SECTION 00 9111

ADDENDUM NUMBER 1

PARTICULARS

1.01 DATE: JANUARY 30, 2014

1.02 PROJECT: UNIVERSITY OF SOUTH CAROLINA - SUMWALT COLLEGE LABORATORY RENOVATIONS

1.03 PROJECT NUMBER: STATE PROJECT #H27-6098-FW, A/E #12044.02

1.04 OWNER: UNIVERSITY OF SOUTH CAROLINA

1.05 ARCHITECT: GMK ASSOCIATES, INC.

TO: PROSPECTIVE BIDDERS

2.01 THIS ADDENDUM FORMS A PART OF THE CONTRACT DOCUMENTS AND MODIFIES THE BIDDING DOCUMENTS DATED 12/20/2013 , WITH AMENDMENTS AND ADDITIONS NOTED BELOW.

2.02 ACKNOWLEDGE RECEIPT OF THIS ADDENDUM IN THE SPACE PROVIDED IN THE BID FORM. FAILURE TO DO SO MAY DISQUALIFY THE BIDDER.

2.03 THIS ADDENDUM CONSISTS OF 3 PAGES AND THE FOLLOWING ATTACHMENTS:

A. Pre-Bid Meeting attendance sign in sheets
B. DRAWING M2.3
C. DRAWING E3.3
D. DRAWING E3.4
E. SECTION 23 3600 - AIR TERMINAL UNITS
F. SECTION 23 3415 - LAB EXHAUST FANS

CHANGES TO THE PROJECT MANUAL

3.01 SECTION 10-1101 - VISUAL DISPLAY BOARDS

A. Add Aarco Products, Inc. as an approved manufacturer.

3.02 SECTION 12-3550 - LABORATORY FUME HOODS

A. Add Air Master as an approved manufacturer.

3.03 SECTION 12-3553.19 - WOOD LABORATORY CASEWORK

A. Add Sheldon Laboratory Systems as an approved manufacturer.
B. Add CiF Laboratory Solutions as an approved manufacturer.

3.04 SECTION 23 2214 - HYDRONIC SPECIALTIES

A. Add Therma Flo and Nexus Valve as approved manufacturers.

3.05 SECTION 23 3300 - AIR DUCT ACCESSORIES

A. 2.03.A. Add Pottorff and NCA as an approved manufacturer.

3.06 SECTION 23 3415 - LAB EXHAUST FANS

A. Add Section in its entirety.

3.07 SECTION 23 3600 - AIR TERMINAL UNITS

A. Replace section in its entirety.

3.08 SECTION 23 3700 - AIR OUTLETS AND INLETS

A. 2.01. Add Metalaire as an approved manfacturer.

3.09 SECTION 23 7313 - MODULAR CENTRAL-STATION AIR-HANDLING UNITS

A. 2.02. Add Temtrol as an approved manufacturer.

3.10 SECTION 23 8414 - STEAM HUMIDIFIERS

A. 2.01.A. Add Neptronic as an approved manufacturer.

CLARIFICATIONS

4.01 JANUARY 30, 2014 AT 2:00 PM IS THE LATEST TIME THAT AN ADDENDUM CAN BE ISSUED.

4.02 THE DEADLINE FOR QUESTIONS OR SUBSTITUTIUONS IS JANUARY 28, 2014 COB.

4.03 THE OWNER WILL REMOVE ANY MOVABLE FURNITURE, FIXTURES AND EQUIPMENT FROM THE PROJECT AREA. COORDINATE WITH THE OWNER AS REQUIRED.

4.04 6 PARKING SPACES WILL BE PROVIDED TO THE CONTRACTOR. 4 WILL BE BEHIND WARDLAW IN D1 SPACES AND 2 WILL BE AT EWS DEVINE STREET ENTRANCE IN D5 SPACES. ALL OTHER SPACES THAT THE CONTRACTOR REQUIRES WILL BE PROVIDED BY THE CONTRACTOR.

4.05 THERE WILL BE NO DISTURBANCE ON THE GREENE STREET SIDE OF THE BUILDING ALLOWED AS PART OF THE WORK.

4.06 THERE IS EXTREMELY LIMITED LAY-DOWN AREA AROUND THE PROJECT SITE. CONTRACTORS SHALL NOT PLAN TO HAVE ANY LAY-DOWN AREA AVAILABLE.

A. USC will provide a location for a dumpster.

B. GC may furnish an install trash chute and/or receive material deliveries to-and-from available 3rd Floor lab window(s), which are within the boundary of renovation scope, and crane lift delivered materials as required, based upon approved safety plan, crane lift plan and construction schedule'

4.07 THE CONSTRUCTION WORK WILL BE CARRIED OUT IN THE SUMMER MONTHS AND IS TO BE COMPLETE IN TIME FOR THE FALL SEMESTER. APRIL 30-MAY 7 ARE THE SCHEDULED FINAL EXAMINATIONS FOR THE SPRING SEMESTER. CONSTRUCTION WORK CAN START AFTER EXAMS AND GO THROUGH AUGUST 21, THURS. WHEN CLASSES BEGIN FOR THE FALL SEMESTER.

A. The Contract will be awarded as soon as possible after bid opening to accomodate the shop drawing and equipment/material procurements in advance of the summer Work period.

4.08 BUILDING OCCUPANCY DURING CONSTRUCTION:

A. Noise and Odor are to be limited as much as possible and give notification (48hrs) through the Owner and Architect. The owner intends to maintain occupancy of the entire building during the work so noise and odor will effect the entire building.

B. The above ceiling work indicated on the second floor will occur while the adjacent areas of the second floor are occupied. Coordination and Scheduling of the work with the Owner will be required to allow vacating of the spaces.

PRE-BID MEETING ATTENDANCE SIGN IN SHEET

5.01 ISSUED AS PART OF THIS ADDENDUM FOR INFORMATION ONLY. SEE ATTACHED.

CHANGES TO THE DRAWINGS

6.01 DRAWING M2.3

A. Replace sheet M2.3 in its entirety.

6.02 DRAWING E3.3

A. Replace sheet E3.3 in its entirety.

6.03 DRAWING E3.4

A. Replace sheet E3.4 in its entirety.

6.04 DRAWING E0.0

A. Light Fixture Schedule:
   1. For fixture A/A3: H.E. WILLIAMS LPT-24-332-SA12125-EB2/1-UNV (A3 WITH EM1400(T8)ST/1 BATTERY PACK) is an approved equal.
   2. For fixture A2: H.E. WILLIAMS LPT-24-232-SA12125-EB2-UNV is an approved equal.
   3. For fixture EX: H.E. WILLIAMS EXIT-R-AC-WHT is an approved equal.

END OF ADDENDUM NUMBER 1

University of South Carolina

Columbia, South Carolina

Project Name: USC Sumwalt College Laboratory Renovations
Project Number: H27-6098-FW
Pre Bid Date & Time: January 22, 2014 @ 10 am

