

HVAC SPECIFICATIONS

PART 1: GENERAL

1.1 DESCRIPTION OF WORK

- A. INCLUDE ALL LABOR, MATERIALS, EQUIPMENT, APPLIANCES AND SERVICES NECESSARY TO FURNISH, FABRICATE AND INSTALL ALL WORK SPECIFIED HEREIN. REFER TO THE DRAWINGS FOR FURTHER DEFINITION OF LOCATION, EXTENT AND DETAILS OF THE WORK.
- B. THE INTENTION OF THE SPECIFICATIONS AND PLANS IS TO PROVIDE FOR FURNISHED SYSTEMS, PROPERLY TESTED, BALANCED AND READY FOR OPERATION, INCLUDING NECESSARY MINOR DETAILS AND ACCESSORIES REQUIRED TO MAKE THE WORK COMPLETE, EVEN THOUGH SUCH ITEMS MAY NOT BE EXPRESSLY SHOWN OR SPECIFIED.
- C. THE WORK COVERED BY THIS SECTION OF THE SPECIFICATION INCLUDES THE FURNISHING OF ALL LABOR AND MATERIALS AND IN PERFORMING ALL OPERATIONS IN CONNECTION WITH THE INSTALLATION OF THE HVAC WORK SHOWN ON THE DRAWINGS AND AS DESCRIBED HEREIN AND SHALL BE INTERPRETED AS WORK TO BE DONE BY THIS CONTRACTOR.

1.2 REGULATORY REQUIREMENTS

- A. COMPLY WITH ALL APPLICABLE FEDERAL AND STATE LAWS, AND ALL LOCAL CODES, BY-LAWS AND ORDINANCES.
- B. REQUEST INSPECTIONS FROM AUTHORITIES HAVING JURISDICTION. OBTAIN ALL PERMITS AND PAY FOR ALL FEES AND INSPECTION CERTIFICATES AS APPLICABLE AND/OR REQUIRED. ALL PERMITS AND CERTIFICATES SHALL BE TURNED OVER TO THE OWNERS UPON COMPLETION OF THE WORK.
- C. ALL WORK, EQUIPMENT AND MATERIALS SHALL CONFORM TO THE BUILDING CONSTRUCTION RULES AND REGULATIONS.

1.3 SUBMITTALS

A. PROVIDE SHOP DRAWINGS FOR ALL EQUIPMENT, INCLUDING BUT NOT LIMITED TO:

- EXHAUST FANS.
- KITCHEN EXHAUST HOOD AND APPURTENANCES.
- DIFFUSERS & GRILLES.
- DUCTWORK & PIPING FABRICATION STANDARDS & ACCESSORIES.
- DUCTWORK & PIPING INSULATION.
- VARIABLE AIR VOLUME BOXES.
- CONTROLS.

1.4 COORDINATION

- A. WORK SHALL BE PERFORMED IN COOPERATION WITH OTHER TRADES ON THE PROJECT AND SO SCHEDULED AS TO ALLOW SPEEDY AND EFFICIENT COMPLETION OF THE WORK.
- B. FURNISH TO OTHER TRADES ADVANCE INFORMATION ON LOCATIONS AND SIZES OF ALL FRAMES, BOXES, SLEEVES AND OPENINGS NEEDED FOR THEIR WORK, AND ALSO FURNISH INFORMATION AND SHOP DRAWINGS NECESSARY TO PERMIT TRADES AFFECTED BY THE WORK TO INSTALL SAME PROPERLY AND WITHOUT DELAY.
- C. IF ANY HVAC WORK HAS BEEN INSTALLED BEFORE COORDINATION WITH OTHER TRADES SO AS TO CAUSE INTERFERENCE WITH THE WORK OF SUCH TRADES, ALL NECESSARY ADJUSTMENTS AND CORRECTIONS SHALL BE MADE BY THE HVAC TRADES INVOLVED WITHOUT EXTRA COST TO THE OWNERS.
- D. PROTECT ALL MATERIALS AND WORK OF OTHER TRADES FROM DAMAGE WHICH MAY BE CAUSED BY THE HVAC WORK AND REPAIR ALL DAMAGES WITHOUT EXTRA COST TO OWNERS.

