SECTION 233113 DUCTWORK

PART 1.00 – GENERAL

1.01 DESCRIPTION
- A. GENERAL REQUIREMENTS DRAWINGS AND GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND CONDITIONS AND DIVISION 1 – GENERAL REQUIREMENTS SECTIONS, APPLY TO THE WORK SPECIFIED IN THIS SECTION.

1.02 WORK INCLUDED
- A. INCLUDE ALL LABOR, MATERIALS, EQUIPMENT TRANSPORTATION AND SERVICES TO FURNISH AND INSTALL COMPLETE ALL DUCTWORK AND RELATED SYSTEMS SPECIFIED HEREIN AND INDICATED ON THE DRAWING.

PART 2.00 – PRODUCTS

2.01 SHEETMETAL WORK
- A. FURNISH ALL DUCTWORK AS SHOWN ON PLANS. ALL DUCTWORK CONSTRUCTION SHALL COMPLY WITH SMACNA STANDARDS AND LOCAL MECHANICAL CODE STANDARDS, WHICHEVER IS MORE STRINGENT. DUCT CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE FOLLOWING PRESSURE VELOCITY CLASSIFICATIONS FOUND IN SMACNA HVAC DUCT CONSTRUCTION STANDARDS, FIRST EDITION (1985).
  1. DUCTWORK BETWEEN VAV AIR HANDLING UNITS AND TERMINAL BOXES & AIR DEVICES: MAXIMUM +3" W.G., 2,500 F.P.M., VARIABLE AIR VOLUME.
  2. DUCTWORK DOWNSTREAM OF TERMINAL BOXES: +2"W.G., 2,500 F.P.M., VARIABLE AIR VOLUME.
  3. EXHAUST DUCTWORK (ALL EXHAUST FAN SYSTEMS WHERE DESIGN FAN STATIC IS LISTED AT 1.0" W.G. OR ABOVE): +2" TO –2"W.G., 2500 F.P.M., CONSTANT VOLUME.
  4. RETURN, RELIEF OR EXHAUST DUCTWORK WHERE FAN DESIGN STATIC IS LISTED BELOW 1.0"W.G.: +1" TO –1" W.G., 2,500 F.P.M., CONSTANT VOLUME.
  5. DUCTS: +0.5" TO –0.5" W.G., 2,000 F.P.M., CONSTANT VOLUME.
- B. PRIOR TO ANY FABRICATING OF SHEET METAL WORK, THE MECHANICAL CONTRACTOR SHALL CAREFULLY MEASURE (AT THE SITE) AVAILABLE SPACE FOR SHEET METAL WORK. HE SHALL PREPARE LARGE SCALE SHOP DRAWINGS OF SHEET METAL WORK SHOWING ALL OTHER ELEMENTS OF THE BUILDING INCLUDING PIPING, STRUCTURAL AND ELECTRICAL SO ALL ARE COORDINATED AND FIT AVAILABLE SPACE. THE SHOP DRAWINGS WILL NOT GO THROUGH A FORMAL SUBMITTAL PROCESS, BUT 2 COPIES SHALL BE GIVEN TO THE ARCHITECT AS EVIDENCE OF THEIR BEING COMPLETED.
- C. LONGITUDINAL SEAMS IN DUCTS SHALL BE FLAT, DOUBLE LOCK TYPE. S AND DRIVE TYPE. SEALED WITH UL 181A OR UL 181B TAPES AND MASTICS.
- D. TRANSVERSE SEAMS SHALL BE SEALED WITH UL 181A OR UL 181B TAPE OR MASTICS. TYPE AND SPACING AS FOLLOWS:

MAX. SIDE	TYPE	SPACING
UP TO 30"	DRIVE SLIP	7'–10"
31" TO 60"	1–1/2" POCKET SLIP	7'–10"
61" AND UP	1–1/2" POCKET SLIP	3'– 9"

CROSS BREAK PANELS 18" AND OVER IN WIDTH.

