

AD_____

Award Number: DAMD17-02-1-0659

TITLE: Process Research and Development of Antibodies as Countermeasures for C. botulinum

PRINCIPAL INVESTIGATOR: Michael Meagher, Ph.D.

CONTRACTING ORGANIZATION: University of Nebraska, Lincoln
Lincoln, NE 68588-0430

REPORT DATE: March 2007

TYPE OF REPORT: Annual

PREPARED FOR: U.S. Army Medical Research and Materiel Command
Fort Detrick, Maryland 21702-5012

DISTRIBUTION STATEMENT: Approved for Public Release;
Distribution Unlimited

The views, opinions and/or findings contained in this report are those of the author(s) and should not be construed as an official Department of the Army position, policy or decision unless so designated by other documentation.

REPORT DOCUMENTATION PAGE				<i>Form Approved</i> OMB No. 0704-0188	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.					
1. REPORT DATE (DD-MM-YYYY) 01-03-2007		2. REPORT TYPE Annual		3. DATES COVERED (From - To) 1 1 Mar 2006 – 28 Feb 2007	
4. TITLE AND SUBTITLE Process Research and Development of Antibodies as Countermeasures for C. botulinum				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER DAMD17-02-1-0659	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S) Michael Meagher, Ph.D. E-Mail: mmeagher1@unl.edu				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) University of Nebraska, Lincoln Lincoln, NE 68588-0430				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) U.S. Army Medical Research and Materiel Command Fort Detrick, Maryland 21702-5012				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION / AVAILABILITY STATEMENT Approved for Public Release; Distribution Unlimited					
13. SUPPLEMENTARY NOTES – Original contains colored plates: ALL DTIC reproductions will be in black and white.					
14. ABSTRACT This report describes the design and construction of a CGMP facility for yeast and bacteria on the first floor and basement of Othmer Hall, the home for the University of Nebraska-Lincoln Biological Process Development Facility. It has taken a significant effort to secure all the required funding and to have final approval by the University of Nebraska Board of Regents to build a fully-funded CGMP facility Design. The report describes the final design and initial construction of the facility.					
15. SUBJECT TERMS No subject terms provided.					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT U	b. ABSTRACT U	c. THIS PAGE U			USAMRMC
			UU	25	19b. TELEPHONE NUMBER (include area code)

Table of Contents

Introduction..... 4

Body..... 4

 CGMP Construction Project 4

 Project Timeline..... 7

 Project Budget..... 8

Key Accomplishments..... 9

Appendix.....10

Introduction

This project in the past has been comprised of two components. The first component, which represents 95% of the funding, is dedicated to building a Phase I/II CGMP facility in the first floor and basement of Othmer Hall, the home for the Biological Process Development Facility. The other 5% has been used to research the expression of antibodies against the botulinum neurotoxins in Chinese Hamster Ovary (CHO) cells. The last annual report described the completion of the antibody research and will no longer be presented in subsequent annual reports.

This report will describe activities to date on the design and construction of the Phase I/II CGMP Facility. The construction project was fully approved with all of the required funding in November 2006. This project is providing a XX% of the funding, while a second DoD contract is providing XX% and the remaining is being provide by University of Nebraska-Lincoln. This facility will have approximately 5,000 sq. ft of modular clean rooms and 5,000 sq ft of support space. The expected completion date for construction is February 2008 with validation taking an additional 4 to 5 months.

Body

cGMP Construction Project

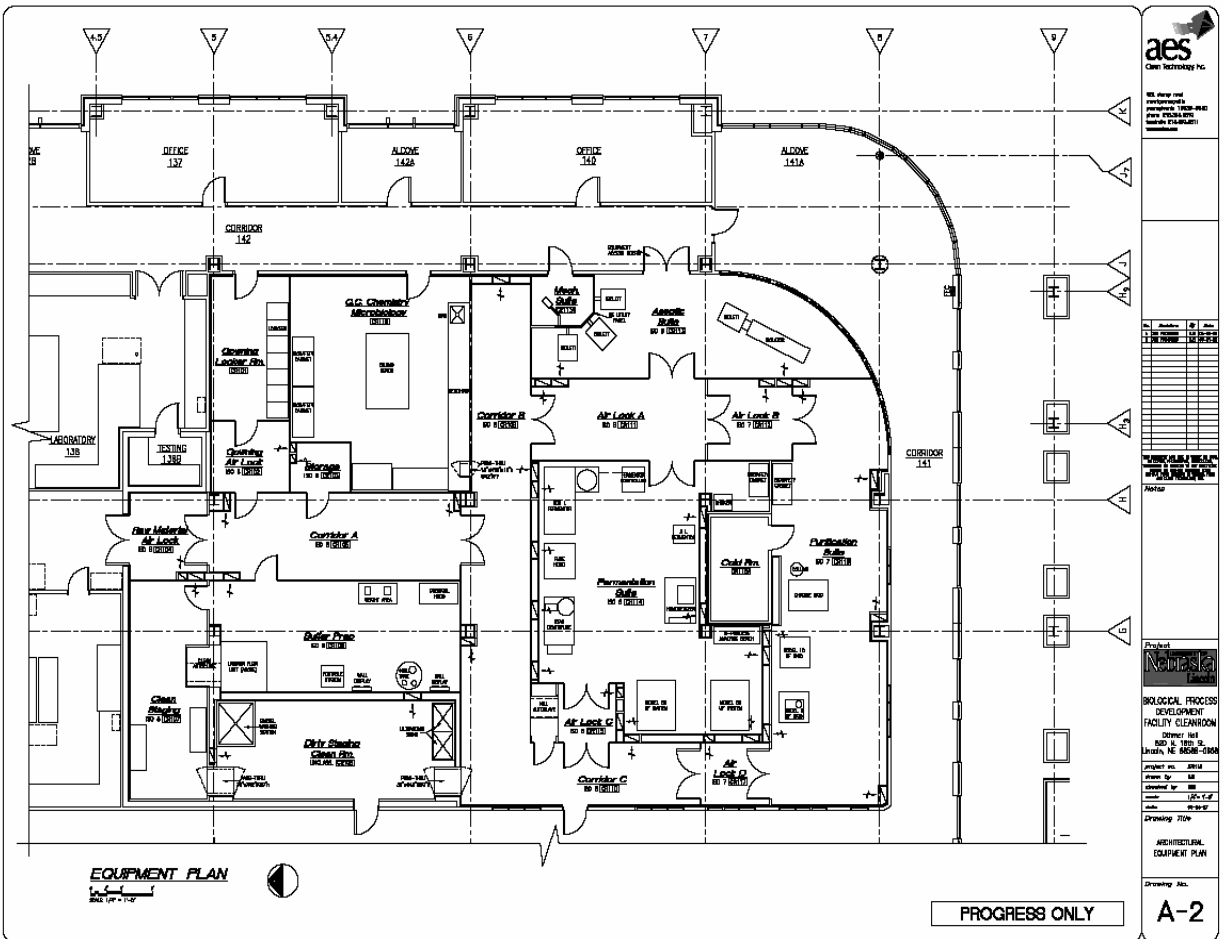
November 2006 the University Of Nebraska Board Of Regents (BOR) approved a **fully funded** CGMP facility to be built on first floor and the basement of Othmer Hall. This CGMP facility will use a modular clean room construction for all clean room space. As of June 1, 2007 all of the bidding has been completed, contractors have been selected and demolition and construction has started. The CGMP construction team includes the following;

- AES Clean Room Technology which is responsible for design, construction, and installation of the modular clean rooms and will oversee installation of all CGMP process piping.
- BioKinetics is a subcontractor to AES and is responsible for all process and utility design, including equipment layout and process piping.
- Davis Design is a local architect responsible for all architectural elements of the project outside the scope of the modular clean rooms.
- Hampton Construction of Lincoln NE is responsible for demolition and construction of all non-clean room space, such as service utilities to the clean rooms and the support space in the basement.
- University of Nebraska-Lincoln Facility Management and Planning has oversight for the project.

The floor plan for the first floor is presented as Figure 1. The basement floor plan is still in the conceptual stage, but a description of functions that will be in the basement are presented below.

The first floor of the CGMP facility will have the following capabilities:

- *Fermentation Suite*: 150 L working volume fermentor for yeast and bacteria, harvesting and clarifying capabilities using either continuous centrifugation or cross flow membrane filtration and cell disruption.
- *Purification Suite*: 0.1 to 6 L/min chromatography skid and two ultrafiltration systems.
- *Asceptic Processing Suite*: Isolator system with a VHP (vaporized hydrogen peroxide) unit for sterilization capable of producing Master and Working Cell Banks and manual filling of up to 1500 liquid vials.



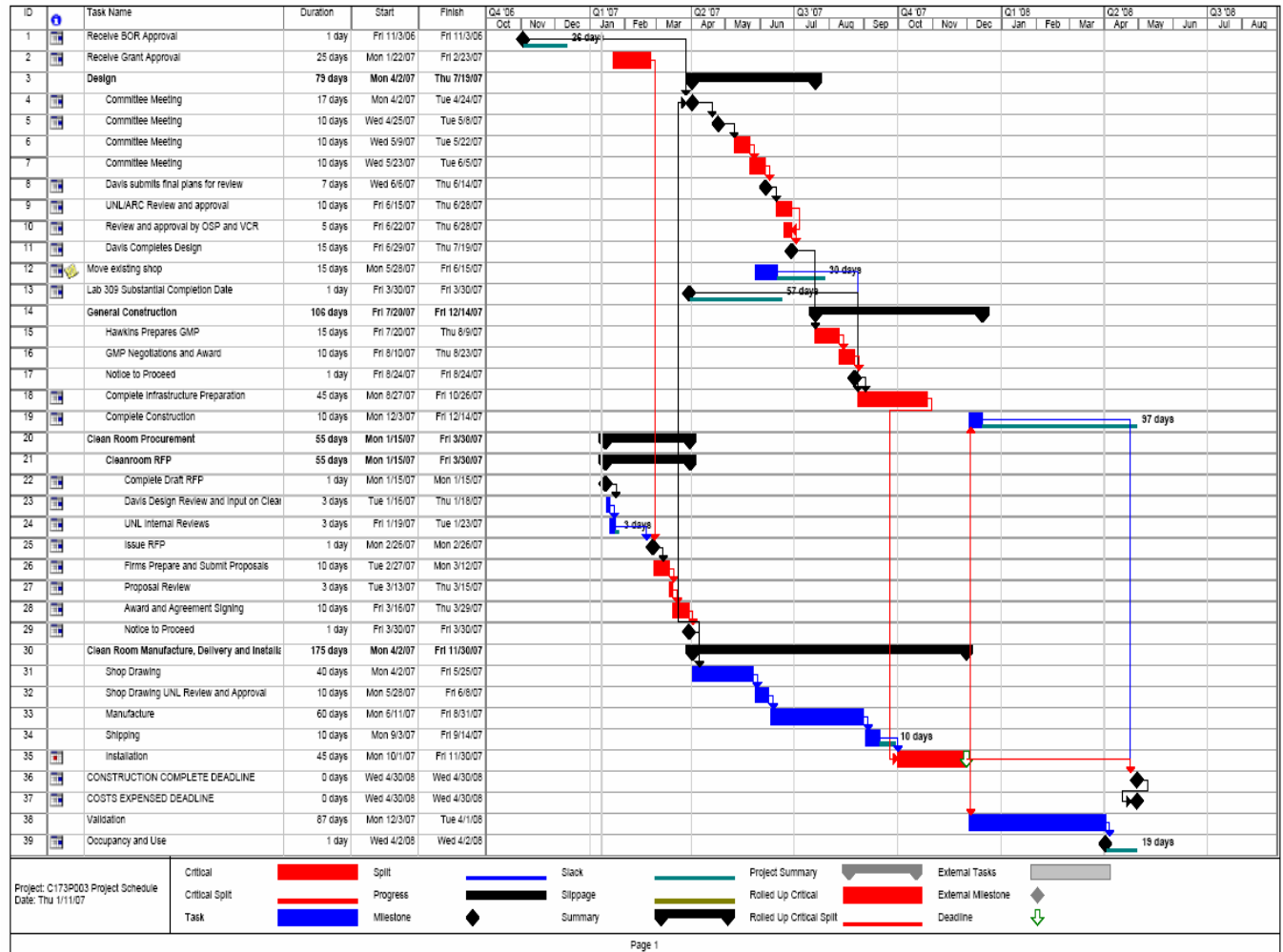
- **Stability Chamber Room:** The BPDF has 5 validated stability chambers with temperature ranges from -80°C to 70°C. This room will be used house these chambers.
- **Final Product Storage Area:** This area will house the BPDF's final product storage freezers (-80°C, -20°C) and refrigerators. These units are segregated into quarantine and released units.
- **Cell Bank Storage Area:** This area will be used for storing Master Cell Bank dewars and Working Cell Bank dewars.
- **Gas Storage Area:** This area is for storage of oxygen and nitrogen dewars that are need for the fermentation suite and the cell bank dewars, respectively.
- **Calibration and Maintenance:** This area is a maintenance area for calibration and small maintenance of the CGMP facility.
- **Utility Room:** This is the location for the CGMP utilities, i.e. R.O. water system, pure steam generator, WFI condenser, hot WFI storage tank, WFI distribution system, and CIP skid.
- **Document Storage Area:** This area will be used to store all of the maintenance documents for the CGMP facility.

Figure 1. First floor layout of CGMP Facility

As of June 16, 2007, design of the clean rooms is at 70%. In the appendix are the 70% drawings generated by AES.

Project Timeline.

Below is the project time.



Project Budget

cGMP BioProcess Pilot Plant C173P003 - Phase II 1/10/2007				APPENDIX 3
				DRAFT
	Record of Expenses As Reported 1/3/07	Total Project Costs Phase II	Record of Expenses + Total Project Costs Phase II	Comments
CONSTRUCTION COSTS				
GENERAL CONSTRUCTION CONTRACT	\$ 918,823	\$ 1,261,000	\$ 2,179,823	
General Construction Contractor	\$ 5,662		\$ 5,662	
Other Construction Contractor			\$ -	
Electrical			\$ -	
Elevator			\$ -	
Sitework/Demolition			\$ -	
Parking, Drives, Roads, Walks			\$ -	
Audio Visual			\$ -	
OTHER CONSTRUCTION CONTRACTORS	\$ 328,563		\$ 328,563	
Unit Price Contractors		\$ -	\$ -	All other necessary construction will come from contingency
Utilities Contractor (outside of general contract)		\$ -	\$ -	
ENVIRONMENTAL ISSUES/ASBESTOS			\$ -	
RELOCATION CONSTRUCTION			\$ -	\$1,173,068 Removed 10/06/06 per PC email
CONSTRUCTION REVIEW & INSPECTION			\$ -	
CARPET (INSTALLED BY OWNER)			\$ -	
INTERNAL SERVICES			\$ -	
Energy Management Controls Systems (EMCS)	\$ 35,932	\$ 5,000	\$ 40,932	BSM budget for controls in the basement only. See 8/22/06 email regarding controls inc. in AES estimate
Card Access System		\$ 25,000	\$ 25,000	SEI - \$5k x 5 doors
Fire Alarm System (included in EMCS)	\$ 12,221	\$ 30,000	\$ 42,221	Estimate
Security System		\$ -	\$ -	
Other UNL Services	\$ 2,961		\$ 2,961	
Utilities (UNL Services)			\$ -	
Keying of Doors	\$ 180	\$ 2,000	\$ 2,180	
Landscaping		\$ -	\$ -	
TELECOMMUNICATIONS		\$ 6,000	\$ 6,000	20 ports @ \$300 ea
ACCESSIBILITY DEFICIENCIES		\$ -	\$ -	
CONSTRUCTION CONTINGENCY		\$ 385,757	\$ 385,757	
FIXED EQUIPMENT (INSTALL BY OWNER)			\$ -	
Cleanroom		\$ 2,252,000	\$ 2,252,000	
ALB Estimate			\$ -	
Transfer Panel		\$ 70,000	\$ 70,000	Remove \$140,000 , controls programming by local vendor
inc costing for transfer panel \$70k				
TOTAL CONSTRUCTION COSTS	\$ 1,304,342	\$ 4,036,757	\$ 5,341,099	
NON-CONSTRUCTION COSTS				
DESIGN & MANAGEMENT				
Planning & Program Statement			\$ -	
A & E Basic Services	\$ 604,920	\$ 106,300	\$ 711,220	
A & E Additional Services		\$ 72,000	\$ 72,000	
A & E Reimbursable Expenses		\$ 28,500	\$ 28,500	
Other A & E Services		\$ 100,000	\$ 100,000	Pharma consultant for final review of piping drawings
PROJECT MANAGEMENT SERVICES			\$ -	
Project Management and Inspection Services	\$ 107,903	\$ 100,000	\$ 207,903	Davis Design
OTHER & SPECIALTY CONSULTANTS (BPOF PM)	\$ 166,457	\$ 8,129	\$ 174,586	Modified 10/6/06 pc email
Facilities overhead 46%????		\$ -	\$ -	
MOVABLE EQUIPMENT	\$ 454,645		\$ 454,645	
SPECIAL & TECHNICAL EQUIPMENT	\$ 661,731	\$ 275,000	\$ 936,731	Kill system - planned to award work to Conecraft includes water makeup units and condenser (\$75k)
Calibration and controls programming for ex. Equip			\$ -	
LAND ACQUISITION		\$ -	\$ -	
ARTWORK		\$ -	\$ -	
OTHER NON-CONSTRUCTION			\$ -	
Builders Risk	\$ 650	\$ 2,000	\$ 2,650	
Moving and Relocation	\$ 41,521	\$ 19,000	\$ 60,521	Including \$6k in rental
Machine shop decommissioning/moving		\$ 6,086	\$ 6,086	Added 10/6/06 pc email
Interior Signage	\$ 3,986	\$ 2,000	\$ 5,986	
Printing, Advertising, Mailing	\$ 2,566	\$ 20,000	\$ 22,566	
Other Non-construction costs	\$ 5,723		\$ 5,723	
State Fire Marshal Plan Review		\$ 4,000	\$ 4,000	
Building Code Review (inc. in SFM cost)			\$ -	
Estimating Consulting Fee			\$ -	
Non-construction Contingency		\$ 95,550	\$ 95,550	
TOTAL NON-CONSTRUCTION COSTS	\$ 2,050,102	\$ 838,565	\$ 2,888,667	
	\$ 3,354,444			
Less credit from P002 project funds \$518,147	\$ 2,836,297	\$ 4,875,322	\$ 7,711,619	
BOR Approved Funding 11/3/06			\$ 7,711,619	
			\$ -	
Note: Cost per month for schedule delay = \$39,000				

Key Accomplishment

The key accomplishment during this funding period is securing all of the needed funding to attain approval by the University of Nebraska Board of Regents for construction of a Phase I/II CGMP facility.