1.5 MECHANICAL AND ELECTRICAL COORDINATION

- A. HEATING, VENTILATION, AND AIR CONDITIONING SUBCONTRACTOR SHALL FURNISH AND INSTALL VARIOUS ELECTRICAL ITEMS RELATING TO THE HVAC EQUIPMENT AND CONTROL APPARATUS. THE ELECTRICAL SUBCONTRACTOR SHALL BE REQUIRED TO CONNECT POWER WIRING TO THIS EQUIPMENT UNLESS NOTED OTHERWISE.
- B. THE HVAC AND ELECTRICAL SUBCONTRACTOR SHALL COORDINATE THEIR RESPECTIVE PORTIONS OF THE WORK, AS WELL AS THE ELECTRICAL CHARACTERISTICS OF THE HVAC EQUIPMENT.
- C. ALL POWER WIRING AND LOCAL DISCONNECT SWITCHES WILL BE PROVIDED BY THE ELECTRICAL SUBCONTRACTOR FOR THE LINE VOLTAGE POWER. ALL CONTROL AND INTERLOCKING WIRING SHALL BE THE RESPONSIBILITY OF THE HVAC SUBCONTRACTOR.
- D. 120 VOLT POWER WIRING SOURCES EXTENDED AND CONNECTED TO HEATING AND VENTILATING CONTROL PANELS, TRANSFORMERS, AND SWITCHES SHALL BE THE RESPONSIBILITY OF THE ELECTRICAL SUBCONTRACTOR. ALL LOW VOLTAGE THERMOSTAT, ZONE VALVE AND ANY SWITCH WIRING SHALL BE THE RESPONSIBILITY OF THE HVAC SUBCONTRACTOR.
- E. ALL ELECTRICAL WORK SHALL CONFORM TO THE REQUIREMENTS OF DIVISION 16.
- F. ALL STARTERS SHALL BE FURNISHED AND INSTALLED UNDER DIVISION 16 EXCEPT THOSE FURNISHED AS AN INTEGRAL PART OF PACKAGED EQUIPMENT. COORDINATE WITH ELECTRICAL CONTRACTOR.

1.6 INSTALLATION REQUIREMENTS

- A. THE ARRANGEMENT OF ALL HVAC WORK SHOWN ON THE DRAWINGS IS DIAGRAMMATICAL ONLY AND INDICATES THE MINIMUM REQUIREMENTS OF THE WORK. CONDITION AT THE BUILDING INCLUDING ACTUAL MEASUREMENTS SHALL DETERMINE THE DETAILS OF THE INSTALLATION.

1.7 RECORD DRAWINGS/PROJECT CLOSEOUT

- A. PROVIDE RECORD AS-BUILT DRAWINGS AT COMPLETION OF INSTALLATION.

1.8 GUARANTEE/WARRANTY

- A. ALL NEW MATERIALS, ITEMS OR EQUIPMENT AND WORKMANSHIP FURNISHED UNDER THIS SECTION SHALL CARRY STANDARD WARRANTY AGAINST ALL DEFECTS IN MATERIAL AND WORKMANSHIP FOR A PERIOD OF NOT LESS THAN ONE (1) YEAR FROM THE DATE OF FINAL ACCEPTANCE OF WORK. ANY FAULT, DUE TO DEFECTIVE OR IMPROPER MATERIAL, EQUIPMENT, WORKMANSHIP OR MANUFACTURING DESIGN WHICH MAY DEVELOP WITHIN THAT PERIOD SHALL BE MADE GOOD, FORTHWITH, BY AND AT THE EXPENSE OF THIS CONTRACTOR, INCLUDING ALL OTHER DAMAGES DONE TO AREAS, MATERIALS AND OTHER SYSTEMS RESULTING FROM THIS FAILURE.
- B. THIS CONTRACTOR SHALL GUARANTEE THAT ALL NEW ELEMENTS OF THE SYSTEMS MEET THE SPECIFIED PERFORMANCE REQUIREMENTS AS SET FORTH HEREIN OR AS INDICATED ON THE DRAWINGS.

PART 2: PRODUCTS

2.1 SUPPLY AIR DUCTWORK

A. LOW PRESSURE DUCTWORK-

- GALVANIZED STEEL SHEETS, REINFORCING AND COMPANION ANGLES, HANGERS, METAL SPECIFICATIONS, GAUGES AND CONSTRUCTION OF SEAMS, JOINTS AND REINFORCING SHALL BE ACCORDING TO THE LATEST SMACNA PUBLICATION - "HVAC CONSTRUCTION STANDARDS".
- ALL RECTANGULAR SHEET DEFINED AS ALL DUCTWORK, UNLESS OTHERWISE SPECIFIED, SHALL BE CONSTRUCTED WITH PITTSBURGH LONGITUDINAL SEAMS. TRANSVERSE JOINTS SHALL BE MADE WITH POCKET LOCKS AND CORNER CLOSURES.
- THE DUCTWORK SHALL BE CONSTRUCTED OF HOT DIPPED GALVANIZED STEEL WITH G-90 COATING.

