Contractor prior to the award of a Contract.

LUMP SUM PROPOSAL

The Bidder agrees to furnish all labor, materials, supplies and services required to complete the Work, for the above referenced Project, for the Capital Construction Procurement Section, University of Kentucky, as described in the Specifications and Contract Documents and shown on the Drawings enumerated below and as modified by the Addenda listed above.

FOR THE LUMP SUM OF

			(USE WORDS)	
			DOLLARS AND	CENTS.
	(USE WORDS)		(USE WORDS)	
(\$)		
	(USE FIGURES)			

Alternate:

Alternate No. 1 (Reduced Schedule):

- 1. Base Bid: Base bid work includes the construction of the Project within the Construction Time (schedule) listed in the Special Conditions. Refer to the Specifications and Special Conditions for additional information.
- 2. Alternate Bid: Alternate work includes the construction of the Project within the Construction Time (schedule) listed in the Special Conditions, **less ninety (90) days**. Refer to the Specifications and Special Conditions for additional information.

004100B01 FORM OF PROPOSAL

AUTHENTICATION OF BID AND STATEMENT OF NON-COLLUSION AND NON-CONFLICT OF INTEREST

I hereby certify:

- 1. That I am the Bidder (if the Bidder is an individual), a partner in the Bidder (if the Bidder is a partnership), or an officer or employee of the bidding corporation having authority to sign on its behalf (if the Bidder is a corporation);
- 2. That the submitted Bid or Bids covering Capital Construction Procurement Section Invitation No. <u>CCK-2581.0-1-24</u> have been arrived at by the Bidder independently and have been submitted without collusion with, and without any agreement, understanding or planned common course of action with, any other contractor, vendor of materials, supplies, equipment or services described in the Invitation to Bid, designed to limit independent bidding or competition; as prohibited by provision KRS 45A.325;
- 3. That the contents of the Bid or Bids have not been communicated by the Bidder or its employees or agents to any person not an employee or agent of the Bidder or its surety on any bond furnished with the Bid or Bids and will not be communicated to any such person prior to the official opening of the Bid or Bids;
- 4. That the Bidder is legally entitled to enter into the contracts with the University of Kentucky and is not in violation of any prohibited conflict of interest, including those prohibited by the provisions of KRS 164.390, and 45A.330 to 45A.340 and 45A.455;
- 5. This offer is good for 60 calendar days from the date this Bid is opened. In submitting the above, it is expressly agreed that upon proper acceptance by the Capital Construction Procurement Section of any or all items Bid above, a contract shall thereby be created with respect to the items accepted;
- 6. That I have fully informed myself regarding and affirm the accuracy of all statements made in this Form of Proposal including Bid Amount.
- 7. Unless otherwise exempted by KRS 45.590, the Bidder intends to comply in full with all requirements of the Kentucky Civil Rights Act and to submit data required by the Kentucky Equal Employment Act upon being designated the successful contractor.
- 8. That the bidding contractor and all subcontractors to be employed do not and will not maintain any facilities they provide for employees in a segregated manner and they are in full compliance with provisions of 41 CFR 60-1.8 that prohibits the maintaining of segregated facilities.
- 9. In accordance with KRS45A.110(2), the undersigned hereby swears under penalty of perjury that he/she has not knowingly violated any provision of the campaign finance laws of the Commonwealth of Kentucky and that the award of a contract to the bidder will not violate any provision of the campaign finance laws of the Commonwealth of Kentucky.

READ CAREFULLY - SIGN IN SPACE BELOW - FAILURE TO SIGN INVALIDATES BID

SIGNED BY			TITLE	
PRINT NAME			FIRM	
ADDRESS			AREA CODE & PHONE	
			FAX	
CITY	STATE	ZIP CODE		
BIDDER'S EMAIL			DA	ТЕ

BUSINESS CLASSIFICATION

Please complete this form which is necessary for the University of Kentucky vendor database. Mark only one classification. Refer to "Definitions" for assistance in determining correct classification.

(01)Small Business	(06)Woman-Owned Large Business
(02) Large Business	(07)Disadvantaged Woman-Owned Small Business
(03)Disadvantaged Small Business	(08)Disadvantaged Woman-Owned Large Business
(04)Disadvantaged Large Business	(09)Other

(05) Woman-Owned Small Business

DEFINITIONS

- (01) SMALL BUSINESS: A business concern that is organized for profit, is independently owned and operated, is not dominant in the field of operations in which it is bidding, and meets the size standards as prescribed in the Code of Federal Regulations, Title 13, Part 121. Consult your local or district Small Business Administration (SBA) office if further clarification is needed.
- (02) LARGE BUSINESS: A business concern that exceeds the small business size code standards established by SBA.
- (03) DISADVANTAGED SMALL BUSINESS: A business concern (a) that is at least 51 percent owned by one or more socially and economically disadvantaged individuals (as defined below), or a publicly owned business, having at least 51 percent of its stock owned by one or more socially and economically disadvantaged individuals; and (b) has its management and daily business operations controlled by one or more such individuals. Socially and economically disadvantaged individuals include: Asian, Black/African American, Hispanic or Latino, Native American, Native Hawaiian/Pacific Islander, Women, Disabled, Veteran and Disabled Veteran and other minorities or individuals found to be disadvantaged by the SBA.
- (04) DISADVANTAGED LARGE BUSINESS: A concern that meets the definition of socially and economically disadvantaged individuals as defined above, but which is not a small business by the SBA's size standards.
- (05) WOMAN-OWNED SMALL BUSINESS: A small business that is at least 51 percent owned by a woman or women who also control and operate it. "Control" in this context means exercising the power to make policy decisions. "Operate" means actively involved in the day to day management.
- (06) WOMAN-OWNED LARGE BUSINESS: A concern that meets the definition of woman owned and operated, but which is not a small business by the SBA's standards.
- (07) DISADVANTAGED, WOMAN-OWNED SMALL BUSINESS: A concern that meets the definition of both (03) and (05) above.
- (08) DISADVANTAGED, WOMAN OWNED LARGE BUSINESS: A concern that meets the definition of both (04) and (06) above.
- (09) OTHER: A concern that does not meet any of the above definitions.

004100B01

THE FOLLOWING ITEMS ARE HEREWITH ENCLOSED AS REQUIRED BY KRS 45A.185

- 1. Bid Bond or Certified Check in an amount not less than five percent (5%) of total Bid.
- 2. List of Proposed Subcontractors and Unit Prices. (if required)
- 3. Authentication of Bid and Statement of Non-Collusion and Non-Conflict of Interest.
- 4. List of Materials and Equipment.

5. VENDOR NUMBER: It is imperative that you furnish your Federal Employer Identification Number in the space provided below. Failure to do so may delay the processing of purchase orders issued to your firm.

(Nine Digit Number)

BIDDER'S QUALIFICATIONS

The Commonwealth of Kentucky Model Procurement Code (KRS 45A.080) requires contracts to be awarded, "to the responsive and responsible bidder whose bid offers the best value" to the University of Kentucky. In order to determine if the Bidder has the experience, qualifications, resources and necessary attributes to provide the quality workmanship, materials and management required by the plans and specifications, the Bidder may be required to complete and submit the information requested on the University of Kentucky Contractor Bidder Determination of Responsibility questionnaire. Failure to provide the information requested on the questionnaire or failure to provide any additional submittals or information that may be requested to make this determination may be grounds for a declaration of non-responsibility with respect to the Bidder. A copy of the Contractor Determination of Responsibility questionnaire is available upon request to all Bidders.

TIME LIMIT FOR EXECUTION OF CONTRACT DOCUMENTS

It is further agreed, that in the event this Proposal is accepted by the Owner and the undersigned shall fail to execute the Contract and furnish satisfactory Payment and Performance Bond within ten (10) consecutive calendar days from the date of notification of the award of the Contract, the Owner may at his option, determine that the undersigned has abandoned the Contract and thereupon, the Proposal shall become null and void and the Bid guarantee, check or Bid bond which accompanied it shall be forfeited and become the property of the Owner as liquidated damages for each failure and no protest pursuant to such action will be made. If the Undersigned shall execute the Contract, and furnish satisfactory Payment Bond and Performance Bond, it is understood that the Bid Guarantee or Bid Bond will be returned to the undersigned by the Owner.

UNIT PRICES

NOTE: Unit Prices shall include the furnishing of all labor, materials, supplies and services and shall include all items of cost, overhead and profit for the Contractor and any subcontractor involved, and shall be used uniformly without modifications for either additions or deductions. The Unit Prices as established shall be used to determine the equitable adjustment of the Contract Price in connection with changes, deletions or extra work performed under the Contract and the "Rules of Measurement" set forth in the General Conditions shall govern.

All Bidders will be required to complete and submit the following Unit Prices with the bid.

The apparent low bidder is requested to attend a post bid meeting which will be scheduled at a later date.

Number	Description of Work	Unit	Cost/Unit
1	Complete furnishing and installation of operational gfireceptacle, dual gang outlet box, and 50'-0" of wiring in ¾" conduit, including all hangers and supports, and connection to a circuit. 2#12, 1#12 Ground.	each	\$
2	Complete furnishing and installation of operational duplex receptacle, dual gang outlet box, and 50'-0" of wiring in ¾" conduit, including all hangers and supports, and connection to a circuit. 2#12, 1#12 Ground	each	\$
3	Complete furnishing and installation of operational ceiling mounted exit sign light fixture (Type EX1) and 25'-0" of wiring in ¾" conduit, including all hangers and supports, and connection to a circuit.	each	\$
4	Furnishing and installation of data/voice/systems outlet and 1"conduit to above accessible ceiling and tied into cable tray. Conduit distance of 25' and provision of CAT6 cable 275' routed through cable tray to MDF/IDF room. Provide single RJ-45 termination on each end of the cable and single port device plate and backbox at field location.	each	\$
5	Fire Alarm Audio/Visual device with 200' of 1" conduit/wiring and terminations	Each	\$
6	Undercut unsuitable soils, dispose of off-site	CY	\$
7	DGA in place, compacted	Ton	\$
8	Earth fill in place, compacted	CY	\$
9	Standard concrete sidewalk, in place	SY	\$
10	Standard Duty Asphalt, in place	SY	\$
11	Heavy Duty Asphalt, in place	SY	\$
12	Heavy Duty Concrete, in place	SY	\$
13	3" C-900 Water Line, in place	LF	\$
14	6" C-900 Fire Main, in place	LF	\$
15	4" C-900 Fire Water, in place	LF	\$
16	Trench Backfill, compacted earth fill	CY	\$
17	Trench Backfill, D.G.A. fill	Ton	\$
18	8" PVC Sanitary Sewer Line, in place	LF	\$
19	10" PVC Sanitary Sewer Line, in place	LF	\$
20	24" Drain Basin Storm Inlet	each	\$
21	18" R.C.P. Storm Pipe, in place	LF	\$
22	4" Sched. 40 PVC Pipe, in place	LF	\$
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23	4" Sched. 40 lab waste piping, in place	LF	\$
24	6" Sched. 40 PVC Pipe, in place	LF	\$
25	8" Sched. 40 PVC Pipe, in place	LF	\$
26	10" Sched. 40 PVC Pipe, in place	LF	\$
27	12" Sched. 40 PVC Pipe, in place	LF	\$
28	Seeding, including fine grading, in place	LF	\$

PRIMARY LIST OF PROPOSED SUBCONTRACTORS

All subcontractors are subject to the approval of the Capital Construction Procurement Section and Capital Project Management Division, University of Kentucky, Lexington, KY.

If certain branches of the Work are to be done by the Prime Contractor, so state.

The apparent low bidders will be required to complete and submit to the University the following information by twelve o'clock (12) noon of the first working day following the bid opening. The information requested in this submittal is required to assist the University in determining contractor responsibility to complete the project being bid.

The apparent low bidder is requested to attend a post bid meeting which will be scheduled at a later date.

Division of Work	Name of Subcontractor
Building Demolition	
Concrete	
Masonry	
Steel	
Decorative Railings	
Metal Fabrications	
Rough Carpentry	
Exterior Woodwork	
Interior Woodwork	
EPDM Roofing	
Formed Metal Panels	
Metal Soffit Panels	
Fiber Cement Wall Panels	
Doors, Frames, & Hardware	
Curtainwall and Storefront Systems	
Glazing	
Gypsum Assemblies	
Ceilings	
Flooring	
Painting	
Specialties	
Fume Hoods/ Lab Equipment	
Lab Casework	
Roller Shades	

J04100D01	
Insulation	
HVAC	
Sheet Metal	
Test and Balance	
Fire Protection	
Plumbing System	
Electrical	
Telecommunication	
Fire Alarm	
Access Control (Security)	
Site Demolition	
Earthwork	
Site Concrete	
Asphalt Paving	
Stormwater	
Utilities	

LIST OF MATERIALS AND EQUIPMENT

Each item listed under the different phases of construction must be clearly identified so that the Owner will definitely know what the Bidder proposes to furnish.

The use of a manufacturer's or dealer's name only, or stating "as per Plans and Specifications," will not be considered as sufficient identification.

Where more than one "Make" or "Brand" is listed for any one item, the Owner has the right to select the one to be used.

The apparent low bidders will be required to complete and submit to the University the following information by twelve o'clock (12) noon of the first working day following the bid opening. The information requested in this submittal is required to assist the University in determining contractor responsibility to complete the project being bid.

The apparent low bidder is requested to attend a post bid meeting which will be scheduled at a later date.

Materials and Equipment	Brand or Manufacturer
Concrete Supplier	
Masonry Supplier	
Steel Fabricator	
Cold Formed Framing	
Solid Surface Fabrications	
Modified Bituminous Sheet Barriers	
EPDM Roofing	
Roof Specialties	
Hollow Metal Doors & Frames	
Flush Wood Doors	
Overhead Coiling Door	
Aluminum Curtainwall and Storefronts	
Non-Structural Metal Framing	
Gypsum Board	
Ceramic Tile	
Acoustical Panel Ceilings	
Wood Ceilings	
Resilient Base and Accessories	
Resilient Tile Flooring	
Tile Carpeting	
Paint	
Toilet Compartments	

Toilet Accessories	
Fume Hoods	
Lab Casework	
Metal Lockers	
Roller Shades	
Water Heaters	
Reverse Osmosis System	
Water Closets / Urinals	
Lavatory	
Flush Valves – Sensor Operated	
Lab Sink Faucets	
Safety Station	
Acid Waste Piping	
Temperature Controls	
Laboratory Exhaust Controls	
Hydronic Pumps	
Air Cooled Chiller	
Boilers	
Air Handling Unit	
Rooftop Units	
Rooftop Units with Energy Recovery	
General Exhaust Fans	
Laboratory High Plume Exhaust Fames	
Grilles, Registers, Diffusers	
VAV Boxes	
Electrical Switchgear	
Generator	
Panelboards/Disconnect Switches	
Lighting Control System	
Lighting Fixture Types (Attach List)	
Wiring Devices	
Occupancy Sensors	
Network (Ethernet) Cable	
A/V System	
Limestone (DGA, #57, 9M)	
Water Piping	

Sanitary Sewer Piping	
Storm Sewer Piping	
Storm Sewer Structures	
Asphalt	
Concrete	
Tactile Warning	

004100B01 IDENTIFICATION OF DIVERSE BUSINESS ENTERPRISE SUBCONTRACTORS AND MATERIAL SUPPLIERS

Diverse Business Enterprises (DBE) consist of minority, women, disabled, veteran and disabled veteran owned business firms that are at least fifty-one percent owned and operated by an individual(s) of the aforementioned categories. Also included in this category are disabled business enterprises and non-profit work centers for the blind and severely disabled.

MBE, WBE, Veterans, Disable Veterans and Disabled make up Diverse Business Enterprises, DBE.

Participation of DBE owned Contractors and businesses.

The University of Kentucky encourages and supports the participation Diverse Business Enterprises. Please list Subcontractors and Material Suppliers according to following Ethnic Vendor List or if they are a Woman Owned Business:

- Asian
- Black/African American
- Hispanic or Latino
- Native American Native Hawaiian/Pacific Islander
- White
- Other
- 1. DBE (Ethnic or Woman) Subcontractors

2. DBE (Ethnic or Woman) Material Suppliers

SUPERINTENDENT

In accordance with Article 17 of the General Conditions a full-time superintendent will be required on this project. Below, please list the superintendent your firm will employ on this project. The successful Bidder will be required to furnish a resume of the superintendent's qualifications and or past projects.

List the Superintendent's Name

SECTION 012100 - ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements governing allowances.
- B. Types of allowances include the following:
 - 1. Lump-sum allowances.
 - 2. Unit-cost allowances.
- C. Related Requirements:
 - 1. Section 012200 "Unit Prices" for procedures for using unit prices, including adjustment of quantity allowances when applicable.
 - 2. Section 014000 "Quality Requirements" for procedures governing the use of allowances for field testing by an independent testing agency.

1.3 DEFINITIONS

A. Allowance is a quantity of work or dollar amount established in lieu of additional requirements, used to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.

1.4 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection, or purchase and delivery, of each product or system described by an allowance must be completed by the Owner to avoid delaying the Work.
- B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
- C. Purchase products and systems selected by Architect from the designated supplier.

1.5 ACTION SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances in the form specified for Change Orders.

1.6 INFORMATIONAL SUBMITTALS

- A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.
- C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.7 LUMP-SUM ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
 - 1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.8 UNIT-COST ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
 - 1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.9 ADJUSTMENT OF ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

- 1. Include installation costs in purchase amount only where indicated as part of the allowance.
- 2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other markups.
- 3. Submit substantiation of a change in scope of Work, if any, claimed in Change Orders related to unit-cost allowances.
- 4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.
- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.
 - 1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of Work has changed from what could have been foreseen from information in the Contract Documents.
 - 2. No change to Contractor's indirect expense is permitted for selection of higher- or lowerpriced materials or systems of the same scope and nature as originally indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

- A. Allowance No. 1: After walking the site it became evident that many of the existing utilities under grade have not been removed and are still very much in place. This will likely result in additional demolition and removal of pipes conduit, etc. underneath the slab during the installation of new footings and new under slab components. Include the sum of \$30,000.00 for removal of existing utilities.
- B. Allowance No. 2: Lump-Sum Allowance of \$(To be Released by Addendum) for the contractor to furnish all labor, materials, equipment and services required to provide the fire alarm system as specified.

END OF SECTION 012100

SECTION 098433 - SOUND-ABSORBING WALL UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes shop-fabricated, acoustical panel units tested for acoustical performance, including the following:
 - 1. Fabric wrapped, sound-absorbing wall panels.
 - 2. Wall-covering wrapped wall panels.

1.3 DEFINITIONS

- A. NRC: Noise Reduction Coefficient.
- B. SAA: Sound Absorption Average.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.1. Include fabric facing, panel edge, core material, and mounting indicated.
- B. LEED Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
 - 2. Product Data for Credit IEQ 4.1: For adhesives, documentation including printed statement of VOC content.
- C. Shop Drawings: For unit assembly and installation.
 - 1. Include plans, elevations, sections, and mounting devices and details.
 - 2. Include details at panel head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Indicate panel edge profile and core materials.
 - 3. Include details at cutouts and penetrations for other work.
 - 4. Include direction of fabric weave and pattern matching.
- D. Samples for Initial Selection: For each type of fabric facing.
 - 1. Include Samples of hardware and accessories involving color or finish selection.
- E. Samples for Verification: For the following products:
 - 1. Mounting Devices: Full-size Samples.
 - 2. Assembled Panels: Approximately 36 by 36 inches, including joints and mounting methods.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Elevations and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Electrical outlets, switches, and thermostats.
 - 2. Items penetrating or covered by units including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Alarms.
 - e. Sprinklers.
 - f. Access panels.
 - 3. Show operation of hinged and sliding components covered by or adjacent to units.
- B. Product Certificates: For each type of unit.
- C. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of unit to include in maintenance manuals. Include fabric manufacturers' written cleaning and stain-removal instructions.

1.7 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials, fabrication, and installation.
 - 1. Build mockup of typical wall area 48 inches wide by full height. Include intersection of wall and ceiling, corners, and perimeters.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with fabric and unit manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.
- B. Deliver materials and units in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not install units until spaces are enclosed and weathertight, wetwork in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

- C. Air-Quality Limitations: Protect units from exposure to airborne odors, such as tobacco smoke, and install units under conditions free from odor contamination of ambient air.
- D. Field Measurements: Verify unit locations and actual dimensions of openings and penetrations by field measurements before fabrication, and indicate them on Shop Drawings.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace units and components that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to the following:
 - a. Acoustical performance.
 - b. Fabric sagging, distorting, or releasing from panel edge.
 - c. Warping of core.
 - 2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain wall units specified in this Section from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Units shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Fire-Test-Response Characteristics: Units shall comply with "Surface-Burning Characteristics" or "Fire Growth Contribution" Subparagraph below, or both, as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Surface-Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
 - 2. Fire Growth Contribution: Comply with acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 265 Method B Protocol or NFPA 286.

2.3 SOUND-ABSORBING AND WALL-COVERING WRAPPED WALL UNITS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Acoustical Panel Systems (APS, Inc.).
 - 2. AVL Systems, Inc.

- 3. Carneige
- 4. Proudfoot Company, Inc. (The).
- B. Sound-Absorbing Wall Panel: Manufacturer's standard panel construction.
 - 1. Basis of Design Product: Acoustical Panel Systems (APS, Inc.), Ecocore
 - 2. Mounting: Back mounted with manufacturer's standard Z-Clips, secured to substrate, as recommended by manufacturer to support weight of unit.
 - 3. Core: Manufacturer's standard.
 - 4. Edge Construction: Manufacturer's standard.
 - 5. Edge Profile: Manufacturer's standard.
 - 6. Dimensional tolerances of finished units: Plus or minus 1/16 inch (1.6 mm) for the following:
 - a. Thickness, edge straightness, overall length and width, and squareness from corner to corner.
 - 7. Facing Material: As indicated on the Materials Legend and Room Finish Schedule.
 - 8. Acoustical Performance: Sound absorption with NRC Testing Results as determined by ASTM C423.
 - 9. Thickness: 3/4 inch.
 - 10. Panel Width: Custom; as indicated on Drawings.
 - 11. Panel Height: Custom; as indicated on Drawings

2.4 MATERIALS

- A. Sustainable Design Requirements:
 - 1. Minimum Recycled Content of Units: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 60 percent by weight.
 - 2. Regional Materials: Units shall be manufactured within 500 miles of Project site.
- B. Core Materials: Manufacturer's standard.
- C. Facing Material: Fabric from same dye lot; color and pattern as indicated on Drawings.
 - 1. Facing Material Type (F-1):
 - a. Basis-of-Design Manufacturer: Filzfelt.
 - b. Fabric Type: 5mm, 100% Merino or Karacul Wool
 - c. Color & Style: As indicated on the Finish Material Schedule.
 - 2. Facing Material Type (F-2):
 - a. Basis-of-Design Manufacturer: Filzfelt.
 - b. Fabric Type: 2mm, 100% Merino or Karacul Wool
 - c. Color & Style: As indicated on the Finish Material Schedule.
 - 3. Facing Material Type (F-3):
 - a. Basis-of-Design Manufacturer: Maharam
 - b. Fabric Type: Woven Polyester
 - c. Style: Metric
 - d. Color: As indicated on the Finish Material Schedule.
 - 4. Facing Material Type (WC-1):
 - a. Basis-of-Design Manufacturer: Xorel Wallcovering, Manufacturer Carneige.
 - b. Style: Xorel Mesh
 - c. Color: As indicated on the Finish Material Schedule.
 - d. Application: 3/4" wrapped panel, mechanically fastened to partition.
 - e.
- D. Mounting Devices: Concealed on back of unit, recommended by manufacturer to support weight of unit, and as follows:

1. Metal Clips or Bar Hangers: Manufacturer's standard two-part metal "Z" clips, with one part of each clip mechanically attached to back of unit and the other part to substrate, designed to permit unit removal.

2.5 FABRICATION

- A. Standard Construction: Use manufacturer's standard construction unless otherwise indicated; with facing material applied to face, edges, and back border of dimensionally stable core; and with rigid edges to reinforce panel perimeter against warpage and damage.
- B. Edge Hardening: For glass-fiber board and mineral-fiber board cores, chemically harden core edges and areas of core where mounting devices are attached.
- C. Core-Face Layer: Evenly stretched over core face and edges and securely attached to core; free from puckers, ripples, wrinkles, or sags.
- D. Facing Material: Apply fabric facing fully covering visible surfaces of unit; with material stretched straight, on the grain, tight, square, and free from puckers, ripples, wrinkles, sags, blisters, seams, adhesive, or other visible distortions or foreign matter.
 - 1. Square Corners: Tailor corners. Heat-seal vinyl fabric seams at corners.
 - 2. Radius and Other Nonsquare Corners: Attach facing material so there are no seams or gathering of material.
 - 3. Fabrics with Directional or Repeating Patterns or Directional Weave: Mark fabric top and attach fabric in same direction so pattern or weave matches in adjacent units.
- E. Dimensional Tolerances of Finished Units: Plus or minus 1/16 inch for the following:
 - 1. Thickness.
 - 2. Edge straightness.
 - 3. Overall length and width.
 - 4. Squareness from corner to corner.
 - 5. Chords, radii, and diameters.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fabric, fabricated units, substrates, areas, and conditions for compliance with requirements, installation tolerances, and other conditions affecting unit performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install units in locations indicated. Unless otherwise indicated, install units with vertical surfaces and edges plumb, top edges level and in alignment with other units, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.
- B. Comply with manufacturer's written instructions for installation of units using type of mounting devices indicated. Mount units securely to supporting substrate.
- C. Align fabric pattern and grain with adjacent units and as indicated on Drawings.

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3.3 INSTALLATION TOLERANCES

- A. Variation from Plumb and Level: Plus or minus 1/16 inch in 48 inches, noncumulative.
- B. Variation of Joint Width: Not more than 1/16-inch variation from hairline in 48 inches, noncumulative.