APPENDIX

DUCTWORK SYMBOLS

EXISTING DUCT (TO REMAIN)		DUCT MOUNTED TEMPERATURE AND HUMIDITY SENSORS	
EXISTING DUCT (TO BE REMOVED)		DUCT MOUNTED PRESSURE, LOW PRESSURE, AND HIGH PRESSURE SENSORS	
NEW DUCT		DUCT MOUNTED SMOKE DETECTOR	
RECTANGULAR DUCT SUPPLY/MAKE-UP AIR ELBOW (UP AND DOWN)		ACCESS DOOR	
RECTANGULAR DUCT RETURN/BYPASS AIR ELBOW (UP AND DOWN)		FLEXIBLE DUCT	
RECTANGULAR DUCT EXHAUST/RELIEF AIR ELBOW (UP AND DOWN)		SUPPLY TERMINAL (SEE AIR TERMINAL SCHEDULE FOR ADDITIONAL INFORMATION)	
ROUND DUCT SUPPLY/MAKE-UP AIR ELBOW (UP AND DOWN)		RETURN/EXHAUST TERMINAL (SEE AIR TERMINAL SCHEDULE FOR ADDITIONAL INFORMATION)	
ROUND DUCT RETURN/BYPASS AIR ELBOW (UP AND DOWN)		THERMOSTAT (ROOM MOUNTED)	
ROUND DUCT EXHAUST/RELIEF AIR ELBOW (UP AND DOWN)		HUMIDISTAT (ROOM MOUNTED)	
RECTANGULAR DUCT SIZE (FIRST FIGURE—SIDE SHOWN)		SWITCH (ROOM MOUNTED)	
ROUND DUCT SIZE			
DUCT INCLINED RISE IN DIRECTION OF FLOW		DUCT PRESSURE CLASS DESIGNATION (BY STATIC PRESSURE CLASS)	
DUCT INCLINED DROP IN DIRECTION OF FLOW			
90° RADIUS ELBOW (NO TURNING VANES)			
90° SQUARE ELBOW (WITH TURNING VANES)			
45° RADIUS ELBOWS (NO TURNING VANES)			
RECTANGULAR DUCT SUPPLY OR RETURN BRANCH CONNECTION			
SUPPLY BRANCH WITH SPIN COLLAR CONNECTION (RECTANGULAR MAIN/ROUND BRANCH)			
ROUND DUCT BEVELED TEE CONNECTION			
ROUND DUCT CONICAL TEE CONNECTION			
DUCT MOUNTED ELECTRIC HEATING COIL (SEE SCHEDULE FOR ADDITIONAL INFO)			
DUCT MOUNTED EQUIPMENT (SEE SCHEDULE FOR ADDITIONAL INFO)			
VOLUME DAMPER			
MOTORIZED/CONTROL DAMPER			
BACK DRAFT DAMPER			
FIRE DAMPER			
FLEXIBLE CONNECTION			

PIPING SYMBOLS			
EXISTING PIPE (TO REMAIN)		STEAM TRAP	
EXISTING PIPE (TO BE REMOVED)		COMBINATION SHUT-OFF, CHECK, & BALANCING VALVE	
NEW PIPE		BACKFLOW PREVENTER RPZ CHECK VALVE TYPE	
DIRECTION OF FLOW		FLOW MEASURING DEVICE FOR 3" AND SMALLER LINES	
DIRECTION OF SLOPE		FLOW MEASURING DEVICE FOR 4" AND LARGER LINES (PILOT TUBE)	
LATERAL & TEE CONNECTION		FLOW SENSOR	
TAKE-OFF (TOP AND BOTTOM)		SIGHT GLASS	
90° & 45° ELBOW		FLEXIBLE CONNECTION	
RISER (UP AND DOWN)		THERMOMETER - STEM	
CONCENTRIC REDUCER/ ECCENTRIC REDUCER		EXPANSION JOINT	
UNION		PRESSURE GAUGE W/GAUGE COCK	
STRAINER		AIR VENT W/GAUGE COCK	
STRAINER W/BLOW-OFF AND CAP		ORIFICE PLATE	
BASKET STRAINER		COMBINATION PRESSURE AND TEMPERATURE PLUG	
SHUT-OFF VALVE IN PLAN AND IN RISER (SEE SPECS FOR TYPE)		PIPE GUIDE	
GLOBE VALVE FOR STEAM BALANCING VALVE FOR ALL OTHER SERVICES (SEE SPEC FOR TYPE)		PIPE ANCHOR	
CHECK VALVE (SEE SPEC FOR TYPE)		DOMESTIC COLD WATER PIPE LINETYPE	
BALL VALVE (SEE SPEC FOR TYPE)		DOMESTIC HOT WATER PIPE LINETYPE	
PRESSURE REGULATING VALVE (SEE SPEC FOR TYPE)		VENT PIPE/PIPE BELOW GRADE LINETYPE	
PRESSURE REDUCING VALVE (SEE SPEC FOR TYPE)		"X" = SERVICE INDICATED BY ABBREVIATION	
2-WAY CONTROL VALVE (SEE SPEC FOR TYPE)			
3-WAY CONTROL VALVE (SEE SPEC FOR TYPE)			
BACK PRESSURE VALVE (SEE SPEC FOR TYPE)			
THERMAL EXPANSION VALVE (SEE SPEC FOR TYPE)			
SOLENOID VALVE (SEE SPEC FOR TYPE)			
ANGLE SHUT-OFF VALVE (SEE SPEC FOR TYPE)			
RELIEF OR SAFETY VALVE (SEE SPEC FOR TYPE)			

MISC. SYMBOLS	
	NEW CONNECTION TO EXISTING
	NEW SEPARATION FROM EXISTING
	COORDINATION POINT BETWEEN FLOOR PLANS AND DIAGRAMS (NUMBER)
	DEMOLITION NOTE (NUMBER)
	SHEET NOTE (NUMBER)

GENERAL ABBREVIATIONS

A	ABV AC AC(-) ACC ACD AD AD(-) AF AFR AFS AHU AL AMD APPROX AR ARCH AS ATC ATF ATMOS V AVC	AUTOMATIC AIR VENT ABOVE AND AUTOMATIC CONTROL DAMPER AIR CONDITIONING AIR COMPRESSOR-(TYPE) AIR COOLED CONDENSING UNIT AUTOMATIC CONTROL DAMPER AUTOMATIC CONTROL VALVE ACCESS DOOR AREA DRAIN-(TYPE) AIR FILTER ABOVE FINISHED FLOOR/ROOF AIR FLOW STATION AIR HANDLING UNIT ALUMINUM FLOW MEASURING DEVICE ACCESS PANEL APPROXIMATE ACID RESISTANT ARCHITECTURAL AIR SEPARATOR ASSEMBLY AIR TERMINAL AUTOMATIC TEMPERATURE ATTACHMENT ATMOSPHERIC VENT AVERAGE
B	BAS BCA BCK BHP BLG BLK BLDG BRK BOD BOT BOU BTJ BTM BTTH	BUILDING AUTOMATION SYSTEM BOTTLED COMPRESSED AIR BACKFART DAMPER BLACK FLOOR DRAIN-(TYPE) BRAKE HORSEPOWER BACKWARD INCLINE BREAKER BUILDING BULOW BOTTOM OF DUCT BOTTOM OF PIPE BOTTOM OF STRUCTURE BOTTOM BRITISH THERMAL UNIT PER HOUR
C	C(-) C CAP CC CCA CCO CFM CHW CHWS CLS CO COL COMB COMP CONC COND CONN CONT	CONDENSATE "STEAM" RETURN-(PSIG) CENTER LINE CAPACITY COOLING COIL CLEAN COMPRESSED AIR CEILING DIFFUSER CURIC FEET PER MINUTE CHILLED WATER RETURN CHILLED WATER RETURN CAST IRON CEILING N/A/C COLUMN COMBINATION COMPRESSOR CONCRETE CONDENSATE CONNECTION/CONNECT CONTINUOUS/CONTINUITY/ CONTINUATION CONTRACTOR CORRIDOR CRW CSW CW CWR CWS
D	DB DCB DET DET DETA DIAM DIFF DNW DNW DWG DWC DX	DRY BULB DOMESTIC COLD WATER DIRECT DIGITAL CONTROL DETAIL DRAWING FOUNTAIN DIAMETERS DIFFERENTIAL DOWN DOWN IN WALL DRAIN DRAWING DRAINAGE-WASTE-VENT DIRECT EXPANSION
E	EA EAG EAR EAR EEL EFF EG EQW EHC EHF ELEV ELECT ELEC ESP EQA EX EXP EXT	EXHAUST AIR EXHAUST AIR DAMPER EXHAUST AIR GRILLE EXHAUST AIR REGISTER ENTERING TEMPERATURE EXHAUST AIR WALL ELECTRIC CONTRACTOR EXHAUST FAN EFFICIENCY EXHAUST GRILLE ETHYLENE GLYCOL/WATER SOLUTION RETURN ETHYLENE GLYCOL/WATER SOLUTION SUPPLY ELECTRIC HEATING COIL EXPANSION JUNCTION ELEVATION ELECTRICAL EQUIPMENT EXHAUST REGISTER EXTERNAL STATIC PRESSURE EXHAUST EXISTING EXPANSION EXTERNAL
F	F FA FC FCI FCV FD FD(-) FDN FE FL FLX FLT FLG FM FPM FS FT FTD FY/WG	DEGREES FAHRENHEIT FAN FREE AREA FRESH AIR INLET/TAKE FLEXIBLE CONNECTION FLOW CLEANOUT FAN COIL UNIT FLOW CONTROL VALVE FIRE DAMPER (W/O ALARM) FLOOR DRAIN-(TYPE) FOUNDATION FILTER BRILLE FILTER FULL LOAD AMPS FLEXIBLE FLANGED FLOOR FLASH TANK FLOW METER FEET PER SECOND FEET PER MINUTE FLOW SWITCH COMBINATION FIRE & SMOKE DAMPER FEET/FOOT FEET WATER GAUGE
G	G GA GAL CALV GC GEN GPH GRIPR GRHS GRM GRILE GR/LB GRAV	GAS (NATURAL) GAUGE GALLON GALVANIZED GENERAL CONTRACTOR GENERAL GALLONS PER HOUR GLYCYL PREHEAT RETURN GLYCYL PREHEAT SUPPLY GALLONS PER MINUTE GRILLE GRAMS PER POUNDS GRAVITY
H	H HB HC HCX HEAD HEPA HFT HFFT HGM HOA HORIZ HP/O PL H/P HOUR HT HUM HVAC HW HWP HWS HWT HX HZ	HUMIDIFIER/HUMIDISTAT HOSE BIB-HOT HEATING COIL HIGH PRESSURE CARBON DIOXIDE HEAD HIGH EFFICIENCY PARTICULATE ARRESTANCE HEPA FILTER TERMINAL HUMA FAN FILTER TERMINAL HUMIDITY HIGH LIMIT HAND-OFF AUTOMATIC SELECTOR SWITCH HORIZONTAL HANDS-OFF SELECTOR SWITCH PILOT LIGHT HORSEPOWER HOUR HEIGHT HUMIDITY HEATING, VENTILATING, AIR CONDITIONING HEATING AND VENTILATING HOT WATER HOT WATER PUMP HOT WATER SUPPLY (HEATING) HOT WATER RETURN HEAT EXCHANGER HERTZ
I	I IA IC IQ INS IN/G INCH INSUL INV INVT IW K	INSTRUMENT AIR INSTRUMENT AIR COMPRESSOR INDOOR AIR QUALITY INCH INSIDE DIAMETER INCH INCHES MERCURY INCHES WATER GUAGE INSULATION INVERT INVEST ELEVATION INLET WAVE DAMPER INDIRECT WAVE
K	KW LAT LAV LES/HR LIQ LOA LOVER LWT LWW	KILOWATT LEAVING AIR TEMPERATURE LAVALRY POUNDS PER HOUR (#/HR) LIQUID LOCKED ROTOR AMPS LOWER LEAVING WATER TEMPERATURE LABORATORY WASTE VENT
M	MAV MAX MBH MECH MFR MG MIN MOD MOTO MTR	MANUAL AIR VENT MAXIMUM 1000 BTU PER HOUR MECHANICAL CONTRACTOR MECHANICAL MANUFACTURER MANUFACTURED GAS MOTOR HORSE POWER MINIMUM MOTOR OPERATED DAMPER MOUNTED MOTOR
N	N N2 N/A NC NIC NP NPS NOT TO SCALE	NEW NITROGEN NOT APPLICABLE NORMALLY CLOSED NOT IN CONTRACT NORMALLY OPEN NUMBER NON-POTABLE WATER NOT TO SCALE
O	OA OAD OAU OBD OD OPNG OPEN OZ	OUTSIDE AIR OUTSIDE AIR DAMPER OUTSIDE AIR TAKE OUTSIDE AIR TEMPERATURE OPPPOSED BLADE DAMPER OUTSIDE DIAETER OPEN END DUCT OPENING OUTSIDE SCREW & YOKER OUTLET VELOCITY OUNCE
P	P PEWS PC AD PC(-) PCWR PCWG PD PFHX PH PHC PRV PNEU PRD PRESS PRV PSF PSI PSID PSS PVC	PUMP PRESSURE BOOSTER WASH DOWN SYSTEM PRESSURE CONTROL AUTOMATIC VALVE DAMPER PUMPED CONDENSATE-PSIG PROCESS CHILLED WATER RETURN SUPPLY PRESSURE DIFFERENTIAL PLATE AND FRAME HEAT EXCHANGER PHASE PREHEAT COIL POST INDICATOR VALVE PNEUMATIC PRESSURE REDUCING DEVICE PRESSURE PRESSURE REDUCING/REGULATING VALVE POUNDS PER SQUARE FOOT POUNDS PER SQUARE INCH POUNDS PER SQUARE INCH GAUGE POLYCARBON SPRINKLER SYSTEM POLYVINYL CHLORIDE
R	RA RAD RAF RAH RAR RAW RC RD RO(-) ROA REL RELD REV RH RHC RHD RM RMC RPM RR RS RV RW RWC	RETURN AIR RETURN AIR DAMPER RETURN AIR FAN RETURN AIR GRILLE RETURN AIR REGISTER RETURN AIR WALL REFRIGERANT-COMPRESSOR DISCHARGE ROOF DRAIN-(TYPE) RELIEF RELIEF AIR DAMPER RELOAD REVISION RELATIVE HUMIDITY REHEAT COIL REFRIGERANT HOT GAS BYPASS REFRIGERANT-LIQUID RELOAD AMPS REFRIGERANT-SECTION REFRIGERANT-VENT RAW WATER RAIN WATER CONDUCTOR
S	S(-) SA(-) SAFE SGH SEF SDA SED SEG SEP SHR SHR SNK SPC SPR SPKR SQFT SRV SS STL STD STL SW T	STEAM-(PSIG) SHOCK ABSORBBER-(TYPE) SAFETY SHOWER SANITARY SCHEDULE SMOKE DAMPER SMOKE DETECTOR SMOKE ATTENUATOR SMOKE EXTRACTOR SECTION SEWAGE EJECTOR DISCHARGE SMOKE EXHAUST FAN SUPPLY FAN SUPPLY GRILLE SPLIT SHEET SNK STATIC PRESSURE SPECIFICATION SPRINKLER SERVICE SNK SPREADER SUPPLY REGISTER SAFETY RELIEF VALVE/VENT SERVICE SNK STANDARD STEEL STANDARD STEEL SOFT WATER SYSTEM
T	T TA TDH TE TEMP THERM TMV(-) TOO TOP TOR TP TS TSP TYP TOWER	THERMOSTAT THROWAWAY TOTAL DYNAMIC HEAD TOLERANCE TEMPERATURE TRANSFER GRILLE THERMISTOR TEMPERATURE MIXING VALVE-(TYPE) THERM TOP OF DUCT TOP OF PIPE TOP OF STEEL TRAP PRIMER TAMPON SWITCH TOTAL STATIC PRESSURE TYPICAL WATER
U	UC ULT UFFT UH ULPA UNO UNRL	UNDERCUT ULTRA FILTRATION TERMINAL UNIT HEATER ULTRA LOW PENETRATION AIR UNLESS NOTED OTHERWISE UNREAL
V	V VA VAC VAC BK VAV VEL VD VERT VFD VIB VTR	VENT OR VOLTS VALVE VACUUM VACUUM BREAKER VARIABLE AIR VOLUME VOLUME DAMPER VELOCITY VERTICAL VARIABLE FREQUENCY DRIVE VIBRATION ISOLATOR VENT THRU ROOF
W	W W W/O WB WB WCD WMS WT WS(-) WT XP	WASTE WITH WITHOUT WEIGHT WALL WATER CLOSURE WATER GLOSS WATER MESH SCREEN WATER PROOF WATER SOFTENER-(TYPE) WEIGHT EXPLOSION PROOF