B. FLEXIBLE DUCTS-

- FURNISH AND INSTALL, WHERE SHOWN ON DRAWINGS, INSULATED FLEXIBLE DUCT. FLEXIBLE DUCT IS ALLOWED ONLY ABOVE DROPPED CEILINGS. FLEXIBLE DUCT MAXIMUM LENGTH SHALL BE 5 FEET.

C. VOLUME DAMPERS-

- FURNISH AND INSTALL MANUAL VOLUME DAMPERS WHERE INDICATED ON THE DRAWINGS AND WHERE REQUIRED. DAMPERS SHALL BE NOT LESS THAN TWO GAUGES HEAVIER THAN DUCTWORK IN WHICH THEY ARE INSTALLED.

D. DUCT SEALING-

- ALL TRANSVERSE & LONGITUDINAL SEAMS, JOINTS AND WHERE DUCTS CONNECT SHALL BE MADE AIR TIGHT BY GENEROUSLY COATING WITH DUCT SEALANT AS MANUFACTURED BY MINNESOTA MINING AND MANUFACTURING, DOW CORNING, BOSTIK OR APPROVED EQUAL.
- THE MAXIMUM ALLOWABLE DUCT LEAKAGE SHALL BE 5% OF THE RESPECTIVE SYSTEM TOTAL AIR QUANTITY.

2.2 SUPPLY AIR DUCT INSULATION

A. GENERAL

- INSULATION SHALL BE KNAUF, CERTAIN-TEED, JOHNS MANVILLE OR OWENS CORNING. INSTALL INSULATION, MASTICS, ADHESIVES, COATINGS, COVERS, ETC. AS REQUIRED BY MANUFACTURER'S RECOMMENDATIONS. MATERIALS SHALL MEET REQUIREMENTS OF ADHESIVE AND SEALANT COUNCIL STANDARDS AND SMACNA.
- APPLY INSULATION AFTER SYSTEMS HAVE BEEN TESTED, PROVED TIGHT AND APPROVED BY ARCHITECT. REMOVE DIRT, SCALE, OIL, RUST AND OTHER FOREIGN MATTER PRIOR TO INSTALLATION OF INSULATION.
- LEAKS IN VAPOR BARRIER OR VOIDS IN INSULATION WILL NOT BE ACCEPTED.
- ASTM E-84 MINIMUM FIRE HAZARD RATINGS SHALL BE 25 FLAME-SPREAD, 50 FUEL CONTRIBUTED AND 50 SMOKE DEVELOPED.
- WHERE DUCTS ARE INSULATED, FLEXIBLE CONNECTIONS TO DUCTS SHALL BE INSULATED.
- INSULATE STANDING SEAMS WITH SAME MATERIAL AND THICKNESS AS DUCT.
- INSULATION SHALL BE CONTINUOUS THROUGH WALL AND CEILING OPENINGS AND IN SLEEVES.
- TRANSMISSION RATES OF VAPOR BARRIERS SHALL NOT EXCEED 0.02 PERMS.

B. RECTANGULAR AND CIRCULAR DUCTWORK

- INSULATE ALL SUPPLY AND RETURN AIR DUCTS IN CONCEALED SPACES WITH 1 1/2" THICK FIBERGLASS DUCT WRAP WITH FOIL-KRAFT FLAME RESISTANT VAPOR BARRIER.
- INSULATION DENSITY SHALL BE 3/4 LB. PER CUBIC FOOT AND MAXIMUM K-FACTOR SHALL BE 0.3 AT 75°F MEAN TEMPERATURE.
- COVER BREAKS IN VAPOR MATERIAL WITH PATCHES OF SAME MATERIAL, SECURED WITH ADHESIVE AND STAPLES. SEAL STAPLES WITH MATCHING FOIL FACE TYPE.

2.3 KITCHEN EXHAUST DUCTWORK

- A. ALL WORK AND MATERIALS SHALL CONFORM TO NFPA 96 (VENTILATION CONTROL AND FIRE PROTECTION OF COMMERCIAL COOKING OPERATIONS)

- B. ALL KITCHEN EXHAUST DUCTWORK SHALL BE CONSTRUCTED OF AND SUPPORTED BY CARBON STEEL NOT LESS THAN .054 IN. (NO. 16 MSG) OR STAINLESS STEEL NOT LESS THAN .043 IN. (NO. 18 MSG) IN THICKNESS. EXPOSED DUCTWORK SHALL BE STAINLESS TO RESIST CORROSION UNLESS MATERIAL IS STAINLESS STEEL.

