15010 - BASIC MECHANICAL REQUIREMENTS

A. CODES & REFERENCES

1. FLORIDA BUILDING CODE 2014 (WITH AMENDMENTS)
2. SMACNA
3. NFPA 101
4. NFPA 90A
5. NFPA 99

B. SCOPE OF WORK

1. PROVIDE ALL REQUIRED PERMITS, LABOR, MATERIAL AND EQUIPMENT REQUIRED TO COMPLETE THE SCOPE OF THE PROJECT SHOWN ON THE DRAWINGS AND READY FOR OCCUPANCY AND USE BY OWNER. THE WORK SHALL INCLUDE BUT IS NOT LIMITED TO:
   a. CLEANING AND TESTING
   b. INSTRUCTION TO OWNER'S PERSONNEL
2. PROVIDE ALL BUILDING PENETRATIONS REQUIRED TO COMPLETE PROJECT. ALL PENETRATIONS TO BE PATCHED AND SEALED TO BE WATERTIGHT. MAINTAIN FIRE RATINGS OF EXISTING STRUCTURE.
3. PROVIDE ALL NECESSARY DUCT, EQUIPMENT AND PIPE SUPPORTS AND MATERIALS REQUIRED FOR INSTALLATION. PER THE REQUIREMENTS OF LOCAL, STATE OR FEDERAL CODES.
4. NOT ALL COMPONENTS REQUIRED ARE INDICATED ON THESE DRAWINGS. REFER TO MANUFACTURERS INSTRUCTIONS FOR ADDITIONAL REQUIREMENTS INCLUDING CONNECTION LOCATIONS, TYPES AND SIZES. PROVIDE ISOLATING VALVES AND UNIONS AT ALL EQUIPMENT CONNECTIONS.

C. REQUIRED SHOP DRAWINGS:

1. INSULATION
2. AIR DEVICES
3. DUCTWORK COORDINATION DRAWINGS
4. CONTROLS
5. AIR HANDLING EQUIPMENT
6. THERMOSTATS
7. FANS
8. TERMINAL BOXES
9. FILTERS
10. FIRE AND SMOKE DAMPERS

D. MAINTENANCE MANUALS

1. PROVIDE MAINTENANCE MANUALS TO OWNER(S) FOR ALL NEW EQUIPMENT CONTAINING ALL OPERATING AND MAINTENANCE DATA, SUBMITTALS, WARRANTEES, DIAGRAMS, AHRI CERTIFICATES, INSPECTION REPORTS AND VALVE LISTS IN A 3 RING BINDER WITH POCKETS FOR DRAWINGS. PROVIDE OWNER WITH 2 COPIES.
2. PROVIDE AN INDEX INSIDE THE BINDER COVER WITH A LIST OF EACH EQUIPMENT ITEM. EACH ITEM SHALL BE INDIVIDUALLY TABBED.
3. PROVIDE A LIST OF ALL REQUIRED REGULAR MAINTENANCE ACTIONS.
4. MAINTENANCE LIST SHALL REFERENCE TABULATED ITEM AND SHALL INCLUDE THE TITLE OR PUBLICATION NUMBER FOR THE OPERATION AND MAINTENANCE MANUAL FOR THAT PARTICULAR MODEL AND TYPE OF PRODUCT.

E. AS-BUILT DRAWINGS

1. THE CONTRACTOR SHALL MAINTAIN AN ACCURATE RECORD OF ALL CHANGES MADE TO THE CONTRACT DOCUMENTS (AS-BUILT).
2. THE CONTRACTOR SHALL PROVIDE THE ENGINEER 2 SETS OF COMPLETED AS-BUILT DRAWINGS.
3. THE PROJECT WILL NOT BE CONSIDERED COMPLETE UNTIL ACCURATE AS-BUILTS ARE DELIVERED.

F. SUBSTITUTIONS

1. EQUIPMENT AND DESIGN OF SYSTEMS INDICATED ON THE DESIGN DRAWINGS AND WITHIN THESE SPECIFICATIONS SHALL BE CONSIDERED AS "SPECIFIED STANDARD" OF QUALITY. NO SUBSTITUTIONS SHALL BE MADE WITHOUT PRIOR WRITTEN APPROVAL OF THE ENGINEER 10 DAYS PRIOR TO BID DATE.
2. ANY DEVIATION FROM SPECIFIED EQUIPMENT THAT AFFECTS THE ELECTRICAL REQUIREMENTS SHALL BE COORDINATED BY THE MECHANICAL CONTRACTOR AND EQUIPMENT VENDOR WITH THE ELECTRICAL CONTRACTOR PRIOR TO SUBMITTING BIDS.

G. WIND LOADS

1. ALL EQUIPMENT TO BE MOUNTED OUTSIDE SHALL BE FURNISHED WITH A NOA (NOTICE OF ACCEPTANCE) FOR WINDSTORM OR BE FURNISHED WITH AN ENGINEERED DETAIL GOOD FOR THE LOCAL WIND RATE.

