DEDICATED OUTDOOR AIR UNITS

RT 1:	GENERAL
1.01	SECTION INCLUDES
Α.	PACKAGED ROOFTOP AIR CONDITIONERS

1.02 REFERENCES

- A. AFBMA 9 LOAD RATINGS AND FATIGUE LIFE FOR BALL
- BEARINGS
- B. AMCA 99––STANDARDS HANDBOOK AMCA 210--LABORATORY METHODS OF TESTING FANS FOR
- RATING PURPOSES D. AMCA 500--TEST METHODS FOR LOUVER, DAMPERS, AND
- SHUTTERS. AHRI 340/360 – UNITARY LARGE EQUIPMENT
- NEMA MG1--MOTORS AND GENERATORS
- NATIONAL ELECTRICAL CODE.
- H. NFPA 70--NATIONAL FIRE PROTECTION AGENCY.
- I. SMACNA--HVAC DUCT CONSTRUCTION STANDARDS--METAL AND FLEXIBLE
- J. UL 900--TEST PERFORMANCE OF AIR FILTER UNITS.
- 1.03 SUBMITTALS
- A. SHOP DRAWINGS: INDICATE ASSEMBLY, UNIT DIMENSIONS, WEIGHT LOADING, REQUIRED CLEARANCES, CONSTRUCTION DETAILS, FIELD CONNECTION DETAILS, ELECTRICAL CHARACTERISTICS AND CONNECTION REQUIREMENTS.
- B. PRODUCT DATA:
 - 1. PROVIDE LITERATURE THAT INDICATES DIMENSIONS, WEIGHTS, CAPACITIES, RATINGS, FAN PERFORMANCE, AND ELECTRICAL CHARACTERISTICS AND CONNECTION REQUIREMENTS.
 - 2. PROVIDE COMPUTER GENERATED FAN CURVES WITH SPECIFIED OPERATING POINT CLEARLY PLOTTED.
 - MANUFACTURER'S INSTALLATION INSTRUCTIONS.
- 1.04 OPERATION AND MAINTANENCE DATA MAINTENANCE DATA: PROVIDE INSTRUCTIONS FOR
- INSTALLATION, MAINTENANCE AND SERVICE
- 1.05 QUALIFICATIONS
- A. MANUFACTURER: COMPANY SPECIALIZING IN MANUFACTURING THE PRODUCTS SPECIFIED IN THIS SECTION WITH MINIMUM FIVE YEARS DOCUMENTED EXPERIENCE, WHO ISSUES COMPLETE CATALOG DATA ON TOTAL PRODUCT.
- B. STARTUP MUST BE DONE BY TRAINED PERSONNEL EXPERIENCED WITH ROOFTOP EQUIPMENT.
- C. DO NOT OPERATE UNITS FOR ANY PURPOSE, TEMPORARY OR PERMANENT, UNTIL DUCTWORK IS CLEAN, FILTERS AND REMOTE CONTROLS ARE IN PLACE, BEARINGS LUBRICATED, AND MANUFACTURERS' INSTALLATION INSTRUCTIONS HAVE BEEN FOLLOWED.
- 1.06 DELIVERY, STORAGE, AND HANDLING
- A. DELIVER, STORE, PROTECT AND HANDLE PRODUCTS TO SITE.
- B. ACCEPT PRODUCTS ON SITE AND INSPECT FOR DAMAGE. C. STORE IN CLEAN DRY PLACE AND PROTECT FROM WEATHER AND CONSTRUCTION TRAFFIC. HANDLE CAREFULLY TO AVOID DAMAGE TO COMPONENTS, ENCLOSURES, AND FINISH.

PART 2: PRODUCTS

- 2.01 MANUFACTURERS
- A. BASIS OF DESIGN: DAIKIN APPLIED
- 1. NO EQUAL EXISTS. [DEDUCTS FOR ALTERNATIVE EQUIPMENT WILL BE CONSIDERED.]

2.02 GENERAL DESCRIPTION

- A. FURNISH AS SHOWN ON PLANS, DAIKIN APPLIED REBEL SINGLE ZONE HEATING AND COOLING UNIT(S) MODEL DPS. UNIT PERFORMANCE AND ELECTRICAL CHARACTERISTICS SHALL BE PER THE JOB SCHEDULE.
- B. CONFIGURATION: FABRICATE AS DETAILED ON PRINTS AND
- DRAWINGS 1. RETURN PLENUM / ECONOMIZER SECTION
- 2. FILTER SECTION
- 3. COOLING COIL SECTION
- 4. SUPPLY FAN SECTION 5. CONDENSING UNIT SECTION
- C. THE COMPLETE UNIT SHALL BE CETLUS LISTED.
- D. THE UNIT SHALL BE ASHRAE 90.1–2013 COMPLIANT AND LABELED.
- E. EACH UNIT SHALL BE SPECIFICALLY DESIGNED FOR OUTDOOR ROOFTOP APPLICATION AND INCLUDE A WEATHERPROOF CABINET. EACH UNIT SHALL BE COMPLETELY FACTORY ASSEMBLED AND SHIPPED IN ONE PIECE. PACKAGED UNITS SHALL BE SHIPPED FULLY CHARGED WITH R-410 REFRIGERANT AND OIL.
- F. THE UNIT SHALL UNDERGO A COMPLETE FACTORY RUN TEST PRIOR TO SHIPMENT. THE FACTORY TEST SHALL INCLUDE A REFRIGERATION CIRCUIT RUN TEST, A UNIT CONTROL SYSTEM OPERATIONS CHECKOUT, A UNIT REFRIGERANT LEAK TEST AND A FINAL UNIT INSPECTION.
- G. ALL UNITS SHALL HAVE DECALS AND TAGS TO INDICATE CAUTION AREAS AND AID UNIT SERVICE. UNIT NAMEPLATES SHALL BE FIXED TO THE MAIN CONTROL PANEL DOOR. ELECTRICAL WIRING DIAGRAMS SHALL BE ATTACHED TO THE CONTROL PANELS. INSTALLATION, OPERATING AND MAINTENANCE BULLETINS AND START-UP FORMS SHALL BE SUPPLIED WITH EACH UNIT.
- H. PERFORMANCE: ALL SCHEDULED EER, IEER, CAPACITIES AND FACE AREAS ARE MINIMUM ACCEPTED VALUES. ALL SCHEDULED AMPS, KW, AND HP ARE MAXIMUM ACCEPTED VALUES THAT ALLOW SCHEDULED CAPACITY TO BE MET.
- I. WARRANTY: THE MANUFACTURER SHALL PROVIDE 12-MONTH PARTS ONLY WARRANTY. DEFECTIVE PARTS SHALL BE REPAIRED OR REPLACED DURING THE WARRANTY PERIOD AT NO CHARGE. THE WARRANTY PERIOD SHALL COMMENCE AT STARTUP OR SIX MONTHS AFTER SHIPMENT, WHICHEVER

OCCURS FIRST.

