University of Kentucky
Procurement Services

INVITATION FOR BIDS

CCK-2802.0-1-24
Fine Arts Room# 306 Renovation
ADDENDUM #1
06/25/2024

IMPORTANT: BID AND ADDENDUM MUST BE RECEIVED BY: 07/02/2024 @ 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: BIDDER NOTICES

- The pre-bid attendance log is enclosed.
- Attendance at this pre-bid meeting was not mandatory. However, all responsive bids warrant that the bidder has examined the site and local conditions (IB-3, 2iii).
- The bid "Due Date" has been moved to 07/02/2024. The time and location for submission of the bids remains the same.

ITEM #2: REVISIONS TO THE ORIGINAL BID DOCUMENTS

- It has been decided that "luxury vinyl tile" will no longer be used in this renovation. Instead, the Owner has decided to use carpet tile for the flooring. Specific information for the carpet tile (Diffuse 24X24 Ecoworx®) the Owner has chosen for installation can be found here: https://www.shawcontract.com/en-us/products/59575/colors/75597.
- Please refer to the enclosed drawings and specifications when preparing your bid.

ITEM #2: QUESTIONS AND RESPONSES

- Refer to and incorporate within the offer, the enclosed Questions and Responses.

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

OFFICIAL APPROVAL
UNIVERSITY OF KENTUCKY

Ken Scott 06/25/2024

Ken Scott / (859) 257-9102

SIGNATURE

_____

_____

Typed or Printed Name

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

UK UNIVERSITY OF KENTUCKY Purchasing Division

CCK-2802.0-1-24
Fine Arts Room# 306 Renovation

Pre-Bid Meeting
June 13, 2024

SIGN-IN SHEET

	REPRESENTATIVE	COMPANY
1.	Ken Scott	UK
2.	Billy Harvey	Churchill McGee
3.	Steve Bohon	Churchill McGee
4.	Jason Murphy	UKY - PDC
5.	David Crossan	Fine Arts - IT Dir
6.	Jeff Hurst	OMNI Communications
7.	Mike Mitchell	PARSONS Electric, Inc.
8.	Perry Parker	AACON
9.	Daniel Jones	SimpliSynced
10.	Sean Bamford	Sand D Construction
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		

FINE ARTS GUIGNOL BUILDING

2802.0 ROOM 306 CLASSROOM IMPROVEMENTS (MAC LAB)

UNIVERSITY OF KENTUCKY
LEXINGTON, KENTUCKY

DESIGN AND CONSTRUCTION ADMINISTRATION PROVIDED BY:
FACILITIES ENGINEERING
211 PETERSON SERVICE BUILDING
LEXINGTON, KY 40506

MECHANICAL ENGINEERS:

TECHNICAL HORIZONS
Industrial • Commercial • Institutional
501 Darby Creek, Suite #31 Lexington, KY 40509
859.263.5983

Contacts: Matt Ellis or Eric Frank

DRAWING INDEX

PROJECT DESCRIPTION

REFURBISH EXISTING CLASSROOM INCLUDING REPLACEMENT OF EXISTING VINYL TILE FLOORING WITH NEW LUXURY VINYL TILE AND BASE, REPLACING EXISTING CEILING WITH NEW LAY-IN ACOUSTICAL CEILING, PATCHING AND REPAINTING ALL WALLS, INSTALLING NEW ROLLER SHADES ON WINDOWS, UPGRADING ELECTRICAL POWER, LIGHTING AND DATA SYSTEMS FOR NEW CLASS FURNITURE CONFIGURATION, UPGRADING OF HVAC SYSTEMS, AND NEW A/V EQUIPMENT.

VICINITY MAP

University of Kentucky
Facilities Engineering & Asset Management

TECHNICAL HORIZONS
Industrial • Commercial • Institutional
501 Darby Creek, Ste #31 Lexington, KY
859.263.5983

FINE ARTS GUIGNOL BLDG.
ROOM 306 MAC LAB

TITLE SHEET AND DRAWING INDEX SHEET

PROJECT NO.:	2802.0
BUILDING NO.:	0022
DESIGNED BY:	GWW
DRAWN BY:	GWW
UK PROJ. MGR.:	MURPHY
DATE:	5-17-2024

REVISIONS

NO	DESCRIPTION	DATE
1	FOR CONSTRUCTION	6-7-2024

DRAWING NUMBER:
T-001

ARCHITECTURAL GENERAL NOTES:

DEMOLITION:

A. COORDINATE DEMOLITION WORK WITH NEW WORK. REMOVE ADDITIONAL EXISTING ITEMS AS REQUIRED TO PERFORM NEW WORK.
B. WHEN INDICATED IN DRAWINGS AS BEING REQUIRED, COORDINATE HAZARDOUS MATERIAL ABATEMENT WITH TOMMY TAYLOR IN UK ENVIRONMENTAL MANAGEMENT DEPARTMENT - 257-5295 (O), 229-3045 (C) OR TWTAYL02UKY.EDU
C. REFER TO WORK RESTRICTIONS IN THE PROJECT MANUAL. CLOSELY FOLLOW THE PROJECT MANUAL REQUIREMENTS FOR THE LOCATIONS AND TYPES OF BARRICADES, WORKING HOURS, AND NOTIFICATIONS TO THE OWNER. COORDINATE DEMOLITION TO MAINTAIN PROTECTION OF THE EXISTING BUILDING.
D. REFER TO THE PROJECT MANUAL SECTIONS ENTITLED "CUTTING AND PATCHING" AND "SELECTIVE DEMOLITION."
E. REFER TO THE MECHANICAL, ELECTRICAL, PLUMBING, AND STRUCTURAL DRAWINGS AND COORDINATE DEMOLITION WORK WITH ALL DISCIPLINES.
F. FOR PROJECTS LOCATED WITHIN PATIENT CARE AREAS OF THE HOSPITALS OR CLINICS, COORDINATE ALL DEMOLITION WORK WITH "INFECTION CONTROL GUIDELINES". DO NOT REMOVE AND TRANSPORT MATERIALS IN A MANNER THAT WOULD BE UNSAFE TO PATIENTS AND STAFF.
G. SURFACES ADJACENT TO AREAS OF DEMOLITION WHICH ARE AFFECTED BY THE WORK SHALL BE PATCHED AND FINISHED TO MATCH ADJACENT SURFACES.
H. ALL DEMOLITION SHALL BE DISPOSED OF IN A MANNER ACCEPTABLE TO LOCAL AND STATE REGULATORY AGENCIES.
I. CONTRACTOR SHALL PROVIDE TEMPORARY PARTITIONS TO AVOID MIGRATION OF DUST INTO ADJACENT OCCUPIED AREAS.
J. IF APPLICABLE, SEE EARTHMOVING SPECIFICATION FOR ADDITIONAL EXCAVATION SPECIFICATIONS.
K. ALL ROCK AND CONCRETE REMOVAL SHALL BE PERFORMED SO THAT THE EXISTING BUILDING AND BUILDING SYSTEMS (INCLUDING SENSITIVE MEDICAL SYSTEMS) ARE NOT NEGATIVELY AFFECTED. CONTRACTOR SHALL COORDINATE EXACT REQUIREMENTS WITH THE OWNER PRIOR TO CONSTRUCTION.
L. BLASTING, JACKHAMMERING, AND HOE RAMMING ARE PROHIBITED ON SITE.
M. CHEMICAL ROCK BREAKING (I.E. NON-EXPLOSIVE EXPANDING GROUT) IS AN ACCEPTABLE FORM OF DEMOLITION AND ROCK REMOVAL.
N. USE OF NON-VIBRATION INDUCING HYDRAULIC BREAKING MACHINES, SAWS AND WIRE CUTTERS IS AN ACCEPTABLE FORM OF DEMOLITION AND ROCK REMOVAL.
O. REMOVAL OF CHEMICALLY BROKEN ROCK FROM THE SITE SHALL BE COORDINATED WITH THE OWNER TO AVOID INTERFERENCE WITH SENSITIVE MEDICAL EQUIPMENT DURING HOURS OF OPERATION

ARCHITECTURAL:

A. WORK SHOWN ON THE DRAWINGS SHALL BE BASE BID UNLESS SPECIFICALLY NOTED TO BE BY ALTERNATE BID.
B. FIELD VERIFY EXISTING FINISH FLOOR ELEVATIONS PRIOR TO STARTING CONSTRUCTION. MATCH NEW FLOOR ELEVATION WITH EXISTING UNLESS NOTED OTHERWISE.
C. DRAWING DIMENSIONS ARE TO FINISHED SURFACE. FIELD VERIFY ALL CONDITIONS AND DIMENSIONS PRIOR TO STARTING WORK AND NOTIFY ARCHITECT IMMEDIATELY IF DISCREPANCIES ARE FOUND BETWEEN CONTRACT DOCUMENTS AND ACTUAL FIELD CONDITIONS.
D. WHERE A FIXED DIMENSION IS SHOWN ON AN ACCESSIBLE FIXTURE OR ACCESSORY, THAT ITEM SHALL BE INSTALLED EXACTLY AS DIMENSIONED. REFER TO THE ACCESSORY MOUNTING LEGEND FOR MOUNTING HEIGHTS.
E. DO NOT SCALE DRAWINGS. REFER DIMENSION QUESTIONS TO ARCHITECT FOR INTERPRETATION.
F. DOOR AND FRAME NUMBERS CORRESPOND TO RESPECTIVE ROOM NUMBERS. IN ROOMS WITH MULTIPLE OPENINGS, A SUFFIX HAS BEEN ADDED TO DOOR NUMBERS, I.E., A101-B.
G. LOCATE INSIDE FACE OF DOOR FRAME JAMBS 6 INCHES FROM FINISH FACE OF ADJACENT WALLS UNLESS NOTED OTHERWISE.
H. COORDINATE EQUIPMENT WORK WITH MANUFACTURERS AND SUPPLIERS TO INSURE PROPER ROUGH-IN CLEARANCES FOR INSTALLATION, USE AND MAINTENANCE.
I. REFER TO CIVIL DRAWINGS FOR FINISH FLOOR ELEVATIONS RELATIVE TO SITE GRADING.
J. PROTECT EXISTING SURFACES TO REMAIN THAT ARE NOT INCLUDED IN SCOPE OF WORK BUT THAT ARE WITHIN AREAS OF CONSTRUCTION ACTIVITY.
K. PATCH, REPAIR AND RESTORE EXISTING FINISHES AND SURFACES TO "AS NEW CONDITION" AS REQUIRED TO MATCH SURROUNDING MATERIALS OR TO PROVIDE APPROPRIATE SUBSTRATE PRIOR TO INSTALLING NEW FINISHES. AREAS NOTED TO BE PATCHED OR REPAIRED ON THE DRAWINGS ARE GIVEN FOR REFERENCE AND SHALL NOT BE INTERPRETED TO LIMIT THE SCOPE OF WORK.
L. VERTICAL COURSING FOR NEW MASONRY WALL CONSTRUCTION SHALL EQUAL EIGHT INCHES (8") FOR ONE CONCRETE MASONRY UNIT PLUS ONE MORTAR JOINT AND THREE BRICK COURSES PLUS THREE MORTAR JOINTS, UNLESS NOTED OTHERWISE.
M. TOOTH NEW MASONRY INTO EXISTING MASONRY UNLESS OTHERWISE INDICATED. PROVIDE HORIZONTAL ANCHORS BETWEEN NEW AND EXISTING MASONRY AT CONDITIONS THAT PROHIBIT TOOTHED-TYPE CONSTRUCTION. HORIZONTAL JOINTS OF NEW MASONRY SHALL MATCH EXISTING UNLESS OTHERWISE INDICATED. NEW MASONRY BOND SHALL MATCH EXISTING UNLESS OTHERWISE INDICATED.
N. PROVIDE CONTROL JOINTS (C.J.) IN MASONRY WALL CONSTRUCTION AS INDICATED. WHERE NOT SHOWN, PROVIDE MAXIMUM SPACING BETWEEN JOINTS OF 40'-0" AND MAXIMUM DISTANCE BETWEEN OUTSIDE CORNERS AND JOINTS OF 10'-0." PROVIDE JOINTS BETWEEN INTERIOR LOAD BEARING AND NON-LOAD BEARING PARTITIONS, AT ALL ABRUPT CHANGES IN WALL HEIGHT, AT CHANGES IN PARTITION THICKNESS AND AT PILASTER LOCATIONS. VERIFY FINAL CONTROL JOINT LOCATIONS WHETHER OR NOT INDICATED ON THE DRAWINGS WITH ARCHITECT PRIOR TO STARTING WORK.
O. PROVIDE CONTROL JOINTS (C.J.) IN GYPSUM BOARD WALL CONSTRUCTION AS INDICATED. WHERE NOT SHOWN, PROVIDE MAXIMUM SPACING BETWEEN JOINTS OF 30'-0." VERIFY FINAL CONTROL JOINT LOCATIONS WHETHER OR NOT INDICATED ON THE DRAWINGS WITH ARCHITECT PRIOR TO STARTING WORK.
P. INTERIOR STUD SPACING SHALL BE MAXIMUM 16" ON CENTER UNLESS NOTED OTHERWISE.
Q. PROVIDE FINISHED END PANELS, FILLERS, SUPPORTS, ETC. REQUIRED FOR A COMPLETE CABINETRY INSTALLATION. PROVIDE CUTOUTS, ACCESS PANELS AND REMOVABLE COMPONENTS AS REQUIRED BY NEW OR EXISTING CONDITIONS SUCH AS ELECTRICAL OUTLETS, JUNCTION BOXES, CLEANOUTS, ETC.
R. VERIFY MOUNTING HEIGHTS OF ACCESSORIES, EQUIPMENT, DOOR HARDWARE, CASEWORK, ETC., AND PROVIDE SOLID 2X SUPPORT WOOD BLOCKING FASTENED TO FRAMING MEMBERS AS REQUIRED TO SUPPORT WEIGHT AND USE OF ITEMS. WHERE MOUNTING HEIGHTS ARE NOT INDICATED, MOUNT ITEMS IN ACCORDANCE WITH RECOGNIZED INDUSTRY STANDARDS, COORDINATE LOCATIONS WITH MANUFACTURER OR SUPPLIER AND REFER MOUNTING HEIGHT QUESTIONS TO ARCHITECT FOR INTERPRETATION.
S. AT ALL EXTERIOR ENVELOPE CONDITIONS, SOLID WOOD BLOCKING INDICATED SHALL BE CONTINUOUS, UNLESS SPECIFICALLY NOTED OTHERWISE
T. PROVIDE SEALANT BETWEEN HOLLOW METAL FRAME PERIMETERS AND SURROUNDING WALL/FLOOR CONSTRUCTION UNLESS OTHERWISE INDICATED.
U. PROVIDE SEALANT AT FRAME'S PERIMETER JOINT WITH THE SURROUNDING CONSTRUCTION.
V. PROVIDE SEALANT BETWEEN DISSIMILAR MATERIALS SUCH AS GYPSUM BOARD AND MASONRY, MASONRY AND CONCRETE, COUNTERTOPS AND WALLS, ETC.
W. STAIRWELLS, ELEVATOR HOISTWAYS, ELEVATOR EQUIPMENT ROOMS, AND SHAFT WALLS SHALL BE TWO-HOUR FIRE-RATED CONSTRUCTION UNLESS OTHERWISE INDICATED.
X. REPAIR AND PATCH SPRAYED FIRE-RESISTIVE AND FIRESTOP MATERIALS WHERE DAMAGED DUE TO INSTALLATION OF NEW MATERIALS TO RESTORE SPECIFIED FIRE RATING.
Y. DO NOT BEGIN WORK THAT MAY REQUIRE COORDINATION, SUCH AS CEILING INSTALLATION, PRIOR TO FINAL SUBMITTAL OF MECHANICAL AND ELECTRICAL COORDINATION DRAWINGS TO ARCHITECT; NOR PRIOR TO RESOLUTION AND APPROVAL OF COORDINATION ISSUES.
Z. REFER TO LIFE SAFETY DRAWINGS FOR FIRE-RATED FLOOR, WALL, CEILING AND ROOF LOCATIONS. INSTALL FIRESTOPPING AT PENETRATIONS IN RATED CONSTRUCTION AND AT TOPS OF RATED WALLS.
  Z.1. REFER TO STRUCTURAL DRAWINGS FOR FOOTING, UNDERSLAB DRAINAGE AND BACKFILL REQUIREMENTS.
  Z.2. REFER TO LANDSCAPE AND CIVIL DRAWINGS FOR SITE ELEMENTS AND IMPROVEMENTS ADJACENT TO BUILDING EXTERIOR.
  Z.3. REFER TO CIVIL DRAWINGS FOR FOUNDATION DRAINS AND STORM DRAINAGE REQUIREMENTS.

SIGNAGE:

A. ALL INTERIOR SIGNAGE (TEXT, BRAILLE, PICTOGRAMS, SIZES, ETC) SHALL CONFORM WITH ICC/ANSI A117.1 'ACCESSIBLE AND USABLE BUILDINGS AND FACILITIES', CHAPTER 703.
B. ALL PERMANENT SIGNAGE TEXT TO BE VERIFIED WITH OWNER PRIOR TO FABRICATION.
C. REFER TO DRAWING SHEET A-621 AND SPECIFICATIONS FOR SIGNAGE SCHEDULE AND SIGNAGE TYPES SHOWN.

CEILING:

A. CENTER CEILING GRIDS WITHIN ROOMS EACH DIRECTION UNLESS NOTED/DIMENSIONED OTHERWISE.
B. LOCATE CEILING GRIDS WITHIN ROOMS SUCH THAT BORDERS CONTAIN NOT LESS THAN 1/2 TILE WIDTH, UNLESS OTHERWISE INDICATED.
C. CENTER PENETRATIONS IN ACOUSTICAL CEILING SYSTEMS WITHIN INDIVIDUAL CEILING PANELS, SUCH AS SPRINKLER HEADS, DIFFUSERS, LIGHT FIXTURES, ETC., UNLESS OTHERWISE INDICATED.
D. PAINT EXPOSED GYPSUM BOARD AND PLASTER CEILING SURFACES UNLESS OTHERWISE INDICATED.
E. PROVIDE CONTROL JOINTS (C.J.) IN GYPSUM BOARD CEILING CONSTRUCTION AS INDICATED. WHERE NOT SHOWN, PROVIDE MAXIMUM SPACING BETWEEN JOINTS OF 30'-0." VERIFY FINAL CONTROL JOINT LOCATIONS WITH ARCHITECT PRIOR TO STARTING WORK WHETHER OR NOT INDICATED ON THE DRAWINGS.
F. CEILING ACCESS PANELS INDICATED ARE NOT INTENDED TO LIMIT NUMBER OF PANELS REQUIRED. PANEL QUANTITY SHALL BE SUFFICIENT TO PROVIDE REQUIRED ACCESS WHETHER OR NOT INDICATED ON THE DRAWINGS. VERIFY FINAL LOCATIONS WITH ARCHITECT PRIOR TO STARTING WORK.
G. REFER TO FINISH PLANS FOR ADDITIONAL CEILING FINISH INFORMATION.
H. REFER TO ELECTRICAL LIGHTING DRAWINGS FOR CEILING-MOUNTED LIGHT FIXTURE TYPES AND QUANTITIES.
I. REFER TO MECHANICAL DRAWINGS FOR CEILING-MOUNTED DIFFUSERS, GRILLE TYPES AND QUANTITIES.
J. REFER TO FIRE PROTECTION DRAWINGS FOR SPRINKLER HEAD TYPES AND QUANTITIES. HEADS HAVE BEEN INTENTIONALLY OMITTED FROM REFLECTED CEILING PLANS FOR CLARITY.

PARTITION TYPES:

A. REFER TO FLOOR PLANS FOR LOCATIONS OF ALL INTERIOR PARTITION CONTROL JOINTS.
B. REFER TO DETAILS B & C /A-702 FOR CONTROL JOINT DETAILS, INCLUDING CONTROL JOINT DETAILS FOR FIRE-RATED WALLS.
C. REFER TO A/A-702 FOR THE DEFLECTION TRACK DETAIL TO BE USED AT ALL PARTITIONS CONNECTED TO STRUCTURE OR BRACED TO STRUCTURE.
D. PROVIDE 5/8" TYPE X GYSUM BOARD UNLESS NOTED OTHERWISE
E. PROVIDE MOLD AND MOISTURE RESISTANT GYPSUM BOARD PANELS AT EXTERIOR WALLS, INCLUDING BASEMENT EXTERIOR WALLS, AND WITHIN 4'-0", IN EACH DIRECTION (LEFT, RIGHT, UP, DOWN, SIDE WALLS, ETC) OF OPERABLE PLUMBING FIXTURES.
F. PROVIDE SOUND ENHANCED GYPSUM BOARD AS / IF INDICATED BY PARTITION TYPES.
G. GAUGE, SPACING, AND PERFORMANCE REQUIREMENTS OF METAL STUDS SHALL BE DETERMINED BY SPECIFICATION, UNLESS NOTED OTHERWISE. STUDS AT LEAD-LINED GYPSUM BOARD WALLS SHALL BE 18 GAUGE.
H. FOR UL DETAILS SHOWN, REFER TO SHEET A-701 FOR ADDITIONAL ASSEMBLY INFORMATION.
I. PROVIDE TILE BACKING PANELS WHERE TILE IS INDICATED. -SEE FINISH SCHEDULE AND WALL TYPES. STOP BACKING PANELS 1" BELOW TOP OF TILE.
J. FOR PENETRATION THROUGH UL DESIGN, PROVIDE THRU PENETRATION ASSEMBLIES EQUAL TO OR GREATER THAN THE FIRE RATING OF THE ASSEMBLY PENETRATED.
K. SKIM COAT ANY EXISTING-TO-REMAIN WALLS WHERE WALL COVERING AND/OR WALL PROTECTION IS REMOVED, AND PREPARE AS REQUIRED TO RECEIVE NEW FINISHES.
L. AT PENETRATIONS OF LEAD LIINGS, PROVIDE LEAD SHIELDS AS REQUIRED TO MAINTAIN CONTINUITY OF PROTECTION. CONTRACTORS SHALL REFERENCE MECHANICAL AND E ELECTRICAL DRAWING FOR LOCATION OF THESE ITEMS. INSTALL SHEET LEAD BEHIND BACK BOXES OF EXISTING AND NEW LEAD LINED WALLS.

DOORS AND FRAMES:

A. REFER TO WALL SECTIONS AND INTERIOR PARTITION TYPES FOR ADDITIONAL NOTES REGARDING TYPICAL WALL CONSTRUCTION.
B. MOUNT ANY INTERIOR SIGNAGE ON LATCH SIDE OF DOOR.
C. ALL FIRE RATED DOORS SHALL BE CATEGORY "A" POSITIVE PRESSURE RATED COMPLYING WITH THE REQUIREMENTS OF UL 10C TESTING. ADDITIONAL INTUMESCENT SEALS SHALL NOT ACCEPTABLE. WHERE A FIRE RATING IS INDICATED ON THE DOOR SCHEDULE, HARDWARE AND DOOR ASSEMBLY COMPONENTS SHALL MEET THE REQUIREMENTS OF THAT LABEL.
D. CYLINDERS / CORES TO BE PROVIDED BY CONTRACTOR; SEE HARDWARE SPECIFICATIONS FOR ADDITIONAL INFORMATION.
E. ALL NEW HOLLOW METAL DOOR FRAMES ARE TO BE PAINTED, AND ARE TO RECEIVE SILENCERS UNLESS SPECIFICALLY NOTED OTHERWISE ON THE DOOR SCHEDULE.
F. UNLESS SPECIFICALLY NOTED OTHERWISE, THE SPECIES, CUT AND STAIN OF ALL NEW INTERIOR WOOD DOORS SHALL MATCH THE EXISTING WOOD DOORS OF THE RADIATION MEDICINE SUITE. CONTRACTOR SHALL SUBMIT SAMPLE FOR INITIAL MATCH APPROVAL, AND SHALL ALSO PROVIDE ONE FULL DOOR MOCKUP PRIOR TO ORDERING, FABRICATING INSTALLING PROJECT DOORS.
G. PROVIDE SEALANT BETWEEN HOLLOW METAL FRAME PERIMETERS AND SURROUNDING WALL CONSTRUCTION, AND AT JOINTS WITH NEW FLOORING, UNLESS OTHERWISE INDICATED.
H. SPOT GROUT NEW HOLLOW METAL DOOR FRAMES IN GYPSUM BOARD WALL CONSTRUCTION.
I. AUTO-OPERATORS SHALL BE MOUNTED ON THE PUSH SIDE OF DOORS (SECURED SIDE).
J. AT DOORS SHOWN WITH GLASS LITES, BOTTOM OF GLASS MUST BE NO HIGHER THAN 43" WHEN INSTALLED.
K. LOCATE INSIDE FACE OF DOOR FRAME HINGE JAMBS 6 INCHES FROM FINISH FACE OF ADJACENT WALLS UNLESS NOTED OTHERWISE.

CASEWORK:

A. IN ADDITIONAL TO ALL KEYNOTES SHOWN, CASEWORK MANUFACTURER(S) SHALL PROVIDE FINISHED ENDS AT ALL EXPOSED SURFACES.
B. PROVIDE IN-WALL BLOCKING FOR ALL WALL/TALL CABINETS. ALL WOOD BLOCKING TO BE FIRE TREATED.
C. PROVIDE 4" HIGH SIDE SPLASHES AT ALL COUNTERTOPS ADJACENT TO WALLS OR OTHER VERTICAL SURFACE.
D. PROVIDE ALL FILLERS, APRONS, CLOSURES, TRIM, ETC. AS REQ'D. FOR A COMPLETE INSTALLATION.
E. PROVIDE 1" RADIUS ON ALL OUTSIDE, EXPOSED CORNERS OF COUNTERTOPS.
F. UNLESS NOTED OTHERWISE, ALL BASE CABINETS ARE 24" DEEP. U.N.O., ALL WALL CABINETS ARE 12" DEEP.

FINISHES:

A. TO FINISH PLANS, REFLECTED CEILING PLANS, INTERIOR ELEVATIONS, ROOM FINISH SCHEDULE, FINISH MATERIAL SCHEDULE FOR FINISH MATERIAL LOCATIONS & INFORMATION.
B. REFER TO CASEWORK DRAWINGS FOR LAMINATE AND SOLID SURFACE LOCATIONS.
C. PAINT NEW & EXISTING HOLLOW METAL DOORS, DOOR FRAMES AND LINTELS EXPOSED TO VIEW IN FINISHED AREAS AND AT EXTERIOR LOCATIONS UNLESS OTHERWISE INDICATED.
D. FINISH SOFFITS, BULKHEADS, AND SIMILAR CONDITIONS TO MATCH SURROUNDING SURFACES UNLESS OTHERWISE INDICATED. ONLY VERTICAL FACES OF SOFFITS TO BE PAINTED WITH WALL COLOR. HORIZONTAL SURFACES TO BE PAINTED CEILING WHITE, FLAT.
E. PROVIDE FINISHES BEHIND FIXED EQUIPMENT SUCH AS CABINETRY, CASEWORK, CHALK AND TACKBOARDS, LOCKERS, ETC.
F. ALIGN FLOOR FINISH TRANSITIONS AT DOOR LOCATIONS WITH CENTERLINE OF DOOR SUCH THAT TRANSITION MATERIALS ARE NOT VISIBLE FROM EITHER SIDE WHEN DOOR IS IN CLOSED POSITION.
G. FLOORING NOT NOTED AS ACCENT AREAS SHALL RECEIVE FIELD FLOORING - SEE FINISH MATERIAL SCHEDULE AND ROOM FINISH SCHEDULE FOR ADDITIONAL DETAILS.
H. FOR FLOOR TRANSITIONS SHOWN, REFER TO DETAILS ON SHEET A-621.
I. UNLESS SPECIFICALLY DENOTED OTHERWISE, ALL WALL AND FLOOR FINISHES SHALL EXTEND BEHIND AND/OR UNDER ALL EQUIPMENT, ACCESSORIES, FURNITURE, AND OWNER FURNISHED 'MIDMARK' MODULAR CASEWORK.
J. WALLS NOT NOTED AS ACCENT PAINT SHALL RECEIVE FIELD PAINT, P-1.
K. INSIDE CORNER OF TILE WALLS SHALL RECEIVE SEALANT JOINT IN LIEU OF GROUT, UNLESS NOTED OTHERWISE.

INFECTION CONTROL GUIDELINES:

1. PROVIDE ACTIVE MEANS TO PREVENT AIRBORNE DUST FROM DISPERSING INTO ATMOSPHERE.
2. COMPLETE ALL CRITICAL BARRIERS (PREFABRICATED PANEL SYSTEM - 'EDGE-GUARD') TO SEAL AREA FROM NON-WORK AREA, OR IMPLEMENT CONTROL CUBE METHOD (CART WITH PLASTIC COVERING AND SEALED CONNECTION TO WORK SITE WITH HEPA VACUUM FOR VACUUMING PRIOR TO EXIT) BEFORE CONSTRUCTION BEGINS.
3. WATER MIST WORK SURFACE TO CONTROL DUST WHILE CUTTING.
4. SEAL UNUSED DOORS WITH DUCT TAPE.
5. BLOCK OFF AND SEAL AREA VENTS.
6. PLACE DUST MAT AT ENTRANCE AND EXIT OF WORK AREA.
7. REMOVE OR ISOLATE HVAC SYSTEM IN AREAS WHERE WORK IS BEING PERFORMED.
8. MAINTAIN NEGATIVE AIR PRESSURE WITHIN WORK SITE UTLIZING HEPA EQUIPPED FILTRATION UNITS.
9. CONTAIN CONSTRUCTION WASTE BEFORE TRANSPORT IN TIGHTLY COVERED CONTAINERS.
10. COVER TRANSPORT RECEPTACLES OR CARTS. CLEAN WHEELS OF CARTS PRIOR TO ENTERING NON-WORK AREAS.
11. DO NOT REMOVE BARRIERS FROM WORK AREA UNTIL COMPLETED PROJECT IS INSPECTED BY THE OWNERS SAFETY DEPARTMENT AND INFECTION CONTROL DEPARTMENT AND THROUGHLY CLEANED BY THE OWNERS ENVIRONMENTAL SERVICES DEPARTMENT.
12. REMOVE BARRIER MATERIAL CAREFULLY TO MINIMIZE SPREADING OF DIRT AND DEBRIS ASSOCIATED WITH CONSTRUCTION.
13. VACUUM AREA WITH HEPA FILTERED VACUUMS.
14. WET MOP AREA WITH DISINFECTANT.
15. UPON COMPLETION, RESTORE HVAC SYSTEM WHERE WORK WAS PERFORMED.

ABBREVIATIONS:

A

A/C	AIR CONDITIONING
ACP	ACOUSTICAL CEILING PANEL
ACT	ACOUSTICAL CEILING TILE
AD	AREA DRAIN
ADD	ADDENDUM
AFF	ABOVE FINISH FLOOR
ALT	ALTERNATE
AP	ACCESS PANEL

B

B/M	BENCH MARK
B.P.	BID PACKAGE
B/S	BOTH SIDES
B/W	BOTH WAYS

C

CB	CATCH BASIN
CFCI	CONTRACTOR FURNISHED, CONTRACTOR INSTALLED
CFT	CERAMIC FLOOR TILE
CG	CORNER GUARD
CGL	CLEAR GLASS
CJ	CONTROL JOINT
℄	CENTERLINE
CLG	CEILING
CLR	CLEAR
CMU	CONCRETE MASONRY UNIT
CONC	CONCRETE
CONT	CONTINUOUS
CPT	CARPET
CPTL	CARPET TILE
CT	CERAMIC TILE
CTG	CLEAR TEMPERED GLASS
CUH	CABINET UNIT HEATER

D

D	DEEP
DF	DRINKING FOUNTAIN
DIM	DIMENSION
DN	DOWN
DW	DUMBWAITER

E

E	EAST
EA	EACH
EFS	EXTERIOR FINISH SYSTEM
E/F	EACH FACE
EG	END GUARD
EIFS	EXTERIOR INSULATION FINISH SYSTEM
EJ	EXPANSION JOINT
EL	ELEVATION
ELEC	ELECTRIC
ELEV	ELEVATOR
EQ	EQUAL
E/W	EACH WAY
EWC	ELECTRIC WATER COOLER
EXP	EXPOSED
EXST	EXISTING

F

FD	FLOOR DRAIN
FE	FIRE EXTINGUISHER
FEB	FIRE EXTINGUISHER / WALL BRACKET
FEC	FIRE EXTINGUISHER CABINET
FF&E	FURNITURE, FIXTURES AND EQUIPMENT
FH	FIRE HYDRANT
FV	FIELD VERIFY
FWC	FABRIC WALL COVERING

G

G	GAS
GA	GAUGE
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GL	GLASS
GLMU	GLASS MASONRY UNIT
GYP BD	GYPSUM BOARD

H

H	HIGH
HB	HOSE BIBB
HDWR	HARDWARE
HM	HOLLOW METAL
H/P	HIGH POINT
HR	HOUR
HT	HEIGHT
HVAC	HEATING, VENTILATION & AIR CONDITIONING
HVC	HOSE VALVE CABINET
HVEC	HOSE VALVE & EXTINGUISHER CABINET

I

ID	INSIDE DIAMETER
INV	INVERT

L

L	LONG
LBS	POUNDS
LGMF	LIGHT GAUGE METAL FRAMING
LH	LEFT HAND
LHR	LEFT HAND REVERSE
D	
LL	LIVE LOAD #
LLH	LONG LEG HORIZONTAL
LLV	LONG LEG VERTICAL
L/P	LOW POINT
LVT	LUXURY VINYL TILE

M

MAX	MAXIMUM
MH	MANHOLE
MIN	MINIMUM, MINUTES
MO	MASONRY OPENING

N

N	NORTH
NIC	NOT IN CONTRACT
NO (OR #)	NUMBER
NOM	NOMINAL
NRC	NOISE REDUCTION COEFFICIENT

O

OC	ON CENTER
OD	OUTSIDE DIAMETER
OFCI	OWNER FURNISHED, CONTRACTOR INSTALLED
OFOI	OWNER FURNISHED, OWNER INSTALLED
OGL	OBSCURE GLASS
OPP	OPPOSITE HAND

P

%	PERCENT
PLAM	PLASTIC LAMINATE
± OR +/-	PLUS OR MINUS
PSI	POUNDS PER SQUARE INCH
PSF	POUNDS PER SQUARE FOOT
PT	PAINT
PWG	POLISHED WIRE GLASS

Q

QT	QUARRY TILE

R

R	RADIUS, RISER
RB	RESILIENT BASE
RCB	RESILIENT COVE BASE
RD	ROOF DRAIN
REFR	REFRIGERATOR
REQD	REQUIRED
RGL	REFLECTIVE GLASS
RH	RIGHT HAND
RHR	RIGHT HAND REVERSED
RO	ROUGH OPENING
RSF	RESILIENT SHEET FLOORING
RSB	RESILIENT STRAIGHT BASE
RT	RESILIENT TREAD

S

S	SOUTH
SAN	SANITARY SEWER
SCWD	SOLID CORE WOOD
SF	SQUARE FEET
SIM	SIMILAR
SP	SPACES
STC	SOUND TRANSMISSION COEFFICIENT
STS	STORM SEWER
SV	SHEET VINYL
SVCB	SHEET VINYL INTEGRAL COVE BASE

T

T	TREAD
T/	TOP OF
T/G	TONGUE AND GROOVE
T/M	TOP OF MASONRY
TS	TUBE STEEL
T/S	TOP OF STEEL
T/W	TOP OF WALL
TYP	TYPICAL

U

UC	UNDERCOUNTER
UNO	UNLESS NOTED OTHERWISE

V

VCT	VINYL COMPOSITION TILE
VT	VINYL TILE
VWC	VINYL WALL COVERING

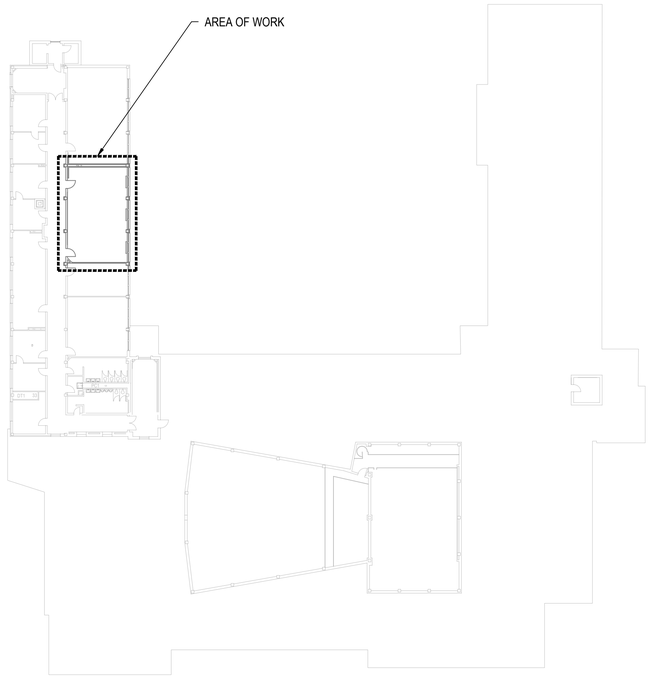
W

W	WEST, WIDE, WATER
W/	WITH
WB	WOOD BASE
WD	WOOD
W/O	WITHOUT
W/P	WORKING POINT
WWF	WELDED WIRE FABRIC

Y

YD	YARD, YARD DRAIN

AREA OF WORK:



AREA OF WORK PLAN - 3RD FLOOR FINE ARTS

Scale: 1" = 30'

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FINE ARTS GUIGNOL BLDG.
ROOM 306 MAC LAB

ARCHITECTURAL GENERAL NOTES, ABBREVIATIONS, ETC.

PROJECT NO.:	2802.0
BUILDING NO.:	0022
DESIGNED BY:	GWW
DRAWN BY:	GWW
UK PROJ. MGR.:	MURPHY
DATE:	5-17-2024

REVISIONS

NO.	DESCRIPTION	DATE
1	FOR CONSTRUCTION	6-7-2024

DRAWING NUMBER:

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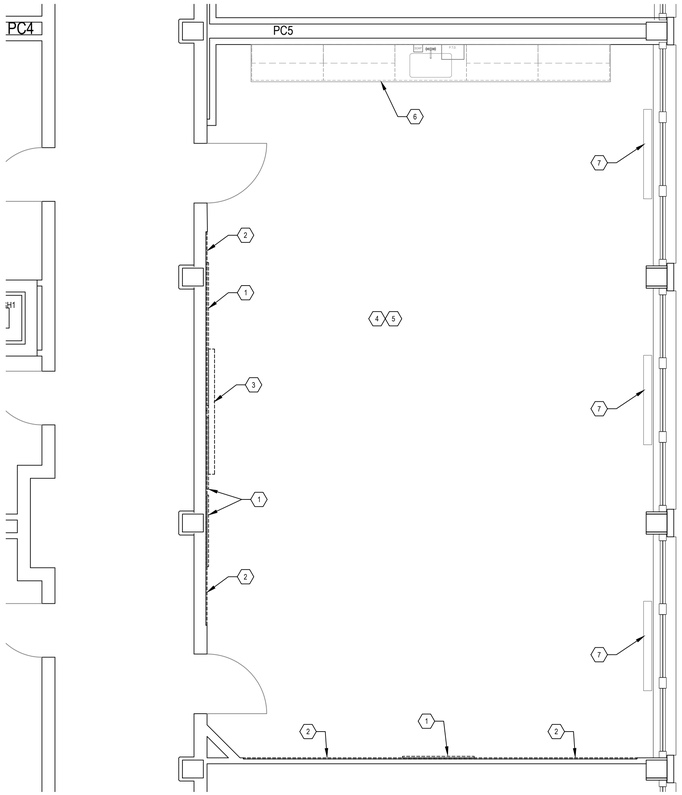
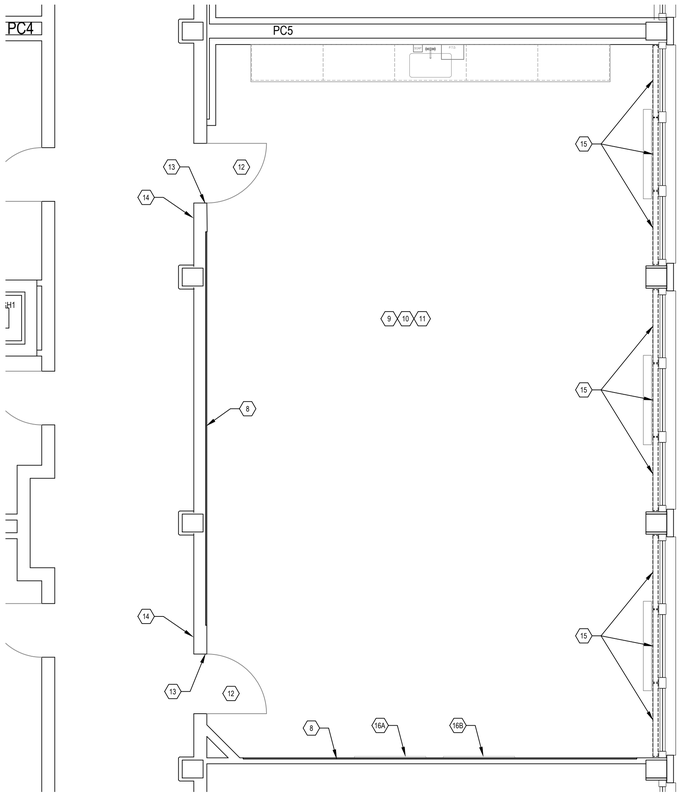


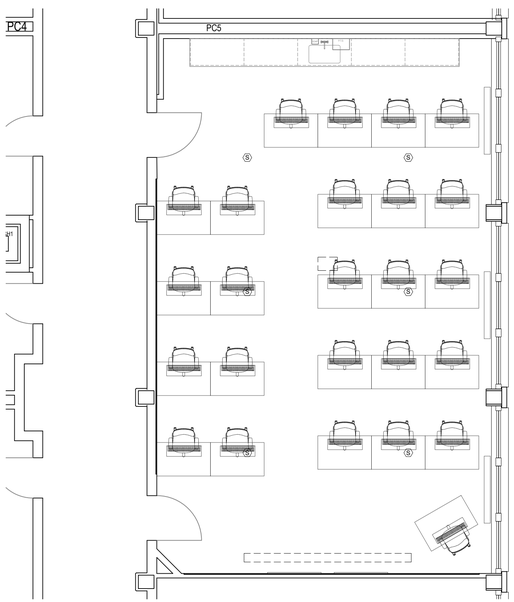
1 DEMOLITION PLAN

Scale: 1/4" = 1'-0"



2 NEW WORK PLAN

Scale: 1/4" = 1'-0"



3 FURNITURE / EQUIPMENT PLAN

Scale: 3/16" = 1'-0"

SHEET NOTES: (X)

1. DEMO EXISTING MARKER BOARD.
2. DEMO EXISTING RECESSED CORK BOARD AND ALL ASSOCIATED TRIM.
3. DEMO EXISTING WALL MOUNTED MANUAL PROJECTION SCREEN.
4. DEMO EXISTING VINYL TILE FLOORING AND PREP SLAB FOR INSTALLATION OF NEW FLOORING.
5. DEMO EXISTING VINYL WALL BASE.
6. EXISTING CABINETS TO REMAIN.
7. EXISTING RADIANT HEATING UNITS TO REMAIN. REPAINT COVER TO MATCH WALLS.
8. INFILL RECESS WHERE CORK BOARD WAS REMOVED WITH ½" GYPSUM BOARD ON FURRING STRIPS AS REQUIRED TO FLUSH OUT WITH EXISTING ADJACENT WALL SURFACE.
9. PATCH AND PAINT WALLS. SEE FINISH LEGEND FOR MATERIAL AND COLOR INFO.
10. INSTALL NEW LUXURY VINYL TILE. SEE FINISH LEGEND FOR MATERIAL AND COLOR INFO.
11. INSTALL NEW 6" HIGH VINYL BASE. SEE FINISH LEGEND FOR MATERIAL AND COLOR INFO.
12. REPAINT DOOR FRAME ON ROOM SIDE USING TRIM COLOR. SEE FINISH LEGEND FOR MATERIAL AND COLOR INFO. REPLACE EXISTING SILENCERS WITH NEW SILENCERS.
13. DEMO EXISTING STRIKE PLATE. MODIFY FRAME AS REQUIRED AND INSTALL NEW ELECTRIC STRIKE (HES 1006CLB-630-LBM, OR APPROVED EQUIVALENT). COORDINATE WITH SECURITY VENDOR AND ACCESS CONTROL DETAILS ON ELECTRICAL DRAWINGS.
14. NEW BADGE READER. SEE ELECTRICAL DRAWINGS FOR HARDWARE DESCRIPTION AND ACCESS CONTROL DETAILS. COORDINATE WITH SECURITY VENDOR.
15. INSTALL NEW MANUAL ROLLER SHADES AT WINDOWS. NEW SHADES TO BE MECHOSHADE 'MECHO/S' SINGLE ROLL. SHADE CLOTH TO BE THERMOVEIL® 0900 SERIES; COLOR: #0911 'PORCELAIN'. CONTRACTOR TO FIELD VERIFY WINDOW SIZES.
16. INSTALL OWNER FURNISHED MARKER BOARDS (ONE WITHOUT MARKINGS (16A) AND ONE WITH MUSIC STAFF MARKINGS (16B)). MOUNT WITH BOTTOM OF BOARD @ 42" AFF.

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ARCHITECTURAL DEMOLITION, NEW WORK AND FURNITURE PLANS

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DESIGNED BY:	GWW
DRAWN BY:	GWW
UK PROJ. MGR.:	MURPHY
DATE:	5-17-2024

REVISIONS

NO.	DESCRIPTION	DATE
1	FOR CONSTRUCTION	6-7-2024

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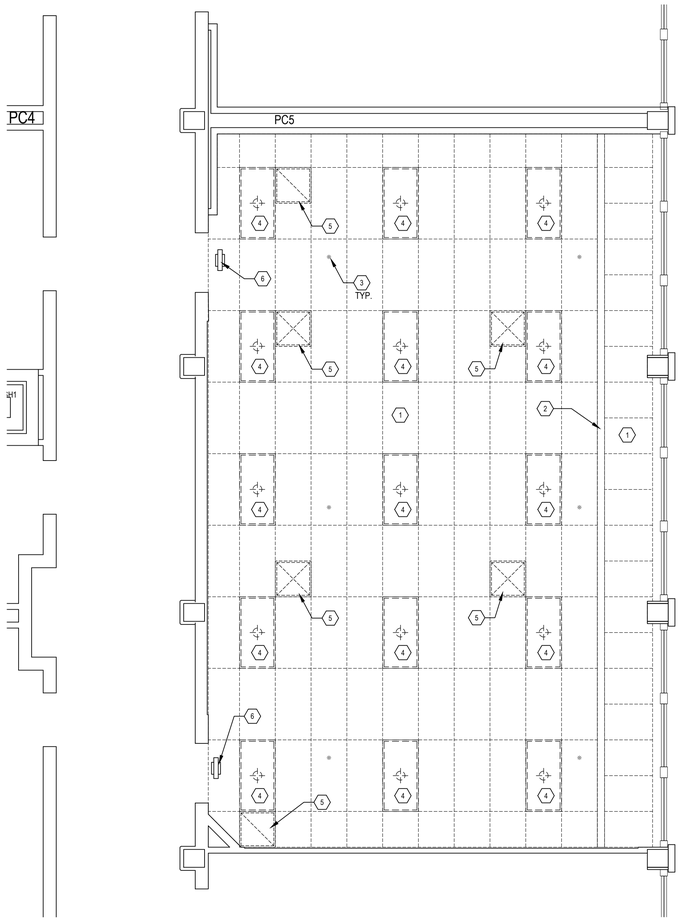
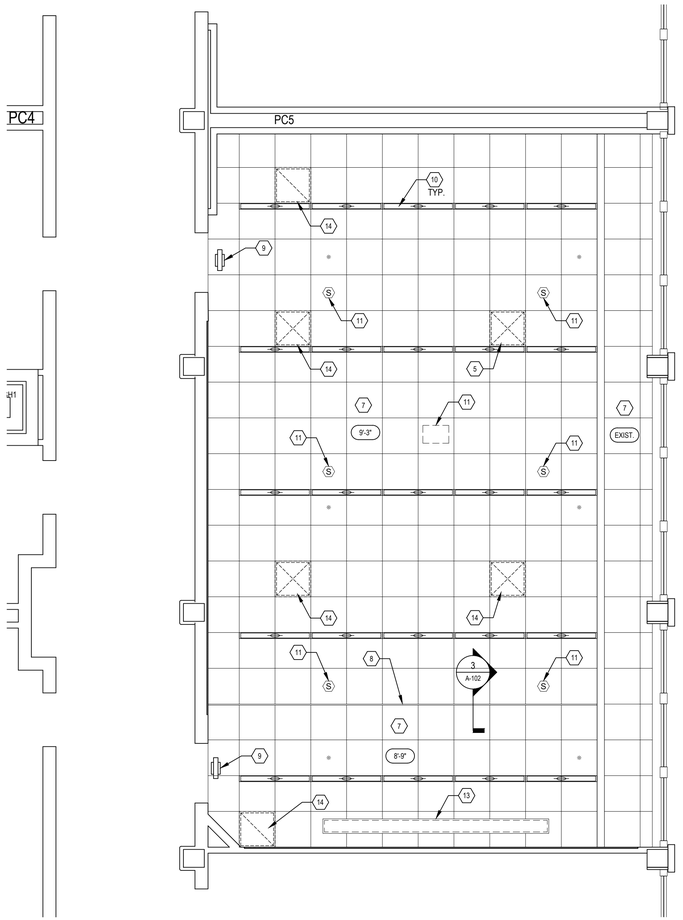


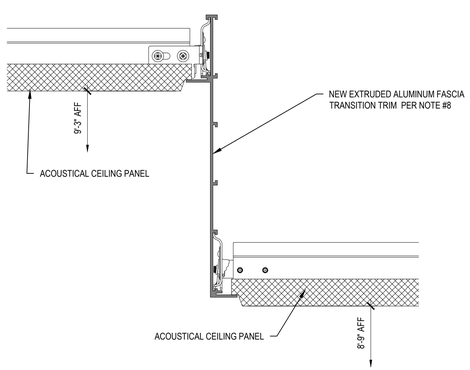
1 CEILING DEMOLITION PLAN

Scale: 1/4" = 1'-0"



2 CEILING NEW WORK PLAN

Scale: 1/4" = 1'-0"



3 DETAIL

Scale: HALF FULL SIZE

SHEET NOTES: (X)

1. DEMO COMPLETE EXISTING ACOUSTICAL CEILING SYSTEM (ACOUSTICAL PANELS, GRID SYSTEM, WALL MOLDING, HANGER WIRES, ETC.). PROVIDE TEMPORARY HEAT DETECTORS TIED INTO FIRE ALARM SYSTEM WHILE CEILING IS REMOVED.
2. EXISTING HEADER SOFFIT TO REMAIN.
3. COORDINATE WITH FIRE PROTECTION VENDOR FOR MODIFICATIONS TO EXISTING SPRINKLER PIPING AND HEADS.
4. COORDINATE WITH ELECTRICAL DRAWINGS FOR DEMOLITION OF EXISTING LIGHT FIXTURES.
5. COORDINATE WITH MECHANICAL DRAWINGS FOR REPLACEMENT OF HVAC DIFFUSERS / GRILLES AND ANY MODIFICATIONS TO EXISTING BRANCH DUCTWORK RELATED TO NEW CEILING HEIGHTS.
6. REMOVE AND SALVAGE EXISTING EXIT SIGN FOR REINSTALLATION ON NEW CEILING PANEL.
7. INSTALL COMPLETE NEW ACOUSTICAL CEILING SYSTEM (INCLUDING GRID SYSTEM, WALL MOLDING, HANGER WIRES, ACOUSTICAL PANELS, FASCIA TRANSITION, ETC.) @ HEIGHT INDICATED ON PLAN. HEIGHT BETWEEN EXISTING HEADER SOFFIT AND WINDOW TO BE INSTALLED AT SAME HEIGHT AS EXISTING. SEE FINISH LEGEND, SHEET A-601, FOR MATERIAL INFO.
8. INSTALL NEW EXTRUDED ALUMINUM FASCIA TRANSITION TRIM AT CHANGE IN CEILING HEIGHT. FASCIA TRANSITION TRIM TO BE USG 'COMPASSO™ ELITE' TRANSITION #ALSFTACAC610; COLOR: FLAT WHITE 050, OR APPROVED EQUIVALENT.
9. REINSTALL SALVAGED EXIT SIGN ON NEW CEILING PANEL.
10. COORDINATE WITH ELECTRICAL DRAWINGS FOR NEW LIGHT FIXTURES.
11. NEW CEILING MOUNTED SPEAKERS.
12. NEW CEILING MOUNTED PROJECTOR.
13. NEW CEILING MOUNTED PROJECTION SCREEN.
14. COORDINATE WITH MECHANICAL DRAWINGS FOR NEW HVAC DIFFUSERS / GRILLES.