15050 - BASIC MATERIALS AND METHODS

A. ACCESS PANELS - FURNISHED BY MECHANICAL CONTRACTOR, INSTALLED BY GENERAL CONTRACTOR.

1. PROVIDE FOR ACCESS TO ALL SERVICEABLE EQUIPMENT IN WALLS AND CEILINGS
2. MICOR STYLE M FOR DRYWALL
3. MICOR STYLE K FOR PLASTER
4. MINIMUM SIZE 16"x16"
5. NYSTROM, KARP, J.L. INDUSTRIES OR WILLIAMS PAINT

B. LABELING

1. PROVIDE RIGID PLASTIC EMBOSSED EQUIPMENT NAMETAGS FOR ALL NEW EQUIPMENT AND DISCONNECTS. SETON NAMEPLATE CORPORATION.
2. PAINT ALL MECHANICAL PIPING IN EQUIPMENT ROOMS, BOILER ROOMS AND WHERE EXPOSED OR OUTDOORS. MATCH EXISTING COLOR CODES USED ON SIMILAR SYSTEMS.
3. PROVIDE VALVE TAGS ON ALL NEW AND RELOCATED VALVES. VALVE TAGS SHALL MATCH TAGS USED AT THE EXISTING FACILITY. TAGS TO BE SECURED TO VALVES WITH BRASS CHAINS. PROVIDE UPDATED INFORMATION ON ALL NEW VALVES TO THE EXISTING VALVE CHART.
4. PROVIDE PIPE LABELS ON ALL NEW PIPING. PIPE LABELS TO MATCH SIZE, COLOR AND TYPE USED AT THE EXISTING FACILITY AND COMPLY WITH ANSI A1 3.1. LABELS SHALL BE APPLIED CLOSE TO VALVES, CHANGES IN PIPE DIRECTIONS, BRANCHES, PIPES PASSING THRU WALLS OR FLOORS AND EVERY 20 FEET IN STRAIGHT RUNS OF PIPING AND AT LEAST ONE TIME PER ROOM.

C. FLASHING AND COUNTER FLASHING

1. FURNISH MATERIALS AND COORDINATE INSTALLATION FOR ALL PENETRATIONS OF ROOF BY ALL DUCT AND PIPE
2. SHEET METAL - 24ga. ASTM A525
3. SHEET LEAD 6 lbs. PER SQ. FT. (WHERE ALLOWED)
4. STAINLESS STEEL 20 ga.
5. SHEET COPPER 24 oz. PER SQ. FT.

D. MECHANICAL SYSTEMS CLEANING

1. CLEAN AND TOUCH UP ALL FACTORY FINISHES
2. FLUSH ALL HVAC SYSTEMS BEFORE CONNECTION TO EQUIPMENT
3. CLEAN ALL CLOSED HVAC SYSTEMS WITH ALKALINE CLEANER CIRCULATED FOR 72 HOURS
4. PRESSURE TEST ALL MECHNICAL PIPING SYSTEMS
   a. STEAM SYSTEMS 150 psi FOR SIX HOURS
   b. WATER SYSTEMS 150 psi FOR SIX HOURS

E. CLEANING TESTING AND ADJUSTING

1. THE MECHANICAL CONTRACTOR, AT HIS EXPENSE, SHALL CLEAN, REPAIR, ADJUST, CHECK, BALANCE AND PLACE IN SERVICE THE VARIOUS SYSTEMS HEREIN SPECIFIED WITH THEIR RESPECTIVE EQUIPMENT, ACCESSORIES AND PIPING. HE/SHE SHALL FURNISH ALL LABOR, MATERIALS, EQUIPMENT AND TOOLS REQUIRED TO PERFORM TESTS REQUIRED BY THESE SPECIFICATIONS AND BY THE GOVERNING AUTHORITIES.
2. NO WORK SHALL BE COVERED OR CONCEALED UNTIL PROPERLY INSPECTED AND TESTED.

F. HANGERS AND SUPPORTS

1. PROVIDE ALL NECESSARY DUCTWORK, PIPE SUPPORTS, HANGERS, RODS, CLAMPS AND ATTACHMENTS TO PROPERLY INSTALL AND SUPPORT DUCTWORK, PIPING AND EQUIPMENT FROM THE BUILDING STRUCTURE.
2. PROVIDE ANY ANGLE IRON OR UNISTRUT AND SUSPENSION RODS REQUIRED TO INSTALL EQUIPMENT, PIPING AND DUCTWORK.
3. ALL SUPPORTS EXPOSED TO OUTDOORS SHALL BE CLEANED, PRIMED AND PAINTED TO PREVENT RUSTING. FINISH COLOR AS SELECTED BY OWNER.
4. THE USE OF BALING WIRE OR PERFORATED METAL STRAPPING IS NOT PERMITTED FOR SUPPORTS.

G. WARRANTY/GUARANTEE

1. THE CONTRACTOR SHALL WARRANTY/GUARANTEE AND MAINTAIN THE STABILITY OF WORK AND MATERIALS AND KEEP SAME IN PERFECT REPAIR AND CONDITION OF THE PERIOD OF ONE YEAR.
2. DEFECTS OF ANY KIND DUE TO THE FAULTY WORK OR MATERIALS APPEARING DURING THE ABOVE MENTIONED PERIOD MUST BE IMMEDIATELY MADE GOOD BY THE CONTRACTOR AT HIS OWN EXPENSE TO THE ENTIRE SATISFACTION OF THE OWNER AND ENGINEER. SUCH RECONSTRUCTION AND REPAIRS SHALL INCLUDE DAMAGE TO THE FINISH OR FURNISHING OF THE BUILDING RESULTING FROM THE ORIGINAL DEFECT OR REPAIR THERETO.

15250 - INSULATION

A. INSULATION, ADHESIVES, COATINGS, SEALERS, TAPES, ETC. SHALL HAVE A FLAME SPREAD OF 25 OR LESS AND SMOKE DEVELOPMENT OF 50 OR LESS IN ACCORDANCE WITH ASTM E-84, NFPA 225, UL 723 AND MEET THE REQUIREMENTS OF NFPA 90A. ALL INSULATING R-VALUES TO MEET THE REQUIREMENTS OF THE FLORIDA ENERGY CODE.