3.4 CLEANING

- A. Clip loose threads; remove pills and extraneous materials.
- B. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

END OF SECTION 098433

SECTION 107516 - GROUND-SET FLAGPOLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes ground-set flagpoles made from aluminum.
- B. Owner-Furnished Material: Flags.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, operating characteristics, fittings, accessories, and finishes for flagpoles.
- B. Shop Drawings: For flagpoles.
 - 1. Include plans, elevations, and attachment details. Show general arrangement, jointing, fittings, accessories, grounding, anchoring, and support.
 - 2. Include section, and details of foundation system.
- C. Samples for Verification: For each type of exposed finish, in manufacturer's standard sizes.
- D. Delegated-Design Submittal: For flagpoles.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.
- 1.5 DELIVERY, STORAGE, AND HANDLING
 - A. Spiral wrap flagpoles with heavy paper and enclose in a hard fiber tube or other protective container.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain flagpoles as complete units, including fittings, accessories, bases, and anchorage devices, from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design flagpole assemblies.
- B. Structural Performance: Flagpole assemblies, including anchorages and supports, shall withstand design loads indicated within limits and under conditions indicated.
 - 1. Wind Loads: Determine according to NAAMM FP 1001. Basic wind speed for Project is indicated on the Drawings .
 - 2. Base flagpole design on polyester flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent.

2.3 ALUMINUM FLAGPOLES

- A. Aluminum Flagpoles: Cone-tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B241/B241M, Alloy 6063, with a minimum wall thickness of 3/16 inch.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Flagpole.
 - b. Baartol Company.
 - c. Morgan-Francis Flagpoles and Accessories.
- B. Exposed Height:
 - a. 25 feet.
- C. Construct flagpoles in one piece.
- D. Metal Foundation Tube: Manufacturer's standard corrugated-steel foundation tube, 0.060-inch wall thickness with 3/16-inch steel bottom plate and support plate; 3/4-inch-diameter, steel ground spike; and steel centering wedges welded together. Galvanize foundation tube after assembly. Furnish loose hardwood wedges at top of foundation tube for plumbing pole.
 - 1. Flashing Collar: Same material and finish as flagpole.

2.4 FITTINGS

- A. STARGAZER LED Downlight/ Internal External Truck Combo.
 - 1. 5K LED Kelvin Temp
 - 2. Truck Finish: Satin
 - 3. Dome Finish: Bronze

- 4. Voltage: as indicated on electrical drawings.
- B. External Halyard: Ball-bearing, nonfouling, revolving truck assembly of cast metal with continuous 5/16-inch-diameter, braided polypropylene halyard and 9-inch cast-metal cleats with fasteners. Finish exposed metal surfaces to match flagpole.
 - 1. Halyards and Cleats: One at each flagpole.
 - 2. Cleat Covers: Cast metal, finished to match flagpole, secured with cylinder locks.
 - 3. Halyard Flag Snaps: Chromium-plated bronze swivel snap hooks. Furnish two per halyard.

2.5 MISCELLANEOUS MATERIALS

- A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M.
- B. Drainage Material: Crushed stone, or crushed or uncrushed gravel; coarse aggregate.
- C. Sand: ASTM C33/C33M, fine aggregate.
- D. Elastomeric Joint Sealant: Single-component nonsag urethane joint sealant complying with requirements in Section 079200 "Joint Sealants."
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.6 ALUMINUM FINISHES

- A. Natural Satin Finish: AA-M32, fine, directional, medium satin polish; buff complying with AA-M20; seal aluminum surfaces with clear, hard-coat wax.
- B. Gold Anodic Finish: AAMA 611, AA-M32C22A43; gold color.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prepare uncoated metal flagpoles that are set in foundation tubes by painting below-grade portions with a heavy coat of bituminous paint.
- B. Foundation Excavation: Excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete. Place and compact drainage material at excavation bottom.
- C. Provide forms where required due to unstable soil conditions and for perimeter of flagpole base at grade. Secure and brace forms to prevent displacement during concreting.
- D. Foundation Tube: Place foundation tube, center, and brace to prevent displacement during concreting. Place concrete. Plumb and level foundation tube and allow concrete to cure.

- E. Place concrete, as specified in Section 033000 "Cast-in-Place Concrete." Compact concrete in place by using vibrators. Moist-cure exposed concrete for no fewer than seven days or use nonstaining curing compound.
- F. Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks, and uniform in texture and appearance. Provide positive slope for water runoff to perimeter of concrete base.

3.2 FLAGPOLE INSTALLATION

- A. General: Install flagpoles where indicated and according to Shop Drawings and manufacturer's written instructions.
- B. Foundation Tube: Place flagpole in tube, seated on bottom plate between steel centering wedges, and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch layer of elastomeric joint sealant and cover with flashing collar.

END OF SECTION 107516

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(E-37)

WTH CHAMBER ROOM





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K		DESCRIPTION	CFCI	OFCI	OFOI	
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SP1	SOUND ABSO	RBING PANEL (4X12)	X			
SP2	SOUND ABSO	RBING PANEL (4X9)	X			
40.440						
10 110 M1	MARKER BOA	RD	X			4' X 12'
M2	MARKER BOA	RD	X			20'-0" x
10.260						
CG1		RD - 4' AFF - SEE A-101B FOR	X			
\frown	DETAIL					
10 280	0 - TOILET AC	CESSORY	Y			Y
T1	GRAB BAR SE	T: 36" BACK, 42" SIDE, 18" VERT	Х			
T2	AMBULATORY	GRAB BAR SET: (2) 36" SIDE	X			
T4	TOILET PAPE	R DISPENSER - SINGLE ROLL	X			
T5	SANITARY NA	PKIN DISPOSAL - PARTITION MTD	X			
T6	SANITARY NA	PKIN DISPOSAL - RECESSED	X			
18	SOAP DISPEN	ISER - SURFACE MID, VERI			X	COORL
19	FRAMED MIRI	ROR - 24" x 36"	X			055 0.0
110	FRAMELESS	MIRROR	X			SEE IN
T11	BABY CHANG	ING STATION	X			20" X 36
T14	UTILITY SHEL	F	X			
T15	DISPENSER, I	PAPER TOWEL, SURFACE MTD			X	COORE
T16		PKIN DISPOSAL - SURFACE MTD	X			
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F2	BRACKET MO	UNTED FIRE EXTINGUISHER	X			
F3	RECESSED FI	RE EXTINGUISHER CABINET	X			LABS
F4	RECESSED S	PILL KIT CABINET	X			LABS
F5	BRACKET MT	D CLEAN AGENT FIRE	X			
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10 511 L1 AV1 AV2 P01 P02 V1 V2 APPLI, A1 A2 A3 A4 A5 A6 OFFIC O1 02 O3 O4 O5 ROLLE RS1 RS2	AV RACK (28" AV RACK (28" LECTERN RECESSED S FIXED SCREE 70" LCD SCRE 50" LCD SCRE 50" LCD SCRE 50" LCD SCRE 4NCES (N.I.C.) REFRIGERAT MICROWAVE COFFEE MAK UNDERCOUN ICE MACHINE UNDERCOUN ICE MACHINE UNDERCOUN ICE MACHINE UNDERCOUN ICE ACHINE LARGE COPIE COPIER LAMINATOR WASTE / REC ER WINDOW SH MANUAL ROL MANUAL BLAG	METAL LOCKER SUAL SYSTEMS H x 21"W x 21"D) CREEN, 9' WIDE, MOTORIZED N EN EN EN OR ER TER REFRIGERATOR TER REFRIGERATOR (N.I.C.) R HADES (12 2413) LER SHADE CKOUT ROLLER SHADE	X X X X X X X X X X X X X X X X X X X		 X X X X X X X X X X	SURFA

A GROWTH CHAMBER ROOM



Ē	GROWTH CHAMBER - D
(F)	1/4" = 1'-0"

MOBILE LAB TABLE/STORAGE SCHEDULE						
TYPE	PE DESCRIPTION					
M1	ADJUSTABLE LAB TABLE NO SHELF	2' - 6"				
M2	ADJUSTABLE LAB TABLE WITH SHELF	2' - 6"				
M3	ADJUSTABLE LAB VIBRATION TABLE	2' - 6"				
M4	ADJUSTABLE LAB VIBRATION TABLE	2' - 6"				
M5	ADJUSTABLE LAB TABLE WITH SHELF	2' - 6"				
M6	MOBILE STORAGE UNITS WITH DRAWER	1' - 6"				
M7	MOBILE STORAGE UNITS WITH DRAWER / CUPBOARD	1' - 6"				







		SPECIALTIES & EQUIPN	IENT S	CHEDL	JLE	
MAR K		DESCRIPTION	CFCI	OFCI	OFOI	
09 843	3 - SOUND AB	SORBING WALL UNITS				
SP1	SOUND ABSC	RBING PANEL (4X12)	Х			
SP2	SOUND ABSC	RBING PANEL (4X9)	Х			
10 110						
M1	MARKER BOA	RD	X			4' X 12
M2	MARKER BOA	NRD	X			20'-0"
			1			
10 260 CG1	0 - WALL & DO	OR PROTECTION	X			
	DETAIL					
10.290			Y		~	Y
10 200 T1	GRAB BAR SE		X			
T2		(GRAB BAR SET: (2) 36" SIDE	X			
T4	TOIL FT PAPE	R DISPENSER - SINGLE ROLL	X			
T5	SANITARY NA	PKIN DISPOSAL - PARTITION MTD	X			
T6	SANITARY NA	PKIN DISPOSAL - RECESSED	Х			
T8	SOAP DISPEN	ISER - SURFACE MTD, VERT			Х	COOR
T9	FRAMED MIR	ROR - 24" x 36"	Х			
T10	FRAMELESS I	MIRROR	Х			SEE II
T11	BABY CHANG	ING STATION	Х			20" X 3
T14	UTILITY SHEL	F	Х			
T15	DISPENSER,	PAPER TOWEL, SURFACE MTD			Х	COOR
T16	SANITARY NA	PKIN DISPOSAL - SURFACE MTD	Х			
بر		M M M M	~	<u> </u>	λ.	~
10 441 F1		MENT	X			
F2	BRACKET MO		X			
F3	RECESSED E		X			LARS
F4	RECESSED S		X			LABS
F5	BRACKET MT	D CI FAN AGENT FIRE	X			27.00
	EXTINGUISHE					
F6	KNOX BOX		Х			
F7	DEFIBRILLAT	OR CABINET	X			SEMI-
10 511		YERS				
			X			
L1	DOODEL HER					
27 511	16 - AUDIO & VI	SUAL SYSTEMS				
AV1	AV RACK (28"	H x 21"W x 21"D)	Х			
AV2	LECTERN		Х			
P01	RECESSED S	CREEN, 9' WIDE, MOTORIZED	Х			
P02	FIXED SCREE	N	Х			
V1	70" LCD SCRE	EEN	Х			
V2	50" LCD SCRE	EN	X			
	ANCES (N I C)					
		OR			X	
A2	MICROWAVE				X	
A3	COFFEE MAK	FR			X	
A4	UNDERCOUN	TER REERIGERATOR			X	
A5					X	
A6	UNDERCOUN	TER REFRIGERATOR			X	
0.55		(111.0.)				
		(N.I.C.)			V	
		D			X	
02		IN				
03					X	
04	WASTE / REC	YCLE BINS			X X	
			1	<u> </u>		1
ROLLE	ER WINDOW SH	HADES (12 2413)				
RS1	MANUAL ROL	LER SHADE	Х			SURF
RS2	MANUAL BLA	CKOUT ROLLER SHADE	Х			SURF
RS3	MOTORIZED I	ROLLER SHADE	X			SURF
_			-	-	_	_









UPON INFORMATION OBTAINED FROM UTILITY COMPANIES AND FIELD EVIDENCE. OTHER BURIED UTILITIES MIGHT EXIST ON THE SUBJECT SITE WHICH ARE NOT SHOWN ON THIS DRAWING. USE EXTREME CAUTION DURING EXCAVATION PROCEDURES AND CONTACT KENTUCKY 811 @ 811 OR 1-800-752-6007 FOR EXACT LOCATION OF BURIED FACILITIES PRIOR









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IT'S THE LAW

CONTROL POINT COORDINATES:

▲CP-9 NORTHING: 3566716.942 EASTING: 4308056.740

∆CP-10 NORTHING: 3567141.711 EASTING: 4307239.681

ACP-11

NORTHING: 3567592.669 EASTING: 4307643.323 ∆CP-12

NORTHING: 3567232.873 EASTING: 4308293.096

1 ENLARGED GRADING PLAN SCALE: 1" = 20'

FLOOD ZONE INFORMATION:

THIS PROPERTY IS LOCATED IN FLOOD ZONE X, "AREA OF MINIMAL FLOOD HAZARD", AS SHOWN ON THE NATIONAL FLOOD INSURANCE RATE MAP, COMMUNITY PANEL NO. 21033C0255D, EFFECTIVE APRIL 19, 2019.

BENCHMARK INFORMATION: NOTE: ELEVATIONS ARE BASED FROM U.S.G.S. DATUM (NAVD 88) BM () "M" ON FIRE HYDRANT ELEVATION = 527.20

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	LEGEND
500 501 500	EXISTING MAJOR CONTOUR EXISTING MINOR CONTOUR PROPOSED CONTOURS
<u> 전신 이상 위한 이 것 같은 것 같은 것 같은 것 같이 않</u>	PROPOSED SIDEWALK
	PROPOSED BUILDING
	EXISTING ASPHALT PAVEMENT TO BE MILLED & OVERLAID
	PROPOSED HEAVY DUTY ASPHALT PAVEMENT
	PROPOSED STANDARD DUTY ASPHALT PAVEMENT
	PROPOSED CONCRETE PAVEMENT
500.00	SINGLE SPOT ELEVATION
TFC: 500.50 BFC: 500.00	DOUBLE SPOT ELEVATIONS REPRESENT AN IMMEDIATE VERTICAL CHANGE IN GRADE. TOP ELEVATION IS THE ELEVATION AT THE TOP OF THE VERTICAL CHANGE. THE BOTTOM ELEVATION IS THE ELEVATION AT THE BOTTOM OF THE VERTICAL CHANGE
EX: 500.00	EXISTING SPOT ELEVATION









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www.kentucky811.com Two Business Days Before You Dig IT'S THE LAW

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Autodesk Docs://202225 - UK Grain Center Rebuild/2022.XKPR22 Central File.n



ELECTRICAL FIRE ALARM NOTES

- A THIS RISER IS PARTIAL. ALL THE DEVICES CONNECTED TO THE "FACP" UNITS ARE NOT SHOWN. THE CONTRACTOR SHALL REFER TO THE ELECTRICAL FLOOR PLANS FOR THE COMPLETE FIRE ALARM SYSTEM.
- B THE EXTENT OF ALL FIRE ALARM SYSTEM WORK IS INDICATED OR IMPLIED ON THE CONTRACT DRAWINGS.
 C FIELD VERIFY THE EXACT NUMBER AND LOCATIONS OF ALL
- MECHANICALLY RELATED ITEMS (SPRINKLER CONNECTIONS, EXTINGUISHING SYSTEMS, SMOKE DAMPERS, RANGE HOOD SUPPRESSION SYSTEMS, ETC.) AND MAKE CONNECTIONS AS REQUIRED/INDICATED.
- D PROVIDE CONNECTIONS TO ALL FIRE PROTECTION TAMPER AND FLOW SWITCHES VIA ZONE ADDRESSABLE MODULES AS REQUIRED. CONTRACTOR SHALL VERIFY ALL LOCATIONS WITH FIRE PROTECTION SYSTEM SHOP DRAWINGS. CONTRACTOR SHALL PROVIDE A UNIT PRICE FOR COMPLETE INSTALLATION OF A CONNECTION TO EXISTING FIRE PROTECTION SWITCHES.
- E ALL FIRE ALARM STROBE LIGHTS SHALL BE SYNCHRONIZED TO ACCOMMODATE BUILDING STANDARDS AS REQUIRED.
- F TAP SPEAKERS TO PROVIDE SUFFICIENT AUDIBILITY FOR AREA SERVED.
- G SMOKE DETECTORS SHALL NOT BE LOCATED CLOSER THAN 36" TO SUPPLY, RETURN OR EXHAUST AIR OPENINGS NOR CLOSER THAN 12" TO WALL/ CEILING INTERSECTIONS.
 H AIR HANDLING UNITS SHALL ONLY SHUT DOWN WHEN SMOKE IS
- DETECTED AT THAT PARTICULAR AIR HANDLING UNIT (UON). SMOKE DAMPERS SHALL CLOSE ONLY WHEN SMOKE IS DETECTED AT THAT PARTICULAR SMOKE DAMPER BY ACTIVATION OF THE CONTROLLING SMOKE DETECTOR. REFER TO THE SPECIFICATIONS FOR FURTHER REQUIREMENTS.
- I PROVIDE DUCT SMOKE DETECTORS WITH REMOTE TEST SWITCH/INDICATOR LIGHT AT 7'-6" AFF ON WALL IN AREA BELOW DETECTOR.
- J RISER DIAGRAM IS FOR BID PURPOSES ONLY. SYSTEM SHALL BE INSTALLED AND CONNECTED IN ACCORDANCE WITH WIRING DIAGRAMS OBTAINED FROM MANUFACTURER, THAT HAVE BEEN APPROVED BY THE STATE FIRE MARSHAL'S OFFICE OR AUTHORITY HAVING JURISDICTION.
- K PROVIDE FIRE ALARM MANUFACTURER WITH LOCATION DESCRIPTIONS FOR ALL FIRE ALARM DEVICES AS SOON AS POSSIBLE AFTER AWARD OF CONTRACT FOR PRE-PROGRAMMING OF FIRE ALARM SYSTEM. COORDINATE DESCRIPTIONS WITH BUILDING OWNER. UTILIZE FINAL ROOM NAMES AND NUMBERS, NOT NAMES AND NUMBERS FROM FLOOR PLANS.
- L EACH FIRE ALARM DEVICE SHALL BE LABELED WITH SELF ADHESIVE POLYESTER COATED PRINTED LABELS INDICATING DEVICE ADDRESS AND CIRCUIT PER FIRE ALARM SHOP DRAWINGS.
 M MODIFY AND/OR EXPAND EXISTING CONTROL PANEL(S) AND
- ANNUNCIATOR(S) TO ACCOMMODATE AS REQUIRED TO SUPPORT ADDITIONAL DEVICES SHOWN. FURNISH AND INSTALL ANY MODULES OR EQUIPMENT NECESSARY TO EXPAND SYSTEM. EXISTING ANNUNCIATOR(S) AND CONTROL PANEL(S) SHALL BE UPDATED TO DISPLAY TROUBLES AND ALARM LOCATIONS FOR ALL NEW ZONES.
- N PROVIDE CONNECTIONS TO NEW ACCESS CONTROL DOORS TO ALLOW POSITIVE LATCHING AND FREE EGRESS UNDER ALARM CONDITIONS. COORDINATE EXACT REQUIREMENTS WITH SUCCESSFUL DOOR HARDWARE MANUFACTURER PRIOR TO CONSTRUCTION.
- O PROVIDE ACCESS PANELS AS REQUIRED FOR MAINTENANCE AND TESTING FOR SMOKE DETECTORS LOCATED ABOVE INACCESSIBLE CEILINGS. COORDINATE SIZE AND LOCATIONS WITH ARCHITECT PRIOR TO INSTALLATION.
- P PROVIDE APPROVED TESTING AND REQUIRED CERTIFICATION OF SYSTEM COMPONENTS AND PROVE OPERATION OF SYSTEM FOR THE AREA OF WORK WHEN COMPLETE.
 Q WIRING TO ALL FIRE ALARM DEVICES SHALL BE PER NEC AND
- MANUFACTURER'S RECOMMENDATIONS. VERIFY ALL WIRING REQUIREMENTS WITH THE OWNER AND FIRE ALARM VENDOR
- R ALL NEW DEVICES INDICATED, SUCH AS SMOKE DETECTORS, NOTIFICATION APPLIANCES, ETC., SHALL MATCH AND BE COMPATIBLE WITH EXISTING BUILDING SYSTEM.
 S ALL 120V POWER FOR NEW FIRE ALARM SYSTEM COMPONENTS SHALL BE CONNECTED TO EMERGENCY LIFE-SAFETY BRANCH PANELS AS
- APPLICABLE. PROVIDE ALL NEW POWER CONNECTIONS AS REQUIRED FOR SYSTEM OPERATION.
 T PROVIDE A DEDICATED POWER CIRCUIT TO EACH FIRE ALARM EQUIPMENT PANEL OR POWER SUPPLY.
- U FIRE ALARM OCP DEVICES SHALL HAVE NON-REMOVABLE LOCKABLE HANDLE PAINTED RED.
- V THIS CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL BUILDING PERMITS, ELECTRICAL APPROVALS, AND APPROVALS FROM THE STATE OFFICE OF FIRE SAFETY OR AUTHORITY HAVING JURISDICTION (AHJ). THIS INCLUDES PREPARING DRAWINGS, CUTSHEETS, AND OTHER DOCUMENTATION REQUIRED BY THE AHJ OR FIRE ALARM EQUIPMENT MANUFACTURER. A COPY OF THESE REQUIREMENTS SHALL BE OBTAINED FROM AHJ. THE DRAWINGS SHALL BE PREPARED AS A FINAL SUBMITTAL AS OUTLINED IN THE SUBMITTAL REQUIREMENTS. ELECTRONIC COPIES OF THESE PLANS REQUIRED FOR THIS PURPOSE MAY BE OBTAINED FROM THE ENGINEER. DRAWINGS THAT ARE REQUIRED FOR APPROVAL SHALL BE FINISHED WITHIN 7 WORKING DAYS OF AWARD OF CONTRACT.
- W WRITTEN CERTIFICATION OF ENTIRE FIRE ALARM SYSTEM SHALL BE SUBMITTED TO OWNER & ENGINEER AT CLOSE OF PROJECT.
 X A TECHNICAL REPRESENTATIVE OF FIRE ALARM MANUFACTURER SHALL BE PRESENT AT ALL TIMES DURING FIRE ALARM
- CERTIFICATION. Y CONTRACTOR SHALL MONITOR TROUBLES ON EXISTING PANEL EQUIPMENT ON A DAILY BASIS. WHERE A TROUBLE IS INDICATED, IT SHALL BE REPORTED TO THE OWNER AND CONSTRUCTION SHALL STOP UNTIL TROUBLE IS RESOLVED UNLESS OTHERWISE INDICATED BY OWNER.
- Z INITIATING DEVICE CIRCUITS AND NOTIFICATION APPLIANCE CIRCUITS SHALL BE IN SEPARATE RACEWAYS. FIRE ALARM SYSTEM JUNCTION BOXES, BACK BOXES, AND PULL BOXES SHALL BE PAINTED RED.
 AA PROVIDE QUANTITY OF POWER SUPPLIES AND NAC PANELS BASED UPON FINAL SYSTEM DESIGN AND REQUIRED SPARE CAPACITY. LOCATE ADDITIONAL PANELS ADJACENT TO THOSE SHOWN ON PLANS. DO NOT INSTALL ADDITIONAL EQUIPMENT IN OTHER AREAS

OF THE PROJECT WITHOUT WRITTEN CONSENT BY THE ENGINEER.

ELECTRICAL LIGHTING NOTES

- A REFER TO THE ARCHITECT'S REFLECTED CEILING PLANS, ELEVATIONS, AND CASEWORK DETAILS FOR EXACT LOCATIONS OF
- ALL WALL AND CEILING MOUNTED ELECTRICAL DEVICES.
 B CONTRACTOR SHALL FOLLOW BRANCH CIRCUITING LAY-OUT, AS INDICATED ON THE FLOOR PLANS, WITH A MAXIMUM OF THREE (3) BRANCH CIRCUITS PER HOMERUN. EACH BRANCH CIRCUIT SHALL BE PROVIDED WITH A DEDICATED NEUTRAL CONDUCTOR. DEDICATED NEUTRAL CONDUCTORS SHALL BE CONSIDERED CURRENT CARRYING. IF ADDITIONAL CONDUCTORS ARE RAN IN THE SAME CONDUIT WITH THOSE INDICATED, CONTRACTOR SHALL DERATE ALL CURRENT CARRYING CONDUCTORS PER N.E.C. #310.15(B)(3), AND UPSIZE CONDUIT AS REQUIRED PER N.E.C. #300.17 AND ANNEX C. MULTIWIRE BRANCH CIRCUITS AS DEFINED IN N.E.C #100 / 210.4 (CIRCUITS SHARING A COMMON NEUTRAL CONDUCTOR) SHALL NOT BE PERMITTED.
- C IDENTIFY THE PANEL AND CIRCUIT NUMBER FOR ALL RECEPTACLES, SWITCHES, ETC. IN AREA OF CONSTRUCTION. PROVIDE CLEAR ADHESIVE LABELS WITH BLACK LETTERING. IN HEALTHCARE FACILITIES, ENGRAVE EMERGENCY DEVICE COVERPLATES IN PATIENT CARE AREAS. ALSO, MARK INSIDES OF ALL DEVICE BOXES WITH PANEL AND CIRCUIT NUMBER.
 D LOCATE CHAIN-HUNG INDUSTRIAL FIXTURES IN MECHANICAL ROOMS
- TO AVOID DUCTWORK AND PIPING, TO MAXIMIZE AVAILABLE LIGHT. SPACE AROUND EQUIPMENT, AIR HANDLERS, ETC. TO PROVIDE ADEQUATE LIGHTING TO ALL AREAS OF ROOM. PROVIDE ADDITIONAL FIXTURES OF SAME TYPE AS NEEDED TO FULFILL THIS REQUIREMENT
- E LOCATE EXIT SIGNS FOR MAXIMUM VIEWING AREA TO IDENTIFY EGRESS PATHS AS INDICATED ON PLANS. COORDINATE LOCATIONS SUCH THAT ARCHITECTURAL FEATURES OR EQUIPMENT FROM OTHER TRADES DO NOT OBSTRUCT VIEW.
- F LUMINAIRES INDICATED WITH MULTI-LEVEL SWITCHING SHALL HAVE SIMILAR LAMPS CONTROLLED TOGETHER, I.E. INBOARD AND OUTBOARD LAMPS OR RIGHT AND LEFT HAND LAMPS.
- G ALL LIGHTING FIXTURE LENSES, PARABOLIC LOUVERS, DOWNLIGHTING ALZAK CONES AND "PARACUBE" LOUVERS SHALL BE HANDLED WITH COTTON GLOVES DURING INSTALLATION AND LAMPING TO AVOID FINGERPRINTS OR DIRT DEPOSITS. IT IS PREFERRED THAT FIXTURES BE SHIPPED AND INSTALLED WITH CLEAR PLASTIC BAGS TO PROTECT LOUVERS. AT CLOSE OF PROJECT, AND AFTER CONSTRUCTION AIR FILTERS ARE CHANGED, REMOVE BAGS. ANY LOUVER OR CONE SHOWING DIRT OR FINGER PRINTS SHALL BE CLEANED WITH SOLVENT RECOMMENDED BY THE MANUFACTURER, OR REPLACED AS NECESSARY IN ORDER TO TURN
- OVER TO THE OWNER NEW FIXTURES AT OCCUPANCY.
 H RECESSED LUMINAIRES SHALL BE SECURED SUCH THAT THE FORCE REQUIRED INSERTING LAMPS, TRIMS, LENSES, LOUVERS, OR DOOR FRAMES DOES NOT SHIFT HOUSING. ALL TRIMS SHALL BE COMPLETELY FLUSH WITH FINISHED CEILINGS AT COMPLETION OF CONSTRUCTION.
- I CONTRACTOR SHALL PROVIDE UNSWITCHED CONDUCTOR TO ALL EXIT SIGNS, EMERGENCY INVERTER BATTERY PACKS, AND NIGHT LIGHTS AS REQUIRED.