GENERAL NOTES

1. GENERAL NOTES, SYMBOLS LIST, AND DETAILS ARE APPLICABLE TO ALL DRAWINGS WITH TITLES PREFIRED WITH "M" AND "P".
2. ALL WORK SHALL BE PERFORMED IN A TIME, WORKMANSHIP MANNER. THIS CONTRACTOR SHALL MAINTAIN ANY INCORPORATION OR DISTURBANCE TO OTHER OPERATIONAL AREAS OF THE BUILDING.
3. DRAWINGS ARE DIAGRAMMATIC; THIS CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND EXISTING CONDITIONS PRIOR TO PROCEEDING WITH ANY WORK WHERE DISCREPANCIES OCCUR. THESE DISCREPANCIES AND EXISTING CONDITIONS, THE DISCREPANCY SHALL BE REPORTED TO THE OWNER AND /OR ENGINEER FOR EXPEDIENT AND RESOLVE.
4. NO PIPING, EQUIPMENT, ETC. SHALL BE REMOVED, DISCONNECTED OR SHUT DOWN WITHOUT PRIOR REVIEW WITH THE OWNER AND/OR ENGINEER TO DETERMINE THAT THE AREAS TO REMAIN IN OPERATION WILL NOT BE AFFECTED.
5. ALL ITEMS REMOVED SHALL BECOME PROPERTY OF THE OWNER. IF OWNER INSTRUCTS THE REMOVAL OF DEMOLISHED ITEMS, DISPOSE OF IN ACCORDANCE WITH ALL APPLICABLE LOCAL, STATE AND FEDERAL REGULATIONS.
6. PATCH FINISHING SURFACES DISTURBED IN THE COURSE OF WORK TO MATCH EXISTING FINISHES, WHEN DEMOLITION OR REMOVED WORK EXPOSES HOLES OR GAPS, PATCHING WORK SHALL BE BROUGHT UP FLUSH TO SURROUNDING FINISHES.
7. PATCH AND SEAL ANY OPENINGS IN FIRE RATED BUILDING ASSEMBLIES RESULTING FROM MECHANICAL WORK TO MEET THE REQUIRED FIRE RESISTANCE RATING OF THE BUILDING ASSEMBLY.
8. ALL SHUTDOWNS OF EXISTING SYSTEMS SHALL BE SCHEDULED AND APPROVED BY THE OWNER PRIOR TO COMMENCING WITH WORK.
9. CLEAN THE JOB SITE DAILY AND REMOVE FROM THE PREMISES ANY DIRT AND DEBRIS CAUSED BY THE PERFORMANCE OF THE WORK INCLUDED IN THIS CONTRACT.
10. 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.
11. IF CONTRACTOR ENCOUNTERS WHAT APPEARS TO BE A HAZARDOUS OR QUESTIONABLE MATERIAL, HE SHALL DISCONTINUE WORK IMMEDIATELY AND CONTACT THE OWNER'S REPRESENTATIVE.
12. WHERE USED, THE TERM "PROVIDE" SHALL MEAN, "TURNISH AND INSTALL".
13. REFER TO ARCHITECTURAL REFLECTED CEILING PLANS FOR EXACT LOCATION OF ALL CEILING MOUNTED DEVICES.
14. ALL WORK SHALL BE COORDINATED WITH ALL TRADES PRIOR TO FABRICATION, PURCHASE AND/OR INSTALLATION OF ALL WORK INVOLVED. ALL PIPING AND ELCTS. SHALL BE COORDINATED WITH ALL TRADES AND TRANSITIONS AROUND OBSTRUCTIONS SHALL BE PROVIDED.
15. VERIFY ALL EQUIPMENT CONNECTIONS WITH MANUFACTURER'S CERTIFIED DRAWINGS. VERIFY COMPOSITE DUCT TRANSITIONS TO FURNISHED EQUIPMENT. FIELD VERIFY AND COORDINATE ALL DIMENSIONS BEFORE FABRICATION.
16. DO NOT LOCATE ANY DUCTWORK, HYDRAULIC OR DRAINAGE PIPING DIRECTLY ABOVE ELECTRICAL EQUIPMENT AND PANELS (INCLUDING INSTRUMENTATION AND FIRE DETECTORS).
17. PROVIDE ALL AUXILIARY STEEL, THREADED RODS, VIBRATION ISOLATORS, TURNBUCKLES, ETC. TO SUPPORT ALL EQUIPMENT, PIPING AND DUCTWORK OR FROM STRUCTURE AS REQUIRED FOR A VIBRATION FREE INSTALLATION.
18. ALL ATC WIRING SHALL BE RUN IN CONDUIT, IN COMPLIANCE WITH NEC AND ELECTRICAL SPECIFICATIONS, UNLESS CONCEALED ABOVE SUSPENDED CEILING.
19. ALL NEW DUCT SIZES INDICATED ARE INSIDE CLEAR DIMENSIONS. ALL EXISTING DUCT SIZES INDICATED ARE ACTUAL SHEET METAL DIMENSIONS.
20. PROVIDE VOLUME DAMPERS OR OTHER SHUT OFF BALANCING DEVICES AT DUCT BRANCHES AND RUNOUTS, AND IF SPECIFIED, AT REGISTER, GRILLE, AND DIFFUSER NECKS, IN SUPPLY, RETURN, AND EXHAUST DUCTWORK, WHETHER SHOWN OR NOT.
21. PROVIDE AT LEAST THREE ELBOW SWINGS FOR PIPE TAKEOFFS.
22. TEMPERATURE AND PRESSURE GAUGES SHALL BE INSTALLED IN LOCATIONS WHERE THEY ARE EASILY READABLE FROM FLOOR LEVEL.
23. PROVIDE SEISMIC RESTRAINTS ON PIPING AND DUCTWORK AS REQUIRED.
24. SMOKE DETECTORS SHALL BE FURNISHED AND WIRED TO THE FIRE ALARM SYSTEM BY THE ATC CONTRACTOR. THE MECHANICAL CONTRACTOR SHALL MOUNT THE DETECTOR TO THE SHUTTERS, WHERE REQUIRED BY CODE. THE ATC CONTRACTOR SHALL WIRE THE DETECTOR TO THE ATC SYSTEM AND FAN CONTROLS. PROVIDE SHUTTERS, ELECTRICAL CONTRACTOR (BY OTHERS) SHALL WIRE TO THE BUILDING FIRE ALARM SYSTEM SOST.
25. PROVIDE CONDENSATE DRAIN PIPING FROM AHU COOLING COIL AND RUN TO ROOF.
26. PROVIDE ACCESS DOORS FOR ALL DEVICES PER SPECIFICATIONS.
27. NOT ALL VALVES, INSTRUMENTS AND MISCELLANEOUS PIPING COMPONENTS HAVE BEEN SHOWN ON THE PLAN DRAWINGS. PROVIDE VALVES AND INSTRUMENTS AS REQUIRED BY FOLLOWING DIMENSIONS, DETAILS AND SPECIFICATIONS IN ADDITION TO THOSE SHOWN ON PLAN DRAWINGS.
28. ALL PENETRATIONS IN EXISTING ROOFING SYSTEMS SHALL BE ENGINEERED AND COMPLETED BY QUALIFIED/CERTIFIED ROOFING INSTALLERS.
29. ALL VALVE AUTOMATES, AUTOMATIC TEMPERATURE CONTROL DEVICES SHALL BE "MASKED OFF" OR OTHERWISE PROTECTED DURING THE APPLICATION OF PAINT AND INSULATION.

MISC. TAGS

SECTION TAG		DIRECTION OF VIEW	SECTION NUMBER
ELEVATION TAG		DRAWING ON WHICH ELEVATION IS SHOWN	ELEVATION NUMBER
DETAIL TAG		DRAWING ON WHICH DETAIL IS SHOWN	DETAIL NUMBER
EQUIPMENT TAG (EQUIP. NEEDING ELECTRIC)		EQUIPMENT DESIGNATION	EQUIPMENT REFERENCE NUMBER
EQUIPMENT TAG (EQUIP. NOT NEEDING ELECTRIC)		EQUIPMENT DESIGNATION	EQUIPMENT REFERENCE NUMBER
TRAP TAG		TRAP TYPE	TRAP TAG

TT INDICATES TRAP
T = FLAT AND THERMOSTATIC
B = INVERTED BUCKET
THERMODYNAMIC

STEAM PRESSURE:
1 = 5 PSIG
2 = 15 PSIG
4 = 100 PSIG

CAPACITY / LB. INCLUDES
STEAM SATURATOR

[illegible]

THIS DOCUMENT MAY NOT, IN WHOLE OR PART
BE COPIED, PHOTOCOPIED, REPRODUCED,
TRANSLATED OR REDUCED TO ANY ELECTRONIC
MEDIUM OR MACHINE READABLE FORM
WITHOUT PRIOR CONSENT IN WRITING, FROM
AES CLEAN TECHNOLOGY, INC.

Notes

Project

<i>project no.</i>	
<i>drawn by</i>	OSC
<i>checked by</i>	RGS
<i>scale</i>	NOT TO SCALE
<i>date</i>	04-13-07

Drawing Title

MECHANICAL LEGENDS AND ABBREVIATIONS

Drawing No.

OFFICE USE ONLY

M-9

Mechanical Specifications

1.0 GENERAL MECHANICAL SPECIFICATIONS

1.1 CODES AND STANDARDS

1.1.1 ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE LATEST APPLICABLE CONSTRUCTION CODES, GUIDELINES AND STANDARDS AS ADOPTED AND AMENDED BY THE LOCAL MUNICIPALITY. THE NEBRASKA BUILDING CODE THE BOCA NATIONAL CODE THE BOCA BASIC/NATIONAL MECHANICAL CODE THE BOCA BASIC/NATIONAL FIRE PREVENTION CODE THE NATIONAL ELECTRICAL CODE THE NATIONAL FIRE PROTECTION CODE THE NATIONAL STANDARD PLUMBING CODE. ADDITIONALLY, ALL WORK SHALL CONFORM TO THE REQUIREMENTS OF THE OWNER'S STANDARDS, LOCAL ZONING, OSHA, AND ALL OTHER APPLICABLE CODES, TITLES AND REGULATIONS, ALL IN THEIR LATEST EDITION, OF ALL AUTHORITIES HAVING JURISDICTION OVER WORK OF THIS TYPE. SUBCONTRACTORS SHALL NOT PROCEED WITH WORK OF ANY KIND UNTIL PLANS ARE APPROVED BY THE OWNER.

1.2 THESE DRAWINGS ARE CONCEPTUAL ONLY. SHOULD CHANGES OR DISCREPANCIES OCCUR, THEY SHALL BE REPORTED TO AES. AES WILL NOT BE RESPONSIBLE OR LIABLE FOR THIS PROJECT SHOULD, CHANGES BE MADE TO THE DRAWINGS OR PROJECT BY THE OWNER AND/OR CONTRACTOR WITHOUT WRITTEN CONSENT FROM AES. DO NOT BEGIN WORK ON DISCREPANCIES OR OMISSIONS WITHOUT WRITTEN APPROVAL FROM AES.

1.3 CUSTOMER SHALL SIGN-OFF "APPROVED" OR "APPROVED-AS-NOTED" ON AES FURNISHED DRAWINGS AND SPECIFICATIONS PRIOR TO RELEASE OF ORDERING MATERIALS OR COMMENCING CONSTRUCTION.

1.4 DO NOT SCALE DRAWINGS FOR INSTALLATION PURPOSES.

1.5 CONTRACTORS SHALL FIELD VERIFY ALL DIMENSIONS AND CONDITIONS PERTAINING TO THEIR SCOPE OF WORK.

1.6 CONTRACTORS SHALL PROVIDE THE FOLLOWING DOCUMENTS TO AES UPON COMPLETION OF PROJECT:

- ONE (1) COMPLETE SET OF MARKED BLUEPRINTS REFLECTING AS-BUILT CONDITIONS. NOTE: CONTRACTOR SHALL MAINTAIN ONE (1) COMPLETE SET OF "RED-LINE" MARKUPS REFLECTING ONGOING PROGRESS OF AS-BUILTS. MARKUPS SHALL BE RECORDED WITHIN SEVEN (7) DAYS FOLLOWING INSTALLATION.
- MFG. DOCUMENTS ON DAMPERS DUCT MATERIALS, VALVES AND PIPING SPECIALTIES.

1.7 CONTRACTOR SHALL TAKE EXTREME CARE IN PREVENTING DAMAGE TO THE OWNER'S PROPERTY. ANY DAMAGE TO BUILDING, FURNITURE, EQUIPMENT, ETC., SHALL BE REPAIRED OR REPLACED BY CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER.

1.8 RIGGING AND RECEIVING OF ALL EQUIPMENT AND MATERIAL BY CONTRACTOR.

1.9 SUBCONTRACTORS SHALL KEEP JOB SITE CLEAN AND FREE OF DEBRIS AND TRASH AT ALL TIMES.

1.10 PERFORM ALL WORK IN ACCORDANCE WITH THE BEST STANDARD TRADE PRACTICES. ALL TRADES AND SUBCONTRACTORS SHALL COOPERATE TO FACILITATE JOB SCHEDULING AND COMPLETION.

1.11 ALL WELDING, CUTTING, OR BURNING PERFORMED AT JOB SITE SHALL NOT COMMENCE UNTIL CONTRACTOR RECEIVES PERMISSION FROM PLANT MAINTENANCE PERSONNEL. CONTRACTOR SHALL COMPLY WITH ALL SAFETY REQUIREMENTS AS SPECIFIED ON PERMIT AND SHALL PROVIDE FIRE WATCH, WELDING TARPS, ETC., DURING WELDING.

1.12 ALL CUTTING AND PATCHING THRU MSS WALLS, CEILINGS, ETC. SHALL BE THE RESPONSIBILITY OF AES CONTRACTORS FOR EACH CONSTRUCTION DISCIPLINE. ALL CUTTING AND PATCHING OF ROOFS, FLOORS, ETC. SHALL BE THE RESPONSIBILITY OF OTHERS.

1.13 SECURITY - ALL SECURITY PROCEDURES SHALL BE FOLLOWED WITH STRICT ACCORDANCE AS REQUIRED.

1.14 SAFETY - CONTRACTOR SHALL STRICTLY ABIDE BY THE OWNER'S SAFETY PROCEDURES AND WEAR EYE PROTECTION, HARD HATS, AND SAFETY SHOES AS REQUIRED.

2.0 DUCTWORK

2.1 SHEET METAL

2.1.1 ALL NEW SUPPLY, RETURN, OUTSIDE, AND EXHAUST AIR DUCTWORK, AS SHOWN ON THE PLANS, SHALL BE FABRICATED AND INSTALLED AS PER THE SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION, INC. (SMACNA) GUIDELINES FOR INDUSTRIAL DUCT CONSTRUCTION AND SHALL ACCOMMODATE PRESSURES OF 4 INCHES W.G. UNLESS OTHERWISE NOTED. ALL NEW SUPPLY, RETURN, OUTSIDE, AND EXHAUST AIR DUCTWORK SHALL BE OF GALVANIZED SHEET METAL STEEL- LOCK-FORMING QUALITY, ASTM A-453/A-453-M, COATING DESIGNATION 90 WILL PHOSPHATIZED FINISH FOR EXPOSED SURFACES OF DUCTWORK. ALL SEAMS SHALL BE CAULKED AIR TIGHT TO SMACNA SEAL CLASS "A". FITTINGS SHALL BE MANUFACTURED BY "DUCTIMATE" INDUSTRIES OR BY ALTERNATE MANUFACTURERS CONSIDERED. ALL JOINTS SHALL BE FLANGED, GASKETED AND BOLTED PER SMACNA STANDARDS. ALL JOINTS FOR ROUND DUCT SHALL BE FLANGED, GASKETED AND BOLTED AS PER "DUCTIMATE SPRAUIMATE".

2.1.2 ALL DUCTWORK TO BE DELIVERED & STORED AT JOB SITE, CLEANED AND SEALED; DUCT ENDS SHALL BE MAINTAINED AND SEALED DURING THE CONSTRUCTION PROCESS. ALL DUCTWORK INTERIORS SHALL BE WIRED CLEAN WITH 70% SOLUTION OF ISOPROPYL ALCOHOL.

2.1.3 DUCT DEVICES SHALL BE CONSTRUCTED OF THE SAME MATERIAL AS THE DUCT IN WHICH THEY ARE INSTALLED.

2.1.4 SECURE COUPLINGS OR BRANCH DUCT TIGHT TO DUCT WALL SURFACE. SECURE COUPLINGS WITH SELF TAP SCREWS AS REQUIRED TO SUPPORT CONNECTION.

2.1.4.1 TAPE SEALING SYSTEM: WOVEN-FIBER TAPE IMPREGNATED WITH A CYPUSUM MINERAL COMPOUND AND A MODIFIED ACRYLIC/SILICONE ACTIVATOR TO REACT EXOTHERMICALLY WITH THE TAPE TO FORM HARD, DURABLE, AIRTIGHT SEAL.