B. BLANKET TYPE DUCT INSULATION, JOHNS MANVILLE, CERTAINTEED, KNAUF, OWENS CORNING, MINIMUM R=6.0, FOIL FACED KRAFT VAPOR BARRIER:

1. ALL SUPPLY, OUTSIDE AIR AND RETURN WHERE CONCEALED FROM VIEW, R-6

C. SEMI RIGID BOARD TYPE DUCT INSULATION 1.5lb DENSITY, CERTAINTEED 1B-300, JOHNS MANVILLE, KNAUF, OWENS CORNING:

1. ALL SUPPLY, RETURN AND OUTSIDE AIR WHERE EXPOSED
2. MINIMUM DUCT INSULATION THICKNESS AND R VALUES ARE AS FOLLOWS:
   a. SUPPLY AND RETURN AIR IN UNCONDITIONED SPACE: 2" (R-6 MIN.)
   b. SUPPLY AND RETURN AIR IN CONDITIONED INTERIOR SPACE: 1.5" (R-4.2 MIN.)
   c. OUTSIDE AIR: 2" (R-6 MIN.)
   d. SUPPLY AIR IN CEILING RETURN AIR PLENUM: 1.5" (R-4.2 MIN.)
   e. RETURN AIR IN CEILING RETURN AIR PLENUM: NOT REQUIRED
   f. DUCTWORK OUTSIDE OF BUILDING: 3" (R-8 MIN.)

D. FLEXIBLE ELASTOMERIC INSULATION, ARMSTRONG "AP ARMAFLEX", MITCHEL, RUBATEX :

1. CONDENSATE DRAINS - 3/4 " THICK
2. REFRIGERATION MACHINE EVAPORATOR - 2 LAYERS - 3/4 " THICK
3. REFRIGERATION SUCTION LINES: 3/4 " THICK
4. SUPPLY AND RETURN DUCT WITHIN 10 FEET OF RTU - 1" THICK
5. ALL OUTDOOR EXPOSED PIPING INSULATION SHALL BE PAINTED WITH TWO COATS OF ARMAFLEX STANDARD WHITE WB FINISH. PRIOR TO APPLYING THE FINISH, THE INSULATION SHALL BE WIPED CLEAN WITH DENATURED ALCOHOL. THE FINISH SHALL NOT BE TINTED.
6. ALL OUTDOOR EXPOSED PIPING SHALL HAVE THE SEAMS LOCATED ON THE LOWER HALF OF THE PIPE.
7. CONTACT MANUFACTURER FOR ALTERNATIVE PRODUCTS.

15890 - SHEETMETAL DUCTWORK

A. ALL DUCT TO BE INSTALLED ACCORDING TO LATEST SMACNA STANDARDS

B. ALL DUCT EXCEPT THAT SPECIFICALLY SHOWN IS TO BE GALVANIZED. RETURN, EXHAUST AND DUCT DOWNSTREAM OF CV BOXES TO BE 0-2" PRESSURE CLASS. SUPPLY DUCT FROM FAN TO CV OR VAV BOX TO BE 4" CLASS

C. ALL SYSTEMS TO BE LEAKAGE TESTED

15910 - SHEETMETAL ACCESSORIES

A. AIR INLETS AND OUTLET

1. REFER TO SCHEDULE
2. ALL ALUMINUM CONSTRUCTION
3. ACCEPTABLE MANUFACTURERS: TITUS, PRICE, METAL-AIRE, CARNES, ANEMOSTAT, NAILOR

B. FIRE DAMPERS

1. FIRE DAMPERS SHALL BE TYPE "B" CURTAIN TYPE, SUITABLE FOR EITHER VERTICAL OR HORIZONTAL INSTALLATION, WITH 20 GAUGE STEEL CHANNEL FRAMES, 24 GAUGE STEEL BLADES AND 18 GAUGE STEEL ENCLOSURE WITH DUCT COLLARS. ALL PARTS GALVANIZED MILL FINISH.
2. FIRE DAMPERS SHALL BE EQUAL TO RUSKIN TYPE IBD2 FOR WALLS UP TO 2 HOURS.
3. INSTALL IN ACCORDANCE WITH NFPA-90A, TESTED IN ACCORDANCE WITH UL SAFETY STANDARD 555.
4. FURNISH FIRE DAMPERS AND ACCESS DOORS IN ALL DUCTS PENETRATING ANY RATED CONSTRUCTION AND WHERE INDICATED ON DRAWINGS.
5. USE FOLDING BLADE TYPE "C" IN HIGH VELOCITY ROUND DUCTS. USE FOLDING BLADE TYPE FOR SQUARE AND RECTANGULAR DUCTS, AS DETAILED.
6. FIRE DAMPERS SHALL BEAR THE 1 HOUR UNDERWRITER'S LABORATORY UL SAFETY STANDARD 555, RATED PROTECTION REQUIRED, 165°F FUSIBLE LINK.
7. ACCEPTABLE MANUFACTURERS SHALL BE RUSKIN, AIR BALANCE, GREENHECK, AND NAILOR.