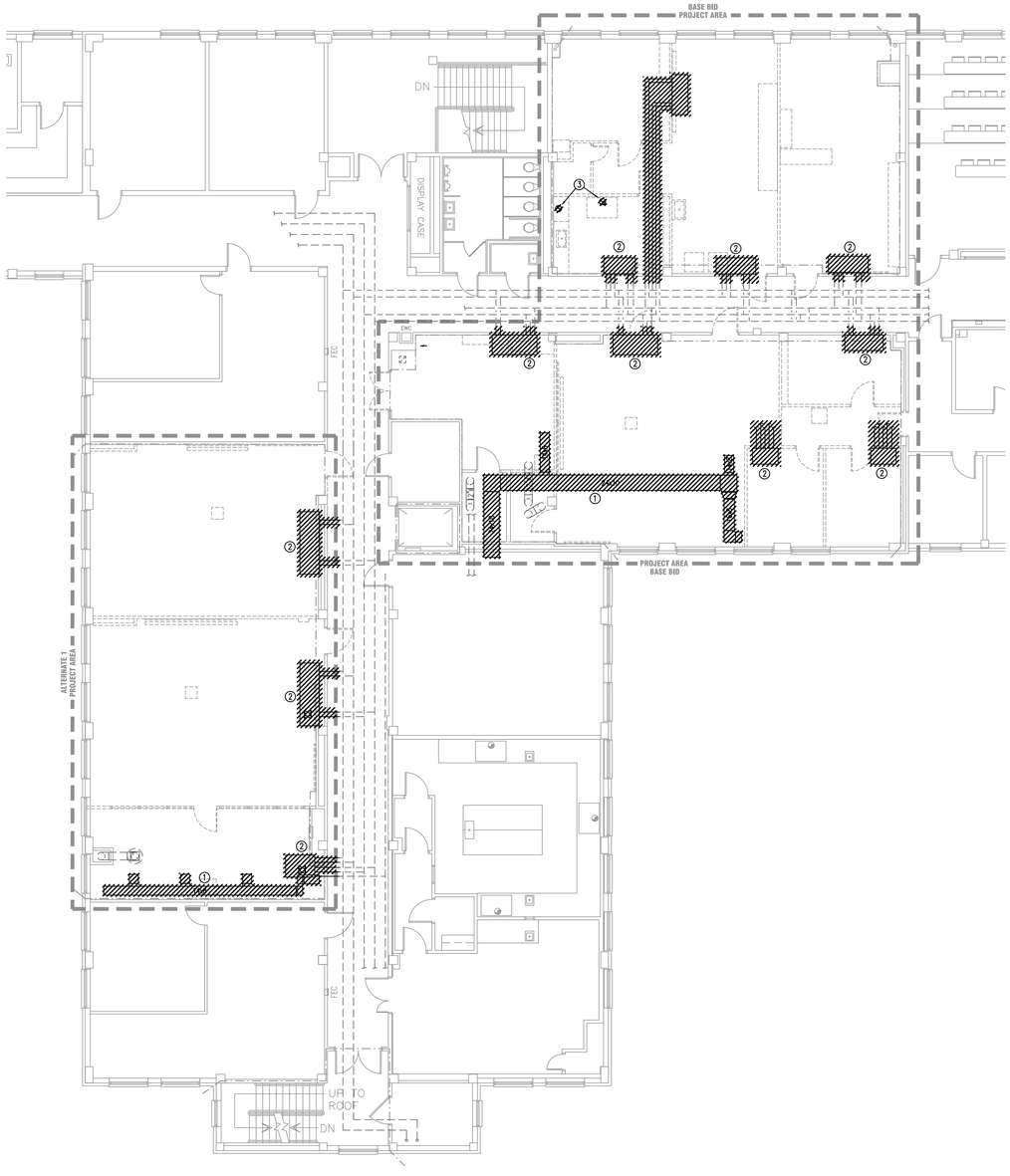
Name	Company Name	Address	Phone #	Email
Lee Bedenbaugh	Core Construction	PO Box 2156 West Columbia, SC 29171	(803) 791-8788	lee@coreconstructionsc.com
Gill Holland	ICI	14 Woodcross Dr Cola, SC 29212	803 2778880	gill.w.holland@jci.com
Frank Ayers	Solid Structures, LLC	2548 Mormingside Dr West Columbia, SC 29169	803. 926 0298	INOAH@SOLIDSTRUCTURES.INFO
Grey Tyler	Tyler Const. Group	P.O. Box 25037 Columbia 29224	865-1404 (F)865-1415	gtyler@tyler-construction.com
CHARLES STUART	HOOD CONSTRUCTION	1050 SHOP RD. COLUMBIA, SC 29201	803-765-2940	CHARLESSTUART@HOODCONSTRUCTION.COM
JEFF PASCHAL	MAR Construction	141 Riverchase Way Lexington SC 29072	803 796 8960	KathyM@marconstruction.com
Cheryl Amaker	USC	745 Greene St Columbia SC	803.777.9155	CAmaker@mailbox.sc.edu

University of South Carolina

Columbia, South Carolina

Project Name: USC Sumwalt College Laboratory Renovations
Project Number: H27-6098-FW
Pre Bid Date & Time: January 22, 2014 @ 10 am

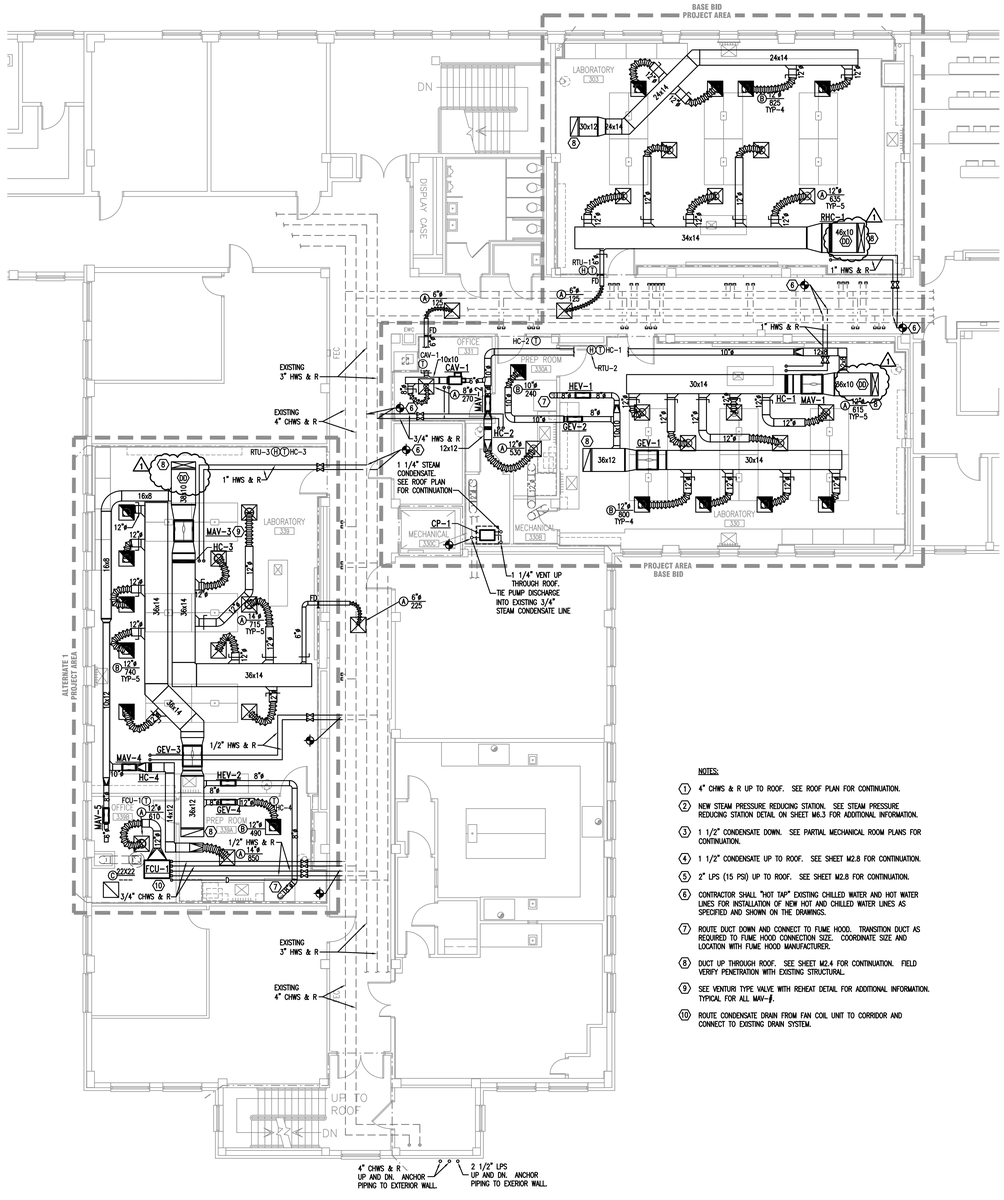
Name	Company Name	Address	Phone #	Email
JASON PROUSE	HAMMER CONSTRUCTION	785 HAMPTON CREEK LANE COLUMBIA, 29209	803-783-7033	jason@hammerllc.com
EVAN LIOLLIO	THS CONSTRUCTORS, INC	150 EXECUTIVE CENTER DR GREENVILLE, SC 29615 #B106	864.254.6006	eliollio@thsconstructors.com
CHRIS MERGNER	USC, Proj. Mgr.	743 Greene St.	777.4569	cmergner@fmc.sc.edu
ED PEARCE	GMK	1201 Main ST	256.0000	epearce@gmka.com
TOM Weiland	GMKA	1201 MAIN ST. STE 2100 COLA SC	256.0000	tweiland@gmka.com
Bart Sease	Edcon	P.O. Box 100 Peak, S.C. 29122	345-3791	bids@edconinc.com
Jaquana Brookins	USC	743 Greene st Columbia SC	777.3596	jbrookin@fmc.sc.edu



DEMOLITION NOTES:

1. REMOVE EXISTING DUCTWORK AND PIPING AS HATCHED ON PLAN.
2. REMOVE EXISTING FAN COIL UNIT, ASSOCIATED CONTROLS, AND CAP PIPING BACK ABOVE CORRIDOR CEILING.
3. REMOVE ALL ASSOCATED DUCTWORK AND CONTROLS CONNECTED TO FUME HOODS. FIELD VERIFY EXHAUST FAN ASSOCATED WITH FUME HOODS AND REMOVE EXHAUST FANS AND PATCH ROOF OPENINGS.