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FINE ARTS GUIGNOL BLDG.
ROOM 306 MAC LAB

ARCHITECTURAL CEILING DEMOLITION AND NEW WORK PLAN

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DESIGNED BY:	GWW
DRAWN BY:	GWW
UK PROJ. MGR.:	MURPHY
DATE:	5-17-2024

REVISIONS

NO.	DESCRIPTION	DATE
1	FOR CONSTRUCTION	6-7-2024

DRAWING NUMBER:

A-102

ROOM FINISH SCHEDULE

ROOM NUMBER	ROOM NAME	BASE					FLOOR					WALLS				CEILING					CLG.. HT.	REMARKS
		6" VINYL	CERAMIC TILE	EXISTING	NONE		CARPET TILE	LVT	CERAMIC TILE	CONCRETE	EXISTING	PAINT	WALL TILE	EXISTING		ACOUSTICAL CEILING PANEL	METAL CEILING PANEL	GYPSUM BOARD	EXISTING			
306	MAC LAB CLASSROOM	●						●				●				●					8'-9"/9'-3"	1

REMARKS

1	SEE CEILING PLAN FOR LOCATION OF DIFFERING HEIGHTS

FINISH LEGEND

ACOUSTICAL CEILING

MARK	MFR.	MFR MODEL #	DESCRIPTION	COLOR	SIZE	NOTES
ACP-1	USG	'MARS' #86785	SHADOWLINE TAPERED ACOUSTICAL PANEL	WHITE	24" X 24"	
ACP-1	USG	DONN 'DX'	GRID SYSTEM	WHITE	15/16" FACE	

LUXURY VINYL TILE

MARK	MFR.	MFR MODEL #	DESCRIPTION	COLOR	SIZE	
LVT-1	SHAW	CRETE 0230V	LUXURY VINYL TILE	03520 'INDUSTRIAL'	18" x 18"	1

WALL BASE

MARK	MFR.	MFR MODEL #	DESCRIPTION	COLOR	SIZE	
WB-1	JOHNSONITE		VINYL WALL BASE	20 'CHARCOAL'	6"	

PAINT

MARK	MFR.	MFR MODEL #	DESCRIPTION	COLOR	SIZE	
PT-1	SHERWIN-WILLIAMS	SW7636	WALL FIELD PAINT (EGGSHELL)	'ORIGAMI WHITE'		
PT-1A	SHERWIN-WILLIAMS	SW7636	WALL FIELD PAINT (SEMI-GLOSS)	'ORIGAMI WHITE'		2
PT-2	SHERWIN-WILLIAMS	SW7068	TRIM PAINT (SEMI-GLOSS)	'GRIZZLE GRAY'		

NOTES:

1	QUARTER-TURN INSTALLATION
2	USE FOR PAINTING RADIANT HEATING UNIT COVERS

University of Kentucky
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FINE ARTS GUIGNOL BLDG.
ROOM 306 MAC LAB

ROOM FINISH SCHEDULE AND FINISH LEGEND

PROJECT NO.:	2802.0
BUILDING NO.:	0022
DESIGNED BY:	GWW
DRAWN BY:	GWW
UK PROJ. MGR.:	MURPHY
DATE:	5-17-2024

REVISIONS

NO.	DESCRIPTION	DATE
1	FOR CONSTRUCTION	6-7-2024

DRAWING NUMBER:
A-601

ABBREVIATIONS:

ø	DIAMETER, PHASE
ABV	ABOVE
AC	AIR CONDITIONING UNIT
AD	AREA DRAIN, ACCESS DOOR
ADA	AMERICANS WITH DISABILITIES ACT
AFF	ABOVE FINISHED FLOOR
AFUE	ANNUAL FUEL UTILIZATION EFFICIENCY
AHJ	AUTHORITY HAVING JURISDICTION
AHU	AIR HANDLING UNIT
ALT	ALTERNATE
ALUM	ALUMINUM
AMB	AMBIENT
APD	AIR PRESSURE DROP
APPROX	APPROXIMATE
ARCH	ARCHITECT
ASHRAE	AMERICAN SOCIETY OF HEATING, REFRIGERATION AND AIR–CONDITIONING ENGINEERS, INC.
ATM	ATMOSPHERE
BDD	BACKDRAFT DAMPER
BF	BELOW FLOOR
BFF	BELOW FINISHED FLOOR
BHP	BRAKE HORSEPOWER
BLDG	BUILDING
BLW	BELOW
BOD	BOTTOM OF DUCT
BOP	BOTTOM OF PIPE
BOT	BOTTOM
BTU	BRITISH THERMAL UNIT
BTUH	BRITISH THERMAL UNIT PER HOUR
C	CONDENSATE DRAIN PIPING
CAP	CAPACITY
CC	COOLING COIL
CD	CEILING DIFFUSER
CFH	CUBIC FEET PER HOUR
CFM	CUBIC FEET PER MINUTE
CI	CAST IRON
CL	CENTER LINE
CLG	CEILING
CMU	CONCRETE MASONRY UNIT
CO	CLEANOUT
COMB	COMBUSTION, COMBINATION
COND	CONDENSATE
CONN	CONNECTION
CONT	CONTINUE, CONTROL
CONTR	CONTRACTOR
COP	COEFFICIENT OF PERFORMANCE
CP	CONDENSATE PUMP
CT	COOLING TOWER
CU	CONDENSING UNIT, CUBIC
CV	CHECK VALVE, CONSTANT VOLUME
CW	DOMESTIC COLD WATER
DB	DRY BULB
DC	DUCT COIL, DUST COLLECTOR
DDC	DIRECT DIGITAL CONTROL
DEPT	DEPARTMENT
DEG	DEGREE
DF	DRINKING FOUNTAIN
DH	DUCT HEATER
DI	DUCTILE IRON
DIA	DIAMETER
DIAG	DIAGRAM
DIFF	DIFFERENTIAL
DIM	DIMENSION
DN	DOWN
DP	DIFFERENTIAL PRESSURE
DX	DIRECT EXPANSION
DWG	DRAWING
(E)	EXISTING
EA	EACH, EXHAUST AIR
EAT	ENTERING AIR TEMPERATURE
ECG	EGGCRATE GRILLE
EDH	ELECTRIC DUCT HEATER
EER	ENERGY EFFICIENCY RATIO
EF	EXHAUST FAN
EFF	EFFICIENCY
EG	EXHAUST GRILLE
EJ	EXPANSION JOINT
ELEC	ELECTRIC
ELEV	ELEVATION
EMCS	ENERGY MANAGEMENT CONTROL SYSTEM
ENT	ENTERING
EQUIP	EQUIPMENT
ESP	EXTERNAL STATIC PRESSURE
ET	EXPANSION TANK
ETC	AND SO FORTH
EUH	ELECTRIC UNIT HEATER
EVAP	EVAPORATOR, EVAPORATIVE
EW	EYE WASH
EWC	ELECTRIC WATER COOLER
EWH	ELECTRIC WATER HEATER
EWT	ENTERING WATER TEMPERATURE
EX	EXHAUST
EXT	EXTERIOR, EXTERNAL
F	FIRE SPRINKLER
°F	DEGREES FAHRENHEIT
FC	FLEXIBLE CONNECTOR, FLUID CONTROLLER
FCU	FAN COIL UNIT
FD	FLOOR DRAIN
F/D	FIRE DAMPER
FDC	FIRE DEPARTMENT CONNECTION
FFD	FUNNEL FLOOR DRAIN
FLA	FULL LOAD AMPS
FLR	FLOOR
FLEX	FLEXIBLE
FP	FIRE PROTECTION, FIRE PUMP
FPM	FEET PER MINUTE
FPS	FEET PER SECOND
FS	FLOOR SINK
F/S/D	COMBINATION FIRE SMOKE DAMPER
FT	FEET, FINNED TUBE
FV	FACE VELOCITY
G	GAS
GAL	GALLON
GALV	GALVANIZED
GC	GENERAL CONTRACTOR
GFU	GAS FIRED UNIT
GPD	GALLONS PER DAY
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
GPR	GAS PRESSURE REGULATOR
GR	GRILLE
GRD	GRILLES, REGISTERS, AND DIFFUSERS
GWB	GYPSUM WALLBOARD
HB	HOSE BIBB
HC	HEATING COIL
HD	HEAD
HOR	HORIZONTAL
HP	HEAT PUMP, HORSEPOWER
HR	HOUR
HRU	HEAT RECOVERY UNIT
HT	HEIGHT
HTR	HEATER
HX	HEAT EXCHANGER
HVAC	HEATING, VENTILATION & AIR CONDITIONING
HZ	HERTZ
IAQ	INDOOR AIR QUALITY
IN	INCH
INCL	INCLUDING
INT	INTERNAL
INV	INVERT
ISP	INTERNAL STATIC PRESSURE
KW	KILOWATT
L	LENGTH
LAT	LEAVING AIR TEMPERATURE
LAV	LAVATORY
LB	POUND
LBS/HR	POUNDS PER HOUR
LD	LINEAR DIFFUSER
LF	LINEAR FEET
LL	REFRIGERANT LIQUID LINE
LRA	LOCKED ROTOR AMPS
LVG	LEAVING
LVR	LOUVER
LWT	LEAVING WATER TEMPERATURE
MAT	MIXED AIR TEMPERATURE
MAV	MANUAL AIR VENT
MAX	MAXIMUM
MBH	THOUSANDS OF BTUH
MCA	MINIMUM CIRCUIT AMPACITY
MECH	MECHANICAL
MED	MEDIUM
MERV	MINIMUM EFFICIENCY REPORTING VALUE
MFR	MANUFACTURER
MIN	MINIMUM
MISC	MISCELLANEOUS
MOCP	MAXIMUM OVERCURRENT PROTECTION
MPC	MEDIUM PRESSURE CONDENSATE
MPG	MEDIUM PRESSURE GAS
MPS	MEDIUM PRESSURE STEAM
MS	MOP SINK
MTD	MOUNTED
MU	MAKEUP WATER
MUA	MAKEUP AIR UNIT
(N)	NEW
NA	NOT APPLICABLE
NC	NOISE CRITERIA, NORMALLY CLOSED
NEG	NEGATIVE
NO	NORMALLY OPEN
NO.	NUMBER
NOM	NOMINAL
NTS	NOT TO SCALE
O2	OXYGEN
OA	OUTSIDE AIR
OAT	OUTSIDE AIR TEMPERATURE
OBD	OPPOSED BLADE DAMPER
OC	ON CENTER
OCC	OCCUPIED
OSA	OUTSIDE AIR
OT	OFF TOP
OV	OUTLET VELOCITY
P	PRESSURE, PUMP
PC	PUMPED CONDENSATE
PD	PRESSURE DROP
PERF	PERFORATED
PH	PHASE
PIV	POST INDICATOR VALVE
POC	POINT OF CONNECTION
PRESS	PRESSURE
PRV	PRESSURE REDUCING VALVE
PSI	POUNDS PER SQUARE INCH
PSIG	POUNDS PER SQUARE INCH GAUGE
PSIA	POUNDS PER SQUARE INCH ABSOLUTE
PTRV	PRESSURE/TEMPERATURE RELIEF VALVE
PU	PUMP
PVC	POLYVINYL CHLORIDE
QTY	QUANTITY
R	REFRIGERANT PIPING
RA	RETURN AIR
RAF	RETURN/RELIEF AIR FAN
RAG	RETURN AIR GRILLE
RAH	RADIANT HEATER
RCP	REFLECTED CEILING PLAN
RD	ROOF DRAIN
REF	REFERENCE, RETURN/EXHAUST FAN
REG	REGISTER
REL	RELIEF
REQD	REQUIRED
RET	RETURN
RF	RETURN FAN
RG	RETURN GRILLE
RH	RELATIVE HUMIDITY, ROOF HOOD
RHC	REHEAT COIL
RLA	RATED LOAD AMPS
RM	ROOM
RPM	REVOLUTIONS PER MINUTE
RTU	ROOFTOP UNIT
RV	RELIEF VALVE
SA	SUPPLY AIR
SAD	SUPPLY AIR DIFFUSER
SAT	SUPPLY AIR TEMPERATURE
SCFM	STANDARD CUBIC FEET PER MINUTE
SCH	SCHEDULE
SCHEM	SCHEMATIC
S/D	SMOKE DAMPER
SF	SUPPLY FAN, SQUARE FOOT
SG	SUPPLY GRILLE
SL	REFRIGERANT SUCTION LINE
SMACNA	SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION, INC.
SP	STATIC PRESSURE
SPEC	SPECIFICATION
SQ	SQUARE
SRV	SAFETY RELIEF VALVE
SS	STAINLESS STEEL
ST	STORAGE TANK, SOUND TRAP
STD	STANDARD
STM	STEAM
STR	STARTER, STRUCTURAL
SUCT	SUCTION
SUP	SUPPLY
TAB	TESTING, ADJUSTING AND BALANCING
TDH	TOTAL DYNAMIC HEAD
TEMP	TEMPERATURE
TG	TRANSFER GRILLE
TOD	TOP OF DUCT
TOF	TOP OF FOOTING
TOP	TOP OF PIPE
TP	TOTAL PRESSURE
TPRV	TEMPERATURE/PRESSURE RELIEF VALVE
TSP	TOTAL STATIC PRESSURE
T'STAT	THERMOSTAT
TU	TERMINAL UNIT
TYP	TYPICAL
UH	UNIT HEATER
UNOCC	UNOCCUPIED
V	VENT, VOLTS
VAV	VARIABLE AIR VOLUME UNIT
VD	VOLUME DAMPER
VEL	VELOCITY
VENT	VENTILATION, VENTILATOR
VFD	VARIABLE FREQUENCY DRIVE
VTR	VENT THRU ROOF
W	WASTE, WATT, WIDTH
W/	WITH
WB	WET BULB
W/O	WITHOUT
WPD	WATER PRESSURE DROP
WSEC	WASHINGTON STATE ENERGY CODE
WSFU	WATER SUPPLY FIXTURE UNIT
WT	WEIGHT
WTD	WATER TEMPERATURE DROP

MECHANICAL SYMBOLS

AFG	ABOVE FINISHED GRADE
FFE	FINISHED FLOOR ELEVATION
AFF	ABOVE FINISHED FLOOR
TYP	TYPICAL
NTS	NOT TO SCALE
FC	FLEXIBLE CONNECTION
FD	FIRE DAMPER

NEW MECHANICAL WORK

EXISTING MECHANICAL WORK

EXISTING MECHANICAL WORK TO BE DEMOLISHED

S–# / CFM — INDICATES AIR DISTRIBUTION DEVICE SPECIFICATION
L = LOUVER
T = TRANSFER GRILLE
S = SUPPLY DIFFUSER OR REGISTER,
R = RETURN GRILLE OR REGISTER,
E = EXHAUST GRILLE OR REGISTER)
CFM IF INDICATED ON DWG.

SA 20X12 — SUPPLY AIR DUCT/DUCT DIM. 20'' HORIZ. X 12'' VERT. (ONE LINE)

RA — RETURN AIR DUCT (ONE LINE)

EA — EXHAUST AIR DUCT (ONE LINE)

TRANSITION – FROM OR TO EQUIPMENT TO DUCT SIZE INDICATED.

NEW DUCTWORK

FD — FIRE DAMPER

SUPPLY AIR DUCT SECTION

RETURN OR OUTSIDE AIR DUCT SECTION

EXHAUST AIR DUCT SECTION

RECTANGULAR DUCT UP

RECTANGULAR DUCT DOWN

ROUND DUCT UP

ROUND DUCT DOWN

FLEXIBLE DUCTWORK

VOLUME DAMPER (MANUAL)

U.L. LISTED PENETRATION

SUPPLY, RETURN, EXHAUST GRILLE

T — THERMOSTAT OR REMOTE SENSOR

UNION

BALANCING VALVE

TWO WAY VALVE

—HWS— HOT WATER SUPPLY

—HWR— HOT WATER RETURN

LIMIT OF DEMOLITION

CONNECT TO EXISTING

MECHANICAL EQUIPMENT DESIGNATOR

TAGGED NOTE

GENERAL NOTES:

GENERAL:

1. COORDINATE MECHANICAL WORK WITH ELECTRICAL, ARCHITECTURAL, STRUCTURAL, CIVIL AND LANDSCAPE WORK SHOWN ON OTHER CONTRACT DOCUMENTS. PROVIDE ADDITIONAL OFFSETS FOR COORDINATED INSTALLATION WHERE REQUIRED.
2. COORDINATE HVAC, PLUMBING AND FIRE PROTECTION WORK PRIOR TO INSTALLATION. DUCTWORK AND EQUIPMENT ACCESS TAKES PRECEDENCE OVER PIPING FOR AVAILABLE SPACE.
3. WHERE USED, THE TERM 'PROVIDE' SHALL MEAN 'FURNISH AND INSTALL'.
4. COORDINATE EQUIPMENT CONNECTIONS WITH MANUFACTURERS' CERTIFIED DRAWINGS. COORDINATE AND PROVIDE DUCT AND PIPING TRANSITIONS REQUIRED FOR FINAL EQUIPMENT CONNECTIONS TO FURNISHED EQUIPMENT. FIELD VERIFY AND COORDINATE DUCT AND PIPING DIMENSIONS BEFORE FABRICATION.
5. PROVIDE MISCELLANEOUS STEEL REQUIRED TO ENSURE PROPER INSTALLATION OF MECHANICAL SYSTEMS.
6. LOCATE VALVES, WATER HAMMER ARRESTERS, CLEANOUTS, DAMPERS, CONTROLS AND SIMILAR COMPONENTS SO THAT THEY ARE ACCESSIBLE. PROVIDE ACCESS DOORS FOR MECHANICAL EQUIPMENT INSTALLED BEHIND WALLS, ABOVE INACCESSIBLE CEILINGS AND BELOW FLOORS. COORDINATE ACCESS DOOR LOCATIONS WITH ARCHITECT/ENGINEER. INSTALL TAG ON CEILING GRID FRAME TO INDICATE LOCATION AND TYPE OF EQUIPMENT THAT REQUIRES MAINTENANCE. PROVIDE 16 GA, STEEL, FLUSH TYPE ACCESS DOOR WITH CONCEALED HINGE AND SLOT SCREWDRIVER TYPE CAM LATCH. PROVIDE FACTORY PRIMED IN PAINTED SURFACE AREAS FOR FIELD PAINTING. PROVIDE STAINLESS STEEL FOR ALL OTHER AREAS. PROVIDE UL LISTED AND LABELED DOOR WHERE FIRE–RESISTANCE RATING IS INDICATED ON DRAWINGS. ACCESS DOOR SHALL BE SIZED SO THAT ADJACENT EQUIPMENT IS ACCESSIBLE. PROVIDE ACUDOR, ELMDOR, MILCOR, OR APPROVED.
7. COORDINATE ATTACHMENTS TO STRUCTURE TO VERIFY THAT ATTACHMENT POINTS ON EQUIPMENT AND STRUCTURE CAN ACCEPT SEISMIC, WEIGHT, AND OTHER LOADS IMPOSED.
8. REFER TO TYPICAL DETAILS PROVIDED IN THIS DWG SET FOR DUCTWORK, PIPING, AND EQUIPMENT INSTALLATION. CONTRACTOR IS RESPONSIBLE FOR CONFORMANCE WITH DETAILS.
9. LOCATIONS AND SIZES OF FLOOR, WALL, AND ROOF OPENINGS SHALL BE COORDINATED WITH OTHER TRADES INVOLVED. INCLUDE IN THE COST OF MECHANICAL WORK, CUTTING, CORING, PATCHING AND PAINTING OF EXISTING WALLS, CEILINGS, FLOORS AND ROOFS AS REQUIRED TO ACCOMMODATE WORK AS INDICATED IN THE MECHANICAL CONTRACT DOCUMENTS, UNLESS SPECIFICALLY SHOWN ON ARCHITECTURAL DRAWINGS.
10. PROVIDE ELASTOMERIC FOAM MATERIAL ON MECHANICAL EQUIPMENT THAT PRESENT A SAFETY HAZARD. PAINT SAFETY YELLOW.
11. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE SAFEKEEPING OF HIS OWN PROPERTY ON THE JOB SITE. OWNER ASSUMES NO RESPONSIBILITY FOR PROTECTION OF PROPERTIES AGAINST FIRE, THEFT AND ENVIRONMENTAL CONDITIONS.
12. CLEAN THE JOB SITE DAILY AND REMOVE FROM THE PREMISES ANY DIRT AND DEBRIS CAUSE BY THE PERFORMANCE OF THE WORK INCLUDED IN THIS CONTRACT. BEFORE SUBSTANTIAL COMPLETION, CLEAN EQUIPMENT, FIXTURES, EXPOSED DUCTS, PIPING AND SIMILAR ITEMS.
13. PROVIDE EQUIPMENT THAT FITS INTO THE SPACE ALLOTTED AND ALLOWS ADEQUATE ACCEPTABLE CLEARANCE FOR INSTALLATION, REPLACEMENT, ENTRY, SERVICING AND MAINTENANCE. COORDINATE WITH OTHER TRADES TO ENSURE NO CONFLICT WITH REQUIRED CLEARANCES.
14. PROVIDE OFFSETS IN PIPING WHERE PLUMBING/PIPING WALL IS LOCATED DIRECTLY ABOVE STRUCTURE. OFFSET PIPING INTO CASEWORK OR SHAFT TIGHT TO WALL AND BACK INTO WALL ONCE BELOW STRUCTURE. REFER TO STRUCTURAL DRAWINGS.
15. BUILDING SPACE IS LIMITED. STRONG ATTENTION TO DETAIL AND CARE MUST BE TAKEN WHEN DEVELOPING SHOP DRAWING SO ROUTING IS COORDINATED WITH OTHER DISCIPLINES.
16. MATERIALS WITHIN PLENUMS SHALL BE NONCOMBUSTIBLE OR SHALL HAVE A FLAME SPREAD INDEX OF NOT MORE THAN 25 AND A SMOKE–DEVELOPED INDEX OF NOT MORE THAN 50 WHEN TESTED IN ACCORDANCE WITH ASTM E 84 OR UL 723.
17. MECHANICAL EQUIPMENT, PACKAGED UNITS, CONTROL PANELS, MOTOR STARTER, MOTOR CONTROLLERS, VARIABLE FREQUENCY DRIVES AND SIMILAR EQUIPMENT SHALL CARRY A SHORT CIRCUIT CURRENT RATING (SCCR) EQUAL TO OR GREATER THAN AVAILABLE FAULT CURRENT DELIVERED FROM ELECTRICAL SYSTEM. INCLUDE VISIBLE FACTORY NAMEPLATE FOR SUCH EQUIPMENT INDICATING SCCR OF EQUIPMENT IN ACCORDANCE WITH UL 1995 AND UL 508A.

HVAC/SHEET METAL:

1. PROVIDE TEMPORARY COVERS OVER OPEN ENDS OF EQUIPMENT AND DUCTWORK DURING CONSTRUCTION.
2. PROVIDE MANUAL VOLUME DAMPER FOR EACH DIFFUSER, REGISTER, AND GRILLE.
3. PROVIDE DUCT ACCESS DOORS AT DUCT SMOKE DETECTORS, BACKDRAFT DAMPERS, MOTORIZED CONTROL DAMPERS, FIRE DAMPERS, SMOKE DAMPERS, COMBINATION FIRE/SMOKE DAMPERS, DUCT MOUNTED COILS, DUCT AIRFLOW STATIONS AND LOUVER PLENUMS.
4. PROVIDE THE FOLLOWING MINIMUM BRANCH DUCT SIZE TO DIFFUSERS, REGISTERS, AND GRILLES, UNLESS NOTED TO USE LARGER SIZE ON DRAWINGS:
   - 4.1. 6"ø: 110 CFM
   - 4.2. 8"ø": 225 CFM
   - 4.3. 10"ø: 350 CFM
   - 4.4. 12"ø: 450 CFM
   - 4.5. 14"ø: 600 CFM
   - 4.6. 16"ø: 750 CFM

ENERGY CODE:

1. MOTORS: COMPLY WITH MINIMUM FULL LOAD EFFICIENCIES LISTED IN THE STATE ENERGY CODE.
2. PIPING AND DUCT INSULATION: COMPLY WITH THICKNESS AND TYPES LISTED IN THE STATE ENERGY CODE.
3. DUCT SEALING: SEAL DUCT TRANSVERSE JOINTS AND LONGITUDINAL SEAMS PER STATE ENERGY CODE.
4. RECORD DRAWINGS: PROVIDE PER STATE ENERGY CODE.
5. OPERATION AND MAINTENANCE MANUALS: PROVIDE PER THE STATE ENERGY CODE.
6. SYSTEM BALANCING: PROVIDE PER THE STATE ENERGY CODE.
7. MECHANICAL SYSTEMS COMMISSIONING: PROVIDE PER SPECIFICATIONS.
8. THIS BUILDING AND ITS ENERGY SYSTEMS HAVE BEEN DESIGNED TO COMPLY WITH THE STATE ENERGY CODE. CONTRACTOR IS RESPONSIBLE FOR CORRECT INSTALLATION OF ENERGY CONSERVATION MEASURES.

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18396
LICENSED PROFESSIONAL ENGINEER

TECHNICAL HORIZONS
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501 Darby Creek, Ste #51 Lexington, KY
859.255.5983

FINE ARTS GUIGNOL BLDG.
ROOM 306 MAC LAB

MECHANICAL LEGEND

PROJECT NO.:	2802.0
BUILDING NO.:	0022
DESIGNED BY:	CME
DRAWN BY:	ECF
UK PROJ. MGR.:	MURPHY
DATE:	5-17-2024

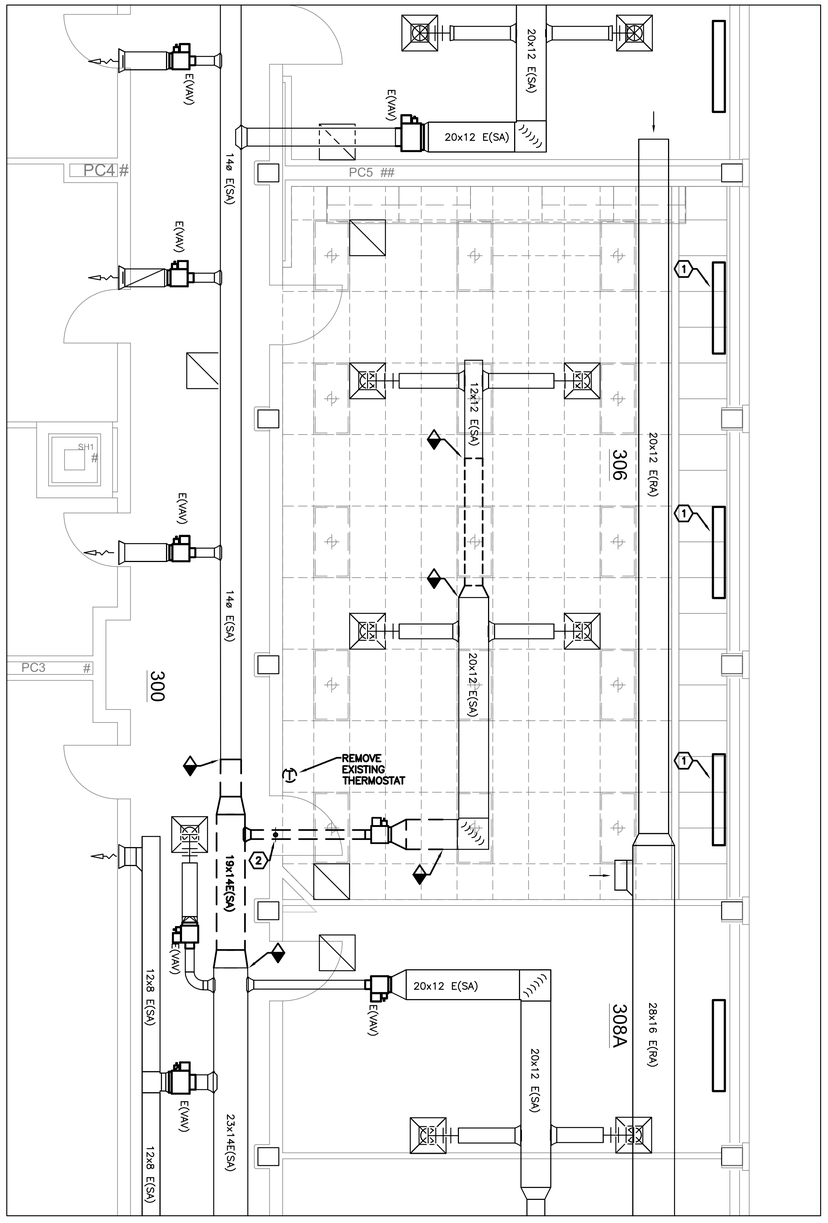
REVISIONS

NO.	DESCRIPTION	DATE
1	FOR CONSTRUCTION	6-7-2024

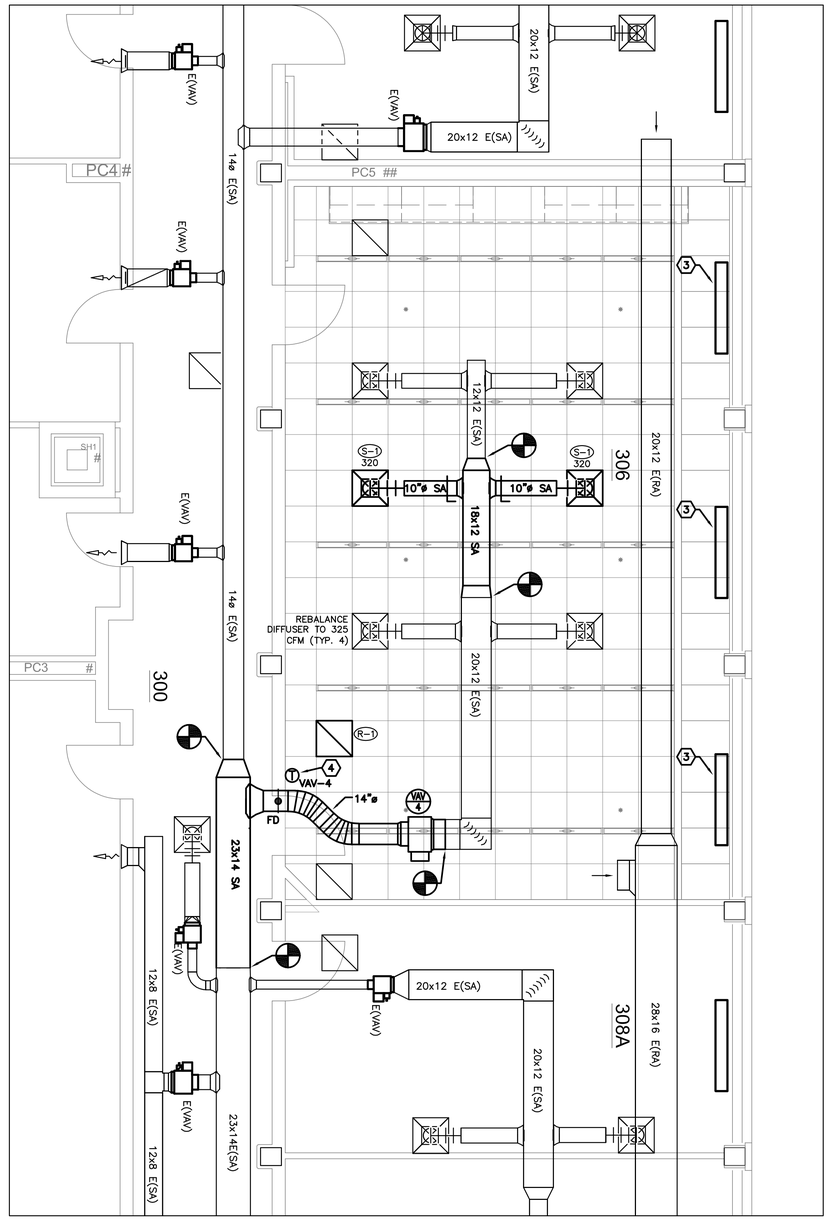
DRAWING NUMBER:
M-001

TAGGED NOTES ⬡

1. REMOVE EXISTING BALANCE VALVE. SEE DETAIL FOR POINTS OF DEMOLITION.
2. DEACTIVATE AND DEMOLISH EXISTING FIRE DAMPER AND PATCH HOLE IN WALL.
3. INSTALL NEW BALANCE VALVE AND NEW 2-WAY, 2-POSITION 24 VOLT HOT WATER CONTROL VALVE. SEE DETAIL FOR PIPE SIZE AND CONNECT TO EXISTING POINTS.
4. INSTALL NEW THERMOSTAT WIRED TO NEW CONTROL VALVES ON EXISTING HOT WATER RADIATORS, AND VAV DAMPER.



1 ROOM 306 HVAC DEMOLITION PLAN
SCALE: 1/4" = 1'-0"



2 ROOM 306 HVAC NEW WORK PLAN
SCALE: 1/4" = 1'-0"

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FINE ARTS GUIGNOL BLDG.
ROOM 306 MAC LAB

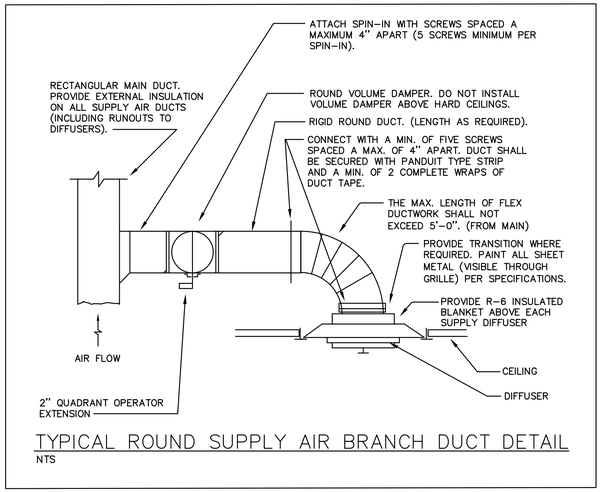
MECHANICAL THIRD FLOOR PLANS

PROJECT NO.:	2802.0
BUILDING NO.:	0022
DESIGNED BY:	CME
DRAWN BY:	ECF
UK PROJ. MGR.:	MURPHY
DATE:	5-17-2024

REVISIONS

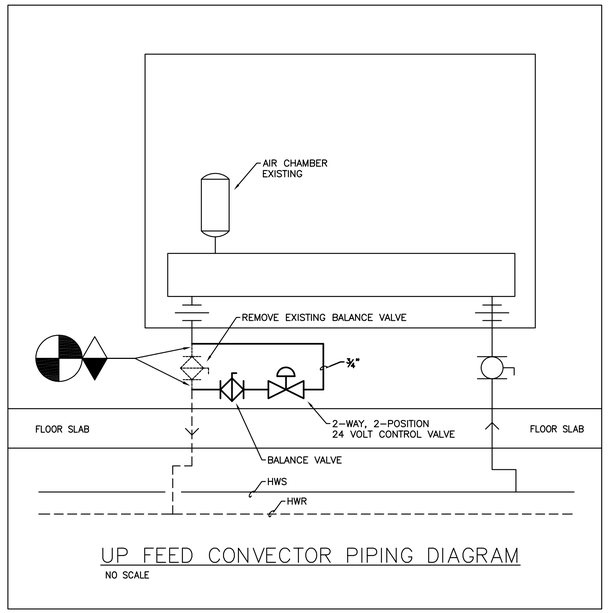
NO.	DESCRIPTION	DATE
1	FOR CONSTRUCTION	6-7-2024

DRAWING NUMBER:
M-103



TYPICAL ROUND SUPPLY AIR BRANCH DUCT DETAIL

NTS



UP FEED CONVECTOR PIPING DIAGRAM

NO SCALE

VAV BOX SCHEDULE

MARK	MANUFACTURER	TRANE MODEL NO.	BOX TYPE	DIMENSIONS (IN)			INLET SIZE	INLET STATIC PRESS @ MAX CFM (IN. WG)	MAX DISCHARGE NC	MAX RADIATED NC	MAX CFM	MIN CFM	PRESSURE INDEPENDENT CONTROLS	LEAKAGE RATE @ 2.0"	REMARKS
				LENGTH	WIDTH	HEIGHT									
VAV-4	NAILOR	D3001	VARIABLE VOLUME	21	24	12.5	14"ø	0.75	19	19	1900	210	YES	2%	1,2,3,4,5

REMARKS
1. MAXIMUM N.C. VALUE OF 25.
2. PROVIDE DUAL WALL BOX WITH 1" INSULATION.
3. AIR VOLUME BOX SHALL INCLUDE CFM READING WITHIN +/- 5% ACCURACY.
4. FACTORY MOUNTED CONTROLLER PROVIDED BY DDC CONTRACTOR
5. ACCEPTABLE MANUFACTURERS INCLUDE JOHNSON CONTROLS, NAILOR, AND TITUS.

REGISTERS, GRILLES AND DIFFUSERS SCHEDULE

MARK	MANUFACTURER	MODEL #	TYPE	NOMINAL SIZE	MOUNTING	CFM MAX	PD MAX.	THROW @ 100 FPM	OBD	FINISH	NC MAX	REMARKS
S-1	E.H. PRICE	ASPD	ALUMINUM SQUARE PLAQUE CEILING DIFFUSER	24"x24" 10"ø NECK	LAY-IN	320	0.06"	5'	YES	CHOSEN BY ARCHITECT	20	1,2,3,4
R-1	E.H. PRICE	80	ALUMINUM EGGCRATE ½" CORE	24"x24"	LAY-IN	--	0.05"	--	--	CHOSEN BY ARCHITECT	25	3,4

REMARKS:
1. PROVIDE DUCT TRANSITION TO GRILLE/DIFFUSER AS REQUIRED.
2. PROVIDE AIR ADJUSTER FLAPS/AIR PATTERN DEFLECTORS.
3. IF ARCHITECT DOES NOT CHOOSE A COLOR, THEN COLOR SHALL BE OFF-WHITE OR AS INDICATED ON PLANS.
4. ACCEPTABLE MANUFACTURERS INCLUDE PRICE, METALAIRE, TITUS OR APPROVED EQUAL.

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FINE ARTS GUIGNOL BLDG.
ROOM 306 MAC LAB

MECHANICAL SCHEDULES & DETAILS

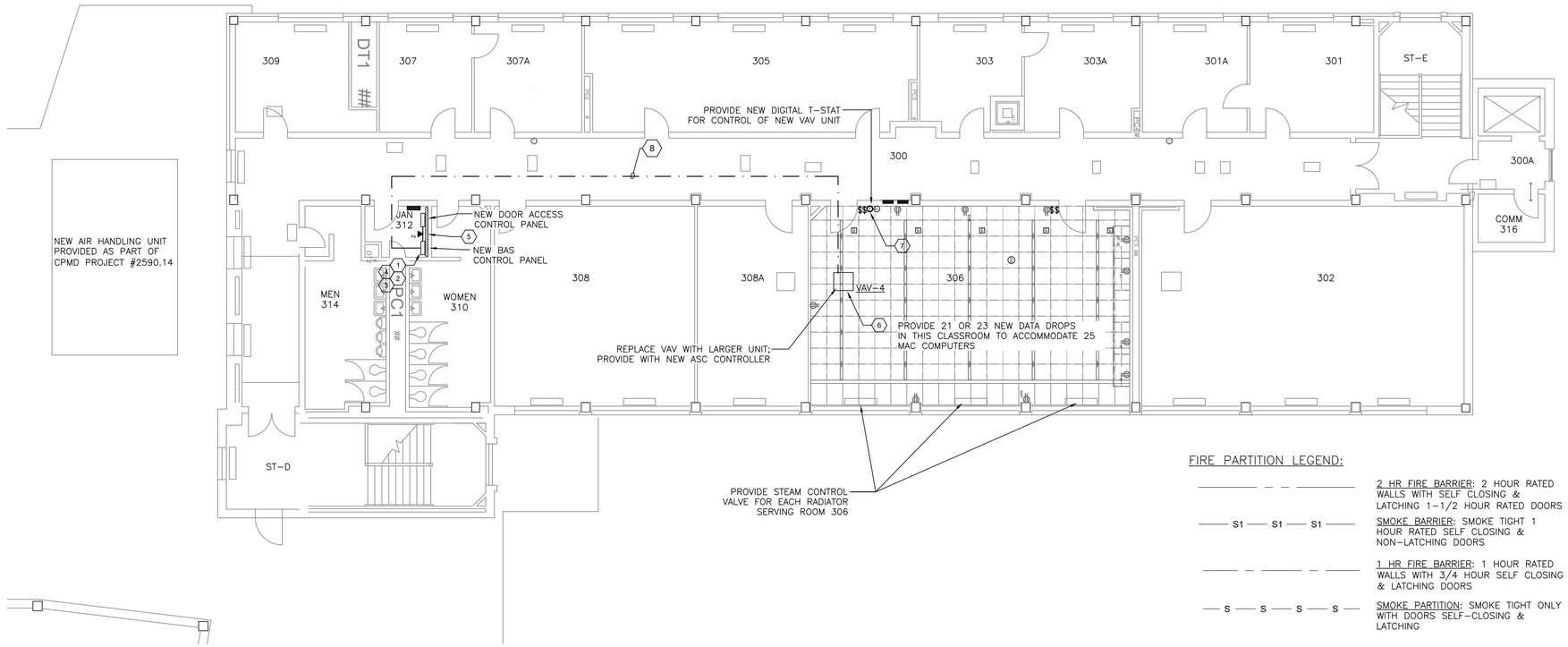
PROJECT NO.:	2802.0
BUILDING NO.:	0022
DESIGNED BY:	CME
DRAWN BY:	ECF
UK PROJ. MGR.:	MURPHY
DATE:	5-17-2024

REVISIONS

NO.	DESCRIPTION	DATE
1	FOR CONSTRUCTION	6-7-2024

DRAWING NUMBER:

M-601

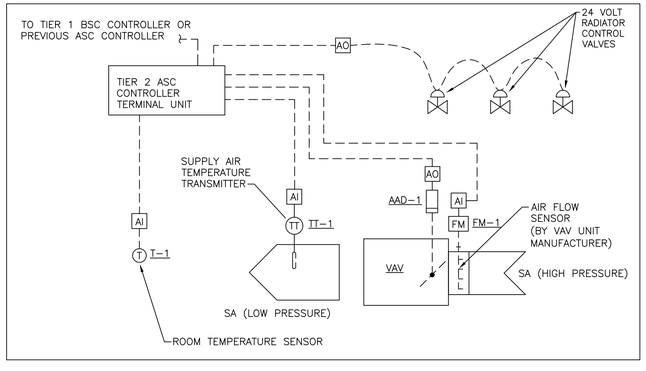


FIRE PARTITION LEGEND:

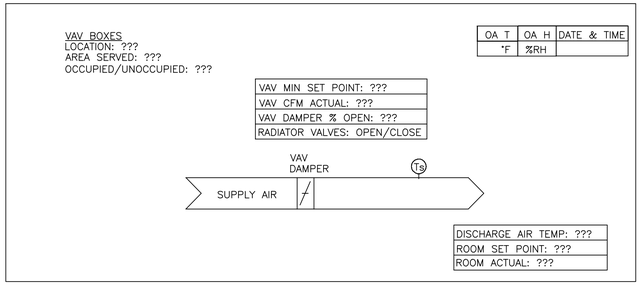
- 2 HR FIRE BARRIER: 2 HOUR RATED WALLS WITH SELF CLOSING & LATCHING 1-1/2 HOUR RATED DOORS
- SMOKE BARRIER: SMOKE TIGHT 1 HOUR RATED SELF CLOSING & NON-LATCHING DOORS
- 1 HR FIRE BARRIER: 1 HOUR RATED WALLS WITH 3/4 HOUR SELF CLOSING & LATCHING DOORS
- SMOKE PARTITION: SMOKE TIGHT ONLY WITH DOORS SELF-CLOSING & LATCHING

SHEET PLAN TAGGED NOTES:

1. PROVIDE ONE (1) NEW SURFACE MOUNTED, NEMA 1, ENCLOSURE WITH HINGED COVER TO HOUSE THE NEW TIER-1, BSC CONTROLLER. THIS ENCLOSURE IS TO BE PROVIDED WITH A 96 VA POWER SUPPLY AND A 5-POINT, 24 VAC DISTRIBUTION TERMINAL BLOCK. INSTALL NEW ENCLOSURE, IN **JANITOR CLOSET 312** AND SHALL BE DESIGNATED AS THE NEW BAS PANEL.
2. UK CONTROLS TO PROVIDE ONE (1) NEW TIER-1 BSC CONTROLLER, WITH 100-DEVICE LICENSE, A 16 PORT INPUT/OUTPUT EXPANSION MODULE AND ONE (1) NEW TIER-2 ASC CONTROLLER. THE CONTROLLERS ARE TO BE PROGRAMMED, BY UK CONTROLS, WITH THE LATEST SOFTWARE, PRIOR TO CONTRACTOR INSTALLATION.
3. PROVIDE ONE (1) NEW UNINTERRUPTABLE POWER SUPPLY KIT TO SERVE AS POWER BACKUP FOR THE NEW TIER-1 BSC CONTROLLER. UPS KIT TO BE INCLUDED WITH AN ENCLOSED POWER CONTROL CENTER (10A SWITCH/CIRCUIT BREAKER, TWO 120VAC OUTLETS, TERMINALS, 120VAC INPUT) WITH A 600VA UPS. INSTALL UPS ENCLOSURE BENEATH THE NEW BAS ENCLOSURE.
4. NEW EMERGENCY POWER TO BAS ENCLOSURE. UTILIZE AN EXISTING SPARE 20A/1P CIRCUIT BREAKER, IN **EXISTING PANEL EE (EMERGENCY),** AND INSTALL (2) #12 AWG + (1) #12 CU GND IN 3/4" EMT CONDUIT, FROM THIS EMERGENCY PANEL, TO THE NEW UPS KIT AND THEN TO THE BAS ENCLOSURE, BOTH UNITS LOCATED IN **JANITOR CLOSET 312.** TERMINATE THE 120V POWER FEED IN THE PRIMARY SIDE OF THE CONTROL TRANSFORMER IN THE BAS ENCLOSURE.
5. NEW DATA DROP TO BAS ENCLOSURE.
   - 5.1. CONTRACTOR TO PROVIDE AND INSTALL A NEW 1-1/4" EMT CONDUIT FROM THE NEW BAS ENCLOSURE TO **JANITOR CLOSET 312.**
   - 5.2. COORDINATE WITH UK C.N.S. TO PROVIDE, AND TERMINATE, NEW CAT 6 DATA CABLING TO THE NEW BAS ENCLOSURE. UTILIZE THE NEW 1-1/4" CONDUIT (SEE NOTE #5) FOR INSTALLATION OF DATA CABLE(S).
6. FOR THE UPGRADED VAV BOX IN CLASSROOM 306, THE CONTRACTOR IS TO PROVIDE AND INSTALL THE FOLLOWING NEW EQUIPMENT AT THIS BOX FOR CONTROLS. UTILIZE THE EXISTING ENCLOSURE FOR MOUNTING THESE DEVICES. SEE VAV SCHEMATIC ON SHEET IC-001 FOR DEVICE LOCATION.
   - 6.1. NEW NEMA 1 METAL ENCLOSURE WITH SCREW COVER. ENCLOSURE TO BE PROVIDED WITH A 40VA, 120V TO 24VAC, CONTROL TRANSFORMER AND A 35 MM TOP HAT DIN RAIL FOR MOUNTING OF NEW ASC CONTROLLER. SURFACE MOUNT ENCLOSURE ON SIDE OF VAV BOX. ENCLOSURE SIZE TO BE NO SMALLER THAN 14.5"L x 7.5"W x 4"D.
   - 6.2. NEW ASC CONTROLLER. UK CONTROLS IS TO PROVIDE AND PROGRAM THIS NEW CONTROLLER. CONTRACTOR TO MOUNT THE NEW CONTROLLER ON THE NEW ENCLOSURE'S DIN RAIL AND INSTALL A NEW 120V EMERGENCY POWER FEEDER TO THE NEW 40VA CONTROL TRANSFORMER IN THE NEW ENCLOSURE. DO NOT LOCK DOWN DAMPER UNTIL DIRECTED BY CONTROLS.
   - 6.3. (3) NEW HOT WATER VALVE WITH BELIMO 2-10V DC ACTUATOR. FOR EACH RADIATOR IN ROOM 306, INSTALL VALVE IN HOT WATER RETURN LINE AND WIRE ACTUATOR TO NEW ASC CONTROLLER OUTPUT AS DOCUMENTED.
   - 6.4. NEW DISCHARGE AIR TEMPERATURE (DAT) SENSOR. INSTALL SENSOR IN DUCTWORK, DOWNSTREAM FROM THE NEW VAV AND WIRE TO NEW ASC CONTROLLER INPUT AS DOCUMENTED. SEE VAV SCHEMATIC DETAIL FOR LOCATION .
   - 6.5. INSTALL ISOLATION VALVES ON EACH HOT WATER RETURN LINE IN ORDER TO ISOLATE THE HWV ACTUATOR FOR MAINTENANCE.
7. FOR CLASSROOM 306, REPLACE THE EXISTING THERMOSTAT WITH A NEW DIGITAL THERMOSTAT. PROVIDE A NEW MODULAR THERMOSTAT CABLE AND UTILIZE THE EXISTING BACK BOX AND RECESSED CONDUIT TO INSTALL THIS CABLE BETWEEN THE EXISTING BACK BOX TO THE EXISTING CONTROLLER ENCLOSURE ON THE NEW VAV BOX. MOUNT THE NEW THERMOSTAT IN THE BACK BOX AND TERMINATE THE CABLE ON THE NEW THERMOSTAT AND ASC CONTROLLER INPUTS. SEE NEW EQUIPMENT SCHEDULE ON SHEET IC-001 FOR DEVICE SPECIFICATIONS.
8. PROVIDE AND INSTALL A **NEW #22 AWG, 2-PAIR, SHIELDED DATA CABLE** IN 3/4" EMT CONDUIT, FROM THE NEW TIER-1, BSC ENCLOSURE, IN COMM ROOM 316, TO THE NEW TIER-2 ASC CONTROLLER IN ROOM 306. ACTIVATE EOL SWITCH ON THIS CONTROLLER SINCE, AT THIS POINT, IT IS THE ONLY TIER-2 CONTROLLER ON THIS MSTP TRUNK.
9. TERMINATE NEW CONTROL WIRING ON THE NEW ASC CONTROLLER AS DOCUMENTED.
10. ONCE ASC CONTROLLER IS INSTALLED AND WIRED, GET WITH CONTROL GROUP TO TEST OPERATION AND DIRECT INSTALLER TO LOCK DOWN DAMPER.
11. UK CONTROLS TECHNICIAN TO COMMISSION CONTROLS AND MODIFY ANY TRIDIUM GRAPHICS, TRENDS AND/OR ALARMS THAT MAY BE REQUIRED.
12. PROVIDE AIR BALANCE TESTING FOR ALL SUPPLY AIR DIFFUSERS. VAV BOXES TO COMPLY WITH VOLUME OUTPUT AS LISTED IN SCHEDULE ON THIS SHEET.
13. PENETRATION OF ATRIUM BARRIER. SEAL PENETRATION AS REQUIRED TO MAINTAIN THE INTEGRITY OF THE BARRIER RATING.



1 VAV UNIT WITH HOT WATER REHEAT SCHEMATIC
No Scale



1. VARIABLE AIR VOLUME (VAV) BOXES

1.1. REFER TO DRAWINGS IF ROOM IS CONTROLLED VIA A WALL MOUNTED THERMOSTAT.

1.2. WHEN COOLING IS REQUIRED, THE INLET DAMPER SHALL MODULATE BETWEEN THE MAXIMUM AND MINIMUM AIR FLOW SETPOINTS AS REQUIRED TO MAINTAIN SPACE TEMPERATURE. VAV BOXES ARE NOT PROVIDED WITH HEATING. WHEN HEATING IS REQUIRED, THE INLET DAMPER SHALL MODULATE TO THE MINIMUM POSITION AND RADIATOR CONTROL VALVES TO OPEN TO MAINTAIN SPACE TEMPERATURE.

1.3. PRIMARY AIR CFM, LEAVING AIR TEMPERATURE, ROOM TEMPERATURE AND ROOM SETPOINT SHALL BE MONITORED BY THE DDC CONTROL SYSTEM. AN AIR FLOW SENSOR SHALL BE LOCATED ON THE INLET SIDE OF THE VAV BOX AND DUCT TEMPERATURE SENSOR SHALL BE LOCATED ON THE DISCHARGE SIDE OF THE VAV BOX.

1.4. OCCUPIED/UNOCCUPIED CONTROL: EACH ROOM IS PROVIDED WITH AN OCCUPANCY SENSOR WHICH SHALL CONTROL THE LIGHTS AND THE HVAC SYSTEM. THIS OCCUPANCY SENSOR IS PROVIDED AND INSTALLED BY THE CONTROLS CONTRACTOR AND SHALL PROVIDE (2) OUTPUTS; ONE FOR THE LIGHTING CONTROL AND ONE FOR THE HVAC CONTROL. THE CONTROL OF THE OCCUPANCY SENSOR SHALL BE HARDWIRED INTO THE DDC SYSTEM AND SHALL NOT BE ACCOMPLISHED VIA SOFTWARE. REFER TO ELECTRICAL DRAWINGS FOR ROOMS THAT ARE PROVIDED WITH AN OCCUPANCY SENSOR. IF DURING THE BUILDING OCCUPIED SCHEDULE AS DICTATED BY THE DDC SYSTEM, THE OCCUPANT LEAVES HIS/HER SPACE FOR MORE THAN 15 MINUTES (ADJ.), THE LIGHTS WILL GO OUT AND THE ROOM SHALL GO INTO AN HVAC UNOCCUPIED MODE. IN THIS ROOM UNOCCUPIED MODE, THE VAV SHALL CLOSE, AND THE ROOM TEMPERATURE SHALL BE ALLOWED TO DRIFT BETWEEN 68°F (ADJ.) AND 75°F (ADJ.). WHEN THE OCCUPANT RETURNS, THE ROOM SHALL GO BACK INTO OCCUPED MODE AND THE ROOM SHALL CONTROL TO THE SPACE THERMOSTAT. EXISTING VAV BOXES SERVING ROOMS WITH NEW OCCUPANCY SENSORS SHALL ALSO BE CONTROLLED ACCORDING TO THIS SEQUENCE.