C. COMBINATION FIRE/SMOKE DAMPERS

1. TYPE "B" FOR ALL LOCATIONS, WITH ACCESS DOORS. ALL DAMPERS SHALL BE INSTALLED IN ACCORDANCE WITH NFPA-90A AND TESTED IN ACCORDANCE WITH UL SAFETY STANDARDS 555S.
2. ALL DAMPERS SHALL BEAR THE UL SAFETY STANDARD 555S LABEL FOR THE COMPLETE ASSEMBLY. DAMPERS SHALL BE RATED FOR 1 1/2 HOUR PROTECTION WITH 165°F FUSIBLE LINK, EQUAL TO RUSKIN FSD-35. MOTOR OPERATOR PNEUMATIC TO MATCH EXISTING OR ELECTRIC VOLTAGE SHALL BE 24 VOLT UNLESS INDICATED ON PLANS. COORDINATE WITH FIRE ALARM CONTROL AND ELECTRICAL CONTRACTORS. DESIGNER NOTE TO COORDINATE WITH ELECTRICAL TO VERIFY VOLTAGE.
3. UNLESS OTHERWISE REQUIRED BY THE AUTHORITY HAVING JURISDICTION, SLEEVES FOR FIRE DAMPERS AND FIRE SMOKE COMBINATION DAMPERS SHALL BE THE RIGID TYPE OF CONSTRUCTION RECOMMENDED IN SCHEDULE 2 OF SMACNA PUBLICATION FOR "FIRE DAMPER AND HEAT STOP GUIDE FOR AIR HANDLING SYSTEMS". USE 16 GAUGE FOR DUCTS 24" OR LESS IN DIAMETER OR EITHER RECTANGULAR DIMENSION AND 14 FOR DUCTS OVER 24". PROVIDE MINIMUM 18" LONG SLEEVES.

D. FLEXIBLE DUCTWORK

1. TO BE FLEXMASTER TYPE 3, WIREMOLD TYPE WCK OMNIAIR 1200, OR THERMAFLEX
2. FLEXIBLE DUCTWORK SHALL BE ACOUSTICAL LOW PRESSURE TYPE WITH INTERIOR LINER, METAL HELIX, FIBERGLASS INSULATION WITH AN R VALUE OF 6.0 OR GREATER AND COPOLYMER SEAMLESS OUTSIDE SLEEVE. THE ENTIRE FLEXIBLE DUCT ASSEMBLY SHALL BE LISTED IN ACCORDANCE WITH UL-181 CLASS 1 AIR DUCT MATERIAL. THE MAXIMUM LENGTH OF ANY FLEX DUCT SHALL BE 6'-0". FLEXIBLE DUCTWORK SHALL MEET THE FLORIDA MODEL ENERGY EFFICIENCY CODE. ALL JOINTS AT CONNECTIONS TO DIFFUSERS AND DUCTWORK SHALL BE SEALED WITH GLASS, FABRIC AND MASTIC.
3. FLEXIBLE NON-INSULATED DUCT SHALL BE FLEXMASTER ALUMINUM TRIPLE-LOCK METAL DUCT, MODEL NI-TL OR APPROVED EQUAL, ETL CLASS 0, MAXIMUM LENGTH USED SHALL BE 6 FT.

E. FLEXIBLE INSULATED DUCT FOR SUPPLY AND RETURN AIR.

1. FLEXIBLE DUCT: UL 181, CLASS 1, MULTIPLE LAYERS OF ALUMINUM LAMINATE SUPPORTED BY HELICALLY WOUND, SPRING-STEEL WIRE; FIBROUS-GLASS INSULATION; POLYETHYLENE OR ALUMINIZED VAPOR-BARRIER FILM. FLEXMASTER, MASTERDUCT TYPE 5M LOW PRESSURE INSULATED OR EQUAL.
   a. PRESSURE RATING: 10-INCH WG POSITIVE AND 1.0-INCH WG NEGATIVE
   b. MAXIMUM AIR VELOCITY: 4000 FPM
   c. TEMPERATURE RANGE: MINUS 20 TO PLUS 210 DEG F
   d. INSULATION R-VALUE: COMPLY WITH ASHRAE/IESNA 90.1, R-6 MINIMUM
   e. FLAME SPREAD: LESS THAN 25
   f. SMOKE DEVELOPED: LESS THAN 50
2. CONNECT FLEXIBLE DUCTS TO METAL DUCTS, DIFFUSERS, OR TAKE-OFFS WITH DRAW BANDS AND PRESSURE SENSITIVE TAPE.
3. COMPLY WITH FMC SECTION 603, DUCT CONSTRUCTION AND INSTALLATION.
4. SPLICING OF TWO OR MORE SECTIONS SHALL NOT BE PERMITTED. DO NOT EXCEED CENTERLINE BEND RADIUS OF 1.5 X DIAMETER. TRIM DUCTS TO PROPER LENGTHS AND DO NOT ALLOW DUCTS TO SAG.
5. DUCTS SHALL BE SUPPORTED WITH APPROVED HANGERS IN ACCORDANCE WITH THE REQUIREMENTS OF FMC SECTIONS 603.10.1 THROUGH 603.10.3, OR BY OTHER APPROVED DUCT SUPPORT SYSTEMS DESIGNED IN ACCORDANCE WITH THE FLORIDA BUILDING CODE. FLEXIBLE DUCTS SHALL BE CONFIGURED AND SUPPORTED SO AS TO PREVENT THE USE OF EXCESS DUCT MATERIAL, PREVENT DUCT DISLOCATION OR DAMAGE, AND PREVENT CONSTRICTION OF THE DUCT BELOW THE RATED DUCT DIAMETER IN ACCORDANCE WITH THE FOLLOWING REQUIREMENTS:
   a. DUCTS SHALL BE INSTALLED FULLY EXTENDED. THE TOTAL EXTENDED LENGTH OF DUCT MATERIAL SHALL NOT EXCEED 5 PERCENT OF THE MINIMUM REQUIRED LENGTH FOR THAT RUN.
   b. BENDS SHALL MAINTAIN A CENTER LINE RADIUS OF NOT LESS THAN ONE DUCT DIAMETER.
   c. TERMINAL DEVICES SHALL BE SUPPORTED INDEPENDENTLY OF THE FLEXIBLE DUCT.
   d. HORIZONTAL DUCT SHALL BE SUPPORTED AT INTERVALS NOT GREATER THAN 5 FEET. DUCT SAG BETWEEN SUPPORTS SHALL NOT EXCEED 1/2 INCH (12.7 MM) PER FOOT OF LENGTH. SUPPORTS SHALL BE PROVIDED WITHIN 1-1/2 FEET OF INTERMEDIATE FITTINGS AND BETWEEN INTERMEDIATE FITTINGS AND BENDS. CEILING JOISTS AND RIGID DUCT OR EQUIPMENT MAY BE CONSIDERED TO BE SUPPORTS.
   e. VERTICAL DUCT SHALL BE STABILIZED WITH SUPPORT STRAPS AT INTERVALS NOT GREATER THAN 6 FEET.
   f. HANGERS, SADDLES AND OTHER SUPPORTS SHALL MEET THE DUCT MANUFACTURER'S RECOMMENDATIONS AND SHALL BE OF SUFFICIENT WIDTH TO PREVENT RESTRICTION OF THE INTERNAL DUCT DIAMETER. IN NO CASE SHALL THE MATERIAL SUPPORTING FLEXIBLE DUCT THAT IS IN DIRECT CONTACT WITH IT BE LESS THAN 1-1/2 INCHES WIDE.