ELECTRICAL POWER NOTES

- A REFER TO THE ARCHITECT'S REFLECTED CEILING PLANS, ELEVATIONS, AND CASEWORK DETAILS FOR EXACT LOCATIONS OF
- ALL WALL AND CEILING MOUNTED ELECTRICAL DEVICES.
 B CONTRACTOR SHALL FOLLOW BRANCH CIRCUITING LAY-OUT, AS INDICATED ON THE FLOOR PLANS, WITH A MAXIMUM OF THREE (3) BRANCH CIRCUITS PER HOMERUN. EACH BRANCH CIRCUIT SHALL BE PROVIDED WITH A DEDICATED NEUTRAL CONDUCTOR. DEDICATED NEUTRAL CONDUCTORS SHALL BE CONSIDERED CURRENT CARRYING. IF ADDITIONAL CONDUCTORS ARE RAN IN THE SAME CONDUIT WITH THOSE INDICATED, CONTRACTOR SHALL DERATE ALL CURRENT CARRYING CONDUCTORS PER NEC 310.15(B)(3), AND UPSIZE CONDUIT AS REQUIRED PER NEC 300.17 AND ANNEX C. MULTIWIRE
- BRANCH CIRCUITS AS DEFINED IN NEC 100 / 210.4 (CIRCUITS SHARING A COMMON NEUTRAL CONDUCTOR) SHALL NOT BE PERMITTED.
 C IDENTIFY THE PANEL AND CIRCUIT NUMBER FOR ALL RECEPTACLES, SWITCHES, ETC. IN AREA OF CONSTRUCTION. PROVIDE CLEAR ADHESIVE LABELS WITH BLACK LETTERING. IN HEALTHCARE FACILITIES, ENGRAVE EMERGENCY DEVICE COVERPLATES IN PATIENT
- CARE AREAS. MARK INSIDES OF ALL DEVICE BOXES WITH PANEL AND CIRCUIT NUMBER.D RECEPTACLES THAT ARE CONTROLLED BY AN AUTOMATIC MEANS SUCH AS OCCUPANCY SENSOR OR ENERGY MANAGEMENT SYSTEM
- SHALL BE MARKED IN ACCORDANCE WITH NEC 406.3(E).
 E LOCATIONS OF ELECTRICAL CONNECTIONS AND LOCAL DISCONNECTS SHALL BE COORDINATED WITH MECHANICAL AND PLUMBING CONTRACTORS TO ENSURE ACCESS AND WORKING CLEARANCE IS MAINTAINED PER NEC. NOTIFY OTHER TRADES OF REQUIRED CLEARANCE AREAS TO AVOID ROUTING OF OTHER SYSTEMS IN THESE AREAS. DO NOT INSTALL ELECTRICAL EQUIPMENT OVER
- EQUIPMENT NAMEPLATES OR ACCESS PANELS OR THROUGH ACCESS/MAINTENANCE CLEARANCES OF EQUIPMENT BY OTHER TRADES. F UNITERRUPABLE POWER SUPPLY (UPS) UNITS SHALL BE PROVIDED FOR EACH WORKSTATION IN AN OFFICE AREA (APC MODEL# BE650G1 OR APPROVED EQUAL). PROVIDE A MINIMUM OF 25 UPS UNITS (APC
- MODEL# BX1000M-LM60 OR APPROVED EQUAL) FOR SENSITIVE LAB EQUIPMENT. QUANTITIES OF UPS UNITS FOR LAB EQUIPMENT SHALL BE COORDINATED WITH THE OWNER PRIOR TO PURCHASING.

ELECTRICAL SYSTEMS NOTES

- A REFER TO THE ARCHITECT'S REFLECTED CEILING PLANS, ELEVATIONS, AND CASEWORK DETAILS FOR EXACT LOCATIONS OF ALL WALL AND CEILING MOUNTED ELECTRICAL DEVICES.
 B CONTRACTOR SHALL FOLLOW BRANCH CIRCUITING LAY-OUT, AS
- INDICATED ON THE FLOOR PLANS, WITH A MAXIMUM OF THREE (3) BRANCH CIRCUITS PER HOMERUN. EACH BRANCH CIRCUIT SHALL BE PROVIDED WITH A DEDICATED NEUTRAL CONDUCTOR. DEDICATED NEUTRAL CONDUCTORS SHALL BE CONSIDERED CURRENT CARRYING. IF ADDITIONAL CONDUCTORS ARE RAN IN THE SAME CONDUIT WITH THOSE INDICATED, CONTRACTOR SHALL DERATE ALL CURRENT CARRYING CONDUCTORS PER NEC 310.15(B)(3), AND UPSIZE CONDUIT AS REQUIRED PER NEC 300.17 AND ANNEX C. MULTIWIRE BRANCH CIRCUITS AS DEFINED IN NEC 100 / 210.4 (CIRCUITS SHARING
- A COMMON NEUTRAL CONDUCTOR) SHALL NOT BE PERMITTED.
 C IDENTIFY THE PANEL AND CIRCUIT NUMBER FOR ALL RECEPTACLES, SWITCHES, ETC. IN AREA OF CONSTRUCTION. PROVIDE CLEAR ADHESIVE LABELS WITH BLACK LETTERING. IN HEALTHCARE FACILITIES, ENGRAVE EMERGENCY DEVICE COVERPLATES IN PATIENT CARE AREAS. MARK INSIDES OF ALL DEVICE BOXES WITH PANEL AND CIRCUIT NUMBER.
- D REFER TO "SYSTEM INSTALLATION MATRIX" (ON SYSTEMS LEGEND SHEET) AND SPECIFICATIONS FOR CONTRACTOR REQUIREMENTS OF EACH SYSTEM.
- E THE CONTRACTOR SHALL ROUTE ALL "SYSTEM CONDUIT STUB-UPS" TO THE NEAREST CORRIDOR CABLING PATH (SEE "STUB-UP" DETAILS). REFER TO CABLING PATH INSTALLATION DETAIL FOR ADDITIONAL REQUIREMENTS.
- F CONTRACTOR SHALL PAINT ALL SYSTEMS CONDUIT STUB-UPS LIGHT BLUE FOR SYSTEMS CABLING INTO THE CORRIDOR CABLING PATH. PROVIDE PULL STRINGS IN ALL NEW CONDUIT RUNS FOR SYSTEM CABLING INSTALLATION.



- 1. MOUNT VISUAL NOTIFICATION APPLIANCES SO THAT ENTIRE LENS IS BETWEEN 80" AND 96" AFF. IF CEILING IS TOO LOW FOR DEVICE TO BE MOUNTED ABOVE 80", MOUNT SO THAT THE LENS IS WITHIN 6" OF FINISHED CEILING.
- ALIGN BACKBOXES OF DEVICES AT THE MOUNTING HEIGHT INDICATED. MEASURE TO THE TOP OF THE BACKBOX FOR STANDARD OUTLET BOXES. NON-STANDARD BACKBOXES ARE TO BE INSTALLED SUCH THAT THE FINISHED DEVICES ARE ALIGNED ALONG THEIR RESPECTIVE CENTERLINES.
 MOUNTING HEIGHTS SHOWN ILLUSTRATE DESIGN INTENT AND ARE TO BE FOLLOWED UNLESS CONTRADICTED BY APPLICABLE CODE. WHERE
- DEVICES ARE SHOWN ADJACENT TO DOOR FRAMES ON PLANS INSTALL 12" FROM FRAME TO AVOID SLUSHED SECTIONS OR BRACING. SPECIFIC DEVICES ARE SHOWN IN RELATIVE ORDER FROM DOOR FRAME; WHERE INDICATED DEVICES ARE NOT PRESENT AT A PARTICULAR LOCATION, ADJUST LOCATIONS OF INSTALLED DEVICES CLOSER TO DOOR.
- THE CONTRACTOR IS TO COORDINATE ALL ROUGH-INS WITH ANY COUNTERTOPS/BACKSPLASHES TO AVOID CONFLICT. ALIGN DEVICE BACKBOXES IN THE NEXT FULL BLOCK ABOVE THE BACKSPLASH AS SHOWN. FOR NON-BLOCK WALLS ALIGN BOTTOM OF DEVICE BACKBOXES 4" ABOVE BACKSPLASH. COORDINATE WORK WITH CASEWORK AND KITCHEN SHOP DRAWINGS. MAXIMUM ELEVATION IS TO BE 44" AFF PER ADAAG REQUIREMENTS. IF CONFLICT STILL ARISES CONTACT THE ENGINEER FOR DIRECTION ON HOW TO PROCEED.
 MAXIMUM SEPARATION FOR POWER AND DATA OUTLETS SERVING THE SAME WORKPLACE TO BE 16".



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- E2 RECEPTACLES CIRCUIT SHALL BE PROTECTED BY GFI BREAKER. E3 INDOOR UNIT SHALL BE INTERCONNECTED TO AND POWERED BY CORRESPONDING OUTDOOR UNIT.
- E6 IQ/MLC2-8 WINDOW BLINDS NETWORK MOTOR GROUP CONTROLLER AND 5-POSITION SWITCH. INSTALL CONTROLLER ENCLOSURE 44" TO BOTTOM AFF COORDINATE FINAL LOCATION WITH ARCHITECT. CAT5e CABLING SHALL BE RAN FROM SWITCH AND DAISY CHAINED TO EACH CONTROLLER. EACH CONTROLLER SHALL POWER UP TO 4 MOTORIZED WINDOW BLINDS. E7 POWER CONNECTION TO MOTORIZED WINDOW BLINDS. ROUTE
- CABLING IN 1" CONDUIT TO AVAILABLE CONNECTION POINT ON IQ/MLC2 CONTROLLER. INSTALLATION METHOD SHALL BE REVIEWED WITH ELECTRICAL INSPECTOR PRIOR TO ROUGH-IN. E8 COORDINATE RECEPTACLE MOUNTING HEIGHT FOR ADA HEIGHT MICROWAVE.
- E9 PROVIDE POWER CONNECTION FOR DOOR OPERATORS/HARDWARE. COORDINATE CONNECTIONS WITH DOOR HARDWARE INSTALLER PRIOR TO ROUGH-IN.

E10 PROVIDE ROUGH-IN FOR LONG RANGE DOOR OPERATOR

TAGGED NOTES

- E11 PROVIDE ROUGH-IN FOR AUTOMATIC PLUMBING FIXTURE. COORDINATE FULLY WITH PLUMBING INSTALLER PRIOR TO ROUGH-IN. PROVIDE AND INSTALL TRANSFORMER ABOVE IN CEILING SPACE. CABLE CONNECTIONS TO PLUMBING FIXTURES SHALL BE ROUTED IN CONDUIT FROM TRANSFORMER. INSTALLATION METHOD SHALL BE REVIEWED WITH ELECTRICAL INSPECTOR PRIOR TO ROUGH-IN. E12 TRANSFORMER TO BE WALL MOUNTED ABOVE OTHER EQUIPMENT.
- E39 CONNECTION FOR FIRE ALARM CONTROL PANEL. E40 CONNECTION FOR PROJECTION SCREEN. CONTROLS PROVIDED BY AV INTEGRATION. REFER TO SERIES T500 SHEETS FOR ADDITIONAL INFORMATION
- E41 200A, 3-PH, 110A FUSED, NEMA 1 RATED DISCONNECT FEEDING TRANSFORMER 'TB1'. REFER TO ELECTRICAL ONE-LINE FOR ADDITIONAL INFORMATION. E52 PROVIDE MOTOR RATED SWITCH FOR TRAP PRIMER CONNECTION.
- E54 CONTINUE CIRCUIT TO RM A110. E55 CONTINUE CIRCUIT TO RM A118.
- E68 PROVIDE 120V POWER FROM CIRCUIT A1-38 FOR LIGHTING
- CONTROLS EQUIPMENT. COORDINATE EXACT LOCATION WITH LIGHTING CONTROLS INSTALLER PRIOR TO ROUGH-IN. E73 PROVIDE ONE (1) 650VA, 120V, 8 OUTLET UNITERRUPTABLE POWER SUPPLY (UPS) FOR EACH WORKSTATION IN OFFICE AREA. TYPICAL
- OF EVERY PRIVATE AND OPEN OFFICE SHOWN ON THIS SHEET. E78 RECEPTACLE SHALL BE MOUNTED AT 12" A.F.F.





TAGGED NOTES E32 PROVIDE NEMA 3R RATED SWITCH FOR FAN. PROVIDE POWER FROM LIGHTING CIRCUIT IN ROOM FAN SERVES.
E34 PROVIDE UNISTRUT SUPPORT FOR RECEPTACLE.

<u>KEY PLAN</u>

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ELECTRICAL DEMOLITION NOTES

- A DOTTED LINES INDICATE ITEMS FOR REMOVAL (UON) AND SOLID HALFTONE LINES INDICATE EXISTING ITEMS TO REMAIN. B THE CONTRACTOR SHALL MAINTAIN THE CONTINUITY OF EXISTING CIRCUITS THAT CONTAIN DEVICES OR
- EQUIPMENT THAT ARE TO REMAIN. WHEN DEMOLITION OF AN ELECTRICAL DEVICE (OR CIRCUIT) IS INDICATED ON THE DRAWINGS: THE CONTRACTOR SHALL ENSURE THAT OTHER DEVICES OR EQUIPMENT "UPSTREAM" OR "DOWNSTREAM" ON THE CIRCUITS SHALL REMAIN IN "PRE- DEMOLITION" WORKING ORDER. "LEFT-OVER" CIRCUIT BREAKERS SHALL REMAIN, BE SWITCHED TO OFF POSITION, AND BE LABELED AS SPARES IN THEIR PANELS. PROVIDE NEW TYPEWRITTEN DIRECTORIES FOR ALL PANELS AFFECTED.
- C LOCATIONS OF DEVICES, CONNECTIONS, ETC., INDICATED ON THIS DRAWING WERE TAKEN FROM VARIOUS SOURCES. THEY ARE DIAGRAMMATIC ONLY AND ARE SUBJECT TO VARIATION FROM EXISTING CONDITIONS. CERTAIN EXISTING ELEMENTS MAY NOT BE INDICATED AT ALL. THE CONTRACTOR PROPOSING TO DO ANY PART OF THE WORK INDICATED HEREON SHALL VISIT THIS SITE AND DETERMINE TO HIS SATISFACTION THAT THEY MAY COMPLETE ALL WORK REQUIRED FOR THE BID WHICH HE PROPOSES.
- D REMOVE ALL ASSOCIATED BACKBOXES, CONDUIT AND CONDUCTORS FOR DEVICES / FIXTURES / ETC. BEING REMOVED (BACK TO SOURCE), WHETHER INDICATED OR NOT (UON). CONTRACTOR SHALL PATCH AND REPAIR ANY EXISTING WALLS, FLOORS OR CEILINGS WHERE DEVICES ARE SHOWN TO BE REMOVED (PATCH AND REPAIR TO RECEIVE NEW FINISHES - SEE ARCHITECTURAL PLANS).
- E COORDINATE DISPOSAL OF ALL FIXTURES, DEVICES, ETC. (INDICATED FOR DEMOLITION) WITH OWNER. TURN OVER ITEMS REMOVED TO OWNER AT THEIR OPTION. F COORDINATE WITH OTHER TRADES FOR THE REMOVAL AND/OR RELOCATION OF ELECTRICAL DEVICES AND CONNECTIONS ASSOCIATED WITH THEIR EQUIPMENT.
- G PROVIDE TEMPORARY EMERGENCY EXIT LIGHTS AT CONSTRUCTION BARRIERS AS REQUIRED. H CONTRACTOR SHALL PATCH AND REPAIR ALL EXISTING WALLS / CEILINGS AS REQUIRED WHERE DEVICES ARE BEING REMOVED OR INSTALLED.
- I UNUSED/ABANDONED CONDUCTORS DISCOVERED ABOVE ACCESSIBLE CEILINGS SHALL BE REMOVED IN ACCORDANCE WITH NEC REQUIREMENTS. J EXISTING ELECTRICAL SYSTEMS IN CONFLICT WITH CONSTRUCTION SHALL BE RELOCATED TO PERMIT INSTALLATION OF DEVICES AND EQUIPMENT SHOWN ON PLANS.
- K CONTRACTOR SHALL SEAL ALL EXISTING AND NEW PENETRATIONS OF BUILDING ENVELOPE (EXTERIOR WALLS, ROOF, ETC.) WATER-TIGHT AND AS APPROVED BY ARCHITECT AND ENGINEER, ROOFING SHALL BE RESTORED BY A LICENSED ROOFING CONTRACTOR BASED ON WRITTEN INSTRUCTIONS AND DETAILS FROM ROOFING MANUFACTURER AS REQUIRED TO MAINTAIN ROOF WARRANTY. REFER TO ARCHITECTURAL AND ENGINEERING PLANS AND SPECIFICATIONS FOR FURTHER REQUIREMENTS.
- L DEVICES INDICATED WITH AN "R" SHALL BE RELOCATED. REMOVE, PROTECT, AND REINSTALL IN NEW LOCATION INDICATED ON NEW WORK PLANS. INTERCEPT AND EXTEND ALL EXISTING CABLING TO NEW LOCATION. CLEAN AND RE-LAMP RELOCATED LUMINAIRES. M ALL EXISTING PANELS AFFECTED BY THIS CONTRACTOR'S WORK SHALL BE PROVIDED WITH NEW
- TYPE-WRITTEN PANEL DIRECTORIES AND INSERT SLEEVES. PANEL DIRECTORIES SHALL NOT USE ROOM NAMES OR NUMBERS FROM THESE DRAWINGS. DIRECTORIES SHALL BE DETAILED AND COORDINATED WITH OWNER'S SUITE NUMBERS, FINAL ROOM NUMBERS, IT RACK NAMES, WORKSTATION DESIGNATIONS, ETC. UNUSED BREAKERS SHALL BE IN OFF POSITION.
- N CONTRACTOR TO VERIFY THAT THERE ARE NO ELECTRICAL CIRCUITS IN CHASES BEING REMOVED UNDER DEMOLITION WHICH REMAIN IN SERVICE AND CANNOT BE REMOVED. SHOULD SUCH CIRCUITS BE ENCOUNTERED, THE CONTRACTOR IS TO REROUTE AND RECONNECT AS REQUIRED TO MAINTAIN SERVICE.

TAGGED NOTES

UE9	EXISTING COMMUNICATIONS DUCTBANK TO FACILITY OUT-BUILDINGS. EXISTING DUCTBANK SHALL REMAIN AND BE PROTECTED DURING CONSTRUCTION.
UE12	EXISTING UNDERGROUND COMMUNICATIONS LINE SHALL REMAIN AND BE PROTECTED DURING CONSTRUCTION.
UE16	EXISTING PAD MOUNTED GENERATOR. GENERATOR TO BE MOVE STORED AND PROTECTED DURING CONSTRUCTION PRIOR TO EXISTING CONCRETE PAD DEMOLITION. GENERATOR SHALL BE PLACED IN SAME LOCATION ON NEW CONCRETE PAD. REFER TO DETAIL 1/EU500 FOR ADDITIONAL INFORMATION.
UE20	EXISTING UTILITY PAD MOUNTED TRASNFORMER. TRANSFORMER WILL BE MOVED BY PRINCETON ELECTRIC PLANT BOARD PRIOR T EXISTING PAD DEMOLITION AND RELOCATED TO THE SAME LOCATION ON THE NEW PAD.
UE21	EXISTING 48-STRAND BACKBONE FIBER OPTIC CABLE FOR THE SHOP BUILDING ROUTED IN EXISTING UNDERGROUND DUCTBANK CABLING EXTENDS FROM SHOP BUILDING TO TRAILER 'B'.
UE23	DEMOLISH EXISTING UNDERGROUND CONDUIT BACK TO ECHH-#0
UE24	EXISTING SECONDARY FEEDERS AND BRANCH CIRCUIT CONDUIT AND WIRING SHALL BE REMOVED. ANY SECONDARY FEEDERS CONNECTED TO THE EXISTING TRANSFORMER AND/OR CENERATOR SHALL BE DISCONNECTED AD REMOVED

GENERATOR SHALL BE DISCONNECTED AD REMOVED.

SITE UTILITIES LEGEND		
	EXISTING, DEMOLITION, NEW WORK	
	HANDHOLE - COMMUNICATIONS	
OP	OVERHEAD PRIMARY	
OS	OVERHEAD SECONDARY	
OSL	OVERHEAD LIGHTING CIRCUITRY	
UP	UNDERGROUND PRIMARY	
US	UNDERGROUND SECONDARY	
USL	UNDERGROUND LIGHTING CIRCUITRY	
UC	UNDERGROUND COMMUNICATIONS	
EUC	EXISTING UNDERGROUND COMMUNICATIONS	
UTV	UNDERGROUND CATV	

UTILITY COMPANY CONTACTS:				
POWER:				
PRINCETON ELECTRIC PLANT BOARD	CHRIS BURTON	270.365.2031		
TELEPHONE:				
PRINCETON ELECTRIC PLANT BOARD	COREY PHILLIPS	270.836.0270		
WATER SEWER:				
PRINCETON WATER & WASTE WATER	DAVID COTTON	270.365.9301		
<u>GAS</u> :		/		
ATMOS ENERGY		270.365.5514		
FIRE CHIEF:				
FIRE DEPARMENT	BRENT FRANCIS	270.365.2022		