1.5. UNIT ENABLE: A NETWORK UNIT ENABLE SIGNAL WILL CONTROL THE MODE OF THE BOX.

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FINE ARTS GUIGNOL BLDG.
ROOM 306 MAC LAB

MECHANICAL CONTROLS

PROJECT NO.:	2802.0
BUILDING NO.:	0022
DESIGNED BY:	CME
DRAWN BY:	ECF
UK PROJ. MGR.	MURPHY
DATE:	5-17-2024

REVISIONS

NO.	DESCRIPTION	DATE
1	FOR CONSTRUCTION	6-7-2024

DRAWING NUMBER:
IC-001

HEATING COIL UNIT / VAV UNIT SCHEDULE

	VAV #	ROOM #	TRIDIUM CTRL #	CONSTANT VOLUME CFM	VARIABLE VOLUME CFM	HEATING COIL GPM	VALVE SIZE (Cv)
	VAV-4	306		N/A	210 - 1940	N/A	N/A
	RAD-306A	306		N/A	N/A	1.4	1.2
	RAD-306B	306		N/A	N/A	1.4	1.2
	RAD-306C	306		N/A	N/A	1.4	1.2

NEW BUILDING CONTROLS EQUIPMENT SCHEDULE

QTY	DESCRIPTION	NOTES
1	NEMA 1, METAL ENCLOSURE WITH HINGED COVER, 96VA, 120V-24VAC, CONTROL TRANSFORMER, AND A 5 POINT 24 VAC DISTRIBUTION TERMINAL BLOCK (FOR BSC CONTROLLER)	
1	TIER-1 BSC (BUILDING SPECIFIC CONTROLLER) CONTROLLER	UK CONTROLS TO PROVIDE AND PROGRAM
1	600VA UPS BACKUP KIT WITH POWER CONTROL CENTER	
1	TIER 2 ASC (APPLICATION SPECIFIC CONTROLLER)	UK CONTROLS TO PROVIDE AND PROGRAM
1	DIGITAL T-STAT	
1	DISCHARGE AIR TEMPERATURE SENSOR	
3	HWV ACTUATOR. SPECIFY A02 CODE WHEN ORDERING (VALVE NORMALLY 2-10V; A02 CODE WILL BE 0-10V); Cv = 1.2	
	HWV ACTUATOR. SPECIFY A02 CODE WHEN ORDERING (VALVE NORMALLY 2-10V; A02 CODE WILL BE 0-10V); Cv = 1.9	
	HWV ACTUATOR. SPECIFY A02 CODE WHEN ORDERING (VALVE NORMALLY 2-10V; A02 CODE WILL BE 0-10V); Cv = 3.0	
1	25' T-STAT CABLE (NUMBER DICTATES LENGTH NEEDED)	IF 25' IS NOT LONG ENOUGH FROM EXISTING TSTAT TO ASC CONTROLLER THEN A 50' OR 75' CABLE CAN BE ORDERED

RESPONSIBILITY MATRIX

	CONTROLS CONTRACTOR	ELECTRICAL CONTRACTOR	UK CONTROLS	UK CNS
FURNISH (1) NEW TIER-1 BSC CONTROLLER & (1) NEW TIER-2 ASC CONTROLLER			X	
PROGRAM NEW CONTROLLERS			X	
FURNISH NEW BSC CONTROLLER ENCLOSURE AND 600VA UPS BACKUP KIT	X			
INSTALL BSC CONTROLLER ENCLOSURE AND UPS UNIT IN COMM ROOM 316		X		
REPLACE EXISTING CONTROLLER OM RPP, INSTALL "PROGRAMMED" BSC CONTROLLER IN EXISTING ENCLOSURE		X		
PROVIDE AND INSTALL EMERGENCY 120V, 20A CIRCUIT TO BSC CONTROLLER ENCLOSURE (WIRE THROUGH UPS BACKUP UNIT)		X		
PROVIDE AND INSTALL CONDUIT FOR DATA DROP TO NEW BSC CONTROLLER ENCLOSURE		X		
PROVIDE AND INSTALL NEW CAT6 WIRING TO NEW BSC CONTROLLER ENCLOSURE FROM COMM ROOM SERVER AND TERMINATE ON NEW BSC CONTROLLER				X
RE-INSTALL EXISTING ASC CONTROLLER ENCLOSURE ON NEW VAV UNIT		X		
INSTALL "PROGRAMMED" ASC CONTROLLER IN NEW CONTROLLER ENCLOSURE ON NEW VAV UNIT		X		
RE-CONNECT EXISTING 120V, 20A POWER CIRCUIT TO NEW ASC CONTROLLER AND TERMINATE ON NEW POWER SUPPLY CONTROL TRANSFORMER		X		
FURNISH ALL NEW CONTROL DEVICES WITH THE EXCEPTION OF THE NEW BSC AND ASC CONTROLLERS NOTE: SEE "NEW BUILDING CONTROLS EQUIPMENT SCHEDULE" ON SHEET IC-001 FOR QUANTITY AND DESCRIPTION OF NEW DEVICES.	X			
PROVIDE AND INSTALL BACK BOXES AND CONDUIT FOR CONTROL WIRING		X		
INSTALL CONTROLS WIRING IN NEW CONDUIT TO ALL NEW CONTROL DEVICES		X		
INSTALL NEW CONTROL DEVICES IN BACK BOXES AND TERMINATE CONTROLS WIRING ON DEVICES		X		
VERIFY CONNECTIVITY OF TIER-1 BSC CONTROLLER TO UNIVERSITY NETWORK			X	
COMMISSION CONTROLS	X		X	
PROGRAM TRIDIUM GRAPHICS, TRENDS AND ALARMS			X	

STANDARD VAV BOXES SYSTEM POINTS LIST

CONTROLLER	POINT TYPE							ALARM	
SYSTEM POINT DESCRIPTION	GRAPHIC	HARDWARE INPUT	HARDWARE OUTPUT	SOFTWARE POINT	HARDWARE INTERLOCK	NETWORK	DEFAULT VALUE	COMMUNICATION FAIL	NOTES:
DISCHARGE AIR TEMPERATURE	X	AI							
SPACE TEMPERATURE LOCAL	X	AI							NOTE 1
VAV AIRFLOW	X	AI							
AIR VALVE DRIVE COMMAND	X								
HEATING VALVE COMMAND	X								
OCCUPIED COOLING SETPOINT			FLTG	X			71°F - 74°F		NOTE 2
OCCUPIED HEATING SETPOINT			FLTG	X			68°F - 71°F		NOTE 2
UNOCCUPIED COOLING SETPOINT				X			85°F		NOTE 2
UNOCCUPIED HEATING SETPOINT				X			55°F		NOTE 2
MINIMUM COOLING AIRFLOW SETPOINT				X					NOTE 1
MAXIMUM COOLING AIRFLOW SETPOINT				X					NOTE 1
MINIMUM HEATING AIRFLOW SETPOINT				X					NOTE 1
MAXIMUM HEATING AIRFLOW SETPOINT				X					NOTE 1
BAS COMMUNICATION STATE				X					
GENERAL NOTES	1. REFER TO FLOOR PLAN FOR AIR FLOWS								
	2. USER ADJUSTABLE SETPOINT								

SEQUENCE OF OPERATION: VAV BOX

BUILDING AUTOMATION SYSTEM INTERFACE:

THE BUILDING AUTOMATION SYSTEM (BAS) SHALL SEND THE CONTROLLER OCCUPIED, AND UNOCCUPIED COMMANDS. THE BAS MAY ALSO SEND A HEAT/COOL MODE, PRIORITY SHUTDOWN COMMANDS, SPACE TEMPERATURE AND/OR SPACE TEMPERATURE SETPOINT. IF COMMUNICATION IS LOST WITH THE BAS, THE CONTROLLER SHALL OPERATE USING ITS LOCAL SETPOINTS.

OCCUPIED:

NORMAL OPERATING MODE FOR OCCUPIED SPACES OR DAYTIME OPERATION. WHEN THE UNIT IS IN THE OCCUPIED MODE THE VAV SHALL MAINTAIN THE SPACE TEMPERATURE AT THE ACTIVE OCCUPIED COOLING SETPOINT. APPLICABLE VENTILATION AND AIRFLOW SETPOINTS SHALL BE ENFORCED. THE OCCUPIED MODE SHALL BE THE DEFAULT MODE OF THE VAV.

UNOCCUPIED:

NORMAL OPERATING MODE FOR UNOCCUPIED SPACES OR NIGHTTIME OPERATION. WHEN THE UNIT IS IN UNOCCUPIED MODE THE VAV CONTROLLER SHALL MAINTAIN THE SPACE TEMPERATURE AT THE STORED UNOCCUPIED COOLING SETPOINT REGARDLESS OF THE PRESENCE OF A HARDWIRED OR COMMUNICATED SETPOINT. WHEN THE SPACE TEMPERATURE EXCEEDS THE ACTIVE UNOCCUPIED SETPOINT THE VAV SHALL MODULATE FULLY OPEN.

HEAT/COOL SETPOINT:

THE SPACE TEMPERATURE SETPOINT SHALL BE DETERMINED EITHER BY A LOCAL (E.G., THUMBWHEEL) SETPOINT, THE ROOM SETPOINT OR A COMMUNICATED VALUE. THE CONTROLLER SHALL USE THE LOCALLY STORED DEFAULT SETPOINTS WHEN NEITHER A LOCAL SETPOINT NOR COMMUNICATED SETPOINT IS PRESENT. IF BOTH A LOCAL SETPOINT AND COMMUNICATED SETPOINT EXIST, THE CONTROLLER SHALL USE THE COMMUNICATED VALUE.

COOLING MODE:

WHEN THE UNIT IS IN COOLING MODE, THE VAV CONTROLLER SHALL MAINTAIN THE SPACE TEMPERATURE AT THE ACTIVE COOLING SETPOINT BY MODULATING THE AIRFLOW BETWEEN THE ACTIVE COOLING MINIMUM AIRFLOW SETPOINT TO THE MAXIMUM COOLING AIRFLOW SETPOINT. THE VAV SHALL USE THE MEASURED SPACE TEMPERATURE AND THE ACTIVE COOLING SETPOINT TO DETERMINE THE REQUESTED COOLING CAPACITY OF THE UNIT. THE OUTPUTS WILL BE CONTROLLED BASED ON THE UNIT CONFIGURATION AND THE REQUESTED COOLING CAPACITY. WHEN IN THE OCCUPIED MODE, THE CONTROLLER SHALL USE THE MEASURED SPACE TEMPERATURE AND THE ACTIVE COOLING SETPOINT TO DETERMINE THE REQUESTED COOLING CAPACITY OF THE UNIT. THE OUTPUTS SHALL BE CONTROLLED BASED ON THE UNIT CONFIGURATION AND THE REQUESTED COOLING CAPACITY.

HEATING MODE:

WHEN THE UNIT IS IN HEATING MODE, THE CONTROLLER SHALL MAINTAIN THE SPACE TEMPERATURE AT THE ACTIVE HEATING SETPOINT BY OPENING THE ROOM 2-WAY, 2-POSITION HOT WATER VALVES. THE CONTROLLER SHALL USE THE MEASURED SPACE TEMPERATURE AND THE ACTIVE HEATING SETPOINT TO DETERMINE THE REQUESTED HEATING NEEDS. THE OUTPUTS WILL BE CONTROLLED BASED ON THE UNIT CONFIGURATION AND THE REQUESTED HEATING CAPACITY. WHEN HEATING DEMAND IS SATISFIED, VALVES TO CLOSE. IF THE SPACE TEMPERATURE IS BELOW THE HEATING SETPOINT THE HOT WATER REHEAT VALVE SHALL CONTROL AS REQUIRED TO MAINTAIN THE ACTIVE HEATING SETPOINT.

SPACE SENSOR FAILURE:

IF THERE IS A FAULT WITH THE OPERATION OF THE ZONE SENSOR AN ALARM SHALL BE ANNUNCIATED AT THE BAS. SPACE SENSOR FAILURE SHALL CAUSE THE VAV TO DRIVE THE DAMPER TO MINIMUM AIR FLOW IF THE VAV IS IN THE OCCUPIED MODE, OR DRIVE IT CLOSED IF THE VAV IS IN THE UNOCCUPIED MODE.

University of Kentucky
Facilities Engineering & Asset Management

STATE OF KENTUCKY
CHARLES MATTHEW ELLIS
18396
LICENSED PROFESSIONAL ENGINEER

TECHNICAL HORIZONS
Industrial • Commercial • Institutional
501 Darby Creek, Ste #51 Lexington, KY
859.255.5983

FINE ARTS GUIGNOL BLDG.
ROOM 306 MAC LAB

MECHANICAL CONTROLS

PROJECT NO.:	2802.0
BUILDING NO.:	0022
DESIGNED BY:	CME
DRAWN BY:	ECF
UK PROJ. MGR.:	MURPHY
DATE:	5-17-2024

REVISIONS

NO.	DESCRIPTION	DATE
1	FOR CONSTRUCTION	6-7-2024

DRAWING NUMBER:

IC-002

GENERAL FIRE PROTECTION NOTES:

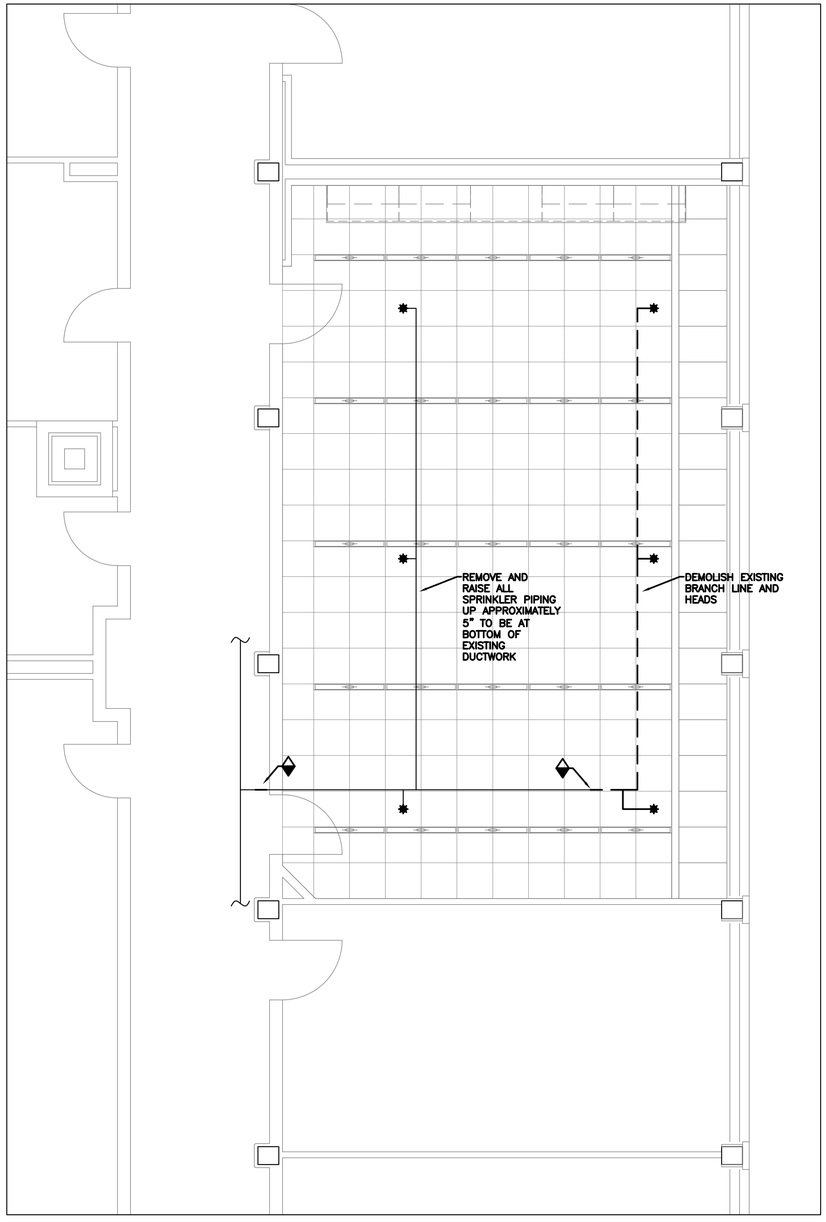
1. INDICATED SPACES SHALL BE PROTECTED 100% BY A WET PIPE FIRE SUPPRESSION SYSTEM DESIGNED AND INSTALLED IN ACCORDANCE WITH NFPA–13, THE KENTUCKY BUILDING CODE AND THE PROJECT SPECIFICATIONS. THE ATTIC AND INDICATED ACCESSORY SPACES TO BE SUPPRESSED BY A DRY PIPE SUPPRESSION SYSTEM.
2. ALL FIRE PROTECTION PIPE SIZES SHALL BE HYDRAULICALLY CALCULATED IN ACCORDANCE WITH NFPA–13.
3. ALL PIPING TO INDIVIDUAL SPRINKLER HEADS, REGARDLESS OF TYPE OF HEAD SHALL BE 1", UNLESS OTHERWISE NOTED.
4. PIPING IN ROOMS WITH SUSPENDED CEILINGS SHALL BE ABOVE CEILING UNLESS OTHERWISE NOTED.
5. LOCATIONS OF PIPING AND EQUIPMENT ARE APPROXIMATE AND SUBJECT TO ADJUSTMENTS IN THE FIELD. DO NOT SCALE THE DRAWINGS.
6. ALL OFFSETS IN PIPING ARE NOT NECESSARY SHOWN, PROVIDE ADDITIONAL OFFSETS WHERE NECESSARY.
7. COORDINATE WITH HVAC, PLUMBING, AND ELECTRICAL EQUIPMENT TO AVOID INTERFERENCE WITH PIPING, DUCTS, AND CONDUIT.
8. INSTALL PIPING AND EQUIPMENT IN ACCORDANCE WITH MANUFACTURERS INSTALLATION INSTRUCTIONS, NFPA–13, K.B.C. ETC...
9. SEAL AIRTIGHT AROUND ALL PIPING PENETRATIONS THROUGH WALLS, FLOOR AND ROOF. FIRE STOP PROPERLY WHERE REQUIRED BY CODE.
10. PROVIDE DRAINS AT LOW POINTS PER NFPA–13.
11. USE MANUFACTURED FITTINGS OR MECHANICAL TEES, ELLS, ETC. (SEE SPECIFICATIONS). WELDOLETS, SIMILAR WELDED CONNECTIONS AND WELDED PIPING ARE NOT ACCEPTABLE.
12. PITCH ALL SPRINKLER PIPING TO MAIN. IF PIPING CANNOT BE PITCHED TO MAIN, PROVIDE AUXILIARY DRAINS AT LOW POINTS.
13. REFER TO ARCHITECTURAL AND ELECTRICAL DRAWINGS FOR EXACT LOCATION OF CEILINGS, CEILING TYPES AND LIGHT FIXTURES.
14. ALL EXPOSED FIRE SUPPRESSION PIPING SHALL BE PRIMED AND PAINTED COLOR CHOSEN BY ARCHITECT.

FIRE PROTECTION LEGEND

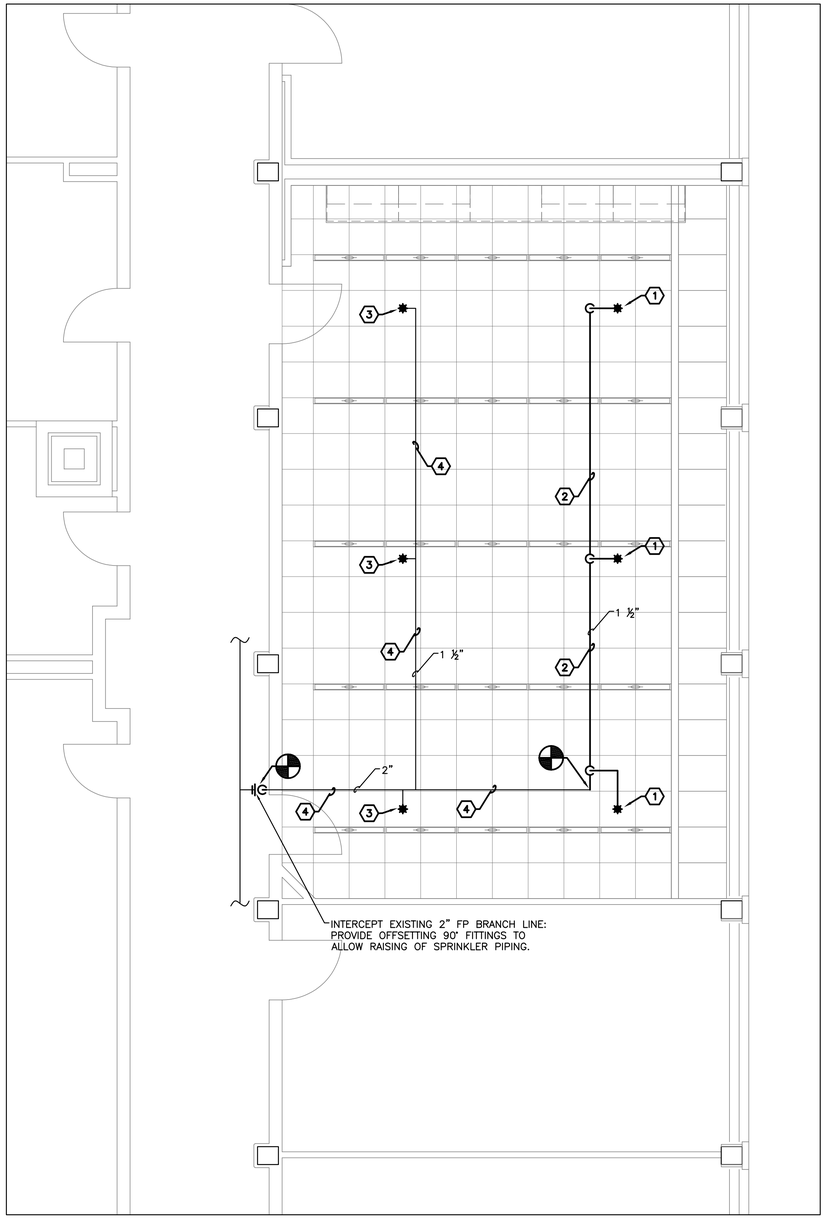
- DEMO FIRE PROTECTION PIPE
- EXISTING FIRE PROTECTION PIPE
- NEW FIRE PROTECTION PIPE
- NEW SEMI–RECESSED PENDANT SPRINKLER HEAD WITH ESCUTCHEON.

TAGGED NOTES ⬡

1. CONTRACTOR TO PROVIDE NEW PIPING TO NEW SPRINKLER HEAD LOCATION.
2. NEW PIPE TO SERVE RELOCATED HEADS; PIPE SIZE TO MATCH EXISTING.
3. NEW SPRINKLER HEAD ONCE PIPING ELEVATION IS CHANGED UPWARDS.
4. RAISE EXISTING PIPING INDICATED APPROXIMATELY 5"; ADJUST EXISTING HANGERS AS REQUIRED. REPLACE ANY HANGER HARDWARE NECESSARY.



1 ROOM 306 FIRE PROTECTION DEMOLITION PLAN
SCALE: 1/4" = 1'–0"



1 ROOM 306 FIRE PROTECTION NEW WORK PLAN
SCALE: 1/4" = 1'–0"

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CHARLES MATTHEW ELLIS
18396
LICENSED PROFESSIONAL ENGINEER

TECHNICAL HORIZONS
Industrial • Commercial • Institutional
501 Darby Creek, Ste #51 Lexington, KY
859.263.5983

FINE ARTS GUIGNOL BLDG.
ROOM 306 MAC LAB

FIRE PROTECTION THIRD FLOOR PLAN

PROJECT NO.:	2802.0
BUILDING NO.:	0022
DESIGNED BY:	CME
DRAWN BY:	ECF
UK PROJ. MGR.	MURPHY
DATE:	5-17-2024

REVISIONS

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1	FOR CONSTRUCTION	6-7-2024

DRAWING NUMBER:
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ELECTRICAL GENERAL NOTES:

ABBREVIATIONS

A, AMP - AMPERES
AC - ABOVE COUNTER
AFF - ABOVE FINISHED FLOOR
AFG - ABOVE FINISHED GRADE
ATS - AUTOMATIC TRANSFER SWITCH
AWG - AMERICAN WIRE GAUGE
BLDG - BUILDING
C - CONDUIT
CB - CIRCUIT BREAKER
CCTV - CLOSED CIRCUIT TELEVISION
CKT - CIRCUIT
C/L - CENTERLINE
CLG - CEILING
COND - CONDUCTOR
CONN - CONNECTION
CTL - CONTROL
CU - COPPER
DB - DIRECT BURIAL
DET - DETAIL
DP - DISTRIBUTION PANEL
DISC - DISCONNECT

DN - DOWN
DP - DISTRIBUTION PANEL
DPST - DOUBLE POLE SINGLE THROW
EA - EACH
EC - EMPTY CONDUIT
ELEC - ELECTRICAL
ELEV - ELEVATOR
EM, EMERG - EMERGENCY
EMT - ELECTRICAL METALLIC TUBING
EOL - END OF LINE
EUH - ELECTRIC UNIT HEATER
EWC - ELECTRIC WATER COOLER
EWH - ELECTRIC WATER HEATER
EX - EXISTING
ETR - EXISTING TO REMAIN
F - FUSE
FLA - FULL LOAD AMPS
FLEX - FLEXIBLE
FLUOR - FLUORESCENT
FOR - FOWARD-OFF-REVERSE
FTG - FITTING
FVNR - FULL VOLTAGE NON-REVERSING

G, GND - GROUND
GFI - GROUND FAULT INTERRUPTING
HID - HIGH INTENSITY DISCHARGE
HP - HORSEPOWER
HT, H - HEIGHT
IG - ISOLATED GROUND
IN - INCH
INC - INCANDESCENT
J-BOX, JB - JUNCTION BOX
KCMIL - 1000 CIRCULAR MILS
KVA - KILOVOLT AMPS
KVAF - KILOVOLT AMPS REACTIVE
KW - KILOWATT
KWH - KILOWATT HOUR
LA - LIGHTNING ARRESTER
LTG - LIGHTING
LV - LOW VOLTAGE
MAX - MAXIMUM
MCB - MAIN CIRCUIT BREAKER
MCP - MOTOR CIRCUIT PROTECTOR
MDP - MAIN DISTRIBUTION PANEL
MFR - MANUFACTURER
MG - MOTOR GENERATOR

MH - MANHOLE, METAL HALIDE, MOUNTING HEIGHT
MIC - MICROPHONE
MIN - MINIMUM
MLO - MAIN LUGS ONLY
MTD - MOUNTED
MV - MEDIUM VOLTAGE
N/A - NOT APPLICABLE
NEC - NATIONAL ELECTRICAL CODE
NEMA - NATIONAL ELECTRICAL MANUFACTURERS ASSOC.
NESC - NATIONAL ELECTRICAL SAFETY CODE
NFPA - NATIONAL FIRE PROTECTION ASSOCIATION
NIC - NOT IN CONTRACT
NTS - NOT TO SCALE
NO - NORMALLY OPEN, NUMBER
OH - OVERHEAD
P - POLE
PB - PULL BOX, PUSH BUTTON
PH - PHASE
PNL - PANEL
QTY - QUANTITY
REF - REFERENCE, REFER
RCPT - RECEPTACLE

RGS - RIGID GALVANIZED STEEL
SCH - SCHEDULE
SMR - SURFACE METAL RACEWAY
S/N - SOLID NEUTRAL
SQ FT - SQUARE FOOT
SS - STAINLESS STEEL
SW - SWITCH
SYS - SYSTEM
TEL - TELEPHONE
TM - THERMAL MAGNETIC
TYP - TYPICAL
UG - UNDERGROUND
UH - UNIT HEATER
UON - UNLESS OTHERWISE NOTED
V - VOLTAGE
W - WIRE
W/ - WITH
W/O - WITH OUT
WP - WEATHERPROOF
WT - WEIGHT
X'FMR, XFMR - TRANSFORMER
(X) - KEY NOTE CALL OUT

GENERAL ELECTRICAL NOTES:

A. ALL WORK SHALL BE IN ACCORDANCE WITH THE LATEST NATIONAL ELECTRICAL CODE, NFPA, ASHRAE 90.1, ALL LOCAL AND STATE CODES.

B. ELECTRICAL CONTRACTOR SHALL VISIT AND EXAMINE THE SITE PRIOR TO SUBMITTING BID TO BECOME FAMILIAR WITH EXISTING CONDITIONS. NO ALLOWANCE SHALL BE MADE FOR EXISTING CONDITIONS NOT KNOWN TO THE CONTRACTOR.

C. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL FEES, PERMITS AND LICENSES FOR THE COMPLETE INSTALLATION OF HIS WORK. DRAWINGS ARE DIAGRAMMATIC REPRESENTATION OF THE WORK AND INDICATES GENERAL ARRANGEMENT. SEE ARCHITECTURAL DRAWINGS FOR EXACT DIMENSIONS.

D. ALL CUTTING AND PATCHING OF WALLS AND FLOOR FOR ELECTRICAL EQUIPMENT/WORK SHALL BE THE RESPONSIBILITY OF THE ELECTRICAL CONTRACTOR.

E. PROVIDE FIRE STOP PER BUILDING CODE TO ALL CONDUITS PENETRATING THROUGH FIRE RATED WALLS/PARTITION, FLOORS AND CEILINGS. COORDINATION WITH THE GENERAL CONTRACTOR SHALL BE MAINTAINED TO INSURE THAT FIRE STOPPING IS ACCOMPLISHED. USE APPROVED U.L. OR EQUIVALENT SEALANT. ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR SEALING/PATCHING ANY CONDUITS OPENINGS IN FLOOR/SLAB/WALL AFTER DEMOLITION.

F. COORDINATE EXACT PHASING OF ALL WORK WITH GENERAL CONTRACTOR.

G. EXACT DEVICE LOCATIONS (RECEPTACLES, DATA/TELEPHONE OUTLETS, JUNCTION BOXES, LIGHT FIXTURES, ETC.) SHALL BE COORDINATED WITH ARCHITECTURAL PLANS.

H. ELECTRICAL CONTRACTOR SHALL VERIFY EXACT MOUNTING LOCATION AND CONNECTION REQUIREMENTS OF ALL PLUMBING/MECHANICAL EQUIPMENT WITH PLUMBING/MECHANICAL CONTRACTOR PRIOR TO ROUGH-IN.

I. ALL DEVICES AND JUNCTION BOXES SHALL BE ACCESSIBLE. PROVIDE ACCESS PANEL AS REQUIRED WITH PRIOR APPROVAL OF ARCHITECT.

J. WHERE MORE THAN ONE SWITCH OR DIMMER OCCURS AT A LOCATION, GANG THE SWITCHES TOGETHER WITH A COMMON JUNCTION BOX AND FACE PLATE.

K. ELECTRICAL CONTRACTOR SHALL COORDINATE LOCATION OF LIGHT FIXTURES WITH MECHANICAL CONTRACTOR, PLUMBING CONTRACTOR AND FIRE PROTECTION CONTRACTOR TO AVOID CONFLICT WITH DUCTWORK, PIPING AND SPRINKLER PIPING.

L. ALIGN ALL THERMOSTATS VERTICALLY ABOVE SWITCHES AT 48" A.F.F. COORDINATE WITH MECHANICAL CONTRACTOR. IF A THERMOSTAT IS NEEDED WHERE A SWITCH DOES NOT OCCUR, COORDINATE LOCATION WITH ARCHITECT. CONDUIT AND BACK BOX FOR THERMOSTAT SHALL BE PROVIDED BY ELECTRICAL CONTRACTOR UNLESS OTHERWISE NOTED.

M. NOT MORE THAN THREE LIGHTING OR RECEPTACLE CIRCUITS OR A MAXIMUM OF THREE 20A BRANCH CIRCUIT CAN BE COMBINED IN A COMMON HOMERUN WITH SEPARATE NEUTRALS FOR A TOTAL OF SIX CURRENT CARRYING CONDUCTORS IN ONE CONDUIT, UNLESS OTHERWISE INDICATED.

N. CONDUCTORS SHALL BE COPPER, RATED NOT LESS THAN 600VOLTS, MINIMUM WIRE SIZE SHALL BE #12 AWG, TYPE THHN OR THWN UNLESS OTHERWISE NOTED,

O. TELEPHONE, FIRE ALARM,DATA, COMMUNICATIONS AND OTHER LOW VOLTAGE WIRING SHALL BE PLENUM RATED IF CONDUCTORS PASS THROUGH AN AIR PLENUM.

P. DISCONNECT SWITCHES SHALL BE MOUNTED ON INDIVIDUAL STRUCTURAL SUPPORTS, OR OTHERWISE DIRECTLY ON EQUIPMENT, PROVIDED NO MODIFICATION TO EQUIPMENT IS NECESSARY. ALL STRUCTURAL SUPPORTS FOR ELECTRICAL EQUIPMENT SHALL BE PROVIDED AND INSTALLED BY ELECTRICAL CONTRACTOR. ELECTRICAL CONTRACTOR SHALL INCLUDE DESIGN FOR ALL STRUCTURAL SUPPORT.

Q. ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR PROPERLY BALANCING ALL BRANCH CIRCUITS AMONG THE PHASES OF THE SYSTEM ACCORDING TO NEC AND PROVIDE LOAD BALANCING REPORT TO ENGINEER.

R. ALL EXTERIOR ELECTRICAL DEVICES AND EQUIPMENT SHALL BE WEATHERPROOF TYPE NEMA 3R.

S. EMERGENCY LIGHTING, IF SWITCHED, SHALL AUTOMATICALLY ILLUMINATE DURING A POWER OUTAGE.

T. ELECTRICAL CONTRACTOR SHALL ARRANGE FOR A JOB WALK-THROUGH WITH THE BUILDING AND FIRE DEPARTMENT INSPECTORS TO DETERMINE IF ANY ADDITIONAL EXIT SIGNS ARE REQUIRED PRIOR TO COVER UP. VERIFY ARROW REQUIREMENTS.

U. PROVIDE PULL WIRE IN EACH EMPTY RACEWAY.

V. EC SHALL PROVIDE CONDUIT SLEEVES FOR CABLE ROUTING, AS NECESSARY, IN WALLS, FLOORS AND CEILINGS.

W. E.C SHALL PROVIDE A TYPED LEDGER/CIRCUIT DIRECTORY IN PANELBOARD INDICATING TYPE OF LOAD AND LOCATION FOR EACH BRANCH CIRCUIT BREAKER. PROVIDE ENGRAVED PHENOLIC NAMEPLATES FOR ALL PANELBOARDS & DISCONNECT SWITCHES, UNLESS OTHERWISE NOTED.

X. BRANCH CIRCUIT PANELBOARDS WITH MORE THAN 42 CIRCUIT BREAKERS SHALL BE INSTALLED IN A SINGLE SECTION CABINET UNLESS OTHERWISE NOTED.

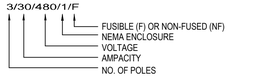
Y. E.C. SHALL PROVIDE J-HOOKS OR BRIDLE RINGS FOR CABLING SUPPORT. INSTALL ABOVE CORRIDOR CEILING SPACES FROM IDF CLOSET TO DEVICE LOCATIONS.

NOTE: GENERAL ELECTRICAL NOTES APPLY TO ALL ELECTRICAL DRAWINGS.

ELECTRICAL SYMBOLS LEGEND

- 2' X 4' FLUORESCENT LAY-IN/SURFACE MOUNTED LIGHT FIXTURE.
- 1' X 4' FLUORESCENT LAY-IN/SURFACE MOUNTED LIGHT FIXTURE.
- F2 — "F2" INDICATES FIXTURE TYPE-REFER TO LUMINAIRE SCHEDULE
- SUSPENDED DIRECT/INDIRECT LINEAR LUMINAIRE.
- FLUORESCENT STRIP LUMINAIRE.
- WALL BRACKET LIGHT FIXTURE
- RECESSED CAN LIGHT FIXTURE
- NL — "NL" - INDICATES LIGHT FIXTURE TO BE ON NIGHT LIGHT CIRCUIT.
- a — "a" - INDICATES LIGHT FIXTURE SWITCH/DIMMER "SWITCH LEG" DESIGNATION.
- $X — SWITCH, SUBSCRIPT INDICATES:
  X=NONE - SINGLE POLE
  X=2 - DOUBLE POLE
  X=3 - THREE WAY
  X=4 - FOUR WAY
  X=a - LETTER INDICATES SWITCH/DIMMER DESIGNATION FOR SPECIFIED LIGHT FIXTURE
  X=K - KEY OPERATED
  X=P - PILOT LIGHT
  X=R - MOMENTARY RELAY ON/OFF
- $M — 1 POLE, 20 AMP, 125 VOLT MOTOR RATED TOGGLE SWITCH WITH THERMAL OVERLOAD PROTECTION.
- $OS — OCCUPANCY SENSOR - WATT STOPPER #WS-200 - PIR, WITH MANUAL ON/AUTO OFF, AUTO ON/AUTO OFF, REDUCED TURN ON. VERIFY COLOR WITH ARCH/OWNER.
- OS — CEILING MOUNTED OCCUPANCY SENSOR - DUAL TECHNOLOGY, 360° LENS.
- DIMMER SWITCH.
- J — JUNCTION BOX.
- AC — 20A, 125V, DUPLEX RECEPTACLE, 2P-3W GROUNDING, NEMA 5-20R MOUNTED VERTICALLY.
  WHEN LETTERS ATTACHED TO SYMBOL,
  C - CEILING MOUNT,
  WP - WEATHER PROOF,
  GF/GFI - GROUND FAULT INTERRUPTER,
  IG - ISOLATED GROUND, ORANGE RECEPTACLE
  AC - ABOVE COUNTER,
  ## - NON STANDARD HEIGHT NOTED IN INCHES,
  TV - FOR TV, VERIFY MOUNTING HEIGHT WITH ARCHITECT/OWNER'S REPRESENTATIVE PRIOR TO ROUGH-IN.
  D - DEDICATED DUPLEX RECEPTACLE.
- SPECIAL RECEPTACLE AS NOTED ON DRAWING.
- QUADRAPLEX RECEPTACLE.
- PANELBOARD.
- RECESSED PANELBOARD.
- M — MOTORIZED DAMPER CONNECTION.
- TV — AUDIO VISUAL/ CABLE TELEVISION OUTLET - TWO GANG JUNCTION BOX. STUB THREE-QUARTER INCH (3/4") CONDUIT W/PULL WIRE INTO ACCESSIBLE CEILING SPACE. VERIFY EXACT MOUNTING HEIGHT AND LOCATION WITH ARCHITECT AND OWNER'S REPRESENTATIVE PRIOR TO ROUGH-IN. LEGRAND #EFSB2 OR FSR EQUAL.

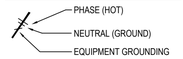
- MOTOR CONNECTION.
- COMBINATION STARTER / DISCONNECT SWITCH. (SIZE AS NOTED)
- EQUIPMENT DISCONNECT SWITCH. PROVIDE SWITCH AS DESIGNATED:



ALL FUSIBLE SWITCHES SHALL BE PROVIDED WITH FUSES SIZED PER EQUIPMENT NAMEPLATE. CONTRACTOR SHALL MAKE FINAL ELECTRICAL CONNECTION TO EQUIPMENT.

- DATA/VOICE OUTLET - SINGLE GANG OUTLET BOX WITH BLANK COVER PLATE. STUB ONE INCH (1") CONDUIT INTO ACCESSIBLE CEILING SPACE.
- TV — CABLE T.V. OUTLET - SINGLE GANG OUTLET BOX WITH BLANK COVER PLATE. STUB THREE-QUARTER INCH (3/4") CONDUIT INTO ACCESSIBLE CEILING SPACE.
- AOM — ADDRESSABLE OUTPUT MODULE.
- IAM — INDIVIDUAL ADDRESSABLE MONITOR MODULE.
- IIM — INITIATING CIRCUIT ISOLATION MODULE.
- S — CEILING MOUNTED SMOKE DETECTOR.
- H — CEILING MOUNTED HEAT DETECTOR.
- S_D — DUCT MOUNTED SMOKE DETECTOR. INTERLOCK WITH HVAC FAN AS REQUIRED FOR FAN SHUTDOWN AND DUCT DAMPER RELEASE UPON DEVICE ACTIVATION.
- IAM — INDIVIDUAL ADDRESSABLE MONITOR MODULE.
- FS — FIRE ALARM SPRINKLER FLOW SWITCH.
- TS — FIRE ALARM SPRINKLER TAMPER SWITCH.
- PS — FIRE ALARM SPRINKLER PRESSURE SWITCH.
- CEILING MOUNTED FIRE ALARM HORN & STROBE LIGHT.
- MANUAL FIRE ALARM PULL STATION. MOUNT TOP OF PULL STATION @ 48" A.F.F.
- WALL MOUNTED FIRE ALARM HORN & STROBE LIGHT. MOUNT @ 80" A.F.F. OR 6" BELOW CEILING WHICHEVER IS LOWER.
- 110cd — "110cd"-INDICATES STROBE CANDELA RATING.
- WALL MOUNTED FIRE ALARM STROBE LIGHT. MOUNT @ 80" A.F.F. OR 6" BELOW CEILING WHICHEVER IS LOWER.
- FARA — FIRE ALARM REMOTE ANNUNCIATOR.
- FACP — MAIN FIRE ALARM CONTROL PANEL.
- CONDUIT RUN UNDERSLAB.
- CONDUIT RUN ABOVE CEILING OR CONCEALED IN WALLS.
- CONDUIT DOWN.
- CONDUIT UP.

CONDUIT BARS INDICATE CONDUCTORS



ALL DIMENSIONS FOR DEVICE MOUNTING HEIGHTS ARE MEASURED FROM FINISHED FLOOR TO CENTER OF DEVICE OUTLET BOX, UNLESS OTHERWISE INDICATED. MOUNTING HEIGHTS SHALL BE AS FOLLOWS:

- WALL SWITCH - 46" AFF
- DIMMER - 46" AFF
- RECEPTACLE - 18" AFF
- ABOVE COUNTER RECEPTACLE/DEVICE - 3" ABOVE BACK SPLASH OF COUNTER OR 8" ABOVE FINISHED COUNTER TOP, WHICHEVER IS LOWER.
- TELEPHONE - 18" AFF
- DATA -18" AFF

NOTE: THESE SYMBOLS COMPRISE A STANDARD LIST, NOT ALL SYMBOLS MAY APPEAR ON THESE DRAWINGS.

University of Kentucky
Facilities Engineering & Asset Management

FINE ARTS GUIGNOL BLDG.
ROOM 306 MAC LAB

ELECTRICAL LEGEND AND PROJECT INFORMATION

PROJECT NO.:	2802.0
BUILDING NO.:	0022
DESIGNED BY:	JWB
DRAWN BY:	JWB
UK PROJ. MGR.:	MURPHY
DATE:	5-17-2024

REVISIONS

NO.	DESCRIPTION	DATE
1	FOR CONSTRUCTION	6-7-2024

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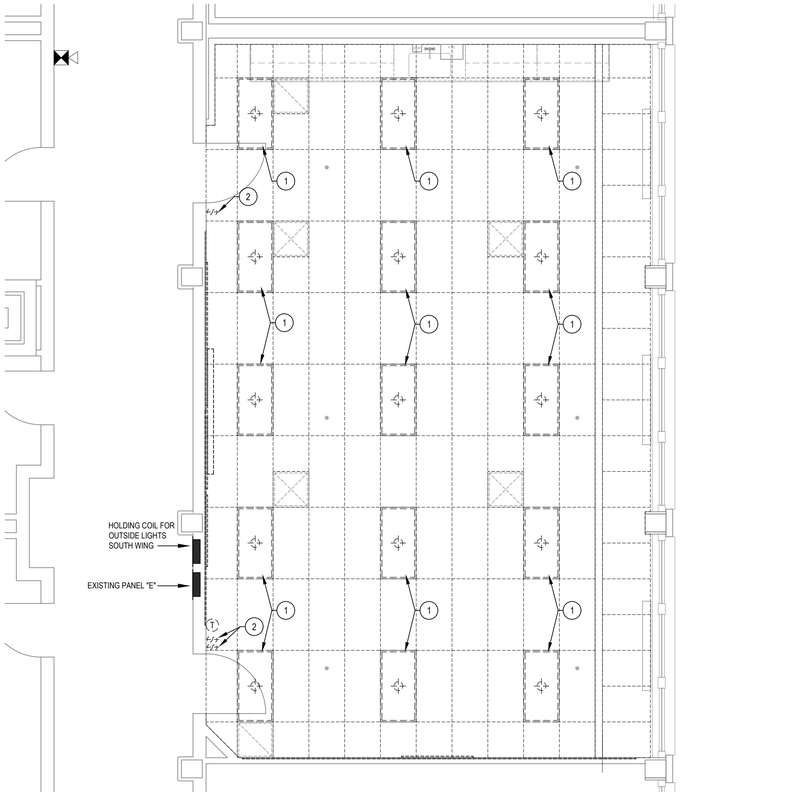
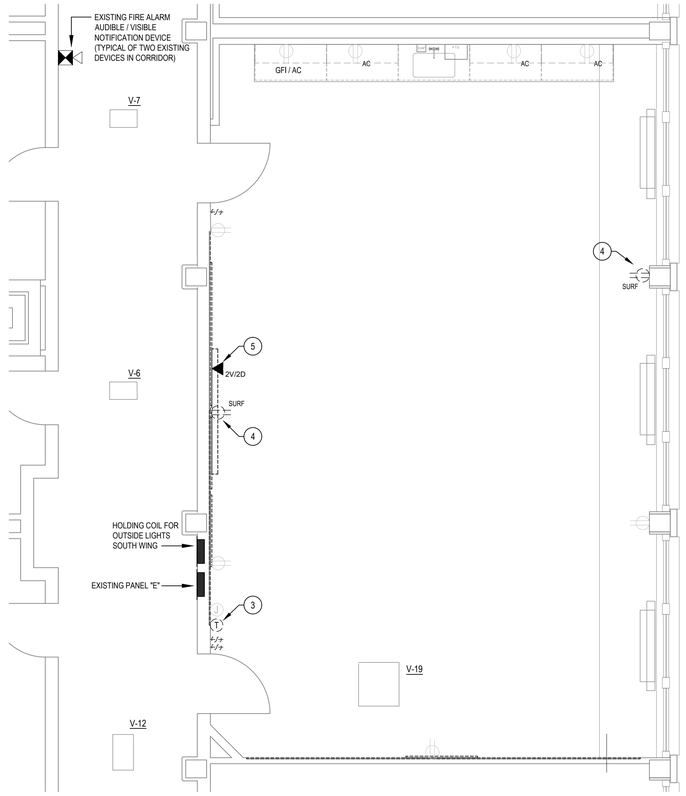
E-001



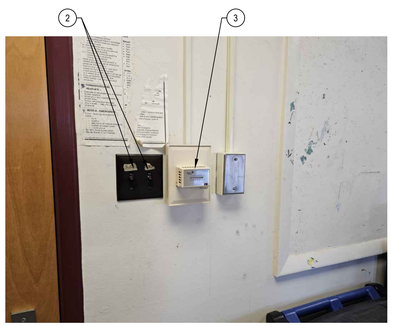
1 CLASSROOM 306 - EXISTING CONDITIONS AND ELECTRICAL CEILING DEMOLITION PLAN

Scale: 1/4" = 1'-0"



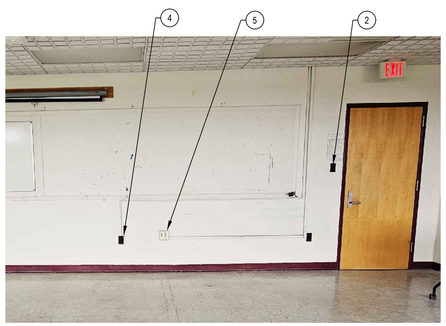
2 CLASSROOM 306 - EXISTING CONDITIONS AND ELECTRICAL POWER DEMOLITION PLAN

Scale: 1/4" = 1'-0"



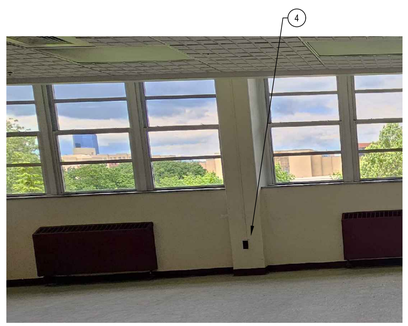
3 CLASSROOM 306 LIGHT SWITCHES & TSTAT

Photo



3 CLASSROOM 306 SURFACE MTD DEVICES

Photo



3 CLASSROOM 306 SURFACE MTD POWER RECEPTACLE

Photo

GENERAL ELECTRICAL DEMOLITION NOTES:

A. CARE SHOULD BE TAKEN BY DEMOLITION PERSONNEL TO AVOID DAMAGING OR DISTURBING EXISTING CONSTRUCTION WHICH IS INDICATED TO REMAIN. MCPPD PERSONNEL SHALL BE RESPONSIBLE FOR MAKING ANY REPAIRS NECESSARY TO RECTIFY DAMAGE AND RESTORE EXISTING CONSTRUCTION TO UNDAMAGED STATE UPON COMPLETION OF WORK AT NO EXPENSE TO CUSTOMER.

B. REFER TO NEW CONSTRUCTION DRAWINGS AND SPECIFICATIONS PRIOR TO BEGINNING DEMOLITION WORK FOR COORDINATION WITH SAME.

C. UNLESS NOTED OTHERWISE SHOWN OR SPECIFIED, ALL MATERIALS AND EQUIPMENT REMOVED OR DEMOLISHED (EXCEPT THAT WHICH IS TO BE SALVAGED OR RELOCATED) AS DIRECTED BY DRAWINGS AND SPECIFICATIONS SHALL BECOME THE PROPERTY OF THE UNIVERSITY AND SHALL BE LEGALLY DISPOSED OF.

D. DEMOLITION PERSONNEL SHALL GIVE A MINIMUM NOTICE OF 48 HOURS TO CUSTOMER PRIOR TO SHUT-DOWN OF ANY EXISTING UTILITIES.

E. WHERE EXISTING WALLS OR PARTITIONS ARE TO BE REMOVED, CUT ALL BRANCH CIRCUITS AND CONDUITS FLUSH WITH FLOOR AND REMOVE CONDUCTORS.

F. REWORK BRANCH CIRCUITS AS REQUIRED TO CONTINUE SERVICE TO ALL DEVICES, LIGHTING AND EQUIPMENT THAT ARE TO REMAIN AND DISCONNECTED FROM SERVICE BY DEMOLITION.

G. ELECTRICALLY DISCONNECT ALL ELECTRICAL EQUIPMENT (BEING REMOVED BY DEMOLITION) BACK AT PANELBOARD.

H. ALL CONDUIT AND WIRE FOR EQUIPMENT LOCATED OUTSIDE AREA OF DEMOLITION SHALL REMAIN IN SERVICE. CAREFULLY COORDINATE WITH OTHER REPRESENTATIVES THE EXACT METHOD OF RE-ROUTING ANY CONDUIT AND WIRE TO EQUIPMENT REMAINING.

I. ALL CONDUIT AND WIRE REMOVED SHALL BE REMOVED COMPLETELY BACK TO NEAREST JUNCTION BOX OR AT SOURCE PANEL AND BRANCH DEVICES PROPERLY LABELED "SPARE".

TAGGED DEMOLITION NOTES: (X)

1. DEMO EXISTING RECESSED CEILING LIGHT FIXTURES. THIS INCLUDES THE REMOVAL OF ALL EXISTING WIRING AND CONDUIT BACK TO PANEL "E". EXISTING LIGHT FIXTURES TO BE DISPOSED OF IN AN APPROPRIATE MANNER.
2. DEMO EXISTING TOGGLE SWITCHES CONTROLLING LIGHTS BEING DEMO'D (SEE NOTE 1). THIS INCLUDES REMOVING THE ASSOCIATED WIRING BACK TO THE CLOSEST J-BOX ABOVE THE DROP CEILING. THE ASSOCIATED BACK BOX AND CONDUIT ARE TO REMAIN.
3. EXISITNG BACK BOX AND RACEWAY SERVING EXISTING THERMOSTAT TO REMAIN FOR RE-USE ON NEW THERMOSTAT.
4. DEMO EXISTING SURFACE MOUNTED POWER RECEPTACLE. THIS INCLUDES THE REMOVAL OF THE ASSOCIATED SURFACE MOUNTED BACK BOX, RACEWAY AND WIRING BACK TO THE CLOSEST ACTIVE J-BOX ABOVE THE DROP CEILING.
5. DEMO EXISTING SURFACE MOUNTED DATA OUTLET(S) COMPLETELY. THIS INCLUDES THE REMOVAL OF ANY ASSOCIATED BACK BOX AND SURFACE MOUNTED WIREWAY BACK TO THE CLOSEST ABOVE CEILING DATA PULL BOX. EXISTING DATA WIRING IS TO BE REMOVED COMPLETELY BACK TO THE COMMUNICATION ROOM.

University of Kentucky
Facilities Engineering & Asset Management

FINE ARTS GUIGNOL BLDG.
ROOM 306 MAC LAB

EXISTING CONDITIONS AND ELECTRICAL DEMOLITION PLANS

PROJECT NO.:	2802.0
BUILDING NO.:	0022
DESIGNED BY:	JWB
DRAWN BY:	JWB
UK PROJ. MGR.:	MURPHY
DATE:	5-17-2024

REVISIONS

NO.	DESCRIPTION	DATE
1	FOR CONSTRUCTION	6-7-2024

DRAWING NUMBER:

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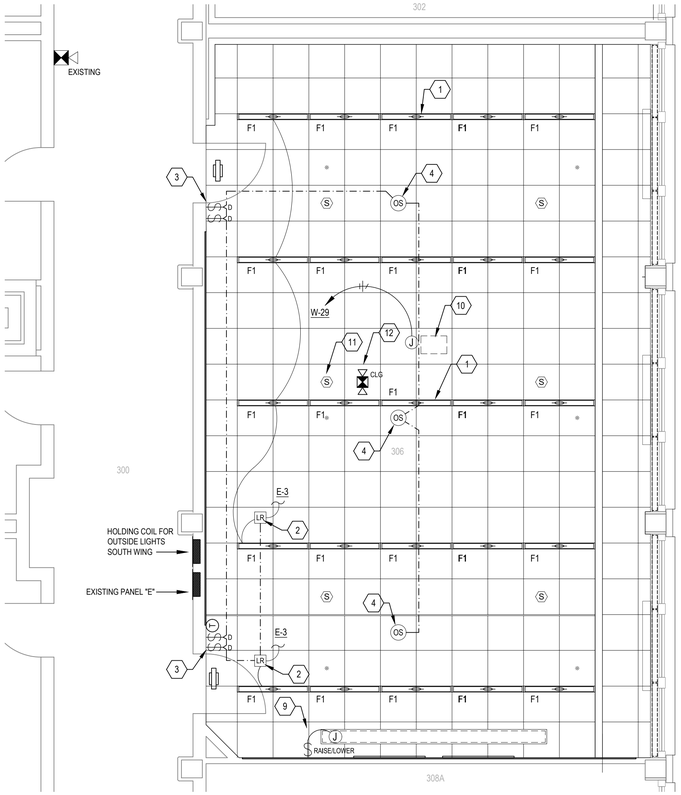
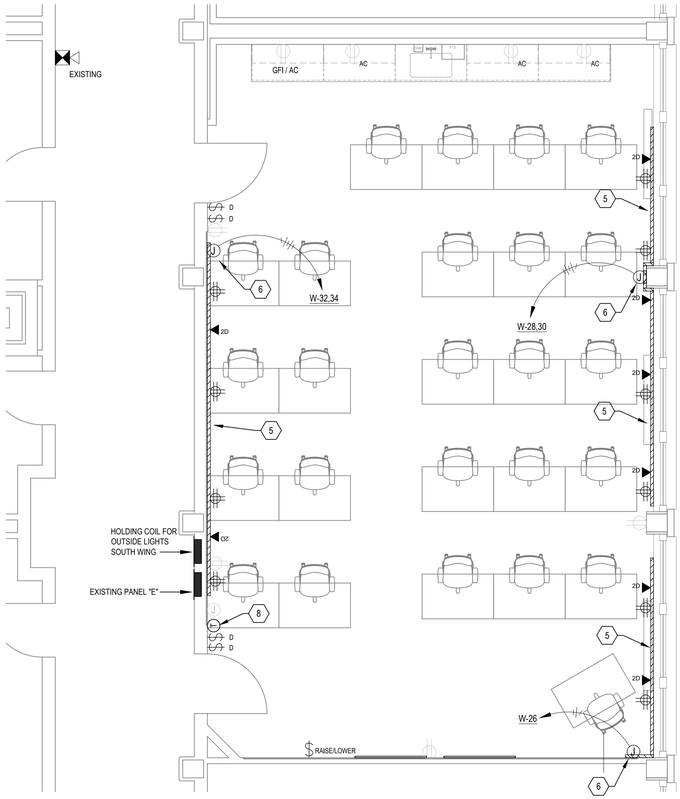


1 NEW WORK PLAN - ELECTRICAL LIGHTING

Scale: 1/4" = 1'-0"



2 NEW WORK PLAN - ELECTRICAL POWER AND DATA

Scale: 1/4" = 1'-0"

LIGHT FIXTURE SCHEDULE

FIXTURE TYPE	DESCRIPTION	CATALOG NUMBER	LAMP	VOLTAGE	INPUT WATTS	DRIVER	REFLECTOR / DIFFUSER	MOUNTING	REMARKS
F1	4' RECESSED LED LINEAR FIXTURE	MARK LIGHTING #SL4L-LOP1-20FT-FLP-FL-90CRI-40K-600LF	4800L 4000K	MVOLT	39.1	GENERIC DRIVER: DIMS TO 10% (0-10V DIMMING)	SMOOTH REFLECTOR WITH A CURVED, RIBBED, ACRYLIC DIFFUSER	RECESSED	

NOTE: CATALOG NUMBER IS BASIS OF DESIGN. EQUIVALENT FIXTURES ARE ACCEPTABLE BASED UPON ENGINEERS REVIEW AND APPROVAL.

