

15000 HEATING, VENTILATING, AND AIR CONDITIONING SPECIFICATIONS

THE ENTIRE MECHANICAL INSTALLATION SHALL CONFORM TO THE FOLLOWING NOTES AND SPECIFICATIONS.

15010 MECHANICAL GENERAL PROVISIONS

- 1.01 GENERAL
 - A. MATERIALS AND WORKMANSHIP UNLESS OTHERWISE NOTED, SHALL BE IN ACCORDANCE WITH BUILDING STANDARDS. ALL MATERIALS AND EQUIPMENT TO BE NEW UNLESS OTHERWISE NOTED.
 - B. ALL APPLICABLE CODES, LAWS AND REGULATIONS, GOVERNING OR RELATING TO ANY PORTION OF THIS WORK, INCLUDING UTILITY COMPANY RULES AND REGULATIONS AND OTHER REQUIREMENTS ARE HEREBY INCORPORATED INTO AND MADE A PART OF THESE SPECIFICATIONS. THESE PROVISIONS SHALL BE CARRIED OUT BY THE CONTRACTOR WHO SHALL INFORM THE OWNER, PRIOR TO SUBMITTING A PROPOSAL, OF ANY WORK OR MATERIALS WHICH VIOLATE ANY OF THE LAWS AND REGULATIONS. ANY WORK DONE BY THE CONTRACTOR CAUSING SUCH VIOLATIONS SHALL BE CORRECTED BY THE CONTRACTOR.
 - C. CONTRACTOR BIDDING THIS JOB SHALL VISIT AND INSPECT THE JOB SITE TO BECOME FULLY KNOWLEDGEABLE OF EXISTING CONDITIONS PRIOR TO SUBMITTING HIS BID. CONTRACTOR SHALL COORDINATE THE SITE VISIT WITH BUILDING MANAGEMENT AND/OR OWNER. CONTRACTOR SHALL ASK THE BUILDING MANAGEMENT AND/OR OWNERS REPRESENTATIVE ANY QUESTIONS HE MAY HAVE PERTAINING TO BUILDING STANDARDS AND EXISTING CONDITIONS THAT PROHIBIT THE PROPER INSTALLATION OF HIS WORK AS PER PLAN AND SPECIFICATION.

- 1.02 NEW WORK
 - A. INSTALL ALL WORK SO AS TO BE READILY ACCESSIBLE FOR OPERATION, MAINTENANCE AND REPAIR.
 - B. PLAN INSTALLATION OF NEW WORK AND CONNECTIONS TO EXISTING WORK TO ENSURE MINIMUM INTERFERENCE WITH REGULAR OPERATION OF EXISTING FACILITIES. ALL SYSTEM SHUTDOWNS AFFECTING OTHER AREAS SHALL BE COORDINATED WITH BUILDING OWNER AND BUILDING MANAGEMENT. INSTALL ISOLATION VALVES AT POINTS OF CONNECTION TO THE EXISTING PIPING. PROVIDE VOLUME DAMPERS OR TEMPORARY DUCT CAPS AT DUCT CONNECTIONS TO MINIMIZE SHUTDOWN TIME.
 - C. CONNECT NEW WORK TO EXISTING IN NEAT AND APPROVED MANNER. RESTORE EXISTING WORK DISTURBED WHILE INSTALLING NEW WORK TO ACCEPTABLE CONDITIONS AS DETERMINED BY OWNER AND BUILDING MANAGEMENT AT THEIR PROPER POSITION.
 - D. DISCONNECT, REMOVE AND/OR RELOCATE EXISTING MATERIAL, EQUIPMENT AND OTHER WORK AS NOTED OR REQUIRED FOR PROPER INSTALLATION OF NEW SYSTEM. TURN OVER TO OWNER OR DISPOSE OF ALL REMOVED EQUIPMENT AS REQUIRED BY OWNER.

- 1.03 SITE VERIFICATION
 - A. INVESTIGATE EACH SPACE THROUGH WHICH EQUIPMENT MUST BE MOVED AND WHEN NECESSARY EQUIPMENT SHALL BE SHIPPED FROM MANUFACTURER IN CRATED SECTIONS OF SIZE SUITABLE FOR MOVING THROUGH RESTRICTED SPACES AVAILABLE. ASCERTAIN FROM BUILDING OWNER AND TENANT AT WHAT TIMES OF DAY EQUIPMENT COULD BE MOVED THROUGH CERTAIN RESTRICTED AREAS, AND REVIEW WITH OWNER PLANNED APPROACH FOR ANY REQUIRED EQUIPMENT RIGGING INTO BUILDING.
 - B. ALL DUCTWORK AND PIPING ARE SHOWN DIAGRAMMATICALLY AND DO NOT SHOW ALL OFFSETS, DROPS AND RISES OF RUNS. THE CONTRACTOR SHALL ALLOW IN HIS BID FOR ROUTING OF DUCTWORK AND PIPING TO AVOID OBSTRUCTIONS. EXACT LOCATIONS SUBJECT TO APPROVAL.
 - C. DURING THIS INSPECTION THE CONTRACTOR FINDS ANY OBSTRUCTION OR INTERFERENCE THAT MAY PROHIBIT THE PROPER INSTALLATION OF HIS WORK HE IS TO MAKE IT KNOWN TO THE BUILDING MANAGEMENT AND/OR OWNER AND TENANT BEFORE AND AT THE TIME OF SUBMITTING HIS PROPOSAL.
 - D. BY SUBMISSION OF THE BID IT IS UNDERSTOOD THAT SUCH INSPECTION HAS BEEN MADE AND INCLUDES ALL THE MATERIALS AND REQUIRED RELOCATION, FOR ALL WORK.
 - E. WHEN CONFLICTS OCCUR IN THE SPECIFICATIONS OR IN THE DRAWINGS OR BETWEEN EITHER, PROVIDE THE ITEM OF GREATER QUANTITY OR HIGHER COST.
 - F. PROVIDE ALL ITEMS OF LABOR OR MATERIALS NOT SPECIFICALLY INDICATED, BUT REQUIRED TO COMPLETE THE INTENDED INSTALLATIONS.

