

MECHANICAL SPECIFICATIONS

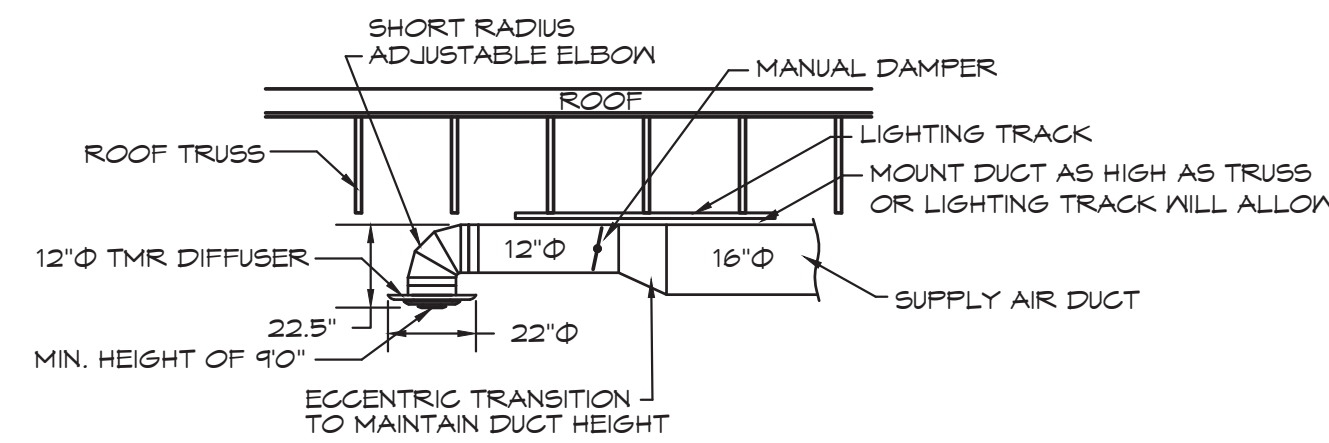
- 1. GENERAL PROVISIONS:
A. PROVIDE ALL LABOR, MATERIALS, EQUIPMENT, NECESSARY FOR THE COMPLETE INSTALLATION OF THE PLUMBING AND MECHANICAL SYSTEMS OUTLINED.
B. OBTAIN ALL PERMITS, FEES, LICENSES, INSPECTIONS, AND CERTIFICATES OF COMPLIANCE OR APPROVAL AS REQUIRED BY THE AUTHORITIES.
C. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH ALL APPLICABLE LAWS, CODES AND REGULATIONS OF THE GOVERNMENTAL BODIES HAVING JURISDICTION OVER THE SITE.
D. ALL TESTING REQUIRED BY AUTHORITIES SHALL BE CONSIDERED PART OF THIS WORK.
E. DURING CONSTRUCTION, ALL FIXTURES, EQUIPMENT, PIPE, DUCT, ETC. SHALL BE COVERED, PLUGGED, OR CAPPED AS REQUIRED TO KEEP CLEAN AND UNDAIMAGED. ALL DAMAGED ITEMS SHALL BE RESTORED TO ORIGINAL CONDITION OR REPLACED. ALL PROTECTIVE COVERING SHALL BE REMOVED BEFORE FINAL ACCEPTANCE.
F. PROVIDE ALL NECESSARY CUTTING AND PATCHING OF WALLS, FLOORS, CEILINGS, AND ROOFS AS NECESSARY. PATCH AROUND ALL OPENINGS SHALL MATCH ADJACENT AREA. COORDINATE ALL ROOFING WORK WITH OWNER OR RESPONSIBLE PARTY, SO THAT THE EXISTING ROOFING WARRANTY WILL BE MAINTAINED.
G. CONTRACTOR SHALL GUARANTEE ALL WORK AND MATERIALS AGAINST DEFECTS FOR A PERIOD OF ONE YEAR FROM FINAL ACCEPTANCE.
2. OPERATION AND MAINTENANCE MANUALS:
A. DURING THE COURSE OF CONSTRUCTION, COLLECT AND COMPILE OPERATING INSTRUCTIONS, WIRING DIAGRAMS, CATALOGS, LUBRICATION AND PREVENTIVE MAINTENANCE INSTRUCTIONS, PARTS LISTS, ETC. FOR ALL EQUIPMENT FURNISHED UNDER THIS CONTRACT.
B. ALL LITERATURE AND INSTRUCTIONS SHIPPED WITH THE EQUIPMENT SHALL BE SAVED FOR INCLUSION IN THE OPERATION AND MAINTENANCE MANUALS.
C. ALL LITERATURE LISTED ABOVE AND ALL PAPERS LISTING WARRANTIES, ETC. SHALL BE BOUND IN A 3-RING BINDER AND LABELED WITH THE PROJECT NAME, ADDRESS, ARCHITECT, ENGINEER, CONTRACTORS, ETC.
3. MANUFACTURERS:
A. MANUFACTURERS, MODEL NUMBERS, ETC. INDICATED OR SCHEDULED ON THE DRAWINGS SHALL BE INTERPRETED AS HAVING ESTABLISHED A STANDARD OF QUALITY AND SHALL NOT BE CONSIDERED AS LIMITING COMPETITION. FITTINGS, FIXTURES, ETC. OF EQUAL QUALITY BY MANUFACTURERS SHALL BE ACCEPTABLE, SUBJECT TO STRUCTURAL AND ELECTRICAL CONSTRAINTS OF THE PROJECT DESIGN, UNLESS NOTED OTHERWISE.
4. MOTORS:
A. PROVIDE THERMAL OVERLOAD PROTECTION FOR EACH MOTOR PROVIDED BY THIS WORK.
5. TESTING, BALANCING, AND CLEANING:
A. ALL PIPING SHALL BE TESTED FOR LEAKS BEFORE BEING CONCEALED IN WALL CONSTRUCTION OR COVERED WITH INSULATION.
B. SEWER AND VENT PIPING SHALL BE HYDROSTATICALLY TESTED WITH NO LESS THAN 10 FEET OF HEAD FOR A PERIOD OF NOT LESS THAN 15 MINUTES, PER THE LOCAL PLUMBING CODE, WITH NO LEAKS.