LIGHT CONTROL DEVICE SCHEDULE

FIXTURE TYPE	DESCRIPTION	CATALOG NUMBER	DIMMING	COVERAGE TYPE	DETECTION TECHNOLOGY	MOUNTING	REMARKS
OS	CEILING MOUNTED OCCUPANCY SENSOR WITH SMALL MOTION DETECTION	NLIGHT #NCM-PDT-9-D	OCCUPANCY CONTROLLED	SMALL MOTION 360°	DUAL TECHNOLOGY (PIR/MICROPHONICS)	CEILING	
LR	POWER/RELAY PACK WITH 0-10V DIMMING OUTPUT AND EXTERNAL FAULT PROTECTION	NLIGHT #NPP16-D-EFP-SA	YES	N/A	N/A	ABOVE CEILING	
$	SINGLE CHANNEL WALLPOD WITH ON/OFF & RAISE/LOWER CONTROL	NLIGHT #NPODM-DX-WH	YES	N/A	N/A	RECESSED WALL	

NOTE: CATALOG NUMBER IS BASIS OF DESIGN. EQUIVALENT FIXTURES ARE ACCEPTABLE BASED UPON ENGINEERS REVIEW AND APPROVAL.

GENERAL ELECTRICAL NOTES:

A. VERIFY EXACT MOUNTING LOCATION AND CONNECTION REQUIREMENTS OF ALL MECHANICAL EQUIPMENT PRIOR TO ROUGH-IN.

B. ALL DEVICES AND JUNCTION BOXES SHALL BE MOUNTED IN AN ACCESSIBLE LOCATION.

C. ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL ALL NECESSARY CONDUIT, WIRING, JUNCTION BOXES AND EQUIPMENT FOR INTERFACING WITH EXISTING FIRE ALARM SYSTEM .

D. ALL CONDUIT PENETRATIONS THROUGH RATED WALLS, FLOORS, AND CEILINGS SHALL BE FIRE STOPPED WITH APPROVED FIRE SEALANT.

E. AT THE COMPLETION OF THE PROJECT REVISED TYPEWRITTEN CIRCUIT DIRECTORIES IN ALL BRANCH CIRCUIT PANEL BOARDS UTILIZED TO SERVE NEW CIRCUITS. REVISED DIRECTORIES SHALL REFLECT ALL REVISIONS MADE DURING THE RENOVATION OF THE PROJECT AREA.

F. COMPUTERS AND MUSICAL EQUIPMENT FOR CLASSROOM 306 TO BE RELOCATED FROM WHITEHALL CLASSROOM 302.

G. ALL A/V EQUIPMENT ON THIS PROJECT IS TO BE PROVIDED NEW BY AN OUTSIDE A/V CONTRACTOR, UNDER A SEPARATE CONTRACT WITH THE UNIVERSITY. THIS A/V CONTRACTOR SHALL ALSO BE RESPONSIBLE FOR THE INSTALLATION OF THIS EQUIPMENT. ALL INFRASTRUCTURE SUPPORT IS TO BE PROVIDED BY THE ELECTRICAL CONTRACTOR.

ELECTRICAL NEW WORK NOTES: (X)

1. PROVIDE AND INSTALL NEW TYPE "F1", LED LIGHTING FIXTURES IN NEW CEILING GRID. UTILIZE THE LIGHTING CIRCUIT SERVING THE AREA AND INSTALL NEW WIRING, INCLUDING DIMMING CONTROL WIRES, IN 3/4" EMT CONDUIT TO THESE NEW LIGHTING FIXTURES. FINAL CONNECTION TO NEW FIXTURES TO BE IN FLEXIBLE CONDUIT.

2. IN ROOMS 0053 AND 0054, PROVIDE NEW DIMMABLE POWER PACKS FOR LOW VOLTAGE CONTROL OF NEW LED LIGHT FIXTURES. FOR EACH POWER SUPPLY, PROVIDE AND INSTALL A 4X4 JUNCTION BOX, ABOVE THE DROP CEILING, FOR MOUNTING OF THE POWER SUPPLY. UTILIZE THE EXISTING LIGHTING CIRCUIT SERVING THIS ROOM TO POWER THESE NEW LIGHT FIXTURES. ROUTE THE NEW POWER WIRING THROUGH THESE POWER RELAYS, ALONG WITH NEW 0-10V DIMMING CONTROL WIRES. FOR CONTROL OF THE NEW LIGHT FIXTURES (SEE POWER PACK WIRING SCHEMATIC ON SHEET E-400). NEW LIGHTING CIRCUITRY TO BE INSTALLED IN 3/4" CONDUIT BETWEEN POWER PACK AND LIGHT FIXTURE. SEE LIGHT CONTROL DEVICE SCHEDULE ON SHEET E-400 FOR DEVICE SPECIFICATION.

3. IN ROOMS 0053 AND 0054, PROVIDE AND INSTALL NEW LOW VOLTAGE DIMMER SWITCHES IN EXISTING BACK BOXES. UTILIZE THE EXISTING CONDUIT AND INSTALL NEW CAT 5 DATA CABLE FROM THE NEW WALL SWITCH TO THE NEW POWER PACK IN EACH ROOM. SEE LIGHT CONTROL DEVICE SCHEDULE ON SHEET E-400 FOR DEVICE SPECIFICATION.

4. IN ROOMS 0053 AND 0054, PROVIDE AND INSTALL A NEW CEILING MOUNTED OCCUPANCY SENSOR WITH DUAL TECHNOLOGY DETECTION AND A LOW VOLTAGE AUXILIARY RELAY. PROVIDE AND INSTALL NEW CONDUIT AND INSTALL NEW CAT 5 DATA CABLE FROM NEW WALL SWITCH TO NEW POWER PACK IN THESE ROOMS. SEE LIGHT CONTROL DEVICE SCHEDULE ON SHEET E-400 FOR DEVICE SPECIFICATION.

5. PROVIDE AND INSTALL NEW 2-CHANNEL, SURFACE MOUNTED, ALUMINUM RACEWAY IN ROOM 306 FOR POWER AND DATA DISTRIBUTION SERVING MAC COMPUTER WORKSTATIONS. MOUNT 2-CHANNEL RACEWAY AT 42" ABOVE FINISHED FLOOR. RACEWAY TO BE LEGRAND WIREMOLD ALA4520 SERIES OR APPROVED EQUAL. RACEWAY COMPONENTS TO INCLUDE BASE AND COVER (CUT TO LENGTH SHOWN), FLAT TEE WITH COUPLING (ALA512), AND INTERNAL MITERED ELBOW WITH COUPLING (ALA517) ALONG WITH THE FOLLOWING DEVICES:

   5.1. POWER CHANNELS TO HAVE INSTALLED A TOTAL OF TEN (10) 120V, 20A 4-PLEX POWER OUTLETS AND TEN (10) 4-PLEX COVER PLATES. LOCATE A 4-PLEX OUTLET AT EACH WORKSTATION ROW AND LABEL EACH OUTLET WITH ITS CIRCUIT IDENTIFICATION.

   5.2. DATA CHANNELS TO HAVE INSTALLED A TOTAL OF EIGHT (8) COMMUNICATION OPENINGS. LOCATE A COMMUNICATION OPENING AT EACH WORKSTATION ROW WITH MORE THAN TWO WORKSTATIONS AND LOCATE ONE BETWEEN ROWS WITH ONLY TWO WORKSTATIONS.

6. PROVIDE FIVE (5) 20A/1P CIRCUIT BREAKERS IN EXISTING PANEL "W" AND INSTALL #12 AWG Cu CONDUCTORS IN 3/4" EMT CONDUIT FROM PANEL "W" TO A NEW 4X4 PULL BOX ABOVE THE DROP CEILING IN ROOM 306. THESE NEW 120V CIRCUITS ARE TO SERVE THE NEW POWER OUTLETS BEING PROVIDED AS PART OF NOTE #5. THE CIRCUIT TICKS DENOTE THE NUMBER OF CONDUCTORS REQUIRED TO EACH PULL BOX. SEE SCHEDULE FOR PANEL "W" ON SHEET E-401.

7. E.C. TO PROVIDE AND INSTALL A SURFACE MOUNTED PULL-BOX BEHIND THE INSTRUCTOR'S DESK THAT SERVES AS AN A/V WIRING HUB THAT CONTROLS THE AS/V DEVICES WITHIN THE CLASS ROOM.

8. NEW DIGITAL THERMOSTAT BY MECHANICAL CONTRACTOR. E.C. TO UTILIZE THE EXISTING BACK BOX TO MOUNT THE NEW T-STAT AND UTILIZE THE EXISTING SURFACE MOUNTED RACEWAY TO INSTALL THE MODULAR T-STAT CABLE FROM THE T-STAT TO THE ASC CONTROLLER ON THE VAV BOX SERVING CLASSROOM 306. SEE SHEET IC-101 FOR MORE T-STAT INFORMATION.

9. NEW MOTORIZED PROJECTION SCREEN PROVIDED WITH RAISE/LOWER SWITCH FOR CONTROL OF SCREEN. E.C. TO PROVIDE AND INSTALL NEW RECESSED 2X4 BACK BOX WITH 3/4" CONDUIT FROM BACK BOX STUBBED UP ABOVE THE CEILING. SEE DETAIL ON SHEET E-401.

10. NEW CEILING MOUNTED PROJECTOR - E.C. TO PROVIDE AND INSTALL THE FOLLOWING INFRASTRUCTURE ITEMS TO SUPPORT THIS NEW PROJECTOR. SEE DRAWING E-401 FOR MORE DETAIL OF THESE INFRASTRUCTURE REQUIREMENTS.

    10.1. A NEW 120V, 20A DUPLEX POWER RECEPTACLE IN CEILING FOR POWER TO THIS NEW PROJECTOR. THIS WILL REQUIRE PROVIDING A NEW 20A/1P CIRCUIT BREAKER IN PANEL "W" AND (3) #12 AWG Cu + (1) #12 Cu GND IN 3/4" EMT CONDUIT FROM PANEL "W" TO THE POWER RECEPTACLE

    10.2. A 6" X 6" PULL BOX WITH A 3/4" EMT CONDUIT INSTALLED FROM THE BOX TO A SURFACE MOUNTED A/V BOX BEHIND THE INSTRUCTOR'S DESK. THIS PULL BOX IS FOR A/V WIRING (I.E. HDMI CABLE, RCA JACKS, USB CABLE, ETC...) FROM THE INSTRUCTOR'S DESK.

11. NEW CEILING MOUNTED SPEAKERS - E.C. TO INSTALL 4X4 PULL BOXES AT EACH SPEAKER LOCATION AND ROUTE 3/4" EMT CONDUIT BETWEEN EACH PULL BOX AND BACK DOWN TO THE A/V BOX BEHIND THE INSTRUCTOR'S DESK.

12. PROVIDE A NEW FIRE ALARM AUDIBLE / VISIBLE NOTIFICATION APPLIANCE IN THE CEILING OF CLASS ROOM 306. CONNECT THIS NEW FIRE ALARM DEVICE TO THE CLOSEST ACTIVE NAC CIRCUIT. FIRE ALARM DEVICE MUST BE OF THE SAME MANUFACTURER AND COMPATIBLE WITH THE EXISTING BUILDING FIRE ALARM SYSTEM.

University of Kentucky
Facilities Engineering & Asset Management

FINE ARTS GUIGNOL BLDG.
ROOM 306 MAC LAB

ELECTRICAL LIGHTING AND POWER NEW WORK PLANS

PROJECT NO.:	2802.0
BUILDING NO.:	0022
DESIGNED BY:	JWB
DRAWN BY:	JWB
UK PROJ. MGR.:	MURPHY
DATE:	5-17-2024

REVISIONS

NO.	DESCRIPTION	DATE
1	FOR CONSTRUCTION	6-7-2024

DRAWING NUMBER:

E-102

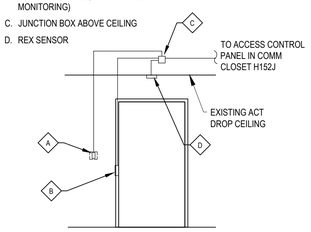
INSTALLATION DIAGRAM NOTES:

A. CARD READER (MOUNT @ +42" AFF)

B. ELECTRIC STRIKE (W/ LATCH BOLT MONITORING)

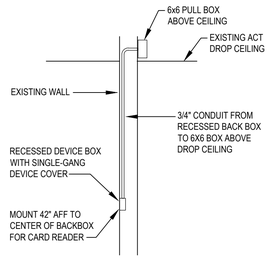
C. JUNCTION BOX ABOVE CEILING

D. REX SENSOR



3 INSTALLATION DIAGRAM

Scale: 1/4" = 1'0"



4 CARD READER BOX INSTALLATION

Scale: 1/2" = 1'-0"

DOOR ACCESS CONTROL HARDWARE SCHEDULE

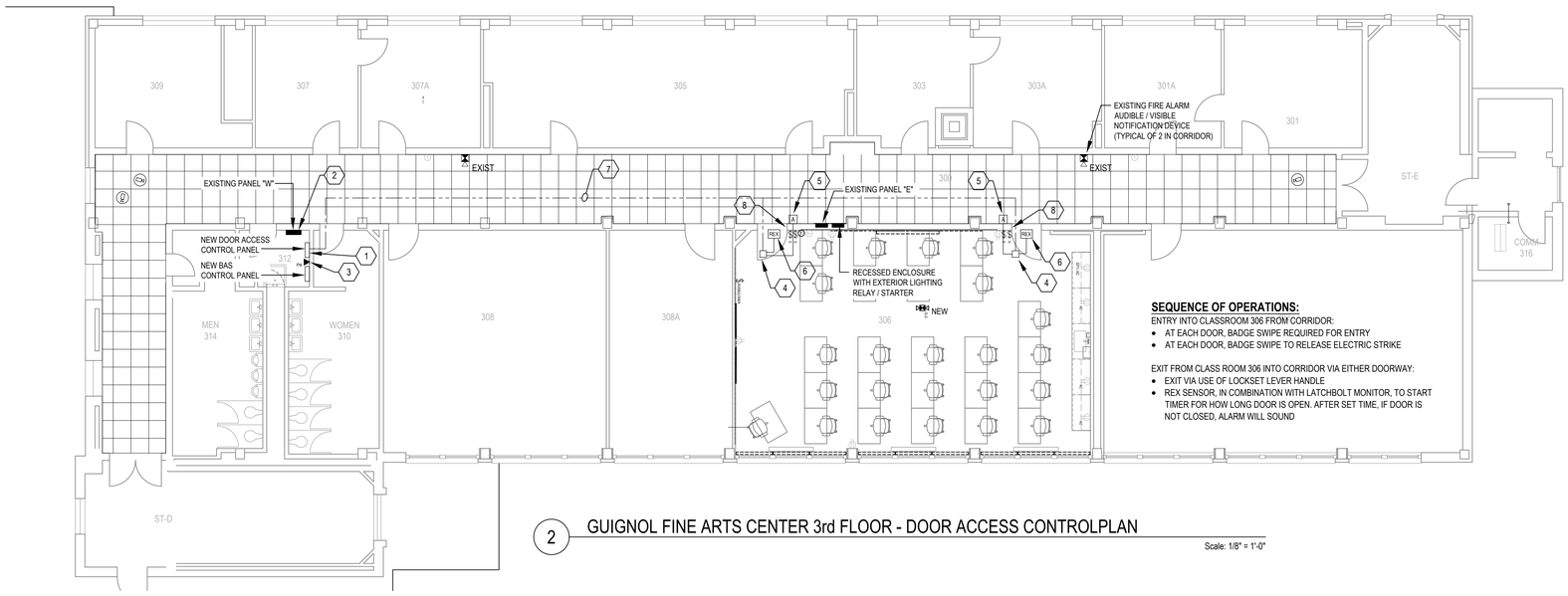
QTY.	DESCRIPTION	MANUFACTURER	MODEL	FINISH	NOTES
1	SECURITY ACCESS PANEL	LIFE SAFETY POWER	FP0250-2C82D8E4	BLACK	
1	DUAL READER INTERFACE MODULE	LENEL	LNL-1320-S3		2
2	ELECTRIC STRIKE	HES	1006CLB-LBM	US32D	1, 3
2	REX SENSOR	BOSCH	DS160	LIGHT GRAY	2
2	BADGE READER	HID GLOBAL	900PTNNEK00000	-----	2
2	COMPOSITE SECURITY CABLE	BELDEN	658AFJ		2

NOTES:

1	PROVIDE STRIKE WITH LATCH BOLT MONITORING
2	SECURITY VENDOR TO PROVIDE
3	TO BE PROVIDED AS PART OF DOOR HARDWARE PACKAGE
4	

DOOR ACCESS CTRL RESPONSIBILITY MATRIX

	CONTROLS CONTRACTOR	ELECTRICAL CONTRACTOR	CNS	UK POLICE	SECURITY VENDOR
FURNISH NEW DOOR ACCESS CONTROL PANEL CAPABLE OF CONTROLLING UP TO 16 DOORWAYS	X				
PROVIDE NEW BADGE READERS, REQUEST TO EXIT DEVICES AND COMPOSITE SECURITY CABLES FOR THIS PROJECT					X
INSTALL RACEWAYS, BOXES AND PULL STRING FOR ALL DOOR ACCESS DEVICES AND WIRING		X			
INSTALL 120V POWER SUPPLY TO NEW DOOR ACCESS CONTROL PANEL		X			
INSTALL DATA DROP FOR NEW DOOR ACCESS CONTROL PANEL			X		
AT EACH DOORWAY, INSTALL BADGE READER AND REQUEST-TO-EXIT DEVICE					X
FOR EACH DOORWAY, INSTALL COMPOSITE SECURITY CABLE FROM THE NEW DOOR ACCESS CONTROL PANEL TO THE 6X6 J-BOX LOCATED ABOVE THE DOORWAY BEING CONTROLLED					
AT EACH DOORWAY, EXTEND COMPOSITE SECURITY CABLE WIRING FROM THE 6X6 J-BOX TO EACH ACCESS CONTROL DEVICE (I.E. BADGE READER, RX DEVICE, ELECTRIC STRIKE)		X			
TERMINATE SECURITY WIRING AT ACCESS CONTROL DEVICES		X			
TERMINATE SECURITY CABLING ON CONTROL CARD LOCATED IN NEW DOOR ACCESS CONTROL PANEL					X
PROGRAM BADGE READER, ELECTRIC STRIKE AND REQUEST-TO-EXIT DETECTOR				X	



2 GUIGNOL FINE ARTS CENTER 3rd FLOOR - DOOR ACCESS CONTROLPLAN

Scale: 1/8" = 1'-0"

SEQUENCE OF OPERATIONS:

ENTRY INTO CLASSROOM 306 FROM CORRIDOR:
- AT EACH DOOR, BADGE SWIPE REQUIRED FOR ENTRY
- AT EACH DOOR, BADGE SWIPE TO RELEASE ELECTRIC STRIKE

EXIT FROM CLASS ROOM 306 INTO CORRIDOR VIA EITHER DOORWAY:
- EXIT VIA USE OF LOCKSET LEVER HANDLE
- REX SENSOR, IN COMBINATION WITH LATCHBOLT MONITOR, TO START TIMER FOR HOW LONG DOOR IS OPEN. AFTER SET TIME, IF DOOR IS NOT CLOSED, ALARM WILL SOUND

GENERAL ELECTRICAL NOTES:

A. U.K. FACILITIES PROJECT MANAGER TO ENSURE NO COMMUNICATION CABLES ARE HANGING FROM ANY SPRINKLER PIPING DURING PROJECT CLOSEOUT.

B. U.K. FACILITIES PROJECT MANAGER TO ENSURE NO OPEN JUNCTION BOXES ABOVE CEILING PRIOR TO PROJECT CLOSEOUT.

C. U.K. FACILITIES PROJECT MANAGER TO ENSURE ALL PENETRATIONS ABOVE CEILING ARE APPROPRIATELY FIRE-STOPPED ACCORDING TO THE WALL RATING WITH A U.L. APPROVED FIRE STOPPING ASSEMBLY.

D. ALL DEVICES AND JUNCTION BOXES SHALL BE MOUNTED IN AN ACCESSIBLE LOCATION.

E. ALL CONDUIT PENETRATIONS THROUGH RATED WALLS, FLOORS, AND CEILINGS SHALL BE FIRE STOPPED WITH APPROVED FIRE SEALANT.

F. AT THE COMPLETION OF THE PROJECT REVISED TYPEWRITTEN CIRCUIT DIRECTORIES IN ALL BRANCH CIRCUIT PANEL BOARDS UTILIZED TO SERVE NEW CIRCUITS. REVISED DIRECTORIES SHALL REFLECT ALL REVISIONS MADE DURING THE RENOVATION OF THE PROJECT AREA.

DOOR ACCESS CONTROL TAGGED NOTES: (X)

1. PROVIDE AND INSTALL A NEW ACCESS CONTROL PANEL IN THE 3RD FLOOR JANITORS CLOSET 312. PANEL TO HAVE THE CAPABILITY TO PROVIDE ACCESS CONTROL TO 16 DOORS. SEE HARDWARE SCHEDULE FOR CONTROL PANEL SPECIFICATION.
2. EXISTING PANEL W. PROVIDE AND INSTALL A NEW 20A/1P CIRCUIT BREAKER AND INSTALL (2) #12 + (1) #12 Cu GND in 3/4" EMT CONDUIT, FROM THIS PANEL, TO THE NEW ACCESS CONTROL PANEL AND CONNECT TO THE PANEL POWER SUPPLY.
3. PROVIDE AND INSTALL A NEW DATA OUTLET IN COMM ROOM 312 FOR NEW SECURITY ACCESS PANEL.
4. IN CLASS ROOM 306, PROVIDE AND INSTALL (2) NEW 6X6 JUNCTION BOXES, ABOVE THE DROP CEILING, WITH 3/4" EMT CONDUIT INSTALLED ABOVE CELING FROM EACH J-BOX TO THE JANITOR CLOSET 312.
5. IN CORRIDOR 300, NEXT TO DOORWAYS 306A AND 306B, PROVIDE AND INSTALL A NEW SURFACE MOUNTED 4-11/16" X 4-11/16" TWO-GANG DEVICE BOX (WIREMOLD #V5752) WITH SINGLE DEVICE MUD RING ON THE EXISTING WALL FOR NEW BADGE READER. SURFACE MOUNT DEVICE BOX AT 48" ABOVE FINISHED FLOOR AND INSTALL A SURFACE MOUNTED RACEWAY (WIREMOLD #V700 SERIES) FROM THIS DEVICE BOX TO THE NEW 6X6 PULL BOX (SEE NOTE #4), ABOVE THE DROP CEILING IN ROOM 306. PROVIDE AND INSTALL BADGE READER ON DEVICE BOX. CONNECT EACH BADGE READER TO THE NEW INTERFACE MODULE CARD, IN THE NEW DOOR ACCESS CONTROL PANEL, WITH THE COMPOSITE SECURITY CABLE. SEE ACCESS CONTROL DEVICE SCHEDULE ON THIS SHEET FOR BADGE READER SPECIFICATION.
6. FOR DOORWAYS 306A AND 306B, PROVIDE AND INSTALL A REQUEST-TO-EXIT (REX) DETECTOR ON WALL, ABOVE EACH DOORWAY AS SHOWN. PROVIDE WIRE IN FLEXIBLE CONDUIT FROM THE NEW DETECTOR TO THE 6" X 6" JUNCTION BOX (SEE NOTE #4). CONNECT EACH REX DETECTOR TO THE NEW INTERFACE MODULE CARD, IN THE NEW DOOR ACCESS CONTROL PANEL, WITH THE COMPOSITE SECURITY CABLE. SEE ACCESS CONTROL DEVICE SCHEDULE ON THIS SHEET FOR REQUEST-TO-EXIT DETECTOR SPECIFICATION.
7. PROVIDE AND INSTALL COMPOSITE SECURITY CABLE FROM EACH 6X6 PULL BOX TO THE NEW ACCESS CONTROL PANEL IN JAN CLOSET 312. UTILIZE NEW 3/4" EMT CONDUIT (SEE NOTE #4) FOR THE INSTALLATION OF THE COMPOSITE SECURITY CABLE FOR EACH DOORWAY.
8. IN CLASS ROOM 306, A NEW ELECTRIC STRIKE IS BEING PROVIDED BY OTHERS IN EACH OF THE DOORWAYS. PROVIDE AND INSTALL NEW SECURITY CABLING IN FLEXIBLE CONDUIT FROM EACH STRIKE TO THE 6X6 JUNCTION BOX (SEE NOTE #2) ABOVE EACH DOORWAY. NOTE: POWER FOR ELECTRIC STRIKE TO BE SUPPLIED FROM EXISTING SECURITY PANEL POWER BOARD. CONNECT TO SECURITY PANEL WITH COMPOSITE SECURITY CABLE.

FIRE PARTITION LEGEND:

2 HR FIRE BARRIER: 2 HOUR RATED WALLS WITH SELF CLOSING & LATCHING 1-1/2 HOUR RATED DOORS

S1 S1 S1 S1 S1 — SMOKE BARRIER: SMOKE TIGHT 1 HOUR RATED SELF CLOSING & NON-LATCHING DOORS

1 HR FIRE BARRIER: 1 HOUR RATED WALLS WITH 3/4 HOUR SELF CLOSING & LATCHING DOORS

S S S S S — SMOKE PARTITION: SMOKE TIGHT ONLY WITH DOORS SELF-CLOSING & LATCHING

University of Kentucky
Facilities Engineering & Asset Management

FINE ARTS GUIGNOL BLDG.
ROOM 306 MAC LAB

DOOR ACCESS CONTROL PLAN

PROJECT NO.:	2802.0
BUILDING NO.:	0022
DESIGNED BY:	JWB
DRAWN BY:	JWB
UK PROJ. MGR.:	MURPHY
DATE:	5-17-2024

REVISIONS

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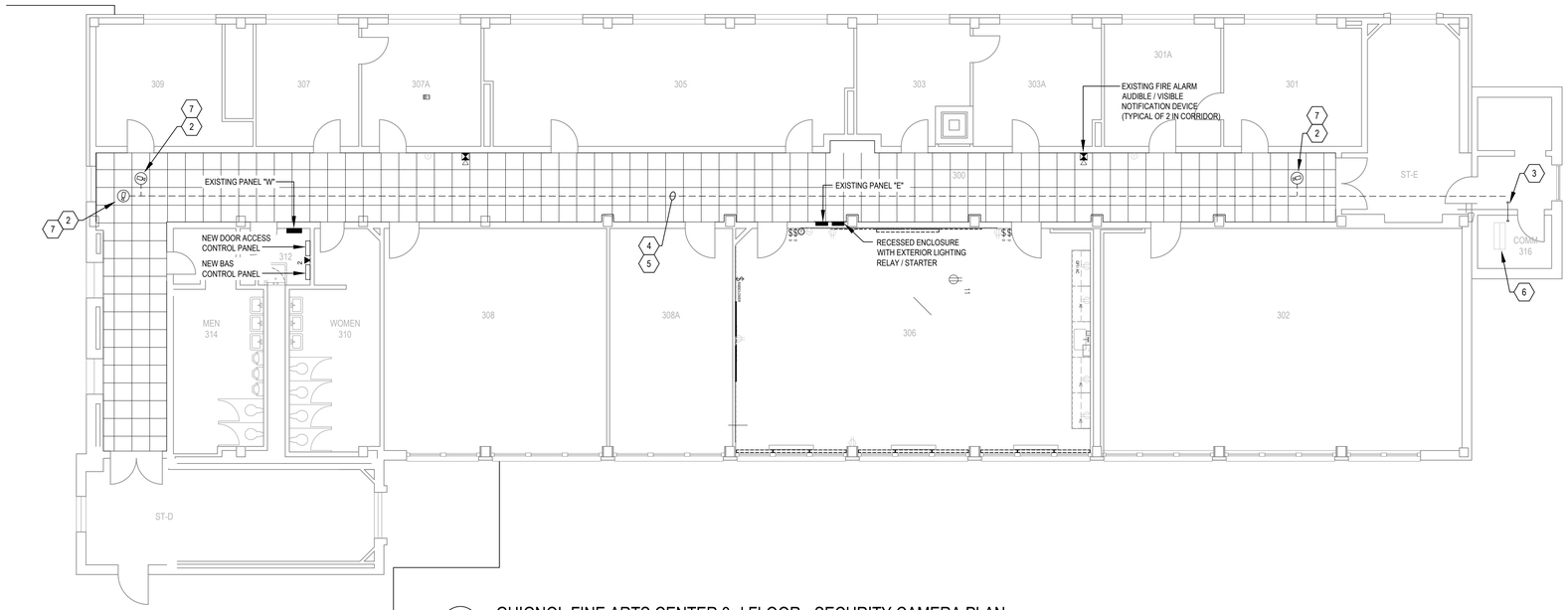


1 GUIGNOL FINE ARTS CENTER 3rd FLOOR - SECURITY CAMERA PLAN

Scale: 1/8" = 1'-0"

GENERAL ELECTRICAL NOTES:

A. U.K. FACILITIES PROJECT MANAGER TO ENSURE NO COMMUNICATION CABLES ARE HANGING FROM ANY SPRINKLER PIPING DURING PROJECT CLOSEOUT.

B. U.K. FACILITIES PROJECT MANAGER TO ENSURE NO OPEN JUNCTION BOXES ABOVE CEILING PRIOR TO PROJECT CLOSEOUT.

C. U.K. FACILITIES PROJECT MANAGER TO ENSURE ALL PENETRATIONS ABOVE CEILING ARE APPROPRIATELY FIRE-STOPPED ACCORDING TO THE WALL RATING WITH A U.L. APPROVED FIRE STOPPING ASSEMBLY.

D. ALL DEVICES AND JUNCTION BOXES SHALL BE MOUNTED IN AN ACCESSIBLE LOCATION.

E. ALL CONDUIT PENETRATIONS THROUGH RATED WALLS, FLOORS, AND CEILINGS SHALL BE FIRE STOPPED WITH APPROVED FIRE SEALANT.

F. AT THE COMPLETION OF THE PROJECT REVISED TYPEWRITTEN CIRCUIT DIRECTORIES IN ALL BRANCH CIRCUIT PANEL BOARDS UTILIZED TO SERVE NEW CIRCUITS. REVISED DIRECTORIES SHALL REFLECT ALL REVISIONS MADE DURING THE RENOVATION OF THE PROJECT AREA.

TAGGED NEW WORK NOTES: (X)

1. UNIVERSITY OF KENTUCKY FACILITIES TO PROVIDE THREE (3) NEW SECURITY CAMERAS FOR MONITORING AND SECURITY OF THE THIRD FLOOR CORRIDOR. SEE SECURITY EQUIPMENT SCHEDULE ON THIS SHEET FOR CAMERA SPECIFICATION.
2. FOR EACH NEW CAMERA, PROVIDE AND INSTALL A NEW 4-11/16" X 4-11/16" X 2-1/8" CAMERA BOX (STEEL CITY 72171-1) WITH SINGLE GANG DEVICE COVER (STEEL CITY 72-C-13) FOR NEW CAT6 CONNECTION JACKS. MOUNT CAMERA BOX TO STRUCTURE ABOVE CEILING.
3. PROVIDE AND INSTALL A NEW 2-1/2" EMT CONDUIT SLEEVE FROM THE COMMUNICATION ROOM 316 TO THE CEILING SPACE IN 3RD FLOOR ELEVATOR LOBBY.
4. PROVIDE AND INSTALL A 4" J-HOOK PATH FROM THE NEW 2-1/2" CONDUIT STUB-OUT TO THE NEW SECURITY CAMERAS. SPACE J-HOOKS EVERY 4 FT ALONG PATHWAY
5. COORDINATE WITH C.N.S. TO PROVIDE NEW DATA WIRING AND TERMINATIONS TO EACH NEW CAMERA BOX FROM COMMUNICATION CLOSET 316. UTILIZE THE NEW J-HOOK PATHWAY FOR INSTALLATION OF DATA CABLES. ROUTE A CAT6 DATA CABLE FROM EACH NEW CAMERA BOX (SEE NOTE 1) TO A POE NETWORK SWITCH IN COMMUNICATION ROOM 316.
6. COORDINATE WITH C.N.S. AND TERMINATE EACH CAMERA CABLE IN POE NETWORK SWITCH.
7. PROVIDE AND INSTALL NEW SECURITY CAMERAS AS SHOWN. IN ADDITION, FOR EACH NEW CAMERA, PROVIDE A 6'-0" CAT 6 PATCH CABLE FOR CONNECTION TO COMMUNICATION JACK.

SECURITY EQUIPMENT SCHEDULE

QTY.	DESCRIPTION	MANUFACTURER	MODEL	FINISH	NOTES
3	2MP IR OUTDOOR DOME CAMERA	HANWHA	XNV-L6080R	-----	
NOTES:					
1					

SECURITY CAMERA RESPONSIBILITY MATRIX	UK FACILITIES	ELECTRICAL CONTRACTOR	CNS	UK POLICE
FURNISH SECURITY CAMERAS	X			
INSTALL RACEWAYS, BOXES, AND PULL-STRINGS FOR NEW SECURITY CAMERAS		X		
INSTALL CAT 6 CABLING FROM TELECOM BOX TO COMM ROOM 316			X	
TERMINATE CABLING FOR CAMERA AT POE SWITCH			X	
INSTALL FACEPLATE AND TERMINATION JACKS AT EACH ABOVE CEILING CAMERA BOX			X	
INSTALL SECURITY CAMERA AT EACH CAMERA BOX LOCATION AND TERMINATE CAT 6 CABLING TO CAMERA BOX DATA JACKS		X		
PROVIDE 6'-0" PATCH CABLES FOR EACH SECURITY CAMERA AND CONNECT CAMERAS TO CAMERA BOXES		X		
PROGRAM SECURITY CAMERA(S)				X

University of Kentucky
Facilities Engineering & Asset Management

FINE ARTS GUIGNOL BLDG.
ROOM 306 MAC LAB

SECURITY CAMERA PLAN

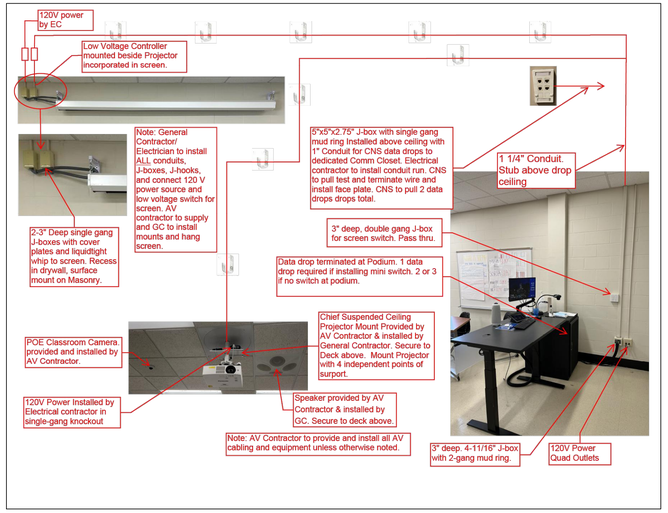
PROJECT NO.:	2802.0
BUILDING NO.:	0022
DESIGNED BY:	JWB
DRAWN BY:	JWB
UK PROJ. MGR.:	MURPHY
DATE:	5-17-2024

REVISIONS

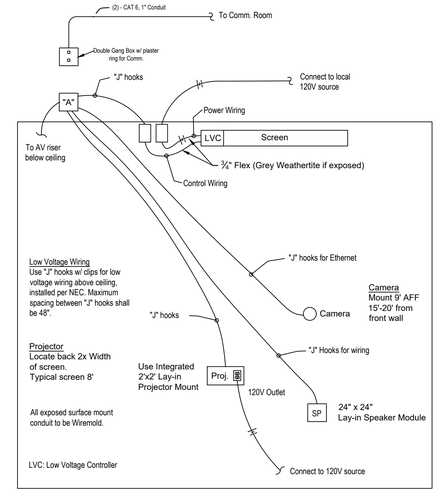
NO.	DESCRIPTION:	DATE
1	FOR CONSTRUCTION	6-7-2024

DRAWING NUMBER:

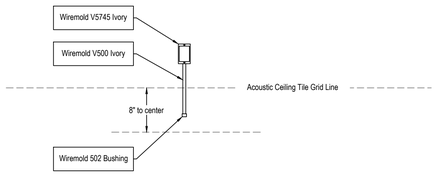
E-202



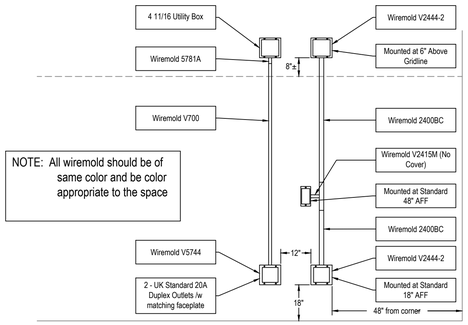
TYPICAL A/V INSTALLATION DETAILS



STANDARD A/V DIAGRAM PLAN



AVS PATHWAY LAYOUT



INSTALLATIONS WITH CONDUIT SURFACE-MOUNTED ON WALL-ELEVATION

AV SYSTEM NOTES

1. GENERAL CONTRACTOR TO INSTALL PROJECTOR MOUNT PROVIDED BY A/V CONTRACTOR. ANCHOR MOUNT TO CEILING DECK WITH FOUR (4) INDEPENDENT WIRES PER CODE.
2. ELECTRICAL CONTRACTOR TO INSTALL CIRCUIT AND RECEPTACLE FOR PROJECTOR.
3. GENERAL CONTRACTOR TO INSTALL PROJECTOR SCREEN AND BRACKETS PROVIDED BY A/V CONTRACTOR.
4. ELECTRICAL CONTRACTOR SHALL INSTALL CONDUIT, RACEWAY, AND "J"-HOOKS AS REQ'D.
5. ELECTRICAL CONTRACTOR TO CONNECT POWER AND LOW VOLTAGE CONTROL WIRING FOR PROJECTOR SCREEN.
6. A/V CONTRACTOR SHALL INSTALL ALL A/V EQUIPMENT & CABLING, AND PROVIDE CAT 6 CABLE & TERMINATIONS APPROVED BY U.K. CNS.
7. U.K. ITS WILL INSTALL COMMUNICATIONS CABLES, FACEPLATE & TERMINATIONS.

A/V INTERCONNECTION DIAGRAM

G.E. A-Series Panel board #AQF3421MBXAXS5B4

PANELBOARD: Existing Panel W — PHASE: 3 — MOUNTING: Rece — LOCATION: 3rd Floor Jan Closet
WIRE: 4 — AIC: 10k
VOLTAGE: 208Y/120V — GROUND: 1 — BUSS RATING: 125A — MAIN BREAKER: M.L.O.
Fed from #22 in MDP (located in Mech Rm 42A)

CKT #	CB	Wire / Cond.	LOAD SERVED	POLE	VA	LOAD A	PER B	PHASE C	VA	POLE	LOAD SERVED	Wire / Cond.	CB	CKT #
1	20/1		*Lights Corr 300*	1		0				2	*RCPTS: 301*	GFI	20/1	2
3	20/1		*RCPTS: 302*	3			0			4	*RCPTS: 301A*	GFI	20/1	4
5	20/1		*RCPTS: 306*	5				0		6	*RCPTS: 303A*		20/1	6
7	20/1		*RCPTS: 302, 308*	7		0				8	*RCPTS: 303*		20/1	8
9	20/1		*RCPTS: 306*	9			0			10	*RCPTS: 305, 307*		20/1	10
11	20/1		*EX Fan Kiln*	11				0		12	*RCPTS: 307, 307A*		20/1	12
13	20/1		*Lights 307A, 309*	13		0				14	*RCPTS: 309*		20/1	14
15	20/1			15			0			16	*Relay EF Control*		20/1	16
17	20/1			17				0		18			20/1	18
19	20/1			19		0				20			20/1	20
21	20/1			21			0			22			20/1	22
23	20/1			23				0		24			20/1	24
25	30/2		*UPS Comm Closet*	25		0				26	*Rcpts: Rm 306 Wireway*		20/1	26
27	"		*" " "*	27			0			28	*Rcpts: Rm 306 Wireway*		20/1	28
29	20/1		*Clg Projector - Rm 306*	29				0		30	*Rcpts: Rm 306 Wireway*		20/1	30
31	20/1		*Door Access Control Panel - Rm 312*	31		0				32	*Rcpts: Rm 306 Wireway*		20/1	32
33	20/1		*BAS Control Panel - Rm 312*	33			0			34	*Rcpts: Rm 306 Wireway*		20/1	34
			Space Only	35				0		36	*Space Only*			
			Space Only	37		0				38	*Space Only*			
			Space Only	39			0			40	*Space Only*			
			Space Only	41				0		42	*Space Only*			
						0	0	0						

TOTAL CONNECTED LOAD: 0 WATTS, 0 Amps

*** GFI RATED CIRCUIT BREAKER

Square D Type NQO Panelboard

PANELBOARD: Existing Panel E — PHASE: 3 — MOUNTING: Rece — LOCATION: 3rd Floor Corridor
WIRE: 4 — AIC: 10K
VOLTAGE: 208Y/120V — GROUND: 1 — BUSS RATING: 100A — MAIN BREAKER: M.L.O.
Fed from #12E in MDP (located in Mech Rm 42A)

CKT #	CB	Wire / Cond.	LOAD SERVED	POLE	VA	LOAD A	PER B	PHASE C	VA	POLE	LOAD SERVED	Wire / Cond.	CB	CKT #
1	15/1		*Lights Room 302*	1		0				2	*Lights: Room #302 & 306*		20/1	2
3	20/1		***Lights Room #306***	3			0			4	*Dimming Lights Room #308*		20/1	4
5	15/1		*Lights Room #308 (Right Side)*	5				0		6	*Lights Room #310, 312, 314*		20/1	6
7	20/1		*Lights Room #301 & 301A*	7		0				8	*Rcpts: Room #301*		20/1	8
9	20/1		*Lights Room #305*	9			0			10	*Rcpts: Room #307*		20/1	10
11	20/1		*Lights Room #303 & 303A*	11				0		12	***Rcpts: Room #306***		20/1	12
13	20/1		*SPARE*	13		0				14	*Rcpts: Room #308 & East Corridor*		20/1	14
15	20/1		*Rcpts: Room #305, 307*	15			0			16			20/1	16
17	20/1			17				0		18	*Water Cooler Corridor*		20/1	18
19	20/1		*303 - 303A, 305*	19		0				20	*Kiln Room #302 (2nd Rcpt)*		30/2	20
21	20/1			21			0			22	---		---	22
23	20/1			23				0		24	*Kiln Room #302 (1st Rcpt)*		40/2	24
25	20/1			25		0				26	---		---	26
27	25/2		*SPARE*	27			0			28	*Kiln Room #302 (3rd Rcpt)*		40/2	28
29	---		---	29				0		30	---		---	30
						0	0	0						

TOTAL CONNECTED LOAD: 0 WATTS, 0 Amps

* ROUTE THIS CIRCUIT THROUGH LIGHTING CONTACTOR
** ROUTE THIS CIRCUIT THROUGH HVAC TIME CLOCK
*** GFI RATED CIRCUIT BREAKER

University of Kentucky
Facilities Engineering & Asset Management

FINE ARTS GUIGNOL BLDG.
ROOM 306 MAC LAB

A/V DETAILS AND ELECTRICAL PANEL SCHEDULES

PROJECT NO.:	2802.0
BUILDING NO.:	0022
DESIGNED BY:	JWB
DRAWN BY:	JWB
UK PROJ. MGR.:	MURPHY
DATE:	5-17-2024

REVISIONS

NO.	DESCRIPTION	DATE
1	FOR CONSTRUCTION	6-7-2024

DRAWING NUMBER:
E-401

INDEX OF TECHNICAL SPECIFICATIONS

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner.

C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.3 PREINSTALLATION MEETINGS

A. Pre-demolition Conference: Conduct conference at Project site.

1.4 CLOSEOUT SUBMITTALS

A. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.5 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. Hazardous materials will be removed by Owner before start of the Work.
2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

PART 2 - PRODUCTS

2.1 PEFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

D. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

1. Comply with requirements for existing services/systems interruptions outlined in Special Conditions, Article 24 "UTILITIES".

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
2. Arrange to shut off indicated utilities with utility companies.
3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.

    a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
    c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
    d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
    e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
    f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
    g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.

C. Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
4. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
5. Dispose of demolished items and materials promptly.

B. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition, cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.6 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes acoustical panels and exposed suspension systems for ceilings.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to 2006 Kentucky Building Code (KBC).

B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
2. Smoke-Developed Index: 50 or less.

2.2 ACOUSTICAL PANEL CEILINGS, GENERAL

A. Low-Emitting Materials: Acoustical panel ceilings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.

C. Acoustical Panel Standard: Comply with ASTM E 1264.

D. Metal Suspension System Standard: Comply with ASTM C 635.

E. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

2.3 ACOUSTICAL PANELS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product listed in Drawings.

B. Classification: Type IV, Form 2, Pattern E.

C. Color: White.

D. LR: 0.90.

E. NRC: 0.75

F. CAC: 35.

G. Edge/Joint Detail: Beveled (shadowline) tegular

H. Thickness: 3/4 inch (19 mm).

I. Modular Size: 24 by 24 inches (610 by 610 mm).

2.4 METAL SUSPENSION SYSTEM

A. Basis-of-Design Product: Subject to compliance with requirements, provide product listed in Drawings.

B. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; pre-painted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 (Z90) coating designation; with prefinished 15/16-inch- (24-mm-) wide metal caps on flanges.

1. Structural Classification: Intermediate-duty system.
2. End Condition of Cross Runners: Butt-edge type.
3. Face Design: Flat, flush.
4. Cap Material: Steel cold-rolled sheet.
5. Cap Finish: Painted white.

C. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

1. Arrange directionally patterned acoustical panels as indicated on reflected ceiling plans.

END OF SECTION 095113

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Resilient base.
2. Resilient molding accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.4 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive resilient products.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer.

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 RESILIENT BASE (WB-1)

A. Resilient Base:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Armstrong World Industries, Inc.
b. Burke Mercer Flooring Products; Division of Burke Industries, Inc.

c. Flexco, Inc.
d. Johnsonite.
e. Roppe Corporation, USA.

B. Resilient Base Standard: ASTM F 1861.

1. Material Requirement: Type TV (vinyl, thermoplastic)
2. Style: Cove (base with toe)

C. Minimum Thickness: 0.080 inch (2.0 mm).

D. Height: 6 inches (152 mm).

E. Lengths: Cut lengths 48 inches (1219 mm) long or coils in manufacturer's standard length.

F. Outside Corners: Job formed or preformed.

G. Inside Corners: Job formed or preformed.

H. Colors and Patterns: As indicated by manufacturer's designations.

I. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

J. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24)
2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Do not install resilient products until they are same temperature as the space where they are to be installed.

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

C. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.2 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

3.3 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

END OF SECTION 096513

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Luxury vinyl floor tile.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 LUXURY VINYL FLOOR TILE (LVT-1)

A. Tile Standard: ASTM F 1700.

1. Class: Class III, Printed Film Vinyl Tile.
2. Type: B, Embossed Surface.

B. Thickness: 0.120 inch (3.0 mm).

C. Size: 18 by 18 inches (457 by 457 mm).

D. Colors and Patterns: As indicated by manufacturer's designations on Drawings.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 10 pH.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.2 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles square with room axis.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles in quarter-turn installation method.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

G. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

END OF SECTION 096519

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following interior substrates:

1. Steel.
2. Gypsum board/plaster.

1.2 DEFINITIONS

A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

D. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

F. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

G. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

B. Product List: For each product indicated. Include printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in other Part 2 articles for the paint category indicated.

2.2 PAINT, GENERAL

A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."

B. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

1. Nonflat Paints and Coatings: 150 g/L.
2. Primers, Sealers, and Undercoaters: 200 g/L.
3. Zinc-Rich Industrial Maintenance Primers: 340 g/L.

D. Colors: As indicated in a color schedule.

1. 10 percent of surface area will be painted with deep tones.

2.3 PRIMERS/SEALERS

A. Primer sealer, interior, institutional low odor/VOC: MPI #149.

1. AkzoNobel; Lifemaster No VOC Interior Acylic Primer (9116)
2. Sherwin-Williams; ProMar 200 Zero Interior Latex Primer (B28W2600/B28WQ2600)

2.4 METAL PRIMERS

A. Primer, Rust-Inhibitive, Water Based: MPI #107.

1. Benjamin Moore; Super Spec High performance Acrylic Metal Primer (P04/KP04).
2. Sherwin-Williams; Pro Industrial Pro-Cryl Universal Primer (B66W310)

2.5 WATER-BASED PAINTS

A. Latex, Interior, Institutional Low Odor/VOC, (Gloss Level 2): MPI #144.

1. Benjamin Moore; Natura Waterborne Interior Eggshell (513/K513)
2. AkzoNobel; Glidden Lifemaster Interior Acylic Eggshell (59311)
3. Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Low Sheen (B24W02651/B24WQ2651)

B. Latex, Interior, Institutional Low Odor/VOC, (Gloss Level 6): MPI #148.

1. AkzoNobel; Glidden Lifemaster No VOC Interior Acrylic Gloss (9400)
2. Sherwin-Williams; Pro Industrial Zero VOC Acrylic Gloss (B66W00611)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Gypsum Board: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 CLEANING AND PROTECTION

A. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

B. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 INTERIOR PAINTING SCHEDULE

A. Steel Substrates:

1. Institutional Low-Odor/VOC Latex System:

a. Prime Coat: Primer, rust-inhibitive, water based MPI #107.
b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
c. Topcoat: Latex, interior, institutional low odor/VOC, gloss (Gloss Level 6), MPI #148.

B. Gypsum Board Substrates:

1. Institutional Low-Odor/VOC Latex System:

a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
c. Topcoat: Latex, interior, institutional low odor/VOC, (Gloss Level 2), MPI #144.

END OF SECTION 099123

210000 - FIRE PROTECTION SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

A. Extent of fire protection systems work is as indicated on the Drawings to suppress the renovated building areas as per the Kentucky Building Code as indicated on Drawings. Work to suppress these areas shall be performed in accordance with NFPA-13. System is to be a wet pipe system. General classification for areas suppressed is Light Hazard. Relocation of heads and raising the piping within the room is the brief summary of work.

B. Before submitting bid, examine all Mechanical, Architectural, and Structural Drawings, visit the site and become acquainted with all conditions that may, in any way whatsoever, affect the execution of this work.

C. Furnish all material, labor, tools, equipment and supervision required for installation of fire protection system as required on the project drawings. Include all necessary piping, sprinkler heads, test connections, valves, drains, etc.

1.2 QUALITY ASSURANCE:

A. Manufacturers: Firms regularly engaged in manufacturer of fire protection piping systems products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer: A firm with at least 5 years of successful installation experience on projects with fire protection piping systems work similar to that required for project.

C. Campus Fire Department/Marshall Regulations: Comply with governing regulations pertaining to fire sprinkler piping.

1.3 SUBMITTALS:

A. Shop Drawings: Submit scaled layout drawings for fire protection pipe and fittings including, but not necessarily limited to, pipe and tube sizes, locations, elevations and slopes of horizontal runs, wall and floor penetrations, and connections.

B. Complete shop drawings shall be submitted to the Campus Fire Marshall office for approval. No work shall proceed until shop drawings are approved. Indicate all information required for review by NFPA-13.

C. The Contractor shall submit these drawings to the Engineer through the General Contractor and Architect. The Engineer will review these drawings and will return these back to the Contractor. It is the Contractor's responsibility to correct any comments and to submit the reviewed drawings to the fire marshal’s office for their review and approval. No work shall be done until drawings are approved by the authority having jurisdiction.

D. All equipment, devices and materials included in the installation shall be approved or listed by Underwriters' Laboratories or other nationally recognized testing laboratories.

PART 2 - PRODUCTS

2.1 FIRE PROTECTION PIPING MATERIALS AND PRODUCTS:

A. Pipe & Fittings

1. Interior Piping:

a. Up to 2" (Interior) Schedule 40 ASTM A-53 black steel; 175# cast iron screwed fittings or Schedule 10, ASTM A-135 black steel with victaulic or similar type approved fittings.

b. 2½" and larger (Interior) Schedule 40 black steel with flanged, welded or victaulic (or similar) type approved fittings or Schedule 10, ASTM A-135 black steel with victaulic or similar type approved fittings.

B. Sleeves and Escutcheon Plates:

1. Provide cast brass chrome plated split ring type escutcheons where piping penetrates walls, ceilings and floors, whether in finished areas or not.

C. Sprinkler Heads:

1. Grinnell, Star, Reliable, Viking, Central Sprinkler Corporation, or approved equivalent as follows:

a. Where piping is exposed: "Standard up right".

b. Where piping is concealed above finished ceilings, provide two piece, semi-recessed, Pendant sprinkler heads with removable escutcheon plates. All piping shall be concealed throughout.

2. Install sprinkler head guards where heads are subject to physical abuse. Heads located below seven (7) feet above floor, etc..

3. Sprinkler head degree ratings shall be determined by the area serviced in accord with current Codes and Standard Practices. Indicate degree ratings on submitted Shop Drawings.

4. Provide other types of heads as specified on the Drawings.

5. NOTE: “Omega” brand & Central Sprinkler Corporation sprinkler heads shall be prohibited.

D. Hangers:

E. All piping shall be adequately and permanently supported in an approved manner on approved hangers (Submit with drawings).

