## GENERAL NOTES

- 1. GENERAL NOTES, SYMBOL LIST AND DETAILS ARE APPLICABLE TO ALL HVAC/MECHANICAL DRAWINGS.
- 2. THE CONTRACTOR SHALL COMPLY WITH ALL LAWS, STANDARDS ORDINANCES. RULES AND REGULATIONS OF ALL LOCAL AND STATE GOVERNMENTAL AUTHORITIES, THE RULES OF THE NATIONAL FIRE PROTECTION ASSOCIATION (NFPA), THE NATIONAL ELECTRIC CODE (NEC) AND ASHRAE AS INTERPRETED BY THE GOVERNMENTAL AUTHORITY AND PUBLIC UTILITIES HAVING JURISDICTION OVER ANY OF THE SYSTEMS HEREIN SPECIFIED
- 2. DRAWINGS ARE DIAGRAMMATIC. DETERMINE LOCATIONS OF SYSTEMS AND COMPONENTS IN FIELD. RELOCATE EXISTING WORK (IF ANY)
- THAT INTERFERES WITH WORK OF THIS CONTRACT AS APPLICABLE. 3. ALL PERMIT AND INSPECTION CERTIFICATES SHALL BE DELIVERED TO THE OWNER IN DUPLICATE.
- 4. THE CONTRACTOR SHALL PROVIDE ALL EQUIPMENT AND MATERIALS ACCORDANCE WITH THE BEST ENGINEERING PRACTICE. UNLESS OTHERWISE SHOWN OR SPECIFIED, FOLLOW THE MANUFACTURER'S PUBLISHED INSTALLATION INSTRUCTIONS AND PROVIDE ALL REQUIRED AUXILIARY ITEMS.
- 5. ALL EQUIPMENT PROVIDED SHALL BE NEW (UNLESS INDICATED OTHERWISE) AND THE CURRENT MODEL FOR WHICH REPLACEMENT PARTS ARE AVAILABLE. SUBSTITUTIONS SHALL ONLY BE ACCOMPLISHED AT THE DISCRETION OF THE DESIGN ENGINEER.
- 6. SHOP DRAWINGS ARE TO BE SUBMITTED AND APPROVED BEFORE THE EQUIPMENT IS INSTALLED. SUBMIT SIX (6) COPIES OF SHOP DRAWINGS TO THE ARCHITECT OF THE FOLLOWING AS APPLICABLE: A. GAS FURNACE B. WATER HEATER C. WALL HEATER D. FANS E PLUMBING FIXTURES OR ANY OTHER EQUIPMENT SHOP DRAWING AS REQUESTED BY THE ARCHITECT
- COORDINATE THIS WORK WITH THAT OF OTHER TRADES. 8. DIMENSIONS SHOWN ON PLAN ARE HORIZONTAL. DIMENSIONS SHOWN IN ELEVATION ARE VERTICAL EXCEPT IN WAY OF STRUCTURAL STEEL, DIMENSIONS ARE MEASURED PERPENDICULAR TO FLANGE.
- NEITHER ACCURACY NOR COMPLETION OF SERVICES AND UTILITY LOCATIONS SHOWN ON DRAWINGS IS GUARANTEED. DETERMINE EXACT LOCATIONS OF EXISTING SERVICES AND UTILITIES IN FIELD, WHETHER OR NOT SHOWN ON DRAWINGS. EXERCISE CAUTION AND IDENTIFY LOCATIONS OF UNMARKED UTILITY LINES AS NECESSARY TO PERFORM WORK OF THIS SECTION
- 10. MANUFACTURERS MODEL NUMBERS ARE SPECIFIED SOLELY TO ESTABLISH STANDARDS OF QUALITY FOR PERFORMANCE AND MATERIALS.
- 11. PRODUCT INSTALLATION SHALL ADHERE TO MANUFACTURERS RECOMMENDATIONS.
- 12. PROVIDE ACCESS PANELS FOR EQUIPMENT THAT REQUIRES PERIODIC SERVICE.
- 13. PROVIDE HANGERS, INSERTS, ANCHORS, SUPPLEMENTAL STEEL & SUPPORTS AS REQUIRED TO SUPPORT DUCTWORK, PIPING AND EQUIPMENT FROM STRUCTURE.
- 14. SCHEDULE WORK OF THIS SECTION TO AVOID INTERFERING WITH EXISTING OPERATIONS IN THE FACILITY.
- 15. COORDINATE ROOF PENETRATIONS WITH WORK OF OTHER SECTIONS. AND WITH FLASHING REQUIREMENTS. MECHANICAL CONTRACTOR TO NOTIFY OWNER PRIOR TO STARTING WORK TO VERIFY COMPLIANCE WITH BOND AND WARRANTY OF EXISTING ROOF.
- 16. RUN DUCTS AND PIPING CONCEALED, UNLESS OTHERWISE SPECIFIED AND CLEAR OF CEILING INSERTS.
- 17. INSTALL THERMOSTATS 4'-6" ABOVE FINISHED FLOOR OR AS DIRECTED OTHERWISE BY ARCHITECT.
- 18. STRUCTURAL WELDING SHALL BE CONTINUOUS 1/4" FILLET UNLESS REQUIRED OTHERWISE.
- 22. THE ENGINEER IS NOT RESPONSIBLE FOR. AND WILL NOT HAVE CONTROL OF, CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES OR PROCEDURES, OR FOR SAFETY PRECAUTIONS AND PROGRAMS IN CONNECTION WITH THE CONSTRUCTION WORK, NOR WILL HE BE RESPONSIBLE FOR THE CONTRACTOR'S FAILURE TO CARRY OUT THE CONSTRUCTION WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
- 23. PROVIDE OPENINGS IN BUILDING CONSTRUCTION FOR PASSAGE OF DUCTWORK, PIPING AND CONDUIT. REPAIR ALL WALLS, CEILINGS AND FLOORS, PENETRATED. THE REPAIRS SHALL BE WITH MATERIALS AND FINISHES THAT COMPLY WITH LOCAL CODES, UNLESS STATED OTHERWISE. ALL PENETRATIONS IN FIREWALLS SHALL BE SEALED WITH SUITABLE MATERIALS TO PRESERVE FIREWALL INTEGRITY. DO NOT PENETRATE STRUCTURAL MEMBERS WITHOUT PRIOR APPROVAL. ALL PENETRATIONS THROUGH THE ROOF SHALL BE BY THE GENERAL CONTRACTORS. THE MEP ENGINEER IS NOT RESPONSIBLE FOR THE EVALUATION OF STRUCTURAL INTEGRITY OF THE BUILDING FOR OPENINGS BEING MADE THROUGHOUT THE
- BUILDING SYSTEM FOR THE INSTALLATION OF MECHANICAL SYSTEM. 24. THE CONTRACTOR SHALL TEST ALL EQUIPMENT PROVIDED UNDER THE CONTRACT AND DEMONSTRATE TO THE OWNER IT'S PROPER OPERATION.

## GENERAL NOTES CONTINUED.

## AIR SYSTEMS

- 1. REFER TO ARCHITECTURAL REFLECTED CEILING PLANS FOR EXACT
- LOCATIONS OF AIR DEVICES (IF PROVIDED) 2. INTERNAL AIRFLOW DIMENSIONS ARE SHOWN FOR DUCTS. INCREASE DUCT SIZE AS NECESSARY TO MAINTAIN FREE FLOW AREA INDICATED.
- 3. USE FLAT TRANSVERSE SEAM FOR DUCTWORK WHERE SPACE AVAILABLE DICTATES.
- 4. DIFFUSER SIZES SHOWN ARE NECK SIZES. REGISTERS AND GRILLE SIZES ARE NOMINAL
- 5. PROVIDE VOLUME DAMPERS OR OTHER APPROVED BALANCING DEVICES AT DUCT BRANCHES AND RUN OUTS, AND AT REGISTER GRILLE AND DIFFUSER NECKS IN SUPPLY, RETURN AND EXHAUST
- DUCTWORK WHETHER SHOWN OR NOT. PROVIDE 36" CLEARANCE IN FRONT OF ALL ELECTRIC CONTROL PANELS PER N.E.C. AND MFG. REQUIREMENTS.
- ALL INSTALLED OUTDOOR AIR INTAKES AND EXHAUSTS SHALL HAVE AUTOMATIC OR GRAVITY BACKDRAFT DAMPERS THAT CLOSE WHEN THE VENTILATION SYSTEM IS NOT OPERATING, PER2013 IECC R403.5