C. FIRE PROTECTION PIPING SHALL BE TESTED IN ACCORDANCE WITH THE REQUIREMENTS OF NFPA.
D. DOMESTIC WATER PIPING SHALL BE HYDROSTATICALLY TESTED AT A PRESSURE OF NOT LESS THAN 1-1/2 TIMES THE OPERATING PRESSURE, BUT NOT LESS THAN 60 PSI, FOR A PERIOD OF NOT LESS THAN 2 HOURS, WITH NO LEAKS.
E. NATURAL GAS PIPING SHALL BE PNEUMATICALLY TESTED AT A PRESSURE OF NOT LESS THAN 1-1/2 TIMES THE OPERATING PRESSURE, BUT NOT LESS THAN 50 PSI, FOR A PERIOD OF NOT LESS THAN 2 HOURS, WITH NO LEAKS.
F. DUCTWORK AND PIPINGS SHALL BE BALANCED BY QUALIFIED INDEPENDENT BALANCING PERSONNEL WHO HAVE PREVIOUS EXPERIENCE WITH BALANCING PROCEDURES AND ARE CERTIFIED BY THE ASSOCIATED AIR BALANCE COUNCIL (AABC) OR NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB).
1) BALANCING SHALL INCLUDE THE BALANCING OF THE EQUIPMENT AND AIR DISTRIBUTION SYSTEMS TO PROVIDE DESIGN QUANTITIES AND VERIFICATION OF PERFORMANCE OF ALL EQUIPMENT AND AUTOMATIC CONTROLS.
2) WITH IN 30 DAYS OF THE COMPLETION OF THE TESTING AND BALANCING WORK, SUBMIT THE TEST AND BALANCING REPORT BEARING THE SIGNATURE OF THE TEST AND BALANCE ENGINEER. THE REPORTS SHALL BE IDENTIFIED PROOF THAT THE SYSTEMS HAVE BEEN TESTED, ADJUSTED, AND BALANCED IN ACCORDANCE WITH THE REFERENCED STANDARDS; ARE AN ACCURATE REPRESENTATION OF HOW THE SYSTEMS HAVE BEEN INSTALLED AND ARE OPERATING. REPORTS SHALL BE BOUND IN A VINYL BINDER AND THE BINDER LABELED OR MAY BE AN ELECTRONIC PDF SUBMITTAL.
6. GREASE DUCT SHALL BE TESTED PRIOR TO USE OR CONCEALMENT OF ANY PORTION OF THE GREASE DUCT SYSTEM. DUCTS SHALL BE CONSIDERED TO BE CONCEALED WHEN INSTALLED IN SHAFTS OR COVERED BY DUCT WRAP INSULATION THAT PREVENTS THE DUCTWORK FROM BEING VISUALLY INSPECTED FROM ALL SIDES. THE PERMIT HOLDER SHALL BE RESPONSIBLE TO PROVIDE THE NECESSARY EQUIPMENT AND PERFORM THE GREASE DUCT LEAKAGE TEST PER NFPA 96 AND ALL LOCAL CODES.
7. BEFORE DOMESTIC WATER PIPING IS PLACED IN SERVICE, ALL DOMESTIC WATER DISTRIBUTION SYSTEMS INCLUDING HOT WATER AND HOT WATER SYSTEMS SHALL BE SYSTEMICALLY DISINFECTED, STERILIZED AND CHLORINATED IN ACCORDANCE WITH HEALTH DEPARTMENT REGULATIONS. THE SYSTEMS SHALL BE THOROUGHLY FLUSHED OF ALL DIRT AND FOREIGN MATTER, THEN FILLED WITH WATER TREATED WITH 50 PPM OF CHLORINE. DURING THE FLUSHING PROCESS, VALVES AND FAUCETS SHALL BE OPENED SEVERAL TIMES TO ASSURE TREATMENT OF THE ENTIRE SYSTEM. THE TREATED WATER SHALL BE LEFT IN THE SYSTEM FOR 24 HOURS AFTER WHICH TIME THE SYSTEM SHALL BE FLUSHED. IF THE RESIDUAL CHLORINE IS NOT LESS THAN 10 PPM, THE FLUSHING SHALL BE REPEATED. AFTER STATIONATION, SAMPLES OF WATER IN THE SYSTEM SHALL BE APPROVED BY THE BOARD OF HEALTH.
8. PIPING:
A. DOMESTIC COLD, HOT, AND HOT WATER REGULATORING (ABOVEGROUND).
1) TYPE L HARD DRAWN COPPER TUBING, ASTM B-88.
a) WROUGHT COPPER SOLDERED FITTINGS, ASTM B75 ALLOY C12200, ANSI B16.22, MSS SP-104.
b) MECHANICAL PRESS COPPER FITTINGS FOR USE IN PLUMBING OR MECHANICAL APPLICATIONS, ASME B16.22, ASME B16.51, OR ASME B16.10. MECHANICAL PRESS COPPER FITTINGS SHALL CONFORM TO ANFPA 35-1111 OR ASME B16.51.
2) PEX, HIGH-DENSITY CROSS-LINKED POLYETHYLENE TUBING SHALL BE MANUFACTURED TO THE REQUIREMENTS OF ASTM F776 AND MEET THE STANDARD GRADE HYDROSTATIC PRESSURE RATINGS FROM PLASTIC PIPE INSTITUTE IN ACCORDANCE WITH THE 40-25.
a) PEX-A AND PEX-B MEETINGS ANS/NSF61 AND ANS/NSF312 STANDARDS FOR POTABLE WATER SAFETY AND LEAD-FREE STANDARDS AND MUST BE MARKED WITH "PP-A-G", "NSF 61-G" OR OTHER NSF-APPROVED MARKINGS, ASTM F2023 FOR USE WITH CHLORINATED WATER.
b) PEX MECHANICAL, CRIMP/INSERT OR EXPANSION FITTINGS INSTALLED IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. PIPE SIZES GIVEN ON THE DRAWINGS ARE NOMINAL COPPER PIPE SIZE. INCREASE PEX PIPING SIZE TO EQUAL OR EXCEED COPPER PIPE INSIDE DIAMETER FOR SUPPLY MAINS.