- C. ALL DUCTWORK SEAMS AND JOINTS SHALL BE WELDED LIQUID TIGHT.

- D. ADEQUATE ACCESS FOR CLEANING SHALL BE PROVIDED ON EACH FLOOR. DUCT ACCESS PANELS SHALL BE OF THE SAME MATERIAL AND THICKNESS AS THE DUCT. ACCESS PANELS SHALL HAVE A GASKET OR SEALANT THAT IS RATED FOR 1500°F.

- E. DISHWASHER EXHAUST DUCTWORK SHALL NOT BE LESS THAN 18-GAUGE STAINLESS STEEL, LIQUID TIGHT AND DETERGENT PROOF, ALL WELDED CONSTRUCTION. PITCH DUCTWORK TOWARD DISHWASHER.

2.4 FIRE BARRIER DUCT WRAP (GREASE DUCT INSULATION)

- A. FIRE BARRIER DUCT WRAP SHALL BE A FIRE RESISTANT WRAP CONSISTING OF AN INORGANIC BLANKET ENCAPSULATED WITH A SCRIM-REINFORCED FOIL.
- B. FIRE BARRIER DUCT WRAP SHALL MAINTAIN A 2 HOUR RATING ON THE DUCTWORK, PROVIDE A 0" CLEARANCE TO COMBUSTIBLES AND CONSIST OF NON-ASBESTOS MATERIAL.
- C. WRAP MUST PASS THE CRITERIA OF UL TEST 1978
- D. DUCT WRAP SHALL BE USED IN CONJUNCTION WITH AN APPROVED SEALANT WHEN PENETRATING FIRE RATED WALLS AND DOORS.

2.5 DIFFUSERS, REGISTERS AND GRILLES:

- A. PROVIDE STEEL/ALUMINUM DIFFUSERS, REGISTERS AND GRILLES FOR SUPPLY AND RETURN OUTLETS, OF SIZE, TYPE AND DESIGN SHOWN ON DRAWINGS. ACCEPTABLE MANUFACTURERS SHALL BE TITUS, PRICE OR APPROVED EQUAL.
- B. EQUIPMENT SHALL BE TESTED AND RATED PER ASHRAE 91-70.
- C. EQUIPMENT SHALL HANDLE AIR QUANTITIES AT OPERATING VELOCITIES:
- WITH MAXIMUM DIFFUSION WITHIN SPACE SUPPLIED OR RETURNED.
 - WITHOUT OBJECTIONABLE AIR MOVEMENT AS DETERMINED BY ARCHITECT.
 - WITH SOUND PRESSURE LEVEL NOT TO EXCEED NC 25.

- D. DIFFUSERS WITHIN SAME ROOM OR AREA SHALL BE SAME TYPE AND STYLE TO PROVIDE ARCHITECTURAL UNIFORMITY.
- E. SURFACE MOUNT DIFFUSERS, REGISTERS, AND GRILLES SHALL BE FURNISHED WITH GASKETS AND INSTALLED WITH FACES SET LEVEL AND PLUMB, TIGHTLY AGAINST MOUNTING SURFACE.
- F. FINISH SHALL BE AS DIRECTED BY ARCHITECT.
- G. COORDINATE DIFFUSERS, REGISTERS AND GRILLES WITH CEILING AND WALL CONSTRUCTION. REFER TO ARCHITECTURAL DRAWINGS FOR EXACT LENGTHS AND FOR FRAMING AND MITERING ARRANGEMENTS THAT MAY DIFFER FROM THOSE SHOWN ON HVAC DRAWINGS.

2.6 PIPE INSULATION

- A. INSULATION SHALL BE FIBROUS GLASS INSULATION WITH FACTORY-APPLIED FIRE RETARDANT VAPOR BARRIER JACKET WITH K-FACTOR OF 0.21 AT 75° F MEAN TEMPERATURE BY OWENS CORNING, CERTAIN-TEED, MANVILLE OR KNAUF, INSTALLED AS REQUIRED BY MANUFACTURER. ASTM E-84 FIRE HAZARD RATINGS SHALL BE 25 FLAME SPREAD, 50 SMOKE DEVELOPED AND 50 FUEL CONTRIBUTED.

- B. APPLY INSULATION AFTER SYSTEMS HAVE BEEN TESTED, PROVED TIGHT AND APPROVED BY THE ARCHITECT. REMOVE DIRT, SCALE, OIL, RUST AND FOREIGN MATTER PRIOR TO INSTALLATION OF INSULATION.