F. TERMINAL CONNECTORS

1. GENERAL - CONNECTORS SHALL BE RATED FOR 12" W.G., AND MEET NFPA 90A REQUIREMENTS. DUCT SHALL BE FABRICATED OR ALUMINUM SPIRAL HELIX AND REINFORCED RIP STOP ALUMINUM POLYESTER. PRESSURE DROP SHALL NOT EXCEED 0.6"/100'-0" AT 1000 FPM. WHERE INSULATION IS REQUIRED, FURNISH FACTORY APPLIED FIBERGLASS WITH REINFORCED VAPOR-BARRIER JACKET. INSULATION CONDUCTANCE VALUE SHALL NOT EXCEED 0.23. NON-INSULATED DUCT SHALL BE EQUAL TO FLEXMASTER TYPE 3. INSULATED DUCT SHALL BE EQUAL TO FLEXMASTER 3M.
2. HIGH VELOCITY - MAXIMUM DEVELOPED LENGTH OF CONNECTOR SHALL BE 6'-0". USE METAL DUCTS AND FITTINGS TO REACH WITHIN 6'-0" WHERE CONNECTORS ARE ATTACHED TO INSULATED DUCT, FURNISH INSULATED FLEXIBLE DUCT.

G. BALANCING DAMPERS

1. GENERAL - IN ALL DUCTWORK SYSTEMS, PROVIDE DAMPERS FOR PROPER CONTROL AND BALANCING OF AIR QUANTITIES. CONCEALED DAMPERS TO HAVE CONCEALED DAMPER REGULATOR. ALL COMPONENTS FOR PROPER OPERATION; (i.e. GEARS, LINKAGES, CABLE, ETC.) SHALL BE INCLUDED.
2. TYPE: OPPOSED BLADE.
3. MATERIAL: STEEL, 3V TYPE BLADES MOUNTED IN STEEL CHANNEL FRAME.
4. SHAFT: 1/2 " SQUARE ROD OPERATOR WITH END BEARINGS AND GASKET SEAL AT DUCT PENETRATIONS. TERMINATE SHAFT IN DAMPER FRAME WITH BUSHINGS.
5. OPERATOR: LOCKING QUADRANT HANDLE WITH DAMPER POSITION INDICATOR AND INSULATION STAND OFF MOUNTING BRACKET FOR EXTERNALLY INSULATED DUCTWORK.

H. ACCESS DOORS

1. ACCEPTABLE MANUFACTURERS: RUSKIN, VENCO, NAILOR.
2. SIZE ACCESS DOOR AS FOLLOWS:
   a. DUCT SIZES UNDER 12": DOOR SIZED SUFFICIENT TO EQUIPMENT OR REPLACE FUSIBLE LINK.
   b. DUCT SIZES 12" TO 20": 12"x12" DOOR
   c. DUCT SIZES 20" TO 36": 18"x18" DOOR
   d. DUCT SIZES 36" AND ABOVE: 24"x24" DOOR
3. USE DOUBLE PANEL CONSTRUCTION, TWO SHEETS OF AT LEAST 24 GAUGE GALVANIZED STEEL WITH 1" THICK INSULATION BETWEEN PANELS.
4. MOUNT DOORS IN A RIGID FRAME OF AT LEAST 22 GAUGE FORMED GALVANIZED STEEL OR ALUMINUM.
5. PROVIDE LATCHES THAT PERMIT EASY REMOVAL OF ACCESS DOOR WHILE MAINTAINING POSITIVE CLOSING AND MINIMUM LEAKAGE.
6. PROVIDE SPONGE RUBBER GASKETS FOR ALL DOORS.
7. IN ACCORDANCE WITH NFPA 90A, IDENTIFY EACH ACCESS DOOR WITH 1/2" HIGH STENCILED LETTERS AS 'FIRE DAMPER', 'SMOKE DAMPER', OR 'COMBINATION FIRE/SMOKE DAMPER'.