- E. STANDING SEAMS ARE NOT ACCEPTABLE ON ANY DUCTWORK.
- F. JOINT LOCKING: THE SLIPJOINT IN POCKET SLIP SEAMS SHALL BE SCREWED USING NOT LESS THAN ONE SCREW PER FACE AND MAXIMUM SPACING OF 2'–0".
- G. DAMPERS PROVIDE DAMPERS AND QUADRANTS IN DUCTWORK AS NECESSARY FOR BALANCING. PROVIDE ONE DAMPER IN THE DUCT LEADING TO EACH SUPPLY OR RETURN/EXHAUST OPENING. DAMPERS SHALL BE LOCATED IN AN ACCESSIBLE LOCATION. DAMPERS SHALL BE FITTED WITH PARKER KALON DAMPER BEARINGS AND PARKER KALON NO. 195T QUADRANTS. DAMPERS SHALL BE OF 20 GA. G.I. SINGLE PLATE TYPE WITH EDGES HEMMED. FOR DAMPERS ABOVE "HARD" (GYPBOARD OR NON–ACCESSIBLE) CEILINGS, PROVIDE BOWDEN CABLE CONTROLLER WITH CONCEALED OPERATORS IN NEAREST RETURN GRILLE. SHOW LOCATION OF ALL REMOTE DAMPER OPERATORS & VOLUME DAMPERS ON RECORD DRAWINGS. INCLUDE DRAWING W/BALANCING REPORT. ADUSTABLE SPLITTER DAMPERS TO BE YOUNG REGULATOR 890B.
- H. ACCESS DOORS SHALL BE PROVIDED BY THIS CONTRACTOR IN FINISHED WALLS AND CEILINGS WHERE REQUIRED TO REACH MECHANICAL EQUIPMENT, MILCOR OR EQUAL.
- I. INSULATED LOW PRESSURE FLEXIBLE DUCT SHALL BE A FACTORY FABRICATED ASSEMBLY CONSISTING OF A ZINC–COATED SPRING STEEL HELIX, NON–PERFORATED INNER LINER, WRAPPED WITH A NOMINAL 1" THICK BY 1 LB/CU. FT. DENSITY FIBERGLASS INSULATION. THE ASSEMBLY SHALL BE SHEATHED IN A VAPOR BARRIER JACKET, FACTORY SEALED AT BOTH ENDS OF EACH SECTION, THUS ASSURING THE VAPOR RESISTANCE OF EACH SECTION AS WELL AS THE COMPLETED INSTALLATION. THE COMPOSITE ASSEMBLY INCLUDING INSULATION AND VAPOR BARRIER SHALL MEET THE CLASS 1 REQUIREMENTS OF NFPA BULLETIN NO. 90–A AND BE LABELED BY UL WITH A FLAME SPREAD RATING OF 25 OR LESS AND A SMOKE DEVELOPED RATING OF 50 OR UNDER. FLEXIBLE DUCTS SHALL BE INSTALLED IN A FULLY EXTENDED LENGTH REQUIRED TO MAKE THE CONNECTION. WHERE HORIZONTAL SUPPORT IS REQUIRED, FLEXIBLE DUCT SHALL BE SUSPENDED ON 36" CENTERS WITH A MINIMUM 1" WIDE FLAT BANDING MATERIAL. ALL JOINTS AND CONNECTIONS SHALL BE MADE WITH 1/2" WIDE POSITIVE LOCKING STEEL STRAPS. INSULATED LOW PRESSURE FLEXIBLE DUCT SHALL BE GREENFLEX TYPE SL–1 OR EQUAL. PROVIDE SPIN–IN FITTINGS FOR CONNECTION TO TRUCK DUCT. MAXIMUM LENGTH OF FLEX DUCT IS 5 FEET WITH ONE 90 DEGREE BEND.
- J. OFFSETS
  PROVIDE OFFSETS AND TRANSITIONS AS REQUIRED TO FIT DUCTWORK INTO AVAILABLE SPACE. MAINTAIN EQUIVALENT FREE AREA OF DUCTWORK, AND TRANSITION SHALL BE SMOOTH (LESS THAN 15 DEGREES).

2.02 DUCT LINING
- A. JOHNS MANSVILLE 1" THICK 1.5 LB/CU.FT. DENSITY (WHERE CALLED OUT ON DRAWINGS AND OR WHERE SPECIFIED) LINACOUSTIC R–4 MIN. OR 1.5" THICK 1.5 LB/CU.FT. DENSITY LINACOUSTIC R–5 MIN. WHERE "SOUNDLINED" OR "LINED" DUCT IS CALLED OUT ON DRAWINGS OR SPECIFIED. SERVICE WITH GLUE AND CLIPS. SPACE CLIPS A MAXIMUM OF 18"O.C. LINE ALL RECTANGULAR DUCTS (INCLUDES OUTSIDE AIR, SUPPLY, RETURN, EXHAUST AND TRANSFER DUCTS). THE NET FREE AREA OF THE DUCT DIMENSIONS GIVEN ON THE DRAWINGS SHALL BE MAINTAINED. INCREASE METAL DUCT DIMENSIONS AS NECESSARY TO COMPENSATE FOR ADDITION OF THE LINER.
- B. THE DUCT LINER SHALL BE APPLIED WITH 100 RESISTANT ADHESIVE. LINER SHALL BE ADDITIONALLY SECURED WITH % COVERAGE OF APPROVED FIRE MECHANICAL FASTENERS ON MAXIMUM 15" CENTERS. FASTENERS SHALL START WITHIN 2" OF THE LEADING EDGE OF EACH SECTION AND WITHIN 3" OF THE LEADING EDGE OF ALL CROSS JOINTS WITHIN THE DUCT SECTION. ALL EXPOSED EDGES AND THE LEADING EDGE OF ALL CROSS JOINTS OF THE LINER SHALL BE HEAVILY COATED WITH AN APPROVED FIRE RESISTANT ADHESIVE. THE DUCT LINER SHALL BE CUT TO ASSURE SNUG CLOSING CORNER JOINTS, THE BLACK SURFACE OF THE LINER SHALL FACE THE AIR STREAM, TRANSVERSE JOINTS SHALL BE NEATLY BUTTED, AND ANY DAMAGED AREAS SHALL BE HEAVILY COATED WITH AN APPROVED FIRE RESISTANT ADHESIVE.

