SECTION 15000 MECHANICAL SYSTEMS DESCRIPTIONS

A. PROJECT INCLUDES
1. Plumbing Systems and Specialties: Refer to individual specification sections following for detailed requirements.
a. Domestic water service and distribution.
b. Sanitary waste and vents.

2. Ventilation Systems: Refer to individual specification sections following for detailed requirements.
a. Fans.
b. Ducts.

3. HVAC Control Systems: Refer to individual specification sections following for detailed requirements.
a. Electric control systems.

4. Design Conditions:
a. Summer Outdoor Conditions: 100 degrees F dry bulb, ASHRAE 1 percentile; 78 degrees F wet bulb, ASHRAE 1 percentile.
b. Winter Outdoor Conditions: 27 degrees F dry bulb, ASHRAE 99 percentile.
c. Summer Indoor Conditions: 74 degrees plus or minus 5 degrees; 50 percent relative humidity plus or minus 5 percent.
d. Winter Indoor Conditions: 72 degrees plus or minus 5 degrees; 50 percent relative humidity plus or minus 5 percent.

B. PRODUCTS
Systems, products, and standards are listed in individual specification sections which follow.

SECTION 15050 BASIC MECHANICAL MATERIALS

A. PROJECT INCLUDES
1. Basic mechanical materials including valves, pipe expansion joints, meters and gages, supports and anchors, motors, mechanical identification, and vibration control.

B. PRODUCTS
1. Pipe, Fittings, and Specialties: Refer to individual piping systems specifications for materials and installation requirements.

2. Valves: General duty valves cast iron, bronze, and brass, fabricated to comply with Manufacturers Standardization Society (MSS) classification listed. Gate, globe, ball, butterfly, and plug valves for shutoff duty; globe, ball, and plug valves for throttling duty.
a. Gate Valves, 2-Inch and Smaller for Domestic Hot and Cold Water: MSS SP-80, Class 125 or 150 based on system pressure, cast bronze, threaded or solder ends based on service.
b. Gate Valves, 2-Inch and Smaller for Heating Hot Water: MSS SP-80, Class 150, cast bronze, threaded or solder ends based on service.
c. Gate Valves, 2-1/2-Inch and Larger: MSS SP-70, Class 125, iron body, flanged ends.
d. Plug Valves, 2-Inch and Smaller: Rated at 150 psi WOG, bronze body, threaded ends.
e. Plug Valves, 2-1/2-Inch and Larger: MSS SP-78, rated at 175 psi WOG, semi-steel body, flanged ends.
f. Globe Valves, 2-Inch and Smaller: MSS SP-80, Class 125 or 150 based on system pressure, cast bronze, threaded or solder ends based on service.
g. Globe Valves, 2-1/2-Inch and Larger: MSS SP-85, Class 125, iron body, flanged ends.
h. Butterfly Valves: 2-1/2-Inch and Larger: MSS SP-67, rated at 200 psi, cast iron body, field replaceable sleeve, stainless steel stem, lug or wafer type based on service.
i. Swing Check Valves, 2-Inch and Smaller: MSS SP-80, Class 125 or 150 based on system pressure, cast-iron body and cap, threaded or solder ends based on service.
j. Swing Check Valves, 2-1/2 Inch and Larger: MSS SP-71, Class 125 (Class 175 FM for fire protection piping systems), cast iron body and cap, flanged ends.
k. Wafer Check Valves: Class 250, cast-iron body, to open with one foot differential pressure.
l. Lift Check Valves, 2-Inch and Smaller: Class 125, cast-bronze body and cap, threaded ends.

3. Expansion Joints for Piping Systems: Joints shall provide 200 percent absorption capacity of piping expansion between anchors.
a. Packless expansion joints.t
b. Slip joints.
c. Flexible ball pipe joints.
d. Mechanical grooved fittings.
e. Fabricated expansion loops.