#### COMMISSIONING OF GENERAL NOTES

- SUBMIT A COPY OF THE APPROVED SUBMITTALS FOR EQUIPMENT TO BE COMMISSIONED TO THE COMMISSIONING AUTHORITY.
- 2. THE COMMISSIONING AUTHORITY REQUIRES THE FOLLOWING DOCUMENTATION FOR THE COMMISSIONING PROCESS: INSTALLATION, OPERATING, AND MAINTENANCE (I-O-M) MANUAL, APPROVED EQUIPMENT SUBMITTALS, AND WARRANTY INFORMATION, LISTING OWNER RESPONSIBILITIES FOR MAINTAINING THE WARRANTY IN FORCE, COPIES OF THE FILED CHECKOUT FORMS ISSUED BY THE FACTORY OR FIELD TECHNICIANS SHALL BE PROVIDE TO THE COMMISSIONING AUTHORITY.
- REFER TO COMMISSIONING PLAN TO BE ISSUED, LISTING EQUIPMENT AND SYSTEMS IN THE COMMISSIONING SCOPE, AND OTHER GUIDELINES.
- 4. THE COMMISSIONING AUTHORITY AND CONTRACTOR(S) SHOULD MEET TO DISCUSS COMMISSIONING SCHEDULE, INSTALLATION OBSERVATIONS, IF ANY, AND TEST PROCEDURES. THE CXA WILL REVIEW THE INSTALLATION FOR QUALITY, CORRECT OPERATOR
- ACCESS, ET AL. AT PROJECT COMPLETION, THE GC SHALL SCHEDULE A DATE FOR THE MECHANICAL, ELECTRICAL AND CONTROLS CONTRACTOR (IF ANY), TO EXECUTE FUNCTIONAL PERFORMANCE TESTS ON THE MECHANICAL AND ELECTRICAL SYSTEMS.
- 6. THE CONTRACTOR SHALL INCLUDE THE CXA IN ANY OPERATOR TRAINING ON THE MECHANICAL EQUIPMENT.
- CONTRACTOR'S RESPONSIBILITY TO COMPLY WITH REQUIREMENTS OF THE CONTRACT DOCUMENTS, EITHER IN SUBMITTALS OR IN THE INSTALLATION, IS NOT RELIEVED BY THE COMMISSIONING AUTHORITY'S REVIEW.

## AIR LEAKAGE TEST FOR BUILDING ENVELOPE:

- 1. THE BUILDING OF DWELLING UNIT TOTAL AREA SHALL BE TESTED AND VERIFIED AS HAVING AN AIR LEAKAGE RATE OF LESS THAN TO 0.25 CFM/SQ.FT UNDER A DIFFERENTIAL PRESSURE OF 0.3 INCHES W.G. (75 PA).
- 2. TESTING SHALL OCCUR AFTER ROUGH-IN AND AFTER INSTALLATION OF PENETRATIONS OF THE BUILDING ENVELOPE, INCLUDING PENETRATIONS FOR UTILITIES, HEATING, SYSTEMS, PLUMBING, AND ELECTRICAL EQUIPMENT AND APPLIANCES.
- 3. TESTING SHALL BE DONE IN ACCORDANCE WITH ASTM E 779 TEST FAN MEASUREMENT EQUIPMENT SHALL THEIR CALIBRATION VERIFIED IN COMPLIANCE WITH ASTM F1258-88(2008).
- 4. WHERE REQUIRED BY THE CODE OFFICIAL, TESTING SHALL BE CONDUCTED BY AN APPROVED THIRD PARTY & WITNESSED BY COMMISSIONING AGENT.
- 5. A WRITTEN REPORT OF THE RESULTS OF THE TEST SHALL BE SIGNED BY THE PARTY CONDUCTING THE TEST AND PROVIDED TO THE CODE OFFICIAL.
- 6. THE TESTING AGENCY IS REQUIRED TO PERFORM A DIAGNOSTIC EVALUATION IN ACCORDANCE WITH ASTM E1186-03 WHETHER THE BUILDING ACHIEVES THE AIR TIGHTNESS REQUIREMENT OR NOT.
- 7. THE DIAGNOSTIC EVALUATION WILL ASSIST THE BUILDING CONTRACTOR AND OTHER RESPONSIBLE PARTIES IN IDENTIFYING AND ELIMINATING AIR LEAKAGE. TESTING SHALL BE PERFORMED AT ANY TIME AFTER CREATION OF ALL PENETRATIONS OF THE BUILDING THERMAL ENVELOPE.
- 8. TESTING SHALL BE CONDUCTED IN ACCORDANCE WITH A METHOD APPROVED BY THE CODE OFFICIAL INCLUDING, BUT NOT LIMITED TO, AN APPROVED SAMPLING PROTOCOL.

## DURING TESTING

- 1. EXTERIOR WINDOWS AND DOORS, FIREPLACE AND STDVE DOORS SHALL BE CLOSED, BUT NOT SEALED, BEYOND THE INTENDED WEATHER STRIPPING OR OTHER INFILTRATION CONTROL MEASURES.
- 2. 2. DAMPERS INCLUDING EXHAUST, INTAKE, MAKEUP AIR, BACKDRAFT AND FLUE DAMPERS SHALL BE CLOSED, BUT NOT SEALED BEYOND INTENDED INFILTRATION CONTROL MEASURES;
- 3. INTERIOR DOORS. IF INSTALLED AT THE TIME OF THE TEST, SHALL BE OPEN:
- 4. EXTERIOR DOORS FOR CONTINUOUS VENTILATION SYSTEMS AND HEAT RECOVERY VENTILATORS SHALL BE CLOSED AND SEALED; 5. HEATING AND COOLING SYSTEMS, IF INSTALLED AT THE TIME OF
- 6. SUPPLY AND RETURN REGISTERS, IF INSTALLED AT THE TIME OF THE TEST, SHALL BE FULLY OPEN.

THE TEST, SHALL BE TURNED OFF; AND

	DUCTWORK	
SINGLE LINE DUCT	DESCRIPTION	DOUBLE LINE DUCT
	SUPPLY DUCT UP	
	SUPPLY DUCT DOWN	
<b>←</b>	ROUND DUCT UP SUPPLY/ RETURN/ EXHAUST	
<del></del>	ROUND DUCT DOWN SUPPLY/ RETURN/ EXHAUST	<b>8</b>
	STANDARD RADIUS ELBOW ( R = W ) SUPPLY/ RETURN/ EXHAUST	-W-I
	MITERED ELBOWS W/ VANES	
	SPLIT TAKE-OFF (TOP AND BOTTOM)	
OR C	BULLHEAD SPLIT SUPPLY	
VD	CEILING DUCT MTD. DIFF/GRILLE	VD
VD VD	TAKEOFF TO DIFF/GRILLE  RECTANGULAR TO ROUND OVAL ( ∅ ) TO ROUND	VD VID
<del></del>	HORIZONTAL OFFSET SUPPLY/RETURN /EXHAUST	
2	45°TAPTAKE-OFFRECTANGULAR / ROUND (Ø) - OVAL ( ♥)	
	90° TAP_TAKE-OFF_ RECTANGULAR / ROUND (ø) - OVAL ( ⊅)	
	BULLHEAD CONVERGE RETURN/EXHAUST  RECTANGULAR / ROUND (Ø) — OVAL ( ♥)  SIDEWALL DUCT MTD. REG./GRILLE	
	OPEN END DUCT W/ 1/4" x 1/4" WMS	

## DRAWING LIST

	SHEET NO.	SHEET NAME
	M001	GENERAL NOTES, LEGENDS & ABBREVIATIONS
	M002 M003	EQUIPMENT SCHEDULES & DETAILS   HVAC NOTES
	M101	HVAC FLOOR PLANS