- C. NO LEAKS IN VAPOR BARRIER OR VOIDS IN INSULATION WILL BE ACCEPTED.

- D. INSULATION AND VAPOR BARRIER ON PIPING WHICH PASSES THROUGH WALLS OR PARTITIONS SHALL PASS CONTINUOUSLY THROUGH SLEEVE, EXCEPT THAT PIPING BETWEEN FLOORS AND THROUGH FIRE-WALLS OR SMOKE PARTITIONS SHALL HAVE SPACE ALLOWED FOR APPLICATION OF APPROVED PACKING BETWEEN SLEEVES AND PIPING, TO PROVIDE FIRESTOP AS REQUIRED BY NFPA. SEAL ENDS TO PROVIDE CONTINUOUS VAPOR BARRIER WHERE INSULATION IS INTERRUPTED.

- E. INSULATE FLEXIBLE CONNECTIONS TO SAME THICKNESS AND WITH SAME MATERIAL AS ADJOINING PIPE INSULATION.

- F. PROVIDE LONGITUDINAL LAP AND 6" WIDE VAPOR BARRIER JOINT SEAL STRIPS SECURED WITH APPROVED ADHESIVE.

- G. SEAL ENDS OF PIPE INSULATION AND SEAL INSULATION TO PIPE WITH APPROVED FIRE RETARDANT VAPOR BARRIER, AT FLANGES, VALVES AND FITTINGS AND AT INTERVALS OF NO MORE THAN 21 FEET ON CONTINUOUS RUNS OF PIPING.

- H. SECURE COVERS ON CONCEALED PIPE WITH METAL BANDS AT LEAST 3/4" WIDE AND NO MORE THAN 18" APART, SPACED TO HOLD ENDS AND CENTER OF EACH SECTION.

2.7 PIPE HANGERS AND SUPPORTS

- A. PROVIDE PIPE STANDS, SUPPORTS, HANGERS AND OTHER SUPPORTING DEVICES IN ACCORDANCE WITH ANSI B31.9 AND MSS-69, AS NECESSARY TO SUPPORT WORK REQUIRED BY CONTRACT DOCUMENTS.

- B. SECURE VERTICAL PIPING TO BUILDING CONSTRUCTION TO PREVENT SAGGING OR SWINGING.

- C. HORIZONTAL COPPER TUBING SHALL HAVE MAXIMUM HANGER SPACING OF 5 FT. FOR TUBING 1-1/4" DIAMETER AND SMALLER AND 10' FOR TUBING 1-1/2" AND LARGER.

- D. REDUCE SPACING TO A MAXIMUM OF 10'-0" APART, REGARDLESS OF PIPE SIZE, AS NECESSARY FOR FITTINGS, VALVES AND OTHER CONCENTRATED LOADS.

- E. SUPPORT PIPING 4" DIAMETER AND LARGER FROM STRUCTURE WITH PIPE ROLL HANGERS WITH ADJUSTABLE STEEL ROD HANGERS, SIZED TO ACCOMMODATE INSULATION.

- F. SUPPORT PIPING 3" DIAMETER AND UNDER FROM STRUCTURE WITH CARPENTER AND PATTERSON FIG. 100 CLEVIS HANGERS OR APPROVED EQUAL.

- G. HANGERS SHALL BE AS MANUFACTURED BY CARPENTER AND PATTERSON, F&S OR GRINNELL CO. FIGURE NUMBERS OF CARPENTER AND PATTERSON ARE SPECIFIED TO ESTABLISH STANDARDS OF QUALITY FOR PERFORMANCE AND MATERIALS.

- H. PROVIDE SPRING HANGERS WITH TRAVEL STOPS AS SPECIFIED IN VIBRATION ISOLATION PARAGRAPH, WHERE NECESSARY AND WHERE SHOWN ON DRAWINGS.

- I. PIPE SUPPORTS FOR 4" AND LARGER PIPE AND INSULATED HIGH-TEMPERATURE PIPING SHALL HAVE WELDED INSERTS OF EQUAL THICKNESS TO INSULATION TO PREVENT COMPRESSION OF INSULATION. OTHER INSULATED PIPE SHALL HAVE 12" x 14" GA. SHIELDS AT HANGERS, COMPOSED OF 180° COVERAGE OF GALVANIZED SHEETMETAL AND HIGH DENSITY, PREFORMED, RIGID INSULATION. WHERE ROLLERS ARE REQUIRED, SHIELD SHALL BE STEEL PIPE.