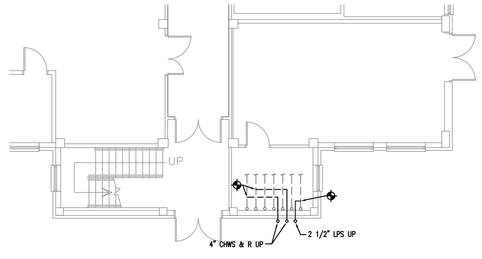
1 PARTIAL THIRD FLOOR PLAN – HVAC DEMOLITION
1/8"=1'-0"



NOTES:

1. 4" CHWS & R UP TO ROOF. SEE ROOF PLAN FOR CONTINUATION.
2. NEW STEAM PRESSURE REDUCING STATION. SEE STEAM PRESSURE REDUCING STATION DETAIL ON SHEET M6.3 FOR ADDITIONAL INFORMATION.
3. 1 1/2" CONDENSATE DOWN. SEE PARTIAL MECHANICAL ROOM PLANS FOR CONTINUATION.
4. 1 1/2" CONDENSATE UP TO ROOF. SEE SHEET M2.8 FOR CONTINUATION.
5. 2" LPS (15 PSI) UP TO ROOF. SEE SHEET M2.8 FOR CONTINUATION.
6. CONTRACTOR SHALL "HOT TAP" EXISTING CHILLED WATER AND HOT WATER LINES FOR INSTALLATION OF NEW HOT AND CHILLED WATER LINES AS SPECIFIED AND SHOWN ON THE DRAWINGS.
7. ROUTE DUCT DOWN AND CONNECT TO FUME HOOD. TRANSITION DUCT AS REQUIRED TO FUME HOOD CONNECTION SIZE. COORDINATE SIZE AND LOCATION WITH FUME HOOD MANUFACTURER.
8. DUCT UP THROUGH ROOF. SEE SHEET M2.4 FOR CONTINUATION. FIELD VERIFY PENETRATION WITH EXISTING STRUCTURAL.
9. SEE VENTURI TYPE VALVE WITH REHEAT DETAIL FOR ADDITIONAL INFORMATION. TYPICAL FOR ALL MAV-#.
10. ROUTE CONDENSATE DRAIN FROM FAN COIL UNIT TO CORRIDOR AND CONNECT TO EXISTING DRAIN SYSTEM.

2 PARTIAL THIRD FLOOR PLAN – HVAC RENOVATION
1/8"=1'-0"



3 PARTIAL FIRST FLOOR PLAN – HVAC
1/8"=1'-0"

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consultants

owner

UNIVERSITY OF SOUTH CAROLINA

project name
SUMWALT COLLEGE
LABORATORY RENOVATIONS

State project number
H27-6098-FW

project number
12044.02

seals/signature

issued for
CONSTRUCTION DOCUMENTS

date
DECEMBER 20, 2013

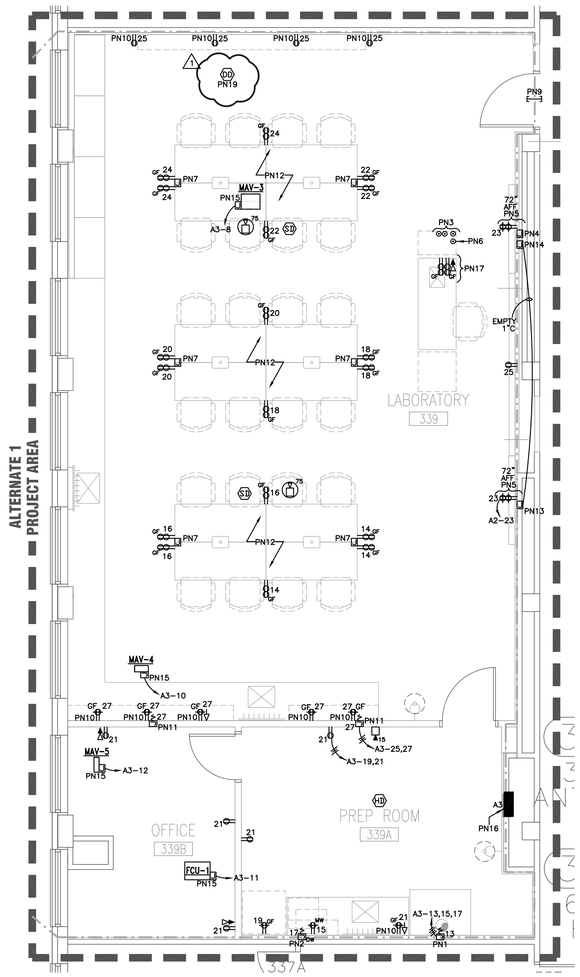
number	item	date
1	ADDENDUM NO. 1	1-30-2014

key plan

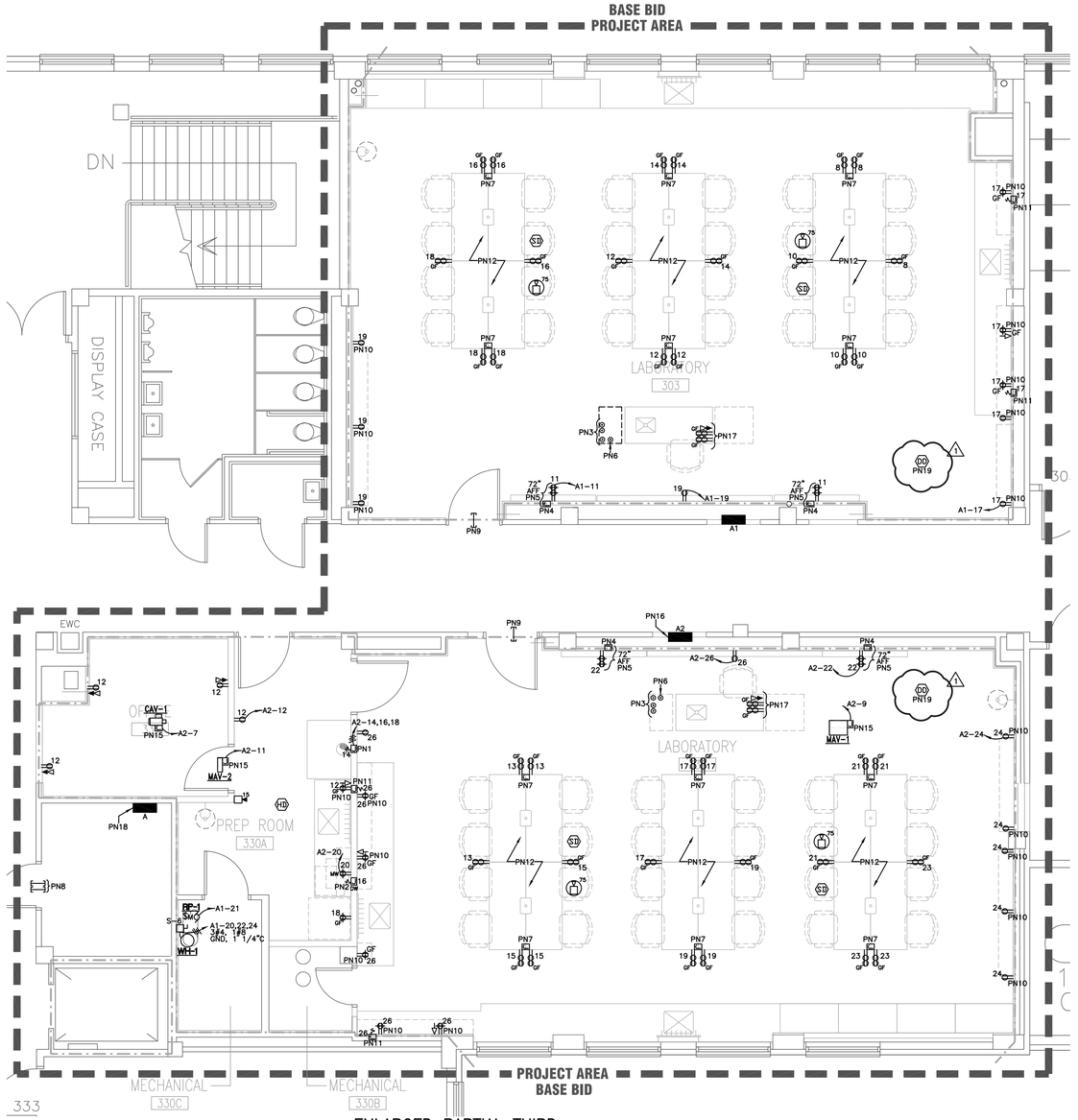
sheet title
PARTIAL FIRST & THIRD FLOOR PLAN - HVAC DEMOLITION AND RENOVATION

sheet number
M2.3

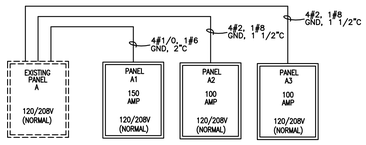
drawn by JDR
checked by JDR



1 ENLARGED PARTIAL THIRD FLOOR PLAN – ALTERNATE BID
1/4" = 1'-0"



2 ENLARGED PARTIAL THIRD FLOOR PLAN – BASE BID
1/4" = 1'-0"



POWER RISER DIAGRAM
NTS

PANEL A1

TYPE : AQ, SURFACE BUS AMPS : 150 AMPS MAIN : MLO VOLTAGE : 120-208V/3ø/4W/SN SOURCE : PANEL A							PANEL NAME A1 RMS SYM AMPS 42K AIC SYSTEM NORMAL
LOAD NAME	RATING	POLES	MLO A B C	POLES	RATING		LOAD NAME
RTU-1	40	3	1 2 3 4 5 6	3	40		LEF-1
LIGHTING	20	1	7 8	1	20		TABLE RECEPTACLES
LIGHTING			9 10				
WALL MOUNTED TV'S			11 12				
A/V EQUIPMENT			13 14				
A/V EQUIPMENT			15 16				
RECEPTACLES			17 18				
RECEPTACLES			19 20				
RP-1			21 22	3	70		WH-1
HEAT TRACE			23 24				
SPACE			25 26				SPACE
			27 28				
			29 30				