4. Meters and Gages: Temperature and indicator ranges for services required. Accuracy of thermometers plus or minus 1 percent.
a. Mercury-In-Glass Thermometers: Die-cast, aluminum finished, glass front, mercury filled tube with magnifying lens.
b. Direct-Mount Filled-System Dial Thermometers: Vapor actuated, universal angle, drawn steel or cast aluminum case with glass lens.
c. Bimetal Dial Thermometers: Direct mounted, bimetal, universal angle type with stainless steel case, glass lens.
d. Dial-Type Insertion Thermometers: Bimetal, stainless steel case and stem.
e. Thermometer Wells: Brass or stainless steel, pressure rated to match piping system design pressure.
f. Pressure Gages: General use, ASME B40.1, Grade A, phosphor bronze bourdon-tube type, drawn steel or brass case, glass lens.
g. Pressure Gage Accessories: Brass tubing straight coil syphon; brass snubber with disc suitable for fluid served and rated pressure.
h. Window-Type Flow Meters: Designed for installation on hydronic piping, measure flow directly in gpm, bronze body and impact tube, integral self-closing valve with indicator valve, plus or minus 5 percent accuracy.

5. Supports and Anchors: Hangers and Support Components: MSS SP-58, pipe and equipment hangers and supports including clamps, hanger-rod attachments, saddles and shields, spring hangers, pipe alignment guides, and anchors.

6. Motors: NEMA MG 1 motors with phase, frequency rating, voltage rating, and capacity suitable for use.

7. Mechanical Identification: ASME A13.1 as applicable, color coded, of the following types: Standard stencils, snap-on plastic pipe markers, pressure-sensitive pipe markers, plastic duct markers, plastic tape, valve tags, valve tag fasteners, access panel markers, valve schedule frames, engraved plastic laminate signs, plastic equipment markers, plasticized tags suitable for use.

8. Vibration Control: Fiberglass pads and shapes, neoprene pads, vibration isolation springs, pad-type isolators, plate-type isolators, double-plate-type isolators, threaded double-plate-type isolators, all-directional anchors, neoprene mountings, free standing spring isolators, housed spring isolators, vertically-restrained spring isolators, earthquake-resistant spring isolators, seismic snubbers, thrust restraints, equipment rails, fabricated equipment bases, inertia base frames, roof-curb isolators, isolation hangers, riser isolators, flexible pipe connectors suitable for use.

SECTION 15250 MECHANICAL INSULATION

A. PROJECT INCLUDES
1. Pipe insulation, equipment insulation, and external duct and plenum insulation.

B. PRODUCTS
1. Mechanical Insulation Types:
a. Pipe Insulation:
1) Glass fiber Cellular glass Flexible elastomeric cellular type with a conductivity not exceeding 0.27 Btu per inch per hour square feet degree Fahrenheit. Provide minimum one-inch thickness for hot water and refrigerant piping of 1.5 inch diameter or less. Provide 1.5 inch thickness for refrigerant piping and two-inch thickness for hot water piping for pipes larger than 1.5 inches.
2) Phenolic Foam (closed cell) meeting ASTM D2867 having a conductivity not exceeding 0.17 Btu per inch per hour square feet degree Fahrenheit. Provide minimum 0.75 inch thickness for water and refrigerant lines of 1.5 inch diameter or less and 1.00 insulation for pipes larger than 1.5 inches diameter.
b. Equipment Insulation: Glass fiber Cellular glass Flexible elastomeric cellular type (1" thick).
c. Duct and Plenum Insulation:
Glass fiber type. Type II. Provide a minimum of R-5 insulation (1.5 inches thick) when located in unconditioned space and a minimum of R-8 insulation (2.0 inches thick) when located outside the Building Envelope. Phenolic Foam (closed cell) meeting ASTM C-1126, Grade 1 with a conductivity not exceeding 0.13 Btu per inch per hour square feet degree Fahrenheit. Provide a minimum of R-5 insulation (0.75 inches thick) when located in unconditioned space and a minimum of R-8 insulation (1.0 inches thick) when located outside the Building Envelope.