- 2.03 CABINET, CASING, AND FRAME
- A. PANEL CONSTRUCTION SHALL BE DOUBLE-WALL CONSTRUCTION FOR ALL PANELS. ALL FLOOR PANELS SHALL HAVE A SOLID GALVANIZED STEEL INNER LINER ON THE AIR STREAM SIDE OF THE UNIT TO PROTECT INSULATION DURING SERVICE AND MAINTENANCE. INSULATION SHALL BE A MINIMUM OF 1" THICK WITH AN R-VALUE OF 7.0, AND SHALL BE 2 PART INJECTED FOAM. PANEL DESIGN SHALL INCLUDE NO EXPOSED INSULATION EDGES. UNIT CABINET SHALL BE DESIGNED TO OPERATE AT TOTAL STATIC PRESSURES UP TO 5.0 INCHES W.G.
- B. EXTERIOR SURFACES SHALL BE CONSTRUCTED OF PRE-PAINTED GALVANIZED STEEL FOR AESTHETICS AND LONG TERM DURABILITY. PAINT FINISH TO INCLUDE A BASE PRIMER WITH A HIGH QUALITY, POLYESTER RESIN TOPCOAT OF A NEUTRAL BEIGE COLOR. FINISHED PANEL SURFACES TO WITHSTAND A MINIMUM 750-HOUR SALT SPRAY TEST IN ACCORDANCE WITH ASTM B117 STANDARD FOR SALT SPRAY RESISTANCE.
- SERVICE DOORS SHALL BE PROVIDED ON THE FAN SECTION, FILTER SECTION, CONTROL PANEL SECTION, AND HEATING VESTIBULE IN ORDER TO PROVIDE USER ACCESS TO UNIT COMPONENTS. ALL SERVICE ACCESS DOORS SHALL BE MOUNTED ON MULTIPLE, STAINLESS STEEL HINGES AND SHALL BE SECURED BY A LATCH SYSTEM. REMOVABLE SERVICE PANELS SECURED BY MULTIPLE MECHANICAL FASTENERS ARE NOT ACCEPTABLE.
- D. THE UNIT BASE SHALL OVERHANG THE ROOF CURB FOR POSITIVE WATER RUNOFF AND SHALL SEAT ON THE ROOF CURB GASKET TO PROVIDE A POSITIVE, WEATHERTIGHT SEAL. LIFTING BRACKETS SHALL BE PROVIDED ON THE UNIT BASE TO ACCEPT CABLE OR CHAIN HOOKS FOR RIGGING THE EQUIPMENT.
- 2.04 OUTDOOR/RETURN AIR SECTION

A. UNIT SHALL BE PROVIDED WITH AN OUTDOOR AIR ECONOMIZER SECTION. THE ECONOMIZER SECTION SHALL INCLUDE OUTDOOR, RETURN, AND EXHAUST AIR DAMPERS. THE ECONOMIZER OPERATION SHALL BE FULLY INTEGRAL TO THE MECHANICAL COOLING AND ALLOW UP TO 100% OF MECHANICAL COOLING IF NEEDED TO MAINTAIN THE COOLING DISCHARGE AIR TEMPERATURE. THE OUTDOOR AIR HOOD SHALL BE FACTORY INSTALLED AND CONSTRUCTED FROM GALVANIZED STEEL FINISHED WITH THE SAME DURABLE PAINT FINISH AS THE MAIN UNIT. THE HOOD SHALL INCLUDE MOISTURE ELIMINATOR FILTERS TO DRAIN WATER AWAY FROM THE ENTERING AIR STREAM. THE OUTSIDE AND RETURN AIR DAMPERS SHALL BE SIZED TO HANDLE 100% OF THE SUPPLY AIR VOLUME. THE DAMPERS SHALL BE PARALLEL BLADE DESIGN. DAMPER BLADES SHALL BE GASKETED WITH SIDE SEALS TO PROVIDE AN AIR LEAKAGE RATE OF 1.5 CFM / SQUARE FOOT OF DAMPER AREA AT 1" DIFFERENTIAL PRESSURE IN ACCORDING WITH TESTING DEFINED IN AMCA 500. A BAROMETRIC EXHAUST DAMPER SHALL BE PROVIDED TO EXHAUST AIR OUT OF THE BACK OF THE UNIT. A BIRD SCREEN SHALL BE PROVIDED TO PREVENT INFILTRATION OF 2.06 EXHAUST FAN RAIN AND FOREIGN MATERIALS. EXHAUST DAMPER BLADES SHALL BE LINED WITH VINYL GASKETING ON CONTACT EDGES. CONTROL OF THE DAMPERS SHALL BE BY A FACTORY INSTALLED DIRECT COUPLED ACTUATOR. DAMPER ACTUATOR SHALL BE OF THE MODULATING, SPRING RETURN TYPE. A COMPARATIVE ENTHALPY CONTROL SHALL BE PROVIDED TO SENSE AND COMPARE ENTHALPY IN BOTH THE OUTDOOR AND RETURN AIR STREAMS TO DETERMINE IF OUTDOOR AIR IS SUITABLE FOR "FREE" COOLING. IF OUTDOOR AIR IS SUITABLE FOR "FREE" COOLING, THE OUTDOOR AIR DAMPERS SHALL MODULATE IN RESPONSE TO THE UNIT'S TEMPERATURE CONTROL SYSTEM.