PART 3 - EXECUTION

3.1 PIPING INSTALLATION;

A. All piping, valving, air maintenance devices, heads, etc. shall be installed in accordance with NFPA 13.

B. Pipe shall be accurately cut from job measurements and shall be neatly aligned, securely connected, and properly supported. Provide pipe sleeves where piping passes through structure.

C. Locate piping runs vertically and horizontally (pitched to drain) and avoid diagonal runs wherever possible.

D. Thread pipe in accordance with ANSI B2.1; cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter. Apply pipe joint compound, or pipe joint tape (Teflon) where recommended by pipe/fitting manufacturer, on male threads at each joint and tighten joint to leave not more than three threads exposed.

E. Ferrous pipe hangers shall comply with standards of NFPA 13.

3.2 FIELD QUALITY CONTROL:

A. Repair or replace piping system as required to eliminate leakage in accordance with ANSI/NFPA standards for "little or no leakage", and retest as specified to demonstrate compliance.

END OF 210000

230500 - COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS:

A. All requirements under Division One and the General and Supplementary Conditions of these specifications shall be a part of this section. Each contractor shall be responsible to thoroughly familiarize himself with all its contents as to requirements which affect this division or section. The work required under this section includes all material, equipment, appliances, transportation, services, and labor required to complete the entire system as required by the drawings and specifications.

1.2 SCOPE

A. The work included in this division consists of the furnishing of all labor, equipment, transportation, supplies, material, appurtenances and services necessary for the satisfactory installation of the complete and operating Mechanical System(s)/Equipment indicated or specified in the Contract Documents.

B. Any materials, labor, equipment or services not mentioned specifically herein which may be necessary to complete or perfect any part of the Mechanical Systems in a substantial manner, in compliance with the requirements stated, implied or intended in the drawings and,or specifications, shall be included as part of this Contract.

C. It is the intent of this Contract to deliver to the Owners a "like new" project once work is complete. Although plans and specifications are complete to the extent possible, it shall be the responsibility of the Contractors involved to coordinate all new systems with items of construction provided by others, and to relocate items which interfere with new equipment or materials required for the complete installation without additional cost to the Owner.

1.3 DEFINITIONS AND ABBREVIATIONS

A. Contractor - Any Contractor whether proposing or working independently or under the supervision of a General Contractor and,or Construction Manager and who installs any type of mechanical work (Controls, Plumbing, HVAC, Boiler Work, Sprinkler, Air Systems, etc.) or, the General Contractor.

B. Engineer - The Consulting Mechanical-Electrical Engineers either consulting to the Owners, Architect, other Engineers, etc.

C. Architect - The Architect of Record for the project (if applicable).

D. Furnish - Deliver to the site in good condition and turn over to the Contractor who is to install.

E. Provide - Furnish and install complete, tested and ready for operation.

F. Indicated - Shown on the Drawings or Addenda thereto.

G. Typical - Where indicated repeat this work, method or means each time the same or similar condition occurs whether indicated or not.

H. OSHA - Office of Safety and Health Administration.

I. NEC - National Electrical Code.

J. NFPA - National Fire Protection Association.

K. AGA - American Gas Association

L. ASME - American Society of Mechanical Engineers.

M. ANSI - American National Standards Institute.

N. ASHRAE - American Society of Heating, Refrigeration and Air Conditioning Engineers.

O. NEMA - National Electrical Manufacturers Association.

P. UL - Underwriters Laboratories.

1.4 INSPECTION OF THE SITE:

A. The contractor shall personally inspect the site of the proposed work and inform himself fully as to the conditions under which the work is to be done. Failure to do so will not be considered sufficient justification to request or obtain extra compensation over and above the contract price.

1.5 MATERIAL AND WORKMANSHIP:

A. All material and apparatus shall be new and in first class condition. All workmanship shall be of the finest possible by experienced mechanics. All installations shall be made in a manner that will comply with applicable Codes and laws. Any abnormal noise caused by rattling equipment, piping, ducts, air devices, and squeaks in rotating components will not be acceptable. In general, all materials and equipment shall be of commercial specification grade in quality.

1.6 DRAWINGS AND SPECIFICATIONS

A. The drawings are diagrammatic only and indicate the general arrangement of the systems and are to

be followed. If deviations from the layouts are necessitated by field conditions, detailed layouts of the proposed departures shall be submitted to the Engineer for approval before proceeding with the work. The drawings are not intended to show every item which may be necessary to complete the systems. All proposers shall anticipate that additional items may be required and submit their bid accordingly.

B. Each Contractor shall make all his own measurements in the field and shall be responsible for correct fitting. He shall coordinate this work with all other branches of work in such a manner as to cause a minimum of conflict or delay.

C. The Engineer shall reserve the right to make adjustments in location of piping, ductwork, equipment, etc. where such adjustments are in the interest of improving the project.

D. Unless dimensioned, the mechanical drawings only indicate approximate locations of equipment, piping, ductwork, etc.. Dimensions given in figures on the drawings shall take precedence over scaled dimensions and all dimensions, whether given in figures or scaled, shall be verified in the field to insure no conflict with other work.

1.7 COORDINATION:

A. Coordinate all work with that of other trades so that the various components of the systems will be installed at the proper time, will fit the available space, and will allow proper service access to those items requiring maintenance. Any components which are installed without regard to the above shall be relocated at no additional cost to the owner.

B. It is the Contractor's responsibility to provide materials with trim which will fit properly the types of ceiling, wall, or floor finishes actually installed. Model numbers in specifications or shown on drawings are not intended to designate the required trim.

1.8 ORDINANCES AND CODES:

A. Comply with National Fire Protection Association codes, Kentucky Building Code, International Mechanical Code, and/or all other applicable codes and ordinances. Obtain and pay for all permits. Contractor shall be held responsible for any violation of the law.

B. The Contractor shall give all necessary notices, obtain and pay for all permits, government sales taxes, fees, inspections and other costs, in connection with his work. He shall also file all necessary plans, prepare all documents and obtain all necessary approvals of all governmental departments having any jurisdiction, whether indicated or specified or not.

C. The contractor shall also obtain all required certificates of inspection for his work and deliver same to the Engineers before request for acceptance and final payment for the work. Contractor shall submit all required documents to obtain boiler permit and inspection.

D. Contractor shall be responsible for submitting plans and obtaining boiler permit for boiler system and all hot water piping.

1.9 PROTECTION OF EQUIPMENT:

A. Adequately protect equipment from damage after delivery to job. Cover with heavy polyethylene plastic as required to protect from plaster, dirt, paint, water, or physical damage. Equipment which has been damaged by construction activities will be rejected, and contractor is obligated to furnish new equipment of a like kind.

B. Keep premises broom clean at all times from foreign material created under this contract. All piping, equipment, etc. shall have a neat and clean appearance at the termination of the work.

1.10 EQUIPMENT AND MATERIALS SUBSTITUTIONS OR DEVIATIONS

A. When any Contractor requests approval of materials and/or equipment of different physical size, capacity, function, color, access, it shall be understood that such substitution, if approved, will be made without additional cost to anyone other than the Contractor requesting the change regardless of changes in connections, space requirements, electrical characteristics, etc. from that indicated, electrical service, etc.. In all cases where substitutions affect other trades, the Contractor requesting such substitutions shall advise all such Contractors of the change and shall renumerate them for all necessary changes in their work.

B. NOTE: Any drawings, Specifications, Diagrams, etc., required to describe and coordinate such substitutions or deviations shall be professionally prepared at the responsible Contractor's expense. Review of Shop Drawings by the Engineers does not in any way absolve the Contractor of this responsibility.

C. Notwithstanding any reference in the specifications to any article, device, product, material, fixture, form, or type of construction by name, make or catalog number, such reference shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition; any devices, products, materials, fixtures, forms, or types of construction which, in the judgment of the Engineer, are equivalent to those specified are acceptable, provided the provisions of the paragraph immediately preceding are met. Requested substitutions shall be submitted to the Engineer a minimum of five days prior to bids.

1.11 SUPERVISION OF WORK

A. Each Contractor shall personally supervise the work for which he is responsible or have a competent superintendent, approved by the Engineers, on the work at all times during progress with full authority to act for him.

1.12 SUBMITTALS AND SHOP DRAWINGS

A. SUBMISSIONS – GENERAL

1. The Contractor shall submit each set of Shop Drawings, product data, samples, and test and/or certification reports as a separate item in UK E-Communication®. Projects not utilizing UK E-Communication® must submit all items electronically to the Consultant and the UK Project Manager and Administrative Coordinator.

2. Any deviation from the Contract Documents shall be noted on the transmittal form comment section.

3. All submittals are to be reviewed by the General Contractor for compliance with the Contract Documents before submission for approval. All submittals are to be initiated by the General Contractor. Submittals made directly to the Consultant by sub-contractors, manufacturers or suppliers will not be accepted or reviewed.

4. Re-submittals shall conspicuously note all changes from earlier submissions. Special notation by the Contractor shall be made to any changes other than those in response to the Consultant's review.

5. Manufacturers shall, when requested by the Consultant, submit test reports prepared by reputable firms or laboratories certifying as to performance, operation, construction, wearability, etc., to support claims made by the manufacturer of the equipment or materials proposed for inclusion in the Work. General Contractor shall also submit a list of three (3) installations where said equipment or materials have been in service for a minimum of five (5) years.

B. SUBMISSIONS – REVIEW

1. Review of submittals is only for compliance with the design concept and the contract documents. THE CONSULTANT SHALL NOT BE RESPONSIBLE FOR CHECKING DEVIATIONS FROM CONTRACT DOCUMENT REQUIREMENTS OR CHANGES FROM EARLIER SUBMISSIONS NOT SPECIFICALLY NOTED.
   a.
2. The following shall be verified prior to making submittals:

   a. Field Measurements, Field Construction Criteria, Catalog numbers and similar data, Quantities and Capacities, and Compliance with requirements, including verification of all dimensions,
3. Review Stamp designations shall be as follows:

   a. “NET = No Exceptions Taken”: Proceed with the Work, no corrections needed.
   b. "FC= Furnish as Corrected”: Proceed with the Work, noting the corrections/conditions of the approval.

c. "RR = Revise and Resubmit": Do not proceed with the Work, as the submittal does not comply with the Contract Documents. Revisions to the submittal are required for approval. On projects utilizing UK E-Communication, “Send Back a Step” is used in lieu of “Revise and Resubmit."
d. "R = Rejected": Do not proceed with the Work, the submittal is rejected.

C. SUBMISSIONS - SPECIAL PROVISIONS

1. In making a submittal, the General Contractor shall be deemed to be making the following representations:

a. The Contractor understands and agrees that he shall bear full responsibility for the products furnished. The Contractor expressly warrants that products described in the attached submittal will be usable and that they conform to the Contract requirements unless specifically noted otherwise.

b. The Contractor understands and agrees that, without assuming design responsibility, he expressly warrants that products described in the attached submittal are capable of being used in accordance with the intent of the design documents and that they conform to the Contract requirements unless specifically noted otherwise.

c. The Contractor acknowledges that the Owner will rely on the skill, judgment, and integrity of the Contractor as to conformance requirements and subsequent usability.

2. Shop Drawings

a. The Contractor shall review, approve, and submit Shop Drawings to the Consultant, in accordance with the Consultant's Shop Drawing & Procurement Submittal Log or UK E-Communication®, as herein detailed. By approving and submitting Shop Drawings, the Contractor represents that he has determined and verified all materials, field measurements, and field construction criteria related thereto, or will do so, and that he has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

b. The Contractor shall submit Shop Drawings required for the Work and the Consultant will review and take appropriate action. The review and approval shall be only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents. The approval of a separate item will not indicate approval of the assembly in which the item functions.

c. The Contractor shall make any corrections required by the Consultant for

compliance to the Contract and shall return the required number of corrected copies of Shop Drawings and resubmit new samples until approved. The Contractor shall direct specific attention, in writing, or on resubmitted Shop Drawings, to revisions other than the corrections called for by the Consultant on previous submissions. The General Contractor's stamp of approval on any shop drawing or sample shall constitute a representation to Owner and Design Consultant that the General Contractor has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar date, or he assumes full responsibility for doing so, and that he has reviewed or coordinated each shop drawing or sample with the requirements of the Work and the Contract Documents.

d. Where a shop drawing or sample submission is required by the specifications, no related Work shall be commenced until the submission has been approved by the Design Consultant. A copy of each approved shop drawing and each approved sample shall be kept in good order by the Contractor at the site and shall be available to the Consultant.

e. The Consultant's approval of Shop Drawings or samples shall not relieve the General Contractor from his responsibility for any deviations from the requirements of the Contract Documents unless the General Contractor has in writing called the Consultant's attention to such deviation at the time of submission and the Consultant has given written approval to the specific deviation. Any approval by the Consultant shall not relieve the General Contractor from responsibility for errors or omissions in the Shop Drawings.

f. All submittals are to be submitted electronically by the contractor. Shop Drawings submitted through UK E-Communication® shall be scanned and submitted in color. Mark-ups must be made using visible color when printed. Workflow in UK E-Communication® will be established during the workflow meeting. Each individual Shop Drawing shall have its respective specification number and description highlighted.

g. Where Shop Drawings include fire alarm, communication systems schematics, sprinkler systems, etc., a sepia of each drawing shall be submitted to the Consultant as part of the "Record" set of drawings.

1.13 SUBMISSIONS - OPERATION AND MAINTENANCE MANUALS

A. The University requires a minimum of one (1) bound copies and one (1) digital copy of the final installation, training, operation, maintenance, and repair manuals to be turned over to the Owner's Project Manager and approved for content by the Consultant by or before the time construction is 75% complete. Projects utilizing e-Communication will create digital copy from the Document Library (Closeouts) in e-Communication. The Closeout Log must contain

individual line items for each physical copy submitted with corresponding PDF attachments. Operation and maintenance manuals and materials, where specified, for mechanical and electrical equipment and for operating items other than mechanical and electrical equipment must be submitted in PDF format with a separate PDF file for each item. In the event the Contractor fails to provide these required electronic submittals prior to reaching seventy-five (75%) completion, it is agreed that the Owner at its sole discretion may deduct from the current and subsequent Applications for Payment an amount deemed by the Owner to be sufficient to encourage prompt compliance with this contractual requirement, until such time as acceptable O&M manuals are received.

B. Manuals provided must be of sufficient detail to enable the Owner or others to install, calibrate, train, operate, maintain, service and repair every system, subsystem, and/or piece of equipment installed on or as part of this Contract. Closeout Documents submitted through UK E-Communication® shall be scanned and submitted in color. Mark-ups must be made using visible color when printed. Each manual must contain:

1. Project Title, Project number, Location, dates of submittals, names, addresses and phone number for the Consultant, General Contractor, and Contractor's Sub-contractors;

2. An Equipment Index that includes vendor’s names, addresses, and telephone numbers for all equipment purchased on the Project;

3. Emergency instructions with phone numbers and names of contact persons on warranty items shall be uploaded to UK E-Communication®;

4. Copies of each system's air balancing record and each system's hydronic balancing record (1) physical copy and (1) digital copy in eCommunication

5. Copy of valve tag list;

6. Copy of As-Built temperature control system drawings and components and sequence of operation;

7. Original copies of the following provided by the manufacturer:

Installation manuals	Instruction Manuals
Training manuals	Calibration manuals
Service Manual	Operation manuals
Parts list	Repair manuals
Reviewed Shop Drawings	Wire list

8. Any Computer, Micro controller, and/or Microprocessor equipped equipment installed shall be provided with source code copies of all software and firmware (prom, EPROM, ROM, other) supplied on this Contract; and

9. Copies of all inspection and guarantee certificates, manufacturers' warranties with the University of Kentucky listed as the Owner for all equipment provided and/or installed.

C. All manuals shall be as follows: Bound in hard cover three(3) ring (D-type) binder, 1", 1.5" or 2" maximum, indexed and in CSI format, tabbed (4,5,8 or 16th cut), no more than 80% binder fill, white vinyl, presentation type with clear vinyl view cover on front, back and spine and with pockets on front and back. Maximum drawing size in binder shall be folded 11"x17" and shall be hole punched and reinforcements added. Do not put drawings in pockets. Top of all drawings shall be at top or spine side of the manual. Complete drawings must be viewed without opening rings. Provide binders as manufactured by Universal Office Products, Des Plaines, IL. 1"(S# B2-20742), 1.5"(B2-20744), or 2"(B2-20746) or equal.

D. If the binder includes manuals from any single vendor covering several different model numbers, the model used on the Project must be highlighted.

1.14 SUBMISSIONS – AS - BUILT SET OF DRAWINGS\

A. The General Contractor shall submit one (1) electronic copy of As - Built set of drawings in .pdf format indicating all deviations of construction as originally specified in the Contract Documents. These As-Built Drawings will compile information from the General Contractor as well as all Sub-contractors. The General Contractor shall provide a qualified representative to update the As - Built set of drawings as construction progresses. As-Builts submitted through UK E-Communication® shall be scanned and submitted in color. Mark-ups must be made using visible color when printed

B. The General Contractor shall provide and utilize a camera to photograph the installation of buried utilities and concealed items. The General Contractor shall provide standard 3 1/2" x 5" photographs with negatives, or digital images (.jpeg format), which shall be submitted as part of the Operation and Maintenance Manuals submission. These photos should be mounted in a bound album with labeling as to subject of photo, date, and Project. Such album is to be kept at job site with the As - Built set of drawings until submittal of same.

C. Approval of the Final Payment request will be contingent upon compliance with these provisions. The General Contractor's As – Built set of drawings shall be delivered to the Consultant at their completion so that the Consultant may make any changes on the original contract drawings.

1.15 SUBMISSIONS - SAP EQUIPMENT LIST

A. Complete equipment list for use with SAP software in electronic spreadsheet format. Data is to

be provided in Uniformat format with the information being provided for individual locations as noted in Attachment A – Uniformat Component List. Information is to be provided as follows (PPDMC or CPPD will provide blank Excel spreadsheets in electronic form for use in compiling the information, if desired)

B. All materials that require preventative maintenance (PM) are listed as in Attachment A of the UK "Special Conditions – General Contractor". The equipment list is to be provided in Excel spreadsheet format and is to include the information listed in Attachment B of the UK "Special Conditions – General Contractor". Required maintenance procedure listing each work task in Excel spreadsheet format as shown in Attachment C of the UK "Special Conditions – General Contractor". .

C. Required frequency of maintenance for the work tasks outlined and included in the Attachment C spreadsheet

D. Listing of maintenance parts and items: i.e. filters, lubricants, etc. for each work task listed in the above references and attachments.

1.16 SUBMISSIONS – MAINTENANCE MATERIALS

A. If specified, Maintenance/Replacement Materials, Spare Parts, and special maintenance tools for proper maintenance shall be provided by the General Contractor.

1.17 OPERATION AND MAINTENANCE INSTRUCTIONS:

I. Operation and Maintenance Manuals:
The University requires One (1) Digital Copy (pdf) each of final installation, training, operation, maintenance, and repair manuals to be turned over to the owner's representative and approved for content by the University prior to the acceptance of substantial completion. PDFA files will NOT be accepted.

A. EComm Closeout Front End Documents - The following shall be uploaded as a single line item to the Ecomm Closeout Log in pdf format:
   a. Information sheet
      i. Project title
      ii. project number
      iii. UK Project Manager
      iv. Architect (name, address, and telephone number)
      v. Engineer (name, address, and telephone number)
      vi. Contractor & Subcontractor (name, address, and telephone number)
      vii. All Vendors for warranty items (name, address, and telephone number)

b. Index: - List of everything submitted for an individual trade package/ category in order by CSI Master format Division.

c. Example:

CSI Master Format	Document Name	Doc Type	File Name
084113-02	Aluminum Frames Entrances	O&M	084113-02 – Aluminum Frames Entrances - O&M
084113 -03	Aluminum Framed Entrances	Warranty	084113-03 – Aluminum Frames Entrances - Warranty

B. Style – Digital PDF file set shall be compiled in CSI Master Format order, with bookmarks. Document properties shall be set to correct reading direction and fit height.

C. Content

Information provided must be of sufficient detail as to enable University Employees to install, calibrate, train, operate, maintain, service, and repair every system, subsystem, and piece of equipment installed on or as a part of any contract awarded by the University.

What follows is a list of items, and their required formats, that must be included as a part of all submitted closeouts.

1. Inspections and Guarantees:
Copies of all inspection, guarantee, and warranty certificates with the University of Kentucky named as owner of all equipment and property.

2. Valve Tag List:
A record of all valves installed shall be made and shall include the following information: Valve tag number, location of valve, service area, type of service, type of valve, manufacturer, and model number.

3. Equipment:
All equipment required by contract and/or installed by the contractors or sub-contractors must be accompanied by the original copies of its documentation. This documentation must be included in the set of manuals and at minimum include: Installation manuals, training manuals, service manuals, parts lists, shop drawings, calibration manuals (if applicable), operation manuals, repair manuals, and wire lists (if applicable). Under no circumstances will catalog cut sheets be considered acceptable replacements for any of the above items. Only include information pertaining to equipment installed and only in English language.

Documentation for each piece of equipment shall be indexed as mentioned above and be placed after the appropriate bookmark. Each bookmarked section must contain, as its first sheet, a checklist of all documentation included in that section, location(s) of equipment, and vendor name and address. If more than one type of equipment falls under the same number, a checklist for each type must be present. If the PDF document includes manuals from any one vendor covering several model numbers, the model used must be highlighted. Print in color if applicable.

4. Shop Drawings:
IF shop drawings are included, the preferred pdf size is to be 11" x 17"

5. Test and Balance Report:
Copies of each system air balancing record and each system hydronic balancing record must accompany digital PDF manuals submittal.

6. Contractor As - Built Drawings:
One (1) digital set of PDF sheets with "As - Built" stamps shall be uploaded upon completion of project. The set should be complete and accurate. Any changes made during construction must be made before submittal of these digital drawings.

Digital PDF set of sheets shall be compiled in sheet number order, with bookmarks indicating Sheet number and title. Pages shall be set to correct reading direction and bookmarks' zoom set to fit page. Compiled pdfs shall be OCRd (text recognition). This set serves as the archivable "As - Built" drawing set for use by University Archives.

7. A/E Record Drawings:

Submitted Record Drawings shall conform to Consultant Contract 2.6.5.14.1. Digital Drawing files shall be submitted in both PDF (uploaded via Ecomm) files and CAD consumable files (.dwg, .dxf, .dxb and/or . rvt formats) delivered to CPMD representative. Digital PDF set of sheets shall be compiled in sheet number order, with bookmarks indicating Sheet number and title. Pages shall be set to correct reading direction and bookmarks' zoom set to fit page. Compiled pdfs shall be OCRd (text recognition).Digital files are for use in the Engineering and Maintenance Departments. Digital Drawing files shall include any shop drawings available in this format.

8. Training Videos
MP4 video format
File name: UK Project Number XXXX.XX; Discipline: 'Training Video'

1.18 GUARANTEE:

A. Each Contractor shall guarantee all equipment, apparatus, materials, and workmanship entering into this Contract to the best of its respective kind and shall replace all parts at his own expense, which are proven defective for a duration as indicated in the Division I General Conditions and Specifications.

B. Where such duration is not identified, then guarantee shall be for one year from final acceptance of the work by the Engineer/Architect. The effective date of completion of the work shall be the date of the Engineer's (Architect's) Statement of Substantial Completion. Items of equipment which have longer guarantees, as called for in these specifications, shall have warranties and guarantees completed in order, and shall be in effect at the time of final acceptance of the work by the Engineer. The Contractor shall present the Engineer with such warranties and guarantees at the time of final acceptance of the work. The Engineer shall then submit these warranties, etc. to the Owner. Refer to other sections for any special or extra warranty requirements.

1.19 RECORD DRAWINGS

A. Each Contractor shall insure that any deviations from the Design are as they occur recorded in red, erasable pencil on record drawings kept at the jobsite. The Engineer may review the record documents from time to time to insure compliance with this specification. Compliance shall be a contingency of final payment. Pay particular attention to Deviations in the Control Systems. Keep information in a set of drawings set aside at the job site especially for this purpose and deliver to the Engineers the originals and three (3) copies of the record drawings upon completion of the work. Delivery of these documents will be contingent of final payment.

1.20 QUALIFICATIONS OF WORKMEN

A. All mechanical work shall be accomplished by qualified workmen competent in the area of work for which they are responsible. Mechanical contractors shall be licensed as required by Kentucky State Law. All boiler and piping work to be performed by a Contractor licensed to do boiler work in State of Kentucky.

B. All sheet metal, insulation and pipe fitting work shall be installed by workmen normally engaged or employed in these respective trades.

C. All electrical work shall be installed only by competent workmen under direct supervision of a fully qualified Electrician.

1.21 CONDUCT OF WORKMEN

A. Each Contractor shall be responsible for the conduct of all workmen under his supervision. Misconduct on the part of any workman to the extent of creating a safety hazard, or endangering the lives and property of others, shall result in the prompt relief of that workman. The consumption of alcoholic beverages or other intoxicants, narcotics, barbiturates, hallucinogens or debilitating drugs on the job site is strictly forbidden.

1.22 CONCRETE BASES

A. Each Contractor shall be finally responsible for the provisions of all concrete work required for the installation of any of his systems or equipment. He may, at his option, arrange with the others to provide the work. This option, however, will not relieve the Contractor of his responsibilities relative to dimensions, quality of workmanship, locations, etc.. In the absence of other concrete specifications, all concrete related to Mechanical work shall be 3000 psi minimum compression strength at 28 days curing and shall conform to the standards of the American Concrete Institute Publication AC1-318.

B. Contractor shall furnish concrete bases for his equipment where indicated on the drawings. Concrete housekeeping pads shall be minimum 4" thick, reinforced with 6 x 6 wire mesh, and have chamfered edges.

1.23 ROUGH-IN:

A. Coordinate without delay all roughing-in with general construction. All piping, conduit, rough-in shall be concealed except in unfinished areas and where otherwise shown.

1.24 CUTTING AND PATCHING:

A. New Work - Cutting and patching shall be done by craftsmen skilled and experienced in the trade or craft that installed or furnished the original Work. Repairs shall be equal in quality and appearance to similar adjacent Work and shall not be obviously apparent as a patch or repair. Work that cannot be satisfactorily repaired shall be removed and replaced.

B. Existing Construction - Refer to Architectural, Mechanical, and Electrical drawings for cutting and patching. All new Work shall be connected to the existing construction in a neat and workmanlike manner, presenting a minimum of contrast between old and new Work. Do all patching of the existing construction as may be required for the new construction to be done. Necessary patching, closing of existing openings, repairing and touching up shall be included as required for a proper, neat and workmanlike finished appearance. Any existing item that is to remain and is damaged during construction shall be replaced at the General Contractor's expense.

1.25 ACCESSIBILITY

A. The Contractor shall locate and install all equipment so that it may be serviced, and maintained as recommended by the manufacturer. Allow ready access and removal of the entire unit and,or parts such as valves, filters, fan belts, motors, prime shafts, etc.

1.26 ELECTRICAL WIRING:

A. All power conduit and wiring shall be furnished by the electrical contractor. All control and interlock conduit and wiring for mechanical systems is the responsibility of the Mechanical Contractor; however he may choose to hire an electrician to perform this work. All wiring shall be in conduit and in accordance with the National Electric Code.

1.27 REQUIRED CERTIFICATIONS

A. Upon completion of the project, the Contractor shall deliver all inspection certificates acquired during the course of the project to the Owner for their records.

B. The Contractor shall upon completion of the Final Punch list, deliver to Architect and Engineer a written certification that all systems and work has been completed in compliance with the plans and specifications. The Contractor also shall deliver over to the Owner all required maintenance manuals and phone numbers of the equipment suppliers. The delivery of these documents and certifications will be required prior to final payment and release of retainage.

1.28 INDEMNIFICATION

A. The Contractor(s) shall hold harmless and indemnify the Engineer, employees, officers, agents and consultants from all claims, loss, damage, actions, causes of actions, expense and/or liability resulting from, brought for, or on account of any personal injury or property damage received or sustained by any person, persons, (including third parties), or any property growing out of, occurring, or attributable to any work performed under or related to this contract, resulting in whole or in part from the negligence of the Contractor, any subcontractor, any employee, agent or representative.

PART 2 - PRODUCTS

NONE

PART 3 - EXECTUTION

NONE

END OF 230500

230523 - VALVES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

A. Extent of valves required by this section is indicated on drawings and/or specified in other Division 15 sections.

B. Types of valves specified in this section include the following:
   1. Gate Valves.
   2. Globe Valves.
   3. Drain Valves.
   4. Ball Valves.
   5. Swing and Lift Check Valves.

1.2 QUALITY ASSURANCE:

A. Manufacturers: Firms regularly engaged in manufacturer of valves, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

1.3 SUBMITTALS:

A. Product Data: Submit catalog cuts, specifications, installation instructions, and dimensioned drawings for each type of valve. Include pressure drop curve or chart for each type and size of valve. Submit valve schedule showing Manufacturer's figure number, size, location, and valve features for each required valve.

PART 2 - PRODUCT

2.1 VALVES:

A. General: Provide factory-fabricated valves recommended by manufacturer for use in service indicated. Provide valves of types and pressure ratings indicated; provide proper selection as determined by Installer to comply with installation requirements. Provide sizes as indicated, and connections which properly mate with pipe, tube, and equipment connections. Where more than one type is indicated, selection is Installer's option.

2.2 GATE VALVES:

A. Packing: Select valves designed for repacking under pressure when fully opened, equipped with packing suitable for intended service. Select valves designed so back seating protects packing and stem threads from fluid when valve is fully opened, and equipped with gland follower.

B. For Hot Water Services:

   1. Threaded Ends 2" and Smaller: Class 125, bronze body, union bonnet, rising stem, solid wedge.

2. Flanged Ends 2½" and Larger: Class 125, iron body bronze mounted, bolted bonnet, rising stem, OS&Y, solid wedge.

3. Soldered Ends 2" and Smaller" Class 125, bronze body, screwed bonnet, non-rising stem, solid wedge.

C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering gate valves which may be incorporated in the work include, but are not limited to the following:

1. Crane Co., Valve Div.
2. Fairbanks Co.
3. Hammond Valve Corp., Div. of Conval Corp.
4. Jenkins Bros., A Corp.
5. NIBCO, Inc.
6. Powell (Wm.) Co.
7. Stockham Valves and Fittings, Inc.
8. Walworth Co.

2.3 GLOBE VALVES:

A. Packing: Select valves designed for repacking under pressure when fully opened, equipped with packing suitable for intended service. Select valves designed so back seating protects packing and stem threads from fluid when valve is fully opened, and equipped with gland follower.

B. Composition Discs: Where required, provide suitable material for intended service. For stem throttling service, fit composition disc valve with throttling nut.

C. Comply with the following standards:
1. Bronze Valves: MSS SP-80.

2. Steel Valves: ANSI B16.34.

D. For HVAC Hot Water Service:

1. Threaded Ends 2" and Smaller: Class 150, bronze body, union bonnet, rising stem, composition disc.

2. Soldered Ends 2" and Smaller: Class 125, bronze body, screwed bonnet, rising stem, composition disc.

3. Flanged Ends 2½" and Larger: Class 125, iron body, bolted bonnet, rising stem, OS&Y, renewable seat and disc.

4. Threaded Ends 2" and Smaller (For By-Pass or Throttling): Class 150, bronze body, union bonnet, rising stem, plug type renewable seat and disc.

E. Available Manufacturers: Subject to compliance with requirements, manufacturers offering globe valves which may be incorporated in the work include, but are not limited to, the following:

1. Crane Co., Valve Div.
2. Fairbanks Co.
3. Hammond Valve Corp., Div. of Conval Corp.
4. Jenkins Bros., A Corp.
5. NIBCO, Inc.
6. Powell (Wm.) Co.
7. Stockham Valves and Fittings, Inc.
8. Walworth Co.

2.4 SWING CHECK VALVES:

A. General: Construct pressure containing parts of valves as follows:

1. Bronze Valves, 125 or 150 PSI: ANSI/ASTM B 62.

2. Iron Body Valves: ANSI/ASTM A 126, Grade B.

B. Construct valves of pressure castings free of any impregnating materials.

C. Construct valves of bronze, regrinding, with seating angle 40° to 45°, unless composition disc is specified.

D. Provide stop plug as renewable stop for disc hanger, unless otherwise specified.

E. Construct disc and hanger as separate parts, with disc free to rotate.

F. Support hanger pins on both ends by removable side plugs.

G. For HVAC Hot Water Service:

1. Threaded Ends 2" and Smaller: Class 125, bronze body, screwed cap, horizontal swing, bronze disc.

2. Flanged Ends 2½" and Larger: Class 125, iron body bronze mounted, bolted cap, horizontal swing, cast iron disc.

H. Available Manufacturers: Subject to compliance with requirements, manufacturers offering swing check valves which may be incorporated in the work include, but are not limited to the following:

1. Crane Co., Valve Div.
2. Fairbanks Co. (The)
3. Hammond Valve Corp., A Condec Co.
4. Jenkins Bros., A Corp.
5. NIBCO, Inc.
6. Powell Co. (The Wm.)
7. Stockham Valves and Fittings, Inc.
8. Walworth Co.

2.5 DRAIN VALVES:

A. For Low Pressure Drainage Service:

1. Threaded Ends 2" and Smaller: Class 125, bronze body, screwed bonnet, rising stem, composition disc, 3/4" hose outlet connection.

2. Soldered Ends 2" and Smaller: Class 125, bronze body, screwed bonnet, rising stem, composition disc, 3/4" hose outlet connection.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering drain valves which may be incorporated in the work include, but are not limited to, the following:

1. Crane Co., Valve Div.
2. Fairbanks Co.
3. Hammond Valve Corp., Div. of Conval Corp.
4. Jenkins Bros., A Corp.
5. NIBCO, Inc.
6. Walworth, Co.

2.6 LIFT CHECK VALVES:

A. General: Provide lift check valves, 2" and smaller, constructed of bronze or forged steel to suit service. Construct bronze valves with basic saturated steam rating of 125 or 150 PSI with pressure containing parts of materials having at least physical properties of ANSI/ASTM B 62. Conform to ANSI /FCI 74-1 for design, rating, and testing. Construct pressure castings, free of any impregnating materials.

B. Horizontal Lift Check Valves: ¼" to 2", straight pattern threaded ends, pressure rated for 150 PSI saturated steam, renewable composition disc, screw-over cap, bronze body.

C. Vertical Lift Check Valves: ¼" to 2", straight vertical pattern, threaded ends, pressure rated for 150 PSI saturated steam, renewable composition disc, screw-in hub, bronze body.

D. Spring Loaded Horizontal Lift Check Valves: ¼" to 2", straight pattern, threaded ends, pressure rated for 150 PSI saturated steam, renewable composition disc, phosphor bronze wire spring, screw over cap, bronze body.

E. Available Manufacturers: Subject to compliance with requirements, manufacturers offering lift check valves which may be incorporated in the work include, but are not limited to the following:

1. Fairbanks Co. (The).
2. Hammond Valve Corp.,A Condec Co.
3. Jenkins Bros., A Corp.
4. Lunkenheimer Co. (The), Div. Conval Corp.
5. Powell Co. (The Wm.).
6. Stockham Valves & Fittings, Inc.

2.7 BALL VALVES:

A. General: Select with port area equal to or greater than connecting pipe area, include seat ring designed to hold sealing material.

B. For HVAC Hot Water Service:

1. Threaded Ends 3" and Smaller: Class 125, bronze 2 piece body, bronze ball, bronze stem.

2. Soldered Ends 2" and Smaller: Class 125, bronze 2 piece body, bronze ball, bronze stem.

C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering ball valves which may be incorporated in the work include, but are not limited to the following:

1. Conbraco Industries, Inc.
2. Crane Co., Valve Div.
3. Fairbanks Co.
4. Hammond Valve Corp., Div. of Conval Corp.
5. Jamesbury Corp.
6. NIBCO, Inc.
7. Stockham Valves and Fittings, Inc.
8. Walworth Co.

2.8 DRAIN VALVES:

A. For Low Pressure Drainage Service:

1. Threaded Ends 2" and Smaller: Class 125, bronze body, screwed bonnet, rising stem, composition disc, 3/4" hose outlet connection.

2. Soldered Ends 2" and Smaller: Class 125, bronze body, screwed bonnet, rising stem, composition disc, 3/4" hose outlet connection.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering drain valves which may be incorporated in the work include, but are not limited to, the following:

1. Crane Co., Valve Div.
2. Fairbanks Co.
3. Hammond Valve Corp., Div. of Conval Corp.
4. Jenkins Bros., A Corp.
5. NIBCO, Inc.
6. Walworth, Co.

2.9 SWING CHECK VALVES:

A. General: Construct pressure containing parts of valves as follows:

1. Bronze Valves, 125 or 150 PSI: ANSI/ASTM B 62.

2. Metallic Seated Bronze Valves, 200 or 300 PSI: ANSI/ASTM B 61.

3. Iron Body Valves: ANSI/ASTM A 126, Grade B.

B. Comply with MSS SP-71 for design, workmanship, material and testing.

C. Construct valves of pressure castings free of any impregnating materials. Construct valves of bronze, regrinding, with seating angle 40° to 45°, unless composition disc is specified.

D. Provide stop plug as renewable stop for disc hanger, unless otherwise specified.

E. Construct disc and hanger as separate parts, with disc free to rotate.

F. Support hanger pins on both ends by removable side plugs.

G. For HVAC Hot Water & Condenser Water Service:

1. Threaded Ends 2" and Smaller: Class 125, bronze body, screwed cap, horizontal swing, bronze disc.

2. Soldered Ends 2" and Smaller: Class 125, bronze body, screwed cap, horizontal swing, bronze disc.

3. Flanged Ends 2½" and Larger: Class 125, iron body bronze mounted, bolted cap, horizontal swing, cast iron disc.

H. Available Manufacturers: Subject to compliance with requirements, manufacturers offering swing check valves which may be incorporated in the work include, but are not limited to the following:

1. Crane Co., Valve Div.
2. Fairbanks Co. (The)
3. Hammond Valve Corp., A Condec Co.
4. Jenkins Bros., A Corp.
5. NIBCO, Inc.
6. Powell Co. (The Wm.)
7. Stockham Valves and Fittings, Inc.
8. Walworth Co.

2.10 LIFT CHECK VALVES:

A. General: Provide lift check valves, 2" and smaller, constructed of bronze or forged steel to suit service. Construct bronze valves with basic saturated steam rating of 125 or 150 PSI with pressure containing parts of materials having at least physical properties of ANSI/ASTM B 62. Conform to ANSI /FCI 74-1 for design, rating, and testing. Construct pressure castings, free of any impregnating materials.

1. Horizontal Lift Check Valves: ¼" to 2", straight pattern threaded ends, pressure rated for 150 PSI, renewable composition disc, screw-over cap, bronze body.

2. Vertical Lift Check Valves: ¼" to 2", straight vertical pattern, threaded ends, pressure

rated for 150 PSI, renewable composition disc, screw-in hub, bronze body.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering lift check valves which may be incorporated in the work include, but are not limited to the following:

1. Fairbanks Co. (The).
2. Hammond Valve Corp.,A Condec Co.
3. Jenkins Bros., A Corp.
4. Lunkenheimer Co. (The), Div. Conval Corp.
5. Powell Co. (The Wm.).
6. Stockham Valves & Fittings, Inc.

2.11 VALVE FEATURES:

A. General: Provide valves with features indicated and, where not otherwise indicated, provide proper valve features as determined by Installer for installation requirements. Comply with ANSI B31.1

1. Bypass: Comply with MSS SP-45, and except as otherwise indicated, provide manufacturer's standard bypass piping and valving.

2. Drain: Comply with MSS SP-45, and provide threaded pipe plugs complying with Division 15 "Pipe, Tube, and Fittings" section.

3. Outside Screw and Yoke: Stem and handwheel designed to rise out of bonnet or yoke as valve is operated from closed to open position.

4. Inside Screw, Non-Rising Stem: Stem and handwheel designed to rotate without rising when valve is operated from closed to open position.

5. Flanged: Valve flanges complying with ANSI B16.1 (cast iron), ANSI B16.5, (steel), or ANSI B16.24 (bronze).

6. Threaded: Valve ends complying with ANSI B2.1.

7. Mechanical Actuator: Factory-fabricated gears, gear enclosure, external chain attachment and chain designed to provide mechanical advantage in operating valve.

8. Bonnet: Part of gate or globe valve through which stem passes to valve body, and attached to valve body by screws, bolts, union or welding.

9. Solid Wedge: One piece tapered disc in gate valve, designed for contact on both sides.

10. Outside Screw and Yoke: Stem and handwheel designed to rise out of bonnet or yoke as valve is operated from closed to open position.

11. Inside Screw, Non-Rising Stem: Stem and handwheel designed to rotate without rising when valve is operated from closed to open position.

B. Valve System: Select and install valves with outside screw and yoke stems, except provide

inside screw non-rising stem valves where headroom prevents full opening of OS&Y valves.

C. Renewable Seats: Select and install valves with renewable seats, except where otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Except as otherwise indicated, comply with the following requirements:

B. Install valves where required for proper operation of piping and equipment, including valves in branch lines where necessary to isolate sections of piping. Locate valves so as to be accessible and so that separate support can be provided when necessary.

C. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward for horizontal plane unless unavoidable. Install valve drains with hose end adapter for each valve that must be installed with stem below horizontal plane.

D. Insulation: Where insulation is indicated, install extended stem valves, arranged in proper manner to receive insulation.

E. Applications Subject to Shock: Install valves with bodies of metal other than cast iron where thermal or mechanical shock is indicated or can be expected to occur.

F. Valve System: Select and install valves with outside screw and yoke stems, except provide inside screw non-rising stem valves where headroom prevents full opening of OS&Y valves.

G. Ball valves installed on reheat water system shall be screwed-on type valves instead of soldered valves.

H. Fluid Control: Except as otherwise indicated, install gate, ball, globe and butterfly valves to comply with ANSI B31.1. Where throttling is indicated or recognized as principal reason for valve, install globe valves.

I. Installation of Check Valves:

1. Swing Check Valves: Install in horizontal position with hinge pin horizontally perpendicular to center line of pipe. Install for proper direction of flow.

END OF 230523

230533 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

A. Extent of mechanical identification work required by this sections indicated on drawings and/or specified in other Division 15 sections. Systems which must be identified are as follows:

1. Variable Volume Boxes
2. Hot Water Water Piping and Valving System
3. Controls (as indicated in the applicable sections)

B. Type of identification devices specified in this section include the following:

1. Engraved Plastic-Laminate Signs
2. Pipe Identification

1.2 SUBMITTALS

A. Product Data: Submit product specifications and installation instructions for each identification material and device required.

PART 2 - PRODUCTS

2.1 MECHANICAL IDENTIFICATION MATERIALS:

A. PIPE IDENTIFICATION

1. All plumbing and mechanical piping must be color coded and labeled, including sprinkler lines, every 15 feet above a ceiling system and every 10 feet in an open mechanical room.

2. University of Kentucky Standard Color Coding for Mechanical Piping

Type of Service	**Markings**	**Color***	**No.***
High pressure steam and return (over 76 psig)	H.P.S. & H.P.R.	Safety Red	SW4081
Medium pressure steam and return (21 psig to 75 psig)	M.P.S. & M.P.R.	International Orange	SW4082
Low pressure steam and return (0 psig to 20 psig)	L.P.S. & L.P.R.	Safety Orange	SW4083
Domestic cold Water	D.C.W.	Safety Green	SW4085
Domestic hot Water	D.H.W.	Green Byte	SW4076
Medium temperature hot water & return	M.T.H.W. &	Safety yellow	SW4084

(300□ F or less)	M.T.H.W.R.		
Reheat supply & return	R.S. & R.R.	Junction yellow	SW4033
Chilled water supply & return	C.W.S. & C.W.R.	Safety blue	SW4086
Condenser water supply & return	C.D.W.S. & C.D.W.R.	Slate gray	SW4026
Natural gas	GAS	Deck Red	SW4040
Safety valve vents	S.V.V.	Galvano	SW4027
Cast iron soil & waste vents	W.&V.	Vacuum Black	SW4032
Chilled hot water	C.H.W.	Galvano	SW4027
Air (steel pipe)	AIR	Galvano	SW4027
Air (copper pipe)	AIR	None	--
Vacuum (copper pipe)	VAC	None	--
Vacuum (steel pipe)	VAC	Galvano	SW4027
Roof leaders	R.L.	Galvano	SW4027
Soft water	S.W.	Pillar White	SW4029
De-mineralized water	D.W.	None	--
Distilled water	DIST. W.	None	--
Diesel fuel	D. FUEL	Galvano	SW4027
Nitrogen	NITROGEN	Galvano	SW4027
Elevator oil lines	E.O.L.	Galvano	SW4027
Muratic acid	MUR. ACID	Galvano	SW4027
Sulfuric acid	SUL. ACID	Galvano	SW4027
Chromate or cooling tower additives	C.T.A.	Galvano	SW4027
Boiler treatment	B.T.	Galvano	SW4027
Gasoline	GASOLINE	Galvano	SW4027
Nitrous oxide (copper)	N. OXIDE	None	--
Caustic soda	C. SODA	Galvano	SW4027
Condensate pump discharge	COND. P.D.	Galvano	SW4027
Sump pump discharge	S. PUMP DIS.	Galvano	SW4027
Oxygen	OXYGEN	None	--
Fire suppression / sprinkler system	FIRE	Safety Red	SW4081
Ammonia	AMMONIA	Bolt brown	SW4001
Glycol solutions	GLYCOL	Rotor Turquoise	SW4066
Freon – R500	FREON R-500	Junction yellow	SW4033
Freon – R502	FREON R-502	Recycled Red	SW4073

NOTES: * Color and number are from the Sherwin Williams System 4000 color selection guide dated 1999.

B. VALVES:

1. All valves must have labels, both a tag on the valve and on the ceiling grid (if applicable). All labels for valves must be on ceiling grid (see UK's standard for lettering below).

2. U.K.'s Standards for Standard Lettering: Attach Seton-Ply Discs to ceiling grid under equipment or to access doors in non- accessible ceiling.

EQUIPMENT: COLOR:	ENGRAVED:
Valve Yellow	V.
Fire Damper Black	F.D.
Smoke Damper Black	SM.D.
Volume Damper Black	V.D.
Terminal Unit Red	T.
Variable Volume Unit Red	V.V.
Heating Coil Blue	H.C.
Cabinet Unit Heater Red	C.H.

C. EQUIPMENT LABELS

1. Plastic Labels for Equipment:

   a. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick, and having predrilled holes for attachment hardware.

   b. Letter Color: Black.

   c. Background Color: White.

   d. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).

   e. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).

   f. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

   g. Fasteners: Stainless-steel rivets or self-tapping screws.

2. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

3. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

D. PIPE LABELS

1. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

   a. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

   b. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

2. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

3. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.

4. Lettering Size: At least 1-1/2 inches (38 mm) high.

E. DUCT LABELS

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving,[1/16 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: Black
3. Background Color: White
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
6. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
9. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.
    a. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions, or as separate unit on each duct label to indicate flow direction.
    b. Lettering Size: At least 1-1/2 inches (38 mm) high.

F. STENCILS

1. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; minimum letter height of 1-1/4 inches (32 mm) for ducts; and minimum letter height of 3/4 inch (19 mm) for access panel and door labels, equipment labels, and similar operational instructions.
2. Stencil Material: Fiberboard or metal.
3. Stencil Paint: Exterior, gloss, acrylic enamel black unless otherwise indicated. Paint may be in pressurized spray-can form.
4. Identification Paint: Exterior, acrylic enamel in colors according to ASME A13.1 unless otherwise indicated.

G. VALVE TAGS

1. Valve Tags: Stamped or engraved with 1/4-inch (6.4-mm) letters for piping system abbreviation and 1/2-inch (13-mm) numbers.
2. Tag Material: Brass, 0.032-inch (0.8-mm) minimum thickness, and having predrilled or stamped holes for attachment hardware.

3. Fasteners: Brass wire-link or S-hook. Wire shall not be used as a method for connecting the tags to the valve. The tags shall be installed after insulation has been installed.

4. Valve Schedules: For each piping system, on 8-1/2-by-11-inch (A4) bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

   a. Valve-tag schedule shall be included in operation and maintenance data.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Piping Color-Coding: Painting of piping is specified in Section "Interior Painting."

B. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels with painted, color-coded bands or rectangles on each piping system.

1. Identification Paint: Use for contrasting background.

2. Stencil Paint: Use for pipe marking.

C. Locate pipe labels where piping is exposed or above accessible ceilings in finished space; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.

2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.

3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.

4. At access doors, manholes, and similar access points that permit view of concealed piping.

5. Near major equipment items and other points of origination and termination.

6. Spaced at maximum intervals of 25 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.

7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
8. Space every 10’ in mechanical rooms.

END OF 220533

230548 - VIBRATION CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

A. Extent of vibration isolation work required by this section is indicated on drawings and schedules, and/or specified in other Division 15 sections.

B. Types of vibration isolation products specified in this section include the following:

1. Flexible Duct Connectors.
2. Isolation Hangers

C. Vibration isolation products furnished as part of factory-fabricated equipment, are specified as part of the equipment assembly in other Division 15 sections.

1.2 QUALITY ASSURANCE:

A. Product Qualification: Provide each type of vibration isolation unit produced by specialized manufacturer, with not less than 5 years' successful experience in production of units similar to those required for project.

1.3 QUALITY ASSURANCE:

A. Product Qualification: Provide each type of vibration isolation unit produced by specialized manufacturer, with not less than 5 years' successful experience in production of units similar to those required for project.

PART 2 - PRODUCTS

2.1 ISOLATION MATERIALS AND SUPPORT UNITS:

A. Neoprene Mountings: Double Deflection neoprene mountings with minimum static deflection of 0.35”. Provide friction pads for both top and bottom. Provide with bolt hole through center of pad for mounting. Mountings to be Mason Industries ND or equal.

B. Isolation Hangers: Hanger units formed with brackets and including manufacturer's standard compression isolators of type indicated. Design brackets for 5 times rated loading of units. Fabricate units to accept misalignment of suspension members, and for use with either rod or strap type members, and including acoustical washers to prevent metal-to-metal contacts.

1. Provide neoprene pad or shape, securely retained in unit, with threaded metal top plate.

2. Provide removable spacer in each unit, to limit deflection during installation to rated-load

deflection.

C. Flexible Duct Connectors: Laminated flexible sheet of cotton duct and sheet elastomer (butyl, neoprene or vinyl), reinforced with steel wire mesh where required for strength to withstand duct pressure indicated. Form connectors with full-faced flanges and accordion bellows to perform as flexible isolators unit, and of manufacturer's standard length for each size unless otherwise indicated. Equip each unit with galvanized steel retaining rings for airtight connection with ductwork.

D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering vibration isolation products, which may be incorporated in the work include, but are not limited to the following:

1. Peabody Noise Control, Inc.
2. Korfund Dynamics Corp.
3. Mason Industries, Inc.
4. Vibration Eliminator Co., Inc.

PART 3 - EXECUTION

3.1 APPLICATIONS:

A. General: Except as otherwise indicated, apply the following types of vibration isolators at indicated locations or for indicated items of equipment. Selection is Installer's option where more than one type is indicated.

B. Flexible Duct Connectors: Install at the following ductwork connections:

1. Connections with vibration-isolation-mounted air handling equipment (i.e. VAV boxes, etc.).

2. Provide flexible duct connections wherever ductwork connects to vibration isolated equipment or as indicated on the Drawings. Construct flexible connections of neoprene coated flameproof fabric crimped into duct flanges for attachment to duct and equipment. Make airtight joint. Provide adequate joint flexibility to allow for thermal, axial, transverse, and torsional movement, and also capable of absorbing vibrations of connected equipment Duro-Dyne, Elgen, Ventfabric or equal. All canvas connections shall have a flame spread of 25 or less and smoke developed rating not higher than 50.

C. Isolation Hangers: Install where the following suspended equipment is indicated:

1. Variable Air Boxes

END OF 230548

230593 - TESTING, ADJUSTING AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of testing, adjusting, and balancing work is indicated by requirements of this section, and also by drawings and schedules, and is defined to include, but is not necessarily limited to, air distribution systems, hydronic distribution systems and associated equipment and apparatus of mechanical work. The work consists of pressure testing, setting speed and volume (flow) adjusting facilities provided for systems, recording data, conducting tests, preparing and submitting reports, and recommending modifications to work as required by contract documents.

B. Component types of testing, adjusting, and balancing specified in this section includes the following as applied to mechanical equipment:

1. VAV Boxes
2. Air terminals
3. Piping systems.

1.3 QUALITY ASSURANCE:

A. Installer: A firm certified by Associated Air Balance Council (AABC) or National Environmental Balance (NEBB) in those testing and balancing disciplines similar to those required for this project. The tab contractor is to be independent of other related project contractors.

B. Industry Standards: Comply with American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE) recommendations pertaining to measurements, instruments and testing, adjusting and balancing, except as otherwise indicated.

1.4 SUBMITTALS:

A. Submit certified test reports signed by Test and Balance (TAB) Supervisor who performed TAB work.

B. Include identification and types of instruments used and their most recent calibration date with submission of final test report.

1.5 JOB CONDITIONS:

A. The tab contractor will conduct an inspection of the mechanical installation at 30% and 70% completion. A report on the installation will be given to the prime contractor listing items to be corrected and addressed prior to the tab contractor beginning tab work.

B. Do not proceed with testing, adjusting, and balancing work until work has been completed and is operable. Ensure that there is no latent residual work still to be completed.

C. Do not proceed until work scheduled for testing, adjusting, and balancing is clean and free from debris, dirt and discharged building materials.

D. HVAC Testing, Adjusting and Balancing:

1. All equipment shall be adjusted to operate as intended by the specification. All bearings shall be lined up. Bearings that have dirt or foreign material in them shall be replaced with new bearings without additional cost to the owner. All thermostats and control devices shall be adjusted to operate as intended. Adjust burners, fans, etc. for proper and efficient operation. Certify to Engineer that all adjustments have been made and that system is operating satisfactorily. Adjust all supply outlets to supply the amount of air shown on the drawings. Further adjustments shall be made to obtain uniform temperature in all spaces. Calibrate, set, and adjust all automatic temperature controls. Check proper sequencing of all interlock systems, and operation of all safety controls.

2. Contractor shall employ the services of a testing and balancing firm to take test readings on all fans and units, and to adjust fan speeds to deliver specified amounts of air. Testing and balancing report logs shall be made showing all air supply quantities, fan and unit test readings, etc.; (3) three copies of the log shall be submitted to the Engineer before final inspection of the project and is necessary for final payment. Log shall be listed by unit, and shall additionally indicate unit horsepower, motor nameplate amps, and actual amps draw after all adjustments are completed. Also each room shall be listed with total exhaust, supply and return air quantities listed.