2.8 ROOF MOUNTED UPBLAST EXHAUST FANS

- A. ROOF EXHAUST FANS SHALL BE UPBLAST CENTRIFUGAL BELT DRIVEN TYPE. THE FAN WHEEL SHALL BE CENTRIFUGAL BACKWARD INCLINED, CONSTRUCTED OF ALUMINUM AND SHALL INCLUDE A WHEEL CONE CAREFULLY MATCHED TO THE INLET CONE FOR PRECISE RUNNING TOLERANCES. WHEELS SHALL BE STATICALLY AND DYNAMICALLY BALANCED. THE FAN HOUSING SHALL BE CONSTRUCTED OF HEAVY GAUGE ALUMINUM WITH A RIGID INTERNAL SUPPORT STRUCTURE. WINDBANDS SHALL HAVE A ROLLED BEAD FOR ADDED STRENGTH AND SHALL BE JOINED TO CURB CAPS WITH A LEAKPROOF, CONTINUOUSLY WELDED SEAM.

- B. MOTORS SHALL BE HEAVY DUTY BALL BEARING TYPE, CAREFULLY MATCHED TO THE FAN LOAD, AND FURNISHED AT THE SPECIFIED VOLTAGE, PHASE AND ENCLOSURE. MOTORS AND DRIVES SHALL BE MOUNTED ON VIBRATION ISOLATORS, OUT OF THE AIRSTREAM. FRESH AIR FOR MOTOR COOLING SHALL BE DRAWN INTO THE MOTOR COMPARTMENT FROM AN AREA FREE OF DISCHARGE CONTAMINANTS. MOTORS SHALL BE READILY ACCESSIBLE FOR MAINTENANCE. DRIVE FRAME ASSEMBLIES SHALL BE CONSTRUCTED OF HEAVY GAUGE STEEL AND MOUNTED ON VIBRATION ISOLATORS.

- C. PRECISION GROUND AND POLISHED FAN SHAFTS SHALL BE MOUNTED IN PERMANENTLY SEALED, LUBRICATED PULLOW BLOCK BALL BEARINGS. BEARINGS SHALL BE SELECTED FOR A MINIMUM (L10) LIFE IN EXCESS OF 100,000 HOURS AT MAXIMUM CATALOGED OPERATING SPEED. DRIVES SHALL BE SIZED FOR A MINIMUM OF 150% OF DRIVEN HORSEPOWER. PULLEYS SHALL BE OF THE FULLY MACHINED CAST IRON TYPE, KEYED AND SECURELY ATTACHED TO THE WHEEL AND MOTOR SHAFTS.

- D. MOTOR PULLEYS SHALL BE ADJUSTABLE FOR FINAL SYSTEM BALANCING. A DISCONNECT SWITCH SHALL BE FACTORY INSTALLED AND WIRED FROM THE FAN MOTOR TO A JUNCTION BOX INSTALLED WITHIN THE MOTOR COMPARTMENT. A CONDUIT CHASE SHALL BE PROVIDED THROUGH THE CURB CAP TO THE MOTOR COMPARTMENT FOR EASE OF ELECTRICAL WIRING.

- E. FANS SHALL BE UL 762 LISTED.

PART 3 - EXECUTION

3.1 TESTING AND CLOSEOUT

A. CLEANING

- UPON COMPLETION ALL SHEETMETAL WORK SPECIFIED UNDER THIS SECTION IS TO BE CLEANED. ALL EQUIPMENT IS TO BE CLEANED, ALL TRIM INSTALLED, ALL PROTECTIVE OIL, TAPE OR OTHER MATERIALS USED TO PROTECT WORK ARE TO BE REMOVED.
- ALL DUCTS, FANS, AND EQUIPMENT SHALL BE THOROUGHLY CLEANED INSIDE AND OUTSIDE AND BLOWN OUT TO PREVENT ANY DEBRIS FROM DAMAGING FAN SHIELDS OR DEBRIS HANGING THROUGH REGISTERS OR DIFFUSERS WHEN SYSTEMS ARE PLACED IN OPERATION. ALL TEMPORARY CONNECTIONS REQUIRED FOR BLOWING OUT THE SYSTEMS, CHEESECLOTH FOR ALL DUCT OPENINGS, AND ANY OTHER EQUIPMENT OR LABOR FOR CLEANING, SHALL BE PROVIDED BY THE HVAC CONTRACTOR. THE ENTIRE HVAC SYSTEM SHALL BE KEPT CLEAN UNTIL FINAL ACCEPTANCE. ANY DAMAGE TO CEILINGS BY THE HVAC CONTRACTOR SHALL BE RECTIFIED BY HIM AT NO ADDITIONAL CHARGE TO THE OWNER, TO THE SATISFACTION OF THE DESIGNER.