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ELECTRICAL SITE NOTES

- A DO NOT SCALE FROM MECHANICAL AND ELECTRICAL DRAWINGS. FIELD VERIFY REQUIRED DIMENSIONS AND COORDINATE WITH CIVIL DRAWINGS AND SURVEYS.
- B REFER ALSO TO ALL OTHER PLANS AND THE SPECIFICATION, BUT ESPECIALLY TO: THE SITE SURVEY, THE ARCHITECTURAL SITE PLAN, THE SITE GRADING PLAN, THE PLANTING PLAN (WHERE AVAILABLE), FOUNDATION PLAN(S), APPROPRIATE MECHANICAL & ELECTRICAL FLOOR PLANS FOR SERVICE CONTINUATIONS, THE SITE UTILITY PLAN - MECHANICAL & ELECTRICAL. WHERE THERE ARE CONFLICTS AMONG THESE PLANS AND/OR RELATED SPECIFICATIONS, ADVISE THESE ENGINEERS AT LEAST TEN DAYS PRIOR TO SUBMISSION OF
- C ALL FEES AND ANY OTHER COSTS TO UTILITY COMPANIES, MUNICIPALITIES, INSPECTORS, REVIEWING AGENCIES, ETC. ARE TO BE INCLUDED AS A PART OF THIS CONTRACT. FEDERAL, STATE, LOCAL, MUNICIPALITY AND UTILITY COMPANY
- CODES, RULES, REGULATIONS AND REQUIREMENTS APPLY UNLESS EXCEEDED BY THIS DESIGN. WHEN INTERRUPTION OF AN EXISTING UTILITY OR SERVICE IS
- PLANNED OR OCCURS ACCIDENTALLY, THE CONTRACTOR(S) SHALL WORK CONTINUOUSLY AS NEEDED TO RESTORE SAME PROVIDING PREMIUM TIME AS NEEDED AT NO INCREASE IN THE CONTRACT PRICE. F LOCATIONS, DEPTHS, MATERIAL TYPES, ELEVATIONS, ETC. OF ALL
- APPURTENANCES, LINES, BUILDINGS, ETC. INDICATED ON THESE DRAWINGS WERE TAKEN FROM VARIOUS SOURCES, ARE DIAGRAMMATIC ONLY AND ARE SUBJECT TO SUBSTANTIAL VARIATION FROM EXISTING CONDITIONS, EXISTING UTILITIES LOCATIONS MAY VARY. CONSEQUENTLY ALL CONTRACTORS SHALL EXERCISE EXTREME CARE IN THE COURSE OF THEIR WORK SO AS TO ENSURE THAT THEY DO NOT INTERRUPT ANY EXISTING SERVICE. FOR SAFETY PURPOSES, PAY PARTICULAR ATTENTION TO THIS PRECAUTION RELATIVE TO NATURAL GAS AND ELECTRICAL LINES. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH ALL FEDERAL. STATE. AND/OR LOCAL RULES, REGULATIONS, STANDARDS AND SAFETY REQUIREMENTS.
- G PROVIDE LONG RADIUS ELBOWS FOR UNDERGROUND CONDUIT BENDS. WHERE SERVING A UTILITY OWNED TRANSFORMER, THE UTILTY STANDARDS SHALL TAKE PRECEDENCE. H UTILITIES SHALL BE INSTALLED IN ACCORDANCE WITH THE
- APPLICABLE MUNICIPALITY OR UTILITY COMPANY STANDARDS. IN ALL CASES, THE MOST STRINGENT REQUIREMENT SHALL APPLY. IF ANY VARIATION OCCURS, CONSULT THE ENGINEER. CONTRACTOR SHALL VISIT THE SITE AND FIELD VERIFY THE ROUTING OF ALL UTILITIES NEW AND EXISTING PRIOR TO SUBMISSION OF BIDS. SUBMISSION OF A BID PROPOSAL INDICATES THAT THE CONTRACTOR IS FULLY AWARE OF ALL OBSTRUCTIONS AND WILL INSTALL ALL OF THE NEW UTILITIES WITHOUT REQUESTS FOR ANY ADDITIONAL CHANGES. I PROVIDE GALVANIZED RIGID CONDUIT FOR EXTERIOR UNDERGROUND TRANSITIONS TO ABOVE GRADE; EXTEND CONDUIT A MINIMUM OF 6"
- ABOVE GRADE. J CONTRACTOR SHALL PERFORM A SMOKE TEST ON ALL CONDUITS INSTALLED ON SITE AND SHALL TAKE ALL NECESSARY CORRECTIVE ACTION IF NOT FOUND IN COMPLIANCE WITH FACILITY STANDARDS.
- K CONTRACTOR SHALL CONTACT ENGINEER FOR INSPECTION OF TRENCHES PRIOR TO INSTALLATION OF CONDUITS OR RACEWAYS. PROVIDE PHOTOS UPON REQUEST. L CONTRACTOR SHALL CUT AND PATCH ALL PAVEMENT, CURBING, ETC.
- AS REQUIRED FOR WORK. CONTRACTOR SHALL REPAIR ALL LANDSCAPING THAT IS DAMAGED FOR WORK. FINISH GRADE, SEED AND STRAW ALL DISTURBED GREEN SPACES. ALL PATCH AND REPAIR WORK SHALL BE IN ACCORDANCE WITH BOTH CIVIL AND LANDSCAPE DRAWINGS AND SPECIFICATIONS.
- M COORDINATE UNDERGROUND ELECTRICAL WITH ALL LANDSCAPING AND FENCING, ADJUST ELECTRICAL LINES TO AVOID CONFLICTS. REFER TO LANDSCAPING PLANS FOR FURTHER INFORMATION. AVOID ROUTING UNDERGROUND CONDUITS UNDER ROADWAYS OR PARKING LOTS, CROSS ROADWAYS WITH UNDERGROUND CONDUITS AT 90 ANGLES WHERE POSSIBLE.
- N PLANNED INTERRUPTION OF ANY SERVICE SHALL BE COORDINATED WITH THE APPROPRIATE MUNICIPALITY OR UTILITY COMPANY, THE ARCHITECT, AND THE BUILDING OPERATORS AT LEASTE ONE WEEK IN ADVANCE OF ANTICIPATED INTERRUPTION. A SCHEDULE FOR THESE OUTAGES SHALL BE DEVELOPED AND AGREED UPON BETWEEN THE PARTIES MENTIONED TO AVOID UNNECESSARY INCONVENIENCE TO THE OWNER OR ANY AFFECTED PARTY. NOTIFY THE UTILITY COMPANY OF ANY ANTICIPATED SERVICES REQUIRED FROM THEM AT LEAST TWO WEEKS IN ADVANCE IN WRITING AND INSURE THAT THEY
- DO NOT DELAY WORK. O THE LOCATIONS OF UTILITIES SHOWN WITHIN THESE DRAWINGS ARE APPROXIMATE ONLY. P THE CONTRACTOR WILL BE RESPONSIBLE FOR ANY EXCAVATION WORK REQUIRED TO LOCATE UNDERGROUND UTILITIES. THE
- CONTRACTOR IS ALSO REQUIRED TO NOTIFY ANY OTHER AFFECTED UTILITY OWNERS PRIOR TO DIGGING. IN THE EVENT OF ACCIDENTAL INTERRUPTION OF SERVICE, CONTRACTOR WILL IMMEDIATELY NOTIFY THE OTHER UTILITY OWNERS. Q THE CONTRACTOR WILL PROVIDE ALL NECESSARY PROTECTIVE
- MEASURES TO SAFEGUARD OTHER EXISTING UTILITIES FROM DAMAGE DURING CONSTRUCTION OF THIS PROJECT. IN THE EVENT THAT SPECIAL EQUIPMENT IS REQUIRED TO WORK OVER AND AROUND THE OTHER UTILITIES. THE UTILITY WILL BE REQUIRED TO FURNISH SUCH EQUIPMENT.
- R CONTRACTOR SHALL PAY ALL TAP FEES, UTILITY COST, UTILITY CONNECTION COSTS, METER FEES, EXTENSION AND DEVELOPMENT CHARGES. REFER TO THE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

S THE UTILITY WILL PROVIDE STAKING DATA INCLUDING NORTHING AND EASTING DATA AS REQUIRED OR SHOWN ON DRAWINGS.

SITE UTILITIES LEGEND

	EXISTING, DEMOLITION, NEW WORK
□Снн	HANDHOLE - COMMUNICATIONS
OP	OVERHEAD PRIMARY
OS	OVERHEAD SECONDARY
OSL	OVERHEAD LIGHTING CIRCUITRY
UP	UNDERGROUND PRIMARY
US	UNDERGROUND SECONDARY
USL	UNDERGROUND LIGHTING CIRCUITRY
UC	UNDERGROUND COMMUNICATIONS
EUC	EXISTING UNDERGROUND COMMUNICATIONS
UTV	UNDERGROUND CATV

UTILITY COMPANY CONTACTS:		
POWER:		
PRINCETON ELECTRIC PLANT BOARD	CHRIS BURTON	270.365.
TELEPHONE:		
PRINCETON ELECTRIC PLANT BOARD	COREY PHILLIPS	270.836.
WATER SEWER:		
PRINCETON WATER & WASTE WATER	DAVID COTTON	270.365.
GAS:		
ATMOS ENERGY		270.365.
FIRE CHIEF:		
FIRE DEPARMENT	BRENT FRANCIS	270.365.
IT IS THE CONTRACTORS RESPONSIBIL	LITY TO MEET ALL LOCAL ORDINA	NCE AND MUNICI







\checkmark				$\overline{}$		$\frown \frown$	\sim	\frown
	ELEC - EXTERIOR LUI	MINAIRE SCHE	DULE					
	BASIS OF DESIGN	EQUALS	LAMPS / CCT	MINIMUM LUMENS	MOUNTING	MAXIMUM WATTAGE	VOLTAGE	REMARK









0-

FIRE PROTECTION GENERAL NOTES:

- A. FIRE PROTECTION PIPING TO BE PROVIDED ABOVE AND BELOW CLOUD CEILINGS. REFER TO ARCHITECTURAL DRAWINGS FOR
- COORDINATION OF CLOUD CEILINGS. B. REFER TO STRUCTURAL DRAWINGS, DETAIL FOR
- REQUIREMENTS OF HANGING FROM JOISTS. C. REFER TO ARCHITECTURAL PLANS FOR ALL RATED WALLS.

TAGGED NOTES

REQUIREMENTS. COORDINATE INSTALLATION OF PIPES AND SPRINKLER HEADS WITH NEW CEILING, DUCTWORK, LIGHTS, AND OTHER TRADES. REFER TO ARCHITECT'S REFLECTED CEILING PLANS FOR CEILING LAYOUT. PROVIDE SEMI-RECESSED SPRINKLER HEADS IN ALL AREAS WITH NEW CEILINGS. F2 FIRE PROTECTION ENTRANCE RISER. REFER TO SHEET FP300 FOR DETAILS. F3 REFER TO SITE UTILITY PLAN FOR CONTINUATION. FIRE PROTECTION MAINS TO ROUTE UNDER FOOTER AT PROPOSED INVERT ELEVATION OF 524.4. SLEEVE AND BACKFULL PER STRUCTURAL REQUIREMENTS. REFER TO DETAILS. (B13) (B14) F6 PROVIDE BACKFLOW PREVENTER AND 4" MAIN TO FIRE DEPARTMENT CONNECTION UPSTREAM OF SYSTEM RISERS. REFER TO FIRE PROTECTION ENTRANCE DETAIL FOR ADDITIONAL INFORMATION. F7 PROVIDE FREEZE-PROOF HEADS IN COOLER/FREEZER. F8 PROVIDE ELECTRONIC ALARM BELL AT BUILDING EXTERIOR PER P ZONE 2 NFPA REQUIREMENTS. COORDINATE POWER WITH ELECTRICIAN. F9 PROVIDE PROTECTIVE CAGE FOR SPRINKLER HEADS TO AVOID ACCIDENTAL DAMAGE. F10 COORDINATE SPRINKLER HEAD PLACEMENT WITH OVERHEAD DOOR. REFER TO ARCHITECTURAL DRAWINGS. SPRINKLER HEADS SHOULD PROVIDE 100% COVERAGE PER NFPA13. F12 PROVIDE PRE ACTION TYPE FIRE PROTECTION SYSTEM PER NFPA FOR AREA INDICATED. REFER TO PROJECT SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS. JEFICE Z Bi118€ B135 OFFICE BOSF B137 FP ZONE 3 0 0 0





COORDINATE REQUIRED FIRE STOPPING ACCORDINGLY.

〈## 〉 F1 IN THE OUTLINED AREA, PROVIDE A NEW 100% WET SPRINKLER COVERAGE SYSTEM AS REQUIRED TO MEET NFPA-13

-(CB)

-00

-CD

-CF

-CG

—(CH)



MECHANICAL CONTROL LEGEND

AFF AFMS AI AO BAS	ABOVE FINISHED FLOOR AIR FLOW MONITORING STATION ANALOG INPUT	SETPT SF	SETPOINT
AFMS AI AO BAS	AIR FLOW MONITORING STATION ANALOG INPUT	SF	
AI AO BAS	ANALOG INPUT		SUPPLY FAN
AO BAS		SFA	SUPPLY FAN ARRAY
BAS	ANALOG OUTPUT	STS	STATUS
	BUILDING AUTOMATION SYSTEM	SW	SOFT WATER
BP	BOOSTER PUMP	TCC	TEMPERATURE CONTROL CONTRA
CCF	100 CUBIC FEET NATURAL GAS	TEMP	TEMPERATURE
CMD	COMMAND	U/C	UNOCCUPIED COOLING SETPOINT
CO2	CARBON DIOXIDE	U/H	UNOCCUPIED HEATING SETPOINT
CR	CONDENSER RETURN	VFD	VARIABLE FREQUENCY DRIVE
CS	CONDENSER SUPPLY	Та	AVERAGING TEMPERATURE SENS
CSR			INSERTION TEMPERATURE SENSO
CWIS			
		Н	HUMIDITY SENSOR
		h	ENTHALPY SENSOR
			LOW LIMIT TEMPERATURE SENSO
DPR	DAMPER	P	PRESSURE SENSOR
EA	EXHAUST AIR PATH		
FBD	FACE AND BYPASS DAMPER		DUCT STATIC PRESSURE SENSOR
HL	HIGH LIMIT	DPSW	DIFFERENTIAL PRESSURE SWITCH
HP	HEAT PUMP	ES	DAMPER END SWITCH
HR	HEAT PUMP RETURN		
HS	HEAT PUMP SUPPLY	UPS	DIFFERENTIAL PRESSURE SENSO
HWR	HOT WATER RETURN	С	START/STOP COMMAND
HWS	HOT WATER SUPPLY		
LL	LOW LIMIT		MOTORIZED DAMPER
LPC	LOW PRESSURE CONDENSATE	F	FLOW METER
LPS	LOW PRESSURE STEAM	CS	CURRENT SENSOR
MAT	MIXED AIR TEMPERATURE	SD	DUCT MOUNTED SMOKE DETECTO
MAU	MAKE-UP AIR UNIT		CONDENSATE OVERELOW SWITCH
MIN	MINIMUM		
NSW	NON-SOFTENED WATER		DUCT STATIC PRESSURE HIGH LIW
NC	NORMALLY CLOSED	DSP-LL	DUCT STATIC PRESSURE LOW LIMI
O/C	OCCUPIED COOLING SETPOINT	_ZN-DP	ZONE DEW POINT
O/H	OCCUPIED HEATING SETPOINT	ZN-OCC	ZONE OCCUPANCY SENSOR
OA	OUTSIDE AIR PATH	ZN-T	ZONE TEMPERATURE - 48" AFF
OAD	OUTSIDE AIR DAMPER	Н	HEATING COIL
OAH	OUTSIDE AIR HUMIDITY		
OAT	OUTSIDE AIR TEMPERATURE	(Co2)	CARBON DIOXIDE SENSOR
000	OCCUPANCY	C	CHILLED WATER COIL
OVR	OVERRIDE VIA USER INTERFACE		
PRESS	PRESSURE	E R	ENERGY RECOVERY COIL
RA	RETURN AIR PATH		HUMIDIFIER
RF	RETURN FAN		
RH	RELATIVE HUMIDITY		
SA	SUPPLY AIR PATH		



Image: Sector of the sector	MISCELLANEOUS CONTROLS LOCATION: AREA SERVED: OCCUPIED/UNOCC	CUPIED	
LOCAL OA TEMP/HUMIDITY IT/ELECT TEMPERATURE MONITORING WALK-IN COOLER/FREEZER TEMPERATURE MONITORING OA TEMP SPACE TEMP COOLER TEMP OA HUMIDITY ALARM - HIGH TEMP FREEZER TEMP OA CO2 ALARM - LOW TEMP COOLER ALARM FREEZER ALARM FREEZER ALARM FREEZER ALARM	Ts H Cs	Ts	Ts
OA TEMP SPACE TEMP COOLER TEMP OA HUMIDITY ALARM - HIGH TEMP FREEZER TEMP OA CO2 ALARM - LOW TEMP COOLER ALARM FREEZER ALARM FREEZER ALARM MISCE	LOCAL OA TEMP/HUMIDITY	IT/ELECT TEMPERATURE MONITORING	WALK-IN COOLER/FREEZER
OA HOMIDITY ALARM - HIGH TEMP FREEZER TEMP OA CO2 ALARM - LOW TEMP COOLER ALARM FREEZER ALARM FREEZER ALARM MISCE		SPACE TEMP	COOLER TEMP
OA CO2 ALARM - LOW TEMP COOLER ALARM FREEZER ALARM FREEZER ALARM		ALARM - HIGH TEMP	FREEZER TEMP
<u>MISCE</u>	OA CO2	ALARM - LOW TEMP	
MISCE			FREEZER ALARM
			MISCE

MISCELLANEOUS CONTROL SEQUENCE OF OPERATION

- sensor output shall be set up with a calibration alarm should the CO2 sensor reading the outside range of 300 to 500 PPM. 2. IT/Elect Temperature Monitoring: Mini-Split units to operate on their own controls. Provide temperature control wiring between indoor unit and outdooor unit per manufacturer
- temperature exceeds 79°F (adj) or fall below 64°F (adj) send alarm to BAS. 3. Walk-in Cooler/Freezer Temperature Monitoring: provide monitoring of walk-in cooler and walk-in freezer. Refer to controls specification for required immersion type cooler
- and freezer temperature sensor. If freezer temperature rises above 5°F (adj) or cooler temperature rises above 40°F (adj), send alarm to BAS. Cooler/freezers come with control interface. Provide data connection to building management system and pull in all available points and alarms. 4. <u>Domestic Water Usage</u>: Provide inline water meter to monitor flow and record water usage of building. Monitor total gallons per day as well as overall average annual gallons per day number. In the event that daily total gallons per day exceeds the annual average daily total gallons per day by more than 50%, provide water leak alarm notice to
- building operator. 5. Natural Gas Usage: Provide inline gas meter to monitor flow of natural gas to building. Natural gas meter shall monitor total CCF usage per day as well as overall average CCF/day for each month of the year. Should the daily average CCF usage exceed the overall average ccf/day by more than 50% for the applicable month, send a natural gas energy notice to the building operator. 6. Building Electrical Usage: Electrical gear provided with overall energy meter. Interface with overall energy use output and pull daily consumption and demand values into
- control system. System shall have trends for both the daily total KWH as well as the daily peak Demand. System shall also calculate the average demand per day per month and the average consumption per day per month. Should the average consumption or demand per day exceed the value for the average demand/consumption / day / month by more than 50% for the applicable month, send an electrical energy notice to the building operator. . Safety Station Monitoring: Each safety station is specified with a visual/audibel alarm shipped loose for installation in the field. Alarm contains leads for remote monitoring.
- Control system shall monitor each safety station location (refer to drawings) throughout and provide alarm in the event of activation. Generator Monitoring: Existing building generator has a building controls interface. Provide new control wiring to existing generator and pull in all available points. Coordinate final list of available points with generator manufacturer. Generator is equipped with a load shedding system controller. BAS system to provide interface with load-shedding controller and provide input as noted within control sequences. In addition to the integration required above, provide hardwired points from dry contacts on generator for generator status, generator trouble and ATS status

A. CONTROL GRAPHICS REQUIREMENTS SHOWN FOR REFERENCE ONLY, ALL GRAPHICS SHALL BE PROVIDED BY OWNER VIA TRIDIUM PLATFORM. REFER TO PROJECT SPECIFICATIONS. THE CONTROLS CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL POINTS. NAMED AS PER THIS SPECIFICATION AS REQUIRED TO ASSIST OWNER IN GENERATION OF ALL REQUIRED GRAPHICS. THE CONTROLS CONTRACTOR SHALL ASSIST OWNER IN MAPPING ALL POINTS, MATCHING ALL STATUSES, AND TROUBLESHOOTING GRAPHICS VIA PROJECT

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B. SETPOINTS & SOFT SETBACK: EACH UNIT USED FOR SPACE CONDITIONING SHALL, ON THE GRAPHIC, SHOW CURRENT HEATING AND COOLING SETPOINT, UNOCCUPIED AND OCCUPIED HEATING AND COOLING SETPOINT, AND TIME FOR WHICH SPACE SHALL CHANGE STATUS (IE. FROM OCCUPIED TO UNOCCUPIED OR UNOCCUPIED TO OCCUPIED). THESE SETPOINTS SHALL BE ADJUSTABLE ON THE GRAPHIC PAGE. ALL TEMPERATURE ADJUSTMENT VALUES (TEMPERATURE RESETS, DEMAND LIMITING, OCCUPANT ADJUST, ETC.) SHALL BE SHOWN ON THE TRENDS ON GRAPHICS: ALL TRENDED POINTS SHALL BE MADE AVAILABLE THROUGH THE GRAPHICAL INTERFACE. D. SAMPLES FOR REVIEW: PROVIDE A SAMPLE OF EACH FOR REVIEW WITH SUBMITTALS OR UNDER SEPARATE E. ANIMATION LINKED TO STATUS. ANY ANIMATION SUCH AS FLOWING PIPE ARROWS SHALL BE LINKED TO THE STATUS OF THE EQUIPMENT. FOR EXAMPLE, DO NOT SHOW MOVING PIPE ARROWS FOR PUMPS THAT ARE OFF. COLORS: USE BACKGROUND COLOR AS DIRECTED BY CMTA (WHITE OR BLACK). G. ALARMS: EQUIPMENT GRAPHICS PAGE SHALL HAVE SECTION THAT CLEARLY DISPLAYS ANY SYSTEM RELATED H. GRAPHICS SHALL HAVE ROOM NAMES, ROOM NUMBERS, AND UNIT DESCRIPTORS SHOWN. THE GRAPHICS SHALL SHOW OUTSIDE AIR TEMPERATURE AND THE CURRENT FACILITY ELECTRIC DEMAND LEVEL (KW). BOUNDARIES SHALL BE DEPICTED OF WHAT UNITS SERVE WHICH AREAS. COLOR CODEING OR BOUNDARY OUTLINE OR OTHER APPROVED METHOD. CMTA SHALL BE PROVIDED WITH AN EXAMPLE AND APPROVE THE METHOD USED. GRAPHICS SHALL INCLUDE SECTION THAT CLEARLY DISPLAYS CURRENT ALARMS WITH LINK TO ASSOCIATED

ALL POINTS LISTS WITHIN THIS DOCUMENT INCLUDE THE DESIGNATIONS AV AND BV. THESE REPRESENT ANALOG VALUES AND BINARY VALUES RESPECTIVELY. THESE DESIGNATIONS

A. IF EQUIPMENT IS FUNISHED WITH A FACTORY BACNET CONTROLLER, ALL AVAILABLE POINTS ARE BROUGHT IN THROUGH INTEGRATION BY CONTROLS CONTRACTOR. POINTS ALL FUNCTION AS SOFTWARE POINTS EVEN IF SENSOR REQUIRE TO BE FIELD INSTALLED AND WILL ALL BE DESIGNATED AS VIRTUAL POINTS. AV/BV SENSORS WILL BE FURNISHED WITH THE EQUIPMENT, UNLESS OTHERWISE NOTED. CONFIRM AVAILABLE POINTS AND CONFIGURATION WITH CMTA UPON EQUIPMENT SELECTION. B. IF EQUIPMENT IS FURNISHED WITH A TERMINAL STRIP FOR CONNECTION TO A THIRD PARTY CONTROLLER BY THE CONTROLS CONTRACTOR, THE INPUTS AND OUTPUTS FUNCTION AS HARDWARE POINTS WHILE THE VIRTUAL POINTS FUNCTION AS SOFTWARE POINTS. CONFIRM AVAILABLE POINTS AND CONFIGURATION WITH CMTA C. PLEASE NOTE FOR FACTORY-IMPORTED ALARMS, THE GRAPHICS SHALL BE PROGRAMMED SUCH THAT IN THE EVENT OF AN ALARM, BOTH AN ALARM CODE AS

CONTROL RISER GENERAL NOTES:

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A. ALL WORKS SHALL BE PERFORMED IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL CODES. CONTROLS CONTRACTOR SHALL PROVIDE ALL PERMITS AND APPLICABLE FEES REQUIRED. B. CONTROLS CONTRACTOR SHALL COORDINATE CONTROL POWER REQUIREMENTS FOR NEW AND REPLACEMENT CONTROLLERS AND CONTROL DEVICES. PROVIDE NEW KEYED LOCKABLE UL LISTED CONTROL CABINETS. D. PROVIDE NEW COMMUNICATION NETWORKS AS REQUIRED TO ACCOMPLISH THE SEQUENCE OF OPERATION FOR EACH DEVICE. E. CONTROLS CONTRACTOR SHALL ENSURE ALL BAS CONTROLLERS ARE COMMUNICATING PRIOR TO COMPLETION OF WORK. F. ALL EQUIPMENT TO BE CONNECTED TO NEW BACNET NETWORK

UNLESS OTHERWISE SPECIFIED BY CMTA. G. CONTROLS CONTRACTOR TO CONFIRM ALL EQUIPMENT COUNTS USING DESIGN MECHANICAL DRAWINGS. CONTROL RISER TAGGED NOTES: 1. PROVIDE NEW NETWORK ROUTER/JACE AS REQUIRED TO INTEGRATE

ALL POINTS WITH UNIVERSITY OF KENTUCKY FACILITY MANAGEMENT'S EXISTING BACNET HEAD-END SOFTWARE USING BACNET/IP. EACH MAJOR SYSTEM SHALL BE PROVIDED WITH ITS OWN INDEPENDENT JACE WITH IP CONNECTION TO NET WORK. REFER TO UK CONTROL SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS. 2. TEMPERATURE CONTROLS SUBCONTRACTOR IS RESPONSIBLE FOR INTEGRATION TO SUPERVISOR SERVER. 3. CONTROLS CONTRACTOR TO PROVIDE AND INSTALL OR INTEGRATE ALL NEW CONTROLLERS. 4. TYPICAL BACNET TRUNK SHOWN FOR REFERENCE ONLY. CONTROLS

CONTRACTOR TO PROVIDE SYSTEM ARCHITECTURAL DRAWING IN SUBMITTAL, ALL SYSTEM ARCHITECTURE MUST CONFORM TO UNIVERSITY OF KENTUCKY'S AUTOMATIC TEMPERATURE CONTROL SPECIFICATION. FOR THE PURPOSES OF BIDDING, PROVIDE 16 SEPARATE IP CONNECTIONS FOR MAJOR SYSTEMS TO NETWORK AS INDICATED 5. ALL TIER 2 AND OTHER SYSTEMS SHALL COMMUNICATE WITH THE UNIVERSITY OF KENTUCKY FACILITY MANAGEMENT'S EXISTING BACNET HEAD-END SOFTWARE USING BACNET/MSTP. NO SERVERS SHALL BE USED FOR COMMUNICATION TO CONTROLLERS INSTALLED UNDER THIS SECTION. REFER TO CONTROLS SPECIFICATIONS FOR

EQUIPMENT SCHEDULING REQUIREMENTS:

EQUIPMENT SCHEDULES:

EVERY SYSTEM SHALL OPERATE ACCORDING TO A USER DEFINABLE SCHEDULE. COORDINATE FINAL SCHEDULES AND GROUPS WITH CMTA PRIOR TO IMPLEMENTATION. COORDINATE FINAL SCHEDULING CAPABILITY WITH OTHER BID REQUIREMENTS.

ORMAL SCHEDULE - THESE ARE THE BASIC NORMAL WEEKLY SCHEDULES THAT ARE ENTERED AND RETAINED. THESE MAY BE PUT IN AT ANY LEVEL CHOSEN BY THE USER (EQUIPMENT, ZONE, BUILDING, ETC) AND MUST BE ADJUSTABLE. AN ADJUSTABLE STAGED OR OPTIMAL START ALGORITHM MUST BE INCLUDED TO ENABLE SPACES TO MEET NORMAL SCHEDULE OCCUPIED SETPOINT BY NORMAL SCHEDULE START TIME.