2.03 BACKDRAFT DAMPERS
- A. GENERAL PROVIDE DAMPERS AT ALL OUTSIDE AIR AND RELIEF DUCTS INTAKING OR EXHAUSTING TO ATMOSPHERE.
- B. TYPE
  1. BACKDRAFT DAMPERS ON FAN SYSTEMS SHALL BE GALVANIZED STEEL OR ALUMINUM MULTIBLADE TYPE. BLADES SHALL HAVE FELT STRIPS RIVETED OR CRIMPED IN PLACE. BLADES SHALL BE JOINED TOGETHER WITH CONNECTION BARS. EACH BLADE SHALL BE RIGIDLY ATTACHED TO A PIVOT ROD. THE ROD SHALL EXTEND INTO OIL–IMPREGNATED BRONZE BUSHINGS, OR ANTIFRICTION BEARINGS, LOCATED IN THE FRAMES. RUSKIN CBD2 OR EQUAL.
  2. FABRIC BACKDRAFT DAMPERS ON RELIEF DUCTS SHALL BE CONSTRUCTED TO INDUSTRY STANDARDS.
- C. MANUFACTURER

2.04 LOUVERS
- A. FURNISH WONDER METAL MODEL 'SDL–4" DRAINABLE FORMED GALVANIZED STEEL STORM–PROOF MULLION NON–MECHANICAL FIXED WALL LOUVERS, OR AIR LOUVERS INC., THE AIROLITE CO., CONSTRUCTION SPECIALTIES INC., RUSKIN, OR INDUSTRIAL LOUVERS INC. EQUIVALENT, OR APPROVED; SIZES AND CONFIGURATIONS AS SHOWN, COMPLETE WITH FLAT BAR ORNAMENTAL SHAPES WERE SHOWN; REFER TO EXTERIOR BUILDING ELEVATIONS AND LOUVER SCHEDULE, SECTION 22 OF PROJECT MANUAL VOLUME II. PROVIDE WITH BIRD SCREEN AND COLOR AS DESIGNATED BY ARCHITECT.
- B. LOUVERS SHALL HAVE BEEN TESTED AND RATED TO HAVE MINIMUM 45% FREE OPENING BASED ON A 4X4 FOOT SIZE LOUVER.
- C. FRAME AND BLADES TO BE 16 GAUGE GALVANIZED STEEL.
- D. HEADS, SILLS AND JAMBS TO BE ONE PIECE STRUCTURAL MEMBERS AS DETAILED AND SECURELY ANCHOR TO WALL CONSTRUCTION AS APPROVED.
- E. SLIDEABLE INTERLOCKED MULLIONS TO HAVE PROVISION TO EXPANSION AND CONTRACTION.
- F. FURNISH COMPLETE WITH MANUFACTURER'S STANDARD BIRD SCREEN MOUNTED IN FOLDED "U" TYPE FRAME AND ATTACH TO INSIDE FACE OF LOUVER FRAME WITH STEEL SCREWS AT ACTIVE (OPEN) PORTIONS OF LOUVERS AND WITH 20 GAUGE GALVANIZED STEEL FACED INSULATED 'BLANK–OFF' PANELS AT INACTIVE LOUVER AREAS, COMPLETE WITH PERIMETER GASKETS AND FINISHED TO MATCH LOUVER. INSULATION CORE SHALL BE 1 INCH THICK EXTRUDED POLYSTRYENE HAVING A MINIMUM THERMAL RESISTANCE "R" VALUE OF 5.0.
- G. ALL LOUVERS TO BE FREE OF SCRATCHES AND BLEMISHES AND SHALL BE FINISH PAINTED WITH BAKED–ON ENAMEL POWDER COATING.

2.05 FIRE DAMPERS
- A. DYNAMIC FIRE DAMPERS SHALL BE CONSTRUCTED AND TESTED IN ACCORDANCE WITH UL SAFETY STANDARD 555. EACH DAMPER SHALL HAVE A 1 1/2 HOUR RATING WITH 165 F FUSABLE LINK AND BE LABLED PER UL 555 STANDARD.
- B. DYNAMIC COMBINATION FIRE/SMOKE DAMPERS,RUSKIN FSD36, SHALL BE OF MIN. 16 GAUGE GALVANIZED STEEL WITH STAINLESS STEEL BEARINGS, JAMB SEALS UNDER 450 DEG. F RATED BLADE EDGE SEAL. DAMPERS SHALL BE 1 HR. RATED UNDER UL STANDARD 555 AND UL 555S. ALL DAMPERS USED UNDER THIS SPECIFICATION MUST BE UL TESTED & QUALIFED IN THE COMPLETE RANGE OF SIZES USED. A SINGLE DAMPER TESTED WITHIN THIS RANGE IS NOT ACCEPTABLE. LEAKAGE RATING SHALL BE CLASS 11 INCLUDE A UL CLASSIFIED FIRE STAT. FIRESTAT SHALL ELECTRICALLY AND MECHANICALLY LOCK DAMPER CLOSED WHEN DUCT TEMPERATURE EXCEEDS 165°F. DAMPER MUST BE OPERABLE ABOVE 250° F. FIRESTAT SHALL BE EQUIPPED WITH TWO DAMPER POSITION INDICATORS FOR REMOTE INTERFACING WITH SMOKE DETECTORS & FIRE ALARM SYSTEM. ALSO PROVIDE INTEGRAL FLOW RATE DUCT SMOKE DETECTORS FOR NON–DUCTED FIRE SMOKE DETECTORS.
- C. CEILING FIRE DAMPERS SHALL BE INSTALLED IN ALL CEILING REGISTERS AND GRILLES. IN THE RATED CEILING. FIRE DAMPERS CONSIST OF A RADIANT DAMPER IN THE DIFFUSER NECK AND THERMAL INSULATING BLANKET COVERING THE DIFFUSER PAN. THE ENTIRE SYSTEM SHALL BE UL RATED FOR FLOOR/CEILING AND ROOF/CEILING SYSTEM.