- 1.04 COORDINATION BETWEEN TRADES
 - A. THIS CONTRACTOR IS RESPONSIBLE FOR FIELD CONDITIONS AND FIELD COORDINATION WITH ALL OTHER TRADES.
- 2.01 DEMOLITION AND REMOVAL
 - A. CONTRACTOR SHALL ERECT AND MAINTAIN BARRIERS TO PROTECT ADJACENT AREAS FROM DUST AND DEBRIS DURING DEMOLITION AND CONSTRUCTION.
 - B. ALL WORK SHALL BE DONE IN ACCORDANCE WITH BUILDING REGULATIONS AND IN QUALITY WORKMANSHIPLIKE MANNER.
 - C. ALL EXISTING WORK NOT INDICATED FOR DEMOLITION SHALL BE PROTECTED FROM DAMAGE. IF EXISTING WORK IS DAMAGED, CONTRACTOR SHALL MAKE REPAIRS USING SAME MATERIALS AT THE CONTRACTOR'S COST.
 - D. CONTRACTOR SHALL TAKE PRECAUTIONS AGAINST DAMAGING OR DISRUPTING BUILDING SYSTEMS, WIRING OR CONTROL TUBING FOR THE TENANTS ABOVE OR BELOW. ANY DAMAGE TO THESE ITEMS SHALL BE REPAIRED AT THE CONTRACTOR'S COST.
 - E. REMOVE EXISTING DUCTWORK AND AIR TERMINALS AS INDICATED. PROVIDE CAP OR BLANKING PLATES AND SEAL ALL OPENINGS IN THE DUCTS CAUSED BY REMOVAL OR RELOCATION OF DUCTS AND TERMINAL UNITS.
 - F. PROVIDE CAPPED CONNECTIONS ON ALL OPENINGS IN THE PIPING CAUSED BY RELOCATION OR REMOVAL OF PIPING.
 - G. TAG ALL EQUIPMENT REMOVED. STORE ALL EQUIPMENT SLATED FOR RELOCATION ON THE FLOOR. TURN OVER TO THE BUILDING MANAGEMENT ALL OTHER REMOVED EQUIPMENT. DISPOSE OF EQUIPMENT AND MATERIAL AS REQUIRED BY THE BUILDING MANAGEMENT.
 - H. PROVIDE FOR LEGAL REMOVAL AND DISPOSAL OF ALL RUBBISH AND DEBRIS FROM THE BUILDING AND SITE. COORDINATE ALL DEMOLITIONS AND REMOVALS WITH BUILDING MANAGEMENT. PROTECT ALL WORK NOT SLATED FOR DEMOLITION.

- 3.01 CUTTING AND PATCHING
 - A. THIS CONTRACTOR SHALL INCLUDE FOR ALL CUTTING AND PATCHING AS REQUIRED BY HIS TRADE.
 - B. THIS CONTRACTOR SHALL BE RESPONSIBLE FOR ALL CUTTING, FITTING, PATCHING, WATERPROOFING, FIREPROOFING AND FLASHING THAT MAY BE REQUIRED TO SUPPORT THE GLYCOL DRY COOLER, DUAL GLYCOL PUMPS, PIPING, DUCTWORK, EQUIPMENT, ETC.
 - C. THIS CONTRACTOR SHALL COORDINATE SUPPORTS, AND FLASHING WITH BUILDING MANAGEMENT AND SUBMIT THE METHOD OF SUPPORT FOR REVIEW TO THE BUILDING MANAGEMENT.
 - D. THIS CONTRACTOR SHALL PROVIDE SLEEVES FOR DUCTS AND PIPING AND PROVIDE ESUTOCHONS. SEAL OPENINGS AROUND DUCTS AND PIPING THROUGH PARTITIONS, WALLS AND FLOOR (NOT IN SHAFTS) WITH MINERAL WOOL OR OTHER NON-COMBUSTIBLE MATERIAL.
 - E. PROVIDE NECESSARY FLASHING AND COUNTERFLASHING TO MAINTAIN WATER-PROOF INTEGRITY OF THE BUILDING AS REQUIRED BY REMOVAL AND/OR INSTALLATION OF PIPES, DUCTS, CONDUITS AND EQUIPMENT. SUBMIT FOR REVIEW TO THE BUILDING MANAGEMENT.

- 15020 SCOPE OF WORK
 - 1.01 GENERAL
 - A. PROVIDE REQUIRED LABOR, MATERIALS, EQUIPMENT AND SERVICES NECESSARY FOR A COMPLETE AND SAFE INSTALLATION OF HVAC WORK IN CONFORMITY WITH THE REQUIREMENTS OF BUILDING CODES AND AUTHORITIES HAVING JURISDICTION; ALL AS INDICATED ON DRAWINGS AND/OR HEREIN SPECIFIED.
 - B. CONTRACTOR SHALL FURNISH AND INSTALL EQUIPMENT, DUCTWORK, INTERCONNECTING PIPING, FITTING, INSULATION, INTERLOCK AND CONTROL WIRING, ETC.

- 1.02 PERMITS
 - A. SECURE PERMITS, LICENSES AND CERTIFICATES. PAY FEES AND CHARGES FOR WORK INSTALLED CERTIFYING COMPLIANCE WITH LOCAL CODES AND GOVERNING AUTHORITIES. DELIVER CERTIFICATES TO BUILDING MANAGEMENT OFFICE PRIOR TO THE COMMENCEMENT OF WORK.
- 1.03 EQUIPMENT SUPPORT
 - A. SUPPORT CEILING MOUNTED EQUIPMENT, DUCTWORK AND PIPING FROM BUILDING STRUCTURE AND/OR FRAMING IN AN APPROVED MANNER. WHERE OVERHEAD CONSTRUCTION DOES NOT PERMIT FASTENING OF SUPPORTS AND EQUIPMENT, PROVIDE ADDITIONAL STEEL FRAMING.