- HOLIDAY SCHEDULE THESE SCHEDULES PUT EQUIPMENT, ZONES, OR BUILDINGS IN UNOCCUPIED MODE WHILE "NORMAL" SCHEDULES REMAIN INTACT. WHEN THE BUILDING IS UNOCCUPIED OR OVER BREAKS. MANY TIMES. THESE ARE PUT IN AT THE DELTA-ROOM LEVEL VIA THE UNIVERSITY. COORDINATE WITH UNIVERSITY OF KENTUCKY DELTA ROOM. HOLIDAY TAKES PRIORITY OVER "NORMAL" SO THAT BUILDING/ZONES/EQUIPMENT OPERATE AS UNOCCUPIED.
- OVERRIDE SCHEDULES TURNS EQUIPMENT OR AREAS TO OCCUPIED MODE WHILE "HOLIDAY" OR "NORMAL" IS ETAINED. OVERRIDE TAKE PRIORITY OVER "HOLIDAY" AND "NORMAL" (ENTILATION SCHEDULE - THIS SCHEDULE SHALL CONTROL THE OPERATION OF THE SCHEDULED BUILDING
- EXHAUST FANS AND OUTSIDE AIR VENTILATION EQUIPMENT AND DAMPERS. THIS SCHEDULE SHALL CLOSE THE VENTILATION OFF AND TURN OFF THE BUILDING EXHAUST FANS DURING UNOCCUPIED PERIODS TO ENABLE BETTER TEMPERATURE AND HUMIDITY CONTROL. DURING THE SUMMER WHEN THE ECONOMIZER IS ENABLED, VENTILATION WILL BE ALLOWED.
- SNOW DAY OPERATION FUNCTIONALITY SHALL BE BUILT INTO THE CONTROLS TO ALLOW FOR THE OVERRIDE OF ALL SCHEDULES INTO AN UNOCCUPIED STATE DUE TO THE SUDDEN CANCELLATION OF SCHOOL OR SIMILAR EVENT. SYSTEM OVERRIDE SWITCHES SHALL REMAIN IN PLACE AS STATED IN EACH SYSTEMS CONTROL SEQUENCE TO ALLOW FOR ISOLATED SPACES TO BE PLACED IN OCCUPIED MODE DURING SCHEDULED UNOCCUPIED HOURS.
- SYSTEM SHALL HAVE ABILITY TO PUT A BUILDING, GROUP, OR PIECE OF EQUIPMENT INTO OVERRIDE. FOR XEXAMPLE, THIS WOULD APPLY TO TYPICAL HOLIDAY OPERATION, ALL SCHOOLS ARE TYPICALLY TURNED TO UNOCCUPIED VIA A HOLIDAY THAT OVERRIDES THE NORMAL SCHEDULE, HOWEVER, REMOTE BUILDING EVENTS MAY REQUIRE CERTAIN AREAS OR PIECES OF EQUIPMENT TO BE TURNED ON AT ANY GIVEN TIME IN THIS REMOTE BUILDING VS THE MAIN CAMPUS. THE OVERRIDE FUNCTION ALLOWS THESE TO BE TURNED ON. WHILE THE CAMPUS WIDE SUMMER HOLIDAY REMAINS IN FORCE FOR ALL OTHER BUILDINGS.
- BASE/DEFAULT TIME IN ALL SCHEDULES SHALL BE UNOCCUPIED. IF THERE IS NO EVENT. OR NO SCHEDULE. THE ITEM IS TO BE UNOCCUPIED. DO NOT REQUIRE THE USER TO PUT IN BOTH UNOCCUPIED TIME AND OCCUPIED TIME FOR SCHEDULES, ONLY OCCUPIED TIME IS TO BE INPUT BY USER. IF A PIECE OF EQUIPMENT IS TO BE OCCUPIED/ENABLED 24 HOURS PER DAY, THE SCHEDULE SHALL BE PUT IN AS 24 HOURS PER DAY. DO NOT CHANGE DEFAULT TO OCCUPIED.

BASE BUILDING GROUPS ARE AS FOLLOWS: RTU-1: CONFERENCE/ASSEMBLY AREA TU-2: OFFICE AREA

TU-3: MECHANIZED LAB TU-4: MUTLI-PURPOSE ROOM AHU-1: LABORATORY AREAS

SEE EXAMPLE SCHEDULE BELOW:

		BU	ILDING \$	SCHEDL	ILE	
SEMESTER	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
FALL	8AM-4PM	8AM-4PM	8AM-4PM	8AM-4PM	8AM-4PM	UNOCCUPIED
SPRING	8AM-4PM	8AM-4PM	8AM-4PM	8AM-4PM	8AM-4PM	UNOCCUPIED
SUMMER	8AM-4PM	8AM-4PM	8AM-4PM	8AM-4PM	8AM-4PM	UNOCCUPIED

OA T OA H DATE & TIME

%RH



CELLANEOUS CONTROL SCHEMATIC

M

BUILDING GAS METER

TOTAL CCF

F	ΟΙΝΤ Ι	lst	- MI	SCI	ELLA	ANE(OUS C	ONTROL		
POINT DESCRIPTION	BI	BO	BV	AI	AO	AV	OVR	ALARMS	GRAPHIC	-
COOLER C114 TEMP				Х				HIGH	Yes	
COOLER C118 TEMP				Х				HIGH	Yes	
DOMESTIC WATER USE				Х	Х			HIGH	Yes	
ELECTRICAL CONSUMPTION					Х			ENERGY NOTICE	Yes	
ELECTRICAL DEMAND				Х				ENERGY NOTICE	Yes	
FREEZER C116 TEMP				Х				HIGH	Yes	
GENERATOR (PULL IN ALL AVAILABLE POINTS)			Х			Х		ALL AVAILABLE	Yes	-
GENERATOR LOAD-SHEDDING CONTROLLER			Х			Х			Yes	-
IT - A111A TEMP				Х				HIGH/LOW	Yes	
IT - A117A TEMP				Х				HIGH/LOW	Yes	
IT - B151 TEMP				Х				HIGH/LOW	Yes	
IT - C121 TEMP				Х				HIGH/LOW	Yes	
NATURAL GAS USE				Х	Х			ENERGY NOTICE	Yes	
OUTSIDE AIR CO2 SENSOR				Х				CALIBRATION ERROR	Yes	
OUTSIDE AIR HUMIDITY				Х					Yes	
OUTSIDE AIR TEMPERATURE				Х					Yes	-
SAFETY STATION STS (TYP OF ALL - SEE PLANS)	X							SAFETY STATION ALM	Yes	

1. Local OA Temperature/Humidity Monitoring: Provide humidity CO2 and temperature monitoring of local outside air for use in building control system and sequences. CO2 requirements and wire/mount unit temperature sensor. Additionally, provide supplemental temperature sensor in each IDF closet/elect room served by a mini-split. If room

M

BUILDING DOMESTIC

WATER METER

GPM FLOW

TOTAL GAL.







			POI	NT L	IST -	RTU	-03, 04		
POINT DESCRIPTION	BI	BO	BV	AI	AO	AV	OVR	ALARMS	GRAPH
DA PRESSURE				Х				HIGH	Yes
DAT				Х				HIGH/LOW	Yes
DX COIL ALM			Х					ALL FACTORY ALARIMS	Yes
DX COIL CMD		Х					X		Yes
DX COIL HGRH CMD		X							Yes
DX COIL HGRH STS			Х						Yes
DX COIL STAGE						Х			Yes
DX COIL STS			Х						Yes
FILTER PRESSURE DROP				Х				HIGH	Yes
MIXED AIR TEMPERATURE				Х					Yes
NATURAL GAS HEATER %						Х			Yes
NG HEATER ALM			Х					ALL FACTORY ALARIMS	Yes
NG HEATER CMD		Х					X		Yes
NG HEATER STS						Х			Yes
OA CFM				Х				15% LOW/HIGH ALARM	Yes
OA DAMPER CMD					Х		X		Yes
OA DAMPER STS				Х				DAMPER ALARM	Yes
OA HUMIDITIY				Х					Yes
OAT				Х					Yes
RA DAMPER CMD					Х		X		Yes
RA DAMPER STS					Х			DAMPER ALARM	Yes
RA HUMIDITY				Х					Yes
RAF CFM				Х					Yes
RAF CMD					Х		X		Yes
RAF SPEED				Х					Yes
RAF STS	Х							FAN ALARM	Yes
RAT				Х					Yes
REA DAMPER CMD					X		X		Yes
REA DAMPER STS				Х				DAMPER ALARM	Yes
SAF CFM				Х					Yes
SAF CMD					X		X		Yes
SAF SPEED				Х					Yes
SAF STS	X							FAN ALARM	Yes



- b. Heating Energy Recovery Mode: When the OAT is less than 52°F (adj.), the energy recovery control valve will modulate to maintain discharge coil temperature of 55°F (adj.). Supply Air Temperature Controls - Cooling:
- Refer to associated Chilled Water System controls schematic for additional details. Cooling mode shall be enabled when DAT set point temperature exceeds 2 degrees (adj) above current DAT setpoint Upon a call for cooling chiller system and pumps shall be activated Refer to related sequence for additional requirements. When CHWS temperature sensor detects a water temperature of less than or equal to 48°F (adj.), modulate the 2-way chilled water control valve as required to maintain 55°F (adj.) unit discharge temperature.
- The HW control valve shall be off. Supply Air Temperature Controls - Heating: A. Refer to associated Heating Water System controls schematic for additional details. Heating mode shall be enabled when DAT set point temperature falls 2 degrees (adj) below current DAT setpoint and energy recovery valve is at 100% open.h Upon a call for heating heating system and pumps shall be activated Refer to related sequence for additional requirements. When the HWS temperature sensor detects a water temperature of greater than 100°F (adj.), modulate the 2-way heating water control valve as required to maintain 55°F (adj.) unit discharge temperature.
- The CW control valve shall be off. System shall monitor outside air dew point as well as each connected zone's temperature sensors as well as distributed lab humidity sensors (see drawings). In the event that outside air dew point temperature falls below 50 degrees (adj.), reset DAT to 65 degrees. DAT Override: In the event that any one temperature sensor on the system rises higher
- than 2 degrees (adj.) above setpoint OR any of the distributed humidity sensors throughout the labs rise above 60% RH (adj.), disable DAT reset sequence and resume normal DAT of 55 degrees Freeze Protection: A. Freeze Protection Pumps:
- a. The unit is equipped with redundant freeze protection pumps to ensure flow accross the preheat coil during low ambient outdoor air temperatures. These pumps shall operating according to the following sequence: b. When the outdoor air temperature is below 40°F (adj.), the freeze protection pump
- shall be activated. c. Redundant pumps shall cycle based upon total runtime. Lead pump shall rotate every 40 hrs (adj.) of operation. Upon pump failure-Backup pump shall Automatically start and run to maintain flow to coil.
- d. Pump Alarms: Provide a differential pressure sensor across the freeze protection pump to provide pump status. If pump status does not match pump command, provide alarm to BAS. Hardwired Freeze Protection:
- a. The freeze protection wire shall be serpentine across the entire face of the coil every six inches on center. The freeze stat shall be a dual contact sensor with one circuit hardwired to the supply fan and the other to the controller to maintain appropriate control. The hardwired freeze stat shall require a manual reset. Freeze Protection Programming:
- a. The hot water coil control valve must remain under full control during any trip to prevent any overheating of the air handling unit and proper unit reset. This requirement for heating water valve control shall apply to any safety shutoff of the unit - not just to a freeze protection shut-down. The hot water control valve shall controls preheat plenum to 55° (adj.). b. If the heating coil plenum temperature falls below 38°F (adj.), then the supply fan shall shut down, the outside air damper shall close.
- r/Under Pressurization Control: A hardwired static pressure sensor shall be located at the supply air outlet in the discharge ductwork as well as within the air handler upstream of the unit's energy recovery coil. If the pressure in the supply plenum exceeds 4 .0" W.G. (adj.) or the pressure upstream of the energy recovery coil falls below -4.0" W.G. (adj.), the fan shall be shut down. Upon correction of the problem, the system shall be reset and unit shall return to normal operation. This shall be a manual reset. B. In addition to hardwired static pressure safety, provide discharge static pressure sensor
- and display on unit graphic. 1. Filter Monitoring: Each filter in the air handler will be provided with an analogue input which tracks the actual pressure drop across the filter. Coordinate alarm for each filter such that is adjustable by the user. Initial setpoint to be at 0.5 " WC (adj.) greater than the initial filter pressure drop with clean filters. Coordinate with test and balance contractor to obtain this setpoint and program accordingly.



RTU-01, 02 CONTROL SCHEMATIC

		I
POINT DESCRIPTION	BI	BO
DISCHARGE AIR PRESSURE		
DISCHARGE AIR TEMPERATURE		
DUCT STATIC PRESSURE ACTUAL		
DUCT STATIC PRESSURE SETPOINT		
DX COIL ALM		
DX COIL CMD		Х
DX COIL STS		
FILTER PRESSURE DROP		
MIXED AIR HUMIDITY		
MIXED AIR TEMP		
NG HEATER ALM		
NG HEATER CMD		Х
NG HEATER STS		
OA CFM		
OA DAMPER CMD		
OA DAMPER STS		
OA HUMIDITY		
OAT		
RA DAMPER CMD		
RA DAMPER STS		
RA HUMIDITY		
RAF CFM		
RAF CMD		
RAF SPEED		
RAF STS	Х	
RAT		
REA DAMPER CMD		
REA DAMPER STS		
SAF CFM		
SAF CMD		
SAF SPEED		
SAF STS	Х	



TREND Yes Yes Yes No No Yes Yes Yes Yes Yes Yes Yes No Yes Yes No Yes Yes Yes No Yes Yes Yes No Yes No Yes No

Yes

Yes

No

Yes

No

Yes

Yes

No

No

Yes

Yes

No

Yes

Yes

Yes

Yes

No

Yes

No

Yes

Yes

Yes

No

Yes

Yes

No

No

No

No

Yes

Yes

No

Yes

No

Yes

No

No

No

No

POINT LIST - RTU-01, 02 BV AI AO AV OVR ALARMS GRAPHIC | TREND HIGH Yes Yes X **HIGH/LOW** Yes Yes X LOW Yes Yes Yes X X No ALL FACTORY ALARMS Yes Yes Yes X No Yes Yes HIGH Yes X No X HIGH Yes Yes X Yes Yes ALL FACTORY ALARMS X Yes Yes Yes No Х Yes Yes 15% LOW/HIGH ALARM Yes Yes X Yes X No -Х DAMPER ALARM Yes Yes Х Yes Yes X Yes Yes ~ Yes No X X DAMPER ALARM Yes X Yes Yes Yes X Yes Yes Yes No X X X Yes Yes **RETURN AIR FAN ALARM** Yes No Yes X Yes Yes No DAMPER ALARM Yes X Yes Yes Yes X X Yes No X Yes Yes SUPPLY AIR FAN ALARM Yes No

RTU-3, 4 SEQUENCE OF OPERATION

2/SE	<u>QNENCE OF QPERATION</u>
_	
Gei	neral:
Α.	RTU-1 is the sole unit responsible for the air conditioning and ventilation of the bu
	conference room, classroom area. The unit is a VAV air handling unit with DX ref
	as natural gas preheat. Final system heating and zone reheat is accomplished vi
	heating hot water system. Refer to related sequence for details. Also refer to VAV
_	sequence for additional information.
В.	RTU-2 is the sole unit responsible for the air conditioning and ventilation of the bu
	lobby areas. The unit is a VAV air handling unit with DX refrigeration as well as n
	preheat. Final system heating and zone reheat is accomplished via the building's
	system. Refer to related sequence for details. Also refer to VAV reheat control se
~	additional information.
C.	Each unit is sized with diversity in mind. Refer to test and balance specifications
_	details on unit balance.
D.	The unit will be provided with complete field mounted controls. DX cooling coil, and
	heating coil provided by manufacturer will require some interface with supplied fa
	The controls contractor shall coordinate with manufacturer during shop drawing r
	ensure that all coordination required to achieve the sequence of operation takes
	ordering of equipment.
<u> Occ</u>	cupancy Schedule:
Α.	Refer to Controls General Notes for occupancy Schedule.
В.	The unit shall be placed into occupied or unoccupied mode from the DDC control
	scheduling requirements for additional information.
C.	In the occupied mode, both the supply and return fans shall be on and the tempe
	shall be active. VAV boxes shall control to their Occupied setpoints (Refer to VAV
	Sequence of Operation)
D.	In the unoccupied mode, the unit shall poll all VAV boxes to determine if unoccup
	setpoint is being met. If more than 5 zones (adi.) fall outside of the range, the unit
	and run until all zones meet the unoccupied setpoint, at which point the unit will a
Sur	poly and Return Fan Control:
A	Both supply and return fan to be single packaged fan provided with packaged roc
,	unit Each fan will be provided by an airflow measurement device with an accurate
	+/- 5% Balance fans to CEM indicated on drawings. Coordinate with TAB contra
	fan sneeds damner nositions etc
в	Supply and Return fan will be started and stopped from the local DDC Panel per
υ.	When the start command is issued the outside air damper and relief air damper v
	minimum positions and return air damper will open 100% When the dampers ha
	required positions an end switch will engage an EP which will then allow the fan
	switch fails to engage the EP the fan will not be allowed to start. If for this or any
	supply fan status does not match the commanded value an alarm will be generat
	supply fan and return fan status indicates the fan has started, the control sequen
	enabled
C	The supply and return fan shall be controlled from their respective VED's provide
0.	packaged unit. Controls contractor to provide wiring sensors and programming
	accomplish the sequence of control
П	The supply fan will operate to maintain duct static pressure. Refer to the control of
υ.	mounted static pressure sensors which shall control the supply fan to maintain a
	procedure solution of 0.6" (adj.) at all locations. Coordinate initial static procedure s
	contractor. Proceuro cotroint shall be as low as foosible to maintain proper syste
	locations of the dust static pressure concers are also shown on the drawings. Es
	processing on the duct static pressure sensors are also shown on the drawings. For
	pressure optimization shall be utilized by polling of associated VAV and CAV all v
-	The return for shall normally encrete off of a www.efm (adi.) differential from our
⊏.	The return fan shall normally operate of of a XXXX cim (adj.) differential from supp
	Refer to air handling unit schedule and match offset CFM with required outdoor a
	Coordinate setting of fan speeds and CFW differential at each of the following pol
	70%, 90%, and 100%. Refer to test and balance specification for additional detail
	support to test and balance contractor as required. Typical all air balance support
-	snall adjust proportionally between these two values.
⊢.	Factory Controller Safeties - BAS shall interface with simple factory controller saf
	shut down and start fans as required by onboard factory controller inbuilt safety c
<u>Uni</u>	t Damper Control:
Α.	Damper TAB: The controls contractor is to assist the TAB contractor to set minim
	position. Minimum OA position must be maintained accross the entire opration of
	OA damper position shall be set by TAB at the following supply fan speeds: 30%
	and 100%. Refer to TAB specification for additional required.
В.	Occupied Mode: In the occupied mode, OA damper will be at minimum position a
	Relief air damper shall maintain it's minimum position as set by TAB and the retu
	shall be open 100%. Refer to economizer mode of operation for additional require
	a. Demand Control Ventilation - OA Damper Control: Refer to VAV sequence o
	occupied zone is provided with a CO2 sensor. The building control system w
	calculate an overall average zone CO2 for each air handling system as well
	maximum CO2 level within all zones on each system. These values should be
	the main system graphic.
	b. In the even that zone average CO2 level falls below 800 ppm (adj.), modulate
	damper closed on a PID loop to maintain a setpoint of 800 ppm (adj.)
	c. Should any single zone on the system have a CO2 level which rises above 1
	disable Demand Control Ventilation OA Damper Controls Sequence.
C.	Unoccupied Mode: In the unoccupied mode, the OA damper and REA damper po
	closed and the RA damper will be open 100%. Refer to economizer model for ad
	requirements.
Eco	pnomizer Control:
Α.	Economizer mode shall be activated if the outside air temperature is less than 65
	event that the economiizer mode is activated, outside air damper and return air d
	air damper shall be modulated proportionally from their minimum position to 100%
	required to achieve a unit discharge air temperature of 55 deg (adi.) Relief air da

- shall mirror outside air damper position. Outside air damper position will modulate to unit DAT. RA Damper will be modulated opposite relief air damper position. (Eg. When Relief air damper is 100% open, RA damper will be 0% open, etc.) Provide Economizer mode status and setpoints on graphic. Supply Air Temperature Controls - Cooling: When the unit DAT is greater than or equal to 56°F (adj.), cooling mode shall be enabled.
- When cooling mode is enabled, the control system will enable the onboard packaged dx cooling coil to stage onboard compressors as required to meet the required unit DAT SP of 55 deg. (adj. Cooling mode lockout: Cooling mode shall be disabled when OAT is less than 50 degrees (Adj.) Supply Air Temperature Reset: a. System shall monitor outside air dew point as well as each connected zone's temperature sensors as well as distributed humidity sensors (see drawings). In the event that outside air dew point temperature falls below 50 degrees (adj.), reset DAT to 65 degrees. (adj).
- b. DAT Override: In the event that any one temperature sensor on the system rises higher than 2 degrees (adj.) above setpoint OR any of the distributed humidity sensors throughout the building rises above 60% RH (adj.), disable DAT reset sequence and resume normal DAT of 55 degrees Supply Air Temperature Controls - Heating:
- When the unit DAT is less than or equal to 53°F (adj.), heating mode shall be enabled. When heating mode is enabled, the control system will enable the onboard packaged natural gas heating unit and modulate the onboard gas control valve as required to provide 55 deg (adi.) DAT. Heating mode lockout: Heating mode shall be disabled with OAT is greater than 50 degrees (Adj.) Morning Warmup: During morning warmup, override temperature discharge air setpoint to 65 deg (adj) until 80% of zones have reached occupied setpoints.
- Over Pressurization Control: A static pressure sensor shall be located at the supply air outlet in the discharge ductwork. If the pressure in the supply plenum exceeds 4 .0" W.G. (adj.) the fan shall be shut down. Upon correction of the problem, the system shall be reset and unit shall return to normal operation. This shall be a manual reset. Under Pressurization Control: A static pressure sensor shall be located at the return air inlet in the inlet
- plenum of the packaged air handling unit. If the pressure in the inlet plenum falls below -4 .0" W.G. (adj.) the fan shall be shut down. Upon correction of the problem, the system shall be reset and unit shall return to normal operation. This shall be a manual reset. . <u>Smoke Shutdown</u>: Smoke detectors shall be located in the return air stream. If smoke is detected, the supply and exhaust fans shall de-activate and an audio/visual alarm shall activate. Upon correction of the problem, the system shall be reset and unit shall return to normal operation. The smoke detectors shall provide a supervisory signal to the Fire Alarm System.
- . Filter Monitoring: Each filter in the air handler will be provided with an analogue input which tracks the actual pressure drop across the filter. Coordinate alarm for each filter such that is adjustable by the user. Initial setpoint to be at 0.5 " WC (adj.) greater than the initial filter pressure drop with clean filters. Coordinate with test and balance contractor to obtain this setpoint and program accordingly. . <u>Outside Air Monitoring</u>: An airflow monitoring station must be provided to monitor the flow of outdoor air and alarm should the outdoor air quantity fall 15% above or below the required OA threshold for the
- 13. <u>Freeze Protection Sequence</u>: Unit DAT shall be monitored. Should DAT fall below 48 degrees (adj.) unit shall shut down, outdoor damper shall close. Shutdown shall allow an automatic reset twice before manual reset is required.
- A. RTU-3 is the sole unit responsible for the air conditioning and ventilation of the Mechanized Systems Lab. The unit is a single zone packaged air handling unit with DX refrigeration with hot gas . RTU-4 is the sole unit responsible for the air conditioning and ventilation of the building's multipurpose room. The unit is a single-zone packaged air handling unit with DX refrigeration with hot The unit will be provided with complete field mounted controls. DX cooling coil, HGRH, and natural gas heating coil provided by manufacturer will require some interface with supplied factory controllers. The controls contractor shall coordinate with manufacturer during shop drawing review period to ensure that all coordination required to achieve the sequence of operation takes
- B. The unit shall be placed into occupied or unoccupied mode from the DDC control system. Refer to scheduling requirements for additional information. C. In the occupied mode, the supply fan shall be on and the temperature control shall be active to maintain occupied setpoint of 72 degrees (adj) with a deadband of 2 degrees (adj). D. In the unoccupied mode, the unit shall be off, outside and relief dampers closed and fan and compressors shall cyclel as required to maintain unoccupied room setpoint of 65 degrees (adj.)
- Supply fan to be single packaged fan provided with rooftop air handling unit. Coordinate with TAB contractor to set final fan speed to maintain target airflow as scheduled. B. Supply fan will be started and stopped from the local DDC Panel per the schedule. When the start command is issued the outside air damper and relief air damper will open to their minimum positions and return air damper will open 100%. When the dampers have proven their required positions, an end switch will engage an EP which will then allow the fan to start. If the end switch fails to engage the EP the fan will not be allowed to start. If for this or any other reason the supply fan status does not match the commanded value an alarm will be generated. When the supply fan status indicates the fan has started, the control sequence will be enabled. . The relief fan shall normally be off. Refer to economizer section for powered relief fan operation.
- . Damper TAB: The controls contractor is to assist the TAB contractor to set minimum OA damper position. Refer to TAB specification for additional requirements. B. Occupied Mode: In the occupied mode, OA damper will be at minimum position as set by TAB, the Relief air damper shall maintain it's minimum position as set by TAB and the return air damper shall be open 100%. Refer to economizer mode of operation for additional requirements. 2. Unoccupied Mode: In the unoccupied mode, the OA damper and REA damper position will be closed and the RA damper will be open 100%. Refer to economizer model for additional
- D. Demand-Control Ventilation: Space-Mounted CO2 sensor will record the the space CO2 level. When not in economizer mode, OA damper postion will modulate between it's minimum position and closed as required to maintain a CO2 differential of 700PPM from ambient.
- . Economizer mode shall be activated if the outside air temperature is less than 65 deg. (adj.). In the event that the economiizer mode is activated, outside air damper and return air damper and relief air damper shall be modulated proportionally from their minimum position to 100% open as required to achieve a unit discharge air temperature of 55 deg (adj.). Relief air damper position shall mirror outside air damper position. Outside air damper position will modulate to unit DAT. RA Damper will be modulated opposite relief air damper position. (Eg. When Relief air damper is Relief Fan Control: Powered relief fan shall activate in economizer mode when OA damper is between 60 to 100% (adj.) open and shall otherwise be "off". Provide Economizer mode, damper and relief fan status and setpoints on graphic.
- M. When the space zone temperature sensor calls for cooling, cooling mode shall be enabled. B. When cooling mode is enabled, the control system will enable the onboard packaged dx cooling coil to stage onboard compressors as required to meet the required unit DAT SP of 55 deg.
- Cooling mode lockout: Cooling mode shall be disabled when OAT is less than 50 degrees (Adj.) . When the unit DAT is less than or equal to 53°F (adj.), heating mode shall be enabled
- B. When heating mode is enabled, the control system will enable the onboard packaged natural gas heating unit and modulate the onboard gas control valve as required to provide 55 deg (adj.) 2. Heating mode lockout: Heating mode shall be disabled with OAT is greater than 50 degrees (Adj.)
- A. The unit shall monitor zone humidity via zone humidity sensor. In the event that zone humidity exceeds 60% (adj.), The unit shall activate it's cooling coil and stage HGRH as required to maintain room-nuetral discharge air temperature. Dehumidification mode shall be deactivated when space humidity falls below 55% (adj). Filter Monitoring: Each filter in the air handler will be provided with an analogue input which tracks the actual pressure drop across the filter. Coordinate alarm for each filter such that is adjustable by the user. Initial setpoint to be at 0.5 "WC (adj.) greater than the initial filter pressure drop with clean filters. Coordinate with test and balance contractor to obtain this setpoint and program
- according • Outside Air Monitoring: An airflow monitoring station must be provided to monitor the flow of outdoor air and alarm should the outdoor air quantity fall 15% above or below the required OA threshold for the unit.