2. Mechanical Insulation Materials:
a. Glass Fiber Insulation: Inorganic glass fibers bonded with thermosetting resin; board type, ASTM C 612, Class 2, semi-rigid jacketed board; blanket type, ASTM C 553, Type II, Class F-1, jacketed flexible blankets; preformed pipe insulation, ASTM C 547, Class 1, rigid pipe insulation, jacketed with vapor barrier.
b. Cellular Glass Insulation: Inorganic, foamed or cellulated glass, annealed, rigid, hermetically sealed cells, incombustible, ASTM C 921, Type I facing; blocks, ASTM C 552, Type I; boards, ASTM C 552, Type IV; preformed pipe, ASTM C 552, Type II, Class 2 (jacketed); special shapes, ASTM C 552, Type III.
c. Flexible Elastomeric Cellular Insulation: Flexible expanded closed-cell structure with smooth skin on both sides; tubular materials, ASTM C 534, Type I; sheet materials, ASTM C 534, Type II.
d. Phenolic Foam (closed cell) meeting ASTM D 2856 with temperature limits from 40°F to 212°F. Flame spread shall be less than 25 and smoke development less than 50 per ASTM E84.
e. Fire Performance: Type suitable for service.
Vapor Barrier: All insulation on chilled water, brine, and refrigerant line and air conditioning duct insulation incorporate a fully sealed ASJ vapor barrier. Insulation Accessories: Insulating cements, adhesives, jackets, glass cloth and tape, bands, wire, and sealing compounds suitable for service and exposure. Load bearing inserts provided at all piping and duct supports within insulation. Standards - HVAC equipment insulation to meet NAIMA standards and International Energy Code.

SECTION 15850 AIR HANDLING

A. PROJECT INCLUDES
1. Fans, ventilators, air handling units, and air filters for building mechanical systems.

B. PRODUCTS
1. Centrifugal Fans:
a. Centrifugal Fans for Indoor Installations: Belt-driven with housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, support structure.
b. Tubular Centrifugal Fans: Tubular inline, belt driven with housing, wheel, outlet guide vanes, fan shaft, bearings, drive assembly, motor, mounting brackets, accessories.
c. Inline Centrifugal Fans: Inline, belt driven with housing, wheel, outlet guide vanes, fan shaft, bearings, drive assembly, motor and disconnect switch, mounting brackets, accessories.
2. Axial Fans:
a. Propeller Axial Fans: Belt-driven or direct-drive propeller fan with fan blades, hub, housing, orifice ring, motor, drive, accessories.
b. Vaneaxial Axial Fans: Belt-driven or direct drive, variable pitch or adjustable pitch, vaneaxial fan with fan wheel and housing, straightening vane section, factory-mounted motor, inlet cone section, accessories.
3. Central Station Air-Handling Units:
a. Constant-Volume, Central-Station-Air Handling Units for Indoor Installations: ARI 430, NFPA 90A; blow-through type.
b. Components: Motors, coils, dampers, filters
4. Air Filters:
a. Air Filters: ASHRAE 52, ARI 850, NFPA 90A, 90B.
b. Replaceable (Throwaway) Panel Filters: Flat panels, interlaced glass fiber media, cardboard frame, 20 gage galvanized steel duct holding frame.
c. Front and Rear Access Filter Frames: Aluminum framing members, prefilters, sealers.
d. Side Service Housings: 16 gage galvanized steel side-service housings, prefilters, access doors, sealers.

SECTION 15890 AIR DISTRIBUTION

A. PROJECT INCLUDES
1. Air distributions systems including ductwork, duct systems, HVAC casings, duct accessories, air outlets and inlets, and air terminals.