3) VALVES
a) GATE VALVE, JOMAR T-9-301 OR EQUAL, NSF 61-8, ANSI B16.20, 1, ANSI B16.10.
b) GLOBE VALVE, CRANE #1 OR EQUAL.
c) BALL VALVE, JOMAR T-9-1000 OR EQUAL, NSF 61-8, ANSI B16.20, 1, ANSI B16.10.
d) BALL VALVE, JOMAR T-100NE OR EQUAL, UL642, FM, CSA, NSF 61-8, MSS SP-110.
e) BALL VALVE, JOMAR T-100NE OR EQUAL, UL642, FM, CSA, NSF 61-8, MSS SP-110.
B. STORM SEWER, SANITARY SEWER, GREASE WASTE, AND VENTS (UNDERGROUND, INTERIOR TO THE BUILDING).
1) ABS SCHEDULE 40 CELLULAR CORE (FOAM CORE) PIPE AND DWV FITTING SYSTEM: PIPE AND FITTINGS SHALL BE MANUFACTURED FROM ABS COMPOUND WITH A CELL CLASS OF 42222 FOR PIPE AND 32222 FOR FITTINGS AS PER ASTM D 3969 AND CONFORM WITH NATIONAL SANITATION FOUNDATION (NSF) STANDARD 14. PIPE SHALL BE IRON PIPE SIZE (IPS) CONFORMING TO ASTM F 625 FITTINGS SHALL CONFORM TO ASTM D 2235.
2) PVC SCHEDULE 40 CELLULAR CORE (FOAM CORE) PIPE AND DWV FITTING SYSTEM: PIPE AND FITTINGS SHALL BE MANUFACTURED FROM PVC COMPOUND WITH A CELL CLASS OF 1432 PER ASTM D 4396 FOR PIPE AND 12454 PER ASTM D 1184 FOR FITTINGS AND CONFORM WITH NATIONAL SANITATION FOUNDATION (NSF) STANDARD 14. PIPE SHALL BE IRON PIPE SIZE (IPS) CONFORMING TO ASTM F 625 FITTINGS SHALL CONFORM TO ASTM D 2235.
3) PVC SCHEDULE 40 SOLID WALL PIPE AND DWV FITTING SYSTEM: PIPE AND FITTINGS SHALL BE MANUFACTURED FROM PVC COMPOUND WITH A CELL CLASS OF 1432 PER ASTM D 4396 FOR PIPE AND 12454 PER ASTM D 1184 FOR FITTINGS AND CONFORM WITH NATIONAL SANITATION FOUNDATION (NSF) STANDARD 14. PIPE SHALL BE IRON PIPE SIZE (IPS) CONFORMING TO ASTM F 625 FITTINGS SHALL CONFORM TO ASTM D 2235.
4) HUBLESS CAST IRON SOIL PIPE AND FITTINGS: HUBLESS CAST IRON PIPE AND FITTINGS SHALL BE MANUFACTURED FROM GRAY CAST IRON AND SHALL CONFORM TO ASTM A 889 AND GSP1 STANDARD 301. HUBLESS COUPLINGS SHALL CONFORM TO GSP1 STANDARD 310 AND BE CERTIFIED BY NSF6 INTERNATIONAL.
5) HUB AND SPIGOT CAST IRON SOIL PIPE AND FITTINGS: HUB AND SPIGOT CAST IRON PIPE AND FITTINGS SHALL BE MANUFACTURED FROM GRAY CAST IRON AND SHALL CONFORM TO ASTM A 74.
6) COPPER DWV, DRAINAGE TUBE SHALL CONFORM TO ASTM B306, WROUGHT COPPER FITTINGS, ANS B16-24.
7) GALVANIZED STEEL PIPE, WITH MALLEABLE IRON, THREADED FITTINGS, DRAINAGE PATTERN FOR SEWERS SHALL CONFORM TO ASTM A 55.
C. CONDENSATE DRAINS 4 INDIRECT WASTE (ABOVEGROUND).
1) DWV, WROUGHT COPPER, ANS B16-24.
2) POLYETHYLENEGLYCOL (PE-G) DWV PIPE, SCHEDULE 40, SOLVENT JOINT.
D. REFRIGERANT.
1) ASTM B 260, TYPE ACR, HARD-DRAWN STRAIGHT LENGTHS, AND SOFT-ANNEALED COILS, SEAMLESS COPPER TUBING.
2) WROUGHT COPPER, ANS B16.22, STREAMLINED PATTERN, FITTINGS, BRAZED JOINTS, AVG A 5.0, CLASSIFICATION BAG-1 (SILVER).
3) TUBING SHALL BE FACTORY GASEARED, READY FOR INSTALLATION, AND HAVE ENDS CAPPED TO PROTECT CLEANLINESS OF PIPE INTERIORS PRIOR TO SHIPPING.
4) SIZE AND INSTALLATION OF PIPE SHALL BE IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS.
5. NATURAL GAS.
1) BLACK STEEL PIPE, SCHEDULE 40, ASTM A83.
a) PIPE 2" AND SMALLER; 150 LB. MALLEABLE IRON, THREADED FITTINGS.
b) PIPE 2" AND SMALLER, VEGA MEGAPRESS FOR WATER AND GAS, CSA G34, T55A/ASME B31 FOR USE WITH ASTM A53 SCHEDULE 40 BLACK IRON PIPE.
c) PIPE 2-1/2" AND LARGER, WELDED.
d) FLUG VALVE, ROSSWELL, NORDSTRUM FIGURE NO. 142 OR 143.
e) BALL VALVE, JOMAR T-100NE, APPROVALS: UL642, FM, CSA, NSF 61-8, MSS SP-110.