DOINTLICT EAN COILC

POINT DESCRIPTIONBIBOBVAIAOAVRALARMSGRAPHICTFCHW LEAVING WATER TEMPERATUREXXXYes<	POIN	NI	LI	3	•		AI	N C	JUILS		
POINT DESCRIPTIONBIBOBVAIAOAVRALARMSGRAPHICTCHW LEAVING WATER TEMPERATUREXXXYes <t< th=""><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th>OV</th><th></th><th></th><th></th></t<>								OV			
CHW LEAVING WATER TEMPERATUREXYesCHW VALVE COMMANDXXXYesCHW VALVE STATUSXXVALVE ALARMYesFACTORY ALXXFACTORYYesFAN CMDXXFACTORYYesFAN STSXXYesYesHW LEAVING WATER TEMPERATUREXFAN ALARMYesHW VALVE COMMANDXXYesYesHW VALVE COMMANDXXYesHW VALVE COMMANDXXYesHW VALVE STATUSXYesMODE OF OPERATIONXYesOA DAMPER CMDXXYesOA DAMPER STSXDAMPER ALARMYesRA DAMPER STSXDAMPER ALARMYesRA DAMPER STSXYesYesUNIT DISCHARGE AIR TEMPERATUREXXHIGH/LOW ALARMYesXYesYesZONE TEMP ACTUALXXHIGH/LOW ALARMYesYesYesYes	POINT DESCRIPTION	BI	BO	BV	AI	AO	AV	R	ALARMS	GRAPHIC	TRE
CHW VALVE COMMANDXXXYesCHW VALVE STATUSXXVALVE ALARMYesFACTORY ALXXFACTORYYesFAN CMDXXXFACTORYYesFAN STSXXXYesHW LEAVING WATER TEMPERATUREXXYesHW VALVE COMMANDXXYesHW VALVE COMMANDXXYesHW VALVE STATUSXYesMODE OF OPERATIONXYesOA DAMPER CMDXXYesOA DAMPER STSXDAMPER ALARMRA DAMPER STSXYesRA DAMPER STSXYesUNIT DISCHARGE AIR TEMPERATUREXXZONE TEMP ACTUALXXZONE TEMP SET POINTXXXHIGH/LOW ALARMYes	CHW LEAVING WATER TEMPERATURE				Х					Yes	Ye
CHW VALVE STATUSXXVALVE ALARMYesFACTORY ALXXFACTORYYesFAN CMDXXXYesFAN STSXXXYesHW LEAVING WATER TEMPERATUREXXYesHW VALVE COMMANDXXYesHW VALVE STATUSXXYesMODE OF OPERATIONXXYesOA DAMPER CMDXXYesOA DAMPER STSXXDAMPER ALARMRA DAMPER STSXXYesRA DAMPER STSXYesUNIT DISCHARGE AIR TEMPERATUREXYesZONE TEMP ACTUALXXHIGH/LOW ALARMYesYes	CHW VALVE COMMAND					X		Х		Yes	N
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FAN CMDXXXYesFAN STSXXXFAN ALARMYesHW LEAVING WATER TEMPERATUREXXYesYesHW VALVE COMMANDXXXYesHW VALVE STATUSXXYesYesMODE OF OPERATIONXXYesYesOA DAMPER CMDXXYesYesOA DAMPER STSXXYesYesRA DAMPER CMDXXYesYesRA DAMPER STSXYesYesRA DAMPER STSXYesYesRA DAMPER STSXYesYesRA DAMPER ALARM RESETXYesYesUNIT DISCHARGE AIR TEMPERATUREXHIGH/LOW ALARMYesZONE TEMP ACTUALXXHIGH/LOW ALARMYesYesYesYes	FACTORY AL			X					FACTORY	Yes	N
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OA DAMPER STSXDAMPER ALARMYesRA DAMPER CMDXXXYesRA DAMPER STSXXDAMPER ALARMYesREMOTE ALARM RESETXXDAMPER ALARMYesUNIT DISCHARGE AIR TEMPERATUREXXHIGH/LOW ALARMYesZONE TEMP ACTUALXXYesYes	OA DAMPER CMD					X		Х		Yes	N
RA DAMPER CMDXXXYesRA DAMPER STSXXDAMPER ALARMYesREMOTE ALARM RESETXXXYesUNIT DISCHARGE AIR TEMPERATUREXXHIGH/LOW ALARMYesZONE TEMP ACTUALXXYesZONE TEMP SET POINTXXYes	OA DAMPER STS				Х				DAMPER ALARM	Yes	Ye
RA DAMPER STSXDAMPER ALARMYesREMOTE ALARM RESETXXXYesUNIT DISCHARGE AIR TEMPERATUREXHIGH/LOW ALARMYesZONE TEMP ACTUALXYesYesZONE TEMP SET POINTXXHIGH/LOW ALARM	RA DAMPER CMD					X		Х		Yes	N
REMOTE ALARM RESETXXYesUNIT DISCHARGE AIR TEMPERATUREXHIGH/LOW ALARMYesZONE TEMP ACTUALXYesYesZONE TEMP SET POINTXXHIGH/LOW ALARMYes	RA DAMPER STS				Х				DAMPER ALARM	Yes	Ye
UNIT DISCHARGE AIR TEMPERATURE X HIGH/LOW ALARM Yes ZONE TEMP ACTUAL X Yes ZONE TEMP SET POINT X X HIGH/LOW ALARM	REMOTE ALARM RESET		X					Х		Yes	N
ZONE TEMP ACTUAL X Yes ZONE TEMP SET POINT X X HIGH/LOW/ALARM	UNIT DISCHARGE AIR TEMPERATURE				Х				HIGH/LOW ALARM	Yes	Ye
	ZONE TEMP ACTUAL				Х					Yes	Ye
	ZONE TEMP SET POINT					X		Х	HIGH/LOW ALARM	Yes	N

FAN COIL UNIT LOCATION: AREA SERVED:

		P	DINT	LIS	ST - V	AV B	SOX			
POINT DESCRIPTION	BI	BO	BV	AI	AO	AV	OVR	ALARMS	GRAPHIC	TREND
BBH HW VALVE CMD					Х		X		Yes	No
BBH HW VALVE STS				Х				VALVE ALM	Yes	Yes
DAT				X					Yes	Yes
HW VALVE CMD					Х		X		Yes	No
HW VALVE STS				Х				VALVE ALM	Yes	Yes
OCCUPANCY STATUS	Х								Yes	Yes
VAV AIRFLOW (ACTUAL)				X					Yes	Yes
VAV AIRFLOW SETPOINT (CFM)					Х		X		Yes	No
VAV DMPR CMD					Х		X		Yes	No
VAV DMPR STS				Х				VAV ALM	Yes	Yes
ZONE TEMP 1				X				HIGH/LOW	Yes	Yes
ZONE TEMP 2*				X				HIGH/LOW	Yes	Yes
ZONE TEMP. SETPOINT					Х		X		Yes	No

	POINT	LIS	T - L/	AB	CON	ITRO	OLS			
POINT DESCRIPTION	BI	BO	BV	AI	AO	AV	OVR	ALARMS	GRAPHIC	TREND
VVE (AX) CFM ACTUAL						Х		VLV ALARM	Yes	Yes
VVE (AX) CFM SETPOINT						Х	Х		Yes	No
VVE (FH) CFM ACTUAL						Х		VLV ALARM	Yes	Yes
VVE (FH) CFM SETPOINT						Х	Х		Yes	No
VVE (GX) CFM ACTUAL						Х		VLV ALARM	Yes	Yes
VVE (GX) CFM SETPOINT						Х	Х		Yes	No
VVS CFM ACTUAL						Х		VLV ALARM	Yes	Yes
VVS CFM SETPOINT						Х	Х		Yes	No
VVS DAT				Х					Yes	Yes
VVS HW VLV CMD					Х		Х		Yes	No
VVS HW VLV STS				Х				VALVE ALARM	Yes	Yes
ZONE OCCUPANCY STS		Х					Х		Yes	No
ZONE TEMP. ACTUAL				Х				ZONE TEMP ALM	Yes	Yes
ZONE TEMP. SETPOINT					Х		Х		Yes	No

<u>KEY PLAN</u>

REMARKS:

1.REFER TO VAV SEQUENCE OF CONTROL ON IC SHEETS FOR ADDITONAL REQUIREMENTS ON ZONE PROGRAMMING

VAV	MIN/MAX SCHE	DULE AREA B		
			UNOCC	
R	MAX	MIN	MIN	REMARKS
57	210	150	0	1
.1	220	150	0	1
5	220	150	0	1
.9	220	150	0	1
5	150	100	0	1
	170	85	0	1
	185	60	0	1
5	340	170	0	1
6	370	120	0	1
	185	60	0	1
	110	75	0	1
	185	85	0	1
	170	85	0	1
7	370	110	0	1
'8	340	170	0	1
	210	<u>CE</u>	0	1

GENERAL HVAC DESIGN NOTES:

- BALANCING DAMPERS IN THE DUCTWORK PER RUNOUT DETAIL FOR ALL GRILLES, REGISTERS, AND DIFFUSERS WHICH LIST A CFM. IN ALL CASES DAMPERS ARE TO BE INSTALLED IN AN ACCESSIBLE LOCATION.
- REQUIREMENTS OF HANGING FROM JOISTS. C. ELECTRICAL PANELS SHOWN FOR REFERENCE ONLY. REFER TO
- BALANCE MEETING ON-SITE WITH ENGINEER TO REVIEW BALANCING
- E. REFER TO ARCHITECTURAL PLANS FOR ALL RATED WALLS. COORDINATE REQUIRED FIRESTOPPING ACCORDINGLY.

$\gamma \gamma \gamma$	$\gamma \gamma \gamma$	$\gamma \gamma \gamma$	$\gamma \gamma$	$\gamma \gamma$	$\gamma \gamma$	$\gamma \gamma \gamma$	$\gamma \gamma$	$\gamma \gamma$	$\gamma \gamma \gamma$	$\gamma \gamma \gamma$	$\gamma \gamma \gamma$	$\gamma \gamma$	$\gamma \gamma \gamma$	$\gamma \gamma$	Ľ
									TAC	GED	NOTE	<u>S</u>			Ż
									A71	PROVIDE ROOF. RE PENETRA WITH MAN SPECIFIC	FLUE FROM FER TO ARO TION REQU NUFACTURE ATIONS FOR	1 BOILER FL CHITECTUR IREMENTS. R PROVIDE R ADDITION/	UE CONNEC AL DRAWING TERMINATE D FLUE CAP AL REQUIRE	TION UP THR SS FOR ROOF MINIMUM 18 . REFER TO MENTS.	ROUGI = " AFR
									A85	PROVIDE FLASH IN REQUIRE REQUIRE	INSULATED TO ROOFING MENTS AND MENTS.	ROOF FRO G SYSTEM P ROOF CUR	M FAN MANU ER ARCHITE B MANUFAC	IFACTURER / CTURAL TURER	
									A86	PROVIDE REFER TO	PLATFORM D DETAIL.	ROOF CURI	3 WITH INTE	GRAL PIPING	CHAS
									A93	PIPE CON GLUE COI AS INDICA	DENSATE P NDENSATE ATED ON PL	PIPING TO NI PIPING ON F AN.	EAREST ROO ROOF. TRAP	of Drain. Do Per ahu de	DNOT TAIL.)
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<u>KEY PLAN</u>

<u>GE</u> A.		
	NERAL HYDRONIC DESIGN NOTES: REFER TO HVAC CONTROLS SHEETS FOR ADDITIONAL	
B.	INFORMATION ON THERMOSTATS AND CO2 SENSORS. REFER TO TYPICAL WAL DEVICE MOUNTING DETAIL	
C.	MOUNTING. COORDINATE ALL MECHANICAL EQUIPMENT AND HYDRONIC PIPING WITH STRUCTURAL DRAWINGS.	
D.	REFER TO ARCHITECTURAL PLANS FOR ALL RATED WALLS. COORDINATE REQUIRED FIRE STOPPING	
E.	ELECTRICAL EQUIPMENT SHOWN FOR REFERENCE ONLY. REFER TO ELECTRICAL DRAWINGS. DO NOT	
	ROUTE ANY DUCT OR PIPING OVER ELECTRICAL EQUIPMENT. TYPICAL.	
ĀĢ	GED NOTES	
γ A79	PROVIDE AND WIRE THERMOSTAT FROM EACH	Z
	SPLIT SYSTEM TO LOCATION INDICATED. IN ADDITION, PROVIDE TEMPERATURE SENSOR FOR MONITORING BY BUILDING AUTOMATION SYSTEM. ~	
A80	DETAILS. THERMOSTAT/SENSORS LINKED TO ROOFTOP	$\left(\right)$
H1	ADDITIONAL REQUIREMENTS. PROVIDE REFRIGERANT PIPING BETWEEN INDOOR	$\sum_{i=1}^{n}$
Ц 2	UNIT AND CONDENSING UNIT PER MANUFACTURER REQUIREMENTS.	
ПΖ	PLATFORM CURB. REFER TO ARCHITECTURAL DRAWINGS FOR ADDITIONAL REQUIREMENTS ON	
	DETAIL FOR ADDITIONAL REQUIREMENTS ON ROOF CURB.	\mathcal{I}
H3	HEATING WATER SUPPLY/RETURN PIPING TO REHEAT COIL. REFER TO REHEAT COIL PIPING SCHEMATIC FOR ADDITIONAL INFORMATION.	$\left\langle \right\rangle$
H8 H9	ROUTE PIPING UP WITHIN JOIST SPACE.	
	RECOVERY PIPING SCHEMATIC FOR ADDITIONAL INFORMATION.	
H10	MINIMUM FLOW BYPASS VALVE FOR HEATING WATER SYSTEM. REFER TO CONTROL DRAWINGS. MOUNT AT AN ACCESSIBLE LOCATION ON WALL.	Z
H23	REFRIGERANT PIPING. SIZE AND QUANTITY PER MANUFACTURER REQUIREMENTS. REFER TO ARCHITECTRUAL SPECIFICATIONS. ROUTE ALL	
	REFRIGERANT PIPING UP WITHIN STRUCTURE. MAKE FINAL CONNECTIONS TO EQUIPMENT PER MANUFACTURER REQUIREMENTS.	
H24	REFER TO ARCHITECTURAL SPECIFICATIONS.	
	REQUIREMENTS. REFER TO CIVIL DRAWINGS FOR PAD REQUIREMENTS.	
H25	REFER TO ARCHITECTURAL SPECIFICATIONS. REFRIGERATOR CONDENSING UNIT TO BE MOUNTED ON CONCRETE PAR PER	ζ
H26	MANUFACTURER REQUIREMENTS. REFER TO CIVIL DRAWINGS FOR PAD REQUIREMENTS.	
	EVAPORATER ROUTED TO FLOOR DRAIN ADJACENT TO COOLER/FREEZER LOCATION. REFER TO PLUMBING DRAWINGS FOR LOCATION.	
	PROVIDE HEAT TRACE ON PIPING AS REQUIRED BY -< MANUFACURER TO EACH DRAIN LOCATION AND MAKE ANY PENETRATIONS PER MANUFACTURER	$\sum_{i=1}^{n}$
H27	REQUIREMENTS. DISTRIBUTED HUMIDITY SENSOR FOR DAT	
H28	OPERATION FOR ADDITIONAL REQUIREMENTS. PROVIDE MANUAL SWITCH FOR SOIL GRINDER FAN	Ś
H30	AT LOCATION INDICATED. REFER TO CONTROLS DRAWINGS FOR ADDITIONAL REQUIREMENTS. ~ PROVIDE 2" MINIMUM FLOW BYPASS VALVE AT AN	
	ACCESSIBLE LOCATION ABOVE CORRIDOR CEILING. REFER TO CONTROL DRAWINGS FOR ADDITIONAL REQUIREMENTS. LOCATE FINAL	
	LOCATION ON AS-BUILT CONTROL DRAWINGS AND LABEL CEILING TILE PER SPECIFICATIONS.	Ź
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X	REHEAT COIL RUNOUT SCHEDULE MARK (IN) RC-11H 1/2	
	REHEAT COIL RUNOUT SCHEDULE MARK RUNOUT PIPE SIZE MARK (IN) RC-11H 1/2 RC-25H 1/2 RC-25S 1/2 RC-25S 1/2 RC-25S 1/2 RC-25S 1/2	
X	REHEAT COL RUNOUT SCHEDULE MARK RUNOUT PIPE SIZE RC-40H 3/4	
	REHEAT COIL RUNOUT SCHEDULE MARK (IN) RC-11H 1/2 RC-255 1/2 RC-255 1/2 RC-255 1/2 RC-40H 3/4 RC-10D 3/4 RC-10D 3/4 RC-11DH 3/4	
	REHEAT COL RUNOUT SCHEDULE MARK (IN) RC-11H 1/2 RC-255 1/2 RC-255 1/2 RC-255 1/2 RC-40H 3/4 RC-40S 1/2 RC-70H 3/4 RC-110H 3/4 RC-110H 3/4 RC-110H 3/4 RC-110H 3/4 RC-110H 1 RC-150H 1 RC-150H 1	
	REHEAT COIL RUNOUT SCHEDULE MARK RUNOUT PIPE SIZE MARK (IN) RC-11H 1/2 RC-25S 1/2 RC-40H 3/4 RC-10S 3/4 RC-110H 3/4 RC-110S 3/4 RC-110H 1 RC-200S 1 RC-270S 1	
	Reheat coll Runout schedule MARK (IN) RC-11H 1/2 RC-25H 1/2 RC-25S 1/2 RC-200S 3/4 RC-100S 3/4 RC-200S 1 RC-200S 1 RC-300S 1	
	REHEAT COL RUNOUT SCHEDULE MARK (IN) RC-11H 1/2 RC-25H 1/2 RC-25H 1/2 RC-25H 1/2 RC-40H 3/4 RC-10OS 3/4 RC-110S 3/4 RC-200S 1 RC-200S 1 RC-200S 1 RC-300S 1	
	REHEAT COL RUNOUT SCHEDULE MARK (IN) RC-11H 1/2 RC-25H 1/2 RC-25H 1/2 RC-25H 1/2 RC-25H 1/2 RC-25H 1/2 RC-25S 1/2 RC-401 3/4 RC-100S 3/4 RC-110H 3/4 RC-110H 3/4 RC-110S 3/4 RC-110B 3/4 RC-110S 3/4 RC-110S 3/4 RC-200S 1 RC-200S 1 RC-300S 1	
	REHEAT COL RUNOUT SCHEDULE MARK (IN) RC-11H 1/2 RC-25S 1/2 RC-25S 1/2 RC-25S 1/2 RC-201H 3/4 RC-100S 3/4 RC-110S 3/4 RC-100S 1 RC-200S 1 RC-200S 1 RC-300S 1	
	Refeat col runout schedule MARK (IN) RC-255 1/2 RC-255 1/2 RC-255 1/2 RC-40H 3/4 RC-10H 3/4 RC-10S 1 RC-200S 1 RC-200S 1 RC-200S 1 RC-300S 1	
	REHEAT COL RUNOUT SCHEDULE MARK RUNOUT PIPE SIZE RC-11H 1/2 RC-25H 1/2 RC-40H 3/4 RC-10S 3/4 RC-200S 1	
	Reheat Col RUNOUT Schedule MARK RUNOUT PIPE SIZE MARK RUNOUT PIPE SIZE RC-11H 1/2 RC-255 1/2 RC-40H 3/4 RC-100S 1 RC-200S 1 RC-200S 1 RC-300S 1	
	REHEAT COL RUNOUT SCHEDULE MARK RUNOUT PIPE SIZE RC-211H 1/2 RC-255 1/2 RC-201H 3/4 RC-100H 3/4 RC-100H 3/4 RC-100S 3/4 RC-100S 3/4 RC-100S 3/4 RC-100S 3/4 RC-100S 3/4 RC-100S 1 RC-200S 1 RC-300S 1	
	REHEAT COL RUNOUT SCHEDULE MARK (N) RC-11H 1/2 RC-255 1/2 RC-40S 1/2 RC-40S 1/2 RC-10DS 3/4 RC-10DS 1 RC-200S 1 RC-300S 1	

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																_AE	SORA 1	ORY A	AIR	R HAN	DLI	NG l	J
A	NUFACTURE	R			MODEL	#			UNIT C	ONFIG	URATIO	N			SE	RVICE				LOCATIC	N		
	DAIKIN			CA	\H062G[ОНМ			S	EE DE	TAIL				LABC	RATO	RY		M	ECHANICAL	_ C110		
							EN	IERGY REC	OVERY	HOT \	VATER	COIL											
T M	ING IBH) EAT (°	F) LAT (°F) VELO	X. FACE CITY (FPM	MAX	. AIR PRE ROP (IN. V	SSURE NG.)	EWT (°F)	LWT (°	W F) F	ATER FL ATE (GF	LOW N PM)	IAX. WA DRC	TER PRESS DP (IN. WG.)	SURE	MAX (COIL ROWS	NO. OF CO	N NLS	/IAX. FIN SF (FINS/I	PACING N)	TOTAL CAP	н 1) '
	95	88	,	486		0.36		83	86	,	125			8.10			4	2		10		15	;4(
	·	·					CHI	LED WATE	R COIL														
	COOLING																						_
	SENSIBLE	EAT DB	EAT WB	LAT DB	_AT WB	VELOCIT	CE N FY PF	RESSURE	EWT	LWI		ER FLO	N PR	ESSURE	MAX.	COIL	NO. OF	SPACING	3		FILTE	ER	٢
	(MBH)	(°F)	(°F)	(°F)	(°F)	(FPM)	DRO	DP (IN. WG)	(°F)	(°F)	RAT	E (GPM) DF	ROP (FT)	RO	WS	COILS	(FINS/IN))	TYPE	EFFICIE	ENCY F	F١
	1096.2	95	78	53	53	486		0.90	42	57		275		13.30	8	3	2	9	F	PLEATED	MER\	√ 8	
	U		OCTAVE	BAND FRE	QUENC	Y SOUND	POWER	LEVELS							UN	IT OU	TLET OCTA	/E BAND FR	EQUE	NCY SOUN	ID POWE	R LEVE	ΞL
	125 HZ	25	60 HZ	500 HZ	100	0 HZ	2000 HZ	4000	HZ	800	0 HZ	6	3 HZ	125 H	łΖ	250	D HZ	500 HZ	10	000 HZ	2000 H	ΗZ	
	73		70	80	7	1	67	57		5	51		84	76		7	6	84		80	72		

2. FAN ARRAY SHALL BE N+1. FAN PERFORMANCE LISTED ASSUMING N FANS. ALL FANS SHALL BE PROVIDED WITH BACKDRAFT DAMPER, PIEZOELECTRIC AIRFLOW MEASUREMENT RINGS, AND MOTOR REMOVAL WINCH. MOUNT ALL FANS ON 1" SPRING ISOLATORS. 3. SELECTION ASSUMES 95/78 SUMMER OA CONDITIONS, 78/67 RA CONDITIONS AND 0 WINTER OA CONDITIONS WITH 68 DEG RA. 4. ENERGY RECOVERY COIL PERFORMANCE ASSUMES 40% PROPYLENE GLYCOL.

6. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS. 7. PROVIDE UV LIGHTING ARRAY DOWNSTREAM OF COOLING COIL.