- 1.04 EXISTING EQUIPMENT TO REMAIN
 - A. CONTRACTOR SHALL CLEAN AND REFURBISH ALL EXISTING PERIMETER BASEBOARD RADIATORS, INCLUDING BUT NOT LIMITED TO CLEANING COILING COILS, REFURBISHING CONTROLS AND RECALIBRATING THERMOSTATS.
 - B. CONTRACTOR SHALL CLEAN AND REFURBISH ALL EXISTING DUCTWORK.

- 1.05 PREPARATION OF EQUIPMENT AND SYSTEMS
 - A. PROVIDE OPERATING CHARGE OF REFRIGERANT AND OIL.
 - B. PRESSURE TEST ALL PIPING SYSTEMS.

- 2.01 IDENTIFICATION
 - A. VALVES TAGS AND SYSTEMS CHARTS: MINIMUM 2" DIAMETER ALUMINUM TAGS WITH IDENTIFICATION NUMBER AND SYSTEM NUMBERS FOR VALVES & CONTROLS. FASTEN WITH HEAVY ALUMINUM BRASS HOOKS OR CHAIN. NUMBERING AND TYPE OF TAG SHALL FOLLOW EXISTING BUILDING SYSTEM. CHARTS OF SYSTEMS SHALL BE SCHEMATIC WITH LOCATION AND FUNCTION OF TAGGED VALVES. MOUNT ON WOOD PLAQUE WITH CLEAR PLASTIC LAMINATIONS COVERING DIAGRAMS.
 - B. NAMEPLATES: PROVIDE NAMEPLATES (FASTENED WITH EPOXY CEMENT) ON MAJOR EQUIPMENT ITEMS INDICATING UNIT NUMBER.
 - C. PIPING SHALL BE LABELED TO INDICATE SIZE, PURPOSE, AND DIRECTION OF FLOW IN SUCH A MANNER THAT IT CAN EASILY BE READ FROM THE FLOOR. LETTERS SHALL BE NOT LESS THAN 2".

15030 TESTING, BALANCING AND ADJUSTING

- 1.01 GENERAL
 - A. AIR AND WATER SYSTEM BALANCING SHALL BE PERFORMED BY AN INDEPENDENT ORGANIZATION SPECIALIZING IN SYSTEM BALANCING AND PROCEDURES HAVING AT LEAST FIVE (5) YEARS EXPERIENCE AND SHALL BE ASSOCIATED AIR AND WATER BALANCING COMPANY CERTIFIED.
 - B. TEST AND BALANCE HVAC AIR SYSTEMS TO WITHIN +10% , -5% OF DESIGN FLOWS.
 - C. PERFORM TESTS PER AABC NATIONAL STANDARDS OR EQUIVALENT NEBB METHODS. RECORD DATA ON STANDARD AABC OR NEBB FORMS.
 - D. ADJUSTMENTS AND TESTS SHALL BE MADE UNDER SIMULATED MAXIMUM LOAD CONDITIONS.
 - E. MAKE ALL REQUIRED ADJUSTMENTS TO EXISTING AIR SYSTEMS UNTILL ALL SPECIFIED PERFORMANCES ARE MET. BEFORE COMMENCEMENT OF CONSTRUCTION, TEST EXISTING EQUIPMENT TO ESTABLISH OUTPUT, ETC. SUBMIT CERTIFIED REPORTS INCLUDING TOTAL SYSTEM CFM, MOTOR AMPERAGE DRAW, RPT, STATIC PRESSURE, OUTDOOR TEMPERATURE, AT TIME OF TEST. RETURN AIR, MIXED AIR, DISCHARGE AIR AND SETTING OF ALL CONTROLLERS.

- 1.02 EXECUTION
 - A. CHECK FANS AND PUMPS, INSTRUMENTATION DEVICES, CONTROL DEVICES, DAMPERS, ETC., FOR PROPER OPERATION AND CALIBRATION. REPORT DEFICIENCIES WHICH CANNOT BE CORRECTED. MARK AND LOCK DAMPERS AT THEIR PROPER POSITION.
 - B. ADJUST, TEST, AND CONFIRM DESIGN AIR AND WATER FLOW RATES, PRESSURES, TEMPERATURES, AIR AND WATER QUANTITIES, EQUIPMENT SPEED AND MOTOR AMPERAGES FOR EACH SEGMENT BRANCH, AND COMPONENT OF EACH SYSTEM.
 - C. VERIFY THAT DIFFUSER DISCHARGE PATTERNS HAVE BEEN PROPERLY SET. AIR FLOWS SHALL BE BALANCED WITH VOLUME DAMPERS INSTALLED IN BRANCH DUCTWORK. OPPOSED BLADE DAMPERS (OBD) IN THE DIFFUSERS SHALL BE SET IN THE FULLY OPEN POSITION DURING BALANCING. AFTER THE MAIN SYSTEM IS BALANCED WITHIN LIMITS SPECIFIED ABOVE, OBD CAN BE USED FOR MINOR ADJUSTMENTS.
 - D. SET MAXIMUM AND MINIMUM CFM SET POINTS ON ALL NEW AND REUSED VAV BOXES PER DESIGN MAXIMUM AND MINIMUM CFM SCHEDULED ON DRAWINGS.
 - E. DETERMINE REQUIRED MINIMUM STATIC PRESSURE SET POINT OF BASE BUILDING AIR HANDLING UNIT TO ENSURE THAT DESIGN AIRFLOWS ARE ATTAINED. INFORM BUILDING OPERATOR OF THIS REQUIRED SETTING.
- 1.03 SUBMITTALS
 - A. PREPARE REPORT, INCLUDING FORMS AND SUBMIT FOR REVIEW
 - B. ALL SUBMITTALS SHALL INCLUDE ADEQUATE DESCRIPTIVE LITERATURE, CATALOG CUTS, SHOP DRAWINGS AND OTHER DATA NECESSARY ASCERTAIN THAT THE PROPOSED EQUIPMENT AND MATERIALS COMPLY WITH SPECIFICATION REQUIREMENTS. CATALOG CUTS SUBMITTED FOR APPROVAL SHALL BE LEGIBLE AND SHALL CLEARLY IDENTIFY EQUIPMENT BEING SUBMITTED.
 - C. SUBMIT EACH SECTION SEPARATELY AND INCLUDE THE FOLLOWING: INFORMATION WHICH CONFORMS TO CONTRACT REQUIREMENTS. INCLUDE THE MANUFACTURER'S NAME, MODEL OR CATALOG NUMBERS, CATALOG INFORMATION, TECHNICAL DATA SHEETS, SHOP DRAWINGS, PICTURES, NAMEPLATE DATA AND TEST REPORTS AS REQUIRED.