2.1.4.2 FABRICATE AND INSTALL DUCT, ELBOWS, BRANCH CONNECTIONS, AND OTHER CONSTRUCTION TO MINIMIZE PROTRUSIONS INTO THE AIRSTREAM TO MINIMIZE COLLECTION POINTS FOR DIRT.

2.1.5 COORDINATE LAYOUT WITH ALL OTHER ABOVE CEILING WORK, INCLUDING SPRINKLER PIPING, STORM WATER PIPING, PROCESS AND UTILITY PIPING, ELECTRICAL CONDUITS, ETC. PROVIDE ALL OFFSETS, RISERS, AND DROPS AS REQUIRED.

2.2 ELBOWS - ALL SQUARE ELBOWS SHALL HAVE TURNING VANES.

2.3 FLEXIBLE DUCTWORK - THERMOFLEX TYPE M-KC, CL 1, PRESS. RATING POS. 16" W.G./NEG. 2" W.G., VINYL INTERIOR LINING, 1-1/2" INSULATION OR APPROVED EQUAL.

2.3.1 FLEXIBLE DUCT CLAMPS- STAINLESS STEEL BAND WITH CADMIUM-PLATED HEX SCREW TO TIGHTEN BAND WITH A WORM-GEAR ACTION. PROVIDE IN SIZES FROM 3 TO 28 INCHES TO SUIT DUCT SIZE.

2.4 HANGERS & SUPPORTS

2.4.1 DUCT SHALL BE SUPPORTED WITH APPROVED HANGERS AT INTERVALS WITHIN 24 INCHES OF ELBOW, 48 INCHES OF BRANCH, AND HORIZONTAL DUCTS. VERTICAL DUCTS AT INTERVALS OF 16 FEET, OR BY OTHER APPROVED DUCT SUPPORT SYSTEMS DESIGNED IN ACCORDANCE WITH "ROCK" AND "SMACNA".

2.4.2 HANGERS AND SUPPORTS SHALL BE SUITABLE TO SUPPORT DUCT AND EQUIPMENT, SUCH AS HEATING COILS, FANS, AND FIRE DAMPERS. SUPPORT ALL DUCTWORK FROM THE TOP OF NEW SUPPORT STEEL ABOVE CLEANROOMS. HANGERS, SUPPORT AND STAMP HANGERS SHALL BE FASTENED TO STEEL STRUCTURE BY BEAM CLAMPS OR BY STEEL CLIPS WELDED TO THE TOP FLANGES OF BEAM AND GIRDERS. STEEL ANGLES OR CHANNELS SHOULD BE USED AS SUPPLEMENTARY SUPPORT FOR DUCTS BETWEEN BEAMS.

2.5 DUCT ACCESS

2.5.1 DOORS SHALL BE PROVIDED AND SHALL BE MADE AS LARGE AS PRACTICAL. DOORS IN INSULATED DUCTS SHALL BE OF THE INSULATED TYPE. DOORS SHALL BE RIGID WITH FELT GASKETS, GALVANIZED HINGES AND BRONZE PINS, AND BRASS FASTENERS. ACCESS DOORS SHALL BE CONSTRUCTED OF SAME MATERIAL AS DUCTWORK.

2.5.2 INSTALL DUCT ACCESS DOORS TO ALLOW FOR INSPECTING, ADJUSTING, AND MAINTAINING ACCESSORIES AND TERMINAL UNITS AS FOLLOWS:

- ON BOTH SIDES OF DUCT COILS AND DUCT MOUNTED HUMIDIFIERS.
- DOWNSTREAM FROM VOLUME DAMPERS, AUTOMATIC DAMPERS, TURNING VANES, AND EQUIPMENT.
- ADJACENT TO FIRE OR SMOKE DAMPERS, PROVIDING ACCESS TO RESET OR REINSTALL FUSIBLE LINKS.
- TO INTERIOR OF DUCTS FOR CLEANING, BEFORE AND AFTER EACH CHANGE IN DIRECTION, AT MAXIMUM 25'-FOOT SPACING.

2.6 LEAKAGE

2.6.1 MAXIMUM ALLOWABLE LEAKAGE: COMPLY WITH REQUIREMENTS FOR LEAKAGE CLASS 3 FOR ROUND AND FLAT-OVAL DUCTS, LEAKAGE CLASS 12 FOR RECTANGULAR DUCTS IN PRESSURE CLASSES LOWER THAN AND EQUAL TO 2 INCHES W.G. (BOTH POSITIVE AND NEGATIVE PRESSURES), AND LEAKAGE CLASS 6 FOR PRESSURE CLASSES FROM 2 TO 10 INCHES W.G.

2.6.2 LEAKAGE ALLOWANCES ARE TO BE INCLUSIVE OF FLEXIBLE CONNECTIONS AND CONTROL PENETRATIONS. SYSTEMS MUST BE TIGHT TO PERFORM PROPERLY AND TO ENABLE DESIGN AIR BALANCE INCLUDING RELATIVE STATIC PRESSURES TO BE ACHIEVED.

2.6.3 ALL DUCTWORK SHALL BE LEAK TESTED.

2.6.4 SEAL BRANCH DUCT CONNECTIONS AND BELL-MOUTH FITTINGS AIRTIGHT.

2.7 DUCTWORK CONNECTIONS TO TERMINAL DEVICES (GRILLES, DIFFUSERS, TERMINAL HEPA FILTERS) SHOULD BE SEALED AIR TIGHT AS APPLICABLE.

2.8 SHOULD ADDITIONAL DUCT OFFSETS OR FITTINGS BE REQUIRED TO FIT DUCTWORK IN FIELD OTHER THAN THOSE SHOWN ON PLANS, SHEET METAL CONTRACTOR SHALL PROVIDE AT NO ADDITIONAL COST TO OWNER AND AES.

2.9 ALL DUCTWORK ELEVATIONS SHOWN ARE APPROXIMATE AND SHALL BE FIELD VERIFIED BY CONTRACTOR.

2.10 OUTLETS - PROVIDE ALL AIR TERMINALS; HEPA AIR TERMINALS, CEILING DIFFUSERS, REGISTERS, AND GRILLES AS SCHEDULED ON PLANS.

2.10.1 PROVIDE SUPPLY AND RETURN DIFFUSERS OF TYPE, CAPACITY AND WITH ACCESSORIES AND FINISHES AS LISTED ON AIR TERMINAL SCHEDULE.

2.10.1.1 PROVIDE GRILLES AND REGISTERS OF TYPE, CAPACITY, AND WITH ACCESSORIES AND FINISHES AS LISTED ON AIR TERMINAL SCHEDULE.

2.10.1.2 GRILLES AND REGISTERS FACES: HORIZONTAL 0 AND 35 DEGREE FIXED BLADES AT MANUFACTURER'S STANDARD SPACING. GRILLES AND REGISTERS PATTERNS (CEILING REGISTERS ONLY): DOUBLE DEFLECTION: 2 SETS OF BLADES IN FACE, REAR SET AT 90 DEGREES TO FACE SET. REGISTERS TO INCLUDE ADJUSTABLE OPPOSED BLADE DAMPER ASSEMBLY, KEY OPERATED FROM FACE OF REGISTER.

2.10.2 PROVIDE SUPPLY AIR TERMINAL MODULES OF TYPE, CAPACITY AND WITH ACCESSORIES AND FINISHES AS LISTED ON AIR TERMINAL SCHEDULE.

2.10.2.1 CONSTRUCTION: THE TERMINAL HEPA FILTER HOUSING AND FRAME SHALL BE CONSTRUCTED OF 10 GAUGE EXTRUDED ANODIZED ALUMINUM MODULE WITH MAXIMUM DEPTH NOT TO EXCEED 3" WITH 12" DUCT COLLAR. A PROTECTIVE SCREEN, EPOXY POWDER COATED STEEL, 62% OPEN AREA.

2.10.2.2 EACH TERMINAL DUCTED HEPA REPLACEABLE 63-MM GEL SEALED TYPE FILTER SHALL HAVE MINIMUM REMOVAL EFFICIENCY OF 99.99% ON 0.3 MICRON PARTICLES. EACH FILTER SHALL BE FACTORY SCAN TEST PER SECTION 9.2 OF ES-RP-C0001.3 TO ENSURE FREEDOM FROM LEAKS GREATER THAN 0.01% OF THE TEST CHALLENGE. CENTER DIVIDER WITH ONE PORT FOR ROOM-SIDE ADJUSTABLE DIFFUSER PLATE/STATIC PRESSURE AND ONE PORT FOR ROOM-SIDE SAMPLING/AEROSOL INJECTION RING. EACH HEPA AIR TERMINAL SHALL BEAR LABELS INDICATING MODEL AND SERIAL NUMBER. PROVIDE TEST CERTIFICATE.

2.11 DAMPERS - FURNISH ALL VOLUME CONTROL DAMPERS PER PLANS.

2.11.1 DAMPERS IN RECTANGULAR DUCTWORK SHALL BE OPPOSED BLADE WITH LOCKING QUADRANT, TYPE MD-35 - OPPOSED BLADE DAMPER MFG. BY "RUSKIN". SHAFTS SHALL PROTRUDE THROUGH BOTH SIDES OF DUCT WITH STANDOFF TO EXTEND THROUGH INSULATION.

2.11.2 ROUND DAMPER AT BRANCH LINES SHALL HAVE SQUARE SHAFT STOCK WITH LOCKING QUADRANT, TYPE MDRS-25, MFG. BY "RUSKIN". SHAFTS SHALL PROTRUDE THROUGH BOTH SIDES OF DUCT WITH STANDOFF TO EXTEND THROUGH INSULATION.

2.11.3 FIRE DAMPERS SHALL BE UL CLASSIFIED "FIRE RESISTANCE RATING 1 1/2 HOUR" AND SHALL BE FUSIBLE LINE TYPE WITH DAMPERS OUT OF THE AIRSTREAM. FIRE DAMPERS SHALL BE "RUSKIN" TYPE IBOZ OR EQUAL VERTICAL MOUNT. CONTRACTOR TO PROVIDE ACCESS DOORS AT FIRE DAMPERS.

2.11.4 CUTTING AND PATCHING - PROVIDE ALL NECESSARY CUTTING AND PATCHING AT ROOF, EQUIPMENT PLATFORM DECKING OR WALLS TO ACCOMMODATE DUCTWORK, PIPING, AND CONDUIT PENETRATIONS. SEAL WATERIGHT.

2.12 OUTSIDE AIR INTAKE HOODS - HOODS SHALL BE GALVANIZED STEEL CONSTRUCTION WITH WEATHERPROOF HOOD AND SCREENED OPENING. HOODS SHALL BE SUPPLIED WITH CURB (MINIMUM 12") AND CURBS SHALL BE SHIMMED LEVEL TO ACCOMMODATE ROOF SLOPE. HOODS SHALL BE "PENN ARETTE" OR APPROVED EQUAL.

2.13 FLEXIBLE DUCT CONNECTION, ON ALL DUCTS CONNECTING TO FANS AND AIR HANDLING UNITS SHALL BE FIRE RETARDANT, CLOSELY WOVEN GLASS FABRIC, DOUBLE COATED WITH NEOPRENE, AND A MINIMUM OF 4 INCHES WIDE VENT FABRICS OR EQUAL.

2.14 ALL DUCTS TO BE GROUNDED ACROSS FLEXIBLE CONNECTION WITH FLEXIBLE COPPER GROUNDING STRAPS.

3.0 PIPING

3.1 FURNISH AND INSTALL ALL PIPING AS SHOWN ON PLANS. PROVIDE ALL NECESSARY MATERIALS, LABOR, TOOLS, SUPPORTS, CLAMPS, CUTTING AND PATCHING AND PIPE IDENTIFICATION MARKERS.

3.2 TESTING

3.2.1 TEST THE SANITARY PIPING THROUGHOUT UPON COMPLETION OF ROUGH-IN BY TIGHTLY CLOSING ALL OPENINGS WITH SCREW PLUGS OR EQUIVALENT DEVICE AND SUBJECTING THE SYSTEM TO HYDROSTATIC TEST MAINTAINING A 5" HEAD FOR A MINIMUM OF TWO HOURS.

3.2.2 TEST THE DOMESTIC HOT AND COLD WATER PIPING WITH A HYDROSTATIC PRESSURE OF 150 PSI OR 1-1/2" TIMES THE NORMAL WORKING PRESSURE, WHICH EVER IS GREATER, MAINTAINED WITHOUT PUMPING FOR A PERIOD OF FOUR HOURS. TEST AND ADJUST HOT WATER PIPING SYSTEM TO DEMONSTRATE SATISFACTORY OPERATION.

3.3 HANGER AND SUPPORTS

3.3.1 HANGERS AND SUPPORTS SHALL BE OF SUFFICIENT STRENGTH TO SUPPORT THE PIPING. HANGERS AND STRAPPING MATERIAL SHALL BE OF SIMILAR MATERIAL AS THE PIPING TO AVOID GALVANIC ACTION.

3.3.2 ALL PIPE HANGERS AND SUPPORTS SHALL BE STANDARD PRODUCTS OF ITT GRINNELL CORPORATION OR APPROVED EQUAL. PROVIDE A PROTECTION SHIELD BETWEEN HANGER AND PIPE INSULATION. PROVIDE PIPE SLEEVES AT WALL AND FLOOR PENETRATIONS AND SEAL AIRTIGHT.

3.3.3 MISCELLANEOUS SUPPORT STEEL AND ALL PIPE HANGERS SHALL BE PAINTED WITH 1 COAT OF RUST INHIBITING PRIMER AND 2 COATS OF ALKYL SEMI-GLOSS ENAMEL.

3.3.4 HANGER SPACING (MAXIMUM HORIZONTAL SPACING) * COPPER PIPE 1-1/4" AND SMALLER - 6 FEET * ALL PIPING 1-1/2" AND LARGER - 10 FEET

3.4 STEEL PIPE FOR CHILLED AND HOT WATER (GLYCOL), STEAM, AND CONDENSATE RETURN:

3.4.1 (2) INCH AND SMALLER, ASTM A53, SCHEDULE 40, GRADE B, TYPE F, BLACK STEEL OR ASTM A106, SCHEDULE 40, GRADE B, TYPE S, BLACK STEEL. HIGH PRESSURE STEAM AND CONDENSATE PIPING SHALL BE SCHEDULE 80, ASTM A53 GR. B, SEAMLESS. (2-1/2) INCH AND LARGER, ASTM A53, SCHEDULE 40, GRADE B, TYPE E, BLACK STEEL OR ASTM A106, SCHEDULE 40, GRADE B, TYPE S, BLACK STEEL. HIGH PRESSURE STEAM AND CONDENSATE PIPING SHALL BE SCHEDULE 40, ASTM A53 GR. B, SEAMLESS.

3.5 FITTINGS

3.5.1 2 INCH AND SMALLER SCHEDULE 40, SEAMLESS, THREADED ENDS, ASTM A236 ANSI B16.9

3.5.2 2-1/2 INCH AND LARGER SCHEDULE 40, SEAMLESS, BUTT WELD ENDS, ASTM A236 ANSI B16.9

3.6 HIGH PRESSURE STEAM AND CONDENSATE

3.6.1 2 INCH AND SMALLER SCHEDULE 80, SEAMLESS, THREADED ENDS, ASTM A236 ANSI B16.9

3.6.2 2-1/2 INCH AND LARGER SCHEDULE 40, SEAMLESS, BUTTWELD ENDS, ASTM A234 WP8, ANSI B16.9

3.7 COOLING CONDENSATE DRAIN, DOMESTIC WATER AND COMPRESSED AIR

3.7.1 SEAMLESS ASTM B88, TYPE L, HARD DRAWN.

3.8 FITTINGS

3.8.1 ASME B16.18, CAST COPPER ALLOY SOLDER JOINT PRESSURE FITTINGS OR ASME B16.22 WROUGHT COPPER SOLDER JOINT PRESSURE FITTINGS.

3.9 JOINTS

3.9.1 ASTM B32, 95/5 (LEAD FREE) SOLDER.

3.10 VALVES

3.10.1 VALVES, GENERAL UNLESS SPECIFIED OTHERWISE, CONTRACTOR SHALL SUPPLY ALL VALVES NOT FURNISHED AS AN INTEGRAL PART OF A PIECE OF EQUIPMENT. VALVES SHALL BE OF ONE MANUFACTURER ACCEPTABLE FOR TYPE SERVICE, I.E. STEAM, WATER, OIL, GAS ETC., (EXCEPT WHERE FULL LINE OF TYPES OF VALVES ARE NOT AVAILABLE), AND SHALL BE AS MANUFACTURED BY STOCKHAM, WATTS, ROCKWELL, SARCO, NIBCO, WHITEY, SLOAN, DEZURK, CRANE, OR JENKINS. VALVE NUMBERS OF MANUFACTURERS USED BELOW ARE USED ONLY TO ESTABLISH A MINIMUM STANDARD OF QUALITY ONLY. MANUFACTURERS OTHER THAN SPECIFIED ABOVE WILL NOT BE ACCEPTED. VALVES 4" AND LARGER SHALL BE GEAR OPERATED WITH CHAIN WHEN 8'-0" A.F.F.

3.11 HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS

3.11.1 VALVES 2" AND SMALLER (125 PSI).

3.11.2 VALVES 2-1/2" AND LARGER 125 PSI SWP, 200 PSI NON-SHOCK W.O.G., BRONZE, ASTM B-62.

3.12 GATE VALVES

3.12.1 SCREWED BONNET, RISING STEM, SOLID DISC, AND THREADED ENDS: STOCKHAM B-100. SCREWED BONNET, RISING STEM, SOLID DISC, AND SOLDER ENDS: STOCKHAM B-108. SCREWED BONNET, NON-RISING STEM, SOLID DISC, AND THREADED ENDS: STOCKHAM B-103. SCREWED BONNET, NON-RISING STEM, SOLID DISC, AND SOLDER ENDS: STOCKHAM B-104.