								RO	OFT	OP A	AIR H	ANDL	LING L	JNIT SO	CHE	DUL	E																	
									PHYSIC	CAL DATA						SUPPLY	Y FAN								RETUR	RN FAN				UNIT E	LECTR	RICAL RO	QTS	
							N	WIDTH	LENGTH	HEIGHT	WEIGHT	TOTAL	MIN. OA	FAN MOTOR	# OF	FAN	E.S.P.	T.S.P.	RATED H.P.	B.H.P.		TOTAL F	RA FAN MOTOR	# OF	FAN	E.S.P.	T.S.P.	RATED H.P.	B.H.P.					
MODEL #	UN	IIT CONFIGURA	TION	SE	RVICE		LOCATION	(IN.)	(IN.)	(IN.)	(LBS)	SA CFM	CFM	TYPE	FANS	RPM	(" WC)	(" WC)	(PER FAN)	(PER FAN) VFD	CFM	TYPE	FANS	RPM	(" WC)	(" WC)	(PER FAN)	(PER FAN)	VOLT.	PH.	MCA N	MOCP	REMARKS
DPSA050		SEE DETAIL	CO	NFERENCE ROC	M/CLASSROOM	ISPACE	ROOF	97	265	78	7300	10000	1260	ECM	2	1369	1.50	2.6	6	5.20	No	8740	ECM	2	1603	0.75	0.75	2	2.20	480 V	3	82 A	100	1,2,3,4,5,6,7,8,9,12,13 ,17,18
DPSA050		SEE DETAIL		OFFI	CE AREA		ROOF	97	273	78	8400	20000	1800	ECM	4	1656	2.00	4.15	6	5.90	No	182000	0 ECM	2	1618	1.60	1.60	8	7.60	480 V	3	126 A	150	1,2,3,4,5,6,7,8,9,12,14 ,17,18
DPS007A		SEE DETAIL		MECHANIZE	D SYSTEMS LAE	3	ROOF	87	67	41	1430	1400	550	ECM	1	1835	1.30	1.9	4	4.00	No									480 V	3	14 A	20	2,3,4,5,7,8,9,12,15,17, 18
DPS020A		SEE DETAIL		MULTIPURPOS	E ASSEMBLY AF	REA	ROOF	77	163	83	4200	8000	1040	ECM	1	1595	1.20	3.9	10	7.37	No	6960	ECM	1	2271	1.20	1.20	8	3.35	480 V	3	72 A	90	2,3,4,5,7,8,9,12,16,17, 18
	I		l l	COOL	ING PERFORMA	NCE							GAS F	IEATING			·	-										·		I		I		
					DX COIL						INPU	JT	OUTPUT									FILTER S	SECTION											
											HEAT	ING I	HEATING	MAX		MIN						PREF	ILTER											
RIGERANT	TOTAL (MBH)	SENSIBLE (MBH)	EAT DB (°F)	EAT WB (°F)	LAT DB (°F)	LAT WB (°F)	FACE VELOCITY (FPM)	APD	(IN. WG.)	EER	CAPAC (MBI	CITY C H)	CAPACITY (MBH)	PRESURE (PSI)	E PF	RESSURE (PSI)	Е Т	YPE	FILTER EFFICIENCY	NO OF FILTERS	WIDTH (IN)	HEIGHTF/ (IN)	ACE VELOCITY (FPM)	PRESS (CLEA	JRE DRO N) ("WC)) PRE) ([ESSURE [DIRTY) ("V	DROP NC)						
R410A	346.4	273.9	77	64	53	53	377	(0.73	11.3	600	.0	486	14.00		7.00	PLE	EATED	MERV 13	12	24	24	402	().17		1.00							
R410A	572.3	498.9	77	64	54	54	565		1.30	10.1	1125	5.0	931	14.00		7.00	PLE	EATED	MERV 13	12	24	24	457	().20		1.00							
R410A	69.7	45.9	83	69	53	53	232	(0.30	11.3	100	.0	80	14.00		5.00	PLE	ATED	MERV 13	6	18	24	133	(0.03		0.75							
R410A	288.6	222.9	77	64	52	52	374	(0.42	11.1	600	.0	480	14.00		5.00	PLE	ATED	MERV 13	9	18	24	370	(0.16		1.00							

4. UNIT TO BE PROVIDED WITH FIELD-MOUNTED CONTROLS. REFER TO CONTROL DRAWINGS AND COORDINATE WITH CONTROLS CONTRACTOR PRIOR TO SUBMITTING SHOP DRAWINGS FOR REVIEW BY ENGINEER. MANUFACTURER TO INCLUDE POINT LIST OF FACTORY ALARMS AS WELL AS AVAILABLE POINTS FOR PULL-IN BY FIELD-MOUNTED CONTROLS. SUBMITTAL TO ENGINEER MUST INCLUDE SIGNED COVERSHEET REVIEW FROM SUCCESSFUL CONTROLS CONTRACTOR.REFER TO CONTROLS DRAWINGS FOR ADDITIONAL DETAILS.

		SPL	.IT SY	STEM	INDC		r sche	EDULE						S	PLIT	SYSTI	EM O	UTDOOR	UNIT SC	HEDU	LE				
			DII	MENSIONS	(IN.)		AIRFLOW	ELECTF	RICAL					DIME	ENSIONS (I	IN.)	WEIGHT	TOTAL	SENSIBLE	MINIMUM		EL	ECTRICAL		
MARK	MANUF.	MODEL #	LENGTH	WIDTH	HEIGHT	WEIGHT (LBS)	(CFM)	VOLTAGE	PHASE	REMARKS	MARK	MANUF.	MODEL #	LENGTH	WIDTH	HEIGHT	(LBS)	COOLING (MBH)	COOLING (MBH)	SEER	MCA	MOCP	VOLTAGE	PHASE	REMARKS
IU-01	DAIKIN	FTX18AXVJU	12	42	12	35	600	208 V	1	ALL	OU-1	DAIKIN	RX18AXVJU	30	16	26	57	19500.0	17560.0	19	18 A	25	208 V	1	ALL
IU-02	DAIKIN	FTX18AXVJU	12	42	12	35	600	208 V	1	ALL	OU-2	DAIKIN	RX18AXVJU	30	16	26	57	19500.0	17560.0	19	18 A	25	208 V	1	ALL
IU-03	DAIKIN	FTX18AXVJU	12	42	12	35	600	208 V	1	ALL	OU-3	DAIKIN	RX18AXVJU	30	16	26	57	19500.0	17560.0	19	18 A	25	208 V	1	ALL
IU-04	DAIKIN	FTX18AXVJU	12	42	12	35	600	208 V	1	ALL	OU-4	DAIKIN	RX18AXVJU	30	16	26	57	19500.0	17560.0	19	18 A	25	208 V	1	ALL
IU-05	DAIKIN	FTX18AXVJU	12	42	12	35	600	208 V	1	ALL	OU-5	DAIKIN	RX18AXVJU	30	16	26	57	19500.0	17560.0	19	18 A	25	208 V	1	ALL

<u>REMARKS</u>: 1. INDOOR UNIT POWERED FROM OUTDOOR UNIT. 2. PROVIDE HAIL GUARD.

PROVIDE INDOOR UNITS WITH CONDENSATOR PUMPS
 LG UNITS ARE ACCEPTABLE.

			E	LECTRICAL DAT	A		
/E	RPM	FAN HP	VOLTAGE	PHASE	HZ	SONES	REMARKS
СТ	3344	2	208 V	3	60	17	1,4,5,6
СТ	1200	20	480 V	3	60	22	1,2,3,4,5,6
СТ	1200	20	480 V	3	60	22	1,2,3,4,5,6
СТ	1200	20	480 V	3	60	22	1,2,3,4,5,6

					AIRFLOW					ELECT	RICAL DAT	A		
MARK	MANUFACTURER	MODEL #	SERVICE	TYPE	(CFM)	E.S.P.	DRIVE	RPM	FAN HP	VOLTAGE	PHASE	ΗZ	SONES	REMARKS
EF-01	GREENHECK	G	A119 KITCHEN PREP	ROOF-MOUNTED DOWNBLAST CENTRIFIGUAL	280	0.30	DIRECT	942	0.25	120 V	1	60	4	1-5
EF-02	GREENHECK	G	A115 JANITOR	ROOF-MOUNTED DOWNBLAST CENTRIFIGUAL	90	0.30	DIRECT	900	0.25	120 V	1	60	2.9	1-5
EF-03	GREENHECK	G	A104 WOMENS	ROOF-MOUNTED DOWNBLAST CENTRIFIGUAL	420	0.30	DIRECT	934	0.25	120 V	1	60	5	1-5
EF-04	GREENHECK	G	A106 FAMILY TOILET	ROOF-MOUNTED DOWNBLAST CENTRIFIGUAL	70	0.30	DIRECT	1483	0.10	120 V	1	60	3.2	1-5
EF-05	GREENHECK	G	A108 MENS	ROOF-MOUNTED DOWNBLAST CENTRIFIGUAL	420	0.30	DIRECT	934	0.25	120 V	1	60	5	1-5
EF-06	GREENHECK	G	B157 JANITOR	ROOF-MOUNTED DOWNBLAST CENTRIFIGUAL	120	0.30	DIRECT	973	0.25	120 V	1	60	3.5	1-5
EF-07	GREENHECK	G	C105 GRAPHICS	ROOF-MOUNTED DOWNBLAST CENTRIFIGUAL	225	0.30	DIRECT	894	0.25	120 V	1	60	3.7	1-5
EF-08	GREENHECK	G	C107 MAIL/CPY ROOM 149A	ROOF-MOUNTED DOWNBLAST CENTRIFIGUAL	145	0.30	DIRECT	1362	0.10	120 V	1	60	3.1	1-5
EF-09	GREENHECK	G	C108 MENS	ROOF-MOUNTED DOWNBLAST CENTRIFIGUAL	485	0.30	DIRECT	928	0.25	120 V	1	60	3.3	1-5
EF-10	GREENHECK	G	C104 WOMENS	ROOF-MOUNTED DOWNBLAST CENTRIFIGUAL	485	0.30	DIRECT	928	0.25	120 V	1	60	3.3	1-5
EF-11	GREENHECK	G	C102 LOUNGE	ROOF-MOUNTED DOWNBLAST CENTRIFIGUAL	230	0.30	DIRECT	898	0.25	120 V	1	60	3.7	1-5
EF-12	GREENHECK	G	C135 MECH SYSTEMS LAB	ROOF-MOUNTED DOWNBLAST CENTRIFIGUAL	2000	0.30	DIRECT	659	0.25	120 V	1	60	7	1-5
UEF-01	GREENHECK	IPA	C129A SOIL/PLANT GRINDING - PLANT DRYER	UTILITY SET BACKWARD INCLINE FAN	250	2.00	BELT	2466	2.00	120 V	1	60	15	1-7
UEF-03	TWIN CITY	PBW 31906	C129A SOIL/PLANT GRINDING - SOIL GRINDER EXHAUST	UTILITY SET BACKWARD INCLINE FAN	1050	19.50	BELT	3500	7.50	480 V	3	60	30	1-7
UEF-03	TWIN CITY	PBW 31906	C129A SOIL/PLANT GRINDING - SOIL GRINDER EXHAUST	UTILITY SET BACKWARD INCLINE FAN	1050	19.50	BELT	3500	7.50	480 V	3	60	30	1-7

REMARKS: 1. PROVIDE FAN WITH UNIT-MOUNTED SPEED CONTROL. PROVIDE WITH INTEGRAL DISCONNECT.

PROVIDE WITH BACKDRAFT DAMPER. PROVDE WITH INSULATED ROOF CURB.

PROVIDE WITH BIRDSCREEN. PROVIDE AMCA TYPE C SPARK RESISTANT FAN ASSEMBLY.

PROVIDE FAN WITH INSULATED ROOF CURB ASSEMBLY WITH VIBRATION ISOLATION BASE. 8. TWIN CITY AND GREENHECK UNITS ARE ACCEPTABLE.

	VAV/CAV BOX SC	HEDULE						
DUCT CONNECTI ONS	INLET STATIC PRESS. @ MAX CFM ("		MAX RADIATED	MAX.	MIN.	PRESSURE INDEPENDENT	LEAKAGE RATE @	
INLET SIZE	WG)	MAX DISCHARGE NC	NC	CFM	CFM	CONTROLS	2.0"	REMARKS
4	0.75	25	25	110	30	Yes	0.02	1
5	0.75	25	25	250	45	Yes	0.02	1
6	0.75	25	25	400	60	Yes	0.02	1
8	0.75	25	25	700	130	Yes	0.02	1
10	0.75	25	25	1100	165	Yes	0.02	2
12	0.75	25	25	1500	240	Yes	0.02	1
14	0.75	25	25	2000	320	Yes	0.02	1
16	0.75	25	25	2700	420	Yes	0.02	1

	SC		ÚLE	\rightarrow	\sim	\frown	$\bigvee \longrightarrow$	\frown	\checkmark	\searrow	\frown	\sim	\bigvee	\rightarrow	\frown	$\gamma \sim \gamma$	\frown	\checkmark		\frown	$\frown \frown \frown$
	PHY	SICAL D	ATA								SUPPL	Y FAN									
WIDTH (IN.)	I LENG (IN.	TH HEIG	HT WE .) (L	EIGHT _BS)	TOTAL SA CFM	MIN. OA CFM	FAN MOTOR TYPE	# OF FANS	FAN RPM	E.S.P. (" WC)	T.S.P. (" WC)	RATED (PER F	H.P. B.I AN) (PER	H.P. R FAN)	VOLT.	PH.	MCA	мос	CP VFD	OP. FREQ	. REMARKS
108	322	2 94	1'	1785	25000	25000	PREMIUM EFF.	4	2323	3.50	6.03	10	8.	.78	480 V	3	54 A	60) Yes	60	ALL
								HOT	VATER	PREHEA	T COIL										
EATING IBH)	i EAT (°F) LAT	(°F)	MAX. VELOCI	FACE TY (FPM)	MAX [(. AIR PRESSURE DROP (IN WG)	EWT (°F) LW	/T (°F)	WATER RATE	R FLOW (GPM)	MAX PRESSU	. WATEF RE DROI	२ २ (FT)	MAX C	OIL RO	ws	NO OF CO	DILS SF	MAX. FIN PACING (FINS/IN)
5.8	0	5	7	5	02		0.19	180		149	10)0		3.90			2		2		10
							F	ILTER SE	CTION	· · ·											
		PREFIL	TER											PRIMAR	Y FILTE	ĪR					
O OF	WIDTH	HEIGHT	FA VEL (VCE DCITY	PRES	SURE	PRESSURE DROP (DIRTY)				FI	I TFR	NO OF	WIDTH	HEIGH	и и	FACE	Y	PRESS	JRE FAN)	PRESSURE DROP (DIRTY)
TERS	(IN)	(IN)	(FI	PM)	("W	VC)	("WC)		TYPE		EFFI	CIENCY	FILTERS	(IN)	(IN)		(FPM)		("WC	;)	("WC)
20	24	20	4	32	0.1	19	1.00	VARICE	L SH CA	RTRIDG	E ME	RV 14	20	24	20		432		0.47		1.50
S								UNIT F	RADIATE	ED OCTA	VE BAN	D FREQI	JENCY SO	UND PC	WER L	EVELS					
4000 H	ΗZ	8000	HZ		63 HZ		125 HZ	25	50 HZ		500 H	Z	1000	HZ		2000 HZ	2		4000 HZ		8000 HZ
60		51			82		73		70		76		71			61			46		51

EXHAUST FAN SCHEDULE

			VEN		ALVE S	CHEDUL	E			
MARK							VALVE MINIMUM CAPACITY (CEM)	VALVE MAXIMUM CAPACITY (CFM)	MIN. INLET STATIC PRESSURE (" WC)	REMARKS
VVE-70	PHOENIX	ACCEL II	<varies></varies>	EXHAUST	8	8	35	700	0.60	ALL
VVE-100	PHOENIX	ACCEL II	SINGLE	EXHAUST	10	10	50	1000	0.60	ALL
VVE-150	PHOENIX	ACCEL II	SINGLE	EXHAUST	12	12	90	1500	0.60	ALL
VVE-200	PHOENIX	ACCEL II	DOUBLE	EXHAUST	22X10	22X10	100	2000	0.60	ALL
VVE-300	PHOENIX	ACCEL II	DOUBLE	EXHAUST	26X12	26X12	180	3000	0.60	ALL
VVS-70	PHOENIX	ACCEL II		SUPPLY	8	8	100	2000	0.60	ALL
VVS-100	PHOENIX	ACCEL II	SINGLE	SUPPLY	10	10	50	1000	0.60	ALL
VVS-150	PHOENIX	ACCEL II	SINGLE	SUPPLY	12	12	90	1500	0.60	ALL
VVS-200	PHOENIX	ACCEL II	DOUBLE	SUPPLY	22X10	22X10	100	2000	0.60	ALL
VVS-300	PHOENIX	ACCEL II	DOUBLE	SUPPLY	26X12	26X12	180	3000	0.60	ALL

REMARKS: 1. PROVIDE "MEDIUM PRESSURE" RATED VALVES SUITABLE FOR OPERATION DOWN TO 0.6" WC UPSTERAM DUCT PRESSURE. 2. FAILURE STATE FOR FUMEHOOD EXHAUST VALVES IS TO FAIL OPEN. ALL OTHER VALVES TO FAIL CLOSED. PROVIDE ZONE PRESENCE SENSOR FOR ALL FUME HOODS.

REFER TO LAB CONSULTANT DRAWINGS FOR FUME HOOD SASH TYPES AND COORDINATE SASH SENSORS ACCORDINGLY. 5. PROVIDE WITH CONTROL PER UNIVERSITY OF KENTUCKY STANDARDS. REFER TO RELATED CONTROL DRAWINGS FOR ADDITIONAL

REQUIREMENTS. 6. ANTEC IS ACCEPTABLE.

\sim	\sim			\sim	\frown	\sim	$\frown \frown \frown$			\sim	$\overline{}$	\sim	$\frown \frown$	\sim	\frown		\sim	\frown	\searrow	\sim	$\frown \frown \frown$	$\langle \rangle \langle \rangle$	\sim	\sim	$\overline{}$	\checkmark
							F٨	AN CO	IL SC	HEDUL	E															
SIONS (IN)				SUPPLY	Y FAN								COOLIN	IG COIL								HEATING COIL				
					MOTOR								TOTAL COOLING CAPACITY	SENSIBLE COOL CAPACITY							HEATING CAPACITY					
/IDTH	HEIGHT	NOM. CFM	ESP (IN WC)	DRIVE	HP	MCA MOP	VOLTAGE PH	HASE EAT	DB (°F)	LAT DB (°F)	EAT WB (°F)	LAT WB (°F)	(MBH)	(MBH)	EWT (°F)	LWT (°F)	GPM	WPD (IN. WG)	EAT DB (°F)	LAT DB (°F)	(MBH)	EWT (°F)	LWT (°F)	GPM	WPD (IN. WG)	REMA
24	12	1200	0.10	DIRECT	0.17	5 A 15 A	115 V	1	75	56	63	54	12.0	11.5	45	55	3	4.70	70	105	15.0	180	150	2	8.90 A	ALL
24	12	1200	0.10	DIRECT	0.17	5A 15A	115 V	1	75	56	63	54	12.0	11.5	45	55	3	4.70	70	105	15.0	180	150	2	8.90 A	ALL

LOUVER SCHEDULE												
IUFACTURER	MODEL #	SERVICE	WIDTH (IN)	HEIGHT (IN)	FREE AREA	BIRD SCREEN	DRAINABLE BLADE	REMARKS				
RUSKIN	ELF375DX	C110 AHU REMOVAL	120	120	50	Yes	Yes	ALL				
RUSKIN	ELF375DX	MECHANIZED SYSTEMS LAB AIR INTAKE	48	40	8	Yes	Yes	ALL				

			REGISTERS, GRI	LLES, A	ND DIFF	USERS					
MARK	MANUFACTURER	MODEL #	ТҮРЕ	GRILLE SIZE	DUCT INLET SIZE	DUCT BRANCH SIZE	MAX CFM	P.D.	NOISE CRITERIA	THROW PATTERN	REM
E-1	TITUS	45F	ALUMINUM EGG CRATE EXHAUST GRILLE - SIGHT PROOF	24x24	SEE DWGS	SEE DWGS	1000	0.05	10	-	1,3
E-2	<varies></varies>	<varies></varies>	<varies></varies>	<varies></varies>	<varies></varies>	<varies></varies>	<varies></varies>	<varies></varies>	<varies></varies>	<varies></varies>	<varies< td=""></varies<>
R-1	TITUS	45F	ALUMINUM EGG CRATE EXHAUST GRILLE - SIGHT PROOF	24x24	SEE DWGS	SEE DWGS	1000	0.05	25	-	1,3
R-3	TITUS	63FS	ALUMINUM HEAVY DUTY RETURN GRILLE - 1/2" SPACING, 30 DEG. FIXED DEFLECTION, BLADES PARALLEL TO SHORT DIMENSION	30x74	28x72	SEE DWGS	5000	0.12	25	-	1,3
R-4	TITUS	63FS	ALUMINUM HEAVY DUTY RETURN GRILLE - 1/2" SPACING, 30 DEG. FIXED DEFLECTION, BLADES PARALLEL TO SHORT DIMENSION	30x52	28x50	SEE DWGS	3330	0.12	25	-	1,3
R-5	TITUS	45F	ALUMINUM EGG CRATE RETURN GRILLE - SIGHT PROOF	24x24	8"Ø	8"Ø	225	0.05	10	-	1,3
R-6	TITUS	45F	ALUMINUM EGG CRATE RETURN GRILLE - SIGHT PROOF	24x24	10"Ø	10"Ø	350	0.05	10	-	1,3
R-7	TITUS	45F	ALUMINUM EGG CRATE RETURN GRILLE - SIGHT PROOF	24x24	12"Ø	12"Ø	600	0.05	10	-	1,3
S-1	TITUS	PCS-AA	ALUMINUM PERFORATED SUPPLY DIFFUSER	24x24	6"Ø	6"Ø	100	0.12	25	4-WAY	1,3
S-2	TITUS	PCS-AA	ALUMINUM PERFORATED SUPPLY DIFFUSER	24x24	8"Ø	8"Ø	225	0.11	25	4-WAY	1,3
S-3	TITUS	PCS-AA	ALUMINUM PERFORATED SUPPLY DIFFUSER	24x24	10"Ø	10"Ø	350	0.13	25	4-WAY	1,3
S-4		PCS-AA	ALUMINUM PERFORATED SUPPLY DIFFUSER	24x24	12"Ø	12"Ø	600	0.10	25	4-WAY	1,3
S-6	TITUS	TRITEC	ALUMINUM CRITICAL ENVIRONMENT DIFFUSER, PERFORATED, 2-WAY	24x48	12"Ø	12"Ø	650	0.10	25	2-WAY	1,3
S-7	TITUS	TRITEC	ALUMINUM CRITICAL ENVIRONMENT DIFFUSER, PERFORATED, 2-WAY	24x24	10"Ø	10"Ø	350	0.11	25	2-WAY	1,3
S-8	TITUS	TITUS FL-3	ALUMINUM JET-THROW FLOWBAR DIFFUSER, (1) 3" SLOTS	48x6	10"Ø	10"Ø	350	0.12	25	1-WAY	1,3
S-9	TITUS	300FL	ALUMINUM SIDEWALL DIFFFUSER, DOUBLE DEFLECTION BLADES, 3/4" SPACING	8x8	6x6	6x6	110	0.10	25	-	1,3
S-11	TITUS	DL	ALUMINIUM DRUM LOUVER	12x4	12x4	12x4	250	0.12	25	2-WAY	1,3
S-12	TITUS	FL-30	ALUMINUM JET-THROW FLOWBAR DIFFUSER, (1) 3" SLOTS	48x6	10"Ø	10"Ø	350	0.12	25	1-WAY	1,3
S-16	TITUS	TMRA-AA	ALUMINUM, ADJUSTABLE, ROUND DIFFUSER	32"Ø	14"Ø	14"Ø	530	0.13	25	360 DEG	1,3
S-17	TITUS	FL-25	ALUMINUM HIGH-THROW FLOWBAR DIFFUSER, (2) 2.5" SLOTS	48x8	12"Ø	12"Ø	550	0.15	25	2-WAY	1,2,3
S-18	TITUS	ML-38	ALUMINUM SLOT DIFFUSER WITH (3) 3/4" SLOTS	48x6	12"Ø	10"Ø	250	0.12	25	2-WAY	1,2,3
T-1	TITUS	45F	ALUMINUM EGG CRATE TRANSFER GRILLE - SIGHT PROOF	24x24	SEE DWGS	SEE DWGS	1000	0.05	25	-	1,3

REMARKS: 1. COLOR SELECTED BY ARCHITECT. 2. PROVIDE WITH MANUFACTURER PLENUM BOX WITH INLET AS INDICATED ON SCHEDULE. 3. PRICE, KRUEGER ARE ACCEPTABLE.

MARK	MANU
IH-1A	TΛ
IH-1B	TV
IH-02	TV
IH-03	TV
RH-01	TV
RH-02	TV
REMARKS: 1. PROVIE 2. PROVIE 3. PROVIE 4. GREEN	DE WITH IN DE WITH BI DE KYNAR IHECK IS A

GRAVITY HOOD SCHEDULE

			MAXIMUM	THROAT LENGTH		THROAT VELOCITY			
ACTURER	MODEL	SERVICE	CFM	(IN)	THROAT WIDTH (IN)	(FPM)	PRESSURE DROP (IN WC)	WEIGHT (LBS.)	REI
IN CITY	MGI	AHU-01 INTAKE HOOD	12500	52	120	500	0.10	550	ALL
IN CITY	MGI	AHU-01 INTAKE HOOD	12500	52	120	500	0.10	550	ALL
IN CITY	MGI	MECH RM INTAKE	1600	30	30	500	0.10	40	ALL
IN CITY	MGI	MECH RM INTAKE	600	18	18	500	0.10	25	ALL
IN CITY	MGR	MECH ROOM RELIEF	1600	30	30	500	0.10	40	ALL
IN CITY	MGR	MECH RM RELIEF	600	18	18	500	0.10	25	ALL

INSULATED ROOF CURB. BIRDSCREEN. R FINISH. ACCEPTABLE.

								A	AIR COOLED (CHILLEF	र											
				[DIMENSIONS (IN))	_		COOLING CAPACITY						FI UID PD (FT	NO OF	2					
TYPE	MANUFACTURER	MODEL #	SERVICE	LENGTH	WIDTH	HEIGHT	WEIGHT (LBS)	FLUID TYPE	(TONS)	IPLV.IP	EWT (°F)	LWT (°F)	GPM (MIN)	GPM (MAX)	HD)	S	REFRIGERANT	VOLTAGE	PHASE	MCA	MOCP	REM/
AIR-COOLED SCROLL	DAIKIN	AGZ036E	AHU-01 COOLING	95	88	101	2887	PROPYLENE GLYCOL	35.2	15.9	54	44	33	140	6.50	4	R-410A	460 V	3	84 A	90	1,2,3,5,6
AIR-COOLED SCROLL	DAIKIN	AGZ130E	AHU-01 COOLING	192	88	99	5903	PROPYLENE GLYCOL	130.9	17.24	54	44	33	523	9.40	4	R-410A	460 V	3	290 A	350	1,2,3,4,6

REMARKS: 1. PROVIDE SINGLE POINT POWER CONNECTION WITH FACTORY-MOUNTED DISCONNECT

PROVIDE SINGLE FOIRT FOWER CONNECTION WITH FACTORT-MOUNTED DISCONNECT
 PROVIDE WITH INTEGRAL PHASE AND BROWNOUT PROTECTION.
 REFER TO CONTROL DRAWINGS FOR ADDITIONAL REQUIREMENTS. FACTORY PACKAGED CONTROLS WITH BACNET INTERFACE.
 130 LBS R410A REFRIGERANT

PROVIDE WITH INTEGRAL HEAT TRACE ON CHILLER INTERNAL COMPONENTS FOR FREEZE PROTECTION WITH BAS ALARM.
 PROVIDE WITH 65KA SHORT-CIRCUIT RATING.