#### GENERAL ABBREVIATIONS ARCH ARCHITECT N/A NOT APPLICABLE NO. NUMBER CUBIC FEET PER MINUTE NTS NOT TO SCALE DRAIN PIPE OUTSIDE AIR DIA DIAMETER OD OUTSIDE DIAMETER EXHAUST FAN EG EXHAUST GRILL RETURN DIFFUSER RET RETURN ELEV ELEVATION RG REFRIGERANT GAS ΕX EXHAUST REFRIGERANT LIQUID RMROOM FLOOR GRILL RPM REVOLUTIONS PER MINUTE FPM FEET PER MINUTE FEET SUPPLY DIFFUSER SQ SQUARE GAL GALLONS SQFT SQUARE FEET HP HORSEPOWER **TEMPERATURE** HΖ TRANSFER GRILLE INCHES VOLUME DAMPER KILOWATT WIDTH KEF KITCHEN EXHAUST FAN WG WALL GRILL MECH WET BULB TEMPERATURE MECHANICAL MINIMUM

EQUIPMENT SYME	BOLS AND CALL OUTS
VD	MANUAL BALANCING VOLUME DAMPER
	AIR HANDLING UNIT (AHU)
	OUT DOOR UNIT (ODU)
	EXHAUST FAN (EF)
	KITCHEN RE-CIRCULATION FAN (KEF)
	SIDE WALL GRILL
	CEILING DIFFUSER(SUPPLY/RETURN)
	DUCT/WALL GRILL DIFFUSER(SUPPLY/RETURN)
<b>™</b> ®	TRANSFER GRILL
T	7-DAY PROGRAMMABLE THERMOSTAT
	SUPPLY DUCT
	EXHAUST DUCT
[]	RETURN AIR DUCT

PROFESSIONAL SEAL

TE ADDRESS: 35 Atkins Rd, -Varina, NC 275





DRAWN BY: ST CHECKED BY DATE: 11-23-20 SCALE: AS SHOWN

20-1035

## HVAC NOTES

#### HVAC SYSTEM NOTES

- 1. ALL MATERIALS, EQUIPMENT AND INSTALLATIONS SHALL BE IN STRICT ACCORDANCE WITH 2012 INTERNATIONAL MECHANICAL CODE. SMACNA. UL. MANUFACTURER'S RECOMMENDATION & LOCAL TOWNSHIP REQUIREMENTS. COMPLIANCE WITH ASHRAE -62, 1989 - INDOOR AIR QUALITY; LOCAL CODES, AND ALL AUTHORITIES HAVING **JURISDICTION**
- 2. PLANS ARE NOT SCALED, THESE PLANS ARE INTENDED TO BE DIAGRAMMATIC OUTLINE. THE CONTRACTOR SHALL PROVIDE SHOP DRAWINGS FOR ALL EQUIPMENT AND MATERIALS LISTED IN HVAC EQUIPMENT LIST.
- 3. THE CONTRACTOR IS RESPONSIBLE FOR ALL CUTTING AND PATCHING ASSOCIATED WITH THE MECHANICAL WORK
- AND FIRE STOPPING OF ALL PENETRATIONS OF FIRE RATED PARTITIONS ASSOCIATED WITH THE MECHANICAL WORK. 4. THE CONTRACTOR SHALL FURNISH AND INSTALL ALL EQUIPMENT, MATERIALS AND LABOR TO PROVIDE COMPLETE AND OPERATIONAL SYSTEM AS INDICATED ON THE DESIGN DOCUMENTS.
- 5. THE CONTRACTOR SHOULD PROVIDE AIR BALANCE, SO AIR QUANTITIES TO BE DELIVERED FOR EQUAL AIR
- 6. THE CONTRACTOR SHALL COORDINATE ALL WORK WITH OTHER TRADES AND IN FILED PRIOR TO INSTALLATION OF ANY WORK. REPORT ALL CONFLICTS IMMEDIATELY TO THE ENGINEER.
- 7. THE CONTRACTOR SHALL OBTAIN ALL PERMITS, INSPECTIONS AND APPROVALS PRIOR TO AND DURING CONSTRUCTION
- 8. AT CONNECTIONS TO EXISTING SYSTEMS, REPAIR OR REPLACE SHEET METAL PIPING, INSULATION, ETC. AS REQUIRED TO MATCH EXISTING ADJACENT SURFACES.
- 9. CONTRACTOR SHALL BE RESPONSIBLE FOR THE SAFETY OF THE WORK AREA, ADJACENT AREAS AND BUILDING OCCUPANTS THAT ARE LIKELY TO BE EFFECTED BY THE WORK UNDER THIS CONTRACT. WORK SHALL CONFORM TO ALL OSHA REQUIREMENTS.
- 10. ALL MECHANICAL EQUIPMENT AND APPLIANCES SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S INSTALLATION INSTRUCTIONS FOR THE LABELED EQUIPMENT AND APPLIANCES.
- 11. PROVIDE AND INSTALL VOLUME DAMPERS IN ALL SUPPLY/OUTSIDE AIR & RETURN BRANCH TAKE-OFFS TO ENSURE AIR BALANCING OF THE HVAC SYSTEM.
- 12. DESIGN CONDITION: SUMMER: 92 DEG F/ 75 DEG F (OUTSIDE/ROOM)
- WINTER 20 DEG F / 70 DEG F (OUTSIDE/ROOM) 13. AS APPLICABLE, PROVIDE VENTILATION FOR THE FURNACE DUE TO THE USAGE OF GAS, FOLLOW THE DETAIL OF
- THE THROUGH ROOF PIPING FOR THE INSTALLATION OF VENTILATION PIPING. 14. INSTALLATION OF MECHANICAL SYSTEM AND COMPONENT SHALL BE IN ACCORDANCE WITH APPLICABLE LOCAL AND NATIONAL CODES
- 15. ALL AIR HANDLERS SHALL HAVE LEAKAGE RATE OF EQUAL OR LESS THAN 2%. CONTRACTOR SHALL PROVIDE MANUFACTURER'S SPEC SHEET TO VALIDATE THIS DESIGN NOTE. MANUFACTURER'S SPEC IS ATTACHED FOR NCRA REVIEW.