- PROVIDE FACTORY INSTALLED AND TESTED, OUTDOOR AIR MONITOR THAT CONTROLS OUTDOOR AIR +/- 15% ACCURACY DOWN TO 40 CFM PER TON.
- 2.05 ENERGY RECOVERY
- A. THE ROOFTOP UNIT SHALL BE PROVIDED WITH AN AHRI CERTIFIED ROTARY WHEEL AIR-TO-AIR HEAT EXCHANGER IN A CASSETTE FRAME COMPLETE WITH SEALS, DRIVE MOTOR AND DRIVE BELT. THE ENERGY RECOVERY WHEEL SHALL BE AN INTEGRAL PART OF THE ROOFTOP UNIT WITH UNITARY CONSTRUCTION AND DOES NOT REQUIRE FIELD ASSEMBLY. BOLT-ON ENERGY RECOVERY UNITS THAT REQUIRE FIELD ASSEMBLY AND SECTION TO SECTION GASKETING AND SEALING ARE NOT ACCEPTABLE.
- EFFECTIVENESS SHALL BE AHRI CERTIFIED PER AHRI STANDARD 1060. THERMAL PERFORMANCE SHALL BE CERTIFIED BY THE MANUFACTURER IN ACCORDANCE WITH ASHRAE STANDARD 84, METHOD OF TESTING AIR-TO-AIR HEAT EXCHANGERS AND AHRI STANDARD 1060, RATING AIR-TO-AIR HEAT EXCHANGERS FOR ENERGY RECOVERY VENTILATION EQUIPMENT.
- THE ROOFTOP UNIT SHALL BE DESIGNED WITH A TRACK SO 2.08 COOLING COIL THE ENTIRE ENERGY RECOVERY WHEEL CASSETTE CAN SLIDE OUT FROM THE ROOFTOP UNIT TO FACILITATE CLEANING.
- D. THE UNIT SHALL HAVE 2" MERV 7 FILTERS FOR THE OUTDOOR AIR BEFORE THE WHEEL TO HELP KEEP THE WHEEL CLEAN AND REDUCE MAINTENANCE. FILTER ACCESS SHALL BE BY A HINGED ACCESS DOOR WITH 1/4 TURN LATCHES.
- THE MATRIX DESIGN SHALL HAVE CHANNELS TO REDUCE EXHAUST AIR. THE LAYERS SHALL BE EFFECTIVELY CAPTURED IN ALUMINUM AND STAINLESS STEEL SEGMENT FRAMES THAT PROVIDE A RIGID AND SELF-SUPPORTING MATRIX. ALL DIAMETER AND PERIMETER SEALS SHALL BE PROVIDED AS PART OF THE CASSETTE ASSEMBLY AND SHALL BE FACTORY SET. DRIVE BELT(S) OF STRETCH URETHANE SHALL BE PROVIDED FOR WHEEL RIM DRIVE WITHOUT THE NEED FOR EXTERNAL TENSIONERS OR ADJUSTMENT.