3. Patch holes in insulation, ductwork and housings, which have been cut or drilled for test purposes, in manner recommended by original installer.

4. Prepare a report of recommendation for correcting unsatisfactory mechanical performances when system cannot be successfully balanced; including, where necessary, modifications which exceed requirements of contract documents for mechanical work.

5. Retest, adjust and balance systems subsequent to significant system modifications, and resubmit test results.

6. Include a fan curve for each fan serving a 2000 CFM or larger system, in the tab report.

E. HVAC Hydronic Piping Systems Testing and Balancing:

1. Contractor shall employ the services of a testing and balancing firm to take test readings on all unit balancing valves and orifices, across air handling unit coils, geothermal loops, to adjust valves to deliver specified amounts of water. Testing and balancing report logs shall be made showing water supply quantities; (3) three copies of the log shall be submitted to the Engineer before final inspection of the project and is necessary for final payment. Log shall be listed by units, loop numbers, pumps, etc..

2. Test and balance all hydronic pumps and adjust to proper flow. Record inlet, outlet and total pressure of pumps. record amperage draw and nameplate ratings.

3. Retest, adjust and balance systems subsequent to significant system modifications, and resubmit test results.

4. Thermometers and gauges shall be checked for accuracy. If instruments are proven defective, they shall be replaced.

5. System balancing shall be performed only by persons skilled in this work. The system shall be balanced as often as necessary to obtain desired system operation and results.

6. Prepare report of test results, including instrumentation calibration reports, in format recommended by applicable standards.

7. The Test and Balance Contractor shall assist the Architect/Engineer in verifying that proper measuring instruments and methods were used.

F. The tab field work is to be conducted in both the heating and cooling mode of operation. This may require the tab contractor to return to the site after the seasonal change over.

G. The materials, equipment and representative system tests may be witnessed by the University and the engineer. The names of any witnesses are to be listed on the test results.

H. The tab report is to be in a letter size binder with cover and edge title, introduction information, index, a set of drawings, equipment identification, data sheets, etc. A tab report is to accompany each M&O manual required.

I. All corrections of problems discovered by the TAB shall be corrected immediately by the responsible contractor and the system retested for compliance with contract documents.

END OF 230593

230700 - HVAC INSULATION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

A. Extent of mechanical insulation required by this section is indicated on drawings, and by requirements of this section.

B. Types of mechanical insulation specified in this section include the following:

1. Ductwork Insulation:

   a. Supply Air Duct (where concealed above ceilings)
   b. Flexible duct to diffusers.

2. Piping System Insulation:

   a. HVAC Hot Water Systems

1.2 QUALITY ASSURANCE:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to the following:

1. Babcock & Wilcox Co., Insulating Products Div.
2. Certainteed Corp.
3. Johns-Manville Corp.
4. Keene Corp.
5. Knauf Fiber Glass
6. Owens-Corning Fiberglass Corp.

B. Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastics and adhesives) with flame-spread rating of 25 or less, and smoke-developed rating of 50 or less, as tested by ANSI/ASTM E 84 (NFPA 255) method.

1.3 SUBMITTALS:

A. Product Data: Submit manufacturer's specifications and installation instructions for each type of mechanical insulation. Submit schedule showing manufacturer's product number, thickness, and furnished accessories for each mechanical system requiring insulation.

B. Certified Tests: With product data submit certified test reports on performances including burning characteristics and thermal insulating valves.

1.4 DELIVERY, STORAGE AND HANDLING:

A. Deliver insulation, coverings, cements, adhesives, and coatings to site in containers with manufacturer's stamp or label, affixed showing fire hazard ratings of products.

B. Protect insulation against dirt, water, and chemical and mechanical damage. Do not install damaged insulation; remove damaged insulation from project site.

PART 2 - PRODUCTS

2.1 PIPING INSULATION:

A. All hot water, chilled water, and domestic hot water piping shall be insulated within the mechanical rooms: The insulation shall be a heavy density, pipe insulation with a K factor .22 at 75°F mean temperature. The insulation shall be wrapped with a vapor barrier jacket with self-sealing lap, equal to Certain-teed, Mansville, Owens-Corning or Armstrong. Cover fittings with Zeston or equal premolded insulating fittings. Insulation shall be installed in a professional, neat appearing manner; poor workmanship shall be corrected at the Contractor's expense.

B. Application thicknesses shall be as follows:

1. Hydronic hot water piping 1-1/2" and smaller: 1" thick
2. Hydronic hot water piping 2" and larger: 2" thick

2.2 DUCT INSULATION FOR SUPPLY AIR, OUTSIDE AIR AND INDICATED EXHAUST AIR DUCTWORK:

A. Flexible Fiberglass Ductwork Insulation (Outside of Attic): FS HH-I-558, Form B, Type I. Insulation to have a density of 1.5 pcf density and shall have a "k" value of 0.28 maximum at 75 deg. F. Provide all-service insulation jacket with vapor barrier.

B. Application: Provide thicknesses of insulation on ductwork as follows:

1. Supply Air Duct: 1.5” thick

C. Ductwork Insulation Accessories: Provide staples, bands, wires, tape, anchors, corner and angles and similar accessories as recommended by insulation manufacturer for applications indicated. Provide cements, adhesives, coatings, sealers, protective finishes and similar compounds as recommended by insulation manufacturer for applications indicated.

D. All insulating materials, adhesives, coatings, etc., shall have a flame spread of 25 or less and smoke developed rating not higher than 50. All containers for mastics and adhesives shall have U.L. Label.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPING INSULATION:

A. General: Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose.

B. Install insulation materials with smooth and even surface. Insulate each continuous run of piping or ductwork with full-length units of insulation, with single cut piece to complete run. Do not use cut pieces or scraps abutting each other.

C. Clean and dry all surfaces prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.

D. Cover valves, fittings and similar items in each piping system with equivalent thickness and composition of insulation as applied to adjoining pipe run. Install factory molded, precut or job fabricated units (at Installer's option) except where specific form or type is indicated.

E. Install protective metal shields and insulated inserts wherever needed to prevent compression of insulation. Pipe Hanger Insulation Inserts: Butt pipe insulation against pipe hanger insulation inserts.

3.2 INSTALLATION OF DUCTWORK INSULATION:

A. General: Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose. All ductwork shall be externally insulated unless otherwise indicated.

B. Install insulation materials with smooth and even surfaces.

C. Clean and dry ductwork prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.

D. Maintain integrity of vapor-barrier on ductwork insulation, and protect it to prevent puncture and other damage.

E. Extend ductwork insulation without interruption through walls, floors and similar ductwork penetrations, except at penetrations through exterior building barriers and where otherwise indicated.

F. Refer to manufacturer’s instructions for additional insulation installation requirements.

3.3 PROTECTION AND REPLACEMENT:

A. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.

B. Protection: Insulation Installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

END OF 230700

SECTION 230900S03 – INSTRUMENTATION & CONTROL FOR HVAC

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of the Contract, including General and Supplementary Conditions, General Mechanical Provisions and General Requirements, Division 1 Specification Sections apply to the work specified in this section.

DESCRIPTION OF WORK:

Furnish a BACnet system compatible with existing University systems. All building controllers, application controllers, and all input/output devices shall communicate using the protocols and network standards as defined by ANSI/ASHRAE Standard 135-2001, BACnet. This system shall communicate with the University of Kentucky Facility Management's existing BACnet head-end software using BACnet/IP at the tier 1 level and BACnet/MSTP at the tier 2 level. No gateways shall be used for communication to controllers installed under section. BACnet/MSTP or BACnet/IP shall be used for all other tiers of communication. No servers shall be used for communication to controllers installed under this section. If servers are required, all hardware and operating systems must be approved by the Facilities Management Controls Engineering Manager and/or the Facilities Management Information Technology Manager.

All Building Automation Devices should be located behind the University firewall, but outside of the Medical Center Firewall and on the environmental VLAN.

Provide all necessary hardware and software to meet the system's functional specifications. Provide Protocol Implementation Conformance Statement (PICS) for Windows-based control software and every controller in system, including unitary controllers. These must be in compliance with Front End systems PICS and BIBBS and attached Tridium PICS and BIBBS. Provide all hardware and software to backup, restore, troubleshoot and install system. Software, backups, unitary, and ASC files shall be delivered to UEM (Utilities & Energy Management) for archiving purposes.

It is the contractor's responsibility to ensure that the University of Kentucky Facilities Management's head-end system's licensed device/point count is increased to accommodate the number of devices and/or points that are added to fulfill the contractor's obligation to meet the requirements of the project.

Prepare individual hardware layouts, interconnection drawings and software configuration from project design data.

Design, provide, and install all equipment cabinets, panels, data communication network cables needed, and all associated hardware.

Provide and install all interconnecting cables between supplied cabinets, application controllers, and input/output devices.

Provide complete manufacturer's specifications for all items that are supplied. Include vendor name of every item supplied.

Provide supervisory specialists and technicians at the job site to assist in all phases of system installation, startup, and commissioning.

Provide a comprehensive operator, administrator and technician training program as described herein.

Provide as-built documentation, programming software for use site wide, electronic copies of all diagrams, and all other associated project operational documentation (such as technical manuals on approved media, the sum total of which accurately represents the final system.

Furnish, install, and fit-up in complete working order, with all accessories required, the automatic temperature control and monitoring systems shown on the Drawings and specified herein. The systems shall be properly connected, piped and wired in a manner conforming to the laws, ordinances and codes now in force in the Commonwealth of Kentucky.

The controls and all listed I/O points from this project shall communicate with the University of Kentucky Facilities Management's existing BACnet software head-end station using BACnet/IP. All BACnet points shall be exposed to the University of Kentucky Facilities Management's head-end station. Graphics will be installed by UEM on the head-end system. All point and device names shall comply with the University Facilities Management standards and shall be approved before and included in the shop drawings submittal. Cooperate with the Owner (UEM) to ensure that all specified points and alarms communicate and operate on the head-end system. All point and device names shall comply with the University Facilities Management standards (format listed below, consult Utilities and Energy Management (UEM) for the correct abbreviations) and shall be included in the shop drawings submittal for review and approval. Point naming conventions and formats are listed further in this specification in the Direct Digital Controls Equipment section. Refer to University Standard 230553S02 for the AHU Naming Convention.

Related to the alarms, the contractor is to set up the alarm parameters specified by the system sequences of operations without enabling the alarms. Contractor is to provide a list of points containing alarm extensions to Owner (UEM). UEM will be responsible for doing the alarm names, alarm texts and enabling the alarm points provided on the list.

All work must be coordinated and scheduled with the UEM Controls group prior to any work being done on site.

Thermostats: Each terminal unit requires a thermostat for operation, unless specifically indicated on the Drawings to be slaved to another unit. Slaved terminal units shall be controlled to match the CFM and discharge air temperature of the master unit. Thermostat locations have been identified on the Drawings to the extent possible, but all such locations may not be shown. Provide the required thermostats whether or not shown on the Drawings. For those thermostats not shown on the Drawings, work out an acceptable location with the Architect/Engineer. Thermostats are to be provided with no doors.

The control equipment shall be complete and shall include, but not be limited to, all necessary valves, damper operators, pipe, fittings, etc.
Provide VFD's as specified in other sections.

The control and monitoring system for this project shall be made up using standard materials, equipment and components regularly manufactured for systems of this type. The system shall be complete in every respect and shall be a functioning system.

Electrical power wiring and interlock wiring for all controls, signal devices, equipment, alarms, etc., shall be in accordance with diagrams and instructions from the supplier of the systems. All power and control wiring, conduit and wiring connections required for the complete installation, including wiring to smoke dampers and combination fire/smoke dampers and their motors, shall be provided by this Contractor in accordance with Electrical specification requirements. Controls shall be on emergency power.

Refer to other Mechanical Division sections for installation of instrument wells, valve bodies, and dampers in mechanical systems; not work of this section.

QUALITY ASSURANCE:

Manufacturer: Subject to compliance with requirements, manufacturers offering controls that may be incorporated into the work at Tier 1 BACnet/IP include the following:

Vykon
Johnson Controls
Alerton

Subject to compliance with requirements, manufacturers offering controls that may be incorporated into the work at Tier 2 BACnet/MSTP include the following:

Honeywell
Johnson Controls
Alerton
Distech

Acceptable controls manufacturers shall include any controls manufacturers which utilize a BACnet protocol in accordance with the specification. If the bidding manufacturer is not listed above, documentation for approval as an equal must be submitted 10 days prior to the bid opening date to allow for evaluation by the university.

Installing Contractor: Installing controls contractors must comply with the following requirements:

The installing systems integration contractor has been in the business of installing BACnet controls for the last 5 years minimum. In addition, the installing systems integration contractor needs to demonstrate with documentation that they have provided the controls in a minimum of (3) hospital or university renovation projects of similar size and scope where they utilized a BACnet system.

The systems integration contractor must have on staff the following number of key personnel as a minimum, each with a minimum of 5 years of related BACnet controls installation experience: Project Manager - 2, Controls Applications Engineer - 2, Programmer - 2, Installation Supervisor - 2, Controls Technician - 5.

Prefer contractor staff to include Niagara Tridium AX/N4 certified technicians.

Contractor to have experience with successful integrations of controls with Niagara Tridium systems.

Contractor to have a minimum of 3 years of installation history with the brand of controls being bid.

Contractor must have a help desk operation or staff available for phone contact 24/7 for providing technical support to university staff. Call forward and emergency service numbers are not acceptable during normal business hours.

Codes and Standards:

Electrical Standards: Provide electrical components of pneumatic control systems which have been UL-listed and labeled, and comply with NEMA standards.

NFPA Compliance: Comply with NFPA 90A "Standard for the installation of Air Conditioning and Ventilating Systems" where applicable for controls and control sequences.

Kentucky Building Code: Comply with requirements where applicable for controls.

Provide products of the temperature control system with the following agency approvals:

UL-916; Energy Management Systems
UL-873; Temperature Indication and Regulating Equipment
UL-864; Subcategories UUKL, OUXX, UDTZ; Fire Signaling and Smoke Control Systems
CSA; Canadian Standards Association
FCC, Part 15, Subpart J., Class A Computing Devices

All products shall be labeled with the appropriate approval markings. System installation shall comply with NFPA, NEMA, NEC, Local and National Codes.

SUBMITTALS:

Product Data: Submit manufacturer's technical product data for each control device furnished, indicating dimensions, capacities, performance and electrical characteristics, and material finishes, also include installation and start-up instructions.

A. Shop Drawings, Product Data, and Samples

1. Each submittal shall have a cover sheet with the following information provided: submittal ID number; date; project name, address, and title; BAS Contractor name, address and phone number; BAS Contractor project manager, quality control manager, and project engineer names and phone numbers.
2. Each submittal shall include the following information.
    a. BAS riser diagram showing all DDC controllers, network repeaters, and network wiring.
    b. One-line schematics and system flow diagrams showing the location of all control devices.

c. Points list for each DDC controller, including: Tag, Point Type, System Name, Object Name, Expanded ID, Display Units, Controller Type, Address, Cable Destination, Module Type, Terminal ID, Panel, Slot Number, Reference Drawing, and Cable Number. The initial shop drawing submittal for review needs to include all point names meeting the naming convention outlined in this specification for UEM approval at the shop drawing phase prior to the contractor beginning any programming.

d. Vendor's own written description for each sequence of operations, to include the following:

- Sequences shall reference input/output and software parameters by name and description.
- The sequences of operations provided in the submittal by the BAS Contractor shall represent the detailed analysis needed to create actual programming code from the design documents.
- Points shall be referenced by name, including all software points such as programmable setpoints, range limits, time delays, and so forth.
- The sequence of operations shall cover normal operation and operation under the various alarm conditions applicable to that system.

e. Detailed Bill of Material list for each panel, identifying: quantity, part number, description, and associated options.

f. Control Damper Schedules. This spreadsheet type schedule shall include a separate line for each damper and a column for each of the damper attributes, including: Code Number, Fail Position, Damper Type, Damper Operator, Blade Type, Bearing Type, Seals, Duct Size, Damper Size, Mounting, and Actuator Type.

g. Control Valve Schedules. This spreadsheet type schedule shall include a separate line for each valve and a column for each of the valve attributes, including: Code Number, Configuration, Fail Position, Pipe Size, Valve Size, Body Configuration, Close off Pressure, Capacity, Valve CV, Calc CV, Design Pressure, Actual Pressure, and Actuator Type.

h. Cataloged cut sheets of all equipment used. This includes, but is not limited to, the following: DDC panels, peripherals, sensors, actuators, dampers, and so forth.

i. Range and scale information for all transmitters and sensors. This sheet shall clearly indicate one device and any applicable options. Where more than one device to be used is on a single sheet, submit two sheets, individually marked.

j. Hardware data sheets for all local access panels.

k. Software manuals for all applications programs to be provided as a part of the programming devices, and so forth for evaluation for compliance with the performance requirements of this Specification.

l. The controls contractor shall include their BACnet PICS and BIBB statements (as described in ASHRAE 135-2001) for each device.

3. BAS Contractor shall not order material or begin fabrication or field installation until receiving authorization to proceed in the form of an approved submittal. BAS Contractor shall be solely responsible for the removal and replacement of any item not approved by submittal at no cost to the Owner.

4. Submittal shall have approved point names.

Maintenance Data: Submit maintenance instructions and spare parts lists for each type of control device. Include that type data, product and shop drawings in maintenance manual.

Operation and Maintenance Instructions:

This contractor shall prepare an electronic Operations Manual entitled "Automatic Temperature Control and Monitoring Systems Operation and Maintenance Data." Manual shall be PDF files with separate PDFs for each of the items noted below.

Each manual shall contain the following information:

Name and address of Consulting Engineer, Contractor, and index of equipment, including vendor (name and address).

Complete brochures, descriptive data and parts list, etc., on each piece of equipment, including all approved shop drawings.

Complete maintenance and operating instructions, prepared by the manufacturer, on each major piece of equipment, including preventative maintenance instructions.

Complete shop drawing submittal on temperature and monitoring controls including control diagrams updated to reflect "as-built" conditions.

All wiring and component schematics necessary for Owner (UEM) to troubleshoot, repair and expand the system.

All manuals shall be submitted to the Engineer prior to final inspection of the building.

Provide a laminated copy mounted in a sleeve on the outside of the panels for the controls sequences pertinent to equipment supplied by that specific controls panel.

Controls Program Backup: At the end of the project, the contractor is to supply digital back-up copies of all final complete operating controls programs. These shall be delivered to UEM for archiving purposes.

DELIVERY, STORAGE AND HANDLING:

Provide factory shipping cartons for each piece of equipment and control device. Maintain cartons while shipping, storage and handling as required to prevent equipment damage and to eliminate dirt and moisture from equipment. Store equipment and materials inside and protect from weather.

PART 2 - PRODUCTS

DIRECT DIGITAL CONTROL SYSTEM

General: This specification defines the minimum hardware and performance requirements for a computer-based building automation system to be furnished and installed.

SCOPE OF WORK:

System Requirements:

Contractor shall provide all equipment, engineering and technical specialist time to check the installation required for a complete and functioning system. The contractor shall furnish and install all interconnecting system components. Components to include, but not be limited to: power line conditioners, field panels, sensors, motor starter interfaces, and any other hardware items not mentioned above but required to provide the Owner with a complete workable system.

Any feature or item necessary for complete operation, trouble-shooting, and maintenance of the system in accordance with the requirements of this specification shall be incorporated, even though that feature or item may not be specifically described herein. This shall include hardware and software.

All materials and equipment used shall be standard components, regularly manufactured for this and/or other systems and not custom designed especially for this project. All systems and components shall be thoroughly tested and proven in actual use.

Input/Output Summary:

The system as specified shall monitor, control and calculate all of the points and functions as listed in the Input/Output Summary.

System Start-Up and Acceptance:

Upon completion of the installation, the BAS Contractor shall start-up the system and perform all necessary testing and debugging operations. An acceptance test in the presence of the Owner's representative shall be performed. The vendor shall check all sensors that exhibit any problems or faulty reading. When the system performance is deemed satisfactory in whole by UEM, the system parts will be accepted for beneficial use and placed under warranty. The BAS Contractor is to be available for system commissioning at the end of the installation when requested by the Engineer and/or Owner. The contractor is to also be available for seasonal commissioning for the other seasons beyond the initial commissioning.

This Contractor shall work with the Owner (UEM), who is developing the graphics, to ensure that all points report, function and alarm as required on the BACnet head-end system. The Contractor will also work with the Project Manager or CNS/MCIS to obtain all necessary IP’s and Ethernet drops needed for BACnet panel. The Owner (UEM) will assign all BACnet/IP instance numbers and all BACnet/MSTP network numbers for use by the Contractor. All BACnet/IP devices will report directly to the head-end system.

UEM will be performing their own complete point by point evaluation as part of this project,

independently of the commissioning activity. This will occur during the warranty period of the project.

Facilities Management's Instruction:

The BAS Contractor shall provide two copies of an electronic version of the operator's manual describing all operating and routine procedures to be used with the system. This user's manual should contain subjects such as: standard operation, error message explanations, software usage, commands, system troubleshooting, etc. The Contractor shall also provide wiring schematics for all system components.
The BAS Contractor shall instruct the Owner's designated representatives in these procedures during the start-up and test period. The duration of the instruction period shall be no less than four (4) hours during two 2 hour sessions. (Number of hours may be adjusted to a max of 40 dependent upon the size and scope of project. For larger projects, training vouchers for instructional training at the manufacturer's facilities may be requested in lieu of on-site training.) These instructions are to be conducted during normal working hours at the Owner's convenience and are to be prearranged with the Owner. The owner can request this training any time within the one year warranty period and may request any number of classes adding up to the total number of hours. The contractor shall provide an hourly unit price for additional on-site training.

The instructions shall consist of both hands-on at the job site and classroom training at a classroom location on the University of Kentucky campus coordinated with the Project Manager and UEM.

Upon completion, the attendees shall be able to operate the system and implement system changes including start-up, boot load, add point to the data base, enter messages, and down line load field units.

Prior to the scheduling of the sessions, an agenda outlining the training topics must be submitted for approval. Agenda items shall include, but not be limited to, the following topics:

1) Explanation of control sequences. Include which sensors are used and how output device operates.
2) Explanation of control drawings and manuals, including symbols, abbreviations, and overall organization.
3) Walk-through of project to identify controller locations and general routing of network cabling.
4) Review of operation and maintenance of hardware devices including air compressor, air dryers, controllers, instruments, and sensors. Include schedule for routine maintenance.
5) Programming Application Specific Controllers
   (a) Backing up and Restoring Application Specific Programming
   (b) Adding/Deleting/Editing points on Application Specific controllers
   (c) Troubleshooting Application Specific controllers (inputs/outputs/logic/master – slave relationships/bus issues)
6) Programming Building Specific Controllers
   (a) Backing up and Restoring Building Specific Controllers Programming
   (b) Adding/Deleting/Editing points on Building Specific Controllers controllers
   (c) Troubleshooting Building Specific Controllers, controller's

(inputs/outputs/logic/network issues)

7) How to use tools and cables

Warranty:

The system including all hardware and software components shall be warranted for a period of one year when the system performance is deemed satisfactory in whole by UEM. The system parts will be accepted for beneficial use and placed under warranty at that time. A Certificate of Occupancy does not initiate the control system warranty. Any defects in materials and workmanship arising during this warranty period shall be corrected without cost to the Owner.

All applicable software as detailed in this specification shall be updated by the BAS Contractor free of charge during the warranty period. This will ensure that all system software will be the most up-to-date software available from the BAS Contractor.

DIRECT DIGITAL CONTROL (DDC) EQUIPMENT

System Software

All software required for monitoring, modifying, configuring and backup for the system shall be embedded in the controller and accessible via VT terminal, hyper-terminal or the web. This software shall allow any computer with access (and security) to the University's network to perform the work described above using a web browser or provided software. No software upgrades should be required unless provided at no additional cost to the customer. The software version used for installation of any new devices must either be at the current software version used on the University Facilities Management campus at the current JAVA version or the new software at the most current JAVA version must be installed on all devices and the current system prior to the installation of the new devices. All software is to also operate on the latest version of Microsoft Windows operating system. All configuration and programming tools required for the upgraded version must be provided at the time of installation.

Provide a USB, standard RS-232 9 pin female, Bluetooth, RJ11, RJ12 or RJ45 connection for on-site access.

BACnet Conformance

Building Controller shall as a minimum support MS/TP and Ethernet BACnet LAN types. It shall communicate directly via these BACnet LANs as a BACnet device and shall support simultaneous routing functions between all supported LAN types. Global controller shall be a BACnet conformance class 3 device and support all BACnet services necessary to provide the following BACnet functional groups:

1. Clock Functional Group
2. Files Functional Group
3. Reinitialize Functional Group
4. Device Communications Functional Group
5. Event Initiation Functional Group

Please refer to end of this section for a complete list of the services that must be directly supported to provide each of the functional groups listed above. All proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data.

Standard BACnet object types supported shall include as a minimum: Analog Value, Binary Value, Calendar, Device, File, Group, Notification Class, Program and Schedule object types. Alarms should also be setup on this system with limits. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data.

The Building Controller shall comply with Annex J of the BACnet specification for IP connections. This device shall use Ethernet to connect to the IP internetwork. It must support interoperability on the campus area network and function as a BACnet Broadcast Management Device (BBMD) and/or a BACnet router.

Building Controller (B-BC)

General

Building Controller (B-BC) shall be minimum 16-bit microcomputer-based, utilizing a multi-tasking, multi-user operating system.

The B-BC controllers shall permit the simultaneous operation of all control, communication facilities management and operator interface software, as programmed by the Contractor or User. Modification of the on-board B-BC controller database shall be performed on-line using the built-in software. Systems which require the B-BC to be removed from service while DDC control sequences are modified shall not be acceptable.

B-BC controllers shall utilize true floating point arithmetic capabilities.

All B-BC controllers shall have open licensing to connect to existing UK UEM Tridium BACnet BAS.

Databases and Memory Back-Up

All programming defining the functions to be performed by the B-BC, including but not limited to application programs and point database within each B-BC, shall be protected from loss due to power failure for a minimum of 72 hours. All database and backup shall be provided to the UK UEM Controls group.

Service Ports

B-BC controllers shall be equipped with a minimum of one operator service port for the connection of a laptop computer. The service port shall be either a built-in standard RS-232 data terminal port, USB port, CAT5 cable or RJ11/12 connection.

Connection of a service device, to a service port, shall not cause the B-BC controller to lose communications with its peers or other networked device controllers.

Display and Readout Capability

The B-BC controller shall additionally provide diagnostic LED indication of device transmit and receive data communications for all communication port and peripheral ports, normal operation, abnormal operation and control relay operation indication.

Manual/Auto Control and Notification

The B-BC controller shall provide commanded override capability from the built-in operator interface. Such overrides shall be annunciated to the head-end station. Such overrides shall be valid as long as power is applied to the controller.

Adjustments

Every control panel shall provide adjustments for the functions specified. In general, adjustments shall be provided for all setpoints used by controllers within each control panel. In addition, adjustments shall be provided for throttling ranges, mixed air damper minimum positions, or other items as specified. Adjustments shall be integral to each individual B-BC. The built-in operator interfaces shall allow the easy execution of the adjustment through named identifiers within the B-BC. From a single B-BC user interface, any other B-BC shall be accessible and full adjustment capabilities shall be provided.

B-BC Naming Convention

B-BC devices shall be named using the following naming convention:

> *B-BC devices shall be named using the following format:*
> *BuildingName_BuildingNumber_Floor_RoomNumber_B-BC Device Type* OR
> *BuidlingNumber_BuildingName_Floor_RoomNumber_B-BC Device Type*
>
> *All B-AAC points shall be named using the following format:*
> *Building_Floor_RoomNumber_Device Type_Equipment ShortName_Function*

Examples:

A B-BC device located in the Pavilion HA mechanical room HA4001 would be named as follows:

PAVHA_0293_04_HA4001_JACE

An exhaust fan status point for a fan in Pavilion HA mechanical room HA3001 fed directly from the above panel would be named as follows:

PAVHA_03_HA3001_HVA_EF1_STAT

For function short names and building short names and numbers, contact the University Controls Engineering Department.

Advanced Application Controller (B-AAC)

General

Controls shall be microprocessor-based, Advanced Application Controllers (B-AAC's). B-AAC's shall be provided for Air Handling Units, packaged Rooftops, primary and secondary pumping loop systems and other applications as shown on the drawings. B-AAC's shall be based on a minimum 16 bit microprocessor working from software program memory which is physically located in the B-AAC. The application control program shall be resident within the same enclosure as the input/output circuitry which translates the sensor signals. All input/output signal conversion shall be performed through a minimum of a 10 bit A to D converter. All input points shall be universal in nature allowing their individual function definition to be assigned through the application software. All unused input points must be available as universally definable at the discretion of the owner. If the input points are not fully universal in nature, unused points must be equal in quantity between Analog Inputs and Digital Inputs.

All B-AAC controllers shall have open licensing to connect to existing UK UEM Tridium BACnet BAS.

Contractor shall provide a minimum of one B-AAC controller per air handling or mechanical system as shown on the drawings.

The BAS contractor shall provide and field install all B-AAC's specified under this section. Mechanical equipment manufacturers desiring to provide B-AAC' type controls as factory mounted equipment, shall provide a separate bid for their products less all controls, actuators, valve assemblies and sensors, which are specified to be provided by the BAS/Temperature control contractor.

All input/output signals shall be directly hardwired to the B-AAC. Troubleshooting of input/output signals shall be easily executed with a volt-ohm meter (VOM). As a result of this intent, it is specified that power line carrier systems, or other systems which command multiple outputs over a single pair of wires, shall not be utilized.

B-AAC's shall be in continuous direct communication with the network which forms the facility wide Building Automation System. The B-AAC's shall communicate with the B-BC at a minimum baud rate of 9,600 baud.

Non-Volatile Memory

All control sequences programmed into the B-BC shall be stored in non-volatile memory, which is not dependent upon the presence of a battery, to be retained. Power failures shall not cause the GDC memory to be lost, nor shall there be any need for batteries to be recharged or replaced to maintain the integrity of the controller database. The B-BC shall allow for the creation of unique application control sequences. Systems that only allow selection of sequences from a library or table are not acceptable.

All control sequences shall be fully programmable at the B-AAC, allowing for the creation and editing of an application control sequence, while at the unit.

The B-AAC shall be provided with an interface port (standard RS232 data terminal port or USB port) for a laptop computer. The interface port shall allow the laptop to have full functionality as described above. From the interface port or *network terminal, the laptop shall be able to directly access any B-AAC or B-ASC in the* network.

The B-AAC shall provide an input/output point trending utility that is capable of accumulating 48 analog point samples and 10 digital point samples, per Input/Output point. Each sample shall be taken on a user defined interval, ranging from 1 second to 255 hours per sample. The digital readings shall be on a change of state occurrence for the digital points. All samples shall be recorded with the engineering units for the value, along with a time and date identifier for each sample taken. The samples shall be protected against loss due to power interruptions through a battery or capacitor backup method for a minimum of 30 days.
Systems unable to provide the above capability shall provide for the individual Input/Output point trending at the B-BC. Specifics as to how each B-AAC point will be trended, at the B-BC, shall be provided in the submittal documents. Included in the explanation shall be the sample intervals, the memory allocation in the B-BC and the number of B-AAC's per B-BC that can be expected.

The B-AAC shall provide LED indication of transmit/receive communications performance, as well as for the proper/improper operation of the controller itself.

The B-AAC shall be provided with a battery backed time clock that is capable of maintaining the time of day and calendar for up to thirty days, upon loss of power to the B-AAC, without loss of setting. The battery for the time clock shall be replaceable by the customer. The B-AAC shall be provided with integral time schedules; as a minimum, two seven day schedules with eight on/off periods per day shall be provided. Holiday override of weekly schedules shall be provided for pre-scheduling of holidays, for the year in advance.

Controller Location

To simplify controls and mechanical service troubleshooting, the B-AAC shall be capable of being mounted directly in or on the controls compartment of the air handling system. The B-AAC shall be housed in a NEMA 1 enclosure to accommodate direct mounting on the equipment to be controlled. The B-AAC shall be constructed in a modular orientation such that service of the failed components can be done quickly and easily. The modular construction should limit the quantities of printed circuit boards to a maximum of two. All logic, control system, power supply and input/output circuitry shall be contained on a single plug-in circuit board. When required to replace a printed circuit board, it shall not be necessary to disconnect any field wiring. This shall allow all controls maintenance and troubleshooting to be made while at the air handling unit. The B-AAC shall be directly wired to sensory devices, staging relays or modulating valves for heating and cooling.

Every controller and control panel shall be labeled with a lamacoid plate permanently secured to the device. Sticky tape or glued labels are not acceptable. The labeling shall describe the device and include related information such as MAC address, IP address, BACnet Instance numbers, etc.

All power feeds shall be clearly identified and shall include panel number, breaker and electrical panel location if not in the same room.

For compatibility to the environment of the air handling unit, B-AAC's shall have wide ambient ratings. B-AAC's shall be rated for service from -40 DegF (Degrees Fahrenheit) to 140 DegF.

Contractor shall submit description of location of B-AAC's on all mechanical and air handling equipment.

B-AAC Naming Convention

B-AAC devices shall be named using the following naming convention:

B-AAC devices shall be named using the following format:
Building_Floor_RoomNumber_B-AAC Device Type_Equipment Short Name

All B-AAC points shall be named using the following format:
Function

Examples:

An Air Handler controller in the Pavilion HA mechanical room HA4001 for AHU7 would be named as follows:

PAVHA_04_HA4001_HVA_AHU7

The mixed air temperature point for the above system would be named as follows:

MAT

Therefore, when this point is learned, the entire point name will be:

PAVHA_04_HA4001_HVA_AHU7_MAT

For function short names and building short names and numbers, contact the University Controls Engineering Department.

Application Specific Controller (B-ASC)

General

Controls shall be microprocessor based Application Specific Controller (B-ASC). B-ASC's shall be provided for Unit Ventilators, Fan Coils, Heat Pumps and other applications as shown on the drawings. B-ASC's shall be based on a minimum 16 bit microprocessor working from software program memory which is physically located in the B-ASC. The application control program shall be resident within the same enclosure as the input/output circuitry which translates the sensor signals. All input/output signal conversion shall be performed through a minimum of a 10 bit A to D converter.

Contractor shall provide a minimum of one B-ASC controller per unitary system as shown on the drawings.

The BAS contractor shall provide and install all B-ASC's specified under this section.

All input/output signals shall be directly hardwired to the B-ASC. Troubleshooting of input/output signals shall be easily executed with a volt-ohm meter (VOM). As a result of this intent, it is specified that power line carrier systems, or other systems which command multiple outputs over a single pair of wires, shall not be utilized.

B-ASC's shall be in continuous, direct communication with the network which forms the facility

wide building automation system. The B-ASC's shall communicate with the B-BC at a baud rate of no less than 38,400 baud.

Non-Volatile Memory

All control sequences programmed into the B-ASC shall be stored in non-volatile memory, which is not dependent upon the presence of a battery, to be retained. Power failures shall not cause the B-ASC memory to be lost, nor shall there be any need for batteries to be recharged or replaced to maintain the integrity of the controller database. The B-ASC shall allow for the creation of unique application control sequences.

The B-ASC shall be provided with the ability to interface with a laptop computer. The interface port shall be provided at the wall sensor or within the unitary equipment. Connection to the wall sensor must be a standard RJ-45 or USB port.

The B-ASC shall provide an input/output point trending utility that is capable of accumulating 48 analog point samples and 10 digital point samples per Input/Output point. Each sample shall be taken on a user defined interval, ranging from 1 second to 255 hours per sample. The digital readings shall be on a change of state occurrence for the digital points. All samples shall be recorded with the engineering units for the value, along with a time and date identifier for each sample taken.

Systems unable to provide the above capability shall provide for the individual input/output point trending at the B-BC. Specifics as to how each B-ASC point will be trended, at the B-BC, shall be provided in the submittal documents. Included in the explanation shall be the sample intervals, the memory allocation in the B-BC and the number of B-ASC's per B-BC that can be expected.

Controller Location

To simplify controls and mechanical service troubleshooting, the B-ASC shall be mounted directly in the controls compartment of the unitary system. The B-ASC shall be provided with a sheet metal or polymeric enclosure that is constructed of material allowing for the direct mounting within the primary air stream, as defined by UL-465. The direct mounting shall allow all controls maintenance and troubleshooting to be made while at the unitary equipment. The B-ASC shall be directly wired to sensory devices, staging relays or modulating valves for heating and cooling.

For compatibility to the environment of the unitary equipment, B-ASC shall have wide ambient ratings. B-ASC's shall be rated for service from 32 DegF (Degrees Fahrenheit) to 140 DegF.

Contractor shall submit description of location of B-ASC's on all mechanical and unitary equipment.

B-ASC Naming Convention

B-ASC devices shall be named using the following naming convention:

B-ASC devices shall be named using the following format:
Building_Floor_RoomNumber_B-ASC Device Type

All B-ASC points shall be named using the following format:

Function

Examples:

A VAV controller in the Pavilion HA room HA498 would be named as follows:

PAVHA_04_HA498_VAV

The discharge air temperature point for the above room would be named as follows:

DAT

Therefore, when this point is learned, the entire point name will be:

PAVHA_04_HA498_VAV_DAT

For function short names and building short names and numbers, contact the University Controls Engineering Department.

CONTROL PANELS

Panelboard shall contain all instruments and accessories. Provide each item of equipment with an engraved nameplate. Panelboard shall be wall-mounted or stand-mounted and shall be completely enclosed.

As far as is practical, the control components for each system shall be grouped. Provide each group of components with identification.

The entire panelboard shall be pre-wired and brought to a main terminal strip. All relays, switches, etc., shall be installed, furnished and wired on panelboard. Clearly mark each terminal strip as to which wire from which component is to be connected.

Fabricate panels of 0.06-inch- (1.5-mm-) thick, furniture-quality steel or extruded-aluminum alloy, totally enclosed, with hinged doors and keyed lock, with manufacturer's standard shop-painted finish and color.

Panel-Mounted Equipment: Temperature and humidity controllers, relays, and automatic switches; except safety devices. Mount devices with adjustments accessible through front of panel.

Door-Mounted Equipment: Flush-mount (on hinged door) manual switches, including damper-positioning switches, changeover switches, thermometers, and gages.

Graphics: Color-coded graphic, laminated-plastic displays on doors, schematically showing system being controlled, with protective, clear plastic sheet bonded to entire door.

SENSORS

Electronic Sensors used in air ducts or liquid lines shall utilize non-adjustable RTD or thermostat sensing elements with + or -0.36°F, accuracy and stability of at least + or -0.05°F per year. All sensors used in liquid line shall be provided with separable stainless steel immersion wells. Averaging sensors shall be a minimum of five (5) feet in length, and shall be installed in such a manner so as to sense representative sample of the medium being controlled.

Equipment Operation Sensors: As follows:

Status Inputs for Fans: Differential-pressure switch with adjustable range set to 175 percent of rated fan static pressure.

Status Inputs for Electric Motors: Current-sensing relay with current transformers, adjustable and set to 175 percent of rated motor current.

Damper Position Indication: Potentiometer mounted in enclosure with adjustable crank-arm assembly connected to damper to transmit 0 to 100 percent damper travel.

SENSOR INPUT AND OUTPUT DEVICES:

The following sensors and devices, or their equivalents, shall be considered acceptable. Other sensors and devices required for this specification are outlined in their respective subsystem.

Analog sensing elements for remote indication shall be independent of local pneumatic sensors used for local control loops.

System Accuracy: The system shall maintain an end-to-end accuracy for one year from sensor to operator's console display for the application specified.

STANDARD	Temperature Sensors
TYPE	Electronic
APPLICATION	BAS, HVAC, BTU, Boiler Control
STANDARD	100 or 1000 ohm platinum wire wound RTD element Standard J (3 wire) configuration European curve, Alpha = .00385 Ohms/Ohm/deg.C., meets DIN SID 43760 Wire in conduit
MECHANICAL	1/4" stainless steel sheath
SPACE TEMPERATURE	Sensor housing to be similar in appearance to existing thermostats except that thermometers are not required. Similarity to be Owner's decision. Locate on an outside wall if possible.
DUCT TEMPERATURE	Standard lengths -- 5.5", 11.5" and 17.5"

Other lengths with owner's written approval.

Locate in central area of airstream at minimum of 18” from reheat coil.

1/2" NPT mounting thread and flange and conduit connection.

Glass encapsulated element unless otherwise approved.

THERMOWELL — Drilled brass or stainless steel or brass fitting with stainless steel sheath built-up well with Owner approval.

Glass encapsulated element unless otherwise approved.

3/4" process connection with drilled wells.

1/2" NPT process connection on built-up wells.

Insertion into measured medium - 1" + 1/2" diameter of pipe.

Cast iron connector head - 1/2" NPT process connection and conduit connection.

Rated thermowell pressure = 250 psi.

ELEMENT ACCURACY must meet .1% DIN and the DIN 43760 standard.

OVERALL ACCURACY — ± 1 deg.F. General duct, space and thermowell temperatures.
± .75 deg.F. for thermowell ele. on 4" or larger pipes.
± .5 deg.F. for thermowell ele. on 8" or larger pipes.

OVERALL RANGE — -20% to l20% of possible operating conditions.

GENERAL NOTE If wires from RTD probe to DGP are to be more than 200 feet long, provide extra large cast iron connector head (nominal size 2-11/16 x 1/4) or junction box to accommodate a resistance to 4-20 mA convertor transmitter.

STANDARD — Pressure Sensor

TYPE — Electronic with LVDT element.

APPLICATION — 4-20 mA Output (2 wire)
Wire in conduit
Input voltage 10-35 volts DC
Loop resistance greater than or equal to 500 ohms

MECHANICAL Linear variable differential transformer (LVDT) element
Allowable Standard Ranges 0- 30 PSI
0-100 PSI
0-200 PSI
Other ranges with Owner written approval
1/2" NPT input thread and conduit connection.
Provide differential inputs unless otherwise approved.
Provide an air filter on unused differential ports.
Provide with a NEMA 4 watertight enclosure unless otherwise approved.
Min. rate pressure - l50% FS proof and 450 PSI static.

OVERALL ACCURACY ± 0.5% F.S. including Linearity, hysteresis and repeatability.

ACCURACY NOTE: If pressure transducer is used to calculate flow with a pilot tube, then the accuracy of the pressure sensor should be dictated by the overall accuracy requirement of the system and would probably require a high accuracy sensor.

This section covers all new transducers provided. All new transducers provided shall be of the following type:

	INPUT	OUTPUT
l.	Temperature (deg.F.) Temperature (deg.F.)	4-20 mA, 2 wire 100 ohm platinum wire RTD
2.	Pressure	4-20 mA, 2 wire
3.	Flow Instantaneous	4-20 mA, 2 wire
4.	Flow Integrated	Pulse 10 PPS Max A25 msec open (min.) 40 msec closed (min.)
5.	KW Instantaneous	4-20 mA, 2 wire
6.	KWH - Integrated	Pulse – 10 PPS Max A25 msec open (min.) 40 msec closed (min.)

Digital inputs from devices with isolated, dry type contacts (no grounds, no voltage) of either normally open (N.O.) or normally closed (N.C.) configuration. Live contact inputs, those that have voltage present, shall be provided with isolating devices to meet dry contact requirement.

THERMOSTATS:

Room Thermostats: Provide room thermostats that work in conjunction with the B-AAC and B-ASC terminal unit controllers. Thermostats shall have visible thermometers, setpoint indication and

exposed setpoint adjustment in all areas except public spaces. Thermostats are to have push buttons on the front face for adjusting the temperature setpoints. Thermostats are to have no doors.

In cases where a single room sensor is to be shared by multiple controllers the slave box reheat control valves and dampers shall be individually controlled to track the discharge temperature of the master unit. The Master shall be identified locally and on the FMS.

An RJ-11 type connection to serial port shall allow a local portable operator or programmer's terminal to access all program blocks and attributes for complete programmability.

Room Thermostat Accessories: As follows:

Insulating Bases: For all thermostat installations.

Thermostat Guards: Locking transparent-plastic mounted on separate base.

Adjusting Key: As required for device.

Aspirating Boxes: Where indicated for thermostats requiring flush installation.

DAMPERS:

Provide automatic control dampers as indicated, with damper frames not less than 13-gage galvanized steel. Provide mounting holes for enclosed duct mounting. Provide damper blades not less than formed 16-gage galvanized steel, with maximum blade width of 8".

Secure blades to 1/2" diameter zinc-plated axles using zinc-plated hardware. Seal off against spring stainless steel blade bearings. Provide blade bearings of nylon and provide thrust bearings at each end of every blade. Construct blade linkage hardware of zinc-plated steel and brass. Submit leakage and flow characteristics plus size schedule for controlled dampers.

Do not exceed maximum 48"x48" damper size. For sizes larger then this maximum in either dimension, use multiple dampers with a separate operator for each damper. Do not link separate dampers together.

Operating Temperature Range: From -20° to 200° F. The occupant shall have an operation local range as scheduled.

For standard applications as indicated, provide parallel or opposed blade design (as selected by manufacturer's sizing techniques) with inflatable steel blade edging, or replaceable rubber seals, rated for leakage less than 10 CFM/sq.ft. of damper area, at differential pressure of 4" w.g. when damper is being held by torque of 50 inch-pounds.

ACTUATORS:

Electric Valve and Damper Motors: Size each motor to operate dampers or valves with sufficient reserve power to provide smooth modulating action or 2-position action as specified.

For all other applications, provide permanent split-capacitor or shaded pole type motors with gear trains completely oil-immersed and sealed. Equip spring-return motors, with integral spiral-spring mechanism. Furnish entire spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.

Equip motors for outdoor locations and for outside air intakes with "O ring" gaskets designed to make motors completely weatherproof, and equip with internal heaters to permit normal operation at -40° F.

Provide separate motor for each outside air, return air and exhaust air damper. Do not link dampers with different functions together on one damper motor.

Provide separate motor for each damper when overall damper size exceeds 48" in either dimension. Do not link different dampers together on one damper motor.

Binary backed-up motors are not acceptable.

MISCELLANEOUS:

Wells for Pipe Mounted Sensor: Wells shall have minimum working pressure of 150 WOG psig. Wells shall be brass or stainless steel.

Lightning Protection: All electric/electronic equipment supplied must be internally or externally lightning/transient surge voltage protected on all external power feeder and input/output connections which are subject to surge voltage transients. Provide high speed clamping elements which meet IEEE. STD. 472 (SWC) on all digital or analog date channels.

Pressure Instruments:

Differential Pressure and Pressure Sensors: Sensors shall have 4-20 mA output proportional signal with provisions for field checking. Sensors shall withstand up to 150% of rated pressure, without damaging device. Accuracy shall be within 2% of full scale.

Pressure Switches: Pressure switches shall have repetitive accuracy of $\pm$2% of range and withstand up to 150% of rated pressure. Sensors shall be diaphragm or bourdon tube design. Switch operation shall be adjustable over operating pressure range. Switch shall have application rated Form C, snap-acting, self-wiping contact of platinum alloy, silver alloy or gold plating.

Current Sensing Relays: Relays shall monitor status of motor loads. Switch shall have self-wiping, snap-acting Form C contacts rated for application. Setpoint of contact operation shall be field adjustable.

Low Voltage Wiring: Control wiring for analog functions shall be 18 AWG minimum with 600 volt insulation, twisted and shielded, 2 or 3 wire to match analog function hardware.

Manual Override Switches: In case of failure of the DDC system, provide override switches to operate fans, pumps, air handling units, cooling tower, heat exchangers, etc., manually in local interface control panel. Also for temperature and pressure control provide switches to allow supply temperatures, water temperatures, supply air pressure and fans to be manually regulated. All switches shall be located in locked panel to prevent unauthorized use of the manual override switches.

PART 3 - EXECUTION

INSPECTION:

Examine areas and conditions under which control systems are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

INSTALLATION OF AUTOMATIC TEMPERATURE CONTROLS

General: Install systems and materials in accordance with manufacturer's instructions, roughing-in drawings and details shown on the Drawings.

CONTROL WIRING:

Contact the project manager for all required Ethernet connections for this project.

Install control wiring, without splices between terminal points, color-coded. Install in neat workmanlike manner, securely fastened. Install in accordance with National Electrical Code. Install wiring in electrical conduit in all areas. All controls conduit shall be green in color.

Conceal conduit, except in mechanical rooms and areas where other conduit and piping are exposed.

Install all control wiring with color-coded wire in ¾" minimum size conduit. Wire gauge to be in accordance with National Electrical Code.
Connect electrical components to wiring systems and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torqueing requirements are not indicated, tighten connectors and terminals according to tightening requirements specified in UL 486A.

POWER WIRING:

Provide power wiring and conduit to air terminal units (if required) and to smoke dampers and combination fire/smoke dampers and their damper motors.

Furnish and install power cabling and conduit for temperature controls panels and equipment from emergency power panels. Each temperature control panel shall be connected to a separate circuit. Conduits shall connect to panels at the locations directed by the Contractor under Division 26. Final connection in the power panels shall be by Temperature Control Contractor in coordination with Division 26 Contractor.

MISCELLANEOUS:

Software Programming: All software programs shall be programmed by this Contractor.

Installation of Mechanical Devices: Refer to Mechanical Division sections for installation of valve bodies, control wells and dampers; not work of this section.

ADJUSTMENT AND SERVICE:

After completion of the installation, the automatic temperature control manufacturer shall regulate and adjust all thermostats, control valves, motors, and other equipment provided under his contract and shall place them in complete operating condition, subject to approval by the Engineer and Owner.

This shall include but not be limited to "tuning" of all control systems. Systems shall be tuned for decaying wave response and minimal overshoot of setpoint. Contractor is to not leave any system in an Auto Tune mode.

Room temperature controls shall have one temperature setpoint with less than a 0.5˚F between calculated heating and cooling temperatures.

This Contractor shall work with Balancing Contractor to provide verification of CFM reading from the DDC terminal unit controllers.

Final adjustment shall be performed by specially trained personnel in direct employ of manufacturer of primary temperature control system.

After completion of installation, perform the following:

Installation.
Check proper installation and connection of each control device.
Verify electric power.
Verify each sensor and actuator connection to field computer.

Field Computer Operation.
Point Test.
- check of wiring of each sensor and actuator end-to-end
- verify calibration of each sensor.
- verify manual operation of each actuator.

Local loop control.
- bring each local loop under control.
- check response to upset, change in setpoint.
- check full and partial load operation.

Supervisory functions.
- verify time clock schedules.
- verify reset control.

Verify communication with each field device.

- perform end-to-end sensor and actuator checks.
- verify that the database is correct.

Test other software.
Trend Logging.
Report Generation.
Remote Access.
System Documentation.

Verify proper operation of every control point in the presence of the Engineer. Include point-by-point checkout.

The control manufacturer shall provide a period of free service extending through one complete heating season and one complete cooling season, after acceptance of the control system, and shall report the condition of the control equipment to the Owner and the Architect.

PART 4 - SEQUENCE OF OPERATION: See plans.

AIR HANDLING UNITS (AHU)

For all AHUs, the following is a minimum points list that is required for each unit:
Supply discharge temperature
Return temperature
Mixed Air temperature
Preheat temperature
OA temperature
Damper positions – OA, RA, MA
Pressures – Discharge Static, 2/3 Static, Return Static
Fan Commands & Statuses of all fans – Supply, Return and Exhaust
Heating & Cooling Coil Valve Commands
All VFD information – Fans and Pumps
Pump Commands and Status
CFM readings – Discharge, Return, Outside Air
Humidifier Commands and Humidity points
Setpoints for temperature and pressures
Filter pressure differentials

Related to freezestat operation for all AHUs, the following sequence needs to be added to each sequence: *Upon tripping of the freezestat, the heating control valve is to modulate to maintain a heating plenum space temperature of 3 degrees F (adj) less than the specific unit DAT setpoint. Example: For unit with 55 DAT setpoint, plenum temperature is to control to 52 degrees.*

All AHUs shall be programmed to restart on their own without any software lockout reset required.

Reference University Standard 230553S02 for the AHU naming convention.

ROOM TERMINAL HVAC

For all rooms, provide the following points as a minimum:
CFM reading
Room DAT
Room temperature
Room temperature setpoint

For any space that may be unoccupied during periods of operation, consideration needs to be given in the design of the space to the University Energy Guidelines.

BACnet Protocol Implementation Conformance Statement:
The controls contractor shall include their BACnet PICS and BIBB statements (as described in ASHRAE 135-2001) for their BACnet Interface with their shop drawings. The interface shall comply with the following as a minimum.

Vendor Name: Tridium, Inc.
Product Family: Niagara Framework, including N4 Web Supervisor, JACE 6XX at Release 3.8, JACE 8xxx at release 4.6 or greater using the most current version of JAVA or HTML 5. All control work associated with this project must be fully compatible with this version of Tridium such that all alarms, points, etc. communicate and clear alarms seamlessly with the existing system.
Description: This product family provides bi-directional communication between the Tridium Niagara Framework and a BACnet system operating at BACnet Conformance Class 3, over Ethernet media.

BACnet Protocols are documented in Appendices A, B & C.

REQUIRED SUBMITTALS:

The following chart is supplied for the benefit of the Owner, Architect, Engineer and contractor to assure a complete submission of required information. It is a reference listing of documents required by the Specifications under this Section. Refer to Specifications Section - General Provisions for the general requirements of submittals.

ITEM	SHOP DRAWING	M&O MANUAL	PARTS LIST	WRITTEN DESCRIPTION
Control equipment	x	x	x	
Control systems	x			
Control sequence				x
"As-builts" drawings	x	x	x	
Frequency drives	x	x	x	
Air terminal units	x	x	x	

I/O Summary Charts	x			

Print and Save Excel I/O Summary Sheet in Spec Directory (Add general IO Point list)

Appendix A – Vykon Niagara Compatibility Statement (NiCS)

VYKON Niagara^{AX} Compatibility Statement (NiCS) Includes all VYKON branded JACE and Software Products

VYKON Niagara^{AX} Compatibility Statement (NiCS)

Includes all VYKON branded JACE and Software Products

The following information describes Tridium's VYKON branded Niagara^{AX} product licensing.

Tridium's VYKON AX branded products utilizes an open access licensing procedure. VYKON AX branded products can be connected to and managed by any Niagara based tools or systems without the need to modify the license. This means the end user does not have to authorize changes to a VYKON AX license for another systems integrator to gain access to the system. The end user does need to have the necessary user names and passwords installed by the original system integrator so they can be used by another Niagara trained system integrator.

The following is an explanation of the VYKON licensing scheme.

BrandID

Every licensed station and tool has a Brand Identifier (BrandID). This field holds a text descriptor that the OEM chooses as the identifier for its product line. Each station or tool can have only one BrandID entry.