PANEL A1
• NORMAL – 120/208 VOLTS •
SOURCE: PANEL A

PANEL A2

TYPE : AQ, SURFACE BUS AMPS : 100 AMPS MAIN : MLO VOLTAGE : 120-208V/3ø/4W/SN SOURCE : PANEL A							PANEL NAME A2 RMS SYM AMPS 42K AIC SYSTEM NORMAL
LOAD NAME	RATING	POLES	MLO A B C	POLES	RATING		LOAD NAME
RTU-2	60	3	1 2 3 4 5 6	3	40		LEF-2
CAV-1	20	1	7 8	1	20		LIGHTING
MAV-1			9 10				LIGHTING
MAV-2			11 12				RECEPTACLES
TABLE RECEPTACLES			13 14				FUMEHOOD
			15 16				DISHWASHER
			17 18				FRIDGE
			19 20				MICROWAVE
A/V EQUIPMENT			21 22				WALL MOUNTED TV'S
A/V EQUIPMENT			23 24				RECEPTACLES
SPACE			25 26				RECEPTACLES
			27 28				HEAT TRACE
			29 30				SPACE
			31 32				
			33 34				
			35 36				
			37 38				
			39 40				
			41 42				

PANEL A2
• NORMAL – 120/208 VOLTS •
SOURCE: PANEL A

PANEL A3

TYPE : AQ, SURFACE BUS AMPS : 100 AMPS MAIN : MLO VOLTAGE : 120-208V/3ø/4W/SN SOURCE : PANEL A							PANEL NAME A3 RMS SYM AMPS 42K AIC SYSTEM NORMAL
LOAD NAME	RATING	POLES	MLO A B C	POLES	RATING		LOAD NAME
RTU-3	80	3	1 2 3 4 5 6	3	40		LEF-3
LIGHTING	20	1	7 8	1	20		MAV-3
LIGHTING			9 10				MAV-4
FCU-1			11 12				MAV-5
FUMEHOOD			13 14				TABLE RECEPTACLES
MICROWAVE			15 16				
DISHWASHER			17 18				
FRIDGE			19 20				
RECEPTACLES			21 22				
WALL MOUNTED TV'S			23 24				
RECEPTACLES			25 26				A/V EQUIPMENT
RECEPTACLES			27 28				A/V EQUIPMENT
SPACE			29 30				HEAT TRACE
			31 32				SPACE
			33 34				
			35 36				
			37 38				
			39 40				
			41 42				

PANEL A3
• NORMAL – 120/208 VOLTS •
SOURCE: PANEL A

POWER NOTES (PN):

PN1. FLEX AND CONNECT TO FUME HOOD. COORDINATE WITH EQUIPMENT WIRING WIRING REQUIREMENTS AND MAKE OPERABLE.
PN2. FLEX AND CONNECT TO DISHWASHER. COORDINATE WITH EQUIPMENT WIRING WIRING REQUIREMENTS AND MAKE OPERABLE.
PN3. CONDUIT STUB-UP AREA FOR A/V EQUIPMENT CABINET. SEE SHEET E2.0 FOR CONDUIT SIZE AND DESCRIPTION OF EACH PENETRATION.
PN4. FURNISH AND INSTALL AN EMPTY DOUBLE GANG ELEC. BOX MOUNTED IN THE WALL NEXT TO THE QUAD RECEPTACLE. COORDINATE EXACT MOUNTING LOCATION WITH A/V SUPPLIER. RUN AN EMPTY 1"C FROM DOUBLE GANG ELEC. BOX DOWN TO FINISH FLOOR THAT PENETRATES TO FLOOR BELOW. SEE CIRCUIT HOMERUN, FLOOR PENETRATION, AND DESCRIPTION ON 2ND FLOOR RENOVATION PLAN E3.2.
PN5. ELECTRICAL DEVICES SHALL NOT BE ROUGHED IN UNTIL EXACT MOUNTING LOCATION OF OWNER PROVIDED TV'S HAS BEEN DETERMINED AND COORDINATED WITH A/V SUPPLIER.
PN6. FURNISH AND INSTALL A DOUBLE GANG ELECTRICAL BOX WITH 2 FEET OF FLEXIBLE CONDUIT WITH A 90° FLEXIBLE CONDUIT FITTING ON THE 1"C STUB-UP. SEE CIRCUIT HOMERUN, FLOOR PENETRATION, AND DESCRIPTION ON 2ND FLOOR RENOVATION PLAN E3.2.
PN7 . EC SHALL FURNISH AND INSTALL J-BOX INSIDE THE CHASE WALLS OF BENCH TABLE. SEE CIRCUIT HOMERUN, FLOOR PENETRATION, AND DESCRIPTION ON 2ND FLOOR RENOVATION PLAN E3.2.
PN8. 4"C SLEEVE WITH GROMMETED ENDS ABOVE CEILING FOR DATA WIRE.
PN9. 2"C SLEEVE WITH GROMMETED ENDS ABOVE CEILING FOR DATA WIRE.
PN10. RECEPTACLE SHALL BE LOCATED BELOW WALL MOUNTED SHELVING. COORDINATE EXACT LOCATION PRIOR TO ANY ROUGH-INS. SEE SHEET A6.0.
PN11. J-BOX FOR OWNER PROVIDED HARD WIRED PLANT LIGHT. FLEX, CONNECT, AND MOUNT OWNER PROVIDED LIGHT. SEE ELEVATION ON SHEET A6.0 FOR EXACT MOUNTING LOCATION.
PN12. SEE SHEET A6.0 FOR EXACT MOUNTING HEIGHT AND LOCATION OF RECEPTACLES IN STUDENT TABLE. COORDINATE.
PN13. FURNISH AND INSTALL AN EMPTY DOUBLE GANG ELEC. BOX MOUNTED IN THE WALL NEXT TO THE QUAD RECEPTACLE. COORDINATE EXACT MOUNTING LOCATION WITH A/V SUPPLIER.
PN14. RUN AN EMPTY 1"C FROM DOUBLE GANG ELEC. BOX DOWN TO FINISH FLOOR THAT PENETRATES TO FLOOR BELOW. SEE CIRCUIT HOMERUN, FLOOR PENETRATION, AND DESCRIPTION ON 2ND FLOOR RENOVATION PLAN E3.2.
PN15. CONTROL POWER J-BOX FOR MECHANICAL UNIT LOCATED ABOVE CEILING.
PN16. NEW 100A PANEL SHALL BE CIRCUITED TO EXISTING 100A/208V/3P SPARE BREAKER FROM DEMOLITION LOCATED IN EXISTING PANEL "A". SEE POWER RISER DIAGRAM THIS SHEET.
PN17. SEE CIRCUIT HOMERUN, FLOOR PENETRATION, AND DESCRIPTION ON 2ND FLOOR RENOVATION PLAN E3.2.
PN18. FURNISH AND INSTALL A 150A/208V/3P BREAKER TO FEED PANEL "A1" IN EXISTING 100A/3P ~~SPEMSR SPARE~~ FROM DEMOLITION. SEE POWER RISER DIAGRAM THIS SHEET.
PN19. NEW DUCT DETECTOR FOR HVAC UNIT SHALL BE FURNISHED BY ELECTRICAL CONTRACTOR, INSTALLED BY MECHANICAL CONTRACTOR AND WIRED BY ELECTRICAL CONTRACTOR TO EXISTING FIRE ALARM CONTROL PANEL. (1)