PART 3.00 – EXECUTION

3.01 SHEET METAL WORK
- A. PARTITIONS FORMING PLENUMS OR CASINGS SHALL BE #18 GA., WITH GALVANIZED IRON ANGLES AND RIVETS FOR SEAM CONNECTION AND STIFFENING. ALL JOINTS AND STANDING SEAMS SHALL BE SEALED WITH APPROVED DUCT SEALANT.
- B. CORK GASKETS SHALL BE INSTALLED BETWEEN ALL CONNECTIONS OF SHEET METAL TO COIL AND FILTER CASINGS.
- C. SHEET METAL CONNECTIONS OF PLENUMS AND AIR CHAMBERS TO WALL AND FLOORS SHALL BE MADE WITH GALVANIZED ANGLES ANCHORED TO WALL OR FLOOR CONSTRUCTION WITH ANCHOR BOLTS WITH SHEET METAL BOLTED OR RIVETED TO ANGLES. MASTIC SEALER SHALL BE INSTALLED AT CONNECTION OF ANGLES TO SHEET METAL TO PROVIDE AIR–TIGHT JOINTS. PROVIDE ACCESS DOORS IN PLENUMS AND CHAMBERS WITH HANDLES OPERATED FROM BOTH SIDES, VENTLOCK NO. 205 OR APPROVED SUBSTITUTE.
- D. HINGED ACCESS DOORS IN SHEET METAL DUCT FOR ACCESS TO DAMPERS SHALL BE #18 GA., FRAMED WITH STEEL ANGLE AND HEMMED EDGES
- E. CONNECT ALL GRILLES TO DUCTWORK. PAINT THE INSIDE OF THE DUCT A DULL BLACK AT ALL GRILLES.
- F. ALL AIR INLETS AND OUTLETS TO OUTSIDE SHALL HAVE BIRDSCREENS. BACKDRAFT DAMPER SHALL BE PROVIDED WHERE MOTORIZED DAMPER IS NOT INDICATED.
- G. ALL DUCTS THROUGH ROOF SHALL BE FLASHED WATER–TIGHT. ALL DUCTS THRU WALLS AND FLOORS/ROOFS SHALL HAVE ANGLE ENCLOSURES.
- H. CONNECTIONS OF ALL DUCTS TO ALL EQUIPMENT SHALL BE MADE WITH NEOPRENE.
- I. ELBOWS SHALL HAVE AN INSIDE RADIUS EQUAL TO 1/2 THE DUCT WIDTH. RECTANGULAR ELBOWS SHALL HAVE DUCT TURNS, T&B OR APPROVED EQUAL. USE RECTANGULAR ELBOWS WHEREVER A ROUND ELBOW CANNOT BE USED AND WHERE SHOWN ON DRAWINGS. SQUARE INSIDE ELBOW AND ROUND OUTSIDE ELBOW ARE NOT PERMITTED. DO NOT INSTALL TURNING VANES IN GREASE EXHAUST DUCTWORK.
- J. SUPPORTERS SHALL BE GALVANIZED STRAP OR ANGLE IRON HANGERS, ARRANGED TO PREVENT ANY BULGING, BENDING, OR SAGGING OF DUCTWORK. UNDER NO CONDITION SHALL HANGERS PIERCE THE DUCTS. VERTICAL DUCTS SHALL BE SUPPORTED AT EACH FLOOR WITH 18 GA. FORMED ANGLE.
- K. SEAL ALL DUCT JOINTS WITH APPROVED DUCT SEALANT.
- L. HANGERS
  1. PROVIDE HANGERS ON ALL DUCTWORK.
  2. HANGERS FOR CIRCULAR DUCTS AND TUBING: A #18 GAUGE GALVANIZED SHEET STEEL STRAP SHALL BE WRAPPED AROUND THE DUCT AT EACH POINT OF SUPPORT. FOR CONCEALED WORK THIS STRAP SHALL BE BOLTED TO A STRAP HANGER OF SIMILAR GAUGE AND WIDTH; FOR EXPOSED WORK, BOLTED TO A STEEL ROD HANGER IN EACH CASE, ROD HANGER 1/4" SIZE FOR DUCTS UP TO 10" SIZE, 3/8" SIZE FOR LARGER DUCTS. WIDTH OF GALVANIZED STEEL STRAP WRAPPED AROUND THE DUCT SHALL NOT BE LESS THAN 1" IN ANY CASE; WHERE DUCTS ARE IN EXCESS OF 10" IN DIAMETER SHALL BE 2".
  3. SPACING OF HANGERS SHALL NOT EXCEED 10'–0" ON CENTERS IN ANY CASE; WHERE DUCTS ARE INSULATED AND ARE IN EXCESS OF 10" IN SIZE, SPACING SHALL NOT EXCEED 8'–0".
- M. A MAXIMUM OF 3 FEET LENGTH OF FLEX DUCT WITH ONE 90 BEND WILL BE ALLOWED AT CONNECTIONS TO DIFFUSERS, WHERE FLEX DUCT IS SHOWN ON DRAWINGS.
- N. PROVIDE FIRE STOP AROUND DUCTWORK AT ALL DUCT PENETRATION OF RATED CONSTRUCTION. "FIRE STOP SEALANT" BY DOW CORNING.
- O. BACKDRAFT DAMPERS ON RELIEF DUCTS SHALL BE METAL BLADE TYPE.
- P. PROVIDE DUCT TRANSITIONS AS REQUIRED TO SOUND TRAPS AND ALL CONNECTIONS.
- Q. PROVIDE DUCT LINING ON RECTANGULAR DUCTS WHERE INDICATED ON DRAWINGS (OUTSIDE AIR, SUPPLY, RETURN, EXHAUST AND TRANSFER AIR DUCTS). THE NET FREE AREA OF THE DUCT DIMENSION GIVEN ON THE DRAWINGS SHALL BE MAINTAINED. INCREASE METAL DUCT DIMENSIONS AS NECESSARY TO COMPENSATE FOR ADDITION OF THE LINER.
- R. ALL DUCTWORK, INCLUDING, BUT NOT LIMITED TO DUCTS, HANGERS, BRACKETS, FITTINGS AND JOINTS, SHALL BE INSTALLED IN A MANNER WHICH NEITHER REDUCES HEADROOM AND WALKWAY WIDTH NOR PROJECTS ANY SHARP EDGES INTO A CATWALK OR PASSAGE AREA. ANY DUCTWORK WHICH, IN THE OPINION OF THE ARCHITECT, PRESENTS A POSSIBLE HAZARD TO PEOPLE IN THE CATWALK AREA, SHALL BE CHANGED TO AN ACCEPTABLE AND SAFE MANNER. SUCH CHANGES MAY INCLUDE: MOVING THE EQUIPMENT, CHANGING ITS CONFIGURATION, AND/OR ADDING PROTECTIVE PADDING TO THE EQUIPMENT.
- S. INTAKE BACKDRAFT DAMPERS SHALL BE INSTALLED AT THE ENVELOPE OF THE BUILDING.
- T. INSTALL FIRE DAMPERS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.