Tridium's VYKON products have the following:

BrandID – VYKON

Station Compatibility In

This field is a list of brands that this local station will allow Niagara AX data to come in from. Simply stated from the point of view of a JACE, "this is the list of brands that can I can accept data from". Tridium's VYKON products contain:

Station Compatibility In – All (In the actual license ALL is define by an *)

Note: The compatibility fields can contain; a single brand "ABC", a list of multiple brands "ABC, XYZ", no brand

"None" or all brands "All".

Station Compatibility Out

This field is a list of brands that this local station will allow Niagara AX data to be shared with. Simply stated, "This is the list of brands that I can share data with". Tridium's VYKON products contain:

Station Compatibility Out – All

Tool Compatibility In

This field is a list of brands that this station will allow to be connected to it for engineering of its application. Simply stated, "This is the list of brands that can engineer me". Tridium's VYKON products contain:

Tool Compatibility In – All

Tool Compatibility Out

This field is a list of brands that this tool is allowed to connect to and engineer. Simply stated, "This is the list of brands that I can engineer". Tridium's VYKON products contain:

Tool Compatibility Out – All

As long as VYKON branded products are purchased by the end user any Tridium Certified (TCP) system integrator can provide support for the end user without the need for the owner to be involved in the licensing process. For more information on Niagara Connectivity and Security visit our website library at: http://www.vykon.com/cs/library/white_papers

Management Contacts:
Scott Boehm
Director, VYKON Automation Energy Security
Sboehm@tridium.com

Ed Merwin
Director, VYKON Automation Energy Security
Ed.merwin@tridium.com

3951 Westerre Parkway
Suite 350
Richmond, VA 23233
804-747-4771

www.vykon.com

Appendix B – Tridium Niagara 3.8 BACnet PICS

TRIDIUM

8951 Westerre Parkway, Suite 350
Richmond, Virginia 23233 USA
1.804.747.4771 Phone
1.804.747.5204 Fax

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TRIDIUM NIAGARA AX 3.8
BACnet PICS

BACnet Protocol Implementation Conformance Statement

Date: August 31, 2016
Vendor Name: Tridium
Product Name: Niagara AX BACnet Integration
Product Model Number: Tridium JACE models
Application Software Version: 3.8.112 or higher
Firmware Revision: 3.8.112.1 or higher
BACnet Protocol Revision: 7

Product Description:
Niagara AX provides the ability to view, monitor, and control BACnet devices over IP, raw Ethernet, or MS/TP media. Devices, points, schedules, alarms, and logs can be learned and managed from Niagara AX. In addition, Niagara points, schedules, histories, and alarming can be exposed to BACnet for monitor and control by foreign BACnet clients.

BACnet Standardized Device Profile (Annex L):

☐ **BACnet Advanced Operator Workstation (B-AWS)**
☐ **BACnet Operator Workstation (B-OWS)**
☐ **BACnet Operator Display (B-OD)**
☒ **BACnet Building Controller (B-BC)**
☐ **BACnet Advanced Application Controller (B-AAC)**
☐ **BACnet Application Specific Controller (B-ASC)**
☐ **BACnet Smart Sensor (B-SS)**
☐ **BACnet Smart Actuator (B-SA)**

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3951 Westerre Parkway, Suite 350
Richmond, Virginia 23233 USA
1.804.747.4771 Phone
1.804.747.5204 Fax

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Additional BACnet Interoperability Building Blocks Supported (Annex K):

Data Sharing DS-RP-A, B DS-RPM-A, B DS-WP-A, B DS-WPM-A, B DS-COV-A, B DS-COVU-A, B DS-V-A DS-M-A DS-COVP-B	**Device & Network Management** DM-DDB-A, B DM-DOB-A, B DM-DCC-B DM-RD-B DM-TS-B DM-UTC-B DM-LM-A, B DM-BR-B DM-ANM-A DM-ADM-A DM-ATS-A DM-MTS-A
Alarm & Event Management AE-N-A, -I-B AE-ACK-A, B AE-ASUM-B AE-ESUM-B AE-INFO-B AE-VN-A AE-VM-A	**Trending** T-VMT-A, I-B, -E-B T-ATR-A, B T-V-A
Scheduling SCHED-A, I-B, -E-B SCHED-VM-A SCHED-WS-I-B	**Network Management** NM-CE-A

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Richmond, Virginia 23233 USA
1.804.747.4771 Phone
1.804.747.5204 Fax

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Segmentation Capability:

Feature	Supported	Window size
Transmit Segmented Messages	yes	10
Receive Segmented Messages	yes	any

Standard Object Types Supported:

- The CreateObject and DeleteObject services are not supported, so no objects are dynamically creatable or deletable through BACnet service requests, although these objects are dynamically creatable and deletable through Niagara.
- No general range restrictions exist; however, certain specific applications may have specific range restrictions.
- All potentially available properties are listed for each object type.
- Optional properties are listed in *italics*. Not all instances support all optional properties.
- Writable properties are listed in **bold**. Any range limitations are expressed in parentheses following the property name.

Notes from Table

1. The File_Size property of File objects is only writable if the underlying system file is changeable.
2. The Setpoint property of Loop objects is writable only if the setpoint is not linked from within Niagara.
3. The Recipient_List property of the Notification Class object will maintain entries that are internally configured within Niagara.
4. The List_Of_Object_Property_References property of the Schedule object will maintain entries that are internally configured within Niagara.
5. The Priority_For_Writing property of Schedule objects is not important for internal Niagara operation, as the priority at which a point is commanded is determined by the input to which the Schedule output is linked.
6. These Trend Log object properties are not writable if the backing history for the exported Trend Log is a Niagara-generated history. If the history is created as a BACnet Trend Log, then they are writable.
7. Trend Logs in Niagara use internal triggering and are either COV or Interval. So the Log_Interval property cannot be written from BACnet.

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3951 Westerre Parkway, Suite 350
Richmond, Virginia 23233 USA
1.804.747.4771 Phone
1.804.747.5204 Fax

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Object Type	Properties	
Analog Input	Object_Identifier **Object_Name** Object_Type Present_Value ***Description*** *Device_Type* Status_Flags Event_State *Reliability* **Out_Of_Service** Units *Min_Pres_Value* *Max_Pres_Value*	*Resolution* ***COV_Increment*** ***Time_Delay*** ***Notification_Class*** ***High_Limit*** ***Low_Limit*** ***Deadband*** ***Limit_Enable*** *Event_Enable* *Acked_Transitions* ***Notify_Type*** *Event_Time_Stamps*
Analog Output	Object_Identifier **Object_Name** Object_Type Present_Value ***Description*** *Device_Type* Status_Flags Event_State *Reliability* **Out_Of_Service** Units *Min_Pres_Value* *Max_Pres_Value* *Resolution*	Priority_Array **Relinquish_Default** ***COV_Increment*** ***Time_Delay*** ***Notification_Class*** ***High_Limit*** ***Low_Limit*** ***Deadband*** ***Limit_Enable*** *Event_Enable* *Acked_Transitions* ***Notify_Type*** *Event_Time_Stamps*
Analog Value	Object_Identifier **Object_Name** Object_Type Present_Value ***Description*** Status_Flags Event_State *Reliability* **Out_Of_Service** Units *Priority_Array* ***Relinquish_Default***	***COV_Increment*** ***Time_Delay*** ***Notification_Class*** ***High_Limit*** ***Low_Limit*** ***Deadband*** ***Limit_Enable*** *Event_Enable* *Acked_Transitions* ***Notify_Type*** *Event_Time_Stamps*

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Richmond, Virginia 23233 USA
1.804.747.4771 Phone
1.804.747.5204 Fax

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Object Type	Properties	
Binary Input	Object_Identifier **Object_Name** Object_Type Present_Value ***Description*** *Device_Type* Status_Flags Event_State *Reliability* **Out_Of_Service** Polarity ***Inactive_Text*** ***Active_Text***	*Change_Of_State_Time* ***Change_Of_State_Count*** (0) *Time_Of_State_Count_Reset* ***Elapsed_Active_Time*** (0) *Time_Of_Active_Time_Reset* ***Time_Delay*** ***Notification_Class*** ***Alarm_Value*** *Event_Enable* *Acked_Transitions* ***Notify_Type*** *Event_Time_Stamps*
Binary Output	Object_Identifier **Object_Name** Object_Type Present_Value ***Description*** *Device_Type* Status_Flags Event_State *Reliability* **Out_Of_Service** Polarity ***Inactive_Text*** ***Active_Text*** *Change_Of_State_Time* ***Change_Of_State_Count*** (0)	*Time_Of_State_Count_Reset* ***Elapsed_Active_Time*** (0) *Time_Of_Active_Time_Reset* ***Minimum_Off_Time*** ***Minimum_On_Time*** Priority_Array **Relinquish_Default** ***Time_Delay*** ***Notification_Class*** *Feedback_Value* *Event_Enable* *Acked_Transitions* ***Notify_Type*** *Event_Time_Stamps*
Binary Value	Object_Identifier **Object_Name** Object_Type Present_Value ***Description*** Status_Flags Event_State *Reliability* **Out_Of_Service** ***Inactive_Text*** ***Active_Text*** *Change_Of_State_Time* **Change_Of_State_Count** *(0)* *Time_Of_State_Count_Reset*	***Elapsed_Active_Time*** (0) *Time_Of_Active_Time_Reset* ***Minimum_Off_Time*** ***Minimum_On_Time*** *Priority_Array* ***Relinquish_Default*** ***Time_Delay*** ***Notification_Class*** ***Alarm_Value*** *Event_Enable* *Acked_Transitions* ***Notify_Type*** *Event_Time_Stamps*

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Richmond, Virginia 23233 USA
1.804.747.4771 Phone
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Object Type	Properties	
Calendar	Object_Identifier **Object_Name** Object_Type	***Description*** Present_Value **Date_List**
Device	Object_Identifier Object_Name Object_Type System_Status Vendor_Name Vendor_Identifier Model_Name Firmware_Revision Application_Software_Revision ***Location*** ***Description*** Protocol_Version Protocol_Revision Protocol_Services_Supported Protocol_Object_Types_Supported Object_List Max_APDU_Length_Accepted	Segmentation_Supported *Max_Segments_Accepted* *Local_Time* *Local_Date* *UTC_Offset* *Daylight_Savings_Status* *APDU_Segment_Timeout* APDU_Timeout Number_Of_APDU_Retries *Max_Master* *Max_Info_Frames* Device_Address_Binding Database_Revision *Configuration_Files* *Last_Restore_Time* ***Backup_Failure_Timeout*** *Active_COV_Subscriptions*
File (Stream Access Only)	Object_Identifier **Object_Name** Object_Type ***Description*** File_Type	**File_Size**[1] Modification_Date **Archive** Read_Only File_Access_Method

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Object Type	Properties	
Loop	Object_Identifier **Object_Name** Object_Type Present_Value ***Description*** Status_Flags Event_State *Reliability* **Out_Of_Service** Output_Units Manipulated_Variable_Reference Controlled_Variable_Reference Controlled_Variable_Value Controlled_Variable_Units Setpoint_Reference **Setpoint**[2] Action ***Proportional_Constant***	*Proportional_Constant_Units* ***Integral_Constant*** *Integral_Constant_Units* ***Derivative_Constant*** *Derivative_Constant_Units* ***Bias*** ***Maximum_Output*** ***Minimum_Output*** Priority_For_Writing ***COV_Increment*** ***Time_Delay*** *Notification_Class* ***Error_Limit*** *Event_Enable* *Acked_Transitions* *Notify_Type* *Event_Time_Stamps*
Multi-state Input	Object_Identifier **Object_Name** Object_Type Present_Value ***Description*** *Device_Type* Status_Flags Event_State *Reliability* **Out_Of_Service**	Number_Of_States ***State_Text*** ***Time_Delay*** ***Notification_Class*** ***Alarm_Values*** *Fault_Values* *Event_Enable* *Acked_Transitions* ***Notify_Type*** *Event_Time_Stamps*
Multi-state Output	Object_Identifier **Object_Name** Object_Type Present_Value ***Description*** *Device_Type* Status_Flags Event_State *Reliability* **Out_Of_Service** Number_Of_States	***State_Text*** Priority_Array **Relinquish_Default** ***Time_Delay*** ***Notification_Class*** *Feedback_Value* *Event_Enable* *Acked_Transitions* ***Notify_Type*** *Event_Time_Stamps*

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Object Type	Properties	
Multi-state Value	Object_Identifier **Object_Name** Object_Type Present_Value ***Description*** Status_Flags Event_State *Reliability* **Out_Of_Service** Number_Of_States	***State_Text*** *Priority_Array* ***Relinquish_Default*** ***Time_Delay*** ***Notification_Class*** ***Alarm_Values*** *Fault_Values* *Event_Enable* *Acked_Transitions* ***Notify_Type*** *Event_Time_Stamps*
Notification Class	Object_Identifier **Object_Name** Object_Type ***Description***	Notification_Class **Priority** **Ack_Required** **Recipient_List**[3]
Schedule	Object_Identifier **Object_Name** Object_Type ***Description*** **Effective_Period** ***Weekly_Schedule*** ***Exception_Schedule***	**Schedule_Default** **List_Of_Object_Property_References**[4] **Priority_For_Writing**[5] Status_Flags Reliability **Out_Of_Service**
Trend Log	Object_Identifier **Object_Name** Object_Type ***Description*** **Log_Enable**[6] ***Start_Time*** ***Stop_Time*** *Log_DeviceObjectProperty* ***Log_Interval***[6, 7] *COV_Resubscription_Interval* *Client_COV_Increment* Stop_When_Full Buffer_Size	Log_Buffer **Record_Count** (0)[6] Total_Record_Count *Notification_Threshold* *Records_Since_Notification* *Last_Notify_Record* Event_State ***Notification_Class*** *Event_Enable* *Acked_Transitions* ***Notify_Type*** *Event_Time_Stamps*

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Richmond, Virginia 23233 USA
1.804.747.4771 Phone
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Data Link Layer Options:

☒ BACnet IP, (Annex J)
☒ BACnet IP, (Annex J), Foreign Device
☒ ISO 8802-3, Ethernet (Clause 7)
☐ ANSI/ATA 878.1, 2.5 Mb. ARCNET (Clause 8)
☐ ANSI/ATA 878.1, RS-485 ARCNET (Clause 8), baud rate(s) _____
☒ MS/TP master (Clause 9), baud rate(s): 9600, 19200, 38400, 76800
☐ MS/TP slave (Clause 9), baud rate(s): _____
☐ Point-To-Point, EIA 232 (Clause 10), baud rate(s):_____
☐ Point-To-Point, modem, (Clause 10), baud rate(s): _____
☐ LonTalk, (Clause 11), medium: _____
☐ Other:

Device Address Binding:

Is static device binding supported? (This is currently necessary for two-way communication with MS/TP slaves and certain other devices.) ☒Yes ☐ No

Networking Options:

☒ Router, Clause 6 – Routing configurations: Ethernet-IP, Ethernet-MS/TP, IP-MS/TP
☐ Annex H, BACnet Tunneling Router over IP
☒ BACnet/IP Broadcast Management Device (BBMD)
Does the BBMD support registrations by Foreign Devices? ☒ Yes ☐ No

Character Sets Supported:

Indicating support for multiple character sets does not imply that they can all be supported simultaneously.

☒ ANSI X3.4	☐ IBM™/Microsoft™ DBCS	☒ ISO 8859-1
☒ ISO 10646 (UCS-2)	☐ ISO 10646 (UCS-4)	☐ JIS C 6226

If this product is a communication gateway, describe the types of non-BACnet equipment/networks(s) that the gateway supports:
This product supports communications between BACnet and any third-party system to which Niagara can connect. Contact Tridium for a list of supported protocols.

BACnet is a registered trademark of ASHRAE. ASHRAE does not endorse, approve or test products for compliance with ASHRAE standards. Compliance of listed products to the requirements of ASHRAE Standard 135 is the responsibility of BACnet International (BI). BTL is a registered trademark of BI.

BACnet Testing Laboratories Product Listing

This product has been tested at a qualified BACnet Testing Laboratory and found to comply with all the necessary interoperability requirements in place on the published test date. This listing represents the tested capability of the Listed Product. For information on additional functionality that was not covered in the test process, refer to the Manufacturer's PICS statement on the BI website.

Listing Information

Vendor		Listing Status
Tridium, Inc. 3951 Westerre Parkway, Suite 350 Richmond, VA 23233 USA		Listed Product
Test Requirements	BACnet Protocol Revision	Date Tested
Requirements as of July 2009	Revision 7 (135-2008)	July 2011

Product Name	Model Number(s)	Software Version
Niagara AX Supervisor with BACnet B-AWS	S-AX-AWS	3.6.35

Device Profiles

Profile	Model Numbers
BACnet Advanced Workstation (B-AWS)	S-AX-AWS

BIBBs Supported

Data Sharing	ReadProperty-A	DS-RP-A
	ReadProperty-B	DS-RP-B
	ReadPropertyMultiple-A	DS-RPM-A
	ReadPropertyMultiple-B	DS-RPM-B
	WriteProperty-A	DS-WP-A
	WriteProperty-B	DS-WP-B
	WritePropertyMultiple-A	DS-WPM-A
	WritePropertyMultiple-B	DS-WPM-B
	COV-A	DS-COV-A
	View-A	DS-V-A
	Advanced View-A	DS-AV-A
	Modify-A	DS-M-A
	Advanced Modify-A	DS-AM-A

Alarm and Event Management	Alarm and Event-Notification-A	AE-N-A
	Alarm and Event-ACK-A	AE-ACK-A
	Alarm and Event-View Notifications-A	AE-VN-A
	Alarm and Event-Advanced View Notifications-A	AE-AVN-A
	Alarm and Event-View and Modify-A	AE-VM-A
	Alarm and Event-Advanced View and Modify-A	AE-AVM-A
	Alarm and Event-Alarm Summary View-A	AE-AS-A
	Alarm and Event-Event Log View and Modify-A	AE-ELVM-A

Scheduling	Scheduling-View and Modify-A	SCHED-VM-A
	Scheduling-Advanced View and Modify-A	SCHED-AVM-A
	Scheduling-Weekly Schedule-A	SCHED-WS-A

Trending	Trending-View-A	T-V-A
	Trending-Advanced View and Modify-A	T-AVM-A
	Automated Trend Retrieval-A	T-ATR-A

Device and Network Management	Dynamic Device Binding-A	DM-DDB-A
	Dynamic Device Binding-B	DM-DDB-B
	Dynamic Object Binding-A	DM-DOB-A
	Dynamic Object Binding-B	DM-DOB-B
	Automatic Device Mapping-A	DM-ADM-A
	Automatic Network Mapping-A	DM-ANM-A
	Time Synchronization-A	DM-TS-A
	Time Synchronization-B	DM-TS-B
	UTC Time Synchronization-A	DM-UTC-A
	UTC Time Synchronization-B	DM-UTC-B
	Automatic Time Synchronization--A	DM-ATS-A
	Manual Time Synchronization--A	DM-MTS-A
	DeviceCommunicationControl-A	DM-DCC-A
	DeviceCommunicationControl-B	DM-DCC-B
	ReinitializeDevice-A	DM-RD-A
	ReinitializeDevice-B	DM-RD-B
	Backup and Restore-A	DM-BR-A
	Restart-A	DM-R-A
	Object Creation and Deletion-A	DM-OCD-A
	List Manipulation-A	DM-LM-A
	List Manipulation-B	DM-LM-B

Object Type Support

Device		

Data Link Layer Options

Media	Options
BACnet/IP (Annex J)	BBMD
Ethernet	

Networking Options

Networking Functionality	Media
Router	BACnet/IP (Annex J) – Ethernet

Character Set Support

ANSI X3.4 ISO 10646 (UCS-2)

232113 - HVAC HOT WATER PIPING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of HVAC water piping systems work is indicated on drawings and schedules, and by requirements of this section.

B. Refer to section "Testing, Adjusting, and Balancing" for chilled/condenser water system balancing; not work of this section.

1.3 QUALITY ASSURANCE:

A. Manufacturers: Firms regularly engaged in manufacturer of piping products of types, materials and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer: A firm with at least 3 years of successful installation experience on projects with piping system work similar to that required for project.

C. ANSI Compliance: Comply with applicable American National Standards pertaining to products and installation of chilled/condenser and hot water piping systems.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's data for piping systems materials and products.

PART 2 - PRODUCTS

2.1 HVAC HOT WATER PIPING MATERIALS AND PRODUCTS:

A. General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide materials and products complying with ANSI B31.1 Code for Power Piping where applicable, base pressure rating on water piping systems maximum design pressures. Provide sizes and types matching piping and equipment connections, provide fittings of materials which match pipe materials used in chilled/condenser and hot water piping systems. Where more than one type of materials or products are indicated, selection is Installer's option.

2.2 BASIC IDENTIFICATION:

A. General: Provide identification complying with Division 23 Basic Materials and Methods section "Mechanical Identification", in accordance with the following listing:

1. Hot Water Piping: Valve tags.

2.3 BASIC PIPE, TUBE AND FITTINGS:

A. General: Provide pipe, tube, and fittings in accordance with the following listing:

1. Hot Water Piping:

a. Pipe Size 2" and Smaller: Black steel pipe.

1) Pipe Weight: Schedule 40.

2) Fittings: Class 125 cast iron threaded.

2.4 BASIC PIPING SPECIALTIES:

A. General: Provide piping specialties complying with Division 23 Basic Materials and Methods section "Piping Specialties", in accordance with the following listing:

1. Dielectric unions.

2.5 BASIC SUPPORTS, ANCHORS, AND SEALS:

A. General: Provide supports, anchors and seals complying with Division 15 "Supports, Anchors, and Seals", in accordance with the following listing:

B. Adjustable steel clevises, adjustable pipe saddle supports, single pipe rolls, and adjustable roller hangers, for horizontal piping hangers and supports.

C. Two-bolt riser clamps, for vertical piping clamps.

D. Steel turnbuckles, for hanger rod attachments.

E. Concrete inserts, C-clamps, malleable beam clamps and steel brackets for building attachments.

F. Protection saddles, for saddles and shields.

PART 3 - EXECUTION

3.1 INSTALLATION OF BASIC IDENTIFICATION:

A. General: Install mechanical identification in accordance with Division 15 Basic Materials and Methods Section "Mechanical Identification".

3.2 INSTALLATION OF HOT WATER DISTRIBUTION PIPING:

A. General: Install pipe, tube and fittings in accordance with recognized industry practices which will achieve permanently-leakproof piping systems, capable of performing each indicated service without piping failure. Install each run with minimum joints and couplings, but with adequate and accessible unions for disassembly and maintenance/replacement of valves and

equipment. Reduce sizes (where indicated) by use of reducing fittings. Align piping accurately at connection, within 1/16" misalignment tolerance.

B. Locate piping runs, except as otherwise indicated, vertically and horizontally (pitched to drain) and avoid diagonal runs wherever possible. Orient horizontal runs parallel with walls and column lines. Locate runs as shown or described by diagrams, details and notations or, if not otherwise indicated, run piping in shortest route which does not obstruct usable space or block access for servicing building and its equipment.

C. Electrical Equipment Spaces: Do not run piping through transformer vaults and above panels, starters, distribution sections, etc.. and other electrical or electronic equipment spaces and enclosures.

D. Thread pipe in accordance with ANSI B2.1; cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter. Apply pipe joint compound, or pipe joint tape (Teflon) where recommended by pipe/fitting manufacturer, on male threads at each joint and tighten joint to leave not more than three threads exposed.

E. Solder copper tube-and-fitting joints where indicated, in accordance with recognized industry practice. Cut tube ends squarely, ream to full inside diameter, and clean outside of tube ends and inside of fittings. Apply solder flux to joint areas of both tubes and fittings. Insert tube full depth into fitting, and solder in manner which will draw solder full depth and circumference of joint. Wipe excess solder from joint before it hardens.

F. Weld pipe joints in accordance with ANSI B31.

G. Weld pipe joints in accordance with recognized industry practice and as follows:

H. Bevel pipe ends at a 37.5° angle where possible, smooth rough cuts, and clean to remove slag, metal particles and dirt.

I. Install welding rings for buttwelded joints.

J. Use pipe clamps or tack-weld joints with 1" long welds; 4 welds for pipe sizes to 10", 8 welds for pipe sizes 12" to 20".

K. Build up welds with stringer-bead pass, followed by hot pass, followed by cover or filler pass. Eliminate valleys at center and edges of each weld. Weld by procedures which will ensure elimination of unsound or unfused metal, cracks, oxidation, blow-holes and non-metallic inclusions.

L. Do not weld-out piping system imperfections by tack-welding procedures; refabricate to comply with requirements.

M. Flanged Joints: Match flanges within piping system, and at connections with valves and equipment. Clean flange faces and install gaskets. Tighten bolts to provide uniform compression of gaskets.

N. Install eccentric reducers where pipe is reduced in size in direction of flow, with tops of both pipes and reducer flush.

O. Install piping level with no pitch.

P. Connect branch feed piping to mains at horizontal center line of mains, connect run out piping to branches at horizontal center line of branches.

Q. Locate groups of pipes parallel to each other, spaced to permit applying full insulation and servicing of valves.

R. Use dielectric coupling when dissimilar metals are joined and dielectric isolation at any point where dissimilar metals are in contact. (Bronze is not considered a dielectric).

S. Provide fire stopping pipe sleeves to permit the conduit and insulation to pass through partitions. In floors, sleeves are to extend one (1) inch above the floor.

T. Pressure piping, critical piping and, where practical, other piping are to be in chases or other accessible clear space.

U. Isolate and insulate piping as required to minimize objectionable noise and vibration.

V. Provide chrome escutcheons, held tight to the wall, where piping passes through visible walls.

3.3 CLEANING AND FLUSHING HYDRONIC PIPING

A. All water circulating systems for the project shall be thoroughly cleaned before placing in operation to rid the system of dirt, piping compound, mill scale oil and any and all other material foreign to the water.

B. During construction, extreme care shall be exercised to prevent all dirt and other foreign matter from entering the pipe or other parts of the system. Pipe stored on the project shall have the open ends capped and equipment shall have all openings fully protected. Before erection, each piece of pipe, fitting or valve shall be visually examined and all dirt removed.

C. After system is complete, the Contractor shall first fill the piping loop and all runouts with clear water. Remove strainers, open all valves and continuously flush the system with clean domestic water until all foreign matter is removed.

D. After initial flush, the sub-contractor shall add trisodium phosphate in an aqueous solution to the system at the proportion of one pound per fifty gallons of water in the system. After the system is filled with this solution, the system water shall be brought up to 95°F temperature and allowed to circulate for two hours. The engineer shall be given notice by the Contractor of scheduling this cleaning operation and will be present to observe the cleaning operation and, if the Mechanical Engineers representative deems it necessary, the operation shall be repeated.

E. After the system has been completely cleaned as specified herein, it shall be tested by litmus paper or other dependable method and shall be left on the slightly alkaline side (PH=7.5+-). If the system is found to be still on the acid side, the cleaning by the use of Trisodium Phosphate shall be repeated.

F. The Contractor shall not add any water treatment chemicals or stop-leak compounds to the

system at any time.

END OF 232113

232116 - HYDRONIC SPECIALTIES

PART 1 - GENERAL

1.1 QUALITY ASSURANCE:

A. Manufacturers: Firms regularly engaged in manufacturing of hydronic specialties of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. ASTM Code: Comply with all ASTM Codes pertaining to valves and tanks.

PART 2 - PRODUCTS

2.1 MANUFACTURED HYDRONIC SPECIALTIES:

A. General: Provide factory-fabricated hydronic specialties recommended by manufacturer for use in service indicated. Provide hydronic specialties of types, capacities, and pressure ratings indicated for each service, or if not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes as indicated, and connections, which properly mate with pipe, tube, and equipment connections, where more than one type cannot be used on the project.

B. Balance Valves:

1. General: Provide balance valves as indicated, of one of the following types:

2. Soldered Ends 2" and Smaller: Class 125, bronze body, globe type with memory stop, straight or angle pattern.

3. Threaded Ends 2" and Smaller: Class 125, bronze body, ball type with memory stop, straight or angle pattern.

4. Available Manufacturers: Subject to compliance with requirements, manufacturers offering balance valves which may be incorporated in the work include, but are not limited to the following:

a. Bell & Gossett, ITT Fluid Handling Div.
b. Hammond Valve Corp., Div. of Conval Corp.
c. Illinois Products, American Air Filter Co., Inc.
d. Milwaukee Valve Co., Inc.
e. Sarco Co., Div. of White Consolidated.
f. Taco, Inc.

PART 3 - EXECUTION

3.1 INSTALLATION OF MANUFACTURED HYDRONIC SPECIALTIES:

A. Balance Valves:

1. General: Install for each balance valve as indicated, and in accordance with manufacturer's installation instructions.

END OF 232116

233113 – METAL DUCTS AND FANS

PART 1 - GENERAL

1.1 QUALITY ASSURANCE:

A. SMACNA Compliance: Comply with applicable portions of Sheet Metal and Air Conditioning Contractor's National Association (SMACNA) HVAC duct construction standards, latest edition.

B. Industry Standards: Comply with American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc. (ASHRAE) recommendations pertaining to construction of duct accessories, except as otherwise indicated.

C. UL Compliance: Construct, test, and label fire dampers in accordance with Underwriters Laboratories (UL) Standard 555 "Fire Dampers and Ceiling Dampers".

D. NFPA Compliance: Comply with applicable provisions of ANSI/NFPA 90A "Air Conditioning and Ventilating Systems", pertaining to installation of duct accessories.

1.2 SUBMITTALS:

A. Product Data: Submit manufacturer's data for each type of duct accessory, including dimensions, capacities, and materials of construction; and installation instructions.

B. Submit assembly-type shop drawings for each type of duct assembly showing interfacing requirements with ductwork, and method of fastening or support.

PART 2 - PRODUCTS

2.1 DUCTWORK MATERIALS:

A. Sheet Metal: Except as otherwise indicated, fabricate ductwork from galvanized sheet steel complying with ANSI/ASTM A 527, lockforming quality, with ANSI/ASTM A 525, G90 zinc coating; mill phosphatized for exposed locations.

2.2 STATIC PRESSURE RATINGS:

A. All construction of ductwork systems shall comply with SMACNA as it relates to gages of materials seams, joints and joint sealing.

B. 2” Class Construction:

1. All ductwork that does not fall within the description of a higher class system, shall be a

Class 2" construction.

2.3 DUCTWORK:

A. Furnish and install all galvanized steel ductwork and housings as shown on drawings. All ducts shall be in conformance with current SMACNA Standards relative to gauge, bracing, joints, etc. Reinforce all housings and all ducts over 30" with 1¼" angles not less than 5'-6" on centers, and closer if required for sufficient rigidity to prevent vibration. Provide airtight joints and blade elbows. Support horizontal runs of duct on not to exceed 8'-0" centers from strap iron hangers.

B. All offsets in ducts of 45 degrees or more shall have turning vanes of same gauge as duct and shall be rigidly fastened with guide strips. Vanes in ducts over 30" deep shall be installed in multiple sections with vanes not over 30" long and shall be rigidly fastened.

C. Provide balancing dampers in all supply runouts, where shown on drawings and wherever necessary for complete control of air flow. Where access to dampers through a suspended ceiling is required, coordinate the proper location of the access doors. Provide "Spin-in" fitting and double bearing volume dampers for all round duct branch takeoffs to individual air devices. Spin-in fittings shall be installed with a minimum of (5-6) five to six sheet metal screws regardless of manufacturer's recommended screw layout.

D. Duct Sealant: Non-hardening, non-migrating mastic or liquid elastic sealant (type applicable for fabrication/installation detail) as compounded and recommended by manufacturer specifically for sealing joints and seams in ductwork.

E. Duct Cement: Non-hardening migrating mastic or liquid neoprene based cement (type applicable for fabrication/installation detail) as compounded and recommended by manufacturer specifically for cementing fitting components, or longitudinal seams in ductwork.

F. Ductwork Support Materials: Except as otherwise indicated, provide hot dipped galvanized steel fasteners, anchors, rods, straps, trim and angles for support of ductwork.

2.4 FACTORY-FABRICATED DUCTWORK:

A. General: At installer's option, provide factory-fabricated duct and fittings, in lieu of shop fabricated duct and fittings.

B. Round Ductwork: Construct of galvanized sheet steel complying with ANSI/ASTM A 527 by the following methods and in minimum gages listed.

1. Diameter Minimum Gage Method of Manufacturer

2.	3" to 14"	26	Spiral Lockseam
3.	15" to 26"	24	Spiral Lockseam
4.	27" to 36"	22	Spiral Lockseam
5.	37" to 50"	20	Spiral Lockseam
6.	51" to 60"	18	Spiral Lockseam
7.	Over 60"	16	Longitudinal Seam

C. Provide locked seams for spiral duct; fusion welded butt seam for longitudinal seam duct.

D. Fittings and Couplings: Construct of minimum gages listed. Provide continuous welds along seam.

	Diameter	Minimum Gage
1.		
2.	3" t 36"	20
3.	38" to 50"	18
4.	Over 50"	16

E. Flat-Oval Ductwork: Construct of galvanized sheet steel complying with ANSI/ASTM A 527, of spiral lockseam construction, in minimum gages listed.

	Maximum Width	Minimum Gage
1.		
2.	Under 25"	24
3.	25" to 48"	22
4.	49" to 70"	20
5.	Over 70"	18

F. Fittings and Couplings: Construct of minimum gages listed. Provide continuous weld along seams.

	Maximum Width	Minimum Gage
1.		
2.	Under 37"	20
3.	37" to 50"	18
4.	Over 50"	16

G. Optional Ducts and Fittings: At Installer's option, provided that certified tests by Manufacturer show that rigidity and performance is equivalent to SMACNA and/or ASHRAE standard gage ductwork, provide ducts and fittings as follows:

1. Ducts: Construct of Manufacturer's standard gage, with spiral lock seam and intermediate standing rib.

2. Fittings: Construct by fabricating with spot welding and bonding with neoprene base cement in lieu of continuous weld seams.

H. Available Manufacturers: Subject to compliance with requirements, manufacturers offering factory fabricated ductwork which may be incorporated in the work include, but are not limited to the following:

1. United Sheet Metal Div., United McGill Corp.
2. Semco Manufacturing, Inc.
3. Sheet Metal Products Co.
4. Eastern Sheet Metal

I. Fittings shall be welded prefabricated, 20 gauge for 36" fittings and under, 18 gauge for all larger sizes. All 90 degree tee's shall be conical type. Seal all joints in ductwork as recommended by SMACNA.

2.5 FLEXIBLE DUCT:

A. Flexible duct shall be a factory-fabricated assembly consisting of an all steel or aluminum material. **Plastic with spiral wire flexible duct is not permitted.**

B. All supply flexible duct shall be insulated with 1 1/2-inch blanket of glass wool with an outer moisture barrier. The insulation assembly shall have a flame spread of not more that 25 and a smoke development rate of not over 50.

C. Flexible duct shall be rated for 10 inches W.G. static pressure.

D. A single length of flexible duct shall not exceed 4'0".

E. The minimum bend radius shall be 1 1/2 times the duct diameter. The radius shall be measured to the inside edge of the flexible duct.

F. Total offset in any run of flexible duct shall not exceed 90 degrees.

G. Provide a minimum of one hanger of each run of flexible duct. The hanger must be strapped around the flexible duct and secured to the structure above. Hangers shall not be attached to other mechanical or electrical objects. Hangers may be attached to an approved trapeze. Ceiling grid shall not be used to fabricate a trapeze. Support hangers shall be installed horizontal. Screws shall not be used to penetrate the flexible duct to attach the hanger.

H. Flexible duct shall be secured to the rigid duct and appliance with a nylon adjustable, self-locking, strap and a minimum of three sheet metal screws. The flexible duct shall be sealed airtight at each connection with self-adhesive aluminum tape. Fiber or cloth duct tape is not permitted to seal rigid or flexible duct.

I. All flexible duct shall be pressure tested by a testing and balancing agency to ensure the installation is airtight.

2.6 DAMPERS:

A. Low Pressure Manual Dampers: Provide dampers of single blade or multiblade type, constructed in accordance with SMACNA "Low Pressure Duct Standards". Volume dampers shall be opposed blade interlocking type, factory made by Ruskin, APC, Air Balance, or approved equal.

2.7 TURNING VANES:

A. Fabricated Turning Vanes: Provide fabricated turning vanes and vane runners, constructed in accordance with SMACNA "Low Pressure Duct Standards".

B. Manufactured Turning Vanes: Provide turning vanes constructed of 1½" wide curved blades set at 1 1/2" o.c., and set into side strips suitable for mounting in ductwork, per SMACNA Standards for low pressure duct.

2.8 FIRE DAMPERS:

A. Fire Dampers: Provide fire dampers, of types and sizes indicated. Construct casings of 22 ga. galvanized steel with bonded red acrylic enamel finish. Provide fusible link rated at 160-165°F (71-74°C) unless otherwise indicated. Provide damper with positive lock in closed position, and with the following additional features. Dampers shall not obstruct the flow of air in the open position.

B. Provide fire dampers where shown on drawings, and as required by Code enforcing authority. Fire dampers shall conform to NFPA Pamphlet No. 90A and UBC Standard 43-7 with recommended steel sleeves, fusible links, spring catches and noncorrosive bearings. Dampers shall be U.L. listed, manufactured by Ruskin, Air Balance, or American Warming & Ventilating. Provide access door in duct for inspection and service to fire damper and fusible link.

C. NOTE: Contractor shall be responsible for providing the correct type of fire dampers throughout the system(s) with respect to the UL listing of the damper. Provide dynamic dampers where ever static dampers do not have the necessary listing.

2.9 DUCT HARDWARE:

A. Quadrant Locks: Provide for each damper, quadrant lock device on one end of shaft; and end bearing plate on other end for damper lengths over 12". Provide extended quadrant locks and end extended bearing plates for externally insulated ductwork.

B. Concealed Damper regulators: For dampers located above inaccessible plaster or gypsum board ceilings, provide Young Regulator Co. Model No. 301 CDS concealed regulators with cover plates. Units shall be flush with finished surface. Key shall operate damper rod. Lock nut and spring washer shall hold damper in fixed position.

C. Bowden Cable Control Dampers: Where indicated on the drawings, (or in lieu of the type 301 system) Bowden cable control dampers (by Young Regulator) are to be provided to control inaccessible manual dampers above inaccessible ceilings. Cable controllers shall be locking with rack and pinion holding damper securely at setting. The control system to consist of a concealed damper regulator, sheathed stainless steel cable system, rack and pinion controller, worm gear actuator and damper compatible with system. Concealed cup regulator to be Young 270-301(FS) with coverplate. System specialties must be submitted for review prior to purchase.

2.10 DUCT ACCESS DOORS:

A. Construction: Construct of same or greater gate as ductwork served, provide insulated doors for insulated ductwork. Provide flush frames for uninsulated ductwork, extended frames for externally insulated duct. Provide one side hinged, other side with 1 handle type latch for doors 12", 2 handle type latches for larger doors. Access doors must be minimum 12”x12” in size.

B. All ductwork fire dampers not accessible from removal the ceiling grille shall be provided with an access door to access the linkage. All slot diffusers with fire dampers in the throat and sidewall grille penetrations shall have the connected ductwork supplied with an access door near the fire damper.

C. All fire damper access doors shall be permanently labeled on the exterior having letters not less than 0.5” in height reading “Fire Damper” in accordance with Code.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install duct accessories in accordance with manufacturer's installation instructions, with applicable portions of details of construction as shown in SMACNA standards, and in accordance with recognized industry practices to ensure that products serve intended function.

B. Support ducts rigidly with suitable ties, braces, hangers, and anchors of type which will hold ducts true to shape and to prevent buckling.

C. Seal ductwork, to seal class recommended, and method prescribed in SMACNA "HVAC Duct Construction Standards" Latest Edition.

D. Complete fabrication of work at project as necessary to match shop fabricated work and accommodate installation requirements.

E. Locate ductwork runs, except as otherwise indicated, vertically and horizontally and avoid diagonal runs wherever possible. Locate runs as indicated by diagrams, details and notations, or if not otherwise indicated, run ductwork in shortest route which does not obstruct unusable space or block

access for servicing building and its equipment. Hold ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building. Limit clearances to ½" where furring is shown for enclosure of concealment of ducts, but allow for insulation thickness, if any. Where possible, locate insulated ductwork for 1" clearance outside of insulation. Wherever possible in finished and occupied spaces, conceal ductwork from view, by locating in mechanical shafts, hollow wall construction or above suspended ceilings. Coordinate layout with suspended ceiling and lighting layouts and similar finished work.

F. Where ducts pass through interior partitions and exterior walls, conceal space between construction opening and duct over duct-plus-insulation with sheet metal flanges of same gage as duct. Overlap opening on 4 sides by at least 1½".

G. Where ducts pass thru block walls, ensure that a lintel sized per the structural specifications is provide above penetration.

H. Install turning vanes in all rectangular supply, return and outside air duct turns 45 deg. or greater.

I. Coordinate duct installations with installation of accessories, dampers, equipment, controls and other associated work of ductwork system.

J. Support ductwork in manner complying with SMACNA "HVAC Duct Construction Standards – Latest Edition".

3.2 CLEANING AND PROTECTION:

A. Clean ductwork internally, unit-by-unit as it is installed, of dust and debris. Clean external surfaces of foreign substances which might cause corrosive deterioration of metal or, where ductwork is to be painted, might interfere with painting or cause paint deterioration.

3.3 ACCESS DOORS:

A. Minimum requirements for fire dampers access doors are as follows:

1. Door must be no smaller than 12" x 12"
2. Door must be located up-stream, on the bottom of duct, no farther than 12" from the damper.
3. Access area below access door must be at least 24" x 24" and be clear to floor.

B. Reheat Coil Access Doors: All reheat coils shall have an access door installed on each side of the reheat coil for coil cleaning purposes. The access doors are to be of the double cam lock type and easily removable without obstructions underneath the doors.

C. Access Door Installation Locations: Access doors should be installed at all internal duct accessories such as turning vanes, sound attenuators and sensors for use in cleaning and inspecting those accessories. The doors should be the double cam lock type door large enough

(minimum 18” x 18”) for standard work activities and easily removable without obstructions underneath the doors.

3.4 FLEXIBLE DUCTWORK

A. A single length of flexible duct shall not exceed 4'0".

B. The minimum bend radius shall be 1 1/2 times the duct diameter. The radius shall be measured to the inside edge of the flexible duct.

C. Total offset in any run of flexible duct shall not exceed 90 degrees.

D. Provide a minimum of one hanger of each run of flexible duct. The hanger must be strapped around the flexible duct and secured to the structure above. Hangers shall not be attached to other mechanical or electrical objects. Hangers may be attached to an approved trapeze. Ceiling grid shall not be used to fabricate a trapeze. Support hangers shall be installed horizontal. Screws shall not be used to penetrate the flexible duct to attach the hanger.

E. Flexible duct shall be secured to the rigid duct and appliance with a nylon adjustable, self-locking, strap and a minimum of three sheet metal screws. The flexible duct shall be sealed airtight at each connection with self-adhesive aluminum tape. Fiber or cloth duct tape is not permitted to seal rigid or flexible duct.

F. All flexible duct shall be pressure tested by a testing and balancing agency to ensure the installation is airtight.

END OF 233113

15745 AIR CONTROL DEVICES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

A. Types of air control devices specified in this section include the following:

1. Variable Volume Boxes.

1.2 QUALITY ASSURANCE:

A. Manufacturers: Firms regularly engaged in manufacturing of air control devices of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installers: Contractor shall provide all control wiring, piping, calibration and single source responsibility to ensure dampers, volume measuring devices, coils and controls operate fully in accordance with the specification sequences.

C. UL Compliance: Comply with applicable UL standards pertaining to air control devices.

D. ASHRAE Compliance: Comply with ASHRAE Standard 36B-63 sound ratings. Sound rating tested as power levels 10-12 W. Rated NC levels with an 8 db room factor.

1.3 SUBMITTALS:

A. Product Data: Submit catalog cuts, specifications, installation instructions and dimensioned drawings for each type of air control device. Include scale range, ratings, and calibrated performance curves, certified where indicated. Submit schedule showing manufacturer's figure number, scale range, location, operating sound levels, minimum inlet static pressure, individual box identification number, sound attenuation provisions and other accessories for each air control device.

B. Maintenance Data: Submit maintenance data and spare parts list for each type of air control device. Include this data in Maintenance Manual.

PART 2 - PRODUCTS

2.1 AIR CONTROL DEVICES (VARIABLE AIR VOLUME BOXES):

A. Casing: All air control devices to be constructed of galvanized steel of 22 gage minimum thickness.

B. Each air control device shall have a readily accessible, quick opening access door to permit adjustment or replacement of volume controllers and motor operators.

C. Electric operators are specified in other Division 15 sections and are not part of this section.

D. Modulating Dampers: Provide modulating dampers whose leakage through fully closed modulating dampers shall not be less than 2% of design volume at three (3) inches of w.g. inlet static pressure.

E. Volume Control: Volume control shall be accomplished with flow regulators, pressure selectors and sequenced pneumatic (or electric) actuators directly connected to the volume regulator.

F. Volume control for air control devices shall be maintained with ±10% of designed setting at all conditions of upstream inlet pressures from a minimum of 0.65 inches of w.g. to 4.0 inches of w.g.

G. Calibration taps and a volume measuring station shall be provided to facilitate flow measurement. A two tube pressure drop method, independent of duct back-pressure shall be used.

H. Fan Assemblies: As listed on the drawings, provide variable air volume boxes with parallel flow fan assistance with fan performance as indicated. Fans shall be forward curved with permanent split capacitor type motors. Fan/motor assembly shall be vibration isolated within cabinet to minimize vibration transmission. Provide replaceable filter on plenum inlet into fan assembly.

I. INSULATION – Foil Faced - The interior surface of unit casing acoustically and thermally lined with a minimum of 1/2 inch, 1.5 lb./cu. ft. density glass fiber with a high density facing. The insulation R-Value shall be a minimum of 1.9. Insulation shall meet NFPA-90A and UL 181requirements.

J. Sound Attenuation: Manufacturer to provide adequate sound attenuation within the air control device and any additional sound attenuating accessory as indicated on the air control device schedule or as necessary to not exceed the NC level of 33, except for boardrooms and conference rooms, in which the NC rating to be 25.

K. Available Manufacturers: Subject to compliance with requirements, manufacturers offering air control devices which may be incorporated in the work include, but are not limited to the following:

1. E.H. Price
2. Trane Co.
3. Tempmaster, Div. of York International
4. Tuttle and Bailey, Division of Interpace Corp.
5. Titus Products

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install air control devices in a horizontal position per manufacturer's installation instructions and recommendations.

B. Connect all electrical wiring and low voltage wiring to air control devices as required.

C. Locate each air control device so that access panels, electric or hot water reheat coils and its associated valves and any other moving operator are accessible for removal and/or maintenance. Provide a minimum of 18 inches clearance from the side of the device to the nearest obstruction for this purpose. All VAV boxes and Reheat Coil Assemblies control valves must have adequate access space for maintenance, including removal of coils, damper arms, reheat valves, etc. Space must be maintained to top of acoustical ceiling grid. A “coil pull” space of coil length plus 6” is also required.

END OF 233616

233713 - GRILLES, REGISTERS, DIFFUSERS AND LOUVERS

PART 1 - GENERAL

1.1 SUBMITTALS:

A. Product Data: Submit manufacturer's data on outlets and inlets including the following:

B. Schedule of outlets and inlets indicating drawing designation, room location, number furnished, model number, size and accessories furnished.

C. Data sheet for each type of outlet and inlet, and accessory furnished; indicating construction, finish, and mounting details.

D. Performance data for each type of outlet and inlet furnished, velocity traverse, throw and drop, and noise criteria ratings. Indicate selections on data.

E. Ratings are to be certified by ADC or AMCA.

1.2 PRODUCT DELIVERY, STORAGE, AND HANDLING:

A. Deliver outlets and inlets wrapped in factory fabricated fiberboard type containers. Identify on outside of container type of outlet or inlet and location to be installed. Avoid crushing or bending and prevent dirt and debris from entering and settling in devices.

B. Store outlets and inlets in original cartons and protect from weather and construction work traffic. Where possible, store indoors; when necessary to store outdoors, store above grade and enclose with waterproof wrapping.

PART 2 - PRODUCTS

2.1 CEILING AIR DIFFUSERS:

A. General: Except as otherwise indicated, provide manufacturer's standard ceiling air diffusers where shown; of size, capacity, direction of throw, and type indicated; constructed of materials and components as specified in this section and as required for complete installation.

B. Types: Provide ceiling diffusers of type, capacity, and with accessories and finishes as indicated and as specified in this section. The following requirements shall apply:

C. Diffuser Faces:

1. Square: Square housing, core of concentric louvers, square or round duct connection, housing extended to form panel to fit in ceiling module.

2. Rectangular: Rectangular housing, core of rectangular concentric louvers, square or rectangular duct connection.

D. Ceiling Compatibility: Provide diffusers with border styles that are compatible with adjacent ceiling systems, and that are specifically manufactured to fit into ceiling module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems which will contain each type of ceiling air diffuser.

E. Dampers:

1. Opposed Blade: Adjustable opposed blade damper assembly, key operated from face of diffuser.

2. Butterfly: 2 semi-circular flaps connected to linkage adjustable from face of diffuser with key, and with straightening grid.

F. Diffuser Accessories:

1. Operating Keys: Tools designed to fit through diffuser face and operate volume control device and/or pattern adjustment.

G. Available Manufacturers: Subject to compliance with requirements, manufacturers offering diffusers which may be incorporated in the work include, but are not limited to the following:

1. Airguide Corp.
2. Anemostat Products Div., Dynamics Corp. of America
3. Carnes Co., Div. of Wehr Corp.
4. Barber-Colman Co., Air Distribution Div.
5. Environmental Elements Corp., Subs. Koppers Co.
6. Krueger Mfg. Co.
7. Tuttle & Bailey Div. of Interpace Corp.
8. Titus Co.

2.2 CEILING RETURN, EXHAUST AND TRANSFER AIR REGISTERS AND GRILLES:

A. General: Except as otherwise indicated, provide manufacturer's standard ceiling registers and grilles, where shown, of size, capacity and type indicated; constructed of materials and components as specified in this section; and as required for complete installation.

B. Ceiling Compatibility: Provide registers and grilles with border styles that are compatible with adjacent ceiling systems, and that are specifically manufactured to fit into ceiling module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems which will contain each type of ceiling register or grille.

C. Register and Grille Materials:

1. Aluminum Construction: Manufacturer's standard extruded aluminum frames and adjustable blades, unless noted otherwise.

D. Register and Grille Faces:

1. Horizontal Straight Blades: Horizontal blades, individually adjustable, at manufacturer's standard spacing.

2. Vertical Straight Blades: Vertical blades individually adjustable at manufacturer's standard spacing.

E. Register Dampers:

1. Opposed Blade: Adjustable opposed blade damper assembly, key operated from face of register.

F. Register and Grille Accessories:

1. Operating Keys: Tools designed to fit through register or grille face and operate volume control device and/or pattern adjustment.

G. Available Manufacturers: Subject to compliance with requirements, manufacturers offering registers and grilles which may be incorporated in the work include, but are not limited to the following:

1. Airguide Corp.
2. Anemostat Products Div., Dynamics Corp. of America
3. Barber Colman Co., Air Distribution Div.
4. Carnes Co., Div. of Wehr Corp.
5. Environmental Elements Corp., Subs, Koppers Co.
6. Tempmaster Corp.
7. Titus Co.

PART 3 - EXECUTION

3.1 INSPECTION:

A. Examine areas and conditions under which outlets and inlets are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION:

A. General: Install all outlets and inlets as recommended by the manufacturer; in accordance with recognized industry practices; to ensure that products serve intended functions.

B. Coordinate with other work, including ductwork and duct accessories, as necessary to interface installation of outlets and inlets with other work.

C. Provide transition ductwork as required to mate to the device inlet/outlet.

END OF 233713

SECTION 260000 – GENERAL REQUIREMENTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions, Division-1 General Requirements & Specification Sections apply to the work specified in this and other sections of Division 26 and 28.

1.2 WORK INCLUDED

A. Furnish all materials, labor and equipment necessary to construct a complete and functional electrical system as further described in these specifications and on design drawings.

B. This work includes, but is not limited to raceways, wiring, grounding, disconnect and wiring devices and other systems described in these specifications and on design drawings.

C. Work under this section shall include final electrical connections to all equipment furnished under other sections of these specifications.

D. The contractor shall furnish and install all miscellaneous equipment, material and labor which, though not specifically called for in this specification, is necessary for a complete and satisfactory operating installation. The contractor shall leave his work in operating condition.

E. Each Sub-Contractor shall be governed by any alternates and unit prices called for in the Form of Proposal insofar as they affect his part of work.

F. This section (General Requirements for Electrical) applies equally to electrical, heating, ventilating, air conditioning, plumbing and fire protection.

1.3 MATERIALS, EQUIPMENT AND WORKMANSHIP

A. Materials and equipment used throughout shall be new and the best of their respective kinds. No substitutions, other than those specified, shall be used unless approved by the Architect and Engineer. All work shall be executed with speed and consistent with safety and good workmanship. Substitutions of equal equipment will be acceptable only if approved in writing by Architect and Engineer 10 days prior to bid. Substitutions for light fixtures will be submitted with photometrics to Architect and Engineer for approval 3-weeks prior to bid.

B. All materials shall bear the UL label where such standards have been established and listed by Underwriters Laboratories, Inc.

C. Competent workmen shall be employed on all phases of the work. Poor workmanship will be rejected and will constitute cause for removal of the individual performing the work.

D. All material, equipment and locations of same shall at least conform with the standards of the Underwriters Laboratories, Inc. whenever applicable.

E. Should any dispute arise as to the quality or fitness of materials, equipment or workmanship, the decision rests strictly with the Architect.

F. All material specified as furnished by the contracting agent shall be delivered to the site. Contractor shall take receipt of the materials, store and install materials as indicated.

1.4 REFERENCES

A. Utilize the following abbreviations and definitions for discernment within the Drawings and Specifications:

1. Abbreviations:

a.	NEC	National Electrical Code.
b.	OSHA	Occupational Safety and Health Act.
c.	ANSI	American National Standards Institute.
d.	NFPA	National Fire Protection Association.
e.	ASA	American Standards Association.
f.	IEEE	Institute of Electrical and Electronics Engineers.
g.	NEMA	National Electrical Manufacturers Association.
h.	UL	Underwriters Laboratories, Inc.
i.	IES	Illuminating Engineering Society.
j.	ICEA	Insulated Cable Engineers Association.
k.	ASTM	American Society of Testing Materials.
l.	ETL	Electrical Testing Laboratories, Inc.
m.	CBM	Certified Ballast Manufacturers.
n.	EIA	Electronic Industries Association.
o.	OEM	Original Equipment Manufacturer.