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seals/signature

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date
DECEMBER 20, 2013

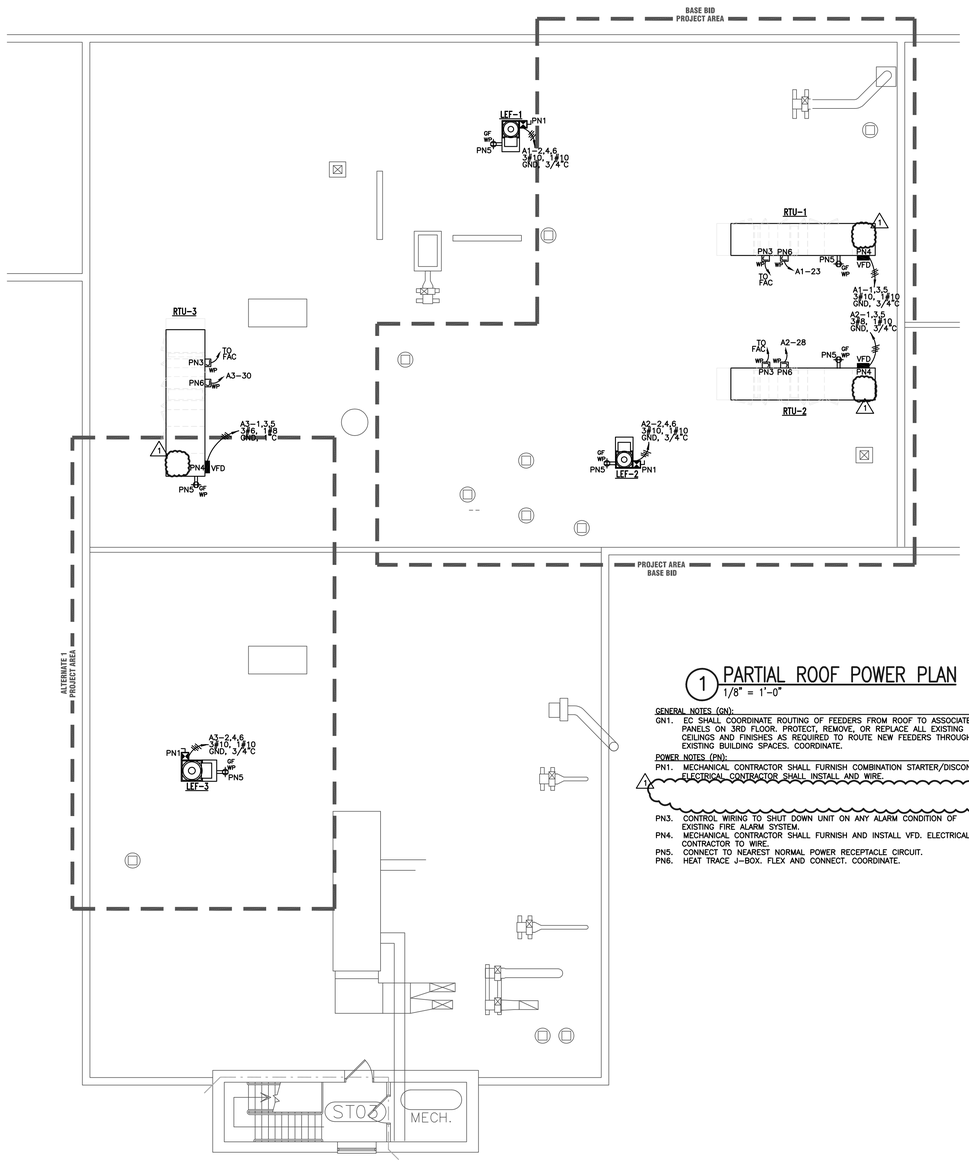
number	item	date
1	ADDENDUM NO. 1	1-30-2014

key plan

sheet title
ENLARGED PARTIAL THIRD FLOOR RENOVATION PLANS

sheet number
E3.3

drawn by TLK
checked by JBF



1 PARTIAL ROOF POWER PLAN
1/8" = 1'-0"

GENERAL NOTES (GN):

GN1. EC SHALL COORDINATE ROUTING OF FEEDERS FROM ROOF TO ASSOCIATED PANELS ON 3RD FLOOR. PROTECT, REMOVE, OR REPLACE ALL EXISTING CEILINGS AND FINISHES AS REQUIRED TO ROUTE NEW FEEDERS THROUGH EXISTING BUILDING SPACES. COORDINATE.

POWER NOTES (PN):

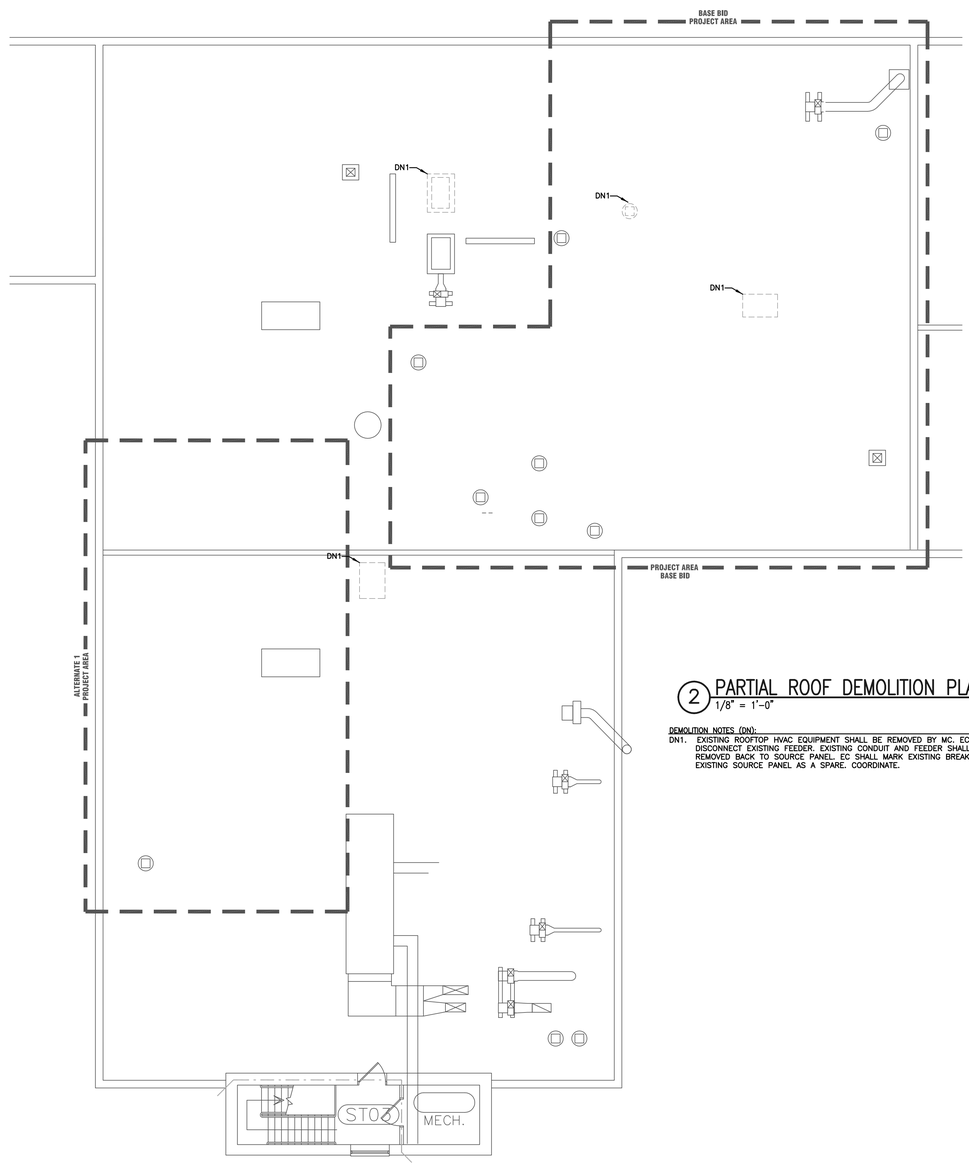
PN1. MECHANICAL CONTRACTOR SHALL FURNISH COMBINATION STARTER/DISCONNECT. ELECTRICAL CONTRACTOR SHALL INSTALL AND WIRE.

PN3. CONTROL WIRING TO SHUT DOWN UNIT ON ANY ALARM CONDITION OF EXISTING FIRE ALARM SYSTEM.

PN4. MECHANICAL CONTRACTOR SHALL FURNISH AND INSTALL VFD. ELECTRICAL CONTRACTOR TO WIRE.

PN5. CONNECT TO NEAREST NORMAL POWER RECEPTACLE CIRCUIT.

PN6. HEAT TRACE J-BOX. FLEX AND CONNECT. COORDINATE.



2 PARTIAL ROOF DEMOLITION PLAN
1/8" = 1'-0"

DEMOLITION NOTES (DN):

DN1. EXISTING ROOFTOP HVAC EQUIPMENT SHALL BE REMOVED BY MC. EC SHALL DISCONNECT EXISTING FEEDER. EXISTING CONDUIT AND FEEDER SHALL BE REMOVED BACK TO SOURCE PANEL. EC SHALL MARK EXISTING BREAKER IN EXISTING SOURCE PANEL AS A SPARE. COORDINATE.

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number	item	date
1	ADDENDUM NO. 1	1-30-2014

key plan

N

sheet title
PARTIAL ROOF DEMOLITION AND POWER PLANS

sheet number
E3.4

drawn by TLK
checked by JBF

SECTION 23 3600
AIR TERMINAL UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Constant volume terminal units.