B. QUALITY ASSURANCE
1. Compliance: NFPA 90A, 96 and International Energy Code.

C. PRODUCTS
1. Metal Ductwork:
a. Types: Rectangular, round, and flat-oval metal ducts and plenums for HVAC systems in pressure classes from Minus 2 inches to plus 10 inches water gage.
b. Galvanized Sheet Steel: Lock-forming quality, ASTM A 527 G90.
c. PVC-Coated Galvanized Steel: UL 181 Class 1, lock-forming quality, ASTM A 527 G90.
d. Carbon Steel Sheets: ASTM A 366, cold-rolled sheets.
e. Stainless Steel: ASTM A 480, Type 316, with No. 4 finish if exposed, No. 1 finish for concealed ducts.
f. Aluminum Sheets: ASTM B 209, Alloy 3003-H14, sheet form, bright finish if exposed, mill finish for concealed ducts.
g. Duct Liner: NFPA 90A, TIMA AHC-101, ASTM C 1071, Type II with coated surface to prevent erosion of fibers thickness to meet NAIMA standards and International Energy Code.
h. Sealing Materials: Joint and seam sealants, tapes and mastics.
i. Firestopping: Fire-resistant sealant.
j. Hangers and Supports: Concrete inserts, powder actuated fasteners, structural steel fasteners suitable for use; galvanized sheet steel hangers; duct attachments; trapeze and riser supports.
k. Fabrication: SMACNA HVAC Duct construction Standards.
2. Fibrous Glass Duct Systems:
a. Types: Round fibrous glass ducts for HVAC systems in pressure classes from minus 2 inches to plus 2 inches water gage.
b. Fibrous Glass Ducts Materials: Fiberglass bonded with thermosetting resin; fire-resistant reinforced foil-scrim-kraft barrier facing; air side erosion prevention surface. Meet NAIMA standards and International Energy Code.
c. Reinforcement: Channel and rod reinforcement.
d. Closure: Tape and glass fabric.
e. Supports and Hangers: Concrete inserts, powder-actuated fasteners, structural steel fasteners suitable for use; galvanized sheet steel, hanger wire, and channel hanger materials.
3. HVAC Casings:
a. Types: Field-erected sheet metal casings used as equipment enclosures and plenums.
b. Low Pressure Casings: Aluminum.
c. High Pressure Casings: Aluminum.
d. Plenum Equipment Casings: Double-wall insulated, pressurized type, galvanized steel exterior shell, solid or perforated galvanized steel interior shell.
e. Duct Liner: ASTM C 1071, Type II, with liner adhesive, mechanical fasteners, duct sealant, duct cement with thickness to meet International Energy Code.
4. Duct Accessories:
a. Backdraft Dampers: Extruded aluminum frame, blades, blade seals, and axles.
b. Manual Volume Control Dampers: Extruded aluminum standard volume, low-leakage volume, and high-performance volume control dampers; galvanized steel jackshaft; damper control hardware
c. Fire Dampers: UL 555 with galvanized steel frame, mounting sleeve, blades, horizontal dampers, fusible link.
d. Ceiling Fire Dampers: UL listed and labeled galvanized steel frame, volume control adjustment, replaceable fusible link.
e. Smoke Dampers: UL 555 and UL 555S, galvanized steel frame, blades and mounting sleeve, replaceable fusible link.
f. Actuators: Damper motors for smooth modulating or 2-position action.
g. Duct Silencers: Factory-fabricated rectangular and round units; acoustic fill.
h. Turning Vanes: Manufactured and acoustic turning vanes.
i. Duct-Mounted Access Doors and Panels:
j. Flexible Connectors: UL 181, Class 1, flame-retardant or noncombustible fabrics.
k. Flexible Ducts: UL 181, Class 1, uninsulated and insulated types.
l. Accessory Hardware: Instrument test holes, splitter damper accessories, flexible duct clamps, adhesives.
5. Air Outlets and Inlets:
a. Ceiling Air Diffusers: Diffuser faces, mountings, patterns, dampers, accessories, and finishes suitable for service, use, and location.
b. Wall Registers and Grilles: Materials, faces, patterns, dampers, accessories, and finishes suitable for service, use, and location as selected.

SECTION 15970 HVAC CONTROL SYSTEMS

A. PROJECT INCLUDES
1. Electric temperature control systems used for building HVAC systems.

B. PRODUCTS
1. Electric Control System Components:
a. Thermostats: Room thermostats, remote-bulb thermostats, fire protection thermostats, low-temperature protection thermostats.
b. Clocks: 7 day, 24 hour type with power backup.
c. Sensors: Electronic temperature and relative humidity sensors.
Controllers: Step controllers for control sequencing; electronic controllers; fan speed controllers; electric heat current controllers.
Meet International Energy Code.

INSTALLATION
1. Drawing shows general location of thermostats. Coordinate with Architect and Owner as to exact locations to avoid conflicts with Owner-hung wall features.

SECTION 15990 TESTING, ADJUSTING, AND BALANCING

PART 1 GENERAL

1.1 DESCRIPTION
A. The Contractor shall furnish all labor, equipment and services necessary for and incidental to Air and Water Systems Testing and Balancing.
B. Include an extended warranty of one year after final acceptance by Owner, during which time the Owner may request a recheck, or resetting of any outlet, coil or device listed in the test report. Provide technicians to assist in making any test or adjustment required.
C. The Contractor shall procure the services of an independent testing and balancing agency, with previous consent of the Owner or the Owner's Representative. The Testing and Balancing Agency shall specialize in testing and balancing of heating, ventilating, air-moving equipment, air-conditioning system and Hydronic Systems. The Testing agency shall provide proof of having successfully completed at least five projects of similar size and scope, and shall be a certified member of the Associated Air Balance Council and/or National Environmental Balancing Bureau and/or Testing Adjusting and Balancing Bureau (TABB), unless otherwise approved. The Mechanical Contractor shall award the test and balance contract to the selected agency as soon as possible after approval of the agency by the Owner or the Owner's Representative.
D. Testing and Balancing shall not begin until the systems have been completed and are in full working order. Submit four (4) copies of data for the testing and balancing work for review by the Owner or Owner's representative.