- F. THE TOTAL ENERGY RECOVERY WHEEL SHALL BE COATED WITH SILICA GEL DESICCANT PERMANENTLY BONDED WITHOUT THE USE OF BINDERS OR ADHESIVES, WHICH MAY DEGRADE DESICCANT PERFORMANCE. THE SUBSTRATE SHALL BE LIGHTWEIGHT POLYMER AND SHALL NOT DEGRADE NOR REQUIRE ADDITIONAL COATINGS FOR APPLICATION IN MARINE OR COASTAL ENVIRONMENTS. COATED SEGMENTS SHALL BE WASHABLE WITH DETERGENT OR ALKALINE COIL CLEANER AND WATER. DESICCANT SHALL NOT DISSOLVE NOR DELIQUESCE IN THE PRESENCE OF WATER OR HIGH HUMIDITY.
- WHEELS SHALL BE PROVIDED WITH REMOVABLE ENERGY TRANSFER MATRIX. WHEEL FRAME CONSTRUCTION SHALL BE A WELDED HUB, SPOKE AND RIM ASSEMBLY OF STAINLESS, PLATED AND/OR COATED STEEL AND SHALL BE SELF-SUPPORTING WITHOUT MATRIX SEGMENTS IN PLACE. SEGMENTS SHALL BE REMOVABLE WITHOUT THE USE OF TOOLS TO FACILITATE MAINTENANCE AND CLEANING.
- H. WHEEL BEARINGS SHALL BE SELECTED TO PROVIDE AN L-10 LIFE IN EXCESS OF 400,000 HOURS. RIM SHALL BE CONTINUOUS ROLLED STAINLESS STEEL. WHEELS SHALL BE CONNECTED TO THE SHAFT BY MEANS OF TAPER LOCK HUBS.
- I. THE EXHAUST AIR FAN SHALL BE A DIRECT DRIVE SWSI PLENUM FAN. THE EXHAUST FAN SHALL BE SIZED FOR THE AIRFLOW REQUIREMENTS PER THE CONSTRUCTION SCHEDULE. THE UNIT CONTROLLER SHALL CONTROL THE EXHAUST FAN TO MAINTAIN BUILDING PRESSURE. A VFD SHALL BE PROVIDED FOR THE EXHAUST FAN MOTOR OR THE EXHAUST FAN MOTOR SHALL BE AN ECM MOTOR. THE ROOFTOP UNIT SHALL HAVE SINGLE POINT ELECTRICAL POWER CONNECTION AND SHALL BE ETL LISTED.
- THE CONTROL OF THE ENERGY RECOVERY WHEEL SHALL BE AN INTEGRAL PART OF THE ROOFTOP UNIT'S DDC CONTROLLER. THE DDC CONTROLLER SHALL HAVE VISIBILITY OF THE OUTDOOR AIR TEMPERATURE, LEAVING WHEEL TEMPERATURE, RETURN AIR TEMPERATURE, AND EXHAUST AIR TEMPERATURE. THESE TEMPERATURES SHALL BE DISPLAYED AT THE ROOFTOP UNITS DDC CONTROLLER LCD DISPLAY. ALL OF THESE TEMPERATURES SHALL BE MADE AVAILABLE THROUGH THE BACNET INTERFACE.
- K. THE ROOFTOP UNIT WITH THE ENERGY RECOVERY WHEEL SHALL INCORPORATE THE ECONOMIZER OPERATION. THE ENERGY RECOVERY WHEEL SHALL HAVE A BYPASS DAMPER. WHEN THE UNIT IS IN THE ECONOMIZER MODE OF OPERATION THE ENERGY RECOVERY WHEEL SHALL STOP AND THE BYPASS DAMPERS SHALL BE OPENED. THE OUTDOOR AIR SHALL BE DRAWN THROUGH THE BYPASS DAMPERS TO REDUCE THE PRESSURE DROP OF THE OUTDOOR AIRSTREAM.
- THE ROOFTOP UNIT DDC CONTROLLER SHALL PROVIDE FROST CONTROL FOR THE ENERGY RECOVERY WHEEL. WHEN A FROST CONDITION IS ENCOUNTERED THE UNIT CONTROLLER SHALL STOP THE WHEEL. WHEN IN THE FROST CONTROL MODE THE WHEEL SHALL BE JOGGED PERIODICALLY AND NOT BE ALLOWED TO STAY IN THE STATIONARY POSITION.
- - EXHAUST FAN SHALL BE A SINGLE WIDTH, SINGLE INLET (SWSI) AIRFOIL CENTRIFUGAL FAN. THE FAN WHEEL SHALL BE CLASS II CONSTRUCTION WITH ALUMINUM FAN BLADES THAT ARE CONTINUOUSLY WELDED TO THE HUB PLATE AND END RIM. THE EXHAUST FAN SHALL BE A DIRECT DRIVE FAN MOUNTED TO THE MOTOR SHAFT. BELTS AND SHEAVES ARE NOT ACCEPTABLE DUE TO THE ADDITIONAL MAINTENANCE.
- THE FAN MOTOR SHALL BE A TOTALLY ENCLOSED EC MOTOR THAT IS SPEED CONTROLLED BY THE ROOFTOP UNIT CONTROLLER. THE MOTOR SHALL INCLUDE THERMAL OVERLOAD PROTECTION AND PROTECT THE MOTOR IN THE CASE OF EXCESSIVE MOTOR TEMPERATURES. THE MOTOR SHALL HAVE PHASE FAILURE PROTECTION AND PREVENT THE MOTOR FROM OPERATION IN THE EVENT OF A LOSS OF PHASE. MOTORS SHALL BE PREMIUM EFFICIENCY.
- THE UNIT DDC CONTROLLER SHALL PROVIDE BUILDING STATIC PRESSURE CONTROL. THE UNIT CONTROLLER SHALL PROVIDE PROPORTIONAL CONTROL OF THE EXHAUST FANS FROM 25% TO 100% OF THE SUPPLY AIR FAN DESIGNED AIRFLOW TO MAINTAIN THE ADJUSTABLE BUILDING PRESSURE SETPOINT. THE FIELD SHALL MOUNT THE REQUIRED SENSING TUBING FROM THE BUILDING TO THE FACTORY MOUNTED BUILDING STATIC PRESSURE SENSOR.
- 2.07 FILTERS A. UNIT SHALL BE PROVIDED WITH A DRAW-THROUGH FILTER SECTION. THE FILTER RACK SHALL BE DESIGNED TO ACCEPT A 2" PREFILTER AND A 4" FINAL FILTER. THE UNIT DESIGN SHALL HAVE A HINGED ACCESS DOOR FOR THE FILTER SECTION. THE MANUFACTURER SHALL SHIP THE ROOFTOP UNIT WITH 2" MERV 8 CONSTRUCTION FILTERS. THE CONTRACTOR SHALL FURNISH AND INSTALL, AT BUILDING OCCUPANCY, THE FINAL SET OF FILTERS PER THE CONTRACT DOCUMENTS.
- THE INDOOR COIL SECTION SHALL BE INSTALLED IN A DRAW Α THROUGH CONFIGURATION, UPSTREAM OF THE SUPPLY AIR FAN. THE COIL SECTION SHALL BE COMPLETE WITH A FACTORY PIPED COOLING COIL AND AN ASHRAE 62.1 COMPLIANT DOUBLE SLOPED DRAIN PAN.
- B. THE DIRECT EXPANSION (DX) COOLING COILS SHALL BE FABRICATED OF SEAMLESS HIGH EFFICIENCY COPPER TUBING THAT IS MECHANICALLY EXPANDED INTO HIGH EFFICIENCY ALUMINUM PLATE FINS. COILS SHALL BE A MULTI-ROW, STAGGERED TUBE DESIGN WITH A MINIMUM OF 3 ROWS. ALL COOLING COILS SHALL HAVE AN INTERLACED COIL CIRCUITING THAT KEEPS THE FULL COIL FACE ACTIVE AT ALL LOAD CONDITIONS. ALL COILS SHALL BE FACTORY LEAK TESTED WITH HIGH PRESSURE AIR UNDER WATER.
- C. THE COOLING COIL SHALL HAVE AN ELECTRONIC CONTROLLED EXPANSION VALVE. THE UNIT CONTROLLER SHALL CONTROL THE EXPANSION VALVE TO MAINTAIN LIQUID SUBCOOLING AND THE SUPERHEAT OF THE REFRIGERANT SYSTEM.