3.2 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. PRIOR TO COMPLETION OF THE CONTRACT, PROVIDE FIELD AND WRITTEN OPERATING INSTRUCTIONS TO THE OWNER'S DESIGNATED REPRESENTATIVE WITH RESPECT TO OPERATION FUNCTIONS AND MAINTENANCE PROCEDURES FOR ALL EQUIPMENT AND SYSTEMS INSTALLED.

- B. ALL OPERATING EQUIPMENT INSTALLED UNDER THIS SECTION SHALL BE PLACED IN OPERATION AND SHALL FUNCTION CONTINUOUSLY IN AN OPERATING TEST FOR A PERIOD OF THREE DAYS, WITHOUT SHUTDOWN DUE TO MECHANICAL FAILURE OR NECESSITY OF ADJUSTMENT. PRIOR TO SCHEDULING THE PROJECT FINAL INSPECTION AND AFTER COMPLETION OF ALL INSTALLATION AND RUNNING EQUIPMENT AND AUTOMATIC CONTROL ADJUSTMENTS, PERFORM AIR BALANCING AND ANY OTHER WORK REQUIRED TO PLACE THE EQUIPMENT IN COMPLETE OPERATING CONDITION TO MEET ALL REQUIREMENTS UNDER THIS SPECIFICATION. DURING THIS RUNNING TEST PERIOD, DELIVER TO THE DESIGNER TWO COMPLETE SETS OF OPERATING, SERVICE, MAINTENANCE AND REPLACEMENT DATA FOR ALL EQUIPMENT WHICH WILL REQUIRE OPERATING MAINTENANCE OR REPLACEMENT AND ONE COPY OF THIS LITERATURE SHALL BE AVAILABLE DURING THE INSTRUCTION OF THE OPERATING PERSONNEL WHILE THE OTHER IS CHECKED FOR COMPLETENESS BY THE DESIGNER. DURING ALL WORKING HOURS OF THE "OPERATING TEST" THIS CONTRACTOR'S PERSONNEL SHALL BE AVAILABLE FOR ON-SITE FIELD INSTRUCTION SHALL COVER OPERATION, MAINTENANCE AND ADJUSTMENT OF ALL EQUIPMENT INSTALLED.

3.3 HOISTING, SCAFFOLDING, STAGING, AND PLANKING

- A. PROVIDE, SET-UP AND MAINTAIN ALL REQUIRED DERRICKS, HOISTING MACHINERY, SCAFFOLDS AND STAGING, PLANKING AND PERFORM ALL HOISTING REQUIRED TO COMPLETE THE WORK OF THIS FILED SUB-BID AS INDICATED AND SPECIFIED.
- B. SCAFFOLDS SHALL HAVE SOLID BACKS AND FLOORS TO PREVENT DROPPING MATERIALS FLED FROM TO THE FLOORS OR GROUND.

3.4 TESTING AND BALANCING

- A. TOTAL SYSTEM BALANCE SHALL BE PERFORMED IN ACCORDANCE WITH NEBB OR AABC NATIONAL STANDARDS FOR FIELD MEASUREMENT AND INSTRUMENTATION.

B. PROVIDE THE FOLLOWING:

- BEFORE COMMENCING WORK, VERIFY THAT SYSTEMS ARE COMPLETE AND OPERABLE. ENSURE THE FOLLOWING:
 - EQUIPMENT IS OPERABLE AND IN A SAFE AND NORMAL CONDITION.
 - TEMPERATURE CONTROL SYSTEMS ARE INSTALLED COMPLETE AND OPERABLE.
 - PROPER THERMAL OVERLOAD PROTECTION IS IN PLACE FOR ELECTRICAL EQUIPMENT.
 - FILTERS ARE CLEAN AND IN PLACE. IF REQUIRED, INSTALL TEMPORARY MEDIA IN ADDITION TO FINAL FILTERS.
 - DUCT SYSTEMS ARE CLEAN OF DEBRIS.
 - CORRECT FAN ROTATION.
 - FIRE AND VOLUME DAMPERS ARE IN PLACE AND OPEN.
 - ACCESS DOORS ARE CLOSED AND DUCT END CAPS ARE IN PLACE.
 - AIR OUTLETS ARE INSTALLED AND CONNECTED.
 - DUCT SYSTEM LEAKAGE HAS BEEN MINIMIZED.