2) GAS PIPING PAINTING:
a) ALL BLACK STEEL GAS PIPING LOCATED EXTERIOR TO THE BUILDING SHALL BE PRIME AND PAINTED TO EITHER MATCH ADJACENT EXTERIOR WHERE LOCATED ON OR NEAR EXTERIOR WALL AND PAINTED SAFETY YELLOW WHERE LOCATED ON THE ROOF.
H. ALL PIPE HANGERS AND SUPPORTS SHALL BE STANDARD PRODUCTS OF GRINNELL, FEE AND MASON, OR ELCON. HANGER SPACING SHALL BE IN ACCORDANCE WITH MSS-SP-64.
I. SLEEVES
1) PROVIDE, SET, AND PROPERLY LOCATE PIPE SLEEVES AS REQUIRED FOR THIS WORK. ALL SLEEVES SHALL BE OF SUFFICIENT STRENGTH TO ALLOW PIPE MOVEMENT DUE TO EXPANSION AND CONTRACTION AND TO ACCOMMODATE PIPE INSULATION.
2) INTERIOR PARTITIONS: 16 GAUGE GALVANIZED STEEL, PACK BETWEEN PIPE AND SLEEVE WITH FIRE SAFING AND GULK AT EACH END WITH FIRE RESISTANT SEALANT.
3) ROOF, PROSET OR EQUAL, MANUFACTURED PVC SCHEDULE 40 PIPE SLEEVE WITH WATERPROOF SEAL, COORDINATE WITH ROOFING CONTRACTOR AND FLASH AS REQUIRED TO MAINTAIN ROOF WARRANTY.
4) PLUMBING VENTS: FLASH ROOF VENT INTO ROOFING SYSTEM AS REQUIRED BY THE ROOFING CONTRACTOR TO MAINTAIN EXISTING ROOF WARRANTY. ALL PLUMBING VENT TERMINALS SHALL TERMINATE A MINIMUM OF 12" ABOVE ROOF OR EQUAL TO HEIGHT OF PARAPET, WHICHEVER IS GREATER.
J. PROVIDE CHROME PLATED BRASS FITTINGS ON ALL PIPE ENTERING FINISHED AREAS.
I. GAS PIPING LABELING:
A. ALL ELEVATED PRESSURE GAS PIPING SHALL BE LABELED EVERY 40 FEET WITH SIGNS INDICATING "ELEVATED PRESSURE".
B. INSULATION AND DUCT LINING:
A. ALL INSULATIONS AND ACCESSORIES SHALL HAVE A FIRE HAZARD CLASSIFICATION WITH A FLAME SPREAD RATINGS OF NOT OVER 25, A FUEL CONTRIBUTION RATINGS OF NOT OVER 50, AND A SMOKE DEVELOPED RATINGS OF NOT OVER 50, IN ACCORDANCE WITH NFPA.
B. PIPE INSULATION - ABOVE GRADE:
1) THE PIPING INSULATION USED SHALL HAVE A THERMAL CONDUCTIVITY OF 0.21 Btu per in./hr./sq.ft./°F OR LESS.
2) FIBERGLASS INSULATION WITH FACTORY APPLIED VAPOR BARRIER, ASJ JACKET, FACTORY APPLIED PRESSURE SEALING LONGITUDE LAP JOINT, NO STAPLES, ZESTON PREMOLDED PVC FITTING COVERS. INSTALLATION SHALL BE IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS.
3) FLEXIBLE CLOSED CELL ELASTOMERIC THERMAL INSULATION, UNSLIT OR PRESLIT WITH PRESSURE SENSITIVE ADHESIVE STRIP, VAPOR CLOSURE AND VAPOR SEALING, EQUAL TO ARMSTRONGS AP ARMAFLEX OR ARMAFLEX 2000.
4) FOR NON CIRCUITING SYSTEMS, THE FIRST 8 FEET OF INLET AND OUTLET PIPING BETWEEN THE TANK AND THE HEAT TRAP (INCLUDING THE HEAT TRAP) MUST BE INSULATED.
5) INSULATION SCHEDULE:
a) DOMESTIC COLD WATER 1/2"
b) DOMESTIC HOT WATER 1-1/2"
c) HOT WATER REGULATORING 1-1/2"
d) CONDENSATE DRAINS INSIDE BUILDINGS 1/2"
e) REFRIGERANT SUCTION 1-1/2" FOR PIPING UP TO 1 1/2"; 2" FOR PIPING 1-1/2" AND LARGER
C. DUCTWORK: ACOUSTICAL INSULATION.
1) DUCT LINING: 2 LB./GF. THICKNESS AS SCHEDULED, AIR STREAM SIDE COATED, INSTALL PER SMACNA STANDARDS.
a) DUCT LINING SCHEDULE:
(1) RECTANGULAR SUPPLY DUCT 1/2" THROUGHOUT THE FIRST 10 FEET OF DUCT.
(2) RETURN AIR DUCT (DINING ROOMS ONLY) 1/2" THROUGHOUT THE FIRST 10 FEET OF DUCT.
D. DUCTWORK: THERMAL INSULATION, (WHERE CONCEALED ABOVE CEILING)
1) DUCT COVERING: 3/4 LB/GF. FIBERGLASS BLANKET WITH FACTORY APPLIED VAPOR BARRIER AND FACING, THICKNESS AS SCHEDULED, INSTALLATION IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS.
a) DUCT COVERING SCHEDULE: MINIMUM R-6
(1) ROUND SUPPLY DUCT (ABOVE CEILING) 2"
(2) RECTANGULAR SUPPLY DUCT (ABOVE CEILING) 2"
(3) RETURN AIR DUCT 2"
(4) OUTDOOR AIR / MAKE-UP AIR DUCT 2"
E. GREASE HOOD AND EXHAUST DUCT.
A. HOOD SHALL BE CONSTRUCTED OF 16 GAUGE STEEL OR 20 GAUGE STAINLESS STEEL IN ACCORDANCE WITH NFPA AND LOCAL CODES.
1) GREASE FILTERS SHALL BE UL LISTED ALUMINUM GREASE EXTRACTORS.