3.13 BALL VALVES

3.13.1 TWO (2) PIECE DESIGN, 600 PSI, W.O.G., BALL VALVE, BRONZE BODY, CHROME PLATED BRASS BALL, AND REPLACEABLE TEFLON OR "TIE" SEATS AND SEALS. BALL VALVES SHALL HAVE BLOWOUT PROOF STEMS AND VINYL COVERED HANDLE. STOCKHAM S-216-BR-RT OR RS AS APPLICABLE.

3.14 GLOBE VALVES

3.14.1 SCREWED BONNET, RISING STEM, TEFLON DISC, AND THREADED ENDS: STOCKHAM B-13T. SCREWED BONNET, RISING STEM, TEFLON DISC, AND SOLDER ENDS: STOCKHAM B-14T. SCREWED BONNET, RISING STEM, ANGLE TYPE, AND THREADED END: STOCKHAM B-22Z. BALL VALVES (200 PSI SWP BRASS BODIES, TEFLON SEATS). THREADED ENDS, STOCKHAM S-216-BR-RT. SOLDERED ENDS, STOCKHAM S-216-BR-RS.

3.15 CHECK VALVES

3.15.1 SOLDERED ENDS, SWING TYPE, STOCKHAM NO. B-309. THREADED ENDS, SWING TYPE, STOCKHAM NO. B-319. SOLDERED END, NON-SLAM TYPE, NIBCO INC., NO. S-480. THREADED END, NON-SLAM TYPE, NIBCO INC., NO. T-480. VALVES 2-1/2" AND LARGER (125 PSI) 125 PSI SWP, 200 PSI NON-SHOCK W.O.G. IRON BODY ATM B-62, TWO AND ONE-HALF (2-1/2") INCH AND LARGER.

3.16 GATE VALVES

3.16.1 FLANGED END, OUTSIDE SCREW AND YOKE, STOCKHAM G-512. FLANGED END, OUTSIDE SCREW AND YOKE, STOCKHAM G-623.

3.17 BUTTERFLY VALVES

3.17.1 150 PSI, REPLACEABLE EPDM SLEEVE, NICKEL-PLATED DUCTILE IRON DISK, STAINLESS STEEL STEM, AND EPDM O-RINGS STEM SEALS, AND LEVER OPERATIONS WITH LOCKS, FLANGED ENDS, JAMESBURY 185L SERIES.

3.18 GLOBE VALVES

3.18.1 FLANGED END, OUTSIDE SCREW AND YORK, STOCKHAM G-512. FLANGED END, ANGLE VALVE, STOCKHAM F-515.

3.19 CHECK VALVES

3.19.1 FLANGED ENDS, SWING TYPE, STOCKHAM NO. G-932B.

3.20 DOMESTIC COLD WATER AND HOT WATER SYSTEMS

3.20.1 BALL VALVES 2" AND SMALLER TWO (2) PIECE DESIGN, 600 PSI, W.O.G., BALL VALVE, BRONZE BODY, CHROME PLATED BRASS BALL, PLATED CARBON STEEL HANDLE WITH VINYL COVER. STOCKHAM S-216-BR-RT OR RS AS APPLICABLE. VALVES 2-1/2" AND LARGER SHALL BE CLASS 125 GATE VALVES, IRON BODY, BRONZE MOUNTED, SOLID WEDGE, FLANGED END, CONFORMING TO ASTM B82 SPECIFICATION. STOCKHAM G-612 OR G-623 OR APPROVED EQUAL.

3.21 EMERGENCY SHOWER/EYE WASH MIXING VALVE

3.21.1 TWO FULLY INDEPENDENT CONTROL MECHANISMS WHICH SPLIT THE FLOW IN HALF, BLEND EACH HALF TO THE DESIGN TEMPERATURE AND THEN INTEGRATE EACH STREAM AT THE OUTLET. THE VALVE SHALL INCLUDE THREE THERMOMETERS TO CONTROL OUTLET TEMPERATURE OVER A WIDE RANGE OF FLOW AND FLOW SHALL BE SUITABLE FOR DELUGE SHOWER OR EYEWASH APPLICATIONS.

3.20.2 IN THE EVENT OF INTERRUPTION OF THE COLD WATER SUPPLY, EACH CONTROL MECHANISM CLOSSES OFF THE HOT WATER PORT STOPPING ALL FLOW. IN THE EVENT OF INTERRUPTION OF THE HOT WATER SUPPLY, EACH CONTROL MECHANISM SHALL ALLOW COLD WATER FLOW THROUGH BOTH THE FIXED AND VARIABLE BY-PASS.

3.20.3 THE VALVE SHALL BE RATED FOR MAXIMUM INLET PRESSURE OF 125 PSI, MAXIMUM INLET TEMPERATURE OF 180°F AND A RATED CAPACITY OF 25 GPM AT 30 PSI INLET PRESSURE. MANUFACTURE SHALL BE LAMIER THERMOSTATIC WATER CONTROLLER MODEL 91T.

3.21 FLOW SETTERS

3.21.1 FLOW SETTERS FOR WATER SERVICE SHALL BE A COMBINATION BALANCING SHUTOFF/FLOW SENSOR. ALL VALVES EN5 INCH TO 3 INCH PIPE SIZE TO BE OF BRONZE BODY/BRASS BALL G CONSTRUCTION WITH GLASS AND CARBON FILLED TIE SEAT RINGS. VALVES TO HAVE DIFFERENTIAL PRESSURE READ-OUT PORTS ACROSS VALVE SEAT AREA. READ-OUT PORTS TO BE FITTED WITH INTERNAL EPT INSERTS AND CHECK VALVES. VALVE BODIES TO HAVE 3/4 INCH NPT TAPPED DRAIN/PURGE PORT. VALVES TO HAVE MEMORY STOP FEATURE TO ALLOW VALVE TO BE CLOSED FOR SERVICE AND THEN REOPENED TO SET POINT WITHOUT DISTURBING BALANCE POSITION. ALL VALVES TO HAVE CALIBRATED NAMEPLATES TO ASSURE SPECIFIC VALVE SETTINGS. VALVES SHALL BE DESIGNED FOR POSITIVE SHUTOFF AS MANUFACTURED BY BELL AND GOSSETT.

3.22 STRAINERS

3.22.1 STRAINERS UP TO 2 INCH: SCREWED IRON BODY FOR 250 PSIG WORKING PRESSURE, Y PATTERN WITH 1/32 INCH STAINLESS STEEL PERFORATED SCREEN. OVER 2 INCHES: FLANGED IRON BODY FOR 125 PSIG WORKING PRESSURE, Y PATTERN WITH 3/64 INCH STAINLESS STEEL PERFORATED SCREEN AS MANUFACTURED BY ARMSTRONG OR APPROVED EQUAL.

3.23 AIR VENTS SHALL BE FLOAT TYPE BRASS OR SEMI-STEEL BODY, COPPER FLOAT, STAINLESS STEEL VALVE AND SEAT; SUITABLE FOR SYSTEM OPERATING TEMPERATURE AND PRESSURE; WITH ISOLATING VALVE AS MANUFACTURED BY BELL AND GOSSETT. INSTALL AIR VENTS AT HIGH POINTS OF SYSTEM AND AS INDICATED.

3.24 THERMOMETERS

3.24.1 THERMOMETERS FOR AIR SYSTEMS SHALL BE 4-1/2 INCH DAL WITH CLEAR GLASS WINDOW. THERMOMETERS SHALL BE SELECTED SO THAT THE NORMAL TEMPERATURE READINGS ARE IN THE MIDDLE THIRD OF THE RANGE OF THE THERMOMETER AND BE COMPLETE WITH THERMO WELLS. THERMOMETERS SHALL BE AS MANUFACTURED BY TRECICE INSTRUMENTS OR APPROVED EQUAL.

3.24.2 THERMOMETERS FOR HYDRONIC AND STEAM SYSTEMS SHALL BE 9 INCH SCALE WITH CLEAR PLASTIC LENS (NO GLASS), RED MERCURY FILLED READING, WHITE FACE AND BLACK NUMERALS. PROVIDED WITH ADJUSTABLE ANGLE STEM AND COATED CAST ALUMINUM CASE. CASE SHALL BE ADJUSTABLE SO THE SCALE IS READABLE FROM THE FLOOR. THERMOMETERS SHALL BE SELECTED SO THAT THE NORMAL TEMPERATURE READINGS ARE IN THE MIDDLE THIRD OF THE RANGE OF THE THERMOMETER AND BE COMPLETE WITH THERMO WELLS. THERMOMETERS SHALL BE AS MANUFACTURED BY TRECICE INSTRUMENTS OR APPROVED EQUAL.

3.25 PRESSURE GAUGES FOR HYDRONIC AND STEAM SYSTEMS, SHALL BE ADJUSTABLE ANGLE STEM INDUSTRIAL TYPE THERMOMETERS WITH COATED CAST ALUMINUM CASE, RED MERCURY FILLED READING COLUMN, CLEAR PLASTIC LENS (NO GLASS), 9-INCH SCALE, WHITE FACE AND BLACK NUMERALS. CASE SHALL BE ADJUSTABLE SO THE SCALE IS READABLE FROM FLOOR LEVEL. SHALL BE 4-1/2 INCH DAL WITH CLEAR GLASS WINDOW. GAUGES SHALL BE CONNECTED BY BRASS PIPE AND FITTINGS WITH SHUTOFF COCKS. GAUGES SHALL BE SELECTED SO THAT THE NORMAL READINGS ARE IN THE MIDDLE THIRD OF THE RANGE OF THE GAUGE. ON THERMALLY INSULATED EQUIPMENT OR PIPING, STANDOFF MOUNTING BRACKETS, BASES, ADAPTERS, OR EXTENDED TUBES SHALL BE PROVIDED. GAUGES SHALL BE BY TRECICE INSTRUMENTS OR APPROVED EQUAL.

3.26 METHODS AND REQUIREMENTS

3.26.1 ALL PIPING SYSTEMS SHALL HAVE VALVES AT POINTS SHOWN ON THE DRAWINGS AND AS REQUIRED FOR COMPLETE ISOLATION OF ALL EQUIPMENT, PUMPS, HEATERS, AUTOMATIC VALVES AND TANKS, ARRANGED SO AS TO GIVE COMPLETE AND REGULATING CONTROL OF PIPING SYSTEMS THROUGHOUT THE BUILDING. INSTALL VALVES WITH NEAT APPEARANCE AND GROUPING AND ACCESSIBLE SO THAT ALL PARTS ARE EASILY ACCESSIBLE FOR MAINTENANCE.

3.26.2 ALL BRANCHES FROM WATER MAINS FEEDING UP SHALL BE TAKEN FROM THE TOP OF THE SUPPLY MAINS AT AN ANGLE OF FORTY-FIVE (45) DEGREES ABOVE THE HORIZONTAL, UNLESS OTHERWISE DIRECTED. BRANCHES FEEDING DOWN SHALL BE TAKEN FROM THE SIDE OF THE MAIN. ALL CONNECTIONS SHALL BE CAREFULLY MADE TO INSURE UNRESTRICTED CIRCULATION, ELIMINATE AIR POCKETS OR TRAPPED CONDENSATE, AND PERMIT THE COMPLETE DRAINAGE OF THE SYSTEM.

3.26.3 DRAIN VALVES WITH HOSE CONNECTIONS SHALL BE PROVIDED AT LOW POINTS FOR DRAINAGE OF PIPING SYSTEMS. BLOW DOWN VALVES SHALL BE PROVIDED AT THE ENDS OF ALL LINES AND BRANCHES SO AS TO PROPERLY CLEAN BY BLOWING DOWN THE LINES THROUGHOUT IN THE DIRECTION OF NORMAL FLOW.

3.26.4 DISCHARGE LINES FROM ALL RELIEF VALVES SHALL BE PIPED TO WITHIN 4" OF FLOOR DRAINS. SAFETY VALVES SHALL BE PIPED TO ATMOSPHERE IN CONFORMANCE WITH GOVERNING CODES, INCLUDING ALL SAFETY MEASURES RELATED TO PROPER OPERATION.

3.26.5 SHUTOFF VALVES CAPABLE OF 100 PERCENT DEAD SHUTOFF SHALL BE PROVIDED ON EACH BRANCH LINE FROM THE MAINS ON ALL PIPING, REGARDLESS OF SERVICE.

3.26.6 SHUTOFF VALVES SHALL BE INSTALLED AT THE INLET AND OUTLET OF EACH INDIVIDUAL PIECE OF EQUIPMENT TO PERMIT ISOLATION FOR MAINTENANCE AND REPAIR.

3.26.7 PROVIDE MANUAL AIR VENT VALVES AT ALL HIGH POINTS IN ALL THE WATER LINES AS INDICATED ON THE DRAWINGS, OR AS REQUIRED TO VENT THE SYSTEM. PIPE DISCHARGE TO WITHIN 4 FEET OF FLOOR DRAINS.

3.26.8 RISING STEM GATE VALVES SHALL BE USED, EXCEPT WHERE PHYSICAL CLEARANCES RESTRICT THEIR USES.

3.26.9 CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS AND CONDITIONS AT THE BUILDING SITE BEFORE INSTALLATION OF HIS WORK.

3.26.10 ALL EXISTING PIPING TO BE VERIFIED IN FIELD.

3.26.11 PIPING TO BE INSTALLED IN ACCESSIBLE AREAS. IN CASES WHERE THE PIPING WILL BE EXTENDED THROUGH A SUPPORTING WALL, PERMANENT CEILING OR FLOOR, SLEEVES MUST BE INSTALLED.

3.26.12 STERILIZE THE WATER DISTRIBUTION SYSTEM BY THE METHOD APPROVED BY THE AUTHORITY HAVING JURISDICTION.

3.26.13 ALL CLEANOUTS SHALL BE BRASS, FLUSH MOUNTED TYPE WITH TAMPER PROOF SCREWS.

3.26.14 ISOLATE CONNECTIONS BETWEEN DISSIMILAR METALLIC MATERIALS BY USE OF DIELECTRIC FITTINGS OR "CLEAR-FLOW" NIPPLES THAT PROVIDE A COMPLETE ISOLATION OF THE TWO ENDS USING MATERIALS SUITABLE FOR THE DESIGN PRESSURE, TEMPERATURE AND FLUID CONTAINED. ISOLATE NON-FERROUS PIPING PASSING THROUGH OPENINGS IN STRUCTURAL STEEL WITH NONCONDUCTIVE MATERIAL PERMANENTLY ATTACHED TO PIPE.



FAN SCHEDULE																		
UNIT NO.	SERVICE	LOCATION	CONST. CLASS	WHEEL PROP.	FAN TYPE	ARRGMT.	FAN								BASIS OF DESIGN		REMARKS	
							AIRFLOW CFM @ 70 F.	EXT SP (IN. W.C.)	VOLUME CONTROL	DRIVE TYPE	FAN BHP	MOTOR RPM	HP	RPM	ELECTRIC V-PH-HZ	MANUF		MODEL
EF 1-1	ASEPTIC SUITE	EQUIP. PLATFORM	2	ALUMINUM	UTILITY	10	1,500	4.0	VFD	V-BELT	1.83	1,476	3	1,725	460-360	GREENHECK	11-IPA	2,3,4,5,6,7,8,10
EF 1-2	FLUME HOODS	EQUIP. PLATFORM	2	ALUMINUM	UTILITY	10	5,000	4.0	VFD	V-BELT	4.61	1,740	7 1/2	1,725	460-360	GREENHECK	20-B5W-41	2,3,4,5,6,7,8,10
EF 2-1	GENERAL EXHAUST	EQUIP. PLATFORM	2	ALUMINUM	UTILITY	10	5,000	4.0	VFD	V-BELT	4.61	1,740	7 1/2	1,725	460-360	GREENHECK	20-B5W-41	2,3,4,5,6,7,8,10
BF 1-1	ISOLATOR	EQUIP. PLATFORM		ALUMINUM	CENT IN-LINE		1,500	2.0	VFD	V-BELT	1.00	1,777	2	1,725	460-360	GREENHECK	BSQ-140-20	2,4,5,6,7,8,10
NOTES & ACCESSORIES:																		
1. GRAVITY-OPERATED BACK DRAFT DAMPER																		
2. MANUALLY-OPERATED DISCHARGE DAMPER (OPPOSED BLADE)																		
3. BASE RAIL WITH SPRING VIBRATION ISOLATORS																		
4. PROVIDE CONTACTOR(S) IN ACCORD WITH LOW-VOLT COIL INTERFACE FOR ATO																		
5. ADJUSTABLE MOTOR SUPPORTS WITH FIXED SOLID CORE SHEAVES AND ANTI-FRICTION BALL BEARINGS																		
6. HI-PRO POLYESTER COATING ON FAN AND ATTACHMENTS																		
7. SPARK RESISTANT CONSTRUCTION TYPE "B"																		
8. WEATHER COVER/BELT GUARD, STANDARD ACCESS DOOR, DRAIN AND FLANGED CONNECTIONS																		
9. ALUMINUM WHEELS, STEEL HOUSING, STEEL MOTOR AND DRIVE HOUSINGS																		
10. AMCA B CERTIFIED FANS - MANUF. BY NEW YORK BLOWER, GREENHECK, OR APPROVED EQUAL																		