- 15040 MAINTENANCE
 - 1.01 SERVICE CONTRACT
 - A. THIS CONTRACTOR SHALL ASSUME COMPLETE RESPONSIBILITY FOR START-UP AND 24 HOUR/DAY SERVICE WITH A MAXIMUM RESPONSE TIME OF 4 HOURS AND QUARTERLY PREVENTIVE MAINTENANCE (4 MAINTENANCE INSPECTIONS A YEAR) FOR A PERIOD OF ONE YEAR FOR ALL NEW EQUIPMENT, AS INDICATED UNDER "EQUIPMENT". THE COST OF THIS SHALL BE INCLUDED IN THIS CONTRACT.
 - B. THIS ONE YEAR MAINTENANCE CONTRACT SHALL INCLUDE, BUT IS NOT LIMITED TO THE FOLLOWING WORK:
 1. CHECK LINES FOR LEAKAGE OF REFRIGERANT/WATER.
 2. REFILL LINES IF NECESSARY.
 3. LUBRICATE MOTORS.
 4. CHECK OPERATION OF THERMOSTATS AND MAKE CORRECTIONS REQUIRED.
 5. REPLACE RETURN AIR FILTERS.
 6. CLEAN CONDENSER COILS.
 7. CHECK AND TIGHTEN ELECTRICAL CONNECTIONS.
 8. CHECK CONTROLS AND MAKE CORRECTIONS IF NECESSARY.
 9. CHECK FOR NOISE AND VIBRATION.
 10. CHECK REFRIGERANT PRESSURE DURING OPERATION.
 11. CHECK CURRENT (AMPERAGE) DRAW OF ALL MOTORS.
 12. CHECK OPERATION OF CONDENSATE DRAIN SYSTEM.
 13. CHECK AND ADJUST BLOWER FAN BELT TENSION.

- 1.02 GUARANTEE
 - A. CONTRACTOR SHALL FURNISH A WRITTEN GUARANTEE TO REPLACE OR REPAIR PROMPTLY, AND ASSUME FULL RESPONSIBILITY OF ALL EXPENSES INCURRED FOR, ANY WORKMANSHIP AND/OR EQUIPMENT IN WHICH DEFECTS OCCUR WITHIN ONE YEAR FROM DATE OF ACCEPTANCE BY OWNER.

- 15050 SUBMITTAL DATA
 - 1.01 COORDINATION
 - A. ALL PIPING, DUCTWORK, AND EQUIPMENT LAYOUT SHALL BE STAMPED ON 3/8" SCALE DRAWINGS AND SHALL BE COORDINATED AND SUBMITTED BY ALL TRADES. SHOP DRAWINGS SHALL SHOW LOCATION OF ALL NEW AND EXISTING EQUIPMENT, EXISTING WORK AND NEW WORK.

- 1.02 SHOP DRAWINGS
 - A. SUBMIT COORDINATED SHOP DRAWINGS FOR ALL EQUIPMENT, DIFFUSERS, TERMINAL UNITS, AUTOMATIC CONTROL DIAGRAMS, DUCTWORK LAYOUT, PIPING LAYOUT, AND SHEET METAL CONSTRUCTION STANDARDS.
 - B. SUBMIT ALL SHOP DRAWINGS FOR REVIEW AND APPROVAL TO CLIFFORD DIAS P.E., P.C. OFFICE PRIOR TO PURCHASE, FABRICATION AND INSTALLATION.
 - C. SUBMIT AIR AND WATER BALANCE REPORTS.
 - D. FOR COORDINATED DUCTWORK AND PIPING SHOP DRAWINGS, SUBMIT ONE PAPER SET/A AND WHITE PRINTS FOR SUBMISSIONS ON 8-1/2" X 14" OR SMALLER, SUBMIT ONE ORIGINAL AND TWO COPIES. IF SUBMISSIONS ARE CATALOG CUTS: SUBMIT ONE ORIGINAL AND TWO COPIES. ALL CATALOG CUTS SHALL BE COMPLETE.
 - E. WHEN NECESSARY TO ELIMINATE CONFLICTS, THE CONTRACTOR SHALL REVERSE SHOP DRAWINGS AS REQUIRED AT NO ADDITIONAL COST TO THE OWNER.

- 1.03 AS-BUILT DRAWINGS
 - A. CONTRACTOR SHALL SUBMIT "AS-BUILT" RECORD DRAWINGS (SIZE 1/8" = 1" - 0") AS COMPLETION OF PROJECT.