2) PROVIDE A COMPLETE AUTOMATIC MET CHEMICAL FIRE EXTINGUISHING SYSTEM FOR THE HOOD AND DUCT AS REQUIRED BY NFPA AND LOCAL CODES. ALL COOKING EQUIPMENT UNDER THE HOOD SHALL BE INTERLOCKED WITH THE SYSTEM, TO SHUTDOWN IN AN ALARM CONDITION.
a) THE GREASE HOOD FIRE SUPPRESSION SYSTEM SHALL BE EQUAL TO AMEREX KP SERIES PRE-ENGINEERED, NET CHEMICAL, STORED-PRESSURE TYPE WITH A FIXED NOZZLE AGENT DISTRIBUTION SYSTEM, THE SYSTEM SHALL BE UL LISTED AND TESTED TO UL STANDARD 300.
b) THE SYSTEM SHALL UTILIZE AN AGENT EQUAL TO AMEREX KP LIQUID FIRE SUPPRESSANT, A POTASSIUM ACETATE BASED SOLUTION THAT SUPPRESSES COOKING GREASE FIRES, SHALL HAVE A PH OF 9 OR LESS, AND SHALL NOT HARM STAINLESS STEEL SURFACES.
c) THE SYSTEM SHALL BE PROVIDED WITH A MANUAL "DUAL ACTION" TYPE FULL STATION. FULL STATION SHALL BE LOCATED NOT LESS THAN 10 FEET AND A MAXIMUM OF 20 FEET FROM THE GREASE HOOD AND THE PATH OF EGRESS. THE MANUAL ACTUATION SHALL REQUIRE A MAXIMUM FORCE OF 40 POUNDS AND A MAXIMUM MOVEMENT OF 14 INCHES TO ACTIVATE THE FIRE SUPPRESSION SYSTEM.
d) PROVIDE A GAS SHUT OFF VALVE FOR MOUNTING IN THE GAS PIPE THAT WILL SHUT OFF GAS FLOW TO EQUIPMENT UNDER THE HOOD IN AN ALARM CONDITION. PROVIDE AN ELECTRICAL SWITCH WHICH SHALL BE CAPABLE OF DE-ENERGIZING ALL ELECTRICAL DEVICES AND EQUIPMENT UNDER THE HOOD IN AN ALARM CONDITION.
B. GREASE DUCT SHALL BE CONSTRUCTED OF 16 GAUGE CARBON STEEL OR 18 GAUGE STAINLESS STEEL IN ACCORDANCE WITH NFPA AND LOCAL CODES.
a) JOINTS, SEAMS AND PENETRATIONS OF GREASE DUCTS SHALL BE MADE WITH A CONTINUOUS LIQUID TIGHT WELD OR BRAZE MADE ON THE EXTERNAL SURFACE OF THE DUCT SYSTEM.
b) DUCT JOINTS SHALL BE BUTT JOINTS, WELDED FLANGE JOINTS WITH A MAXIMUM FLANGE DEPTH OF 1/2" OR OVERLAPPING DUCT JOINTS OF EITHER THE TELESCOPING OR BELL TYPE. OVERLAPPING JOINTS SHALL BE INSTALLED TO PREVENT DRAINAGE OF GREASE OR INTERFERING WITH GRAVITY DRAINAGE TO THE INTENDED COLLECTION POINT.
2) DUCT TO HOOD CONNECTIONS SHALL BE MADE WITH LISTED AND LABELED DUCT TO HOOD COLLAR CONNECTIONS THAT ARE LABELED PER THE TERMS OF THEIR APPROVAL AND PER THE MANUFACTURERS INSTALLATION INSTRUCTIONS.
3) DUCT TO EXHAUST FAN CONNECTIONS SHALL BE FLANGED AND GASKETED AT THE BASE OF THE FAN FOR VERTICAL DISCHARGE FANS, OR SHALL BE FLANGED, GASKETED AND BOLTED TO THE INLET OF THE FAN FOR SIDE INLET EXHAUST FANS. ALL GASKETS SHALL BE RATED FOR A MINIMUM CONTINUOUS DUCT TEMPERATURE OF 1,500°F.
C. SINGLE WALL ROUND GREASE DUCT:
1) FURNISH SINGLE-WALL, FACTORY BUILT, GREASE DUCT FOR USE WITH TYPE I KITCHEN HOODS, WHICH CONFORMS TO THE REQUIREMENTS OF NFPA96. PRODUCTS SHALL BE ETL LISTED TO UL-1190 AND CANULG-9642 FOR VENTING AIR AND GREASE VAPORS FROM COMMERCIAL COOKING OPERATIONS AS DESCRIBED IN NFPA-96.
2) THE DUCT WALL SHALL BE CONSTRUCTED OF .036 AND .041 THICK STAINLESS STEEL AND BE AVAILABLE IN DIAMETERS 8" THROUGH 24".
3) ALL SUPPORTS, FAN ADAPTERS, HOOD CONNECTIONS, FITTINGS AND EXPANSION JOINTS REQUIRED TO INSTALL GREASE DUCT SHALL BE INCLUDED.
4) ROOF PENETRATIONS SHALL COMPLY WITH LISTED CLEARANCE TO COMBUSTIBLES, SEE "CLEARANCE TO COMBUSTIBLES" GUIDE FOR DETAILS. THE GREASE DUCT WILL TERMINATE AT THE FAN ADAPTER PLATE, WILL BE FULLY WELDED TO THE FAN ADAPTER PLATE AND THE FAN ADAPTER PLATE WILL BE FASTENED TO THE CURB USING A SUITABLY SIZED FASTENER PROVIDED BY OTHERS; SEE PAGE 12 OF THE "INSTALLATION, OPERATION AND MAINTENANCE MANUAL" FOR DETAILS.