## **DUCTWORK**

- 1. DUCTWORK SHALL BE FABRICATED FROM GALVANIZED SHEET STEEL ACCORDING TO SMACNA
- 2. INSTALL AUTO GRAVITY DAMPERS IN ALL AIR INTAKES AND EXHAUST VENTS.
- 3. DUCT CONSTRUCTION STANDARDS TO 2" W.G., SEAL CLASS C. EXHAUST DUCTS AND TRANSFER DUCTS SHALL BE CONSTRUCTED TO 1/2" W.G., SEAL CLASS C. NO DUCT LEAKAGE SHALL BE NOTICEABLE TO THE HAND OR EAR OF THE ENGINEER. ALL DUCTWORK SHALL BE SEALED WITH HARDCAST. DUCT TAPE SHALL NOT BE USED
- 4. FLEXIBLE DUCTWORK SHALL BE U.L. 181 CLASS 1 FACTORY-INSULATED EQUIVALENT TO THERMAFLEX G-KM. FLEXIBLE DUCTWORK LENGTH SHALL NOT EXCEED 8 FEET. FLEXIBLE DUCTWORK DIAMETER SHALL BE THE SAME SIZE AS THE COLLAR TO WHICH IT IS CONNECTED.
- 5. ALL DUCTWORK SHALL BE INSTALLED TIGHT TO UNDERSIDE OF THE BUILDING STRUCTURE IN ACCORDANCE WITH THE SMACNA DUCT CONSTRUCTION STANDARDS. DUCTWORK SUPPORTS SHALL BE SECURELY ATTACHED TO THE STRUCTURE ABOVE.
- 6. ALL NECESSARY ALLOWANCES AND PROVISIONS SHALL BE MADE BY THIS CONTRACTOR FOR BEAMS, COLUMNS OR OTHER OBSTRUCTIONS OF THE BUILDING OR THE WORK OF OTHER CONTRACTORS, WHETHER OR NOT SAME IS SHOWN. WHERE NECESSARY TO AVOID OBSTRUCTIONS THE SHEET METAL DUCTWORK SHALL BE TRANSFORMED, DIVIDED, OFFSET, RAISED OR LOWERED WITH THE REQUIRED FREE AREA BEING MAINTAINED. ADJUST DUCTWORK SIZES, LOCATION AND CONFIGURATION, INCLUDING LINEAR DIFFUSER PLENUMS, AS REQUIRED TO COORDINATE WITH WORK OF THIS AND ALL OTHER TRADES. THIS SHALL INCLUDE
- DIAGONAL STEEL BRACING AT THE EXTERIOR WINDOW WALLS AND SIMILAR LOCATIONS SUCH AS BRACING FOR DOOR FRAMES. REFER TO ARCHITECTURAL AND/OR STRUCTURAL DRAWINGS FOR BRACING DETAILS. COORDINATION ITEMS SHALL BE SHOWN BY THE CONTRACTOR ON THE SHOP DRAWINGS.
- 7. PROVIDE AIR TURNING DEVICES IN DUCTWORK AT ANY CHANGES IN DIRECTION OF 30 DEGREES OR GREATER WHEN THE CROSS SECTION AREA OF THE DUCT IS OVER 90 SQUARE INCHES. KITCHEN EXHAUST DUCT SHALL HAVE NO OBSTRUCTIONS INSIDE THE DUCT. TURNING VANES SHALL BE DOUBLE THICKNESS TYPE. SPLITTER DAMPERS SHALL HAVE LOCKING QUADRANTS.
- 8. BRANCH CONNECTIONS SHALL BE IN ACCORDANCE WITH SMACNA FIG. NO. 2-8 WITH THE EXCEPTION OF STRAIGHT TAPS AND DOVETAIL JOINTS WHICH ARE NOT ALLOWED.
- 9. MANUAL BALANCING DAMPERS SHALL BE REINFORCED TO PREVENT VIBRATION. DAMPERS SHALL BE PROVIDED WITH LOCKING QUADRANT LEVERS THAT ARE CLEARLY MARKED FOR POSITION DAMPERS SHALL BE BOLTED OR RIVETED TO QUADRANT TO REFLECT THEIR TRUE POSITION. PROVIDE ELEVATED LOCKING QUADRANT WHEN INSTALLED IN INSULATED DUCTWORK. PROVIDE FILTERS FOR
- 10. PROVIDE FLEXIBLE CONNECTIONS AT ALL EQUIPMENT. FLEXIBLE CONNECTIONS SHALL BE VENT FABRICS "VENTGLAS" 30 OZ/SQ YARD OR APPROVED EQUAL.
- 11. PROVIDE AIR DISTRIBUTION DEVICES WITH FRAMES THAT MATCH CEILING/WALL CONSTRUCTION AS FOLLOWS: ITEM DESCRIPTIONS:
- WR, CR WALL REGISTER/CEILING REGISTER: TITUS 300RS WITH OPPOSED BLADE DAMPER NOTES:
- AIR DEVICE FRAMES SHALL MATCH CEILING / WALL CONSTRUCTION
- AIR DEVICES SHALL BE TESTED IN ACCORDANCE WITH THE AIR DIFFUSION COUNCIL (ADC) ALL AIR DISTRIBUTION DEVICES SHALL BE ALUMINUM.
- 12. DUCTS SHALL BE INSULATED TO R-8 OR GREATER WHERE LOCATED IN UNCONDITIONED SPACES AND R-11 MINIMUM WHERE LOCATED OUTSIDE OF THE BUILDING STRUCTURE. WHERE LOCATED WITHIN A BUILDING ENVELOPE ASSEMBLY, THE DUCT OR PLENUM SHALL BE SEPARATED FROM THE BUILDING EXTERIOR OR UNCONDITIONED OR EXEMPT SPACES BY R-8 INSULATION OR GREATER.
- 13. CONTRACTOR SHALL PROVIDE OPERATING AND MAINTENANCE MANUAL IN ACCORDANCE WITH INDUSTRY ACCEPTED STANDARDS & SHALL INCLUDE ALL THE FOLLOWING
- 13.1. SUBMITTAL DATA STATING EQUIPMENT SIZE AND SELECTED OPTIONS FOR EACH PIECE OF EQUIPMENT REQUIRING MAINTENANCE.
- 13.2. MANUFACTURER'S OPERATION MANUALS AND MAINTENANCE MANUALS FOR EACH PIECE OF EQUIPMENT SHALL BE FURNISHED AS PART OF THE BUILDING PROJECT. REQUIRED ROUTINE MAINTENANCE SHALL BE CLEARLY IDENTIFIED.
- 13.3. NAMES AND ADDRESSES OF NOT LESS THAN ONE SERVICE AGENCY. A SYSTEMS MANUAL SHALL BE PROVIDED AND SHALL INCLUDE ALL THE FOLLOWING: 13.4. HVAC CONTROLS SYSTEM MAINTENANCE AND CALIBRATION INFORMATION, INCLUDING WIRING DIAGRAMS, SCHEMATICS, AND
- CONTROL SEQUENCE DESCRIPTIONS. DESIRED OR FIELD-DETERMINED SET-POINTS SHALL BE PERMANENTLY RECORDED ON CONTROL DRAWINGS AT CONTROL DEVICES OR, FOR DIGITAL CONTROL SYSTEMS, IN PROGRAMMING COMMENTS.
- 13.5. A COMPLETE NARRATIVE OF HOW EACH SYSTEM IS INTENDED TO OPERATE, INCLUDING RECOMMENDED SET-POINTS, SEASONAL CHANGE-OVER INFORMATION AND EMERGENCY SHUTDOWN OPERATION.
- 14. CONTROL SEQUENCE DESCRIPTIONS FOR LIGHTING, DOMESTIC HOT WATER HEATING AND ALL RENEWABLE ENERGY SYSTEMS COMPLETE WITH A DESCRIPTION OF HOW THESE SYSTEMS CONNECT TO, AND ARE CONTROLLED IN CONJUNCTION WITH, THE OVERALL BUILDING SYSTEM.

# HVAC NOTES CONTINUED

### PIPING SYSTEM

- 1. CONDENSATE DRAIN PIPING: TYPE DWV COPPER INSTALLED WITH A SLOPE OF 1/8" PER LINEAR FT AND TRAPPED AT EACH DRAW THROUGH UNIT. ROUTE CONDENSATE PIPING FROM GAS FURNACE AND COOLING COOL SEPARATELY TO THE OUTDOORS AND DAYLIGHT ON GRADE.
- 2. DRAIN VALVES: NIBCO 585-70 600 LBS. W.O.G., TWO PIECE BODY, FULL PORT, MIL SPEC MSS SP-110. WITH "NIB-SEAL" EXTENDED HANDLE AND DRAIN CAP.
- UNIONS: BRONZE BODY, SOLDERED ENDS, 125# THREADED GROUND JOINT TYPE.
- PROVIDE DI-ELECTRIC BREAKS BETWEEN PIPING OF DISSIMILAR MATERIALS. 5. PIPE HANGERS FOR ALL PIPING SHALL BE OF SAME MATERIALS AS ASSOCIATED PIPING. PIPING HANGERS SHALL BE INSTALLED AT 5 FOOT INTERVALS AND AT BOTH SEGMENTS OF ALL DIRECTION
- 6. PITCH PIPING 1" IN 20' IN DIRECTION OF FLOW.
- 7. HVAC LINE-SET PIPING INSTALLATION SHALL COMPLY WITH CURRENT TX MECHANICAL/PLUMBING CODE