- 1.04 OPERATION, MAINTENANCE MANUALS AND INSTRUCTIONS
 - A. FURNISH TO CLIFFORD DIAS ENGINEERING P.E., P.C. FOUR (4) BOUND AND INDEXED COPIES OF THE FINAL APPROVED INSTALLATION, OPERATIONS AND MAINTENANCE MANUALS FOR NEW EQUIPMENT AND SYSTEMS.
 - B. THE MANUAL SHALL PROVIDE DETAILED INFORMATION ON THE APPROVED INSTALLATION, OPERATION AND USE, TROUBLESHOOTING, PARTS LIST, LUBRICATION AND PERIODIC MAINTENANCE, TOGETHER WITH THE SOURCE OF REPLACEMENT PARTS AND SERVICE FOR THE ITEMS OF EQUIPMENT AND THE SYSTEMS COVERED, INCLUDING ELECTRICAL EQUIPMENT, DEVICES AND SYSTEMS.
 - C. THE MANUAL SHALL INCLUDE "AS-BUILT" RECORD DRAWINGS AND ALL BALANCING REPORTS.
 - D. CONTRACTOR SHALL INCLUDE FOR ONE FULL DAY FOR THE INSTRUCTION OF CLIENTS PERSONNEL AND THE BUILDING ENGINEERS IN THE OPERATION OF THE SYSTEM.

- 3.01 PIPING MATERIALS
 - A. CONDENSER WATER AND HOT WATER PIPING SHALL BE COPPER TYPE "K" PIPE.
 - B. CONDENSATE DISCHARGE PIPING SHALL BE COPPER TYPE "L" PIPE.
 - C. THE MANUAL SHALL INCLUDE "AS-BUILT" RECORD DRAWINGS AND ALL BALANCING REPORTS.
 - D. CONTRACTOR SHALL INCLUDE FOR ONE FULL DAY FOR THE INSTRUCTION OF CLIENTS PERSONNEL AND THE BUILDING ENGINEERS IN THE OPERATION OF THE SYSTEM.

- 15100 SHEET METAL WORK
 - 1.01 STANDARDS
 - A. EXCEPT AS OTHERWISE NOTED, ALL DUCTWORK AND OTHER SHEET METAL WORK SHALL BE INSTALLED IN ACCORDANCE WITH LATEST EDITION OF THE SHEET METAL AND AIR CONDITIONING NATIONAL ASSOCIATION, INC. (SMANRA) "HVAC DUCT CONSTRUCTION STANDARDS". MANUAL DUCTWORK SHALL BE GALVANIZED SHEET STEEL UNLESS OTHERWISE NOTED.
 - B. MINIMUM DUCTWORK STATIC PRESSURE CONSTRUCTION SHALL BE 2" W.G.. DUCTWORK STATIC PRESSURE CONSTRUCTION SHALL BE 4" W.G. FOR OPERATING PRESSURE ABOVE 2" W.G. BUT NOT EXCEEDING 4" W.G. ALL DUCTS SHALL BE "SEE CLASS".
 - C. UNEQUAL ELBOWS ARE NOT ACCEPTABLE, EXCEPT RADIUS BRANCH DUCTWORK WITH THROAT.
 - D. DUCTWORK UPSTREAM OF VARIABLE VOLUME DEVICES SHALL BE PRESSURE CLASS 4 IN. W.G.

- 1.02 FLEXIBLE DUCTS
 - A. SHALL BE SIMILAR TO CLEAFLEX TYPE 127V WITH 1" THICK INSULATION AND SHALL CONFORM TO UL 181 AND NFPA BULLETIN 90A. THE FUEL CONTRIBUTED AND SMOKE DEVELOPED SHALL NOT EXCEED 50 AND FLAME SPREAD SHALL NOT EXCEED 25.
 - B. MAXIMUM LENGTH SHALL NOT EXCEED THREE (3) FEET.
 - C. FLEXIBLE DUCTWORK SHALL ONLY BE PERMITTED BETWEEN DUCTWORK AND SUPPLY DIFFUSERS.
- 1.03 SOUND/NUD DUCTWORK
 - A. SOUNDING SHALL BE ARMACELL FIBER FREE LINER, MIN. 1.5 LB. DENSITY, 1" THICKNESS, MAX. 0.25 K FACTOR AT 75 F. MEAN TEMPERATURE AND MUST HAVE A MAXIMUM WATER VAPOR TRANSMISSION RATE OF 0.0 PERM-IN (FLAME SPREAD LESS THAN 25, SMOKE DEVELOPED LESS THAN 50)
 - B. APPLY LINING WITH ADHESIVE OVER ENTIRE SURFACE AND SECURE WITH WELD RING SPACED 16" ON CENTERS. COAT EDGES WITH SEALER AND PROVIDE SHEET METAL EDGE PROTECTORS. SEALER SHALL BE IN CONFORMANCE WITH NFPA 90. PROVIDE 1" SOUND/NUD FOR MIXED AIR DUCTS. AIR FLOW AND TAILPIECE. GROUND JOINT BRASS/COPPER TYPE ARE NOT ACCEPTABLE.
 - C. DIMENSIONS SHOWN ARE CLEAR INSIDE DIMENSIONS.

- 1.04 FLEXIBLE CONNECTIONS
 - A. NEOPRENE-COATED GLASS FABRIC, 30 OZ. PER SQ.YD. WITH SEWED AND CEMENTED SEAMS, SIMILAR TO VENT FABRICS. PROVIDE FLEXIBLE CONNECTIONS BETWEEN ALL EQUIPMENT AND DUCTWORK.