HOT WATER PREHEAT COIL SCHEDULE																
UNIT NO.	SERVICE	LOCATION	SIZE W X H (IN.)	MAX VELOCITY (FPM)	CAPACITY (MBH)	AIR				WATER				BASIS OF DESIGN		REMARKS
						AIRFLOW (CFM)	AIR P.D. (IN. W.C.)	EAT DBWB	LAT DBWB	WTRFLOW (GPM)	MAX P.D. (FT W.C.)	EWT (F)	LWT (F)	MANUF	MODEL	
PHC 1	AHU 1 / AHU 2	EQUIP. PLATFORM	60 X 50	800	1,073.0	15,000	0.5	-20	45	107.0	5.0	180	180	MARLO		1,2,3,4,5,6
NOTES & ACCESSORIES:																
1. ALL COILS ARE 1" ROW COILS																
2. HOT WATER COILS SIZE BASED ON 40% GLYCOL SOLUTION																
3. ENTERING WATER TEMP BASED ON RESET SCHEDULE - 140 F/70 F OAT, 180 F/20 F OAT																
4. TYPE "N" COPPER HEADERS AND 16-GAUGE GALVANIZED CASINGS																
5. HOT WATER HEATING COIL CONNECTIONS SHALL BE SAME SIDE																
6. CONSTRUCT OF 0.01 ALUMINUM FINS, 0.035" X 0.625" COPPER TUBES																

AIR FILTER SCHEDULE																			REMARKS			
UNIT NO.	SERVICE	LOCATION	AIRFLOW CFM	AIR FILTER								MEDIA HOUSING										
				FACE				A.P.D. (IN. W.G.)				BASIS OF DESIGN		UNIT SIZE (HxWxD)		ARRANGEMENT		TOTAL UNIT		BASIS OF DESIGN		
				FILTER TYPE	AREA (S.F.)	EFF. (%)	U.L. CLASS	FILTER SIZE (HxWxD)	INIT.	FINAL	MANUF.	MODEL	H	W	NO.	MANUF.	MODEL					
FIL. 1	FRESH AIR INTAKE	EQUIP. PLATFORM	6,000	PLEATED	32	30	2	24"x24"x4"	0.04	0.5	FARR	AEROPLEAT II	36"x51.5"x12"	2	4	1	FARR	4PI GLIDE PACK				
NOTES & ACCESSORIES:																						
1. FILTERS CONSTRUCTED OF RIGID HEAVY-DUTY BOARD W/DIAGONAL SUPPORT ENCL. FRAMES																						
2. WELDED MEDIA SUPPORT GRID BONDED TO NON-WOVENCOTTON & SYNTHETIC FABRIC MEDIA																						
3. SIDE ACCESS, SINGLE STAGE FILTER SYSTEM CONSISTING OF HOUSING, ACCESS DOORS, TRACKS, & HOLDING FRAMES																						

UNIT/SYSTEM	DUCT SYSTEM	SMACNA PRESSURE/VELOCITY CLASS & SEAL CLASS		DUCT MATERIAL							EXTERNAL DUCT INSULATION						INTERNAL DUCT LINER		KEYED NOTES	
		PRESSURE (IN. W.G.)	POSITIVE	NEGATIVE	LEAKAGE CLASS	SEAL CLASS	GALVANIZED SHEET METAL	ALUMINUM	16 GA. BL. IRON	316L STAINLESS	FRP	RIGID BOARD	WRAP BLANKET	FLEXIBLE ELASTOMER	VAPOR BARRIER	THICKNESS (IN.)	DENSITY (CU. FT.)	THICKNESS (IN.)		DENSITY (CU. FT.)
AHU 1 AND	SUPPLY AIR	4	●		6	A	●						●		●	1.5	0.75			A
AHU 2	RETURN AIR	4		●	6	A	●						●		●	1.5	0.75			A
	MAKE-UP AIR	4			6	A	●						●		●	1.5	0.75			A
EF 1,3 AND	EXHAUST AIR - SUCTION	4		●	6	A									●	1.5	0.75			
EF 1-2	EXHAUST AIR - DISCH	4	●		6	A			●						●	1.5	0.75			B
EF 2,1	EXHAUST AIR - SUCTION	4		●	6	A	●								●	1.5	0.75			
	EXHAUST AIR - DISCH	4	●		6	A	●								●	1.5	0.75			B
GENERAL NOTES : 1. SEE PLANS FOR EXCEPTIONS TO THE ABOVE 2. DUCT SIZES SHOWN ON PLANS ARE SHEET METAL INSIDE DIMENSIONS AND INCLUDE ALLOWANCE FOR INTERNAL LINING 3. ALL ROUND AND FLEXIBLE DUCT FOR THE SYSTEM ARE EXTERNALLY INSULATED AT DISCHARGE OF EXHAUST FANS - SEE DETAIL 4. AT DISCHARGE OF EXHAUST FANS - SEE DETAIL KEYED NOTES : A. FLEXIBLE BRANCH DUCT SHALL MATCH INLET OF DIFFUSERS SERVED UNLESS OTHERWISE NOTED B. DOUBLE WALL DUCT, 316 SS INNER & 20 GA ALUMINUM, AMPCO MODEL VSI-8																				

[illegible]

Notes

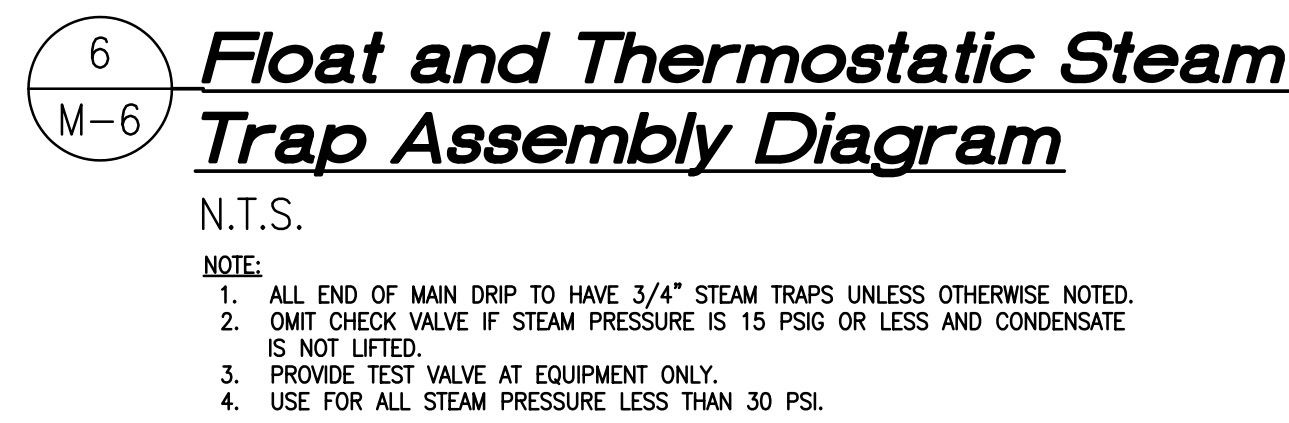
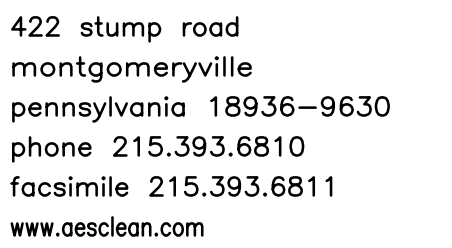
Drawing Title

MECHANICAL
SCHEDULES

Drawing No.

OFFICE USE ONLY

M-7



THIS DOCUMENT MAY NOT, IN WHOLE OR PART,
BE COPIED, PHOTOCOPIED, REPRODUCED,
TRANSLATED OR REDUCED TO ANY ELECTRONIC
MEDIUM OR MACHINE READABLE FORM
WITHOUT PRIOR CONSENT IN WRITING, FROM
AES CLEAN TECHNOLOGY, INC.

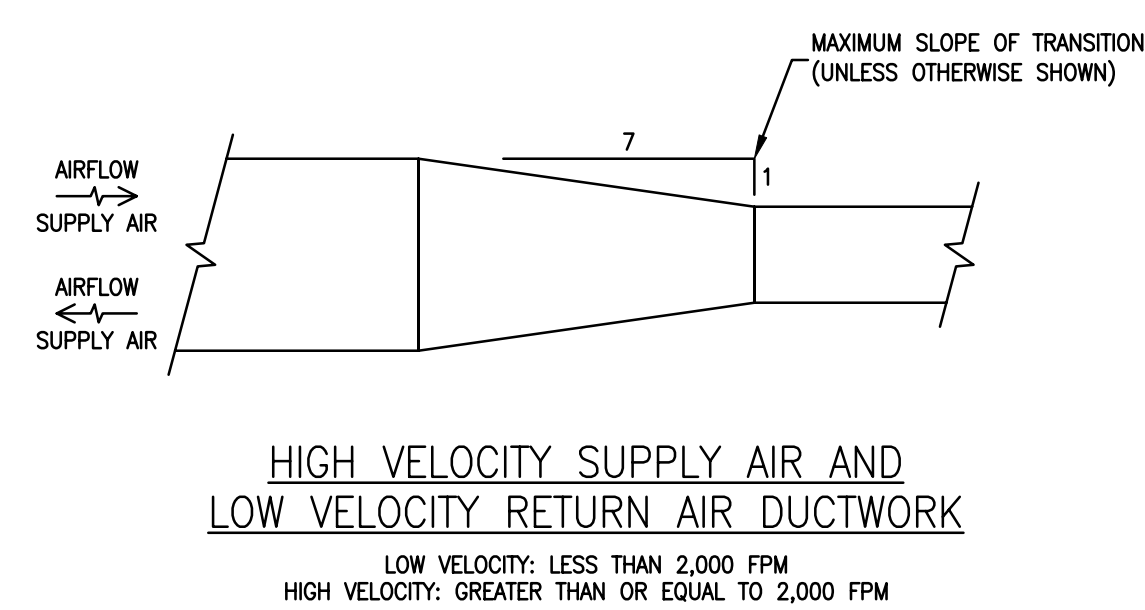
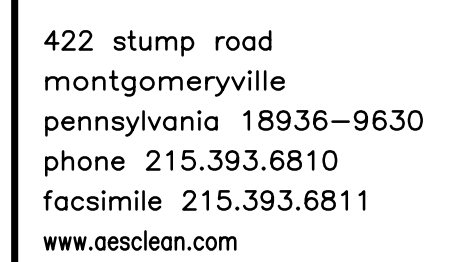
Project

Drawing Title

MECHANICAL
DETAILS AND
DIAGRAMS

M-6

OFFICE USE ONLY



NOTE: MINIMUM 24 GA. VANES AND VANE RUNNER

	X" RADIUS	Y" RADIUS	Z" SPACING
SMALL VANE	2"	1"	1-1/8"
LARGE VANE	4"	2"	2-1/4"

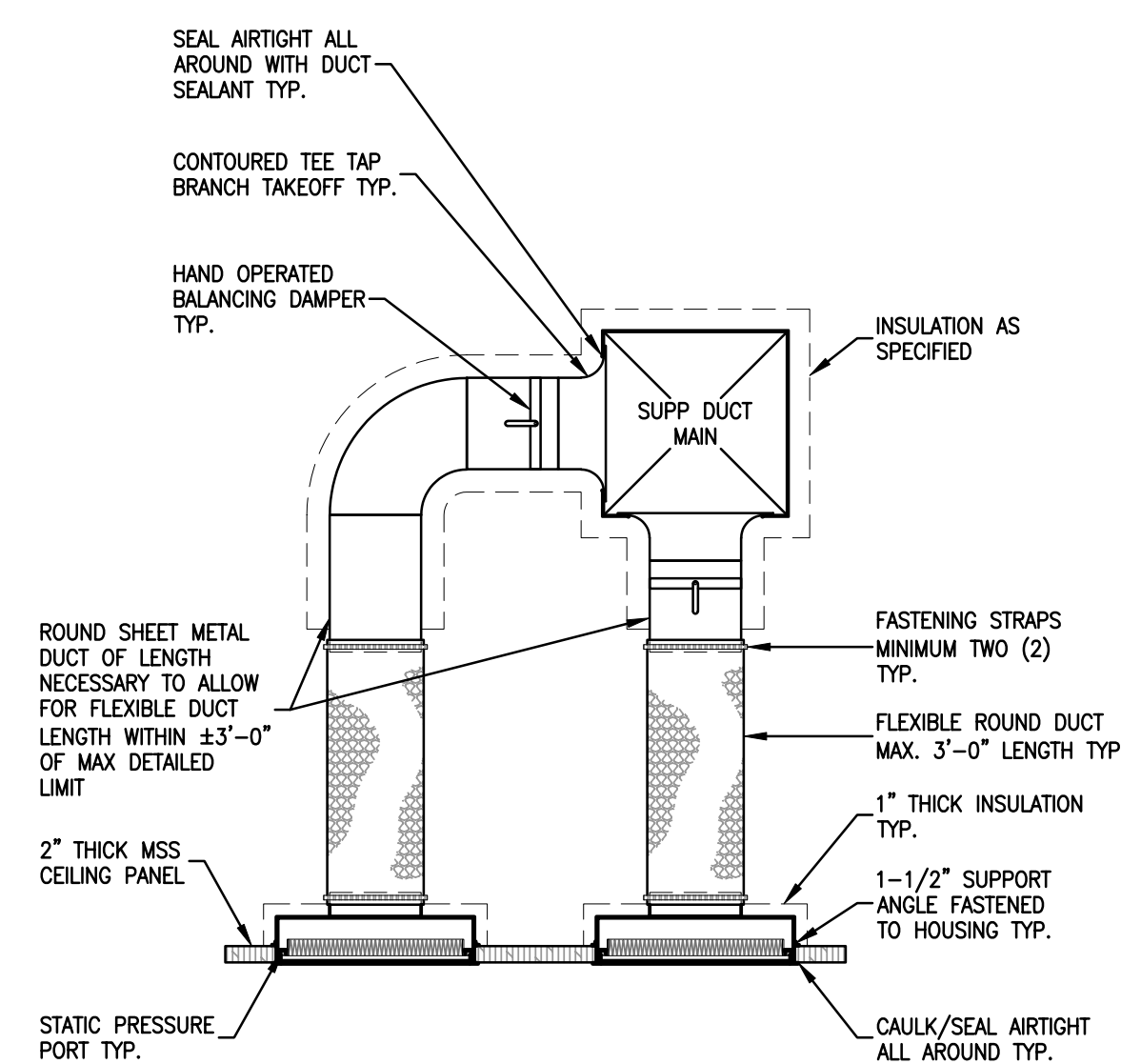
A schematic diagram of a rectangular return air grille. The grille is shown with a top flange and a bottom flange. Arrows indicate 'AIRFLOW' entering the grille and 'RETURN AIR' exiting. A label 'VO' points to the top flange. A label 'OPOSED BLADE DAMPER' points to the bottom flange. A label 'RETURN AIR TAP WITH DUCT COLLAR AND VO' points to the top flange. A label 'RETURN AIR OPENING: PROVIDE AIR TERMINAL WHERE SHOWN ON DRAWING' points to the bottom flange. A label 'MAINTAIN A MINIMUM CLEARANCE EQUAL TO DEPTH OF COLLAR, FROM ANY OBSTRUCTION IN FRONT OF INLET OPENING, E.G. BEAMS, COLUMNS, WALLS, OR OTHER DUCTWORK' points to the bottom flange.

A cross-sectional diagram showing a duct connected to a wall cavity. The duct is labeled "DUCT". It is connected to a "WALL CAVITY" which is labeled "AIRFLOW RETURN AIR". The duct is sealed with "SEAL SEAMS AIRTIGHT WITH HARD CAST TYP." and "TOGGLE". The duct is fastened to the "FRAME AND WALL CAP" with "FASTEN DUCT TO FRAME AND WALL CAP". The duct is connected to a "SHEET METAL FRAME" which is labeled "1-1/2\" x 1-1/2\" (20ga.)". The duct is connected to a "2\" THICK MSS WALL PANEL" which has "CRIMP EDGES SMOOTH". The duct is connected to an "AIRFLOW CLEANROOM RETURN AIR WALL CAVITY" which is labeled "OPEN END".

[illegible]

THIS DOCUMENT MAY NOT, IN WHOLE OR PART,
BE COPIED, PHOTOCOPIED, REPRODUCED,
TRANSLATED OR REDUCED TO ANY ELECTRONIC
MEDIUM OR MACHINE READABLE FORM
WITHOUT PRIOR CONSENT IN WRITING, FROM
AES CLEAN TECHNOLOGY, INC.

Notes



The diagram illustrates the required gap for air flow between a duct and a ceiling module. It shows a cross-section of a duct with a nominal size of ϕ . Below the duct, a ceiling module is shown with a size of $\phi - 1/4"$. The gap between the duct and the ceiling module is labeled as $1/4"$. Arrows indicate the direction of air flow, labeled "AIRFLOW".