## INSULATION

- 8. ALL INTERIOR DUCTWORK ON THE TOP LEVEL SHALL BE INSULATED WITH 1-1/2" THICK FIBERGLASS INSULATION WITH VAPOR BARRIER WITH A "K" VALUE OF 30 AT 75 DEGREES F.
- 9. ALL EXTERIOR DUCTWORK AND DUCTWORK IN / ABOVE UNCONDITIONED SPACE SHALL BE INSULATED WITH 2-1/2" THICK, 3 PCF FIBERGLASS DUCT BOARD WITH LAMINATED LAYER OF FOIL FACED VAPOR BARRIER AND SEALED WITH TWO (2) COATS OF INSULATION FABRIC CLOTH AND
- 10. REFRIGERANT LIQUID LINE SHALL BE INSULATED WITH 1" THICK ARMAFLEX TYPE INSULATION.
- 11. INSULATION SHALL BE CONTINUOUS THROUGH WALLS AND FLOORS.
- 12. SOUND (ACOUSTICAL) LINING: 1" THICK, 1-1/2 LB. PER CF DENSITY AND BE TESTED IN ACCORDANCE WITH NFPA 90A AND UNDERWRITERS LABORATORIES TEST U.L.-723.
- 13. ALL INSULATION AND SOUND LINING SHALL BE INSTALLED IN ACCORDANCE WITH ASTM-84 AND
- HAVE A FLAME SPREAD RATING OF LESS THAN 25 AND A SMOKE RATING OF LESS THAN 50. 14. HEAT TRACE SHALL BE EQUAL TO RAYCHEM XL-TRACE SELF REGULATING HEATING CABLES SYSTEM.
- PROVIDE 1" THICK FIBERGLASS PIPE INSULATION. INSTALL PER MANUFACTURER REQUIREMENTS. 15. HVAC LINE-SET PIPING SHALL HAVE AT LEAST INSULATION RATING OF R3. OUTSIDE HVAC LINE-SET PIPING INSULATION WILL BE SHIELDED FROM THE EFFECTS OF WEATHER BY INSTALLATION OF TPO LINE SET INSULATION WRAP BY (WWW.CARLISLEHVAC.COM) OR EQUIVALENT.

## CONTROLS

- 16. APPROVED MANUAL RESET SMOKE & HEAT DETECTION DEVICES SHALL BE PROVIDED IN DUCTWORK OF ALL FAN/AIR CONDITIONING SYSTEMS ACCORDING TO 2012 INTERNATIONAL MECHANICAL CODE, SECTION 606 "SYSTEMS CONTROLS" AND WITH
- 16.1. NFPA STANDARDS 72. 72E AND 90A AND SHALL BE TIED INTO THE BUILDING FIRE ALARM SYSTEM. COORDINATE ALL CONNECTIONS TO FIRE ALARM SYSTEM WITH THE ELECTRICAL CONTRACTOR. PROVIDE COMPONENTS COMPATIBLE WITH THE BUILDING'S FIRE ALARM SYSTEM.
- 16.2. CONTROLS AND ACCESSORIES FOR EQUIPMENT SHALL BE PROVIDED BY EQUIPMENT MANUFACTURER. PROVIDE ANY ADDITIONAL CONTROLS AS REQUIRED TO ACHIEVE SPECIFIED CONTROL SEQUENCES BELOW:
- 16.2.1. IF APPLICABLE, GAS FURNACE / CASED COIL AND CONDENSING UNIT: GAS FURNACE / CASED COIL AND CONDENSING UNIT SHALL BE CONTROLLED BY A SINGLE, WALL MOUNTED, ELECTRONIC THERMOSTAT LOCATED AS SHOWN ON THE PLANS. THE THERMOSTAT SHALL ENERGIZE THE HEATING IN THE GAS FURNACE AND MODULATE THE OPERATION OF THE CONDENSING UNIT COMPRESSOR AS REQUIRED TO MAINTAIN ITS SET POINT. THE THERMOSTAT SHALL BE EQUIPPED WITH "HEAT", "COOL", "ON", "OFF" AND FAN SETTINGS.
- TOILET FAN: TOILET FAN SHALL OPERATE WHENEVER THE LIGHT IN THE CORRESPONDING TOILET IS ON.
- 17. CONTROL WIRING SHALL BE CONCEALED AND RUN IN CONDUIT. CONDUIT & FITTINGS, EXPOSED TO WEATHER. SHALL BE WEATHERPROOF TYPE
- 18. ALL SWITCHES/CONTROLS HAVE TO BE INSTALLED 54" ABOVE FINISHED FLOOR. 19. THERMOSTATS SHALL BE PROGRAMMABLE PER TX GREEN BUILDING CODE.
- 20. IF MANUFACTURER'S NAMEPLATE OF SUPPLIED EQUIPMENT REQUIRES FUSE CIRCUIT PROTECTION, CONTRACTOR SHALL PROVIDE FUSE PROTECTION AT NO ADDITIONAL COST. COORDINATE ALL ELECTRICAL WORK WITH ELECTRICAL DRAWINGS.

## **EXHAUST CONNECTION NOTES:**

- 1. EXHAUST CONNECTIONS UP TO THE MACHINE CONNECTION POINT TO BE DONE BY MEP CONTRACTOR.
- 3. ALL INSULATION & ALUMINIUM CLADDING FOR EXHAUST DUCTS UP TO THE MACHINE CONNECTION POINT TO BE PROVIDED BY MEP/CIVIL CONTRACTOR
- 4. DETAILED DUCTING DRAWING FOR EXHAUST TO BE PROVIDED BY MEP CONTRACTOR.
- 5. ACCESSORIES FOR EXHAUST UP TO THE MACHINE CONNECTION POINT TO BE PROVIDED BY MEP CONTRACTOR.

# HVAC NOTES CONTINUED

#### COMMISSIONING OF HVAC SYSTEM

#### GENERAL

- 1. THE REQUIREMENTS OF THE SECTION APPLY TO ALL HEATING, VENTILATING, AND AIR CONDITIONING.
- 2. THE COMPLETE LIST OF EQUIPMENT AND SYSTEMS TO BE COMMISSIONED IS LISTED IN THE DRAFT COMMISSIONING PROCESS, WHICH THE CONTRACTOR IS RESPONSIBLE TO EXECUTE, IS DEFINED HEREIN AND IN THE COMMISSIONING PLAN. A COMMISSIONING AGENT (CXA) APPOINTED BY THE ARCHITECT WILL MANAGE THE COMMISSIONING PROCESS.

- 3. PREFER TO COMMISSIONING PLAN FOR MORE DETAILS REGARDING PROCESS AND MEMBERS.
- 4. THE COMMISSIONING PROCESS SHALL MEET THE REQUIREMENTS OF LEED AND TX GREEN.

## SUBMITTALS

- 5. THE COMMISSIONING PROCESS REQUIRES REVIEW OF SELECTED SUBMITTALS THAT PERTAIN TO THE SYSTEMS TO BE COMMISSIONED. THE COMMISSIONING AGENT WILL PROVIDE A LIST OF SUBMITTALS THAT WILL BE REVIEWED BY
- 6. THE COMMISSIONING PROCESS REQUIRES SUBMITTAL REVIEW SIMULTANEOUSLY WITH ENGINEERING REVIEW. THIS INCLUDES THE TEST AND BALANCE REPORT.

#### CONSTRUCTION INSPECTIONS

7. COMMISSIONING OF HVAC SYSTEMS WILL REQUIRE INSPECTION OF THE HVAC SYSTEMS CONSTRUCTION THROUGHOUT THE CONSTRUCTION PERIOD, THE CONTRACTOR SHALL COORDINATE WITH THE COMMISSIONING AGENT, IN ACCORDANCE WITH THE COMMISSIONING PLAN, TO SCHEDULE HVAC SYSTEMS INSPECTIONS AS REQUIRED.

#### PRE-FUNCTIONAL CHECKLISTS

- 8. THE CONTRACTOR SHALL COMPLETE PRE-FUNCTIONAL CHECKLISTS VERIFY SYSTEMS, SUBSYSTEMS, AND EQUIPMENT INSTALLATION IS COMPLETE AND ASSURE THAT SYSTEMS ARE READY FOR FUNCTIONAL PERFORMANCE TESTING. THE EQUIPMENT MANUFACTURER SHALL PROVIDE PRE-FUNCTIONAL CHECKLISTS SO THAT THE CONTRACTOR (OR AUTHORIZED FACTORY REP.) MAY DOCUMENT EQUIPMENT AND STARTUP. COMPLETED CHECKLISTS SHALL BE SUBMITTED TO THE ARCHITECT AND THE COMMISSIONING AGENT FOR REVIEW. CONTRACTORS TESTS
- 9. ALL TESTING SHALL BE INCORPORATED INTO THE PROJECT SCHEDULE, CONTRACTOR SHALL PROVIDE NO LESS THAN 5 CALENDAR DAYS' NOTICE PRIOR TO TESTING. THE COMMISSIONING AGENT MAY WITNESS PRESSURE TESTS OR TESTING AND BALANCING, AT THE DISCRETION OF THE COMMISSIONING AGENT. CONTRACTOR TESTS SHALL BE COMPLETED PRIOR TO SCHEDULING FUNCTIONAL PERFORMANCE TESTING.