B. Variable volume terminal units.

C. Electronic Airflow Control Valve

1.02 RELATED REQUIREMENTS

A. Section 22 0513 - Common Motor Requirements for Plumbing Equipment.

B. Section 23 2113 - Hydronic Piping: Connections to heating coils.

C. Section 23 2114 - Hydronic Specialties: Connections to heating coils.

D. Section 23 3100 - HVAC Ducts and Casings.

E. Section 23 3300 - Air Duct Accessories.

F. Section 23 3700 - Air Outlets and Inlets.

G. Section 23 0913 - Instrumentation and Control Devices for HVAC: Thermostats and Actuators.

1.03 REFERENCE STANDARDS

A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilation Systems; National Fire Protection Association; 2012.

B. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings that indicate air flow, static pressure, and NC designation. Include electrical characteristics and connection requirements.

C. Shop Drawings: Indicate configuration, general assembly, and materials used in fabrication, and electrical characteristics and connection requirements.
   1. Include schedules listing discharge and radiated sound power level for each of second through sixth octave bands at inlet static pressures of 1 to 4 inch wg.

D. Project Record Documents: Record actual locations of units.

E. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts lists. Include directions for resetting constant volume regulators.

F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

G. Operation and Maintenance Manuals: Include in manuals the information listed below. For information on how to prepare and submit manuals see section 1780 (Closeout Submittals).
   1. Spare parts lists
   2. Operating instructions
   3. Maintenance instructions, including preventative and corrective maintenance.
   4. Copies of warranties
   5. Wiring diagrams
   6. Shop drawings and product data

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for air terminal units.

PART 2 PRODUCTS

2.01 AIR TERMINAL UNITS

A. Manufacturers
   1. Carrier
   2. Enviro-Tec
   3. Trane
   4. Titus
   5. Metalaire

B. Refer to schedules for model and type terminal unit specified.

C. Basic Assembly:
   1. Casings: Minimum 22 gage galvanized steel.
   2. Lining: Minimum 1/2 inch thick neoprene or vinyl coated fibrous glass insulation, 1.5 lb/cu ft density, meeting NFPA 90A requirements and UL 181 erosion requirements. Face lining with mylar film.
   3. Plenum Air Inlets: Round stub connections for duct attachment.
   4. Plenum Air Outlets: S slip and drive connections.

D. Basic Unit:
   1. Configuration: Air volume damper assembly inside unit casing. Locate control components inside protective metal shroud.
   2. Volume Damper: Construct of galvanized steel with peripheral gasket and self lubricating bearings; maximum damper leakage: 2 percent of design air flow at 1 inches rated inlet static pressure.
   3. Mount damper operator to position damper normally open.

E. Hot Water Heating Coil:
   1. Construction: 1/2 inch copper tube mechanically expanded into aluminum plate fins, leak tested under water to 200 psig pressure, factory installed.

F. Automatic Damper Operator:
   1. Electric Actuator: 24 volt with high limit.

2.02 ELECTRONIC AIRFLOW CONTROL VALVE

A. Manufacturers
   1. Phoenix Controls
   2. Price
   3. Critical Room Control
   4. Other acceptable manufacturer's that meet specification

B. General
   1. The airflow control device shall be a venturi valve.
   2. The valve assembly manufacturer's Quality Management System shall be registered to ISO 9001:2008.
   3. The airflow control device shall be pressure independent over its specified differential static pressure operating range. An integral pressure independent assembly shall respond and maintain specific airflow within one second of a change in duct static pressure irrespective of the magnitude of pressure and/or flow change or quantity of airflow controllers on a manifolded system.

4. The airflow control device shall maintain accuracy within ±5% of signal over an airflow turndown range of no less than:
    a. Standard Valve Body Type
        1) Up to 1000 CFM - 20 to 1
        2) Up to 1500 CFM - 16 to 1
        3) Up to 2500 CFM - 12 to 1
5. No minimum entrance or exit straight length of duct shall be required to ensure accuracy and/or pressure independence.
6. The airflow control device shall maintain pressure independence regardless of loss of power.
7. The airflow control device shall be constructed of one of the following four types:
    a. Class A-The airflow control device for non-corrosive airstreams, such as supply and general exhaust, shall be constructed of 16-gauge aluminum. The device's shaft and internal “S” link shall be made of 316 stainless steel. The shaft support brackets shall be made of galvaneal (non shutoff valves) or 316 stainless steel (shutoff valves). The pivot arm shall be made of aluminum (for non shutoff valves) and 303/304 stainless (for shut off valves). The pressure independent springs shall be a spring-grade stainless steel. All shaft bearing surfaces shall be made of a PP (polypropylene) or PPS (polyphenylene sulfide) composite. Sound attenuating devices used in conjunction with general exhaust or supply airflow control devices shall be constructed using 24 gauge galvanized steel or other suitable material used in standard duct construction. No sound absorptive materials of any kind shall be used.
    b. Class B-The airflow control device for corrosive airstreams, such as fume hoods and biosafety cabinets, shall have a baked-on, corrosion-resistant phenolic coating. The device's shaft shall be made of 316 stainless steel with a Teflon coating. The shaft support brackets shall be made of 316 stainless steel. The pivot arm and internal “S” link shall be made of 316 or 303 stainless steel. The pressure independent springs shall be a spring-grade stainless steel. The internal nuts, bolts and rivets shall be stainless steel. All shaft bearing surfaces shall be made of PP (polypropylene) or PPS (polyphenylene sulfide) composite.
8. Actuation
    a. A standard-speed electric actuator shall be used to modulate the airflow over the range of the specific valve size. The maximum time to modulate from minimum to maximum flow shall be less than 60 seconds for standard valves and 90 seconds for shut-off valves. A UL or CSA listed electronic actuator shall be factory mounted to the valve. The actuator shall have sufficient torque to modulate the airflow against the maximum duct static pressure (within product specifications).
9. The control valves shall integrate with the BMS.
10. Certification
    a. Each airflow control device shall be factory characterized to the job specific airflows as detailed on the plans and specifications using NIST accredited air stations and instrumentation having a combined accuracy of no more than ±1% of signal (5,000 to 250cfm), ±2% of signal (249 to 100cfm) and ±3% of signal (199 to 35cfm). Electronic airflow control devices shall be further characterized and their accuracy verified to ±5% of signal at a minimum of 48 different airflows across the full operating range of the device.
    b. Each airflow control device shall be marked with device-specific factory characterization data. At a minimum, it should include the room number, tag number, serial number, model number, eight-point characterization information (for electronic devices), date of manufacture and quality control inspection numbers. All information shall be stored by the manufacturer for use with as-built documentation.

Characterization data shall be stored indefinitely by the manufacturer and backed up off site for catastrophic event recovery.

11. Airflow control devices that are not venturi valves and are airflow measuring devices (e.g., pitot tube, flow cross, air bar, orifice ring, vortex shedder, etc.) shall only be acceptable, provided these meet all the performance and construction characteristics as stated throughout this specification and:
    a. The airflow control device employs transducers manufactured by Rosemount, Bailey, Bristol, or Foxboro. Accuracy shall be no less than ±0.15% of span (to equal ±5% of signal with a 15 to 1 turndown) over the appropriate full-scale range, including the combined effects of nonlinearity, hysteresis, repeatability, drift over a one-year period, and temperature effect. 316L stainless steel materials shall be provided for all exhaust applications. The use of 304 stainless steel or aluminum materials shall be provided for all supply air applications.
    b. Airflow sensors shall be of a multi-point averaging type, 304 stainless steel for all supply and general exhaust applications, 316L stainless steel for all fume hood, canopy, snorkel, and biosafety cabinet applications. Single point sensors are not acceptable.
    c. Suppliers of airflow control devices or airflow measuring devices requiring minimum duct diameters shall provide revised duct layouts showing the required straight duct runs upstream and downstream of these devices. Coordination drawings reflecting these changes shall be submitted by the supplier of the LACS. In addition, suppliers shall include static pressure loss calculations as part of their submittals. All costs to modify the ductwork, increase fan sizes and horsepower and all associated electrical changes shall be borne by the control system supplier.