- B. THE WHEEL CAPACITY, AIR PRESSURE DROP AND

- CROSS CONTAMINATION BETWEEN THE OUTDOOR AIR AND THE

- D. THE REFRIGERANT SUCTION LINES SHALL BE FULLY INSULATED FROM THE EXPANSION VALVE TO THE COMPRESSORS.
- E. THE DRAIN PAN SHALL BE STAINLESS STEEL AND POSITIVELY SLOPED. THE SLOPE OF THE DRAIN PAN SHALL BE IN TWO DIRECTIONS AND COMPLY WITH ASHRAE STANDARD 62.1. THE DRAIN PAN SHALL HAVE A MINIMUM SLOPE OF 1/8" PER FOOT TO PROVIDE POSITIVE DRAINING. THE DRAIN PAN SHALL EXTEND BEYOND THE LEAVING SIDE OF THE COIL. THE DRAIN PAN SHALL HAVE A THREADED DRAIN CONNECTION EXTENDING THROUGH THE UNIT BASE.
- 2.09 HOT GAS REHEAT A. UNIT SHALL BE EQUIPPED WITH A FULLY MODULATING HOT GAS REHEAT COIL WITH HOT GAS COMING FROM THE UNIT CONDENSER
- B. HOT GAS REHEAT COIL SHALL BE A MICRO CHANNEL DESIGN. THE ALUMINUM TUBE SHALL BE A MICRO CHANNEL DESIGN WITH HIGH EFFICIENCY ALUMINUM FINS. FINS SHALL BE BRAZED TO THE TUBING FOR A DIRECT BOND. THE CAPACITY OF THE REHEAT COIL SHALL ALLOW FOR A 20°F TEMPERATURE RISE AT ALL OPERATING CONDITIONS.
- THE MODULATING HOT GAS REHEAT SYSTEMS SHALL ALLOW FOR INDEPENDENT CONTROL OF THE COOLING COIL LEAVING AIR TEMPERATURE AND THE REHEAT COIL LEAVING AIR TEMPERATURE. THE COOLING COIL AND REHEAT COIL LEAVING AIR TEMPERATURE SETPOINTS SHALL BE ADJUSTABLE THROUGH THE UNIT CONTROLLER. DURING THE DEHUMIDIFICATION CYCLE THE UNIT SHALL BE CAPABLE OF 100% OF THE COOLING CAPACITY. THE HOT GAS REHEAT COIL SHALL PROVIDE DISCHARGE TEMPERATURE CONTROL WITHIN +/- 2°F.
- D. EACH COIL SHALL BE FACTORY LEAK TESTED WITH HIGH-PRESSURE AIR UNDER WATER.
- 2.010 SUPPLY FAN
- A. SUPPLY FAN SHALL BE A SINGLE WIDTH, SINGLE INLET (SWSI) AIRFOIL CENTRIFUGAL FAN. THE FAN WHEEL SHALL BE CLASS II CONSTRUCTION WITH FAN BLADES THAT ARE CONTINUOUSLY WELDED TO THE HUB PLATE AND END RIM. THE SUPPLY FAN SHALL BE A DIRECT DRIVE FAN MOUNTED TO THE MOTOR SHAFT. BELTS AND SHEAVES ARE NOT ACCEPTABLE DUE TO THE ADDITONAL MAINTENANCE.
- ALL FAN ASSEMBLIES SHALL BE STATICALLY AND DYNAMICALLY BALANCED AT THE FACTORY, INCLUDING A FINAL TRIM BALANCE, PRIOR TO SHIPMENT.
- SUPPLY FAN AND MOTOR ASSEMBLY COMBINATIONS LARGER THAN 8 HP OR 22" DIAMETER SHALL BE INTERNALLY ISOLATED ON 1" DEFLECTION, SPRING ISOLATORS AND INCLUDE REMOVABLE SHIPPING TIE DOWNS.
- D. THE FAN MOTOR SHALL BE A TOTALLY ENCLOSED EC MOTOR THAT IS SPEED CONTROLLED BY THE ROOFTOP UNIT CONTROLLER. THE MOTOR SHALL INCLUDE THERMAL OVERLOAD PROTECTION AND PROTECT THE MOTOR IN THE CASE OF EXCESSIVE MOTOR TEMPERATURES. THE MOTOR SHALL HAVE PHASE FAILURE PROTECTION AND PREVENT THE MOTOR FROM OPERATION IN THE EVENT OF A LOSS OF PHASE. MOTORS SHALL BE PREMIUM EFFICIENCY.
- E. THE SUPPLY FAN SHALL BE CAPABLE OF AIRFLOW MODULATION FROM 30% TO 100% OF THE SCHEDULED DESIGNED AIRFLOW. THE FAN SHALL NOT OPERATE IN A STATE OF SURGE AT ANY POINT WITHIN THE MODULATION RANGE.
- 2.011 VARIABLE AIR VOLUME CONTROL
- A. THE UNIT CONTROLLER SHALL PROPORTIONALLY CONTROL THE ELECTRONICALLY COMMUTATED MOTORS (ECM) ON THE SUPPLY AND EXHAUST FANS. THE SUPPLY FAN SHALL BE CONTROLLED TO MAINTAIN AN ADJUSTABLE DUCT PRESSURE SETPOINT. A DUCT STATIC PRESSURE SENSOR SHALL BE FACTORY MOUNTED IN THE CONTROL PANEL. THE FIELD SHALL FURNISH AND INSTALL THE PNEUMATIC TUBING FOR THE DUCT STATIC PRESSURE SENSOR AND THE BUILDING PRESSURE SENSOR. THE FIELD SHALL FURNISH AND INSTALL THE OUTDOOR AIR PRESSURE SENSOR.
- B. THE UNIT CONTROLLER SHALL PROPORTIONAL CONTROL THE ECM MOTORS ON THE SUPPLY FAN BASED ON SPACE TEMPERATURE. THE UNIT CONTROLLER SHALL INCREASE/DECREASE THE SPEED OF THE SUPPLY FAN IN ORDER TO MAINTAIN THE SPACE TEMPERATURE WITHIN ITS SETPOINT AND DEADBAND. THE UNIT CONTROLLER SHALL PROVIDE DISCHARGE AIR TEMPERATURE CONTROL WITH THE COMPRESSOR MODULATION.
- 2.012 HEATING SECTION A. THE ROOFTOP UNIT SHALL INCLUDE AN ELECTRICAL RESISTANCE HEATING COIL SECTION. STAGED ELECTRIC HEATING COIL MODULES SHALL BE FACTORY INSTALLED DOWNSTREAM OF THE SUPPLY AIR FAN IN THE HEATING SECTION OF THE ROOFTOP UNIT. HEATING COILS SHALL BE CONSTRUCTED OF A LOW WATT DENSITY, NICKEL – CHROMIUM ALLOY RESISTANCE WIRE WITH INTERMEDIATE SUPPORTS THAT INCLUDE CERAMIC BUSHINGS. THE ELECTRICAL CONTACTORS SHALL BE OF THE FULL LINE-BREAKING TYPE WITH ALL THE ELECTRICAL POWER LEGS BEING DISCONNECTED WHEN THE CONTACTORS ARE NOT ENERGIZED. ALL ELECTRICAL CIRCUIT WIRING SHALL BE DESIGNED WITH COPPER CONDUCTORS, ALUMINUM WIRES ARE NOT ACCEPTABLE. HEATING ELEMENT BRANCH CIRCUITS SHALL BE INDIVIDUALLY FUSED TO A MAXIMUM OF 48 AMPS PER NEC REQUIREMENTS. THE POWER SUPPLY FOR THE ELECTRIC HEATER SHALL BE FACTORY WIRED INTO THE UNITS MAIN POWER BLOCK OR DISCONNECT SWITCH.
- B. THE HEATING MODULES SHALL HAVE AN AUTOMATIC RESET, HIGH TEMPERATURE LIMIT SAFETY PROTECTION. A SECONDARY HIGH LIMIT PROTECTION SHALL ALSO BE PROVIDED THAT REQUIRES A MANUAL RESET. AN AIRFLOW SWITCH SHALL BE PROVIDED WITH THE HEATING MODULE TO PREVENT THE ELECTRIC HEATER FROM OPERATING IN THE EVENT OF NO AIRFLOW.