Diagram illustrating a typical roof penetration assembly, showing various components and their specifications:

- 1/4" WIRE MESH SCREEN AS REQ'D
- LISTED DUCT DIA REFER TO PLANS
- 10'-0" MINIMUM ABOVE ROOF
- 7'-0" MINIMUM ABOVE ROOF
- ROOF CURB
- ROOF
- SQUARE-TO-ROUND DUCT TRANSITION
- STEEL
- FLEXIBLE CONNECTION
- ROUND DUCT EQUIVALENT TO DISCHARGE AREA OF RELIEF FAN
- DISCHARGE CONE SIZED @ MIN. 3,000 FPM
- SHEETMETAL RAIN SHIELD
- STAINLESS STEEL OUT WIRE WITH TURNBUCKLE MIN. THREE (3) REQ'D
- DAMPER PROVIDED WITH RELIEF FAN
- TYPICAL RELIEF FAN
- SPRING ISOLATION
- FAN SKID

Diagram illustrating the mechanical room layout and components:

- THREADED ROUND ROD SUPPORT TO EXISTING BUILDING STRUCTURE TYP.
- VIBRATIONS ISOLATING HANGERS AT ALL FOUR CORNERS TYP.
- AIRFLOW →
- SUPPLY AIR
- FLEXIBLE DUCT CONNECTION AT BOTH ENDS TYP
- BOOSTER FAN SEE SCHEDULE FOR SUBSTITUTIONS

ACCESS/PIPING CONNECTION SIDE OF AHU

AIR HANDLING UNIT

PROVIDE MIN. 1" SPACE BETWEEN DRIP PAN AND AHU SUPPORT STEEL ON THIS SIDE OF AHU

4-SIDED, WATERTIGHT DRIP PAN (ONE PIECE) WITH DRAIN

SUPPORT STEEL

PROVIDE NEOPRENE GASKETS FOR VIBRATION ISOLATION UNDER ENTIRE UNIT, SPACING PER MANUF. RECOMMENDATIONS

ROLL TOP EDGE OF DRIP PAN ALL SIDES

MIN. 3" TYP ALL SIDES

3/4" DRAIN TO FLOOR DRAIN

Diagram illustrating the installation of a floor drain assembly, showing the connection to the main drain line and the required clearances and dimensions.

Labels and Dimensions:

- TO SUIT CONDITIONS
- CLEAN OUT PLUG TYP.
- MIN.
- D RIP PAN
- PAN WATER LEVEL
- ADAPT AS NEEDED
- 2" AIR GAP
- 180° BEND
- FLOOR LINE
- FLOOR DRAIN

Formulas:

- *A" = EQUAL TO OR LARGER THAN THE PLENUM NEGATIVE STATIC PRESSURE AT DESIGN OPERATION CONDITIONS
- B" = $A/2 + 1-1/2"$ (MIN.)
- C" = A + B

T

CHWR

SEE SPECS FOR TYPE OF BALANCING FLOW DEVICE REGR. TYP.

P

VENT COIL AND TAPPING TYP.

UNIONS INSTALLED CLEAR OF COIL CASING TYP.

AIRFLOW →

COOLING COIL

COIL CONDENSATE DRAIN

PROVIDE PLUGGED TEE FOR BLOW-OUT TYP.

P

P

P

CHW

Full size connection to heater tapping typ.

DRAIN COIL AND TAPPING TYP.

[illegible]

11 AHU Drip Pan Detail
M-5 N.T.S.

Project	
---------	--

<i>project no.</i>	
<i>drawn by</i>	OSC
<i>checked by</i>	RGS
<i>scale</i>	NOT TO SCALE
<i>date</i>	04-13-07

<i>Drawing Title</i>

MECHANICAL
DETAILS AND
DIAGRAMS

Drawing No.

M-5

OFFICE USE ONLY

No.	Revisions	By	Date
A	30% PROGRESS	OSC	05-04-07
B	70% PROGRESS	OSC	06-01-07

THIS DOCUMENT MAY NOT, IN WHOLE OR PART,
BE COPIED, PHOTOCOPIED, REPRODUCED,
TRANSLATED OR REDUCED TO ANY ELECTRONIC
MEDIUM OR MACHINE READABLE FORM
WITHOUT PRIOR CONSENT IN WRITING, FROM
AES CLEAN TECHNOLOGY, INC.

Notes

Project

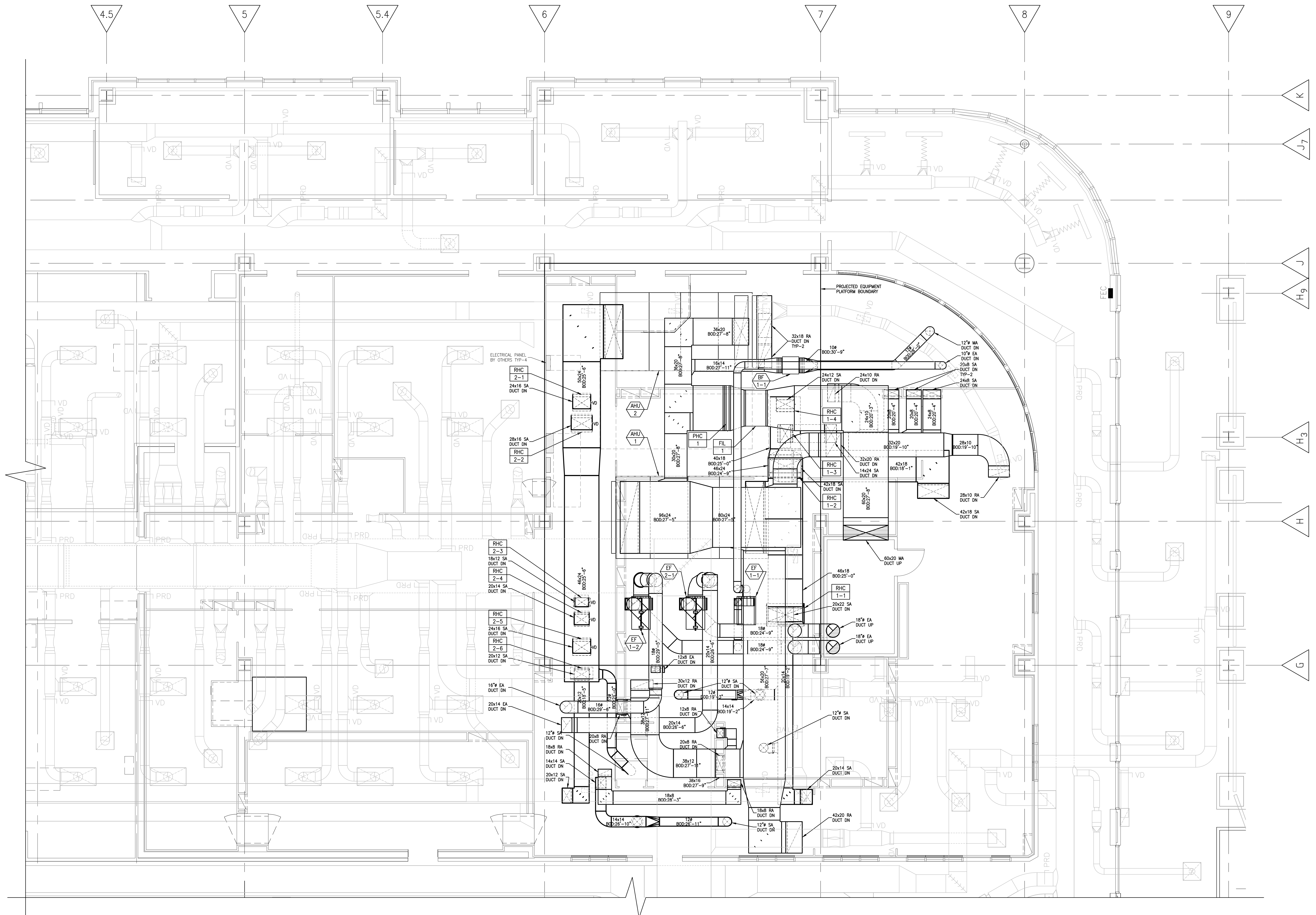
project no.	
drawn by	OSC
checked by	RSS
scale	NOT TO SCALE
date	04-30-07

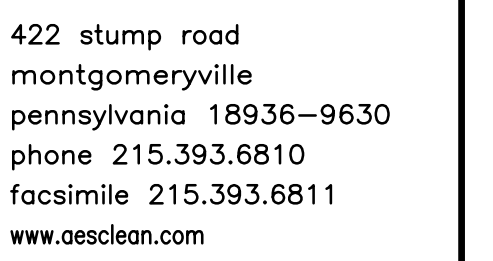
Drawing Title

MECHANICAL
PLATFORM
HVAC PLAN

Drawing No.

M-2



[illegible]

THIS DOCUMENT MAY NOT, IN WHOLE OR PART,
BE COPIED, PHOTOCOPIED, REPRODUCED,
TRANSLATED OR REDUCED TO ANY ELECTRONIC
MEDIUM OR MACHINE READABLE FORM
WITHOUT PRIOR CONSENT IN WRITING, FROM
AES CLEAN TECHNOLOGY, INC.

Notes

Project

project no.

drawn by TMR

checked by	RGS
------------	-----

scale NOT TO SCALE

Drawing Title

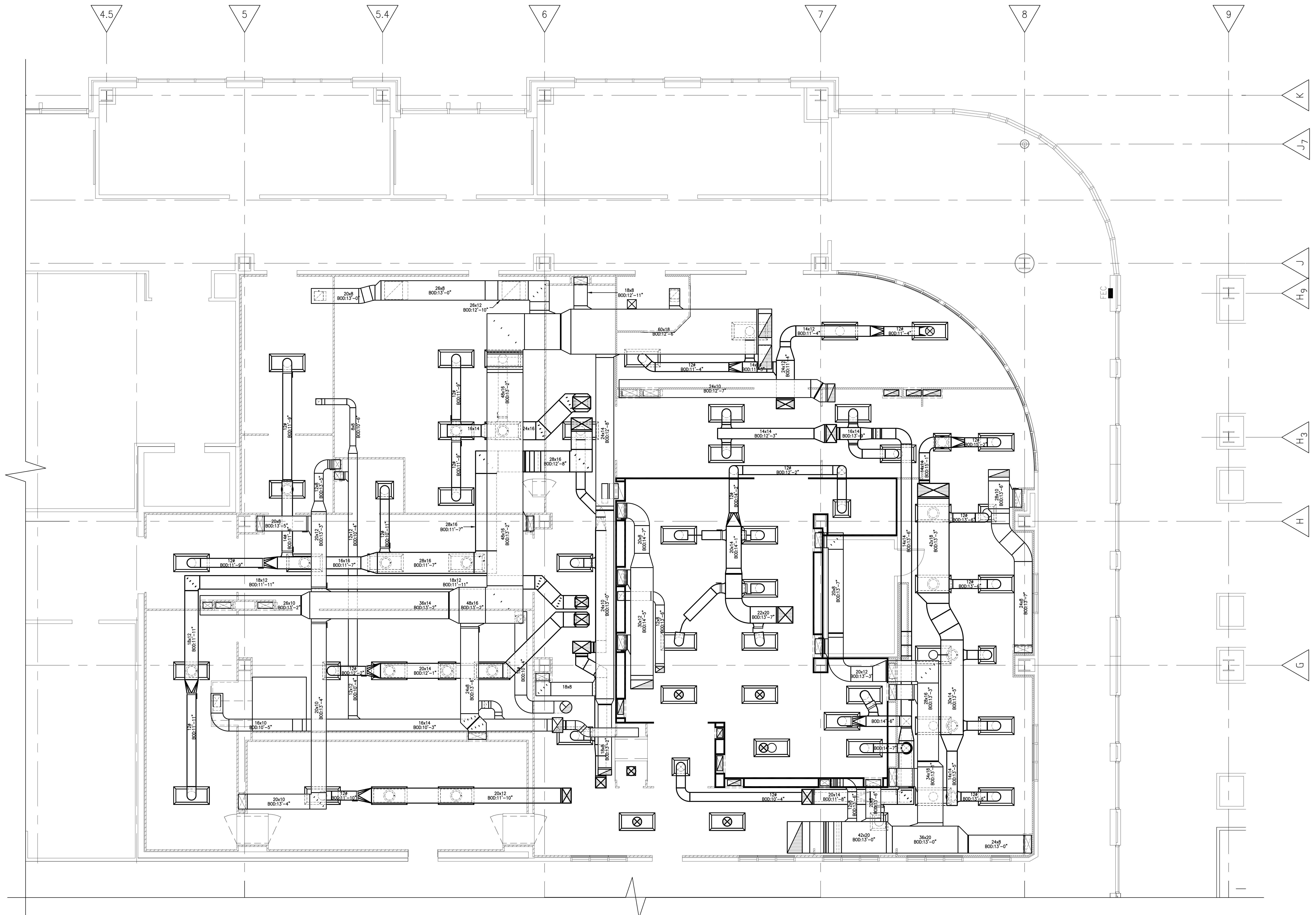
MECHANICAL

MECHANICAL
FIRST FLOOR

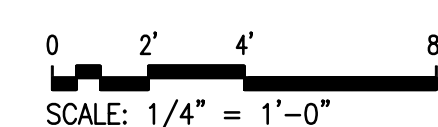
FIRST FLOOR
HVAC PLAN

Drawing No.

M-1



First Floor HVAC Plan



PROGRESS ONLY

[illegible]

THIS DOCUMENT MAY NOT, IN WHOLE OR PART,
BE COPIED, PHOTOCOPIED, REPRODUCED,
TRANSLATED OR REDUCED TO ANY ELECTRONIC
MEDIUM OR MACHINE READABLE FORM
WITHOUT PRIOR CONSENT IN WRITING, FROM
AES CLEAN TECHNOLOGY, INC.

Notes



Project
UNIVERSITY OF
Nebraska
Lincoln

IOLOGICAL PROCESS
DEVELOPMENT
FACILITY CLEANROOM

Othmer Hall
820 N. 16th St.
Lincoln, NE 68588-0668

project no.	270118
-------------	--------

drawn by RJB

checked by RGS

scale	1/4" = 1'-0"
-------	--------------

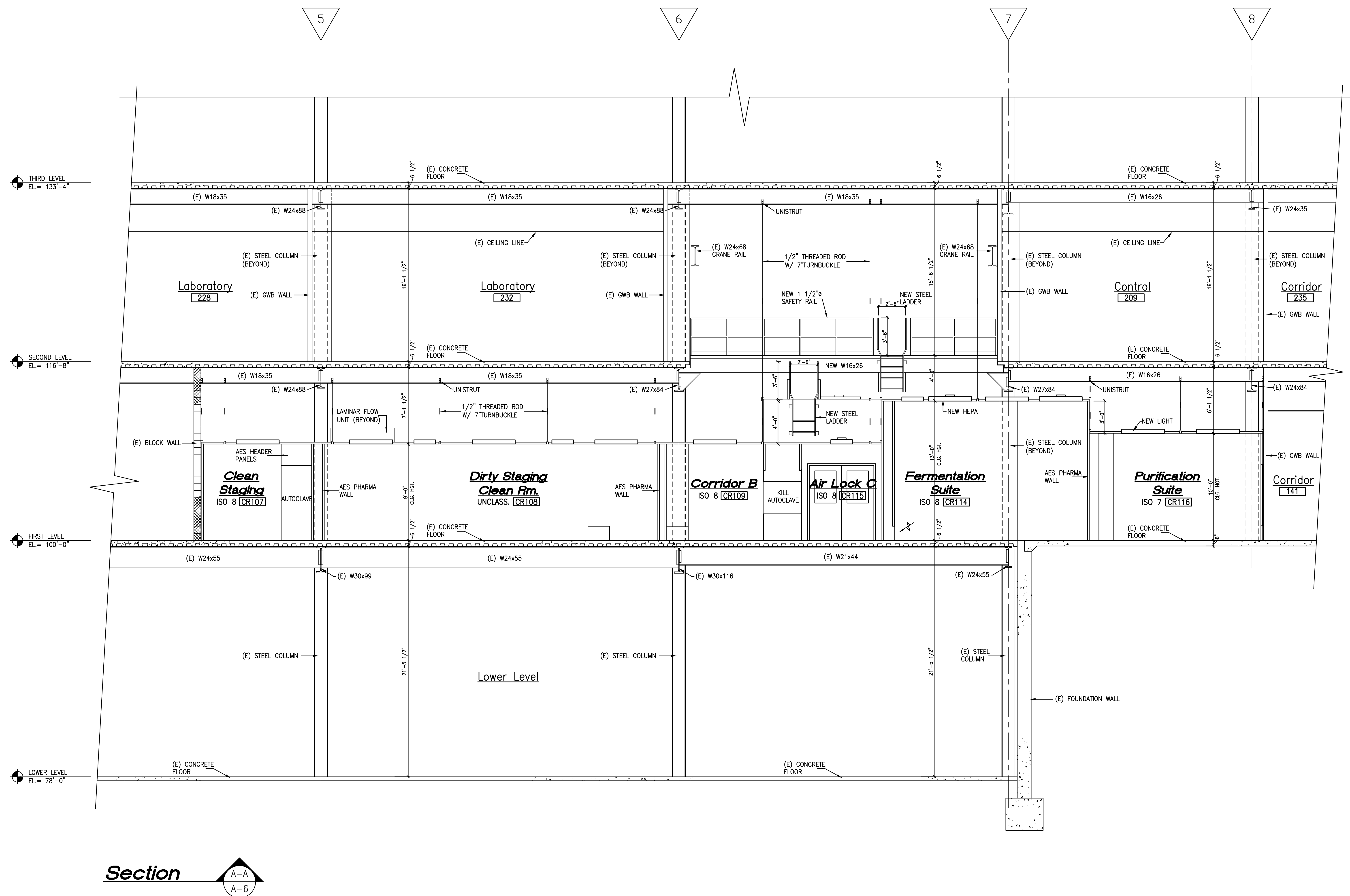
Date	05-15-07
-------------	----------

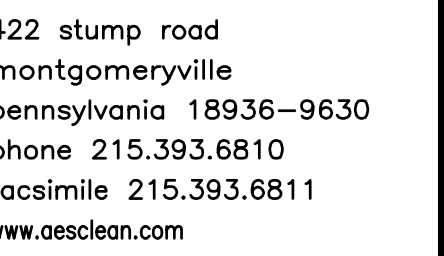
Drawing Title

SECTION A-A

Drawing No.