END OF SECTION 233113

SECTION 233713 OUTLETS AND INLETS

PART 1.00 – GENERAL

1.01 DESCRIPTION
- A. GENERAL REQUIREMENTS
  DRAWINGS AND GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND OTHER CONDITIONS AND DIVISION 1 – GENERAL REQUIREMENTS SECTIONS, APPLY TO THE WORK SPECIFIED IN THIS SECTION.

1.02 COMPLIANCES
- A. ADC COMPLIANCE
  TEST AND RATE REGISTERS, GRILLES, AND DIFFUSERS IN ACCORDANCE WITH ADC EQUIPMENT TEST CODE 1062R4, PROVIDE CERTIFIED RATINGS SEAL ON EACH UNIT.
- B. AMCA COMPLIANCE TEST AND RATE LOUVERS, DAMPERS, AND SHUTTERS IN ACCORDANCE WITH AMCA STANDARD 500, PROVIDE CERTIFIED RATINGS SEAL ON EACH UNIT.

1.03 SUBMITTALS
- A. SUBMIT MANUFACTURER'S TECHNICAL PRODUCT DATA UNLESS AS SPECIFIED ON DRAWINGS, ASSEMBLY–TYPE SHOP DRAWINGS, AND MAINTENANCE DATA.

PART 2.00 – PRODUCTS

2.01 CEILING AIR DIFFUSERS
- A. GENERAL
  EXCEPT AS OTHERWISE INDICATED, PROVIDE MANUFACTURER'S STANDARD AIR DEVICES WITH FIRE DAMPERS; OF SIZE, SHAPE, CAPACITY AND TYPE INDICATED; CONSTRUCTED OF MATERIALS AND COMPONENTS INDICATED AND AS INDICATED ON DRAWINGS FOR COMPLETE INSTALLATION.
- B. COMPATIBILITY:
  1. PROVIDE DIFFUSERS WITH BORDER STYLES THAT ARE COMPATIBLE WITH ADJACENT CEILING SYSTEMS, AND THAT ARE SPECIFICALLY MANUFACTURED TO FIT INTO CEILING MODULE WITH ACCURATE FIT AND ADEQUATE SUPPORT. REFER TO GENERAL CONSTRUCTION DRAWINGS AND SPECIFICATIONS FOR TYPES OF CEILING SYSTEMS WHICH WILL CONTAIN EACH TYPE OF CEILING AIR DIFFUSER.
  2. PRVIDE REGISTERS AND GRILLES WITH BORDER STYLES THAT ARE COMPATIBLE WITH ADJACENT WALL OR CEILING SYSTEMS, AND THAT ARE SPECIFICALLY MANUFACTURED TO FIT INTO CONSTRUCTION WITH ACCURATE FIT AND ADEQUATE SUPPORTS. REFER TO GENERAL CONSTRUCTION DRAWINGS AND SPECIFICATIONS FOR TYPES OF CONSTRUCITION WHICH WILL CONTAIN EACH TYPE OF WALL REGISTER AND GRILLE.