1.2 REFERENCES
A. AABC - National standards for Total System Balance.
B. ADC - Test code for Grilles, Registers, and Diffusers.
C. ASHRAE 111 - Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air-conditioning, and Refrigeration Systems.
D. NEBB - Procedural Standards for Testing, Adjusting, and Balancing.
E. SMACNA - HVAC Systems Testing, Adjusting, and Balancing.
F. TABB - International Standards for Environmental Systems Balance

1.3 SUBMITALS
A. Submit name of testing, adjusting and balancing agency for approval within 30 days after award of Contract.
B. Field Reports: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
C. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect/Engineer and for inclusion in operating and maintenance manuals.
D. Provide reports in soft cover, letter size, binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.

1.4 QUALITY INSURANCE
A. Perform total system balance in accordance with AABC National Standards for Field Measurement and Instrumentation, Total System Balance or NEBB Standards - Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems or Testing Adjusting and Balancing Bureau (TABB)-National Standards for Environmental Systems Balance.
B. Maintain one copy of applicable standards on site.

1.5 QUALIFICATIONS
A. Agency: Company specializing in the testing, adjusting, and balancing of systems specified in this Section with minimum three years experience.

PART 2 PRODUCTS
A. Replacement of adjustable pulleys , additional balancing dampers, additional fan belts, pressure taps and fitting, hydronic balancing valves and any other devices or equipment required to effect proper testing, adjusting and balancing shall be provided by the Contractor at no additional cost to the Owner.

PART 3 EXECUTION

3.1 EXAMINATION
A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
1. Systems are started and operating in a safe and normal condition.
2. Temperature control systems are installed complete and operable.
3. Proper thermal overload protection is in place for electrical equipment.
4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
5. Duct systems are clean of debris.
6. Fans are rotating correctly.
7. Fire and volume dampers are in place and open.
8. Air coil fins are cleaned and combed.
9. Access doors are closed and duct end caps are in place.
10. Air outlets are installed and connected.
11. Duct system leakage is minimized.
12. Hydronic systems are flushed, filled and vented.
13. Pumps are rotating correctly.
14. Proper strainer baskets are clean and in place.
15. Service and balance valves are open.

B. Submit field reports. Report defects and deficiencies noted during performance of services, which prevent system balance.

C. Beginning of work means acceptance of existing conditions.

3.2 INSTALLATION TOLERANCES
A. Air Handling Systems: Adjust to within plus or minus 10 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.
B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 10 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.
C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.3 ADJUSTING - GENERAL
A. Ensure recorded data represents actual measured or observed conditions.
B. Permanently mark setting of valves, dampers, and other adjustment devices allowing setting to be restored. Set and lock memory stops.
C. After adjustment, take measurement to verify balance has not been disrupted or that such disruption has been rectified.
D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
E. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.
F. Check and adjust systems approximately six months after final acceptance and submit report.

3.2 AIR SYSTEMS PROCEDURE
A. Test and adjust fan RPM to design requirements.
B. Test and record motor full load nameplate rating and actual ampere draw.
C. Test and record system static pressures, fan suction and discharge.
D. Adjust all main supply and return air duct to proper design CFM.
E. Test and adjust each diffuser, grille and register. Reading and tests of diffusers, grilles and registers shall include design velocity (FPM) and as adjusted velocity, design CFM and adjusted CFM.
F. Test and record outside, mixed air and discharge temperatures (D.B. for heating cycle, D.B. and W.B. for cooling cycle).
G. In coordination with the ATC contractor, set adjustments of automatically operated dampers to operate as specified, indicated and/or noted.
H. Test and adjust air handling and distribution systems to provide required or design supply, return, outside and exhaust air quantities.
I. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
J. Measure air quantities at air inlets and outlets.
K. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
L. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct mounted devices such as dampers and splitters.
M. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
N. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
O. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
P. Adjust outside air automatic dampers, outside air, return air and exhaust dampers for design conditions.
Q. Measure temperature conditions across air, return air, and exhaust dampers to check leakage.
R. Where modulating dampers are provided, take measurement and balance at extreme conditions.
S. Measure and record pressure differentials between designated spaces such as Operating Rooms, Sterilizer Rooms, Medical Gas Tank Rooms, Red Bag Storage Rooms, etc.