15932 - AIR TERMINAL UNITS

A. ACCEPTABLE MANUFACTURERS: CARRIER, TRANE, ANEMOSTAT, TITUS, ENVIRONMENTAL TECHNOLOGIES, METALAIRE, NAILOR AND KREUGER.

B. SINGLE DUCT UNITS

1. SINGLE DUCT UNITS: PRESSURE INDEPENDENT
2. DUAL WALL INTERIOR LINER OF 26 GAUGE PHOSPHATIZED STEEL COVERING INSULATION. GLASS FIBER INSULATION, 1" THICK, R-V 4.2. UL 181 AND NFPA 90A.
3. FACTORY MOUNT, WIRE AND TEST DDC CONTROLLER, PRESSURE TRANSDUCER AND ELECTRONIC DAMPER ACTUATOR FURNISHED TO BOX MANUFACTURER UNDER SECTION 15970.
4. CONTROL TRANSFORMER: FACTORY MOUNT 120v/24v CONTROL CIRCUIT TRANSFORMER. PROVIDE SAFETY DEVICES INCLUDING TOGGLE DISCONNECT SWITCH AND FUSING.
5. HEATING COILS: ARI CERTIFIED, CONTINUOUS PLATE OR SPIRAL FIN TYPE, LEAKED TEST 300psi.

15970 - TEMPERATURE CONTROLS

A. AIR HANDLING UNIT AND VARIABLE VOLUME REHEAT BOXES.

1. CONTROL CONTRACTOR SHALL PROVIDE ALL WIRING REQUIRED FOR THE CONTROL SYSTEM TO OPERATE. IF THE JOB CONTAINS SMOKE DAMPERS OR CAV/VAV BOXES THEY SHALL ALSO BE WIRED BY T.C.C.
2. MOUNT THERMOSTATS 48" A.F.F. ALIGN WITH LIGHT/SWITCHES, DOOR SWINGS AND OTHER WALL MOUNTED DEVICES. COORDINATE LOCATION WITH ARCHITECT.
3. PROGRAMMABLE TYPE THERMOSTATS SHALL BE HONEYWELL "7300" SERIES OR AS RECOMMENDED BY EQUIPMENT MANUFACTURER. THERMOSTAT SHALL BE COOLING-HEATING COMBINATION OF STAGES MATCHING THE AIR CONDITIONING EQUIPMENT, WITH "COOL-AUTO-HEAT-OFF" AND FAN "AUTO-ON-OFF" SELECTOR SWITCHES. PROVIDE TAMPERPROOF COVER.

15990 - TEST AND BALANCE

A. PROVIDE COMPLETE TEST AND BALANCE OF ALL WATER AND AIR SYSTEMS IN ACCORDANCE WITH NEBB (NATIONAL ENVIRONMENTAL BALANCING BUREAU) OR AABC (ASSOCIATED AIR BALANCE COUNCIL) STANDARDS.

B. TEST AND BALANCE FIRM TO BE:

1. CERTIFIED TEST & BALANCE - (561) 961-5068, OR (954) 532-4772.
2. DADE TEST AND BALANCE, INC. - (954) 791-3194.
3. TOTAL DYNAMIC BALANCE - (954) 425-0764.
4. EARL HAGOOD, INC. - (305) 266-7070.
5. OR APPROVED EQUAL.

C. CONTRACTOR SHALL:

1. VISIT SITE AT START OF PROJECT AND COORDINATE REQUIRED BALANCING EQUIPMENT AND DAMPERS WITH MECHANICAL CONTRACTOR.
2. AIR SYSTEMS:
   a. MAKE CHANGES TO BELTS, PULLEYS, DAMPERS, VOLUME BOXES, ETC. TO OBTAIN DESIGN CONDITIONS AS REQUIRED BY TAB PROCEDURES.
   b. BALANCE SUPPLY, RETURN AND EXHAUST AIR OUTLETS WITHIN 10% OF DESIGN WHILE MAINTAINING REQUIRED PRESSURE RELATIONSHIPS. RECORD DESIGN AND ACTUAL TOTALS.
   c. MEASURE AND REPORT FAN RPM, FAN SUCTION PRESSURE, FAN DISCHARGE PRESSURE, FAN TOTAL PRESSURE AND PRESSURE DROP ACROSS COMPONENTS. DESIGN AND ACTUAL SUPPLY, RETURN, OUTSIDE AND EXHAUST AIR.
   d. ACTUAL AND DESIGN NAMEPLATE AMPERAGE ON FAN MOTORS.
   e. PRESSURE DIFFERENTIAL ACROSS DUCT SMOKE DETECTORS.
   f. ADJUST FANS FOR LOWEST STATIC PRESSURE REQUIRED TO DELIVER TO OUTLETS AS NOTED IN NEBB OR AABC PROCEDURES.
   g. MEASURE SUPPLY AND RETURN ENTERING AND LEAVING TEMPERATURES (DB/WB) ACROSS EACH COIL AND AT EACH SUPPLY DISCHARGE AND RETURN INLET AT UNIT.
4. CONFIRM OPERATION AND PROPER CALIBRATION OF ALL CONTROLS, THERMOMETERS AND SENSING DEVICES.
5. PROVIDE WRITTEN REPORT AT LEAST ONE WEEK BEFORE FINAL INSPECTION AND A TECHNICIAN DURING FINAL INSPECTION OF PROJECT.