- C. THE ELECTRIC HEAT ELEMENTS SHALL BE CONTROLLED BY THE FACTORY INSTALLED DDC UNIT CONTROL SYSTEM. THE HEATER SHALL HAVE PROPORTIONAL SCR CONTROL. THE UNIT CONTROLLER SHALL MODULATE THE ELECTRIC HEATER TO MAINTAIN THE DISCHARGE AIR TEMPERATURE SETPOINT.
- D. FIELD INSTALLED HEATING MODULES SHALL REQUIRE A FIELD ETL CERTIFICATION. DUCT HEATERS MOUNTED WITHIN THE ROOFTOP UNIT IN THE FIELD SHALL NOT BE ACCEPTABLE. THE MANUFACTURER'S ROOFTOP UNIT ETL CERTIFICATION SHALL COVER THE COMPLETE UNIT INCLUDING THE ELECTRIC HEATING MODULES
- 2.013 CONDENSING SECTION OUTDOOR COILS SHALL BE CAST ALUMINUM, MICRO-CHANNEL Δ COILS. PLATE FINS SHALL BE PROTECTED AND BRAZED BETWEEN ADJOINING FLAT TUBES SUCH THAT THEY SHALL NOT EXTEND OUTSIDE THE TUBES. A SUB-COOLING COIL SHALL BE AN INTEGRAL PART OF THE MAIN OUTDOOR AIR COIL. EACH OUTDOOR AIR COIL SHALL BE FACTORY LEAK TESTED WITH HIGH-PRESSURE AIR UNDER WATER.
- OUTDOOR AIR COILS SHALL BE PROTECTED FROM INCIDENTAL CONTACT TO COIL FINS BY A COIL GUARD. COIL GUARD SHALL BE CONSTRUCTED OF CROSS WIRE WELDED STEEL WITH PVC COATING.
- C. FAN MOTORS SHALL BE AN ECM TYPE MOTOR FOR PROPORTIONAL CONTROL. THE UNIT CONTROLLER SHALL PROPORTIONALLY CONTROL THE SPEED OF THE CONDENSER FAN MOTORS TO MAINTAIN THE HEAD PRESSURE OF THE REFRIGERANT CIRCUIT FROM AMBIENT CONDITION OF 0 120°F. MECHANICAL COOLING SHALL BE PROVIDED TO 25º F. THE MOTOR SHALL INCLUDE THERMAL OVERLOAD PROTECTION AND PROTECT THE MOTOR IN THE CASE OF EXCESSIVE MOTOR TEMPERATURES. THE MOTOR SHALL HAVE PHASE FAILURE PROTECTION AND PREVENT THE MOTOR FROM OPERATION IN THE EVENT OF A LOSS OF PHASE.
- THE CONDENSER FAN SHALL BE LOW NOISE BLADE DESIGN. FAN BLADE DESIGN SHALL BE A DYNAMIC PROFILE FOR LOW TIP SPEED. FAN BLADE SHALL BE OF A COMPOSITE MATERIAL.
- THE UNIT SHALL HAVE SCROLL COMPRESSORS. ONE OF THE COMPRESSORS SHALL BE AN INVERTER COMPRESSOR PROVIDING PROPORTIONAL CONTROL. THE UNIT CONTROLLER SHALL CONTROL THE SPEED OF THE COMPRESSOR TO MAINTAIN THE DISCHARGE AIR TEMPERATURE. THE INVERTER COMPRESSOR SHALL HAVE A SEPARATE OIL PUMP AND AN OIL SEPARATOR FOR EACH COMPRESSOR THAT ROUTES OIL BACK TO THE COMPRESSOR INSTEAD OF THROUGH THE DISCHARGE LINE.
- F. PRESSURE TRANSDUCERS SHALL BE PROVIDED FOR THE SUCTION PRESSURE AND HEAD PRESSURE. TEMPERATURE SENSOR SHALL BE PROVIDED FOR THE SUCTION TEMPERATURE AND THE REFRIGERANT DISCHARGE TEMPERATURE OF THE COMPRESSORS. ALL OF THE ABOVE DEVICES SHALL BE AN INPUT TO THE UNIT CONTROLLER AND THE VALUES BE DISPLAYED AT THE UNIT CONTROLLER.
- REFRIGERANT CIRCUIT SHALL HAVE A BYPASS VALVE BETWEEN THE SUCTION AND DISCHARGE REFRIGERANT LINES FOR LOW HEAD PRESSURE COMPRESSOR STARTING AND INCREASED COMPRESSOR RELIABILITY. WHEN THERE IS A CALL FOR MECHANICAL COOLING THE BYPASS VALVE SHALL OPEN TO EQUALIZING THE SUCTION AND DISCHARGE PRESSURES. WHEN PRESSURES ARE EQUALIZED THE BYPASS VALVE SHALL CLOSE AND THE COMPRESSOR SHALL BE ALLOWED TO START.
- H. EACH CIRCUIT SHALL BE DEHYDRATED AND FACTORY CHARGED WITH R-410A REFRIGERANT AND OIL.
- 2.014 ELECTRICAL
- A. UNIT WIRING SHALL COMPLY WITH NEC REQUIREMENTS AND WITH ALL APPLICABLE UL STANDARDS. ALL ELECTRICAL COMPONENTS SHALL BE UL RECOGNIZED WHERE APPLICABLE. ALL WIRING AND ELECTRICAL COMPONENTS PROVIDED WITH THE UNIT SHALL BE NUMBER AND COLOR-CODED AND LABELED ACCORDING TO THE ELECTRICAL DIAGRAM PROVIDED FOR EASY IDENTIFICATION. THE UNIT SHALL BE PROVIDED WITH A FACTORY WIRED WEATHERPROOF CONTROL PANEL. UNIT SHALL HAVE A SINGLE POINT POWER TERMINAL BLOCK FOR MAIN POWER CONNECTION. A TERMINAL BOARD SHALL BE PROVIDED FOR LOW VOLTAGE CONTROL WIRING. BRANCH SHORT CIRCUIT PROTECTION, 115-VOLT CONTROL CIRCUIT TRANSFORMER AND FUSE, SYSTEM SWITCHES, AND A HIGH TEMPERATURE SENSOR SHALL ALSO BE PROVIDED WITH THE UNIT. EACH COMPRESSOR AND CONDENSER FAN MOTOR SHALL BE FURNISHED WITH CONTACTORS AND INHERENT THERMAL OVERLOAD PROTECTION. SUPPLY FAN MOTORS SHALL HAVE CONTACTORS AND EXTERNAL OVERLOAD PROTECTION. KNOCKOUTS SHALL BE PROVIDED IN THE BOTTOM OF THE MAIN CONTROL PANELS FOR FIELD WIRING ENTRANCE.
- A SINGLE NON-FUSED DISCONNECT SWITCH SHALL BE PROVIDED FOR DISCONNECTING ELECTRICAL POWER AT THE UNIT. DISCONNECT SWITCHES SHALL BE MOUNTED INTERNALLY TO THE CONTROL PANEL AND OPERATED BY AN EXTERNALLY MOUNTED HANDLE.
- 2.015 CONTROLS
 - PROVIDE A COMPLETE INTEGRATED MICROPROCESSOR BASED DIRECT DIGITAL CONTROL (DDC) SYSTEM TO CONTROL ALL UNIT FUNCTIONS INCLUDING TEMPERATURE CONTROL, SCHEDULING, MONITORING, UNIT SAFETY PROTECTION, INCLUDING COMPRESSOR MINIMUM RUN AND MINIMUM OFF TIMES, AND DIAGNOSTICS. THIS SYSTEM SHALL CONSIST OF ALL REQUIRED TEMPERATURE SENSORS, PRESSURE SENSORS, CONTROLLER AND KEYPAD/DISPLAY OPERATOR INTERFACE. ALL MCBS AND SENSORS SHALL BE FACTORY MOUNTED, WIRED AND TESTED.