1.5 PERMITS, CODES AND INSPECTIONS

A. Electrical Contractor shall obtain and pay for all permits and inspections required for electrical installation.

B. All work shall be in accordance with the latest edition of the National Electrical Code (NEC), National Fire Protection Association (NFPA), Occupational Safety and Health Administration (OSHA) and local utility company requirements.

C. Electrical Contractor shall furnish final inspection certification to the Owner upon completion of work. Certificate shall be from local inspection authority.

D. Where apparent contradictions are discovered between local codes, NEC, specifications and drawings, the most stringent or safest requirement will prevail. Beyond this, order of compliance shall be:

1. Local Codes/Inspector
2. National Electrical Code
3. Specifications and Drawings

1.6 DRAWINGS AND SPECIFICATIONS

A. DO NOT SCALE DRAWINGS. The scale of drawings is approximate. Exact locations, distances, levels and other conditions shall be governed by field conditions.

B. For the purpose of clearness and legibility, the drawings are essentially diagrammatic. Although, the size and location of the equipment is drawn to scale wherever possible.

C. The drawings and specifications are intended to cover all work enumerated under the respective headings. The Sub-Contractors shall not take advantage of conflict or error between drawings, and specifications, but shall request clarification of such before making his proposal should this condition exist.

D. Contractors shall obtain a set of the Architectural and Structural drawings and specifications and consult with the Architect and General Contractor as to the general construction of the building and the order and time of placement of all electrical work.

E. The drawings accompanying these specifications determine the general design of the equipment. The exact disposition of the equipment is subject to the requirements and construction of the manufacturer's standard, but the space occupied and general design shall correspond to that shown on the plans.

F. It is intended that materials shall be located symmetrically with architectural elements, although locations indicated by drawings may be distorted for clearness or presentation.

1.7 SUBMITTALS

A. See requirements for “Submittals” in both General Conditions and Division 1.

B. Electrical Contractor shall refer to electrical submittal registry which is located at the end of this section. Sections identified within the registry indicate an overview of the products to be submitted. The Contractor shall reference each identified section for the specific items to be included in the submittal.

C. Electrical Contractor shall provide submittals for review and approval on equipment and material listed in the individual technical sections of Division 26 and Division 28.

D. Submittals shall clearly indicate electrical characteristics, physical dimensions and pertinent data which indicate that item meets all requirements specified on drawings and in technical specifications.

E. Each Sub-Contractor shall submit to the General Contractor for review within thirty (30) days after the date of the contract, seven (7) sets of complete catalogue data and/or shop drawings for each item of material or piece of equipment. Catalog data shall include name of the manufacturer, catalog numbers, trade names, performance data, descriptive material (sufficient to identify each item), and specify performance of the products. Shop drawings shall include specified catalogue data and shall show equipment in detail, arrangement and disposition for this particular project design.

F. The Architect and/or Engineer checking and reviewing of the Contractor's and Sub-Contractor's drawings and/or equipment details does not relieve the Contractor or Sub-Contractors from responsibility for errors, omissions or equipment furnished in accordance with such checked or reviewed drawings. Where such errors or omissions are later discovered, they shall be made good by the respective Sub-Contractor irrespective of any review by the Architect or Engineer.

1.8 SITE EXAMINATION

A. Each Contractor shall, before submitting a proposal, visit and examine the site to satisfy themselves as to materials and scope of the construction, any difficulty attending the performance of the work, storage of material, access to any and all areas, etc.

B. The submission of a proposal will be construed as evidence that such an examination has been made. Claims made subsequent to the time of submission of the proposal for labor, equipment and material required for difficulties encountered, which could have been foreseen had an examination been made, will not be recognized.

1.9 QUALIFICATIONS

A. Contractors must have five (5) years of minimum experience, has a satisfactory work resume with comparable projects listed, has a sound financial basis and is technically competent.

B. Equipment Manufacturers must have five (5) years of successful experience, be technically competent, and be industrial financially stable.

C. Owner reserves the right to review and determine if the Contractors and Manufacturers meet the above categories to his satisfaction. The Owner has the authority to reject any equipment and bids if the above standards are not met.

1.10 DEBRIS, CUTTING AND PATCHING

A. Electrical Contractor shall be responsible for removing any dirt, boxes, paper or other debris present as a result of his work.

B. Work areas shall be maintained in a clean and orderly condition at all times.

C. Electrical Contractor shall be responsible for all cutting and patching required for his work. All work shall be by skilled Craftsmen.

D. No more cutting shall be done than is absolutely necessary. Cutting of a structural member or exposed surface of concrete will not be permitted without written approval of the Architect and Structural Engineer.

E. Conduit openings in floor slabs shall be cut with core drill. Edges of trenches or openings in slabs shall be scribe cut with masonry saw.

F. Where necessary to remove exterior walks, paving or lawns, same shall be returned to original condition.

G. Each Sub-Contractor will be required to notify other trades in due time where he will require openings or chases in new masonry. Each Sub-Contractor shall also set all concrete inserts and sleeves for his work in new construction. Failing to do this, he shall cut openings for his work and patch as required at his own expense.

H. All cutting and patching shall be done in a neat and workmanlike manner by men skilled in the various trades and with written permission from the Architect.

1.13 WARRANTY

A. The Contractor shall warrant the systems, equipment, and apparatus to be properly balanced, free from any defects in material and workmanship for a period of one (1) year from date of acceptance. Where warranties for additional time are stated herein, the extended term shall apply.

B. The date of acceptance shall be the date of the voucher for final payment.

C. The Contractor shall replace defective parts or equipment promptly at his own expense.

1.14 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to the project site properly identified with manufacturer’s identification, model number, types, grades, compliance labels, and other information needed for identification.

B. Protect products from weather, construction traffic, dirt, water chemicals and mechanical damage by storing in original packaging.

1.15 MAINTENANCE MANUALS

A. Prepare maintenance manuals in accordance with Division 1. In addition to the requirements specified in Division 1, include the following information for equipment items:

1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
3. Maintenance procedures for routine preventive maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
4. Servicing instructions and lubrication charts and schedules.

1.16 AS-BUILT DRAWINGS

A. Maintain an accurate set of "as built" drawings and record any deviations from contract drawings. Submit two (2) sets of drawings (marked to show all deviations) upon completion of work to General Contractor.

B. As-built drawings shall show all changes, additions, deletions and deviations from contract drawings noted plainly thereon. Special emphasis is placed on recording the exact location of all underground utilities by offset distances to building corners, walls, curbs, etc.

C. A set of prints shall be maintained in the project office at the site for use in keeping a daily log of the work as it progresses. This daily log shall be transferred to the drawings in order that the information might be permanently recorded.

PART 2 PRODUCTS

2.1 MATERIALS

A. All materials and equipment installed shall be new and free of defects and shall be the product of a reputable manufacturer and subject to approval.

B. Applicable equipment and materials shall be listed by Underwriters Laboratories and Manufactured in accordance with ASME, NEMA, ANSI and IEEE standards, and as approved by local authorities having jurisdiction as mentioned in Division 1.

C. If products and materials are specified or indicated on the Drawings for a specific item or system, use those products or materials. If products and materials are not listed in either of the above, use first class products and materials, subject to approval of Shop Drawings where Shop Drawings are required or as approved in writing where Shop Drawings are not required.

2.2 MISCELLANEOUS STEEL

A. Provide all necessary miscellaneous steel as required for mounting, hanging or otherwise supporting panelboards, wall-mounted transformers, light fixtures, conduit, etc. installed by Electrical Contractor.

B. Supports shall be suitably fastened to structural members as approved by Architect and Structural Engineer.

2.3 IDENTIFICATION, NAMEPLATES AND LABELING

A. Provide typewritten circuit directories in panels with clear plastic protection shields and mounted in card holders. Indicate circuit number, devices or equipment being serviced. Final directories shall reflect final installation, reflecting all revisions made during construction and shall reflect final “as-built” conditions.

B. Label all panels, starters, and switchboards with panel designation in one-half inch (1/2") letters and voltage in one-quarter inch (1/4") letters. Use engraved lamacoid plates with black background and white letters. Fasten plate above door on panel trim by using aluminum screws. Refer to Section 260553 for additional requirements.

PART 3 EXECUTION

3.1 ROUGH-IN

A. Verify final locations for rough-ins with field measurements and with the shop drawing requirements of the actual equipment to be connected.

B. Contractor shall perform walk-through inspection with Owner’s Representative prior to commencing work. Locations of all data and voice outlets and power receptacles shall be verified and documented. A complete set of drawings shall be used to mark any revisions and shall be signed by the Owner and the Contractor and kept on site.

3.2 ELECTRICAL INSTALLATION

A. Follow manufacturer’s instructions for installing, connecting, and adjusting all equipment. Provide a copy of such instructions at the equipment during any work on the equipment. Provide all special supports, connections, wiring, accessories, etc.

B. General: Unless otherwise indicated, hook up all equipment requiring electrical services, whether such equipment is furnished under this Section or furnished by others. Comply with the following requirements:

1. Work specified under this Section may be affected by work and materials specified under other Sections of these Specifications. The Contractor shall be re-

sponsible for coordination of work described under this Section with the other Sections.

2. Verify all dimensions by field measurements.
3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for electrical installations.
4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
5. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
7. Coordinate connection of electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
8. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Engineer/Owner.
9. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
10. Install electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
11. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

3.3 WORKMANSHIP, COOPERATION AND COORDINATION

A. All work under this section shall be completed by Workmen skilled in their respective trades.

B. Workmen shall be thoroughly trained and familiar with Manufacturer's recommended methods of installation.

C. Any installation which does not present an appearance of the best trade practices shall be repaired, removed or replaced as directed by Owner’s Representative.

D. Electrical Contractor shall cooperate with other trades to obtain most practical arrangement of work.

E. Electrical Contractor shall coordinate installation with other trades to minimize interferences. "First to install" will not be justification for interferences.

3.4 CLEANING AND TESTING

A. Clean all equipment, panels, disconnects, light fixtures, device outlets and plates, raceway systems and other electrical components after construction completion and prior to Owner's acceptance.

B. Test complete electrical system and all components to assure proper operation. Furnish to Architect/Engineer any test results required to prove proper system operation.

3.5 EQUIPMENT CONNECTIONS

A. Electrical Contractor shall connect all power wiring to any equipment furnished by Others, unless indicated otherwise.

B. Electrical Contractor shall furnish all materials (i.e. disconnect switches, junction boxes, receptacles, cords, plugs, etc.) and labor necessary to complete final connections to all equipment.

C. Electrical Contractor shall be responsible for making final connection to all Owner furnished equipment indicated on plans. Contractor shall check list from Owner with drawings and inform Owner of any discrepancies.

D. Electrical Contractor shall obtain shop drawings and/or cut sheets for all equipment supplied by others which requires electrical connections prior to rough-in. Electrical Contractor shall confirm that electrical services provided for equipment on drawings are correct for equipment to be installed. Inform Engineer of any discrepancies. Any work installed which does not match the requirements of the equipment to be installed shall be removed at the expense of the Electrical Contractor.

3.6 ELECTRICAL FOR HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT

A. The Mechanical Contractor shall furnish and install all air conditioning equipment, air handling units, exhaust fans, etc. The Mechanical Contractor shall provide starters for all HVAC equipment requiring starters, unless otherwise indicated. The Electrical Contractor shall mount and connect all starters and shall furnish all branch circuit wiring, motor disconnects, labor and final electrical connections as required for proper operation. Mechanical Contractor shall furnish and install all controls and control wiring, unless otherwise indicated on drawings.

3.7 FIRESTOPPING

A. All penetrations of fire and smoke rated walls by electrical conduit shall be properly sealed to maintain rating of the partition

END OF SECTION

SECTION 260500S01 – COMMON WORK RESULTS FOR ELECTRICAL
Basic Electrical Materials and Methods

1. BASIC ELECTRICAL MATERIALS

A. All conduits and raceway must be 3/4" or larger. Exposed raceway in finished areas shall be in Wiremold Series 700 or larger raceway.

Exception: ½" conduit may be used for runs to individual devices that are 10' or less in length.

B. All wiring shall be 98% conductivity copper.

C. All buss and buss duct conductors shall be 98% conductivity tin plated copper.

D. Aluminum or aluminum alloy connectors shall not be used on copper.

E. All wiring shall have THHN insulation minimum for installation in conduit.

F. All wiring devices shall be specification grade.

G. Wire size, #12 AWG minimum for power circuits.

H. Conductors #10 AWG and larger shall be stranded copper.

I. All driven ground rods shall be 5/8" X 8'-0" copperweld.

J. All panelboards shall have both neutral and ground bus separate. All panelboards shall use bolt-on breakers, only.

K. No plastic anchors are to be used to support electrical conduit and/or equipment. Use metallic expansion type anchors. Do not use lead anchors. No explosive type install anchors shall be used.

L. All utility markers required inside buildings, structures, and facilities to identify exposed and concealed utilities, including electric, shall be provided in accordance with specification 02600D01.

M. All electrical equipment shall be UL listed for the application in which it is used.

N. All equipment and devices provided to meet this specification shall meet all applicable FCC requirements and restrictions.

O. Do not provide any devices which contain mercury unless there is not a mercury free device on the market which will perform the same function.

P. Rigid Conduit

Rigid conduit shall be standard weight, mild steel pipe. The conduit shall receive a protective zinc coating both inside and outside by means of hot-dip galvanizing. Threads shall not have any coating which will reduce the conductivity of the joint. Couplings, bends, elbows, fittings, etc., shall be subject to the same requirements as for straight lengths. All conduit and fittings shall meet UL-8 and be labeled accordingly. Rigid conduit shall be delivered with plastic protectors on the threads.

Q. Electrical Metallic Tubing (EMT)

Electrical metallic tubing (EMT) shall be cold rolled tubing with a zinc coating on the outside and zinc coating or a protective enamel coating on the inside. All EMT fittings shall be the steel compression type and meet the same requirements as EMT. All entries into boxes, cabinets, etc., shall have insulated throat and compression ring type connectors conforming to UL-514. All EMT shall meet UL-797 and be labeled accordingly.

R. Conduit Colors

Fire Alarm – Red
Communications – Blue
Access Control - Purple

S. Surface Metal Raceway

Metal raceway shall be two-piece type, base mounted with snap-on cover as manufactured by wiremold or equal. Raceway installation shall be in accordance with manufacturer's instructions using adapters and fittings specifically designed and manufactured for the raceway used.

T. Flexible Conduit

Flexible metallic conduit shall be constructed from flexibly or spirally wound electro-galvanized steel. Connections shall be by means of galvanized, malleable iron squeeze type fittings, or tomic twist-in type in sizes not exceeding 3/4" size. Liquid tight flexible metallic conduit shall be light gray in color. It shall have seal tight fittings and shall be equal to American Brass "Sealtite" Type UA.

U. Plastic Conduit

Plastic conduit shall be high impact, high grade, self extinguishing polyvinyl chloride (PVC) schedule 40, 90 deg. C, U.L. rated. Material must have tensile strength of 7,000 psi at 73.4 deg. F., flexural strength of 11,000 psi and compressive strength of 8,000 psi. Conduit fitting and elbows shall have the same requirements as the conduit.
Exception: Use schedule 80 PVC conduit when required by codes.

2. BASIC ELECTRICAL METHODS

A. General

1. All wiring shall be in 3/4" or larger conduit, wireway or raceway.

2. All conduits shall be concealed except in University of Kentucky designated mechanical rooms or unless otherwise specified and shown on drawings approved in writing by the UK Project Manager. Conduits which are not concealed must be surface metal raceway unless otherwise noted in the written exception.

3. Firestop all penetrations in accordance with the current edition of the National Electric Code.

4 All conduit, wiremold and junction boxes must be painted to match existing surface except in mechanical rooms.

5. During construction, cover all equipment subject to mechanical damage or contamination in any way.

6. All metering is to be included in the contract unless provided by local utility company. Each building is to be sub-metered individually. All metering to meet UK Standard 262713.

7. Standard mounting height of devices:

Receptacles	18" A.F.F.

Light Switches	48" A.F.F.
Fire Alarm Manual Stations	48" A.F.F.
Fire Alarm Horns	84" A.F.F.
Thermostats	53" A.F.F.

8. All electrical panels shall be clearly labeled as to what circuit, electrical outlet, and/or room that each breaker feeds.

9. Corridor outlets shall be provided at a maximum 65 feet spacing for floor machines. The 120-volt receptacles shall each be individually protected by a 20 ampere breaker and GFI receptacle.

10. All Fire Alarm, Security Alarm, Communications Equipment, Elevator Controllers, Life Safety (including emergency lights, exit lights and combination emergency\exit lights), Handicap Access, Mechanical and Electrical Room lights and receptacles, and other similar systems shall be supplied by emergency generator distribution panels. Note: Due to battery maintenance cost, do not provide battery backed up emergency and exit lighting on emergency generator power unless the University requests this redundancy in specified areas.

11. Install mechanical identification to properly identify every system and its components.

12. All conduits, duct and raceway shall be installed in accordance with UK Standard 260533 and 260533S03.

13. In the communications cable tray, no AC is allowed of any voltage. Only ethernet, fiber, access control cables are in cable tray.

14. Low Voltage Wiring is any voltage 50 volts or less.

15. All conduits shall be attached to the building structure.

16. Low voltage shall be run in conduit. No more than 18" of exposed wire, outside of conduit, before connecting to a device. All conduit to have bushing installed on end to prevent wire contact with sharp edge.

17. Wire run in HVAC Plenums are to be plenum rated.

B. Grounding

1. A separate equipment ground wire shall be run continuous to all equipment and receptacles. The University does not recognize or accept the conduit ground as an equipment ground. Any ground required must be a properly sized wire or wires (insulated or uninsulated) from the buildings single point ground bus and running through all distribution panelboards and connecting to the equipment to be grounded.

2. All buildings shall have ground rods and ground planes to meet the requirements of the NEC and also the grounding requirements of equipment within the building. All main ground points shall be meggered. If more than 10 OHMS, additional ground rods shall be driven. Additional ground rods shall not be less than 6 ft. apart. If more than 25 OHMS, special care shall be used to obtain less then 10 OHMS.

3. Main service entrance conduit shall have grounding locknuts on one end. Meter shall be grounded to main service disconnect by a bare copper ground wire, sized to NEC.

4. Main service neutral shall be grounded at only one point (the main service disconnect) and that ground shall extend from the main water service entrance point before main water valve.

C. Motors

1. This standard applies to all general duty motors provided, even those specified in all other divisions such as Div 15 where motors are provided with pumps, air handling units and similar equipment.

2. Provide power factor correction capacitors on induction motors of 10 H. P. or above to correct power factor to .91 or more. Provide a disconnect switch for each capacitor bank.

3. All 3 phase electric motors, (5 Hp. and larger), shall be protected against single phasing.

4. Efficiencies specified shall be according to US efficiency test protocol which is IEEE 112 Test Method B.

5. Efficiencies shall be stamped on the nameplate of the motor.

6. All general purpose motors shall be NEMA Premium™ efficiency as noted in tables 1 and 2 as follows:

Table 1

Nominal Efficiencies For NEMA Premium™ Induction Motors Rated 600 Volts Or Less (Random Wound)

	Open Drip-Proof			Totally Enclosed Fan-Cooled		
HP	**6-pole**	**4-pole**	**2-pole**	**6-pole**	**4-pole**	**2-pole**
1	82.5	85.5	77	82.5	85.5	77
1.5	86.5	86.5	84	87.5	86.5	84
2	87.5	86.5	85.5	88.5	86.5	85.5
3	88.5	89.5	85.5	89.5	89.5	86.5
5	89.5	89.5	86.5	89.5	89.5	88.5
7.5	90.2	91	88.5	91	91.7	89.5
10	91.7	91.7	89.5	91	91.7	90.2
15	91.7	93	90.2	91.7	92.4	91
20	92.4	93	91	91.7	93	91
25	93	93.6	91.7	93	93.6	91.7
30	93.6	94.1	91.7	93	93.6	91.7
40	94.1	94.1	92.4	94.1	94.1	92.4
50	94.1	94.5	93	94.1	94.5	93
60	94.5	95	93.6	94.5	95	93.6
75	94.5	95	93.6	94.5	95.4	93.6
100	95	95.4	93.6	95	95.4	94.1
125	95	95.4	94.1	95	95.4	95
150	95.4	95.8	94.1	95.8	95.8	95
200	95.4	95.8	95	95.8	96.2	95.4
250	95.4	95.8	95	95.8	96.2	95.8
300	95.4	95.8	95.4	95.8	96.2	95.8
350	95.4	95.8	95.4	95.8	96.2	95.8

400	95.8	95.8	95.8	95.8	96.2	95.8
450	96.2	96.2	95.8	95.8	96.2	95.8
500	96.2	96.2	95.8	95.8	96.2	95.8

Table 2

Nominal Efficiencies For NEMA Premium™ Induction Motors Rated Medium Volts 5kV or Less (Form Wound)

	Open Drip-Proof			Totally Enclosed Fan-Cooled		
HP	**6-pole**	**4-pole**	**2-pole**	**6-pole**	**4-pole**	**2-pole**
250	95	95	94.5	95	95	95
300	95	95	94.5	95	95	95
350	95	95	94.5	95	95	95
400	95	95	94.5	95	95	95
450	95	95	94.5	95	95	95
500	95	95	94.5	95	95	95

D. Starter Disconnects

Combination starter/disconnects must be equipped with a factory disconnect micro switch and this switch must be wired into control circuit to deenergize the starter before disconnect opens.

E. Computer and Computer Room Circuits

1. Power supply for computer systems shall be provided with an isolated ground wire back to the service entrance single point isolated grounding grid buss.

2. Main feeder routing for computer and telephone cabling shall be inside hinged wireway whenever possible, branching off to individual computer terminations with conduit. Wireway shall be sized for 50% future growth. Minimum wireway size shall be 6".

F. Communications

1. Communications electrical shall meet University of Kentucky Standards Division 27.

2. Clocks and bells shall be self correcting compatible with the campus Primex Wireless system.

3. All television and telecable conduits shall have a home run to the floor communications panel. Outlets looped between rooms are not acceptable.

G. Security Systems

Provide conduit from at least one or more entrance doors on each building wall to a common 6"x6"x4" junction box mounted above the door. Door frame must include a small J-Box on each side of frame for lock/unlock and hinge feed thru and a small J-Box on top of frame for magnetic switch contacts. Provide a minimum of 1" conduit from each door 6"x6"x4" J-Box to the building facility management system or the designated access control panel for the future addition of access control.

END OF SECTION

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS & CABLES

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. This Section includes the following:
   1. Building wires and cables rated 600 V and less.
   2. Connectors, splices, and terminations rated 600 V and less.
   3. Sleeves and sleeve seals for cables.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

1.4 QUALITY ASSURANCE

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

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Alcan Products Corporation; Alcan Cable Division.
   2. American Insulated Wire Corp.; a Leviton Company.
   3. General Cable Corporation.
   4. Senator Wire & Cable Company.
   5. Southwire Company.

B. Copper Conductors: Comply with NEMA WC 70.

C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN-2-THWN-2 and Type XHHW-2.

D. Multiconductor Cable: Comply with NEMA WC 70/ICEA S-95-658 for armored cable, Type AC.

2.2 CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.
6. Thomas & Betts

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type XHHW-2, single conductors in raceway.

B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-2-THWN-2, single conductors in raceway.

C. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, single conductors in raceway.

D. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-2-THWN-2, single conductors in raceway.

E. Non-emergency, non-patient care area, 20 Amp branch circuit wiring: Metal-Clad, Type MC cable

F. Non-emergency, patient care area, 20 Amp branch circuit wiring: HCFC Type Health Care Facility cable.

G. Emergency Circuits: Type THHN-2-THWN-2, single conductors in raceway (separate from normal power circuits).

H. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, single conductors in raceway.

I. Class 1 Control Circuits: Type THHN-THWN, in raceway.

J. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Install cables (type MC cable) parallel and perpendicular to surfaces of structural members, and follow surface contours where possible. Support cable every 4’-0” on center.

F. Support cables according to Division 26 Section "Hangers and Supports for Electrical Systems."

G. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.
   1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

3.6 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating.

END OF SECTION

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

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: Grounding systems and equipment.

B. Section includes grounding systems and equipment, plus the following special applications:
   1. Ground bonding common.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:
   1. Grounding arrangements and connections for separately derived systems.
   2. Grounding for sensitive electronic equipment.

C. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:
   1. Solid Conductors: ASTM B 3.
   2. Stranded Conductors: ASTM B 8.

3. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.

2.2 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.
1. Pipe Connectors: Clamp type, sized for pipe.

C. Bus-bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

D. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum.
1. Bury at least 24 inches below grade.

C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

D. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
1. Install bus on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.

E. Conductor Terminations and Connections:
1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.

2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.
8. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.

C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

D. Water Heater, Heat-Tracing, and Anti-frost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

E. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

F. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. All electrical services shall be grounded. Service shall be bonded to one of the following:
   1. 1) metal underground water pipe in direct contact with the earth;
   2. 2) metal frame of the building or structure
   3. 3) concrete-encased electrode
   4. 4) ground ring encircling the building or structure
   5. 5) rod and pipe electrodes

C. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.
   1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
   2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
   1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
   2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
   3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:
   1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
   2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
   3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

3.4 LABELING

A. Comply with requirements in Division 26 Section "Identification for Electrical Systems" Article for instruction signs. The label or its text shall be green.

B. Install labels at the telecommunications bonding conductor and grounding equalizer and at the grounding electrode conductor where exposed.

1. Label Text: "If this connector or cable is loose or if it must be removed for any reason, notify the facility manager."

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports.
   1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
   2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
   3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.
      a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
      b. Perform tests by fall-of-potential method according to IEEE 81.

B. Grounding system will be considered defective if it does not pass tests and inspections.

C. Report measured ground resistances that exceed the following values:
   1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
   2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
   3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
   4. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s).

D. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

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. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.

1.3 PERFORMANCE REQUIREMENTS

A. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

B. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Steel slotted support systems.
2. Nonmetallic slotted support systems.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze hangers. Include Product Data for components.
2. Steel slotted channel systems. Include Product Data for components.
3. Equipment supports.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Allied Tube & Conduit.
    b. Cooper B-Line, Inc.; a division of Cooper Industries.
    c. ERICO International Corporation.
    d. GS Metals Corp.
    e. Thomas & Betts Corporation.
    f. Unistrut; Tyco International, Ltd.
    g. Wesanco, Inc.

2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
5. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Hilti Inc.
2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
3) MKT Fastening, LLC.
4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Cooper B-Line, Inc.; a division of Cooper Industries.
2) Empire Tool and Manufacturing Co., Inc.
3) Hilti Inc.
4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
5) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with single-bolt conduit clamps using spring friction action for retention in support channel.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
5. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
6. To Light Steel: Sheet metal screws.
7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes,

transformers, and other devices on slotted-channel racks attached to substrate by means that meet strength and anchorage requirements.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 PAINTING

A. Touchup: Comply with requirements in Division 09 painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

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:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Boxes, enclosures, and cabinets.

1.3 SUBMITTALS

A. Product Data: For raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Allied Tube & Conduit; a Tyco International Ltd. Co.
3. Anamet Electrical, Inc.
4. Electri-Flex Company.
5. O-Z/Gedney; a brand of EGS Electrical Group.
6. Picoma Industries, a subsidiary of Mueller Water Products, Inc.
7. Republic Conduit.
8. Robroy Industries.
9. Southwire Company.
10. Thomas & Betts Corporation.
11. Western Tube and Conduit Corporation.
12. Wheatland Tube Company; a division of John Maneely Company.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. IMC: Comply with ANSI C80.6 and UL 1242.

D. EMT: Comply with ANSI C80.3 and UL 797.

E. FMC: Comply with UL 1; zinc-coated steel.

F. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

G. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
2. Fittings for EMT:

    a. Material: Steel.
    b. Type: Compression.

3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.

H. Joint Compound for IMC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Anamet Electrical, Inc.
3. Arnco Corporation.
4. CANTEX Inc.
5. CertainTeed Corp.
6. Condux International, Inc.
7. Electri-Flex Company.
8. Kraloy.
9. Lamson & Sessions; Carlon Electrical Products.
10. Niedax-Kleinhuis USA, Inc.
11. RACO; a Hubbell company.
12. Thomas & Betts Corporation.

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

D. LFNC: Comply with UL 1660.

E. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

F. Fittings for LFNC: Comply with UL 514B.

G. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Adalet.
2. Cooper Technologies Company; Cooper Crouse-Hinds.
3. EGS/Appleton Electric.
4. Erickson Electrical Equipment Company.
5. FSR Inc.
6. Hoffman; a Pentair company.
7. Hubbell Incorporated; Killark Division.
8. Kraloy.
9. Milbank Manufacturing Co.
10. Mono-Systems, Inc.
11. O-Z/Gedney; a brand of EGS Electrical Group.
12. RACO; a Hubbell Company.
13. Robroy Industries.
14. Spring City Electrical Manufacturing Company.
15. Stahlin Non-Metallic Enclosures; a division of Robroy Industries.
16. Thomas & Betts Corporation.
17. Wiremold / Legrand.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.

E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

F. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

H. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

I. Device Box Dimensions: 4 inches square by 2-1/8 inches deep or 4 inches by 2-1/8 inches by 2-1/8 inches deep.

J. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

K. Cabinets:

1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC or IMC.
2. Concealed Conduit, Aboveground: IMC.
3. Underground Conduit: RNC, Type EPC-40-PVC.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Below concrete slab: RNC, Type EPC-40-PVC.
6. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: IMC.
4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: IMC.
7. Boxes and Enclosures: NEMA 250, Type 1.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. EMT: Use compression, stainless steel fittings with insulated throat. Comply with NEMA FB 2.10.
3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Comply with requirements in Division 26 Section "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. A. Support conduit within 12 inches of enclosures to which attached.

I. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum10-foot intervals.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Arrange raceways to keep a minimum of 2 inches of concrete cover in all directions.

J. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

L. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

M. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

N. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

O. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

P. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

Q. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

R. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

S. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
    c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.

5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

T. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC in damp or wet locations not subject to severe physical damage.

U. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

V. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

W. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

X. Locate boxes so that cover or plate will not span different building finishes.

Y. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

Z. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.3 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.4 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

END OF SECTION

SECTION 260533S03 – CONDUIT AND RACEWAY
Conduit and Boxes

1.0 Exterior

A. All exposed and concealed conduit shall be rigid steel. Underground runs shall be Schedule 40 or 80 PVC. Underground conduit runs into a building must transition from PVC to rigid or EMT within 12” of entering the structure. The minimum size of PVC or rigid conduit shall be 3/4".

2.0 Interior

A. All exposed and concealed conduit shall be EMT with exceptions noted. Connectors shall be compression for 2” and smaller conduit. Setscrew or compression connectors may be used for 2-1/2” and larger conduit. Minimum size of EMT conduit shall be 3/4".

B. Surface mounted wall conduit must be Wiremold. No EMT conduit to be surface mounted on any walls.

C. Connections to vibrating equipment shall be flexible steel conduit with PVC jacket (LFMC). Flexible conduit connections shall not exceed 72”. Waterproof connectors shall be used with LFMC.

D. Conduit for recessed and semi-recessed light fixtures shall be connected with flexible steel conduit. Minimum flexible conduit size shall be 3/4". Flexible steel conduit connections shall not exceed 72”.

E. Conduit to under cabinet lights shall be 1/2" flexible conduit. Flexible conduit runs shall not exceed 72”. Flexible conduit may be used for installation through casework. A four-inch junction box must be installed every 72” of flexible conduit to facilitate pulling wire.

F. Flex conduit can be used above ceilings as whips as long as the length is less than 6 feet.

G. Flex conduit can be used in existing drywall installations for fire alarm devices. Installation in new walls must be EMT conduit and not flex.

H. Connectors to be used on all flex conduit needs to be the squeeze connectors. Screw-on connectors are not allowed.

I. Boxes on the flex installations must be secured adequately in the drywall to prevent the flex from coming loose from the box.

J. All conduits shall be concealed within finished spaces.

K. Rigid conduit shall be used in all wet and damp locations.

L. Horizontal conduit shall not be installed directly from the side of one junction box to another junction box. The conduit needs to be either installed vertically to each box or from the junction box bottoms at a level lower than 12 inches AFF. See sketch below.

3.0 Concrete Slabs

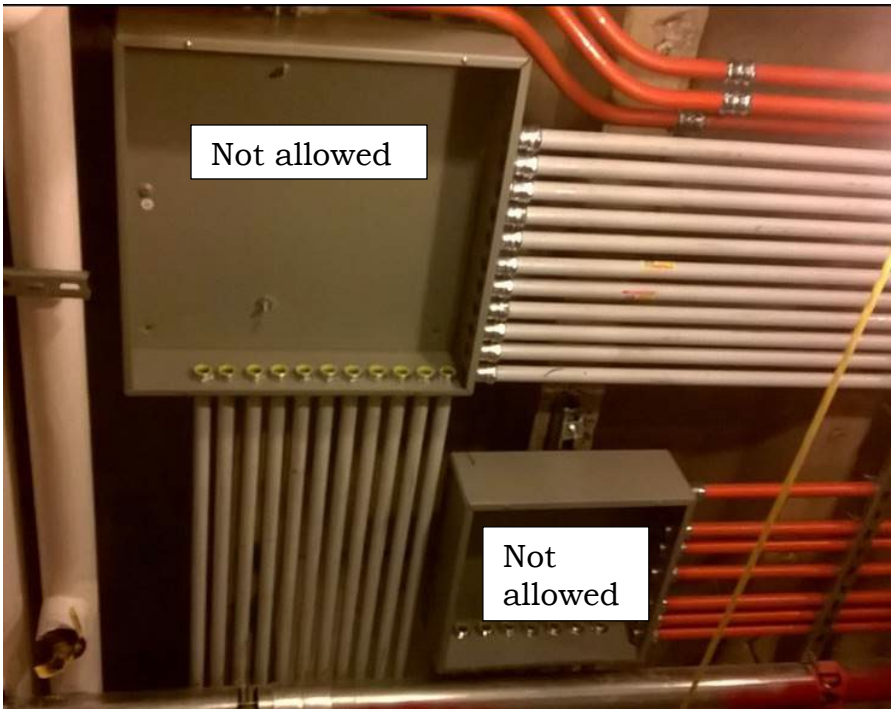
A. Conduit is not permitted to run horizontally in concrete slabs.

4.0 Color

A. Conduit in major renovations and new construction in Medical Center buildings shall follow the following coloring scheme:
   1) Life Safety Branch – Yellow
   2) Critical Branch – Orange
   3) Normal Branch – White
   4) Equipment Branch – Silver
   5) Fire Alarm System – Red
   6) HVAC Controls – Green
   7) Data/Communications – Blue
   8) Access Control - Purple

5.0 Junction Boxes

A. Large junction boxes (as shown in the picture below) may not be used in electrical conductor conduit runs for more than 3 circuits.



B. LB type junction boxes are prohibited in all conduits 1 ¼" or less. Use of LB junction boxes in conduits larger than 1 ¼" may be acceptable in special limited applications but require approval by the Medical Center Physical Plant Division project representative prior to installation.

END OF SECTION

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Equipment identification labels.
7. Miscellaneous identification products.

1.2 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

1.3 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

C. Comply with ANSI Z535.4 for safety signs and labels.

D. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.4 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

PART 2 - PRODUCTS

2.1 POWER AND CONTROL RACEWAY IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Colors for Raceways Carrying Circuits at 600 V or Less:

1. Black letters on an orange field
2. Legend: Indicate voltage.

C. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

2.2 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each cable size.

B. Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

2.3 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.

2.4 UNDERGROUND-LINE WARNING TAPE

A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.
2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE.
3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.

2.5 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Metal-Backed, Butyrate Warning Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application.

2. 1/4-inch (6.4-mm) grommets in corners for mounting.

3. Nominal size, 10 by 14 inches (250 by 360 mm).

D. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."

2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

2.6 EQUIPMENT IDENTIFICATION LABELS

A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

2.7 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished

grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches (400 mm) overall.

F. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

A. Accessible Raceways 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Identify with self-adhesive vinyl label Install labels at 30-foot (10-m) maximum intervals.

B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage.

C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in pull and junction boxes, use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.

a. Colors for 208/120-V Circuits:

1) Phase A: Black.

2) Phase B: Red.

3) Phase C: Blue.

b. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

D. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

E. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.

F. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

G. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Metal-backed, butyrate warning signs.

1. Comply with 29 CFR 1910.145.

2. Identify system voltage with black letters on an orange background.

3. Apply to exterior of door, cover, or other access.

4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:

    a. Power transfer switches.

H. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

I. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Equipment to Be Labeled:

    a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved, laminated acrylic or melamine label.

    b. Enclosures and electrical cabinets.

    c. Access doors and panels for concealed electrical items.

    d. Panelboards.

    e. Enclosed switches.

    f. Push-button stations.

    g. Contactors.

    h. Power-generating units.

    i. Monitoring and control equipment.

END OF SECTION

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Standard-grade receptacles, 125 V, 20 A.
2. USB receptacles
3. GFCI receptacles, 125 V, 20 A.
4. Toggle switches, 120/277 V, 20 A.
5. Wall-box occupancy sensor switch.
6. Wall-box dimmers.
7. Wall plates.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.

PART 2 - PRODUCTS

2.1 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Comply with NFPA 70.

C. RoHS compliant.

D. Comply with NEMA WD 1.

E. Device Color:

1. Wiring Devices: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
2. SPD Devices: Blue.
3. Isolated-Ground Receptacles: As specified above, with orange triangle on face.

F. Wall Plate Color: For plastic covers, match device color.

G. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 STANDARD-GRADE RECEPTACLES, 125 V, 20 A

A. Duplex Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements
   a. Cooper; 5351 (single), CR5362 (duplex).
   b. Hubbell; HBL5351 (single), HBL5352 (duplex).
   c. Leviton; 5891 (single), 5352 (duplex).
   d. Pass & Seymour; 5361 (single), 5362 (duplex).
2. Description: Two-pole, three wire, and self-grounding.
3. Configuration: NEMA WD 6, Configuration 5-20R.
4. Standards: Comply with UL 498 and FS W-C-596.

2.3 USB RECEPTACLES

A. Tamper-Resistant Duplex and USB Charging Receptacles:

1. Products: Subject to compliance with requirements
   a. Cooper; TR7756.
   b. Hubbell; USB20X2.
   c. Leviton; T5832.
   d. Pass & Seymour; PTTR20ACUSB.
2. Description: Single piece, rivet-less, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap. Integral shutters that operate only when a plug is inserted in the line voltage receptacle.
3. Line Voltage Receptacles: Two-pole, three wire, and self-grounding; NEMA WD 6, Configuration 5-20R.
4. USB Receptacles: Dual USB Type A, 5 V dc, and 2.1 A per receptacle (minimum).
5. Standards: Comply with UL 498, UL 1310, USB 3.0 devices, and FS W-C-596.
6. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" Article.

2.4 GFCI RECEPTACLES, 125 V, 20 A

A. Duplex GFCI Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; VGF20.
b. Hubbell; GFR5352L.
c. Pass & Seymour; 2095.
d. Leviton; GFTR.

2. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two-pole, three wire, and self-grounding.
3. Configuration: NEMA WD 6, Configuration 5-20R.
4. Type: Feed through.
5. Standards: Comply with UL 498, UL 943 Class A, and FS W-C-596.

2.5 TOGGLE SWITCHES, 120/277 V, 20 A

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Single Pole:
      1) Cooper; AH1221.
      2) Hubbell; HBL1221.
      3) Leviton; 1221-2.
      4) Pass & Seymour; CSB20AC1
2. Standards: Comply with UL 20 and FS W-S-896.

2.6 WALL-BOX OCCUPANCY SENSOR SWITCHES

A. Wall Sensor Light Switch, Dual Technology:

1. Description: Switchbox-mounted, combination lighting-control sensor and conventional switch lighting-control unit using dual (ultrasonic and passive infrared) technology.
2. Standards: Comply with UL 20.
3. Rated 960 W at 120 V ac for tungsten lighting, 10 A at 120 V ac or 10 A at 277 V ac for fluorescent or LED lighting, and 1/4 hp at 120 V ac.
4. Adjustable time delay of [five] [10] [15] [20] minutes.
5. Able to be locked to Manual]-On mode.
6. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc.
7. Connections: RJ-45 communications outlet.

B. Wall Sensor Light Switch, Passive Infrared:

1. Description: Switchbox-mounted, combination, lighting-control sensor and conventional switch lighting-control unit using passive infrared technology.
2. Standards: Comply with UL 20.

3. Connections: Hard wired.
4. Rated 960 W at 120 V ac for tungsten lighting, 10 A at 120 V ac or 10 A at 277 V ac for fluorescent or LED lighting, and 1/4 hp at 120 V ac.
5. Integral relay for connection to BAS.
6. Adjustable time delay of [five] [10] [15] [20] minutes.
7. Able to be locked to Manual-On mode.
8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc.

C. Wall Sensor Light Switch, Ultrasonic:

1. Description: Switchbox-mounted, combination, lighting-control sensor and conventional switch lighting-control unit using ultrasonic technology.
2. Standards: Comply with UL 20.
3. Connections: RJ-45 communications outlet.
4. Rated 960 W at 120 V ac for tungsten lighting, 10 A at 120 V ac or 10 A at 277 V ac for fluorescent or LED lighting, and 1/4 hp at 120 V ac.
5. Adjustable time delay of [five] [10] [15] [20] minutes.
6. Able to be locked to Manual-On mode.
7. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc.

2.7 DIMMERS

A. Wall-Box Dimmers:

1. Description: Modular, full-wave, solid-state dimmer switch with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.
2. Control: Continuously adjustable slider; with single-pole or three-way switching.
3. Standards: Comply with UL 1472.
4. Incandescent Lamp Dimmers: 120 V; control shall follow square-law dimming curve. On-off switch positions shall bypass dimmer module.
   a. 600 W; dimmers shall require no derating when ganged with other devices. Illuminated when "off."
5. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.
6. LED Lamp Dimmer Switches: Modular; compatible with LED lamps; trim potentiometer to adjust low-end dimming; capable of consistent dimming with low end not greater than 20 percent of full brightness.

2.8 WALL PLATES

A. Single Source: Obtain wall plates from same manufacturer of wiring devices.

B. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
3. Material for Unfinished Spaces: Smooth, high-impact thermoplastic.
4. Material for Damp Locations: Thermoplastic with spring-loaded lift cover and listed and labeled for use in wet and damp locations.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
2. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
3. Install wiring devices after all wall preparation, including painting, is complete.

C. Device Installation:

1. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
2. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

D. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the left.
2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.

E. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

F. Dimmers:

1. Install dimmers within terms of their listing.

2. Install unshared neutral conductors online and load side of dimmers according to manufacturers' device, listing conditions in the written instructions.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

B. Tests for Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.

C. A wiring device will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION

SECTION 26 2726S01 – WIRING DEVICES
University of Kentucky Standard

1. **Receptacles:**
    a) General
        1. In general, duplex receptacles shall be of the grounding type, rated at 20 amperes, 125 volts.
        2. Isolated ground receptacles shall be 20 amperes, 125 volts and shall be orange in color.
        3. Receptacles on emergency circuits shall be red in color.
        4. GFCI outlets must be used at all wet locations.
        5. All outlet covers shall be labeled with panel number and circuit number, voltage, phase, and amperes using P-touch style labels. Label inside of box with permanent marker indicating panel and circuit number.
    b) Receptacle Orientation
        1. Duplex receptacles should be mounted vertically with ground pin on top.
        2. Duplex receptacles mounted horizontally should be oriented with ground pin on left, neutral on top.

2. **Wall Plates:**
    a) A device plate shall be provided for each outlet to suit the device installed. All plates shall be installed with all four edges contacting the finished wall surface and aligned correctly vertically. The use of sectional device plates will not be permitted.
    b) Plates for emergency outlets shall be red and shall be labeled "EMERGENCY" in engraved letters. Plates for isolated ground outlets shall be orange and shall be labeled "ISOLATED GROUND" in engraved letters.

3. **Light Switches:**
    a) Light switches, for at least a minimal amount of lighting for safety, are to be installed at every entrance to a room. If a room has multiple levels of lighting, only one location must have the entire switching arrangement.
    b) Light switches are to be located at a maximum height of 48 inches from the finished floor to the center of the switch, to meet the current ADA handicap guidelines.

4. **Dimmer Controls:**
    a) Only dimmable LED luminaries will be permitted for use in dimmable fixtures.

END OF SECTION

SECTION 26 5110 - INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior lighting fixtures, lamps, and ballasts.
2. Exit signs.
3. Lighting fixture supports.

1.2 SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, and finishes.

1.3 QUALITY ASSURANCE

A. Electrical Components, agency and

B. d Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide product indicated on Drawings.

B. All contractors and suppliers wishing to bid on light fixtures including those listed in the schedule shall submit in detail PDF copies of complete sets of original catalogues cut sheets with catalogue number of the proposed substitutions, lamp information and photometrics from an independent testing laboratory to indicate compliance of submittal with those specified. Submitted light fixtures must be of similar design, appearance, quality and performance. Contractors/Suppliers must submit substitutions to Engineer ten (10) days prior to bid date for review and written approval. Substitution requests received less than ten (10) days prior to bid will be rejected without any review.

2.2 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. Metal Parts: Free of burrs and sharp corners and edges.

C. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.

D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit re-lamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during re-lamping and when secured in operating position.

E. Diffusers and Globes:

1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
   a. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
   b. UV stabilized.
2. Glass: Annealed crystal glass unless otherwise indicated.

F. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

G. Internally Lighted Signs:

1. Lamps for AC Operation: Fluorescent, two for each fixture, 20,000 hours of rated lamp life.
2. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
3. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
   a. Battery: Sealed, maintenance-free, nickel-cadmium type.
   b. Charger: Fully automatic, solid-state type with sealed transfer relay.
   c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
   d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
   e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

2.3 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Division 26 Section "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports, and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.

C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.

D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.

E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage.

F. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

2.4 LED LIGHT FIXTURES AND LEDs:

A. LEDs (Light Emitting Diodes): These shall be high-power suitable for illumination applications with white light output and shall comply with the following standard features:

1. LEDs shall be low voltage illumination grade or high power suitable for illumination application.
2. LEDs shall be designed to last at least 50,000 hours and maintain at least 70% of initial lumen output.
3. LEDs CCT (Correlated Color Temperature) shall be 2700K, 3000K, 3500K, 4100K, 5000K as specified in Luminaire schedule.
4. LEDs Color rendering index (CRI) shall be of minimum 80CRI.
5. Acceptable LED manufacturer include the following, any other manufacture not listed shall be as per approved by the Engineer.

a. Cree Truewhite™

b. Samsung

c. Nichia Corporation

d. OSRAM Opto Semiconductors

e. Norlux

B. LED Driver (Electrical System):

1. LED driver shall be integral, high efficiency driver and power supply with minimum 0.9 input voltage power factor and efficiency between 80% and 90%.
2. LED drivers shall control the current flowing through the LED. LED drivers shall match to the specific device of the array of LEDs to be illuminated.
3. Approved LED Driver Manufacturers:

a. Advance Transformer – Xitanium

b. Color Kinetics – White LED Current Regulator

c. Maxim - White LED Current Regulator

d. Micro semi – High Efficiency LED Driver

e. OSRAM Opto Semiconductors – Optotronics

f. Rohm- White LED Driver.

g. Toshiba – Constant Current LED Driver.

C. LED heat sinks: The long life of LED depends on how effectively the amount of heat around the LED is kept to a minimum. LED mounting material containing metal frames, fasteners and connectors shall dissipate heat away from LEDs. Any metal fins, wings and flat surfaces shall be used to assist in heat sinking of the LED system containing array of LEDs. These could even be integrated into the design of the system to increase attractiveness.

D. LED (Light Emitting Diodes) Luminaires /Light fixtures: LEDs lamps shall be as specified for lighting application where color, extended lamp life and efficacy are important. LED lamps shall be equivalent to those noted in the Luminaire schedule.

1. Luminaire specs shall include the LED manufacturer and the Bin number used in the Luminaire.
2. LEDs shall have nominal input power from 120V / 277V AC and control voltage of 10VAC for dimming and light switching devices.
3. LED Light fixtures shall be “Energy Star’ Rated complete with housing, LED driver and reflector if any.
4. LED light fixtures shall be LM-79-08 & LM-80-08 tested or certified.
5. LED light fixtures shall be tested and certified to UL Standards.
6. Housing: High quality, cast Aluminum, thermal design for optimal cooling efficiency.
7. Optics: Reflector shall be designed for efficient distribution.
8. Acceptable equivalents of LED lamps shall have the same lumen output as other regular lamps.
9. Operating Temperature: -22deg F to 104deg F.

E. Warranty: LED Light fixtures shall have a minimum of 5 years warranty or up to 10 years as available per lighting manufacturer. This shall include field labor or service charge to the repair or replacement of the product.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lighting fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.

B. Comply with NFPA 70 for minimum fixture supports.

C. Suspended Lighting Fixture Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.

2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.

3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.

D. Adjust aimable lighting fixtures to provide required light intensities.

E. Connect wiring according to Section "Low-Voltage Electrical Power Conductors and Cables."

3.2 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION

26 5113S01 - GENERAL REQUIREMENTS FOR LIGHTING AND LIGHTING CONTROLS
University of Kentucky Standard

All new construction and renovation shall comply with 2012 IECC and/or ASHRAE / IES 9.1 – 2010 or with the codes currently adopted by the State of Kentucky

1. INDOOR LIGHTING

*Note: This standard is a design guideline for all new buildings and renovations. LEED certified new building designs and on renovations designed to meet LEED-EB requirements, design exceptions may be taken to this standard if those are required for LEED compliance.

1.1. All general area lighting shall be LED. Lamp Kelvin temperature shall be 4100 degrees and Color Rendering Index shall be 85 or higher.

1.2. All new and replacement lighted "EXIT" signs shall be UL-924 approved, LED type, 2 watts or less, with green letters. For renovations with existing red letters, match existing.

1.3. Computer Labs, Libraries, and similar areas are to be provided with indirect lighting to minimize glare and subsequently eye fatigue.

2. LIGHTING BY AREA TYPE

Light levels to be as follows and consistent with IES recommendations:

2.1. General Areas

Type area	Average Foot-candles (Maintained[1])
Corridors	20
Stairs	20
Offices	50[2,3,4]
Mech. Rooms	50
Computer Labs	100
Libraries	100

NOTES

1. Foot-candle levels calculations must have, associated with them, a spherical coordinate system or polar coordinate system.

2. Provide two (2) levels of illumination when possible in offices. Provide dimmers when required.

3. Occupancy detectors used where required.

4. Foot-candle illumination levels in office areas shall be measured at workstation surface with occupant in place. Task lighting may be used to provide illumination levels at work surface height supplementing overhead lighting system.

2.2. Classrooms

Type area	Average Foot-candles (Maintained[1])
Art Rooms	50
Drafting Rooms	50
Home Economics Room, Sewing	50
Home Economics Room, Cooking & Ironing	50
Home Economics Room, Sink Activities, Note Taking Areas	50
Laboratories	100
Lecture Rooms, Audience Area	50
Lecture Rooms, Demonstration Area	50
Music Rooms, Simple Scores	30
Music Rooms, Advanced Scores	50
Recreation Areas	30
Shops	100
Sight Saving Rooms	50
Study Halls	50
Typing	50

2.3. Lighting by Task in Area

School Task:	Average Foot-candles (Maintained[1])
Reading	50
Spirit Duplicated Material	100
Drafting, Bench work	75
Lip Reading, Chalkboards, Sewing	50

3. INDOOR SPECIALTY LIGHTING
Review with owner in design phase of project and provide as designed.

4. GENERAL REQUIREMENTS FOR ALL LIGHTING

4.1. The standard color temperature for LED lighting design shall be 4100 degree Kelvin. Other color temperatures may be provided if the standard deviation is clearly noted in the design documents and acknowledged by the UK Representative.

4.2. All outdoor/exterior LED drivers shall have a minimum expected life of 100,000 hours at 25 degrees C.

4.3. All indoor LED drivers deliver IES LM-80-08 performance for a minimum expected life of 50,000 hours.

4.4. All indoor and outdoor lighting fixtures shall have power factor greater than .9, EMI shall comply with FCC Part 18, Subpart C and design shall specify the fixture lumen efficacy and shall specify the minimum IEC/PAS photometric code xxx.xxx.

4.5. All LED luminaires/fixtures shall have transient surge protection per ANSI C62.41.

4.6. All lighting lenses shall be of high quality and securely affixed to the fixture.

4.7. Unless specified otherwise, lighting is to be industrial quality.

4.8. All lighting is to be installed in accordance with UK Standards Division 26.

4.9. Do not provide radioactive lighting of any kind on University projects.

4.10. Exterior fixture lens to be tempered Glass, no polycarbonate, acrylic or other plastics.

4.11. Bollard lighting is not to be used as area, grounds, street, parking, or walkway lighting. Bollard lighting may only be used with written exception by UK representative and then only as accent lighting. Other fixtures in the area must be used and must be mounted a minimum of fourteen feet high and provide light levels as specified in this section, independent of the bollard light contribution.

4.12. Low mounted wall floods or step lights will be considered accent lighting only. Other fixtures in the area must be used and must provide light levels as specified in this section above the wall floods or step lights.

4.13. No direct buried posts. Lighting shall be set on concrete pier with bolts.

4.14. All lighting poles less than 41 feet shall be aluminum.

END OF SECTION

CCK-2802.0-1-24

Question and Response Log

As Of 06.13.24 @ 2:17PM

#	Date	From	Question	Responder	Response
1	6/13/2024	ATS Integrated Solutions/Tom Shaughnessy	In reviewing the plan sheet IC-001 it is asking for us to provide the Belimo control valve for the existing radiator heating units. The detail is calling for a hot water control valve but the plan view is calling for steam control valves and there is a difference in which valve we will need to select. Can you please clarify if this is hot water or steam. If steam, can you provide more information on the steam supply?	Matthew Ellis	The control valve is hot water.
2		Omni/Jeff Hurst	Is there a published budget for this project?	Jason Murphy	$125,000
3	6/14/2024	Parsons Electric/Mike Mitchell	Is there an area to stage a dumpster or use existing?	Jason Murphy	On Patterson Drive.
			Could the prebid sign-in sheet be issued as part of the addendum?	Ken Scott	Yes
			Could you please clarify in the Form of Proposal, on page 27, Unit Prices item #6 indicates Fire Alarm, but does not describe what type of fire alarm item (if required)?	Ken Scott	Can be ignored
			In the Form of Proposal, on page 28, Bidder's Proposed Major Subcontractors and Suppliers item #4 indicates Data, will IT-CNS be providing the cabling, terminations, testing and certification of such in-house?	Ken Scott	UK IT-CNS will pull all cable wiring and terminations. Conduit and pull string to be provided by electrician