WITH 05KA SHURT-CIRCUIT	R
IITS ARE ACCEPTABLE.	

LET PIPE	WATER FLOW RATE	WATER PRESSURE DROP (FT	
SIZE	(GPM)	HD)	REMARKS
6	220	2.00	ALL
6	320	2.00	ALL
4	125	1.80	ALL

							WATER FLOW	INPUT	GROSS OUTPUT		WATER PRESSURE DROP			1		
MARK	MANUFACTUREF	R MODEL #	TYPE	FUEL	EWT (°F)	LWT (°F)	(GPM)	(MBH)	(MBH)	GAS INLET PRESSURE (PSI)	(FT HD)	VOLTAGE	PHASE	FLA	HZ	REN
B-01	LOCHINVAR	FTX	CONDENSING	NATURAL GAS	150	180	55	850.0	825.0	8.00	5.70	120 V	1	9 A	60	ALL
B-02	LOCHINVAR	FTX	CONDENSING	NATURAL GAS	150	180	55	850.0	825.0	8.00	5.70	120 V	1	9 A	60	ALL
B-03	LOCHINVAR	FTX	CONDENSING	NATURAL GAS	150	180	55	850.0	825.0	8.00	5.70	120 V	1	9 A	60	ALL
B-04	LOCHINVAR	FTX	CONDENSING	NATURAL GAS	150	180	55	850.0	825.0	8.00	5.70	120 V	1	9 A	60	ALL
L																

REMARKS: 1. PROVIDE INTEGRAL DISCONNECT. 2. PROVIDE WITH INTEGRAL SAFETY RELEIF VALVE.

 PROVIDE WITH NEUTRALIZATION TRAPS AND KITS PER MANUFACTURER REQUIREMENTS.
 PROVIDE FACTORY-MOUNTED CONTORLS. REFER TO CONTROLS SPECIFICATIONS FOR ADDITIONAL DETAILS. 5. LAARS AND FULTON ARE ACCEPTABLE.

LOOP FILTER SCHEDULE

						DIAMETER		
MARK	MANUFACTURER	MODEL #	FILTER	GPM	P.D. (PSI)	(IN)	HEIGHT (IN)	REMARKS
LF-01	HARMSCO	WB 40SC-2	SINGLE-FILTER HOUSING WITH CARTRIDGE PLEATED MEDIA FILTER	20	0.40	13	20	ALL
LF-02	HARMSCO	WB 40SC-2	SINGLE-FILTER HOUSING WITH CARTRIDGE PLEATED MEDIA FILTER	30	0.60	13	20	ALL
LF-03	HARMSCO	WB 40SC-2	SINGLE-FILTER HOUSING WITH CARTRIDGE PLEATED MEDIA FILTER	15	0.30	13	20	ALL

REMARKS: 1. REFER TO PIPING SCHEMATICS. 2. TACO IS ACCEPTABLE.

		HOT WA		HEAT (COIL S	CHEDUL	.E					
IENSIONS (IN)		AIR								RUNOUT	
		0514	PRESSURE			0.014	WATER PRESSURE			CAPACITY		
WIDTH	HEIGHT	CFM	DROP (IN WC)	EAT (°F)	LAT (°F)	GPM	DROP (FEET HEAD)	EVVI (°F)	LVVI(°F)	(MBH)	(IIN)	REMARKS
10	9	110	0.10	55	105	0.3	0.50	180	150	4.8	1/2	ALL
12	12	250	0.07	55	105	0.5	1.20	180	150	6.8	1/2	ALL
12	12	250	0.10	55	80	0.4	1.20	180	150	7.5	1/2	ALL
12	12	400	0.11	55	105	0.9	2.70	180	150	12.2	3/4	ALL
12	12	400	0.10	55	80	0.6	2.80	180	150	10.9	1/2	ALL
16	15	700	0.12	55	105	1.2	3.20	180	150	23.2	3/4	ALL
20	15	1000	0.10	55	80	1.4	4.50	180	150	27.1	3/4	ALL
26	15	1100	0.11	55	105	1.8	4.20	180	150	36.3	3/4	ALL
26	15	1100	0.12	55	80	1.5	4.50	180	150	29.8	3/4	ALL
26	15	1500	0.12	55	105	2.1	6.20	180	150	52.6	1	ALL
26	15	1500	0.15	55	80	1.7	6.20	180	150	40.7	3/4	ALL
28	18	2000	0.16	55	80	2.7	7.80	180	150	54.3	1	ALL
38	18	2700	0.19	55	80	3.6	10.60	180	150	73.2	1	ALL
42	18	3000	0.23	55	80	5.8	12.00	180	150	81.4	1	ALL

BUFFER TANK SCHEDULE

		TANK VOLUME			
	SERVICE	(GAL)	DIAMETER	HEIGHT	REMARKS
CBUFFER TANK	HEATING WATER SYSTEM	300.00	40	80	ALL
BUFFER TANK	CHILLED WATER SYSTEM	500.00	42	80	ALL

				HYD	RONI	C PUMP SC	HEDULE							
						PRESSURE (FEET	MINIMUM EFFICIENCY				ELECTRICAL DATA			
MARK	MANUFACTURER	MODEL	TYPE	SERVICE	GPM	HEAD)	(%)	RPM	HZ	HP	BRAKE HP	VOLTAGE	PHASE	REN
P-01A	BELL&GOSSETT	1.25BC	BASE-MOUNTED	CHILLED WATER SYSTEM - 35 T CHILLER	65	70.00	68	1750	60	3	2.1	480 V	3	ALL
P-01B	BELL&GOSSETT	1.25BC	BASE-MOUNTED	CHILLED WATER SYSTEM - 35 T CHILLER	65	70.00	68	1750	60	3	2.1	480 V	3	ALL
P-02A	BELL&GOSSETT	2BD	BASE-MOUNTED	CHILLED WATER SYSTEM - 130T CHILLER	225	90.00	73	1750	60	10	7.1	480 V	3	ALL
P-02B	BELL&GOSSETT	2BD	BASE-MOUNTED	CHILLED WATER SYSTEM - 130T CHILLER	225	90.00	73	1750	60	10	7.1	480 V	3	ALL
P-03	BELL&GOSSETT	2.5BB	BASE-MOUNTED	HEATING WATER SYSTEM	220	80.00	75.5	1750	60	10	6.1	480 V	3	ALL
P-04	BELL&GOSSETT	2.5BB	BASE-MOUNTED	HEATING WATER SYSTEM	220	80.00	75.5	1750	60	10	6.1	480 V	3	ALL
P-05	BELL&GOSSETT	2X2X7B	INLINE	AHU-01 FREEZE PROTECTION	85	30.00	59.9	1750	60	1.5	1.1	480 V	3	ALL
P-06	BELL&GOSSETT	2X2X7B	INLINE	AHU-01 FREEZE PROTECTION	85	30.00	59.9	1750	60	1.5	1.1	480 V	3	ALL
P-07	BELL&GOSSETT	2BD	BASE-MOUNTED	ENERGY RECOVERY LOOP	125	70.00	64.7	1750	60	7.5	3.6	480 V	3	ALL
P-08	BELL&GOSSETT	2BD	BASE-MOUNTED	ENERGY RECOVERY LOOP	125	70.00	64.7	1750	60	7.5	3.6	480 V	3	ALL
P-B1	BELL&GOSSETT	e60-ECM 2x2x5.25	INLINE	BOILER 1 PRIMARY PUMP	55	15.00	66	1226	60	1	0.8	208 V	1	ALL
P-B2	BELL&GOSSETT	e60-ECM 2x2x5.25	INLINE	BOILER 2 PRIMARY PUMP	55	15.00	66	1226	60	1	0.8	208 V	1	ALL
P-B3	BELL&GOSSETT	e60-ECM 2x2x5.25	INLINE	BOILER 3 PRIMARY PUMP	55	15.00	66	1226	60	1	0.8	208 V	1	ALL
P-B4	BELL&GOSSETT	e60-ECM 2x2x5.25	INLINE	BOILER 4 PRIMARY PUMP	55	15.00	66	1226	60	1	0.8	208 V	1	ALL

<u>REMARKS</u>: 1. PROVIDE SHAFT GROUNDING RINGS. 2. COORDINATE FINAL HORSEPOWER WITH VFD MANUFACTURER. 3. ARMSTRONG AND TACO ARE ACCEPTABLE.

BOILER SCHEDULE

EXPANSION TANK SCHEDULE

					PHYSICAL SIZE (IN)		CAPACITY			
							TANK VOLUME	ACCEPTANCE	AIR CHARGE	1
K	MANUFACTURER	MODEL #	TYPE	SERVICE	DIAMETER	HEIGHT	(GALS)	VOLUME (GALS)	PRESSURE	REMA
1	BELL&GOSSETT	D-120	VERTICAL, DIAPHRAM	HEATING WATER SYSTEM	24	46	70.0	57.00	15.00	ALL
2	BELL&GOSSETT	D-100	VERTICAL, DIAPHRAM	CHILLED WATER SYSTEM	20	49	60.0	49.00	15.00	ALL
3	BELL&GOSSETT	D-60	VERTICAL, DIAPHRAM	GLYCOL WATER SYSTEM	16	44	35.0	28.00	15.00	ALL
ç.										

REMARKS: 1. TACO, WESSELLS ARE ACCEPTABLE.

VARIABLE FREQUENCY DRIVE SCHEDULE

					ELECTRICAL		FUSED AND		
MARK	MANUFACTURER	SERVICE	MOTOR HP	VOLTAGE	PHASE	HZ	DISCONNECT	BYPASS STARTER	RE
VFD-AHU-01	ABB	LAB AIR HANDLER - AHU-01	60.0	480 V	3	60	YES	YES	1,2,3
VFD-FHEF-01A	ABB	LABORATORY EXHAUST FAN 1A	20.0	480 V	3	60	YES	YES	1,2
VFD-FHEF-01B	ABB	LABORATORY EXHAUST FAN 1B	20.0	480 V	3	60	YES	YES	1,2
VFD-FHEF-01C	ABB	LABORATORY EXHAUST FAN 1C	20.0	480 V	3	60	YES	YES	1,2
VFD-FHEF-02	ABB	LABORATORY EXHAUST FAN 2	2.0	480 V	3	60	YES	YES	1,2
VFD-P-01A	ABB	P-01	1.5	480 V	3	60	YES	NO	1,2
VFD-P-01B	ABB	P-01	1.5	480 V	3	60	YES	NO	1,2
VFD-P-02A	ABB	P-02	5.0	480 V	3	60	YES	NO	1,2
VFD-P-02B	ABB	<varies></varies>	<varies></varies>	<varies></varies>	3	60	YES	NO	1,2
VFD-P-03	ABB	P-03	10.0	480 V	3	60	YES	NO	1,2
VFD-P-04	ABB	P-04	10.0	480 V	3	60	YES	NO	1,2
VFD-P-05	ABB	P-05	1.5	480 V	3	60	YES	NO	1,2
VFD-P-06	ABB	P-06	1.5	480 V	3	60	YES	NO	1,2
VFD-P-07	ABB	P-07	7.5	480 V	3	60	YES	NO	1,2
VFD-P-08	ABB	P-08	7.5	480 V	3	60	YES	NO	1,2

REMARKS: 1. YASKAWA ACCEPTABLE.

 HORSEPOWER LISTED IN SCHEDULE FOR REFERENCE ONLY. FINAL HORSEPOWER OF ALL VFDS TO BE COORDINATED WITH FINAL REVIEWED SHOP DRAWINGS OF EACH RESPECTIVE PIECE OF EQUIPMENT. SUBMITTAL FOR VFD'S MUST INCLUDE MANUFACTURER VERIFICATION OF HORSEPOWER REVIEW PRIOR TO BEING SUBMITTED TO ENGINEER FOR REVIEW. 3. PROVIDE REDUNDANT VFD PACKAGE.

FUME HOOD.

PLUMBING UNDERSLAB GENERAL NOTES:

- A. REFER TO STRUCTURAL DRAWINGS SHEET S2.1, FOR REQUIREMENTS OF UNDERSLAB PIPING ROUTED NEAR FOOTER ZONE OF INFLUENCE. PIPING SHALL BE INSTALLED IN A MANNER WHICH DOES NOT
- UNDERMINE FOOTINGS. B. PLUMBING CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING INSTALLATION OF UNDERSLAB SANITARY, ROOF LEADER, FORCED MAIN, AND LAB WASTE PIPING WITH THE BUILDING FOOTINGS. REFER TO STRUCTURAL DRAWINGS FOR FOOTING AND
- FOUNDATION PLAN. C. REFER TO P4 SERIES SHEETS FOR FIXTURE TYPES.
- ARCHITECTURAL DRAWINGS. P68 REFER TO SITE UTILITY PLAN FOR CONTINUATION. INVERT ELEVATION AS LISTED. SLEEVE PER STRUCTURAL REQUIREMENTS. REFER TO DETAIL OR STRUCTURAL DRAWINGS FOR SLEEVE/BACKFILL REQUIREMENTS. P82 REFER TO SITE-CIVIL DRAWINGS FOR CONTINUATION OF

P23 PROVIDE 2" ACID WASTE DRAIN CONNECTION FOR CUP SINK IN

P27 DROP STORM DRAIN PIPING EXPOSED ON WALL. SLEEVE THRU

FLOOR AND ROUTE BELOW GRADE. COORDINATE WITH

STRUCTURAL AND ARCHITECTURAL DRAWINGS. SEE CIVIL

P29 SAWCUT CONCRETE SLAB AND INSTALL NEW SANITARY SEWER

OR ACID WASTE PIPING. REPAIR, PATCH AND FINISH CONCRETE

FLOOR TO MATCH SURROUNDING AREA. COORDINATE WITH

STRUCTURAL AND ARCHITECTURAL DRAWINGS.

DRAWINGS FOR CONTINUATION.

P25 DROP PIPING IN CHASE. COORDINATE WITH ALL OTHER UTILITIES,

- SANITARY PIPING.

P16 ROUTE SEAMLESS NO-JOINT TUBING BELOW SLAB FROM TRAP PRIMERS. REFER TO SPECIFICATIONS. P30 ROUTE OVERFLOW AND STORM DRAIN PIPING AS HIGH AS POSSIBLE IN BUILDING STRUCTURE. COORDINATE WITH DUCTWORK, PIPING, LIGHT FIXTURES, CONDUIT, STRUCTURAL AND

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- ARCHITECTURAL. P31 DROP OVERFLOW STORM DRAIN PIPING IN CHASE. SLEEVE THRU EXTERIOR WALL 12" ABOVE FINISH FLOOR TO BOTTOM OF PIPE AND TERMINATE IN DOWNSPOUT NOZZLE. SEAL WALL
- PENETRATION WEATHER TIGHT. COORDINATE WITH STRUCTURAL AND ARCHITECTURAL DRAWINGS. P32 DROP STORM DRAIN PIPING IN CHASE. SLEEVE THRU FLOOR AND ROUTE BELOW GRADE. COORDINATE WITH STRUCTURAL AND
- ARCHITECTURAL DRAWINGS. SEE CIVIL DRAWINGS FOR CONTINUATION. P33 COORDINATE PIPE ROUTING WITH CEILING MOUNTED PROJECTOR.
- P57 ROUTE DOMESTIC WATER PIPING ABOVE LAY-IN CEILING AS HIGH AS POSSIBLE. COORDINATE WITH DUCTWORK, PIPING, LIGHT FIXTURES, CONDUIT, BUILDING STRUCTURE, ETC. P58 INSTALL SHUT-OFF VALVES IN AN ACCESSIBLE AREA ABOVE LAY-IN CEILING.
- P69 BALANCE VALVE TO 1 GPM.
- P70 PIPING TO MOP BASIN. REFER TO DETAIL. P71 PROVIDE ZURN MODEL Z199 DOWNSPROUT NOZZLE MATCHING PIPE CONNECTION SIZE. PROVIDE STAINLESS STEEL SCREEN. LOCATION SHALL BE COORDINATED WITH ARCHITECTURAL ELEVATION PLANS. REFER TO ARCHITECTURAL ELEVATION FOR

MOUNTING HEIGHT OF OVERFLOW DRAIN.

PLUMBING ABOVE GRADE GENERAL NOTES:

- A. REFER TO STRUCTURAL DRAWINGS FOR REQUIREMENTS OF UNDERSLAB PIPING ROUTED NEAR FOOTINGS. ZONE OF INFLUENCE PIPING SHALL BE INSTALLED IN A MANER THAT DOES NOT UNDERMINE FOOTINGS.
- B. REFER TO STRUCTURAL DRAWINGS, DETAIL FOR REQUIREMENTS OF HANGING FROM JOISTS. C. ELECTRICAL PANELS SHOWN FOR REFERENCE ONLY.
- REFER TO ELECTRICAL DRAWINGS. NO DUCT OR PIPING SHALL BE ROUTED OVER ELECTRICAL PANELS.
- D. ALL EXPOSED PIPING SHALL BE CLEANED AND PREPARED FOR PAINTING ACCORDING TO ARCHITECT'S INSTRUCTIONS AND SPECIFICATIONS.

ACCORDINGLY.

E. REFER TO ARCHITECTURAL PLANS FOR ALL RATED WALLS. COORDINATE REQUIRED FIRE STOPPING

<u>KEY PLAN</u>

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PLUMBING

FLOOR PLAN

AREA A

P301A

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LIGHT FIXTURES, STRUCTURE, ETC.

STRUCTURAL AND ARCHITECTURAL DRAWINGS.

PLUMBING ABOVE GRADE GENERAL NOTES:

- A. REFER TO STRUCTURAL DRAWINGS FOR REQUIREMENTS OF UNDERSLAB PIPING ROUTED NEAR FOOTINGS. ZONE OF INFLUENCE PIPING SHALL BE INSTALLED IN A MANER THAT DOES NOT UNDERMINE
- FOOTINGS. B. REFER TO STRUCTURAL DRAWINGS, DETAIL FOR REQUIREMENTS OF HANGING FROM JOISTS.
- C. ELECTRICAL PANELS SHOWN FOR REFERENCE ONLY. REFER TO ELECTRICAL DRAWINGS. NO DUCT OR
 - PIPING SHALL BE ROUTED OVER ELECTRICAL PANELS. D. ALL EXPOSED PIPING SHALL BE CLEANED AND
 - PREPARED FOR PAINTING ACCORDING TO ARCHITECT'S INSTRUCTIONS AND SPECIFICATIONS.
 - . REFER TO ARCHITECTURAL PLANS FOR ALL RATED WALLS. COORDINATE REQUIRED FIRE STOPPING ACCORDINGLY.
- P41 ROUTE REVERSE OSMOSIS PIPING IN LAB CASEWORK ALONG WALL BEHIND FUME HOOD. P44 DROP IN WALL AND ROUTE REVERSE OSMOSIS PIPING IN LAB CASEWORK. P46 DROP COLD WATER PIPING TO FUME HOOD.

P39 DROP PIPING IN UTILITY PIPE CHASE. COORDINATE WITH LAB CASEWORK AND ARCHITECTURAL DRAWINGS.

P26 DROP OVERFLOW STORM DRAIN PIPING EXPOSED ON WALL. SLEEVE THRU EXTERIOR WALL 12" ABOVE FINISH FLOOR TO

P27 DROP STORM DRAIN PIPING EXPOSED ON WALL. SLEEVE THRU FLOOR AND ROUTE BELOW GRADE. COORDINATE WITH

P37 ROUTE PIPING ABOVE CEILING. COORDINATE WITH DUCTWORK, PIPING, CONDUIT, LIGHT FIXTURES, STRUCTURE, ETC.

STRUCTURAL AND ARCHITECTURAL DRAWINGS. SEE CIVIL DRAWINGS FOR CONTINUATION.

P38 DROP PIPING IN CHASE. COORDINATE WITH STRUCTURAL AND ARCHITECTURAL DRAWINGS.

PIPING, LIGHT FIXTURES, CONDUIT, STRUCTURAL AND ARCHITECTURAL.

BOTTOM OF PIPE AND TERMINATE IN DOWNSPOUT NOZZLE. SEAL WALL PENETRATION WEATHER TIGHT. COORDINATE WITH

P30 ROUTE OVERFLOW AND STORM DRAIN PIPING AS HIGH AS POSSIBLE IN BUILDING STRUCTURE. COORDINATE WITH DUCTWORK,

P40 LOCATE SHUT-OFF VALVES ABOVE LAY-IN CEILING IN AN ACCESSIBLE AREA. COORDINATE WITH DUCTWORK, PIPING, CONDUIT,

<u>KEY PLAN</u>

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4"LW

Autodesk Docs://202225 - UK Grain Center Rebuild/2022.XKPR22 Central File.rv

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- S1 TERMINATION LOCATION OF ALL NETWORK CABLING OF AREA "A". S2 CONNECTION FOR PIV. FULLY COORDINATE WITH FIRE PROTECTION INSTALLER PRIOR TO ROUGH-IN.
- S3 A/V RACK REFER TO SPECIFICATION AND DETAILS. S13 FURNISH AND INSTALL 12" X 4" CABLE TRAY, CONTRACTOR SHALL COORDINATE INSTALLATION WITH ALL ABOVE CEILING DUCT

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- WORK, MECHANICAL EQUIPMENT, PIPING, CONDUIT ETC. HOLD TRAY CLOSE TO WALLS AS POSSIBLE. S22 DUCT SMOKE DETECTOR WITH ASSOCIATED REMOTE
- INDICATOR/TEST STATION PROVIDED BY ELECTRICAL CONTRACTOR, INSTALLED BY MECHANICAL CONTRACTOR.
- S24 OUTDOOR WALL MOUNTED WIRELESS ACCESS POINT. MOUNT OUTLET ON INTERIOR SIDE OF WALL, 6" ABOVE FINISHED CEILING FOR FUTURE CONNECTION TO WAP. PROVIDE ONE 1-1/4" PVC CONDUIT SLEEVE THROUGH EXTERIOR WALL FOR FUTURE CABLING. REFER TO DETAIL 4/T500 FOR ADDITIONAL

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TAGGED NOTES

- E26 DROP CONDUIT IN CHASE/WALL CAVITY TO FEED INTO SURFACE MOUNTED RACEWAY. SEE DETAIL 6/E500 FOR MORE INFORMATION.
- E28 FURNISH AND INSTALL FOUR (4) SINGLE CIRCUIT, TWIST LOCK (L5-20R) OUTLETS IN "SERVICE PANEL" IN CEILING, SEE ARCHITECTURAL DRAWINGS FOR LOCATION AND PANEL INFORMATION. PROVIVE PIGTAIL ELECTRICAL DOP CABLES WITH OUTLET TERMINATIONS AT TABLE TOPS FOR EACH OUTLET.
 S13 FURNISH AND INSTALL 12" X 4" CABLE TRAY, CONTRACTOR SHALL COORDINATE INSTALLATION WITH ALL ABOVE CEILING DUCT
- TRAY CLOSE TO WALLS AS POSSIBLE.
 S19 TERMINATION LOCATION OF ALL NETWORK CABLING OF AREA "B". AND FINAL TERMINATION OF FIBER FROM UTILITY COMPANY.

WORK, MECHANICAL EQUIPMENT, PIPING, CONDUIT ETC. HOLD

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<u>KEY PLAN</u>

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TAGGED NOTES

- E26 DROP CONDUIT IN CHASE/WALL CAVITY TO FEED INTO SURFACE MOUNTED RACEWAY. SEE DETAIL 6/E500 FOR MORE INFORMATION.
- E27 SURFACE MOUNTED RACEWAY SHALL BE FEED FROM CONDUIT DROPPED IN ADJACENT LAB CHASE/WALL. SEE SHEET ES500 FOR MORE INFORMATION.
 E28 FURNISH AND INSTALL FOUR (4) SINGLE CIRCUIT, TWIST LOCK
- (L5-20R) OUTLETS IN "SERVICE PANEL" IN CEILING, SEE ARCHITECTURAL DRAWINGS FOR LOCATION AND PANEL INFORMATION. PROVIVE PIGTAIL ELECTRICAL DOP CABLES WITH OUTLET TERMINATIONS AT TABLE TOPS FOR EACH OUTLET.
 \$13 FURNISH AND INSTALL 12" X 4" CABLE TRAY, CONTRACTOR SHALL COORDINATE INSTALLATION WITH ALL ABOVE CEILING DUCT
- WORK, MECHANICAL EQUIPMENT, PIPING, CONDUIT ETC. HOLD TRAY CLOSE TO WALLS AS POSSIBLE. S19 TERMINATION LOCATION OF ALL NETWORK CABLING OF AREA "B". AND FINAL TERMINATION OF FIBER FROM UTILITY COMPANY.
- S20 TERMINATION LOCATION OF ALL NETWORK CABLING OF AREA "C".
 S24 OUTDOOR WALL MOUNTED WIRELESS ACCESS POINT. MOUNT OUTLET ON INTERIOR SIDE OF WALL, 6" ABOVE FINISHED CEILING FOR FUTURE CONNECTION TO WAP. PROVIDE ONE 1-1/4" PVC CONDUIT SLEEVE THROUGH EXTERIOR WALL FOR FUTURE CABLING. REFER TO DETAIL 4/T500 FOR ADDITIONAL INFORMATION.

<u>KEY PLAN</u>

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