- B. THE STAND-ALONE DDC CONTROLLER DEPENDENT ON COMMUNICATIONS WI REMOTE PC OR MASTER CONTROL PA OPERATION. THE MICROPROCESSOR EXISTING SET POINTS AND OPERAT UNIT LOSES EITHER DIRECT CONNECT COMMUNICATIONS. THE MICROPROCES PROTECTED FROM VOLTAGE FLUCTU EXTENDED POWER FAILURES. ALL FA SCHEDULES AND CONTROL POINTS S NONVOLATILE MEMORY. NO SETTING DURING EXTENDED POWER SHUTDOW
- C. THE DDC CONTROL SYSTEM SHALL STOPPING OF THE UNIT LOCALLY OR CONTROL SYSTEM SHALL BE CAPAB REMOTE ALARM INDICATION. THE UNI SHALL PROVIDE FOR OUTSIDE AIR DA EMERGENCY SHUTDOWN, REMOTE HE REMOTE COOL ENABLE/DISABLE, HEA INDICATION, AND FAN OPERATION.
- ALL DIGITAL INPUTS AND OUTPUTS AGAINST DAMAGE FROM TRANSIENT VOLTAGES. ALL FIELD WIRING SHALL SEPARATE, CLEARLY MARKED TERM
- E. THE DDC CONTROLLER SHALL HAVE SCHEDULE. THE SCHEDULE SHALL BE THE UNIT KEYPAD INTERFACE. THE MAINTAINED IN NONVOLATILE MEMOR NOT LOST DURING A POWER FAILURE START/STOP PER DAY AND A SEPA SCHEDULE. THE CONTROLLER SHALL HOLIDAYS EACH WITH UP TO A 5-DA SHALL ALSO HAVE THE ABILITY TO SCHEDULE VIA BAS NETWORK COMM
- F. THE KEYPAD INTERFACE SHALL ALL NAVIGATION AND ACCESS TO ALL C UNIT KEYPAD/DISPLAY CHARACTER LINES X 20 CHARACTERS. ALL CONTR PASSWORD PROTECTED AGAINST UN FOR EASE OF SERVICE, THE DISPLAY ENGLISH LANGUAGE READOUT. CODE LOOK-UP TABLES WILL NOT BE ACCE INTERACTION WITH THE DISPLAY SH FOLLOWING INFORMATION AS A MININ 1. RETURN AIR TEMPERATUR
 - 2. DISCHARGE AIR TEMPERAT OUTDOOR AIR TEMPERAT 4. SPACE AIR TEMPERATURE 5. OUTDOOR ENTHALPY, HIGH
 - COMPRESSOR SUCTION TE PRESSURE
 - 7. COMPRESSOR HEAD PRESS EXPANSION VALVE POSITI
 - 9. CONDENSER FAN SPEED
 - 10. INVERTER COMPRESSOR S 11. DIRTY FILTER INDICATION.
 - 12. AIRFLOW VERIFICATION.
 - 13. COOLING STATUS. 14. CONTROL TEMPERATURE
 - 15. VAV BOX OUTPUT STATU 16. COOLING STATUS/CAPACI
 - 17. UNIT STATUS. 18. ALL TIME SCHEDULES.
 - 19. ACTIVE ALARMS WITH TIM
 - 20. PREVIOUS ALARMS WITH 1
 - 21. OPTIMAL START 22. SUPPLY FAN AND EXHAU
 - 23. SYSTEM OPERATING HOUR a. A. FAN
 - b. B. EXHAUST FAN
 - c. C. COOLING d. D. INDIVIDUAL COMPRES
 - e. E. HEATING
 - f. F. ECONOMIZER g. G. TENANT OVERRIDE

G. THE USER INTERACTION WITH THE KE THE FOLLOWING: 1. CONTROLS MODE

- a. A. OFF MANUAL b. B. AUTO c. C. HEAT/COOL d. D. COOL ONLY e. E. HEAT ONLY f. F. FAN ONLY 2. OCCUPANCY MODE a. A. AUTO
- Ь. В. OCCUPIED
- c. C. UNOCCUPIED d. D. TENANT OVERRIDE
- 3. UNIT OPERATION CHANGE a. A. RETURN AIR TEMPE
- b. B. SPACE TEMPERATU
- c. C. NETWORK SIGNAL 4. COOLING AND HEATING CH
- TEMPERATURE WITH DEAL
- 5. COOLING DISCHARGE AIR 6. SUPPLY RESET OPTIONS
- a. A. RETURN AIR TEMPE b. B. OUTDOOR AIR TEMP
- c. C. SPACE TEMPERATU
- d. D. AIRFLOW (VAV) e. E. NETWORK SIGNAL
- f. F. EXTERNAL (0-10 VE
- g. G. EXTERNAL (0-20 M

PRIOR TO SUBMITTING THE BID **INFORM THE ARCHITECT AND TH** THE EXISTING CONDITIONS ANI THE ENGINEER AND THE ARCHIT FROM VERIFIABLE EXISTING CO NOT FOR BID UNTIL PERMIT HAS BEEN ISSUED.