### FUNCTIONAL PERFORMANCE TESTS

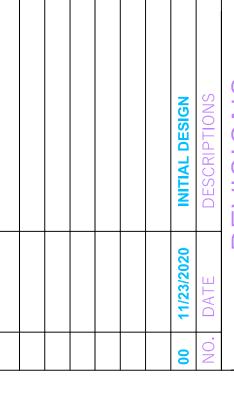
THE COMMISSIONING PROCESS INCLUDES FUNCTIONAL PERFORMANCE TESTS THAT ARE INTENDED TO TEST SYSTEMS UNDER STEADY STATE CONDITIONS, TEST ITS REACTION TO CHANGES IN OPERATING CONDITIONS. AND UNDER EMERGENCY CONDITIONS, THE COMMISSIONING AGENT WILL PREPARE DETAILED FUNCTIONAL PERFORMANCE TEST PROCEDURES. THE CONTRACTOR SHALL REVIEW AND COMMENT ON THE TEST FORMS, THE CONTRACTOR SHALL PROVIDE THE REQUIRED LABOR, MATERIALS, AND TEST EQUIPMENT TO PERFORM THE TESTS, THE COMMISSIONING AGENT SHALL WITNESS AND DOCUMENT THE TESTING. THE CONTRACTOR SHALL SIGN THE TEST REPORTS TO VERIFY TESTS WERE PERFORMED, REFER TO THE DRAFT COMMISSIONING PLAN FOR MORE DETAILS.

## OWNER/OPERATOR TRAINING

11. TRAINING OF THE OWNER OPERATION AND MAINTENANCE PERSONNEL IS REQUIRED IN COOPERATION WITH THE OWNER OPERATORS AND COMMISSIONING AGENT, PROVIDE COMPETENT, FACTORY AUTHORIZED PERSONNEL TO PROVIDE INSTRUCTION TO OPERATION AND MAINTENANCE PERSONNEL CONCERNING THE LOCATION, OPERATION, AND TROUBLESHOOTING OF THE INSTALLED SYSTEMS. CONTRACTOR SHALL SUBMIT TRAINING AGENDAS, AND INSTRUCTORS NAME AND TITLE.

## SEQUENCE OF OPERATION

- 1. OCCUPIED PERIODS (NORMAL OCCUPIED OPERATION) THE UNIT IS ENABLED TO RUN, AS NEEDED, 24 HOURS PER DAY, 7 DAYS PER WEEK.
- 2. FAN OPERATION: RUN THE INDOOR UNIT FAN WHEN THE UNIT IS IN COOLING/HEATING 3. TEMPERATURE CONTROL: A THERMOSTAT IS USED TO DETERMINE EACH SPACE'S REQUIRED MODE. SET EACH + THERMOSTAT FOR THE FOLLOWING RANGES:OCCUPIED HEATING: 55\* F TO 73\* F DURING OCCUPIED HOURS. THE DEFAULT IS 70\* F. B. OCCUPIED COOLING: 73\* F TO 85\* F DURING OCCUPIED HOURS. THE DEFAULT IS
- 4. SHUTDOWN: THE FAN AND COMPRESSOR WILL STOP WHEN THE SYSTEM GOES TO UNOCCUPIED MODE OR WHEN THERE IS NO CALL FOR COOLING OR HEATING. THE FAN RUNS FOR 1 MINUTE AFTER A SHUTDOWN HAS INITIATED ..
- 5. COOLING MODE ENABLE: WHEN THE THERMOSTAT GENERATES A CALL FOR COOING, ENABLE THE UNIT'S COMPRESSOR. THE SUPPLY AIR SETPOINT IN COOLING MODE IS 55\* F . ALLOW THE UNIT'S CONTROLS TO CYCLE THE COMPRESSOR TO SUPPLY THE NEEDED AIR TEMPERATURE.
- 6. HEATING MODE ENABLE: WHEN THE ZONE THERMOSTAT GENERATES A CALL FOR HEATING OUTDOOR TEMPERATURE IS ABOVE 42\* F, SWITCH THE PACKAGED UNIT HEAT PUMP TO SWITCH TO HEATING MODE. IF THE OUTDOOR TEMPERATURE IS LESS THAN 42\* F, LOCK OUT THE HEAT PUMP AND ENABLE THE BACK-UP RESISTANCE HEATER TO SUPPLY HEAT TO THE ZONE. ELECTRIC HEATER SHALL NOT ENERGIZED WHEN THE HEATING LOAD COULD BE MET BY THE HEAT PUMP SYSTEM.