VAV BOXES

PART 1 PRODUCTS

1.1 ACCEPTABLE MANUFACTURERS - AIR TERMINAL UNITS
   A. TITUS
   B. TRANE
   C. ENVIRO-TEC
   D. METALAIRE
   E. CARRIER
   F. CARNES
   G. KRUEGER

1.2 AIR TERMINAL UNIT (VAV BOX)
   A. PROVIDE MEDIUM PRESSURE, SINGLE DUCT, PRESSURE INDEPENDENT VARIABLE AIR VOLUME (VAV) BOX CONTAINING A NORMALLY OPEN VOLUME DAMPER ASSEMBLY INSIDE UNIT CASING AND ELECTRIC HEAT OF THE SIZE AND CAPACITY AS SHOWN IN THE SCHEDULE ON THE DRAWINGS.
   B. CASING: A MINIMUM OF 22 GAUGE GALVANIZED SHEET METAL WITH THE INTERIOR SURFACE LINED WITH MINIMUM 1 INCH THICK NEOPRENE OR VINYL COATED, 1.5 PCF DENSITY FIBROUS GLASS INSULATION WITH A SCRIM REINFORCED FOIL LAMINATE FACING COMPLYING WITH NFPA 90A AND UL 181 EROSION REQUIREMENTS.
      1. LINER FIBERS OR EDGES: NOT EXPOSED TO THE AIR STREAM.
      2. FOIL FACING: ONLY SURFACE EXPOSED TO THE AIR STREAM.
      3. ENSURE STEEL SHEET METAL IS OF THE FOLLOWING MINIMUM THICKNESS:
         (a) UPSTREAM PRESSURE SIDE: 0.0239 INCH.
         (b) DOWNSTREAM PRESSURE SIDE: 0.0179 INCH.
   C. CASING LINING: SECURE LINING TO PREVENT DELAMINATING, SAGGING OR SETTLING. COAT LINER INNER SURFACES AND EDGES WITH EROSION-RESISTANT COATING.
   D. PLENUM AIR INLET: ROUND STUB CONNECTIONS OR S-SLIP AND DRIVE CONNECTIONS FOR DUCT ATTACHMENT.
   E. PLENUM AIR DISCHARGE: S-SLIP AND DRIVE CONNECTIONS.
   F. ACCESS PANEL: REMOVABLE PANELS WITH AIRTIGHT GASKET AND QUARTER TURN LATCHES TO PERMIT ACCESS TO DAMPERS AND OTHER PARTS REQUIRING SERVICE, ADJUSTMENT OR MAINTENANCE.
   G. VOLUME DAMPER: CONSTRUCTED OF GALVANIZED STEEL WITH PERIPHERAL GASKET AND SELF-LUBRICATING BEARINGS, MAXIMUM LEAKAGE OF 2 PERCENT OF NOMINAL AIRFLOW AT 3 INCH WG INLET STATIC PRESSURE AND DAMPER IN NORMALLY OPEN POSITION.
   H. ATTENUATION SECTION: LINED WITH 2 INCH THICK NEOPRENE OR VINYL COATED FIBROUS GLASS INSULATION.
   I. DISCHARGE OUTLET: ROUND DISCHARGE COLLAR MATCHING INLET SIZE.
   J. LEAKAGE: MAXIMUM OF 2 PERCENT OF THEE NOMINAL BOX CAPACITY WHEN INLET PRESSURE IS 6.0 WG.
   K. ELECTRIC HEATING COIL: UL LISTED SLIP-IN TYPE, OPEN-COIL DESIGN WITH INTEGRAL, FACTORY WIRED AND INSTALLED CONTROL BOX WITH PRIMARY AND SECONDARY OVER-TEMPERATURE PROTECTION, MINIMUM AIRFLOW SWITCH AND A MAGNETIC CONTACTORS FOR EACH STEP OF CONTROL.
   L. CONTROLS:
      1. DIGITAL CONTROLS. HVAC INSTRUMENTATION AND CONTROLS AND FACTORY MOUNTED UNDER THIS SECTION.
      2. TEMPERATURE CONTROL SUPPLIER TO FURNISH DIGITAL CONTROLLER, TEMPERATURE SENSOR AND PRESSURE TRANSDUCER AND PILOT RELAYS TO ENERGIZE HEATING CONTACTORS IF REQUIRED.
      3. VAV BOX MANUFACTURER TO FURNISH CONTROL TRANSFORMER, PROTECTIVE METAL SHROUD ENCLOSURE, ELECTRIC 24 VOLT ACTUATOR AND VELOCITY SENSOR.
      4. ENSURE THE DAMPER OR VALVE MECHANISM IS DIRECT DRIVE UTILIZING A BI-DIRECTIONAL ELECTRIC ACTUATOR.
      5. ENSURE ALL ELECTRICAL COMPONENTS ARE UL LISTED.
      6. ROUTE ALL WIRING OUTSIDE OF THE CONTROL BOXES OR PANELS IN METAL CONDUIT.
   M. SOUND POWER LEVEL:
      1. VAV BOX: RATED AND CERTIFIED UNDER PROVISIONS OF ARI 880, INDUSTRY STANDARD FOR AIR TERMINAL UNITS.
      2. SOUND POWER DATA LISTED IS BASED ON MAXIMUM CFM. ENSURE SOUND POWER LEVELS ARE LOWER FOR LOWER CFM'S AT THE PRESSURE INDICATED.
      3. ENSURE SUBMITTAL DATA INCLUDES SOUND POWER LEVELS FOR THE SPECIFIED CFM'S AND PRESSURES.