PART 3.00 – EXECUTION

3.01 INSTALLATION
- A. GENERAL
  INSTALL OUTLETS AND INLETS IN ACCORDANCE WITH MANUFACTURER'S WRITTEN INSTRUCTIONS AND IN ACCORDANCE WITH RECOGNIZED INDUSTRY PRACTICES TO INSURE THAT PRODUCTS SERVE INTENDED FUNCTIONS.
- B. COORDINATE WITH OTHER WORK, INCLUDING DUCTWORK AND DUCT ACCESSORIES, AS NECESSARY TO INTERFACE INSTALLATION OF OUTLETS AND INLETS WITH OTHER WORK.
- C. LOCATE CEILING AIR DIFFUSERS, REGISTERS, AND GRILLES, AS INDICATED ON GENERAL CONSTRUCTION "REFLECTED CEILING PLANS" AND "INTERIOR ELEVATIONS". UNLESS OTHERWISE INDICATED, LOCATE UNITS IN CENTER OF ACOUSTICAL CEILING MODULES.

END OF SECTION 233713

SECTION 234100 FILTERS

PART 1.00 – GENERAL

1.01 GENERAL REQUIREMENTS
- A. DRAWINGS AND GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND OTHER CONDITIONS AND DIVISION 1 – GENERAL REQUIREMENTS SECTIONS, APPLY TO THE WORK SPECIFIED IN THIS SECTION.

1.02 COMPLIANCE
- A. NFPA COMPLIANCE: INSTALL AIR TREATMENT EQUIPMENT IN ACCORDANCE WITH NFPA 90A AND 90B.
- B. UL COMPLIANCE: PROVIDE AIR FILTER UNITS WHICH HAVE BEEN LISTED AND LABELED BY UL.
- C. ASHRAE COMPLIANCE: TEST AIR FILTER UNITS IN ACCORDANCE WITH ARI 850.

PART 2.00 – PRODUCTS

2.01 AIR FILTERS
- A. EXTENDED SURFACE FILTERS
  PROVIDE FACTORY–FABRICATED, DRY, EXTENDED SURFACE FILTERS; WHERE SHOWN, IN SIZES INDICATED. EQUIP WITH UL CLASS 1 FIBROUS MEDIA MATERIAL FORMED INTO 2" DEEP V–SHAPED PLEATS AND HELD BY SELF– SUPPORTING FRAMES. FARR 30/30 OR EQUAL.

2.02 FILTER FRAMES
- A. PROVIDE METAL FILTER FRAMES.

3.01 INSTALLATION
- A. INSTALL AIR FILTERS AND HOLDING DEVICES OF TYPES INDICATED, AND WHERE SHOWN; IN ACCORDANCE WITH AIR FILTER MANUFACTURER'S WRITTEN INSTRUCTIONS AND WITH RECOGNIZED INDUSTRY PRACTICES; TO ENSURE THAT FILTERS COMPLY WITH REQUIREMENTS AND SERVE INTENDED PURPOSES. COMPLY WITH APPLICABLE PORTIONS OF NFPA 70, 90A AND B, PERTAINING TO INSTALLATION OF AIR FILTERS. PROVIDE AS SCHEDULED ON THE DRAWINGS.
- B. INSTALL FILTERS IN PROPER POSITION TO PREVENT PASSAGE OF UNFILTERED AIR.
- C. PROVIDE CLEAN SET OF FILTERS FOR ALL PIECES OF EQUIPMENT:
  1. IMMEDIATELY PRIOR TO AIR BALANCING.
  2. WHEN FINAL PUNCHLIST IS DONE.
  3. IN ADDITION, FURNISH ONE COMPLETE EXTRA SET OF FILTERS TO OWNER WHEN FINAL PUNCHLIST IS DONE. THREE SETS OF FILTERS ARE REQUIRED (TWO INSTALLED, ONE TURNED OVER TO OWNER). LOCATE EXTRA SET IN MECHANICAL ROOMS WHERE FILTERS ARE LOCATED.

END OF SECTION 234100

SECTION 230593 BALANCING

PART 1.00 – GENERAL

1.01 DESCRIPTION
- A. GENERAL REQUIREMENTS
  DRAWINGS AND GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND OTHER CONDITIONS AND DIVISION 1 – GENERAL REQUIREMENTS SECTIONS, APPLY TO THE WORK SPECIFIED IN THIS SECTION.