A-6



[illegible]

THIS DOCUMENT MAY NOT, IN WHOLE OR PART,
BE COPIED, PHOTOCOPIED, REPRODUCED,
TRANSLATED OR REDUCED TO ANY ELECTRONIC
MEDIUM OR MACHINE READABLE FORM
WITHOUT PRIOR CONSENT IN WRITING, FROM
AES CLEAN TECHNOLOGY, INC.

Notes



Project
UNIVERSITY OF
Nebraska
Lincoln

BIOLOGICAL PROCESS
 DEVELOPMENT
 FACILITY CLEANROOM

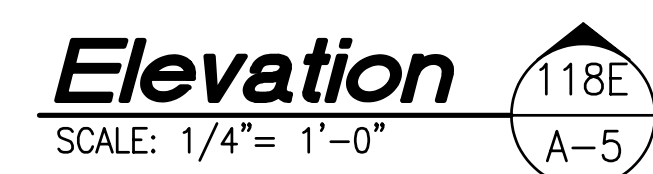
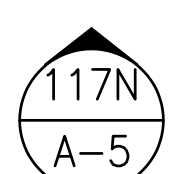
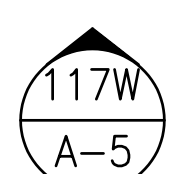
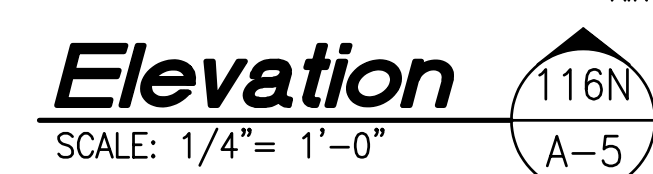
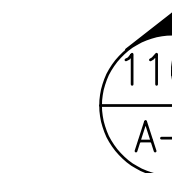
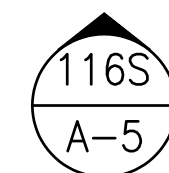
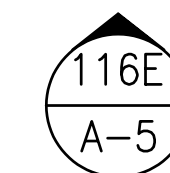
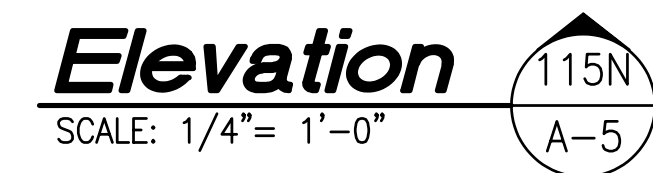
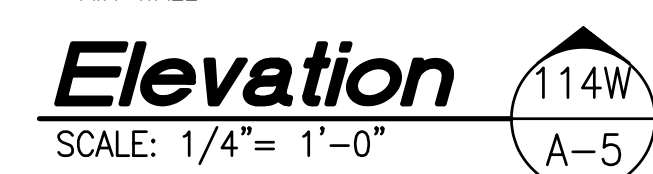
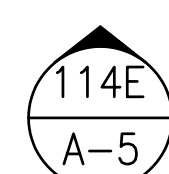
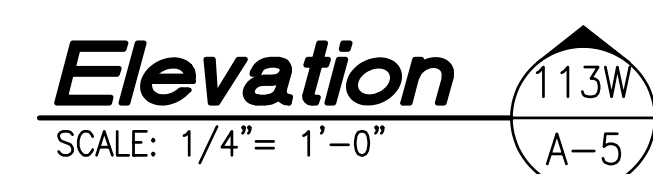
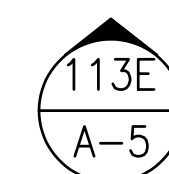
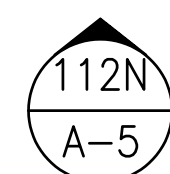
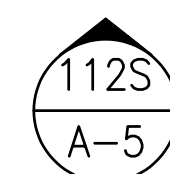
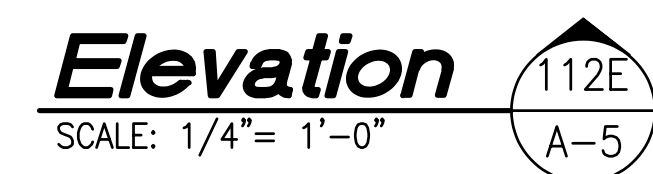
Othmer Hall
820 N. 16th St.
Lincoln, NE 68588-0668

Project no.	270118
Drawn by	BSAM
Checked by	RJB
Scale	1/4" = 1'-0"
Date	06-01-07

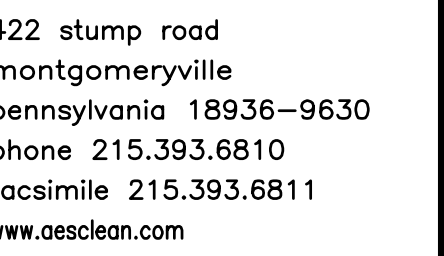
ARCHITECTURAL
ELEVATIONS
112E THRU 118S

Drawing No.

A-5



PROGRESS ONLY

[illegible]

THIS DOCUMENT MAY NOT, IN WHOLE OR PART,
BE COPIED, PHOTOCOPIED, REPRODUCED,
TRANSLATED OR REDUCED TO ANY ELECTRONIC
MEDIUM OR MACHINE READABLE FORM
WITHOUT PRIOR CONSENT IN WRITING, FROM
AES CLEAN TECHNOLOGY, INC.

Notes



Project
UNIVERSITY OF
Nebraska
Lincoln

IOLOGICAL PROCESS
DEVELOPMENT
ACILITY CLEANROOM

Othmer Hall
820 N. 16th St.
Lincoln, NE 68588-0668

project no.	270118
-------------	--------

Drawn by BSAM

checked by RJB

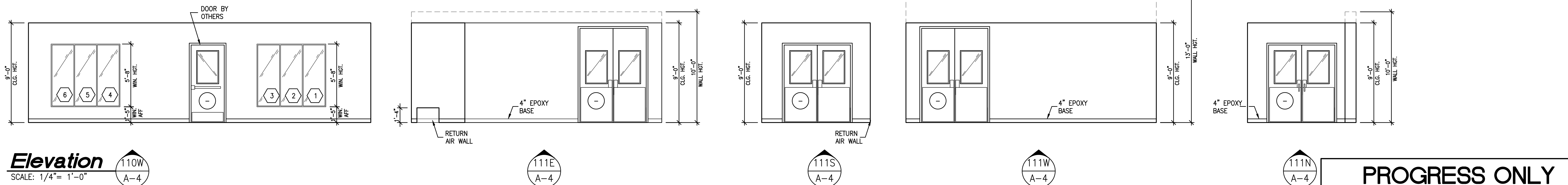
cale	$1/4'' = 1'-0''$
------	------------------

Drawing Title

ARCHITECTURAL
ELEVATIONS
1E THRU 111N

Drawing No.

A-4



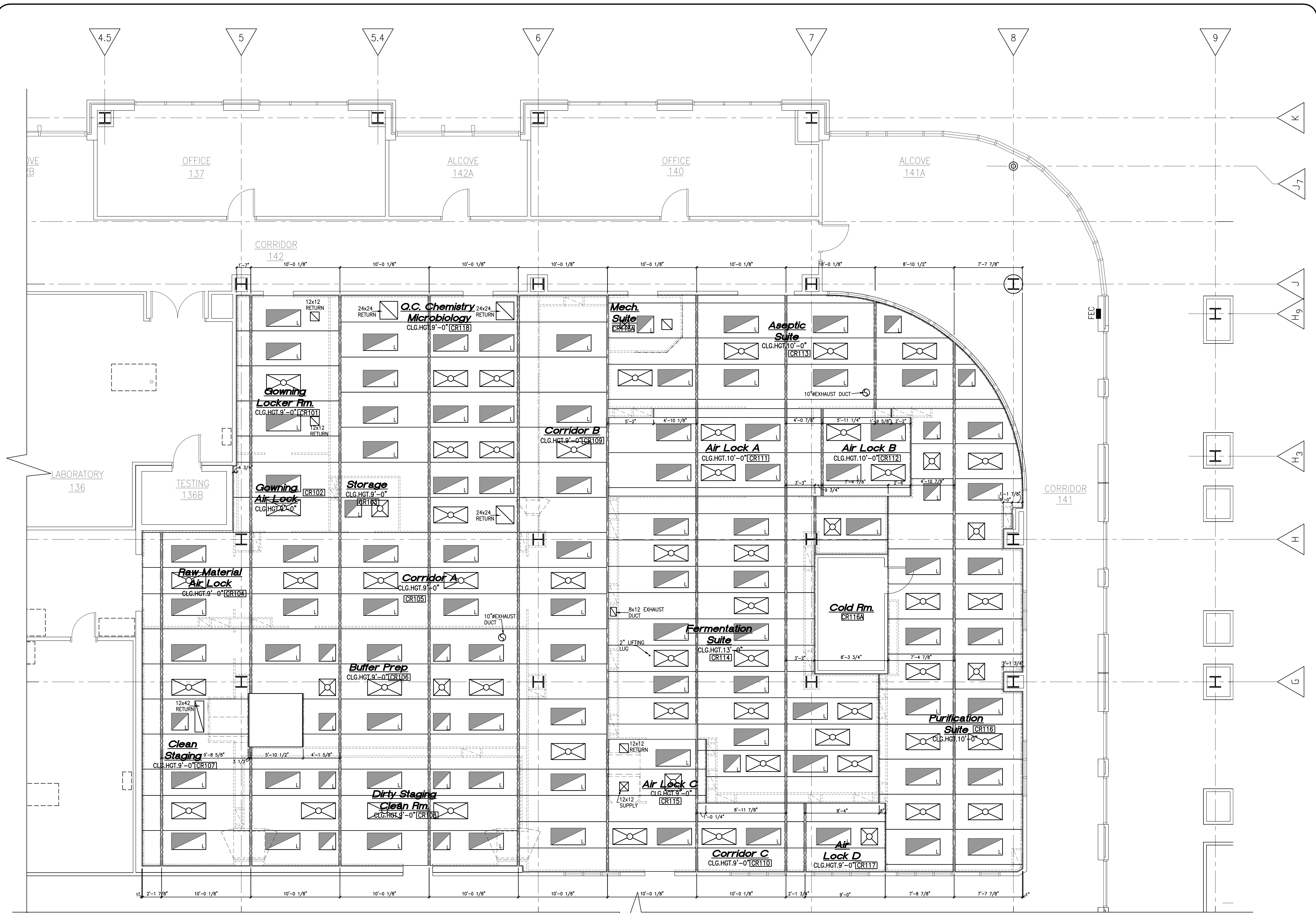
THIS DOCUMENT MAY NOT, IN WHOLE OR PART,
BE COPIED, PHOTOCOPIED, REPRODUCED,
TRANSLATED OR REDUCED TO ANY ELECTRONIC
MEDIUM OR MACHINE READABLE FORM
WITHOUT PRIOR CONSENT IN WRITING, FROM
AES CLEAN TECHNOLOGY, INC.

Project
UNIVERSITY OF
Nebraska
Lincoln

Othmer Hall
820 N. 16th St.
Lincoln, NE 68588-0668

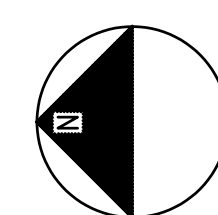
Drawing Title

Drawing No.



0 2' 4' 8'

SCALE: $1/4" = 1'-0"$



	SPRINKLER HEAD		2X4 HEPA FILTER
	2X4 FLUOR. LIGHT FIXTURE		2X2 HEPA FILTER
	2X2 FLUOR. LIGHT FIXTURE		AIR DIFFUSER SIZE PER PLAN
	2X4 FLUOR. LIGHT FIXTURE EMERGENCY LIGHTING		RETURN GRILL SIZE PER PLAN

PROGRESS ONLY

[illegible]

THIS DOCUMENT MAY NOT, IN WHOLE OR PART,
BE COPIED, PHOTOCOPIED, REPRODUCED,
TRANSLATED OR REDUCED TO ANY ELECTRONIC
MEDIUM OR MACHINE READABLE FORM
WITHOUT PRIOR CONSENT IN WRITING, FROM
AES CLEAN TECHNOLOGY, INC.

Notes



Project
UNIVERSITY OF
Nebraska
Lincoln

IOLOGICAL PROCESS
DEVELOPMENT
FACILITY CLEANROOM

Othmer Hall
820 N. 16th St.
Lincoln, NE 68588-0668

project no.	270118
-------------	--------

drawn by RJB

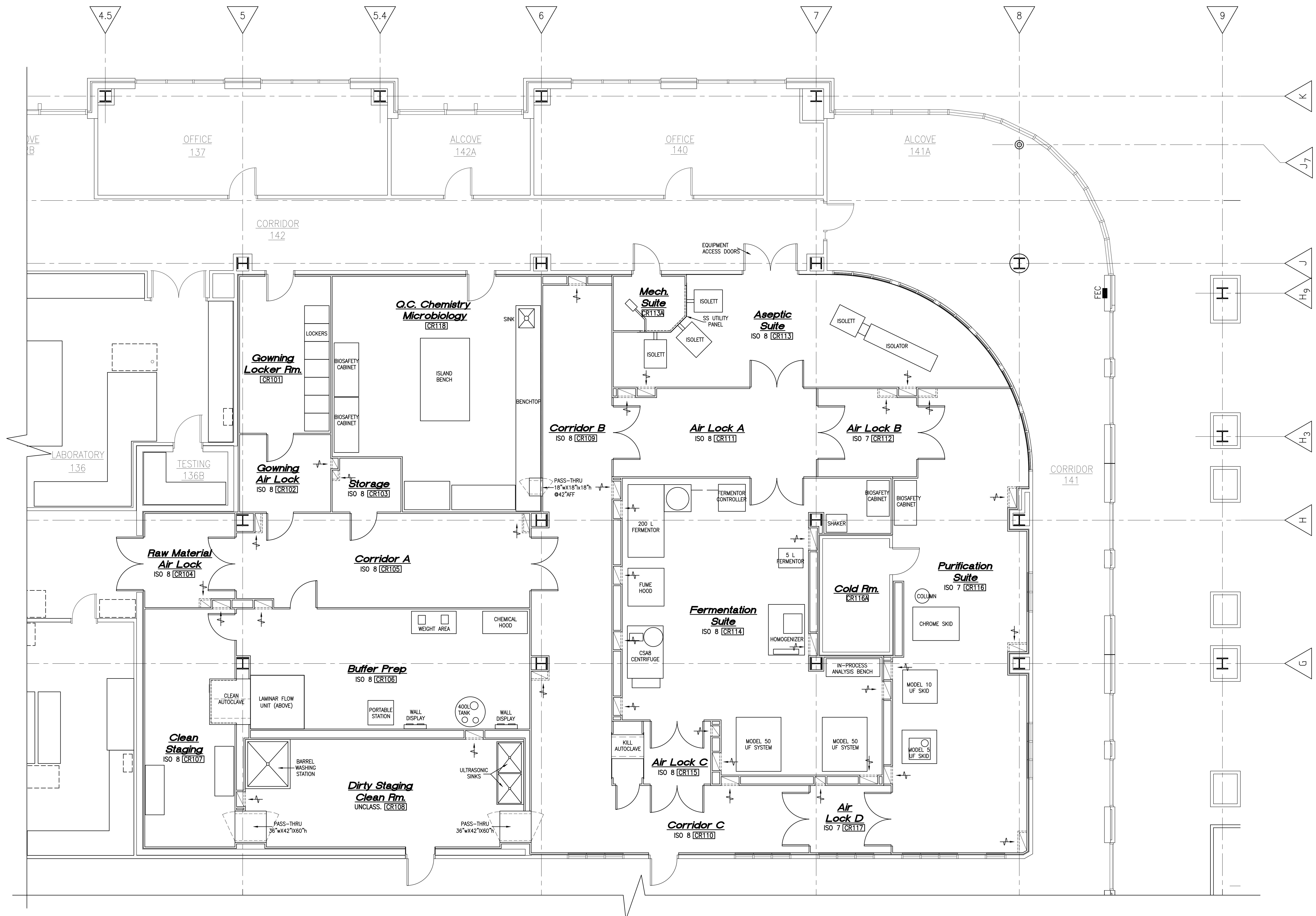
checked by RGS

scale $1/4" = 1'-0"$

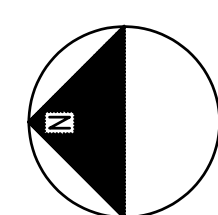
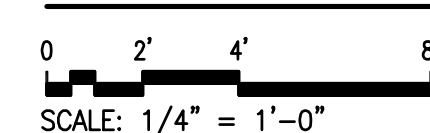
Drawing Title

ARCHITECTURAL
EQUIPMENT PLAN

Drawing No.



EQUIPMENT PLAN



PROGRESS ONLY

[illegible]

THIS DOCUMENT MAY NOT, IN WHOLE OR PART,
BE COPIED, PHOTOCOPIED, REPRODUCED,
TRANSLATED OR REDUCED TO ANY ELECTRONIC
MEDIUM OR MACHINE READABLE FORM
WITHOUT PRIOR CONSENT IN WRITING, FROM
AES CLEAN TECHNOLOGY, INC.

Notes

Project

project no.	
drawn by	BSAM
checked by	RJB
scale	1/4" = 1'-0"
date	04-30-07

Drawing Title

LIGHTING PLAN

Drawing No.