ERS SHALL NOT BE TH ANY ON-SITE OR ANEL FOR PROPER UNIT SHALL MAINTAIN E STAND ALONE IF THE T OR NETWORK SSOR MEMORY SHALL BE JATIONS AS WELL AS ANY ACTORY AND USER SET SHALL BE MAINTAINED IN IS SHALL BE LOST, EVEN WNS. PERMIT STARTING AND R REMOTELY. THE BLE OF PROVIDING A IT CONTROL SYSTEM PARE ACTUATION,	 BUILDING STATIC PRE ECONOMIZER CHANGER a. A. ENTHALPY b. B. DRYBULB TEME CURRENTLY TIME AND TENANT OVERRIDE TI OCCUPIED/UNOCCUPIE ONE EVENT SCHEDULE NOLIDAY DATES AND ADJUSTABLE SET PO SERVICE MODE 	AIR TEMPERATURE AIR TEMPERATURE AIR TEMPERATURE OR COMPRESSORS. STAGE TIMERS SETUP SPACE TEMPERATURE. ESSURE. OVER PERATURE D DATE IME ED TIME SCHEDULE E DURATION INTS	R S WEST PALM BEACH, FLORIDA 33401 ph: 561.684.6844 • gliddenspina.com FLLic.# AA26002399 nterior Design
EAT ENABLE/DISABLE, AT INDICATION, COOL SHALL BE PROTECTED TS OR INCORRECT L BE TERMINATED AT A MINAL STRIP A BUILT-IN TIME E PROGRAMMABLE FROM SCHEDULE SHALL BE RY TO INSURE THAT IT IS E. THERE SHALL BE ONE ARATE HOLIDAY ACCEPT UP TO SIXTEEN AY DURATION. EACH UNIT ACCEPT A TIME 1UNICATIONS. LOW CONVENIENT ONTROL FUNCTIONS. THE	b. B. TIMERS FAST (H. IF THE UNIT IS TO BE PROGRAMI OR SETUP FUNCTION, AN OPTION PROVIDED. SPACE SENSORS SH. SUPPORT FIELD SELECTABLE FE SHALL INCLUDE: 1. ZONE SENSOR WITH T	NAL SPACE SENSOR SHALL BE ALL BE AVAILABLE TO EATURES. SENSOR OPTIONS TENANT OVERRIDE SWITCH TENANT OVERRIDE SWITCH COOLING SET POINT E COMFORT CONTROL OF THE COOLING SYSTEM THE DE A DISCHARGE AIR M FOR PART LOAD OPERATING AIR TEMPERATURE SHALL BE IUM AND A MAXIMUM	Architecture • In Keith M. Spina
R FORMAT SHALL BE 4 ROL SETTINGS SHALL BE NAUTHORIZED CHANGES. Y FORMAT SHALL BE ED FORMATS WITH SEPTED. THE USER HALL PROVIDE THE IMUM: RE. TURE. URE. E. H/LOW. SMPERATURE AND SURE AND TEMPERATURE TON SPEED (CHANGEOVER). JS. ITY. ME AND DATE. TIME AND DATE. ST FAN SPEED. RS. SSOR SSOR SEYPAD SHALL PROVIDE	 OUTSIDE AIR TEMPER SPACE TEMPERATURI RETURN AIR TEMPER/ EXTERNAL SIGNAL OF EXTERNAL SIGNAL OF NETWORK SIGNAL 2.016 ROOF CURB A PREFABRICATED HEAVY GAU MOUNTING CURB SHALL BE PRO ON THE ROOF DECKING PRIOR TO CURB SHALL BE A FULL PERIME PERIMETER SUPPORT OF THE AI CONDENSING SECTION. THE CURI HIGH AND INCLUDE A NOMINAL 2 GASKET SHALL BE PROVIDED FI THE UNIT BASE AND ROOF CURE 	E ATURE F 1–5 VDC F 0–20 MA UGE GALVANIZED STEEL, IVIDED FOR FIELD ASSEMBLY O UNIT SHIPMENT. THE ROOF TER TYPE WITH COMPLETE IR HANDLING SECTION AND B SHALL BE A MINIMUM OF 14" 2" X 4" WOOD NAILING STRIP. OR FIELD MOUNTING BETWEEN	New Building For: New Building For: DODODATION INC. Beach Centry LEARNING CENTER Band Bach County, Florida Band Bach County, Florida Band Bach County, Florida
OVER CONTROL ERATURE JRE HANGE-OVER DBAND			Project no: 15435
TEMPERATURE (DAT) ERATURE PERATURE		PERMIT / BID SET: 09/07/16	Date: 09.09.16 Drawn by: RB/SK/JS Project Architect: BJ
JRE DC) IA)		FAF	SNOITS, w
HE ENGINEER OF ANY DISCRE D SHALL INCLUDE IN THE BID TECT, ARE NOT RESPONSIBLE	ELD VERIFY ALL EXISTING CONDITIONS AND PANCY BETWEEN THESE DOCUMENTS AND TO CORRECT THE SAME AS DIRECTED. FOR ANY ADDITIONAL COSTS RESULTING R CONTRACT HAS BEEN AWARDED.	CONSULTING 700 WEST HILLSBORD BLVD BLDG. #1, SUITE 204 DEERFIELD BEACH, FLORIDA 33441 TEL: (561) 391-9292 FAX: (561) 391-9898 Certificate of Authorization No. 28107 URSULA IAFRATE, P.E. LICENSE #73122 STEPHEN F. ROLLIN, P.E. LICENSE #36428 DONALD H. AUSTIN, JR., PE LICENSE #60651	\overline{O}

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.**

JASON BARBER, P.E. LICENSE #73050 E-MAIL: INFO@FAECONSULTING.COM DESIGNED BY: BJ/SK/JS PM: BJ P/N 15434

09.09.16 BID/PERMIT