PROFESSIONAL SEAL



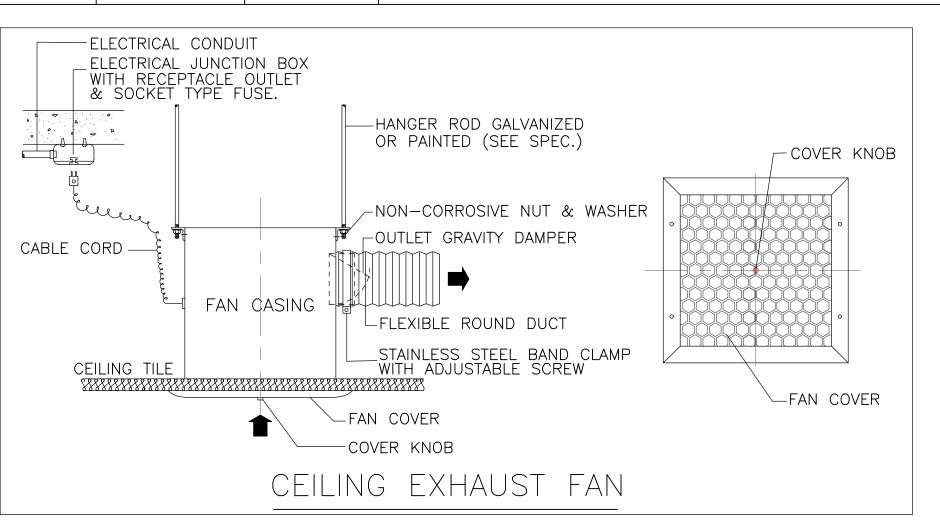
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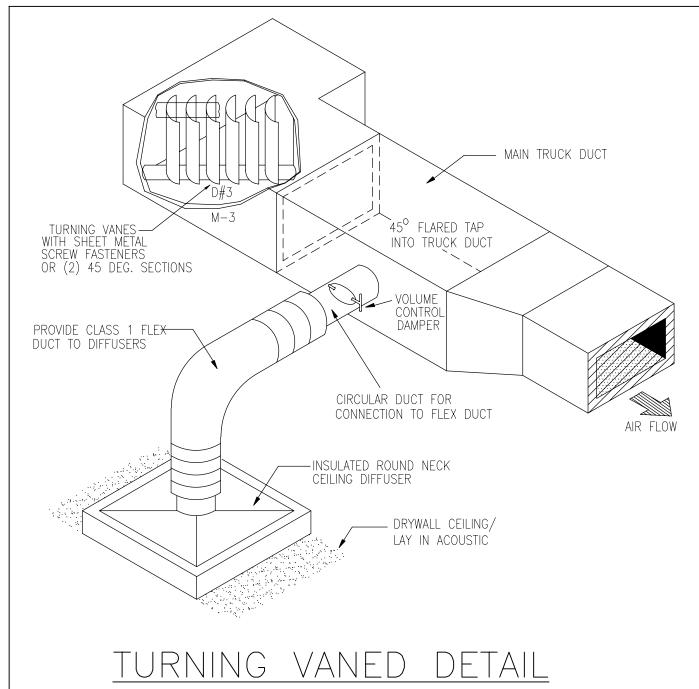
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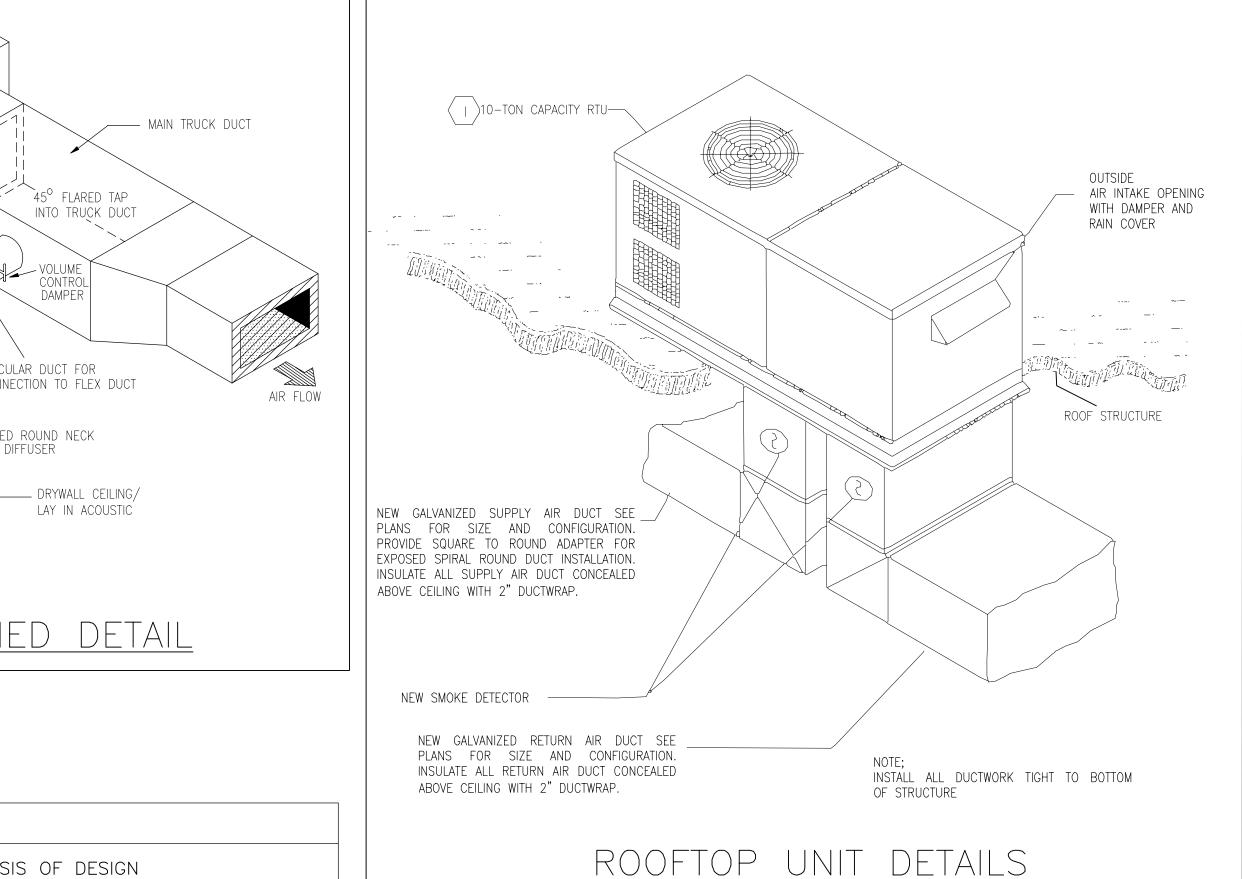
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# AIR DISTRIBUTION SCHEDULE

DWG TAG	SERVICE	MOUNTING	DESCRIPTION	MNF OR EQUAL	MODEL OR EQUAL
А	SUPPLY AIR	SURFACE MNT	SUPPLY AIR REGISTER WITH OPPOSED BLADE DAMPER MAX NC LEVEL 25	TITUS	300RL
В	RETURN/EXHAUST AIR		RETURN AIR REGISTER WITH OPPOSED BLADE DAMPER, 0.67" SPACING, FIXED DEFLECTION, MAX NC LEVEL 25	"	350RL
D	SUPPLY AIR	"	DIRECTIONAL CEILING DIFFUSER, ADJUSTABLE PATTERN WITH FLAT BORDER, OPPOSED BLADE DAMPER	"	250
E	RETURN/EXHAUST AIR	"	CEILING GRILLE WITH FLAT BORDER, ALUMINUM, OPPOSED BLADE DAMPER	"	350FL







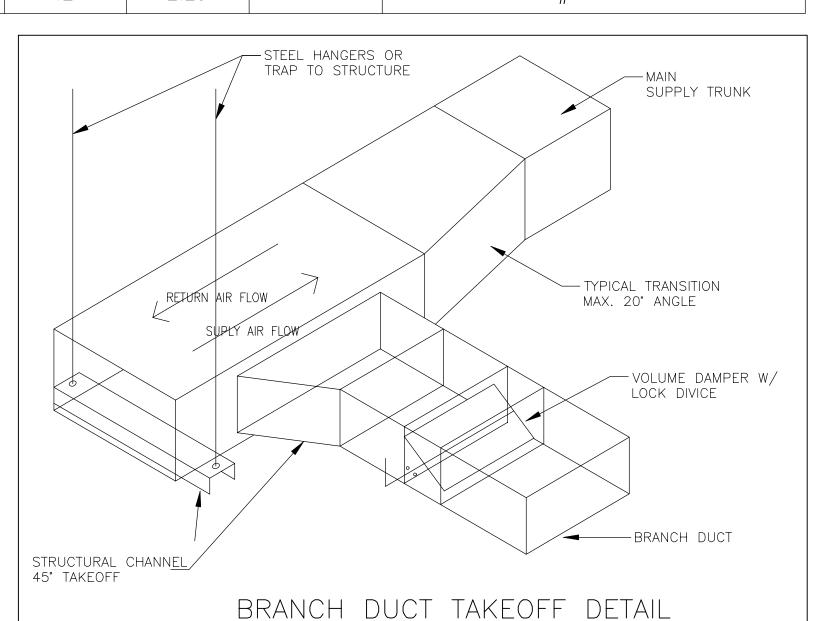
#### PACKAGE UNIT SCHEDULE SYSTEM | REFRIGERANT DIMENSION SENSIBLE BASIS OF DESIGN SERVE TAG NAME | CFM IEER W\*D\*H(INCH) (MBH) POWER(kW) (Lbs.) РΗ RHEEM'S MODEL#RKNL-B073DM15EBYF SLAUGHTER HOUSE AHU-1 94\*59\*44 1 208-230 11.2/11.8 75 R-410A 3.25 OUTDOOR | SLAUGHTER HOUSE | AHU-2 RHEEM'S MODEL#RSNJA048JK000F R - 410A60\*34\*39 2.25 1 208-230 11.4/14 48 42

PROGRAMMABLE HEAT PUMP THERMOSTAT SHALL BE HONEYWELL VISION-PRO 8000 TOUCH SCREEN OR APPROVED ALTERNATE

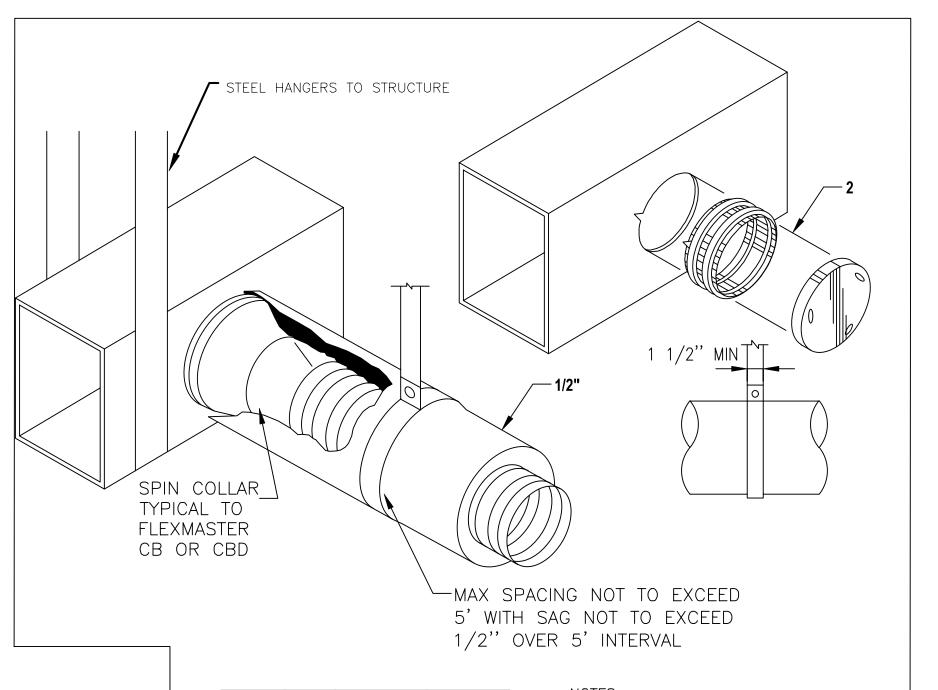
### NOTES:

- 1. INDOOR AND OUTDOOR UNITS SHALL BE SELECTED FROM SAME MANUFACTURER. 2. CONTRACTOR SHALL VERIFY WITH HEAT PUMP MANUFACTURER TO MAKE SURE THAT THE MAX. REFRIGERANT PIPE LENGTH DOES NOT PASS THE MAXIMUM ACCEPTABLE LENGTH, TOTAL EQUIVALENT RUN SHALL BE TAKEN INTO CONSIDERATION INCLUDING ALL ELBOWS FOR THE ACTUAL PIPE RUN.
- 3. CONTRACTOR SHALL VERIFY WITH UNIT MANUFACTURER TO PROVIDE ALL REQUIRED ACCESSORIES TO PROVIDE PROPERLY OPERATIONAL SYSTEM.
- 4. PROVIDE 7-DAY PROGRAMMABLE THERMOSTAT WITH A MINIMUM OF 5 DEGREE F DEADBAND FOR THE INDOOR UNIT.
- 5. ALL PIPING PENETRATIONS THRU THE BUILDING ENVELOP (WALLS & ROOF) SHALL BE SEALED AND WATER TIGHT. 6. ALL REFRIGERANT PIPE SIZES SHALL FOLLOW MANUFACTURER'S INSTRUCTION,
- MAX. PIPE LENGTH SHALL BE TAKEN INTO CONSIDERATION. 7. CONTRACTOR SHALL SUBMIT ALL WARRANTY INFO INCLUDING O & M MANUALS
- FOR THE NEW EQUIPMENT TO THE OWNER. 8. CONTRACTOR TO VERIFY WITH UNIT MANUFACTURER THAT HEAT PUMP CAN
- OPERATE PROPERLY WITH 100 CFM OF OUTSIDE AIR. 9. PROVIDE ANTI SHORT CYCLE TIMER, EVAPORATOR DEFROST CONTROL, RUBBER

ISOLATORS AND EXTREME CONDITION MOUNT KIT.



	EXHAUST FAN SCHEDULE										
TAG NAME	CFM .	ISP IN)	MOTOR POWER QUAN (WATT)	ITY	TYPE	MOUNTING	VOLTS	PHASE	BASIS OF DESIGN	REMARKS	WATTAGE
EF-01	90 0	).25	15 01	DIRE	ECT DRIVE, ECM MOTOR	CEILING MOUNTED	120	1	PANASONIC WHISPER GREEN SELECT FV-05-11VK1	CAPABLE OF CONNECTIVITY TO VENTILATION DAMPER, ENERGY STAR RATED	5.5 watts



GAUGE	THK.	1" STRAP CAPABILITY	MAXIMUM LOAD		
24	.028	840	168		
22	.034	1070	216		
20	.040	1298	259		
* ELASTIC LIMIT ASSUMED					

30ksi; RECOMMEND MAX LOAD (20% OF YIELD STRENGTH).

NOTES: 1. FLEX DUCT WITH EXTERNAL INSULATION AND VAPOR BARRIER JACKETING TYPICAL TO "FABRIFLEX"

2. INSPECTOR SERIES" SPIN 3. PROVIDE HANGER SPACING IAW FBCM AND SMASNA

SUPPORT REQUIREMENT FOR DUCT

PROFESSIONAL SEAL

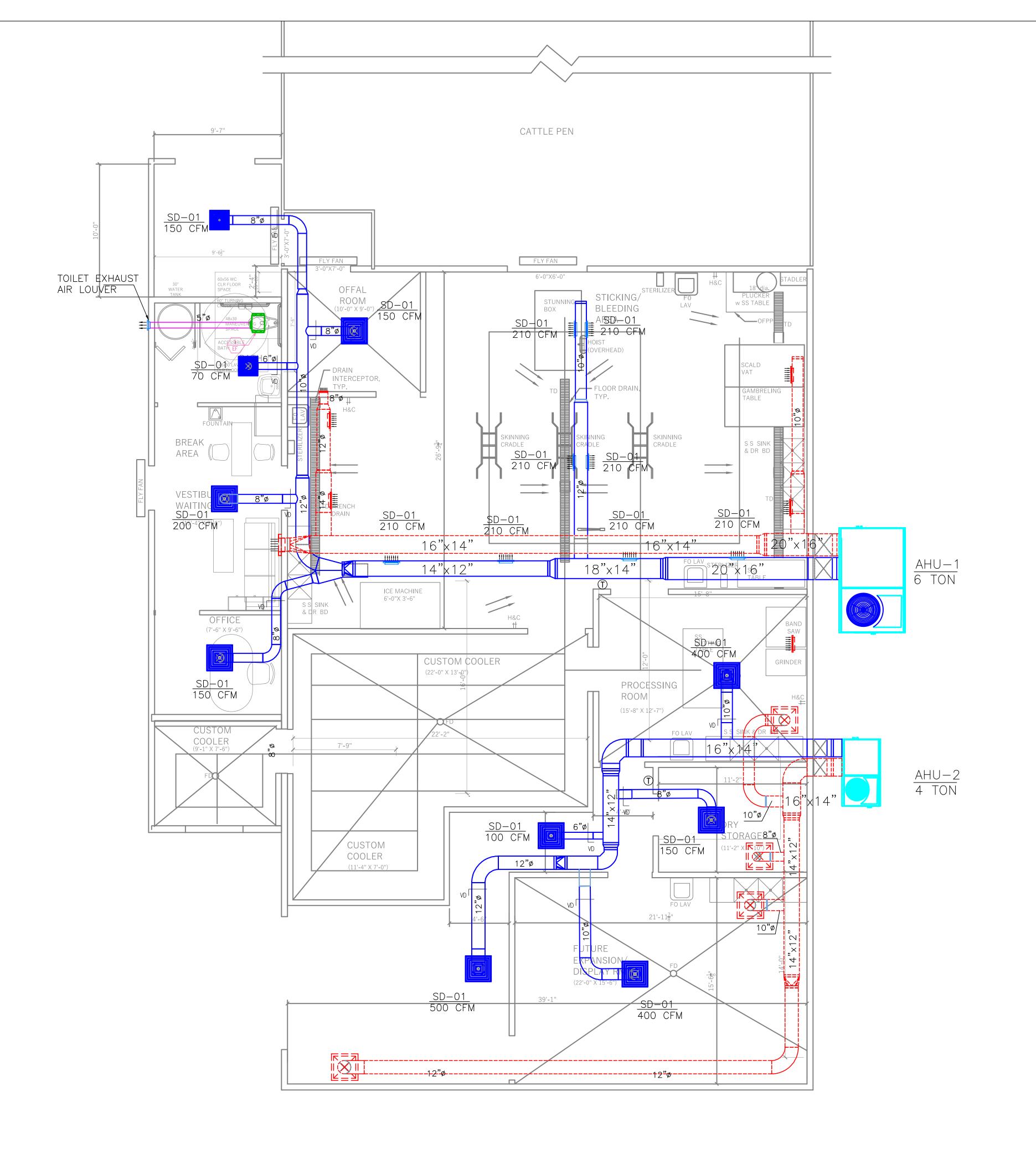


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HVAC FLOOR PLAN

SCALE: 1/4"=1'

PROFESSIONAL SEAL

11/24/2020 MOTI KC

EQUAGEN engineering by ingenuity

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