5) GREASE DUCT JOINTS SHALL BE HELD TOGETHER BY MEANS OF FORMED VEE CLAMPS AND SEALED WITH 3M FIRE BARRIER 2000+. SCREWS USED TO SECURE THE VEE CLAMPS SHALL BE ETL LISTED TO UL-1190 AND CANULG-9642 STOPS AND TAPERED "LEAD IN" THREADS FOR EASY STARTING. NUTS WILL BE RETAINED BY MEANS OF A FREE-FLOATING GAGE TO ALLOW EASY ALIGNMENT.
6) SINGLE-WALL GREASE DUCT SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS "INSTALLATION, OPERATION AND MAINTENANCE MANUAL", ETL LISTING AND STATE AND LOCAL CODES.
7) GREASE DUCT INSTALLED OUTSIDE OF THE BUILDING SHALL BE PROTECTED AGAINST ACCIDENTAL DAMAGE OR VANDALISM.
8) SUPPORT VERTICALLY INSTALLED GREASE DUCT FROM THE BUILDING STRUCTURE USING RIGID STRUCTURAL SUPPORTS. ANCHOR SUPPORTS TO THE STRUCTURE BY WELDING OR BOLTING STEEL EXPANSION ANCHORS OR CONCRETE INSERTS. SUPPORT HORIZONTALLY INSTALLED GREASE DUCT FROM THE BUILDING STRUCTURE USING ABOVE METHOD. 1/2" THREADED RODS AND SADDLES MAY ALSO BE USED FOR THE SUPPORT OF HORIZONTAL GREASE DUCT.
9) FANS SHALL BE SUPPORTED INDEPENDENTLY FROM THE GREASE DUCT SECTIONS, PROTECT GREASE DUCT FROM TWISTING OR MOVEMENT CAUSED BY FAN TORQUE OR VIBRATION.
I. PLUMBING:
A. PROVIDE AN APPROVED WATER HAMMER ARRESTOR FOR EACH PLUMBING FIXTURE SUPPLY AS REQUIRED BY FIXTURE MANUFACTURER.
B. ALL EXPOSED PIPE SHALL BE CHROME PLATED BRASS PIPE, NO FERROUS PIPE.
C. PROVIDE CLEANOUTS AT EACH CHANGE OF DIRECTION AND AT 100 FOOT INTERVALS IN STRAIGHT RUNS.
D. PROVIDE ACCESS PANELS FOR ALL CONCEALED VALVES AND TRAPS.
E. CLEANOUTS:
1) VINYL TILE FLOOR: JR SMITH #4140, OR EQUAL.
2) QUARRY TILE FLOOR: JR SMITH #4200, OR EQUAL.
3) CARPETED FLOOR: JR SMITH #4200, OR EQUAL.
4) UNFINISHED FLOOR: JR SMITH #4020, OR EQUAL.
5) WALL: JR SMITH #4472, OR EQUAL, 24" ABOVE THE FLOOR.
6) GRADE: JR SMITH #4256, OR EQUAL, WITH HEAVY DUTY CAST IRON BODY AND COVER.
F. PROVIDE DIELECTRIC UNIONS WITH APPROPRIATE END CONNECTIONS TO MATCH THE PIPE SYSTEM IN WHICH INSTALLED (SCHEDULED, SOLDERED, OR FLANGED). PROVIDE DIELECTRIC UNIONS ON ALL PIPING CONNECTIONS TO HOT WATER HEATERS AND EXPANSION TANKS.
G. ALL SEWER PIPING LOCATED INSIDE THE BUILDING SHALL BE INSTALLED WITH THE FOLLOWING SLOPES.
1) INSTALL 2-1/2" AND SMALLER PIPE AT 1/4" PER FOOT FALL.
2) INSTALL 3" AND LARGER PIPE AT 1/8" PER FOOT FALL.
H. ALL SEWER PIPING LOCATED EXTERIOR TO THE BUILDING SHALL BE INSTALLED WITH THE FOLLOWING SLOPES.
1) INSTALL 4" AND SMALLER PIPE AT A MINIMUM OF 2% SLOPE.
2) INSTALL 6" AND LARGER PIPE AT A MINIMUM OF 1% SLOPE.
3) INSTALL ALL GREASE WASTE PIPING AT 1/4" PER FOOT FALL.
I. DUCTWORK:
A. ALL DUCTWORK, UNLESS OTHERWISE INDICATED, SHALL BE FABRICATED FROM GALVANIZED SHEET STEEL COMPLYING WITH ASTM A 521, LOCKFORMING QUALITY, WITH 60 ZINC COATING IN ACCORDANCE WITH ASTM A 525, AND MILL PREFERENTIALLY FOR EXPOSED LOCATIONS.
B. WHERE DUCTWORK IS INDICATED TO BE EXPOSED TO VIEW IN OCCUPIED SPACES, PROVIDE MATERIALS WHICH ARE FREE FROM VIBRATION INCLUDING FITTING, SEAM MARKS, ROLLER MARKS, STAINS AND DISCOLORATIONS, AND OTHER IMPERFECTIONS, INCLUDING THOSE WHICH WOULD IMPAIR PAINTING.
C. DUCTWORK, METAL GAUGES, REINFORCING, ETC. SHALL BE CONSTRUCTED IN ACCORDANCE WITH SMACNA "HVAC DUCT CONSTRUCTION STANDARDS", LATEST EDITION FOR A 2 INCH WATER GAUGE STATIC PRESSURE.
1) RECTANGULAR DUCT:
a) ELBOWS, UNLESS INDICATED OTHERWISE SHALL BE CONSTRUCTED WITH CENTERLINE RADIUS OF NOT LESS THAN 1.5 DUCT WIDTH OR SQUARE ELBOW WITH DOUBLE WALL STREAMLINE VANES.
b) RETURN AIR ACOUSTICAL ELBOWS AND SOUND BOOTS SHALL BE A SQUARE ELBOW WITH NO TURNING VANES.
c) SLOPES FOR TRANSITIONS OR OTHER CHANGES IN DIMENSIONS SHALL BE MINIMUM 1 TO 3.