1.02 INDUSTRY STANDARDS
- A. ALL TESTING, ADJUSTING AND BALANCING OF ALL WORK SHALL BE PERFORMED BY AN INDEPENDENT CONTRACTOR WHO IS CURRENTLY LICENSED ASSOCIATED AIR BALANCING COUNCIL (AABC) OR NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB) BALANCING CONTRACTOR. NO OTHER BALANCE REPORTS WILL BE REVIEWED OR ACCEPTED. ALL BALANCING WORK MUST BE COMPLETE AND DONE IN ACCORDANCE WITH THE MOST RECENT STANDARDS OF THEIR SOCIETY. PAYMENT OF ALL COSTS FOR TESTING AND BALANCING SHALL BE BY THE GENERAL CONTRACTOR. ALL BALANCING WORK SHALL BE PERFORMED WITH ACCORDANCE WITH LOCAL CODES AND THIS SECTION.

1.03 SUBMITTALS
- A. SUBMIT CERTIFIED TEST REPORTS SIGNED BY TEST AND BALANCE SUPERVISOR WHO PERFORMED TAB WORK. SUBMIT RECORD HVAC PLAN SHOWING ALL VOLUME DAMPER & REMOTE VOLUME DAMPER OPERATOR LOCATIONS & CONNECTION LINKAGE.
- B. THE BALANCE REPORT SHALL BE ON THE AABC NATIONAL STANDARD REPORT FORMS OR THE NEBB CERTIFIED REPORT FORMS AS PUBLISHED IN THEIR MOST CURRENT EDITIONS AND SHALL INCLUDE AS A MINIMUM THE FOLLOWING INFORMATION.
  1 AABC OR NEBB CERTIFICATION NUMBER AND SIGNATURE OF BALANCING CONTRACTOR.
  2. COPY OF A CERTIFICATE OF CONFORMANCE WITH NATIONAL STANDARDS FOR THIS PROJECT.
  3. INSTRUMENTATION LIST WITH LAST CALIBRATION DATES.
  4. MAKE AND MODEL NUMBERS OF ALL HVAC EQUIPMENT.
  5. AIR CFM AND STATIC PRESSURE READINGS (DISCHARGE AND SUCTION) AS MEASURED BY PITOT TUBE DUCT TRAVERSE AT THE UNIT.
  6. MOTOR NAMEPLATE DATA WITH ACTUAL FIELD VOLTAGE AND AMPERAGE READINGS FOR EACH LEG.
  7. MOTOR AND FAN R.P.M.'S, SHEAVE SIZES AND BELT SIZES.
  8. OUTSIDE, RETURN, MIXED AND SUPPLY AIR TEMPERATURES AND VOLUMES SHALL BE MEASURED AT FULL COOLING WITH MINIMUM OUTSIDE AIR. RETURN/RELIEF/SMOKE EVACUATION AIRFLOW SHALL BE BALANCED AND MEASUREMENTS RECORDED BY PITOT DUCT TRAVERSE AT FULL ECONOMIZER AND POWER EXHAUST.
  9. MAKE AND MODEL NUMBERS OF ALL AIR DISTRIBUTION EQUIPMENT.
  10. FINAL BALANCED AIR VOLUMES AT ALL OUTLETS (INCLUDING RETURNS WHERE DUCTED).
  11. INDEXED PLAN WITH DIFFUSER AND RETURN LOCATIONS. ALSO INDICATE IF DIFFUSER IS 3–WAY OR 2–WAY.
  12. BALANCING DATA FOR CHILLED WATER SYSTEM, WHERE APPLICABLE.
- C. FIVE COPIES OF THE BALANCE REPORT SHALL BE SUBMITTED TO HOLD EVERYTHING PROJECT MANAGER FOR APPROVAL. PROVIDE ONE COPY OF APPROVED REPORT TO LANDLORD UPON COMPLETION OF CONSTRUCTION FOR THE PREMISE AS A REQUIREMENT TO OPEN FOR BUSINESS.

1.04 JOB CONDITIONS
- A. WORK WILL NOT PROCEED WITH TESTING, ADJUSTING AND BALANCING WORK UNTIL WORK HAS BEEN COMPLETED AND IS OPERABLE. ENSURE THAT THERE IS NO LATENT RESIDUAL WORK STILL TO BE COMPLETED. INFORM ARCHITECT IN WRITING WHEN PROJECT IS READY FOR ADJUSTING AND BALANCING.
- B. REFER TO LANDLORD TENANT CRITERIA MANUAL FOR SYSTEM BALANCING REQUIRED AS PART OF TENANT WORK.

PART 2.00 –

PRODUCTS 2.01 GENERAL
- A. MECHANICAL SUB CONTRACTOR SHALL PROVIDE ALL MOTORS, SHEAVES, BELTS, LADDERS, ETC. AS REQUIRED FOR BALANCER TO ACCOMPLISH WORK.
- B. BALANCING SUB CONTRACTOR SHALL BE HIRED BY THE MECHANICAL SUB CONTRACTOR. BALANCING CONTRACTOR SHALL BE AN INDEPENDENT CONTRACTOR, SEPARATE COMPANY FROM THE MECHANICAL SUB CONTRACTOR. COORDINATE WITH LANDLORD, LANDLORD MAY REQUIRE SPECIFIC CONTRACTOR FOR BALANCING.