C. EXHAUST AND SUPPLY AIRFLOW DEVICE CONTROLLER
1. One controller shall be provided for both the supply airflow control device and the corresponding exhaust airflow control device. The controller shall be a microprocessor-based design and use closed-loop control to linearly regulate airflow based on a digital control signal. The device shall generate a digital feedback signal that represents its airflow.
2. In flow tracking applications where an exhaust device and or a return device is tracking a supply device, flow data for each device (up to 3 valves total) shall be downloaded to the controller in the factory.
3. The airflow control device shall store its control algorithms in non-volatile, rewritable memory. The device shall be able to stand alone or to be networked with other room-level digital airflow control devices through an industry standard protocol.
4. Room-level flow tracking control functions shall be embedded in and executed by one controller mounted on one of the airflow devices.
5. The room-level control network shall communicate by using BACnet® MS/TP protocol. The control device must meet the requirements of a BACnet Application Specific Controller (B-ASC Level Device), and be a BACnet Testing Laboratories (BTL) certified device.
6. The airflow control device shall use industry standard 24 VAC power.
7. The airflow control device shall have provisions to connect a notebook PC commissioning tool and every node on the network shall be accessible from any point in the system.
8. The airflow control device shall include inputs with 10-bit resolution that accept 10K thermistors, 0-10 VDC, 0-5 VDC, 0-20 mA and dry contact signals. Controller shall include binary and analog outputs on board. Analog outputs shall be 5 VDC, 0-10 VDC, 2-10 VDC, or 0-20mA. Software shall include scaling features for analog outputs. Controller shall include a 24 Vdc voltage supply for use as power supply to external sensors.
9. Controller shall also include support for interface with digital display which allows display and modification of controller set point variables.

D. Temperature Controller
   1. For zones with constant volume (CV) venturi valves that require hydronic reheat control, provide a low-voltage and microprocessor-based zoning thermostat-controller capable of (Select: three point floating or 0-10Vdc analog control). The thermostat-controller shall operate in a stand-alone mode and be capable of BACnet MSTP communications.
      a. Thermostat-controller shall be pre-programmed, containing all required I/O to accomplish local HVAC temperature control for heating with reheat.
      b. Thermostat-controller shall be provided with two (2) floating or two (2) analog proportional-integral control outputs. Thermostat-controller shall have integrated changeover function, which will allow seamless switching between cooling and heating mode based upon temperature or a network value input.
      c. Thermostat-controller shall achieve accurate temperature control using a PI proportional-integral algorithm. Differential-based thermostat-controllers are not acceptable. Thermostat-controller shall have an adjustable deadband.
      d. Thermostat-controller shall have an on-board 10K NTC thermistor and the capability for a remote temperature sensor that will replace the on-board temperature sensor.
      e. Thermostat-controller shall be capable of local or remote override during unoccupied mode. The thermostat-controller shall resume occupied setpoints and will revert back to unoccupied setpoints after a set time adjustable from 0 to 24 hours. Thermostat-controller shall also have configurable temporary or permanent local override setpoints. When the “temporary setpoints” mode is enabled, once the temporary occupancy timer expires, the setpoints will revert back to their default values. Thermostat-controller shall have adjustable local unoccupied heating and cooling setpoint limits as well as maximum heating and minimum cooling limits.
      f. Thermostat-controller shall also provide; (2) additional configurable inputs for remote night setback, occupancy sensing, door contact, remote override, or filter alarm as required. (1) additional configurable input for dry contact or analog sensor changeover, or for other temperature sensor monitoring as required. (1) configurable auxiliary output to be used for heating or local digital output.
      g. Thermostat-controller shall be equipped with 2-line, 16-character LCD dual intensity backlit display with two status LEDs for heating or cooling mode, and be capable of displaying temperatures in Celsius or Fahrenheit.
      h. Thermostat-controller shall utilize EEPROM memory to back up local configuration parameters in the event of power failure. Thermostat-controllers requiring batteries, or have no provisions for retention during loss of power shall not be acceptable.
      i. Thermostat-controller shall have (4) adjustable keypad lockout levels limiting access to changes of occupied and unoccupied setpoints.

E. OPERATION SEQUENCES
   1. Room Volumetric Offset Control
      a. The airflow control system shall control supply and exhaust airflow devices in order to maintain a volumetric offset (either positive or negative). Offset shall be maintained regardless of any change in flow or static pressure. The offset represents the air volume that enters or exits the room from the corridor or adjacent spaces.
      b. The airflow control system shall maintain the fixed volumetric offset as the supply and exhaust venturi valves increase or decrease flow to meet temperature, occupancy, or ACH demands.
      c. The offset control algorithm shall sum the flow values of all supply and exhaust airflow devices and command appropriate controlled devices to new set points to maintain the desired offset. This offset shall be adjustable from the BMS or locally through commissioning software installed on a laptop computer.

d. The offset control algorithm shall consider non-networked airflow control devices that consist of supply and exhaust flow devices that provide an analog signal scaled to reflect actual flow and any number of constant volume devices where the total of the supply and exhaust devices or may be included in the offset control algorithm.

2. Space Temperature Control
   a. The airflow control system shall regulate the space temperature through a simultaneous combination of programmable volumetric thermal override and control of reheat coils and/or staged or simultaneous auxiliary temperature control devices. The controller shall calculate separate cooling and heating set points based on a single writable set point from the BMS, with the option of a local set point offset adjustment.
   b. Temperature control shall be implemented through the use of independent primary cooling and heating control functions, as well as an auxiliary temperature control function, which may be used for either supplemental cooling or heating. Cooling shall be provided as a function of thermal override of conditioned air with the supply and exhaust airflow devices responding simultaneously to maintain the desired offset. Heating shall be provided through either modulating or floating point control actuator of a properly sized control valve connected to the selected reheat coil.
3. Occupancy Override Control
   a. The airflow control system shall have the ability to change the minimum ventilation and/or temperature control set points, based on the occupied state, to reduce energy consumption when the space is not occupied. Two occupancy modes shall be available: occupied and unoccupied. The occupancy state may be set by either the BMS as a scheduled event or a local override button that allows a user to set the space to occupied for a predetermined interval. The local timed bypass button (located on the wall mounted temp sensor) or the override contact shall be given priority over the BMS command.
4. Emergency Mode Control (Alternate Flow Control)
   a. The airflow control system shall provide a means in conjunction with a BMS supervisory controller of overriding temperature and pressurization control in response to a command indicating an emergency condition exists, and airflow control devices are to be driven to a specific flow set point. The system shall support up to four emergency control modes. The emergency control modes may be initiated either by a local contact input or BMS command. Once an emergency mode is invoked, pressurization (offset) and temperature control are overridden for the period that the mode is active. Emergency modes shall have a priority scheme allowing a more critical mode to override a previously set condition.
5. Humidity Control
   a. The airflow control system shall have an optional embedded humidity control function, which allows the monitoring and control of the relative humidity level in the pressurized zone. The airflow devices shall have the ability to monitor the relative humidity level of the space and, based on a BMS writeable set point, develop a control signal to drive a humidification control circuit.
6. 3-State Control
   a. The airflow control system shall provide a means of controlling a 2 or 3-state local exhaust device (e.g. hood, canopy, snorkel). 2-state control can be set for either min flow (unoccupied) and max flow (occupied), or off and max flow (normal). 3-state control can be off, min (unoccupied) and max (normal) flow.
7. LED Control / Alarming
   a. The airflow control system shall provide LED notification for 2 or 3-state hoods, 2-state snorkels or capture hoods (LED provided by others). Alternatively, when not

used for LED notification, the LED control can be used for room-level alarm indication for spaces such as Operating Rooms (alarm provided by others).

8. Indoor Air Quality (IAQ) Control
   a. The airflow control system shall provide a means of dynamically controlling the air change per hour (ACH) rate to the space, based on the input from an air quality signal (i.e. monitoring system or a maximum of two local sensors). A minimum and maximum ACH shall be programmed into the controller and the airflow control system shall linearly ramp within these values in response to the air quality signal. Proper offset and directional airflow will be maintained at all times.
9. Pandemic Mode Control
   a. The airflow control system shall provide a means of receiving a local or network command to switch to 100% outside exhaust by closing the return air valve and opening the exhaust air valve, change the pressurization (i.e. volumetric offset) of the space from neutral to negative or positive and increase the ACH set point.
10. BACnet Multi-Use Inputs
    a. In addition to the dedicated inputs for standard control functions, each BACnet venturi valve controller shall provide multi-use inputs for the following local monitoring or control functions (per the capabilities and limitations shown in Section 2.05.A):
       1) Discharge Air Sensor
       2) Volumetric Cooling Override
       3) Occupancy Sensor
       4) Humidity Sensor
       5) Pressure Monitoring
       6) IAQ Sensor
       7) Pandemic Switch
       8) Emergency Switch
       9) Additional Flow Inputs (Supply and Exhaust)
       10) Local Offset Selection Switch

F. BACnet INTERFACE TO BUILDING MANAGEMENT SYSTEMS
   1. The airflow control system network shall interface digitally with the BMS via BACnet MS/TP. All room-level points shall be available to the BMS for monitoring or trending. At a minimum, the airflow controller shall be BACnet Testing Lab (BTL) certified as an Application Specific Controller (B-ASC).

2.03

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Support units individually from structure. Do not support from adjacent ductwork.

C. Connect to ductwork in accordance with Section 23 3100.

END OF SECTION

SECTION 23 3415
LAB EXHAUST FANS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Laboratory Exhaust Fans
B. Motors and drives.
C. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 23 0513 - Common Motor Requirements for HVAC Equipment.
B. Section 23 0548 - Vibration and Seismic Controls for HVAC Piping and Equipment.
C. Section 23 3300 - Air Duct Accessories: Backdraft dampers.