2) ROUND AND OVAL SPIRAL SEAM DUCT:
a) PROVIDE RADIUS OF FITTINGS FABRICATED OF MULTIPLE SECTIONS WITH MAXIMUM 15 DEGREE CHANGE OF DIRECTION PER SECTION, UNLESS SPECIFICALLY DETAILED OTHERWISE. USE 45 DEGREE LATERALS FOR BRANCH TAKEOFF CONNECTIONS. WHERE 90 DEGREE BRANCHES ARE INDICATED PROVIDE CONICAL TYPE TEES.
b) SLOPES FOR TRANSITIONS OR OTHER CHANGES IN DIMENSIONS SHALL BE MINIMUM 1 TO 3.
c) AS AN OPTION, PROVIDE FACTORY-FABRICATED DUCT AND FITTINGS, IN LIEU OF SHOP-FABRICATED DUCT AND FITTINGS.
(1) ELBOWS: ONE PIECE CONSTRUCTION FOR 90 DEGREES AND 45 DEGREE ELBOW 14" AND SMALLER. PROVIDE MULTIPLE COPE CONSTRUCTION FOR LARGER DIAMETERS WITH STANDING SEAM CIRCUMFERENTIAL JOINT.
(2) DIVIDED FLOW FITTINGS: 90 DEGREE TEES, CONSTRUCTED WITH SADDLE TAP SPOT WELD AND BONDED TO DUCT FITTING BODY.
(3) ROUND LONGITUDINAL SEAM DUCT: USE FOR RIGID METAL DUCT ON LEAVING SIDE OF DUCT IN CONCEALED LOCATIONS FOR EXTENSION TO FLEX FOR DIFFUSERS, UNLESS OTHERWISE INDICATED.
D. SEAL ALL CONCEALED DUCTWORK JOINTS WITH NON-HARDENING, NON-MIGRATING MASTIC SEALANT, AS RECOMMENDED FOR SEALING SEAMS AND JOINTS IN DUCTWORK. OIL BASE CAULKING AND GLAZING COMPOUNDS SHALL NOT BE ACCEPTABLE.
E. DUCT SIZES SHOWN ON THE DRAWINGS ARE SHEETMETAL SIZES, ALLOWANCE FOR DUCT LINER HAS BEEN MADE WHERE APPLICABLE.
F. INSTALLATION OF METAL DUCTWORK:
1) GENERAL: ASSEMBLE AND INSTALL DUCTWORK IN ACCORDANCE WITH RECOGNIZED INDUSTRY PRACTICES WHICH WILL ACHIEVE AIR-TIGHT SYSTEMS (MAXIMUM 5% LEAKAGE), WITH NO OBSERVABLE NOISE, AND CAPABLE OF PERFORMING INDICATED SERVICE. INSTALL EACH RUN WITH MINIMUM NUMBER OF JOINTS. ALSO, SUPPORT WORK ACCURATELY WITH INTERNAL SURFACES SMOOTH. SUPPORT DUCTS RIGIDLY WITH SUITABLE STRAPS, BRACES, HANGERS AND ANCHORS IN ACCORDANCE WITH SMACNA "HVAC DUCT CONSTRUCTION STANDARDS", LATEST EDITION. DUCT HANGERS SHALL BE OF THE HOLLOW PIPE HOLD DUCTS TRUE-TO-SHAPE AND TO PREVENT BUCKLING. SUPPORT VERTICAL DUCTS AT EVERY FLOOR.
2) AUXILIARY STEEL: PROVIDE AUXILIARY STEEL AS REQUIRED TO ADEQUATELY SUPPORT DUCTWORK.
3) ROUTING: LOCATE DUCTWORK RUNS, EXCEPT AS OTHERWISE INDICATED, VERTICALLY AND HORIZONTALLY, AND AVOID DIAGONAL RUNS WHEREVER POSSIBLE. LOCATE RUNS AS INDICATED BY DRAWINGS, DETAILS AND NOTATIONS OR, IF NOT OTHERWISE INDICATED, RUN DUCTWORK IN SHORTEST ROUTE WHICH DOES NOT OBSTRUCT USABLE SPACE OR BLOCK ACCESS FOR SERVICING BUILDING AND ITS EQUIPMENT. HOLD DUCTS CLOSE TO WALLS, OVERHEAD CONSTRUCTION, COLUMNS, AND OTHER STRUCTURAL AND PERMANENT ENCLOSURE ELEMENTS OF BUILDING, WHEREVER POSSIBLE IN FINISHED AND OCCUPIED SPACES. CONCEAL DUCTWORK FROM VIEW, BY LOCATING IN MECHANICAL SHAFTS, VESTIBULE CONSTRUCTION OR ABOVE SUSPENDED CEILINGS. DO NOT ENGAGE HORIZONTAL RUNS IN SOLID PARTITIONS, EXCEPT AS SPECIFICALLY SHOWN. COORDINATE LAYOUT WITH SUSPENDED CEILING AND LIGHTING LAYOUTS AND SIMILAR FINISHED WORK.
4) DO NOT ROUTE DUCTWORK THROUGH ELECTRICAL EQUIPMENT SPACES AND ENCLOSURES, UNLESS INDICATED OTHERWISE.
5) PENETRATIONS:
a) WHERE DUCTS PASS THROUGH INTERIOR PARTITIONS OR EXTERIOR WALLS, AND ARE EXPOSED TO VIEW, CONCEAL SPACE BETWEEN OPENINGS AND DUCT OR DUCT INSULATION WITH SHEET METAL, FLANGES OF SAME GAGE AS DUCT, OVERLAP OPENING ON 4 SIDES BY AT LEAST 1-1/2". FASTEN TO DUCT AND WALL.
b) WHERE DUCTS PASS THROUGH FIRE-RATED FLOORS, WALLS, OR PARTITIONS, PROVIDE FIRESTOPPINGS BETWEEN DUCT AND WALL.