- REPORT ANY DEFECTS OR DEFICIENCIES NOTED DURING PERFORMANCE OF SERVICES TO THE ARCHITECT.

- PROMPTLY REPORT ABNORMAL CONDITIONS IN MECHANICAL SYSTEMS OR CONDITIONS WHICH PREVENT SYSTEM BALANCE.

- IF, FOR DESIGN REASONS, SYSTEM CANNOT BE PROPERLY BALANCED, REPORT AS SOON AS OBSERVED.

- START OF WORK MEANS ACCEPTANCE OF EXISTING CONDITIONS.

- PROVIDE ADDITIONAL BALANCING DEVICES AS REQUIRED.

- RECORDED DATA SHALL REPRESENT ACTUALLY MEASURED, OR OBSERVED CONDITION.

- AFTER ADJUSTMENT, TAKE MEASUREMENTS TO VERIFY BALANCE HAS NOT BEEN DISRUPTED OR THAT SUCH DISRUPTION HAS BEEN RECTIFIED.

- LEAVE SYSTEMS IN PROPER WORKING ORDER, REPLACING BELT GUARDS, CLOSING ACCESS DOORS, CLOSING DOORS TO ELECTRICAL SWITCH BOXES, AND RESTORING THERMOSTATS TO SPECIFIED SETTINGS.

- AT FINAL INSPECTION, RECHECK RANDOM SELECTIONS OF DATA RECORDED IN REPORT. RECHECK POINTS OR AREAS AS SELECTED AND WITNESSED BY THE OWNER.

- ADJUST AIR HANDLING AND DISTRIBUTION SYSTEMS TO PROVIDE REQUIRED OR DESIGN SUPPLY, RETURN, AND EXHAUST AIR QUANTITIES.

- MAKE AIR QUANTITY MEASUREMENTS IN DUCTS BY PILOT TUBE TRAVERSE OF ENTIRE CROSS SECTIONAL AREA OF DUCT.

- MEASURE AIR QUANTITIES AT AIR INLETS AND OUTLETS.

- ADJUST DISTRIBUTION SYSTEM TO OBTAIN UNIFORM SPACE TEMPERATURES FREE FROM OBJECTIONABLE DRAFTS AND NOISE.

- USE VOLUME CONTROL DEVICES TO REGULATE AIR QUANTITIES ONLY TO EXTENT THAT ADJUSTMENTS DO NOT CREATE OBJECTIONABLE AIR MOTION OR SOUND LEVELS. EFFECT VOLUME CONTROL BY DUCT INTERNAL DEVICES SUCH AS DAMPERS.

- MEASURE STATIC AIR PRESSURE CONDITIONS ON AIR SUPPLY UNITS, INCLUDING FILTER AND COIL PRESSURE DROPS, AND TOTAL PRESSURE ACROSS THE FAN. MAKE ALLOWANCES FOR SOOT LOADING OF FILTERS.

- ADJUST OUTSIDE AIR AUTOMATIC DAMPERS, OUTSIDE AIR, RETURN AIR, AND EXHAUST DAMPERS FOR DESIGN CONDITIONS.

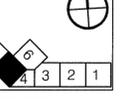
- MEASURE TEMPERATURE CONDITIONS ACROSS OUTSIDE AIR, RETURN AIR, AND EXHAUST DAMPERS TO CHECK LEAKAGE.

Item	Date
PERMIT	5-27-11



Burger King
Portland Int'l Jetport PWM
1001 Westbrook Street
Portland ME 04102

KEY PLAN



HMS Host
6905 Rockledge Drive
Bethesda, MD 20817
T: (240) 694-4746
F: (240) 694-4641
C: (240) 274-6417
E: scott.reimink@hmshost.com

Building Engineering
Resources, Inc.
66 Main Street
North Easton, MA 02356
T: (508) 230-0260
F: (508) 230-0265
E: ber@ber-engineering.com

L2M Foodservice
Design Group
811 Crownwell Park Drive, Suite 113
Crownwell Business Park at BWI
Glen Burnie, Maryland 21061
T: (410) 863-1302
F: (410) 863-1308
E: FSDG@L2MFoodServiceDesign.com

LLOYD ARCHITECTS
Two High Cliff, Plymouth MA 02560
TEL: (508) 746-4646
FAX: (508) 746-1236
E-MAIL: info@lloydarch.com

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**BURGER KING
MECHANICAL
SPECIFICATIONS**

M-4.01