PART 3.00 – EXECUTION

3.01 GENERAL
- A. EXAMINE INSTALLED WORK AND CONDITIONS UNDER WHICH TESTING IS TO BE DONE TO ENSURE THAT WORK HAS BEEN COMPLETED, CLEANED AND IS OPERABLE. DO NOT PROCEED WITH TAB WORK UNTIL UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED IN MANNER ACCEPTABLE TO TESTER.
- B. TEST, ADJUST AND BALANCE AIR CONDITIONING SYSTEMS AND COMPONENTS, AS INDICATED, IN ACCORDANCE WITH PROCEDURES OUTLINED IN APPLICABLE STANDARDS. REFER TO LANDLORD TENANT CRITERIA MANUAL FOR SYSTEM BALANCING REQUIRED AS PART OF TENANT WORK.
- C. PREPARE REPORT OF TEST RESULTS IN FORMAT RECOMMENDED BY APPLICABLE STANDARDS.
- D. PATCH HOLES IN INSULATION, DUCTWORK AND HOUSING, WHICH HAVE BEEN CUT OR DRILLED IN MANNER RECOMMENDED BY THE ORIGINAL INSTALLER.
- E. MARK EQUIPMENT SETTINGS, INCLUDING DAMPER CONTROL POSITIONS, VALVE INDICATORS, FAN SPEED CONTROL LEVERS, AND SIMILAR CONTROLS AND DEVICES, TO SHOW FINAL SETTINGS AT COMPLETION OF BALANCE WORK. PROVIDE MARKINGS WITH PAINT OR OTHER SUITABLE PERMANENT IDENTIFICATION MATERIALS.
- F. INITIAL BALANCING SHALL INCLUDE BALANCING ALL AIR QUANTITIES TO WITHIN 10% OF THOSE LISTED ON THE DRAWINGS.
- G. BALANCER SHALL THEN CHECK ALL BUILDING TEMPERATURES AND READ JUST AIR QUANTITIES TO EVEN OUT SPACE TEMPERATURES TO WITHIN 1 DEG. F WITHIN SPACES.
- H. TESTING, ADJUSTING AND BALANCING REPORT MUST BE COMPLETE AND TURNED OVER EVERYTHING TO PROJECT MANAGER 1 WEEK PRIOR TO STORE TURNOVER.
- I. THE MECHANICAL SUB CONTRACTOR SHALL BE PRESENT FOR AIR BALANCE TO VERIFY ACCESSIBILITY TO ALL DEVICES, VERIFY ALL OPERATING SEQUENCES AND INSTALL NEW FILTERS IN ALL UNITS JUST PRIOR TO THE AIR BALANCE. THE COMPLETE AIR BALANCE SHALL TAKE PLACE WITH OUTSIDE AIR DAMPERS IN MINIMUM POSITION, EXCEPT AS NOTED OTHERWISE. MECHANICAL SUB CONTRACTOR SHALL ALSO INSTALL A NEW SET OF FILTERS AFTER PROJECT IS COMPLETE.
- J. BALANCE AIR TO WITHIN PLUS/MINUS 10% OF THAT INDICATED ON THE DRAWINGS. ANY REQUIRED CHANGES IN SHEAVES, BELTS, PULLEYS OR THE ADDITION OF DAMPERS REQUIRED TO ACHIEVE SPECIFIED FLOW RATES SHALL BE PERFORMED BY THE MECHANICAL SUB CONTRACTOR WITH NO ADDITIONAL COST TO THE OWNER.
- K. THE BALANCING SUB CONTRACTOR SHALL PERFORM ALL APPLICABLE TESTING AND BALANCING FUNCTIONS REQUIRED FOR THE SYSTEM DESIGNED ON THESE DRAWINGS. ALL SYSTEMS UNABLE TO BE COMPLETELY BALANCED AT THE TIME OF ORIGINAL BALANCE MUST BE BALANCED IN FUTURE AT NO ADDITIONAL EXPENSE TO THE OWNER. THE BALANCING CONTRACTOR SHALL RECHECK ANY ITEMS THE OWNER DEEMS NECESSARY AT NO ADDITIONAL COST TO THE OWNER.

END OF SECTION 230593

SECTION 230900 CONTROLS

1. IN ADDITION TO PROGRAMMABLE THERMOSTATS AND REMOTE ROOM TEMPERATURE SENSORS, PROVIDE ALL CONTROLS, WIRING, CONDUIT, RELAYS, ETC TO PROVIDE COMPLETE AND OPERATIONAL CONTROL SYSTEMS. PROVIDE CONNECTION TO LANDLORD BUILDING CONTROL SYSTEM PER LANDLORD TENANT CRITERIA. COORDINATE CAREFULLY WITH LANDLORD CONTROLS SUB–CONTRACTOR.
2. SET – THERMOSTAT FOR 73 D.F. COOLING AND 70 D.F. HEATING INITIALLY.

END OF SECTION 230900

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REVISIONS

HVAC SPECIFICATIONS

SHEET NUMBER

M1.3