1.03 REFERENCE STANDARDS

A. AMCA Publication 99, "Standards Handbook”
B. ANSI/AMCA Standard 210-99, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating"
C. AMCA Publication 211-05, "Certified Ratings Program - Product Rating Manual for Fan Air Performance"
D. AMCA Standard 300-96, "Reverberant Room Method for Sound Testing of Fans"
E. AMCA Publication 311-05, "Certified Ratings Program"
F. AMBA Method of Evaluating Load Ratings of Bearings ANSI-11 (r1999)
G. ANSI/AMCA Standard 204-96, "Balance Quality and Vibration Levels for Fans"
H. AMCA Standard 500-D-98, "Laboratory Methods of Testing Dampers For Rating"
I. AMCA Standard 500-L-99, "Laboratory Methods of Testing Louvers For Rating"
J. SMACNA - Medium Pressure Plenum Construction Standard
K. ANSI Z9.5 - Laboratory Design
L. ASHRAE - Laboratory Design Guide
M. IBC 2012 - International Building Code
N. ICC-ES AC 156 - International Code Council Evaluation Services Acceptance Criteria 156
O. OSHPD- Office of Statewide Health Planning and Development and Special Seismic Certification Preapproval (OSP)

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data on axial fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.
C. Shop Drawings: Indicate assembly of axial fans and accessories including fan curves with specified operating point clearly plotted, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.
D. Test Reports: Indicate performance data for adjustable axial fan blades for at least five blade settings, including maximum.
E. Manufacturer's Instructions: Indicate installation instructions.

F. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

G. Operation and Maintenance Manuals: Include in manuals the information listed below. For information on how to prepare and submit manuals see section 1780 (Closeout Submittals).

H. Recommended spare parts

I. Spare parts lists

J. Operating instructions

K. Maintenance instructions, including preventative and corrective maintenance.

L. Copies of warranties

M. Wiring diagrams

N. Shop drawings and product data

1.05 QUALITY ASSURANCE

A. Performance ratings: Conform to AMCA standard 211 and 311. Fans must be tested in accordance with AMCA 211 and 311 in an AMCA accredited laboratory and certified for sound and air performance. Fan shall be licensed to bear the AMCA ratings seal for both sound and air performance.

B. Classification for Spark Resistant Construction shall conform to AMCA 99.

C. Each fan shall be vibration tested before shipping, as an assembly, in accordance with AMCA 204-05. Each assembled fan shall be test run at the factory at the specified fan RPM and vibration signatures shall be taken on each bearing in three planes - horizontal, vertical, and axial. The maximum allowable fan vibration shall be less than 0.15 in. /sec peak velocity; filter-in reading as measured at the fan RPM. This report shall be provided at no charge to the customer upon request.

D. Seismic certification requires each fan shall be shake table tested at an independent test facility, shall meet an Importance Factor of 1.5, an SDS Value of 2.28 , all Site Classes, all Occupancy Categories and all Seismic Design Catergories (A-F).

E. Laboratory exhaust system defined in this section shall have a 12 month warranty from the date of shipment.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect motors, shafts, and bearings from weather and construction dust.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Loren Cook Company: www.lorencook.com.

B. Greenheck: www.greenheck.com.

C. Twin City

D. American Coolair/ILG

2.02 GENERAL

A. Base fan performance at standard conditions (density 0.075 Lb./ft3).

B. Fans selected shall be capable of accommodating static pressure and flow variations of +/-15% of scheduled values.

C. Each fan shall be belt driven.

D. Each fan to be equipped with 316 stainless steel lifting lugs for corrosion resistance.

E. Fasteners exposed to corrosive exhaust shall be stainless steel.

F. Fan assembly shall be designed for a minimum of 125 MPH wind loading, without the use of guy wires.

2.03 CORROSION RESISTANT COATING

A. All fan and system components (fan, nozzle, windband and plenum) shall be corrosion resistant coated with a two part electrostatically applied and baked, sustainable, corrosion resistant coating system. Finish color shall be selected by architect/engineer.

B. All parts shall be cleaned and chemically prepared for coating using a multi-stage wash system which includes acid pickling that removes oxide, increases surface area, and improves coating bond to the substrate.

C. The first powder coat applied over the prepared surface shall be a zinc rich epoxy primer (no less than 70% zinc) and heated to a gelatinous consistency (partial cure) at which the second powder coat of polyester resin shall be electrostatically applied and simultaneously be cured at a uniform temperature of 400°F.

D. The coating system, a total thickness of up to 6 mils, is not affected by the UV component of sunlight (does not chalk), and has superior corrosion resistance to acid, alkali, and solvents. Coating system shall exceed 4000 hour ASTM B117 Salt Spray Resistance.

E. Note that 10-20 mil thick wet coating systems pollute the environment (air and water), and that these manually applied coatings are not uniform over the impeller surface and can cause fan imbalance and vibration.

2.04 FAN HOUSING TO BE AERODYNAMICALLY DESIGNED WITH HIGH-EFFICIENCY INLET, ENGINEERED TO REDUCE INCOMING AIR TURBULENCE.

A. Fan housing shall be welded steel and meet specification for corrosion resistant coating. No uncoated metal fan parts shall be acceptable.

B. Fan housings that are fabricated of polypropylene or fiberglass that have lower mechanical properties than steel, have rough interior surfaces in which corrosive, hazardous compounds can collect, and / or which chalk and structurally degrade due to the UV component of the sunlight shall not be acceptable.

C. A high velocity conical discharge nozzle shall be supplied by the fan manufacturer and be designed to efficiently handle an outlet velocity of up to 6000 FPM. Discharge stack caps or hinged covers, impeding exhaust flow shall not be permitted.

D. Provide housing drain for removal of rain and condensation.

E. A bolted and gasketed access door shall be supplied in the fan housing allowing for impeller inspection or removal of impeller, shaft and bearings without removal of the fan housing.

2.05 FAN IMPELLER

A. Fan impeller shall be centrifugal, backward inclined, with non-stall characteristics. The impeller shall be electronically balanced both statically and dynamically per AMCA Standard 204.

B. Fan impeller shall be manufactured of aluminum (AMCA type B spark resistant), fully welded and meet specification corrosion resistant coating.

2.06 FAN BYPASS AIR PLENUM

A. The fan shall have a side inlet connection.

B. The plenum shall be constructed of fully welded steel, meet specification for corrosion resistant coating, and mount on roof curb as shown on the project drawings. Plenums that are fabricated of plastics or resins that are combustible and have mechanical properties less than steel shall not be acceptable.

C. The bypass air plenum shall be mounted on factory fabricated roof curb provided by the fan manufacturer.

D. Bypass air dampers shall be opposed-blade design, and coated with up to 4 mils of Hi-Pro Polyester resin, electrostatically applied and baked.

E. A fan isolation damper, either gravity backdraft or two position actuated, fabricated of steel or aluminum and coated with minimum 4 mils of Hi-Pro Polyester resin, electrostatically applied and baked.

2.07 CURB

A. Exhaust system manufacturer shall supply a structural support curb for the plenum.

B. Curb shall be fabricated of a minimum of 14 gauge corrosion resistant coated steel and structurally reinforced. Seismic certification requires a minimum of 12 gauge corrosion resistant coated steel and structurally reinforced roof curb be provided.

C. Curbs shall be insulated.

D. When properly anchored to the roof structure, the standard curb / plenum / blower assembly shall withstand wind loads of up to 125 mph without additional structural support.

2.08 FAN MOTORS AND DRIVE

A. Motors shall be premium efficiency, standard NEMA frame, 1800 or 3600 RPM, TEFC with a 1.15 service factor. A factory-mounted NEMA 3R disconnect switch shall be provided for each fan. Motor maintenance shall be accomplished without fan impeller removal or requiring maintenance personnel to access the contaminated exhaust components.

B. Drive belts and sheaves shall be sized for 200% of the motor horsepower, and shall be readily and easily accessible for service, if required. Drive shall consist of a minimum of two belts under all circumstances.

C. Fan shaft to be turned and polished of 1040 steel material as standard, coated with corrosion resistant coating.

D. Fan shaft bearings shall be Air Handling Quality, ball or roller pillow block type and be sized for an L-10 life of no less than 100,000 hours. Bearings shall be fixed to the fan shaft using concentric mounting locking collars, which reduce vibration, increase service life, and improve serviceability. Bearings that use set screws shall not be allowed.

E. All shaft bearings shall have extended lube lines with zerk fittings

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Pipe housing drain to nearest drain.

C. Install fans with spring isolators and flexible electrical leads. Refer to Section 23 0548.

D. Install flexible connections between fan inlet and discharge ductwork; refer to Section 23 3100. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.

E. Provide fixed sheaves required for final air balance.

END OF SECTION