- 2.01 DEVICES
 - A. VOLUME DAMPERS
 - 1. SAME MATERIAL AS DUCT. PER SMANCA, EXCEPT PROVIDE BEARING AT ONE END OF DAMPER ROD AND QUADRANT, WITH LEVER AND LOCKSCREW AT OTHER END. FOR INSULATED DUCTS, QUADRANTS MOUNTED ON COLLAR TO CLEAR INSULATION, INSTALL WITH LEVERS ACCESSIBLE. BALANCING DAMPERS SHALL BE THE OPPOSED BLADE TYPE.
 - 2. PROVIDE VOLUME DAMPERS ON EACH SUPPLY/EXHAUST UPSTREAM OF VAV TERMINALS), RETURN, AND EXHAUST DUCT TAKE-OFF, AND AT EACH TAKE-OFF TO REGISTER, GRILLE OR DIFFUSER.
 - 3. NOTE: ALL REQUIRED VOLUME DAMPERS NOT BE INDICATED ON DRAWINGS BUT DAMPERS SHALL BE PROVIDED AS NECESSARY FOR BALANCING. SPLITTER DAMPERS, AND EXTRACTORS (ADJUSTABLE TURNING VANES WITH PARALLEL BLADES) SHALL NOT BE USED AS A BALANCING DEVICE.
 - B. ACCESS DOORS: INSULATED OR UNINSULATED, SAME AS DUCT. PROVIDE MINIMUM 20" X 14" ACCESS DOORS ON MAIN DUCTS, 12" X 6" ACCESS DOORS ON BRANCH DUCTS. UNLESS OTHERWISE NOTED, ALL ACCESS DOORS TO BE HINGED, WITH LATCH SIMILAR TO VENTLOCK #100. PROVIDE ACCESS DOORS IN DUCTS ADJACENT TO FIRE DAMPERS, COMBINATION FIRE AND SMOKE DAMPERS, BALANCING DAMPERS, FIRE AND SMOKE DAMPERS, AUTOMATIC DAMPERS (LINKAGE SIDE), COLLS IN DUCTS (ENTERING AND LEAVING SIDE), SMOKE DETECTION HEADS, FAN BEARINGS ENCLOSED IN DUCT AND BOTH SIDES OF DUCTS WHERE NECESSARY TO PROVIDE MAINTENANCE ACCESSIBILITY TO EQUIPMENT ON THE OTHER SIDE.
 - C. TURNING VANES: GALVANIZED STEEL, DOUBLE THICKNESS VANES WITH MINIMUM 2" INSIDE RADIUS. ALL SQUARE ELBOWS SHALL HAVE TURNING VANES.
 - D. ACCESS THE IDENTIFICATIONS: PROVIDE BUTTONS, TABS AND MARKERS TO IDENTIFY LOCATION OF ALL CONCEALED VALVES, DAMPERS, AND EQUIPMENT. SUBMIT TO ARCHITECT FOR APPROVAL.

15200 PIPING

- 1.01 GENERAL
 - A. PIPING SHALL BE COMPLETE WITH PIPE FITTINGS, VALVES, COUPLING, STRAINERS, HANGER RODS, HANGERS, SUPPORTS, GUIDES, SLEEVES, AND ACCESSORIES IN CONFORMANCE WITH THE LATEST CODES AND ASME, ANSI, ASTM, AND MSS STANDARDS.
 - B. NO PIPING SHALL BE LESS THAN 3/4", UNLESS OTHERWISE NOTED.
 - C. FOR PIPE SIZE NOT INDICATED ON PLANS, SEE MANUFACTURER'S EQUIPMENT CONNECTION DETAILS.
 - D. PROVIDE FITTINGS FOR CHANGE IN PIPE SIZE AND FOR FINAL CONNECTION AT EQUIPMENT AS REQUIRED.
 - E. PROVIDE UNION CONNECTIONS AT EACH PIECE OF EQUIPMENT AND ON EACH SIDE OF ALL VALVES AND IN-LINE EQUIPMENT.
 - F. PROVIDE 3/4" DRAIN VALVE AND CAPPED HOSE NIPPLE AT LOW POINTS IN SYSTEMS AND WHERE INDICATED.
 - G. PROVIDE DIELECTRIC GASKETS BETWEEN JOINTS OF DISSIMILAR METALS, SLEEVES, AND WASHERS BETWEEN FLANGES, BOLTS, AND NUTS.
 - H. PROVIDE MINIMUM FITCH TO INSURE ADEQUATE VENTING AND DRAINAGE.
 - I. PROVIDE, AS REQUIRED AUTOMATIC AIR VENTS, MANUAL AIR VENTS AND RELIEF AIR VALVES.

- 2.01 CLEANING AND FILLING
 - A. VOID ENTRY OF FOREIGN MATTER INTO PIPING DURING CONSTRUCTION.
 - B. AFTER COMPLETION OF PIPING, FLUSH WATER SYSTEM WITH WATER UNTIL CLEAR. REMOVE AND CLEAN STRAINER, AND SHUT OFF ALL PIPING LOW POINTS AT THE END OF THE FLUSH PERIOD. REFILL SYSTEM WITH WATER.
 - C. COMPLETELY BLEED SYSTEM OF ALL AIR.
 - D. COORDINATE AND PROVIDE WATER TREATMENT IN ACCORDANCE WITH THE BUILDING STANDARD.
- 2.02 PIPING SUPPORTS
 - A. HORIZONTAL PIPING SHALL BE SUPPORTED BY FORGED STEEL ADJUSTABLE CLEVIS TYPE "CARPENTER & PATTERSON" FIG. #100 OR 100SH OR APPROVED EQUAL.
 - B. HANGER RODS AND MAXIMUM SPACING SHALL BE AS FOLLOWS :

PIPE SIZE	ROD DIAMETER	MAX SPACING
1-1/4 IN. & BELOW	3/8 IN.	6 FT.
1-1/2 IN. & 2 IN.	3/8 IN.	8 FT.
2-1/2 IN. & 3 IN.	1/2 IN.	8 FT.
4 IN.	5/8 IN.	10 FT.
 - C. PROVIDE ADDITIONAL SUPPORTS AT CHANGE OF DIRECTION, RUNOUTS, AND CONCENTRATED LOADS DUE TO VALVES, ETC.
 - D. VERTICAL PIPING SHALL BE SUPPORTED WITH BEARING PLATE ON STRUCTURAL SUPPORT. PROVIDE GUIDES AT EVERY SECOND FLOOR (SPACING NOT TO EXCEED 25FT.) SUPPORT AT TOP SHALL BE PROVIDED WITH SPRING HANGER HAVING A PROVISION FOR EXPANSION.