3.3 WATER SYSTEM PROCEDURE
A. Prepare itemized equipment schedules, listing all heating and/or cooling elements and equipment in the systems to be balanced. List in order on equipment schedules, by pump or zone according to the design, all heating or cooling elements all zone balancing valves circuit pump and ending with the last items of equipment or transfer element in the respective zone or circuit. Include on the schedule sheet column titles listing the location, type of element or apparatus, design conditions and measured conditions. Prepare individual pump report sheets for each zone or circuit.
B. Adjust water systems to provide required or design quantities.

C. Use calibrated Venturi tubes, orifices, or other metered fitting and pressure gages to determine flow rates for system balance. Where flow-metering devices are not installed, bale flow balance in temperature difference across various heat transfer elements in the system.
D. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.
E. Effect system balance with automatic control valves fully open to heat transfer elements.
F. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.
G. Test pumps and adjust flow. Record the following on pumps report sheets: (a) suction and discharge pressure, (b) running amps and brake horsepower of pump motor under full flow and no flow conditions, (c) pressure drop across pump in feet of water and total GMP pump is handling under full flow conditions.
H. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be stimulated by temporary restriction of flow to other parts.

3.4 REQUIRED REPORTS TO BE SUBMITTED

A. Report Forms
1. Title Page
a. Name of Testing, Adjusting, and Balancing Agency
b. Address of Testing, Adjusting, and Balancing Agency
c. Telephone number of Testing, Adjusting, and Balancing Agency
d. Project Name
e. Project location
f. Project Architect
g. Project Engineer
h. Project Contractor
i. Project altitude
j. Report date

2. Summary Comments:
a. Design versus final performance
b. Notable characteristics of system
c. Description of systems operation sequence
d. Summary of outdoor and exhaust flows to indicate of building pressurization
e. Nomenclature used throughout report
f. Test conditions
3. Instrument List:
a. Instrument
b. Manufacturer
c. Model Number
d. Serial number
e. Range
f. Calibration date

4. Electric Motors:
a. Manufacturer
b. Model/Frame
c. HP/BHP
d. Phase, voltage, amperage, nameplate, actual, no load
e. RPM
f. Service factor
g. Starter size, rating, heater elements
h. Sheave Make/Size/Bore

5. V-Belt Drive:
a. Identification/location
b. Required driven RPM
c. Driven sheave, diameter and RPM
d. Belt, size and quantity
e. Motor sheave diameter and RPM
f. Center to center distance, maximum, minimum and actual

6. Pump Data:
a. Identification/number
b. Manufacturer
c. Size/Model
d. Impeller
e. Service
f. Design flow rate, pressure drop, BHP
g. Actual flow rate, pressure drop, BHP
h. Discharge pressure
i. Suction pressure
j. Total operating head pressure
k. Shut off, discharge and suction pressures
l. Shut off, total head pressure

7. Heating Coil Data:
a. Number/number
b. Location
c. Service
d. Manufacturer
e. Air flow, design and actual
f. Water flow, design and actual
g. Water pressure drop, design and actual
h. Entering water temperature, design and actual
i. Leaving water temperature, design and actual
j. Entering air temperature, design and actual
k. Leaving air temperature, design and actual
l. Air pressure drop, design and actual

8. Air Moving Equipment:
a. Location
b. Manufacturer
c. Model number
d. Serial number
e. Arrangement/Class/Discharge
f. Air flow, specified and actual
g. Return air flow, specified and actual
h. Outside air flow, specified and actual
i. Total static pressure (total external) specified and actual
j. Inlet pressure
k. Discharge pressure
l. Sheave Make/Size/Bore
m. Number of belts/Make/Size
n. Fan RPM

9. Return Air/Outside Air Data:
a. Identification/location
b. Design air flow
c. Actual air flow
d. Design return air flow
e. Actual return air flow
f. Design outside air flow
g. Actual outside air flow
h. Return air temperature
i. Outside air temperature
j. Required mixed air temperature
k. Actual mixed air temperature
l. Design outside/return air ratio
m. Actual outside/return air ratio