2 EXECUTION

2.1 INSTALLATION
   A. INSTALL VAV BOX LEVEL AND PLUMB UNDER PROVISIONS OF THE MANUFACTURER'S INSTRUCTIONS, ROUGH-IN DRAWINGS, ORIGINAL DESIGN AND REFERENCE STANDARDS. PROVIDE SUFFICIENT CLEARANCE FOR NORMAL SERVICE AND MAINTENANCE.
   B. MAINTAIN A MINIMUM OF 42 INCH CLEARANCE IN FRONT OF THE VAV BOX HEATER CONTROL PANEL FOR NORMAL SERVICE AND MAINTENANCE AS REQUIRED BY NEC FOR THE VOLTAGE PROVIDED.
   C. LABEL EACH VAV BOX WITH THE PLAN NUMBER, NOMINAL AIR FLOW, MAXIMUM AND MINIMUM FACTORY-SET AIR FLOWS, COIL TYPE AND ARI CERTIFICATION SEAL.
   D. CONNECT THE VAV BOX DIRECTLY TO THE MEDIUM PRESSURE DUCTWORK. THE USE OF FLEXIBLE DUCT IS PROHIBITED.
   E. MAKE ALL DUCT CONNECTIONS TO AND FROM THE VAV BOX AS STREAMLINED AS POSSIBLE SO THE AIR PRESSURE DROP IS MINIMIZED.
   F. COORDINATE THE VAV BOX LOCATION AND THE INLET DUCT CONNECTION SO THAT A MINIMUM OF THREE TO FIVE STRAIGHT DUCT DIAMETERS TO THE INLET DUCT OR THE MINIMUM DUCT DIAMETERS AS REQUIRED BY THE VAV BOX MANUFACTURER ARE PROVIDED.
   G. VERIFY THAT THE VAV BOX DUCT OUTLET IS INSTALLED A MINIMUM OF 5 FEET FROM THE FIRST FLEXIBLE DUCT CONNECTION TAKEOFF FOR THE FIRST DOWNSTREAM AIR DISTRIBUTION DEVICE
   H. ELECTRICAL TO COMPLY WITH APPLICABLE REQUIREMENTS IN DIVISION 16. TIGHTEN ELECTRICAL CONNECTORS AND TERMINALS UNDER PROVISIONS OF THE MANUFACTURER'S PUBLISHED TORQUE TIGHTENING VALUES. WHERE THE MANUFACTURER'S TORQUE VALUES ARE NOT INDICATED, USE THOSE SPECIFIED IN UL 486A AND UL 486B.
   I. TEST AND ADJUST CONTROLS AND SAFETIES. REPLACE DAMAGED AND MALFUNCTIONING CONTROLS AND EQUIPMENT.
   J. DURING CONSTRUCTION, PROVIDE TEMPORARY CLOSURES ON ALL SUPPLY AND RETURN AIR DUCT OPENINGS BY SEALING WITH A DISPOSABLE POLYETHYLENE SHEETING TO PREVENT CONSTRUCTION DUST FROM ENTERING DUCTWORK SYSTEM OR AIR TERMINAL UNITS.

2.2 TEST AND ADJUST
   A. VERIFY THAT THE INLET DUCT CONNECTIONS ARE AS RECOMMENDED BY THE VAV BOX MANUFACTURER IN ORDER TO ACHIEVE PROPER PERFORMANCE AND THAT THE UNIT IDENTIFICATION TAG IS VISIBLE.
   B. VERIFY THAT CONTROL CONNECTIONS ARE COMPLETE AND THAT THEY AND THE CONTROLS ENCLOSURE ARE ACCESSIBLE.
   C. VERIFY THAT THE CONTROLS RESPOND TO INPUTS.
   D. AFTER INSTALLATION, TEST AND OPERATE EACH VAV BOX TO ENSURE THAT THE ADJUSTABLE BLADES AND DAMPERS MOVE FREELY WITHOUT BINDING THROUGH THEIR ENTIRE RANGE OF ADJUSTMENTS. TEST AND RATE VAV BOXES UNDER PROVISIONS OF ARI 880.
   E. BALANCE AIR QUANTITIES TO +10 PERCENT, -5 PERCENT OF SPECIFIED DESIGN VALUES.

2.3 CLEANING
   A. AFTER COMPLETION OF SYSTEM INSTALLATION, REMOVE BURRS, DIRT, DEBRIS AND WASTE MATERIALS RESULTING FROM INSTALLATION.

PRIOR TO SUBMITTING THE BID, THE CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS AND INFORM THE ARCHITECT AND THE ENGINEER OF ANY DISCREPANCY BETWEEN THESE DOCUMENTS AND THE EXISTING CONDITIONS AND SHALL INCLUDE IN THE BID TO CORRECT THE SAME AS DIRECTED. THE ENGINEER AND THE ARCHITECT, ARE NOT RESPONSIBLE FOR ANY ADDITIONAL COSTS RESULTING FROM VERIFIABLE EXISTING CONDITIONS DISCOVERED AFTER CONTRACT HAS BEEN AWARDED. NO CHANGES SHALL BE MADE TO THESE PLANS WITHOUT PRIOR APPROVAL FROM THE ENGINEER OF RECORD. ALL CHANGES SHALL BE SUBMITTED FOR REVIEW PRIOR TO INSTALLATION. NOT FOR BID UNTIL PERMIT HAS BEEN ISSUED.

PERMIT / BID SET: 09/07/16

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New Building For:
OPPORTUNITY INC.
EARLY LEARNING CENTER
4171 Westgate Avenue
Palm Beach County, Florida

Revisions:

Project no:	15435
Date:	09.09.16
Drawn by:	RB/SK/JS
Project Architect:	BJ

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MECHANICAL SPECIFICATIONS

M6.1

09.09.16 BID/PERMIT