- 3.01 PIPING MATERIALS
 - A. CONDENSER WATER AND HOT WATER PIPING SHALL BE COPPER TYPE "K" PIPE.
 - B. CONDENSATE DISCHARGE PIPING SHALL BE COPPER TYPE "L" PIPE.
 - C. THE MANUAL SHALL INCLUDE "AS-BUILT" RECORD DRAWINGS AND ALL BALANCING REPORTS.
 - D. CONTRACTOR SHALL INCLUDE FOR ONE FULL DAY FOR THE INSTRUCTION OF CLIENTS PERSONNEL AND THE BUILDING ENGINEERS IN THE OPERATION OF THE SYSTEM.

- 4.02 VALVES
 - A. VALVES FOR WATER AND GLYCOL PIPING SHALL BE SUITABLE FOR THE SERVICE PRESSURE AND TEMPERATURE AND SHALL BE:
 - B. BALL VALVE: AS MANUFACTURED BY "APOLLO".
 - C. GLOBE VALVE: "JENKINS" FIGURE 556P, FIGURE 1200, FIGURE 613-C, OR FIGURE 923-C OR APPROVED EQUAL.
 - D. CHECK VALVE: "WALWORTH" FIGURE 8928F, OR APPROVED EQUAL.
 - E. STRAINER: "Y" TYPE "MULLER" FIGURE 11, FIGURE 751, FIGURE 752 OR APPROVED EQUAL.
 - F. FLOW CONTROL VALVES AND STRAINER VALVE: MANUFACTURED BY AUTOFLOW, INC. (973-927-9900)
- AC: AUTOFLOW COMBINATION BALL VALVE, AUTOFLOW REGULATOR AND UNION WITH SEVEN ACCESSORY PORT LOCATIONS. UNIT IS FACTORY SET TO AUTOMATICALLY LIMIT THE GPM TO WITHIN 5% OF THE SPECIFIED AMOUNT.
- YC: COMBINATION BALL VALVE, WYE STRAINER AND UNION WITH SEVEN ACCESSORY PORT LOCATIONS. 2053 STAINLESS STEEL STRAINER IS REMOVABLE FROM THE VALVE BODY FOR INSPECTION AND CLEANING WITHOUT BREAKING THE VALVE.
- UP: UNION AND PORT SELECTION WITH FOUR OPTION LOCATIONS. 1/2"-2 1/2" BRASS "O"-RING TYPE UNION. VITON"O"-RING, BRASS NUT AND TAILPIECE. GROUND JOINT BRASS/COPPER TYPE ARE NOT ACCEPTABLE.

- 4.03 PRESSURE GAUGES
 - A. PRESSURE GAUGES SHALL BE BOURDON SPRING TYPE AS MANUFACTURED BY 5S GAUGE, LONGERAN, TRECCE, MARSH, ASHCROFT, OR AS APPROVED EQUAL.
 - B. ALL GAUGES SHALL BE INSTALLED SO AS TO BE EASILY READABLE FROM THE FLOOR.
 - C. GAUGES SHALL BE FITTED WITH RAY PRESSURE SNUBERS AS MANUFACTURED BY AMERICA, TRECCE, WEISS, OR APPROVED EQUAL.
 - D. THE SCALE RANGE SHALL BE 50 PSI TO 150 PSI.
- 4.04 THERMOMETERS
 - A. THERMOMETERS SHALL BE BUILDING WELL TYPE AS MANUFACTURED BY AMERICA, TRECCE, WEISS, OR APPROVED EQUAL AND SHALL BE 5" HERMETICALLY SEALED, BI-METAL, DIAL THERMOMETERS WITH STAINLESS STEEL CASED ANTIPARALLAX DIAL (WITH RAISED VET BLACK FINISH), STAINLESS STEEL STEMS AND BRASS SEPARABLE SOCKETS.
 - B. ALL THERMOMETERS SHALL BE INSTALLED IN SUCH A MANNER AS TO CAUSE A MINIMUM OF RESTRICTION TO FLOW IN THE PIPES AND SO THAT THEY CAN EASILY BE READ FROM THE FLOOR.
 - C. THE SCALE RANGE FOR THE THERMOMETER SHALL BE 30 F TO 250 F.

- 4.05 PRESSURE/TEMPERATURE PORTS
 - A. PROVIDE PETE PLUGS AS INDICATED ON DRAWINGS.

- 5.01 TESTING
 - A. WATER PIPING SYSTEM SHALL BE HYDROSTATICALLY TESTED TO 1.5 TIMES OPERATING PRESSURE BUT NOT LESS THAN 150 PSI.

- 6.01 SLEEVES FOR PIPING
 - A. SLEEVES FOR WEATHERPROOF AND FIRE-RATED WALLS, FLOORS AND MECHANICAL EQUIPMENT ROOM SHALL BE CAST IRON OR STEEL PIPE EXTENDING THROUGH CONSTRUCTION. EXTEND SLEEVES MINIMUM 2" ABOVE FLOOR. SLEEVES FOR WEATHERPROOF CONSTRUCTION SHALL BE OF THE FLASHING TYPE AND SHALL BE AS REQUIRED BY THE BUILDING OWNER.
 - B. FOR INSULATED PIPE, SLEEVES SHALL BE SIZED TO ALLOW FOR INSULATION TO PASS THROUGH SLEEVE.

15300 INSULATION

- 1.01 GENERAL
 - A. ALL INSULATION MATERIALS INCLUDING JACKETS, FACING, ADHESIVE, COATING AND ACCESSORIES SHALL BE FIRE AND SMOKE HAZARD RATED AND LISTED BY UNDERWRITERS LABORATORIES INC. AND COMPLY WITH UL 723 (ASTM E-84). THE FUEL CONTRIBUTED AND SMOKE DEVELOPED SHALL NOT EXCEED 50 AND FLAME SPREAD SHALL NOT EXCEED 25.