10. Exhaust Fan Data:
a. Location
b. Manufacturer
c. Model Number
d. Serial Number
e. Air flow, specified and actual
f. Total static pressure (total external) specified and actual
g. Inlet pressure
h. Discharge pressure
i. Sheave Make/Size/Bore
j. Number of Belts/Make/Size
k. Fan RPM

11. Duct Traverse
a. System zone/Branch
b. Duct size
c. Area
d. Design Velocity
e. Design air flow
f. Test velocity
g. Test air flow
h. Duct static pressure
i. Air temperature
j. Air correction factor

12. Air Distribution Test Sheet:
a. Air terminal number
b. Room number/location
c. Terminal type
d. Terminal size
e. Area factor
f. Design velocity
g. Design air flow
h. Test (final) velocity
i. Test (final) air flow
j. Percent of design air flow

NOTE:
ALWAYS REVIEW YOUR PLANS PRIOR TO COMMENCEMENT OF ANY WORK. YOU HAVE APPROVED THESE PLANS WHEN WORK BEGINS AND IT IS YOUR RESPONSIBILITY THEREAFTER.

NOTE:
CONSTRUCTION SHALL NOT PROCEED UNTIL CONTRACTOR HAS OBTAINED ALL PERMITS AND INCORPORATED COMMENTS FROM TEXAS ACCESIBILITY STANDARDS REVIEW AND PERMITTING ENTITIES IN WORK.

STATE OF TEXAS
RON A. SAIKOWSKI
42191
LICENSED PROFESSIONAL ENGINEER

I, RON A. SAIKOWSKI, P.E., AUTHORIZED THE PLACEMENT OF THIS SEAL ON THIS DRAWING FOR THE PURPOSE OF ISSUING THIS DOCUMENT FOR BELOW

Not For Construction
For Background Use Only
Preliminary
For Concept Approval
Preliminary Bid Set
For Preliminary Approval
Check Set
Permit
For Final Approval
For Construction

ENGINEERING BY:
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TEXAS REGISTRATION NO FOR ENGINEERING FIRM IS F-10574

I/WE HAVE THROUGHLY REVIEWED AND APPROVED THESE PLANS AND SPECIFICATIONS WHICH SUPERCEDE ALL OTHER PLANS AND SPECIFICATIONS.
APPROVED WITH CHANGES:

PLANS HAVE BEEN CREATED BY OWNER. WESTBROOK PURPOSE IS TO CREATE WORKING DRAWINGS CHECKED BY OWNER BEFORE CONSTRUCTION. ANY CHANGES TO THESE DRAWINGS ARE UNDER THE DIRECTION OF OWNER AND SHOULD BE CHECKED BEFORE CONSTRUCTION BEGINS.

WESTBROOK DESIGNS
EPIC CREATIVE CO OP BUILDING

"from thought to reality"

ADDRESS:
LOT:
BLOCK:
SECTION:
SUBDIV:
CITY: SPRING
COUNTY: MONTGOMERY

NOTICE

NEITHER WESTBROOK DESIGNS, ITS PRINCIPALS, ITS ASSOCIATES, NOR ITS EMPLOYEES ARE STRUCTURAL ENGINEERS. IT IS HIGHLY RECOMMENDED THAT ALL PLANS BE REVIEWED BY A QUALIFIED LICENSED ENGINEER PRIOR TO COMMENCING CONSTRUCTION. ANY ENGINEERING PLANS AND/OR SPECIFICATIONS PROVIDED BY A QUALIFIED LICENSED ENGINEER WILL TAKE PRECIDENCE OVER ANY INFORMATION PROVIDED IN THESE DOCUMENTS. BY ACCEPTING THESE PLANS ALL PARTIES AGREE TO HOLD WESTBROOK DESIGNS, ITS PRINCIPALS, ITS ASSOCIATES, AND ITS EMPLOYEES HARMLESS IN THE EVENT OF ANY STRUCTURAL DEFICIENCIES.

SQUARE FOOTAGE

FIRST FLOOR
SECOND FLOOR
COV. BALCONY
INDIV.BALCONIES

TOTAL OFFICE SPACE
TOTAL
COV'D AREA

FOLDER: EPIC

M-5