1.02 DUCTWORK INSULATION

- A. INSULATE ALL NEW DUCTWORK AND PATCH/REPAIR EXISTING DUCTWORK EXCEPT WHERE SOUNDING/LINE IS MINIMUM THICKNESS SPECIFIED FOR INSULATION.
- B. DUCTWORK SHALL BE INSULATED WITH 1" THICK 3/4 LB. DENSITY FIBERGLASS BLANKET, MAXIMUM 0.28 K-FACTOR AT 75 F MEAN TEMPERATURE WITH FACTORY APPLIED FOIL-SCRM-KRAFT-FACING. VAPOR SEAL IS REQUIRED.
- C. WHERE MANUFACTURED, USE FACTORY PREMOLDED FITTINGS (OF THE SAME MATERIAL AND THICKNESS AS THE PIPE INSULATION) FOR FITTINGS, FLANGES AND VALVES. WHERE PREMOLDED INSULATION FITTINGS ARE NOT MANUFACTURED, INSULATE FITTINGS, FLANGES AND VALVES WITH MITERED SEGMENTS OF THE SAME DENSITY AS THE ADJOINING INSULATION COVERING.
- D. INSULATION THICKNESS SHALL BE AS FOLLOWS:

INDOOR	OUTDOOR
CONDENSATE DRAIN PIPING	1/2 IN.
CONDENSER PIPING	1-1/2 IN.
PIPING UP TO 4 INCH IPS	2 IN.
PIPING 5 INCH AND ABOVE	2-1/2 IN.
HOT WATER PIPING FROM 100 TO 250 F	1-1/2 IN.
PIPING UP TO 2 INCH IPS	2 IN.
PIPING 2-1/2 INCH TO 4 INCH	2 IN.
PIPING 5 INCH AND ABOVE	2-1/2 IN.
3 IN.	

- 2.01 EXECUTION
 - A. PRIOR TO APPLYING ANY INSULATION, ALL PRESSURE AND LEAK TESTS SHALL BE COMPLETE AND APPROVED. ALL INSULATION SHALL BE BUTTED FIRMLY. USE 2 IN. LAP STRIPS AT ALL SEAMS SECURED WITH ADHESIVE. NO STAPLES ARE PERMITTED. APPLY COAT OF VAPOR SEAL ADHESIVE WHERE REQUIRED.
 - B. ALL INSULATION AND VAPOR BARRIER SHALL BE CONTINUOUS PASSING THRU SLEEVES ETC.
 - C. INSULATION OF STRAINERS, EXPANSION JOINTS, FITTINGS, AND ACCESSORIES REQUIRING SERVICING OR INSPECTION SHALL BE ARRANGED FOR REMOVAL AND REPLACEABLE WITHOUT DAMAGE AND ENCLOSED WITHIN TWO 1B GAUGE ALUMINUM COVERS FLANGED AND BOLTED.
 - D. NO HANGERS SHALL BE EMBEDDED IN INSULATION. PROVIDE INSULATION PROTECTION SADDLES AND SHIELDS.

- 15400 VIBRATION ISOLATORS
 - 1.01 GENERAL
 - A. FOR EQUIPMENT, PIPING AND DUCTWORK, FURNISH AND INSTALL COMPLETE VIBRATION ISOLATION SYSTEM WITH VIBRATION ISOLATORS, FOUNDATIONS AND SUPPORTS.
 - B. FOR CEILING MOUNTED EQUIPMENT ISOLATORS SHALL BE MASON INDUSTRIES COMBINATION SPRING/ ELASTOMER HANGER TYPE 30N.

15500 AIR DISTRIBUTION DEVICES

- 1.01 DIFFUSERS, GRILLES AND ACCESSORIES
 - A. DIFFUSERS AND GRILLES SHALL BE AS FOLLOWS:
- TYPE DESCRIPTION
 - AD NAILOR SQUARE CEILING DIFFUSER WITH REMOVABLE CORE MODEL PSI
 - AE PROVIDE DIELECTRIC FITTINGS FOR JOINTS OF DISSIMILAR METALS. ISOLATING GASKETS, SLEEVES AND WASHERS BETWEEN FLANGES, BOLTS, AND NUTS.
 - AG RETURN GRILLES SHALL BE NAILOR MODEL 5145H FOR LAY IN T-BAR CEILING (45° DEFLECTION). CONTRACTOR SHALL COORDINATE BORDER TYPE WITH ARCHITECTURAL DRAWINGS.
 - ALD NAILOR FLOW BAR GRILLE SHALL BE FLH SERIES WITH PATTERN CONTROLLER. BORDER TYPE SHALL BE COORDINATED WITH ARCHITECT. SEE DETAILS PLAN FOR SLOT WIDTH.
 - AM FINISH FOR DIFFUSERS AND GRILLES SHALL BE BAKED ENAMEL TO MATCH COLOR SAMPLE AS APPROVED BY ARCHITECT.
 - AN ALL DIFFUSERS SHALL BE FURNISHED WITH OPPOSED BLADE DAMPERS.

- 15600 EQUIPMENT
 - 1.00 MOTORS
 - A. ALL MOTORS SHALL BE AS PER NEMA STANDARDS WITH NEMA SERVICE FACTOR RATINGS.
 - B. TYPE OF ENCLOSURE SHALL BE AS REQUIRED FOR SPECIFIC APPLICATION.
 - 1.01 MAGNETIC STARTERS
 - A. PROVIDE COMBINED UNFUSED DISCONNECT SWITCH ACROSS-THE-LINE MAGNETIC STARTERS FOR ALL MOTORS WITH HOA SELECTOR SWITCH, PILOT LIGHTS AND AUXILIARY CONTACTS AS REQUIRED FOR INTERLOCKING AND REMOTE START/STOP.
 - 1.02 ELECTRICAL CHARACTERISTICS
 - A. IT SHALL BE THE RESPONSIBILITY OF THIS CONTRACTOR TO ENSURE THAT THE VOLTAGE AND CURRENT CHARACTERISTICS OF THE ELECTRICAL EQUIPMENT FURNISHED BY HIM SHALL BE SUITABLE FOR THE ELECTRICAL SERVICES AS SPECIFIED.