6) COORDINATION: COORDINATE DUCT INSTALLATIONS WITH INSTALLATION OF ACCESSORIES, DAMPERS, COIL FRAMES, EQUIPMENT, CONTROLS, AND OTHER ASSOCIATED WORK OF THE DUCTWORK SYSTEM.
7) INSTALLATION: INSTALL METAL DUCTWORK IN ACCORDANCE WITH SMACNA "HVAC DUCT CONSTRUCTION STANDARDS", LATEST EDITION.

MECHANICAL SPECIFICATIONS (CONTINUED)

- 1) ABS SCHEDULE 40 CELLULAR CORE (FOAM CORE) PIPE AND DWV FITTING SYSTEM: PIPE AND FITTINGS SHALL BE MANUFACTURED FROM ABS COMPOUND WITH A CELL CLASS OF 42222 FOR PIPE AND 32222 FOR FITTINGS AS PER ASTM D 3969 AND CONFORM WITH NATIONAL SANITATION FOUNDATION (NSF) STANDARD 14. PIPE SHALL BE IRON PIPE SIZE (IPS) CONFORMING TO ASTM F 625 FITTINGS SHALL CONFORM TO ASTM D 2235.
2) PVC SCHEDULE 40 CELLULAR CORE (FOAM CORE) PIPE AND DWV FITTING SYSTEM: PIPE AND FITTINGS SHALL BE MANUFACTURED FROM PVC COMPOUND WITH A CELL CLASS OF 1432 PER ASTM D 4396 FOR PIPE AND 12454 PER ASTM D 1184 FOR FITTINGS AND CONFORM WITH NATIONAL SANITATION FOUNDATION (NSF) STANDARD 14. PIPE SHALL BE IRON PIPE SIZE (IPS) CONFORMING TO ASTM F 625 FITTINGS SHALL CONFORM TO ASTM D 2235.
3) PVC SCHEDULE 40 SOLID WALL PIPE AND DWV FITTING SYSTEM: PIPE AND FITTINGS SHALL BE MANUFACTURED FROM PVC COMPOUND WITH A CELL CLASS OF 1432 PER ASTM D 4396 FOR PIPE AND 12454 PER ASTM D 1184 FOR FITTINGS AND CONFORM WITH NATIONAL SANITATION FOUNDATION (NSF) STANDARD 14. PIPE SHALL BE IRON PIPE SIZE (IPS) CONFORMING TO ASTM F 625 FITTINGS SHALL CONFORM TO ASTM D 2235.
4) HUBLESS CAST IRON SOIL PIPE AND FITTINGS: HUBLESS CAST IRON PIPE AND FITTINGS SHALL BE MANUFACTURED FROM GRAY CAST IRON PIPE AND FITTINGS SHALL BE MANUFACTURED FROM GRAY CAST IRON AND SHALL CONFORM TO ASTM A 889 AND GSP1 STANDARD 301. HUBLESS COUPLINGS SHALL CONFORM TO GSP1 STANDARD 310 AND BE CERTIFIED BY NSF6 INTERNATIONAL.
5) HUB AND SPIGOT CAST IRON SOIL PIPE AND FITTINGS: HUB AND SPIGOT CAST IRON PIPE AND FITTINGS SHALL BE MANUFACTURED FROM GRAY CAST IRON AND SHALL CONFORM TO ASTM A 74.
6) COPPER DWV, DRAINAGE TUBE SHALL CONFORM TO ASTM B306, WROUGHT COPPER FITTINGS, ANS B16-24.
7) GALVANIZED STEEL PIPE, WITH MALLEABLE IRON, THREADED FITTINGS, DRAINAGE PATTERN FOR SEWERS SHALL CONFORM TO ASTM A 55.
E. CONDENSATE DRAINS 4 INDIRECT WASTE (ABOVEGROUND).
1) DWV, WROUGHT COPPER, ANS B16-24.
2) POLYETHYLENEGLYCOL (PE-G) DWV PIPE, SCHEDULE 40, SOLVENT JOINT.
D. REFRIGERANT.
1) ASTM B 260, TYPE ACR, HARD-DRAWN STRAIGHT LENGTHS, AND SOFT-ANNEALED COILS, SEAMLESS COPPER TUBING.
2) WROUGHT COPPER, ANS B16.22, STREAMLINED PATTERN, FITTINGS, BRAZED JOINTS, AVG A 5.0, CLASSIFICATION BAG-1 (SILVER).
3) TUBING SHALL BE FACTORY GASEARED, READY FOR INSTALLATION, AND HAVE ENDS CAPPED TO PROTECT CLEANLINESS OF PIPE INTERIORS PRIOR TO SHIPPING.
4) SIZE AND INSTALLATION OF PIPE SHALL BE IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS.
5. NATURAL GAS.
1) BLACK STEEL PIPE, SCHEDULE 40, ASTM A83.
a) PIPE 2" AND SMALLER; 150 LB. MALLEABLE IRON, THREADED FITTINGS.
b) PIPE 2" AND SMALLER, VEGA MEGAPRESS FOR WATER AND GAS, CSA G34, T55A/ASME B31 FOR USE WITH ASTM A53 SCHEDULE 40 BLACK IRON PIPE.
c) PIPE 2-1/2" AND LARGER, WELDED.
d) FLUG VALVE, ROSSWELL, NORDSTRUM FIGURE NO. 142 OR 143.
e) BALL VALVE, JOMAR T-100NE, APPROVALS: UL642, FM, CSA, NSF 61-8, MSS SP-110.
2) GAS PIPING PAINTING:
a) ALL BLACK STEEL GAS PIPING LOCATED EXTERIOR TO THE BUILDING SHALL BE PRIME AND PAINTED TO EITHER MATCH ADJACENT EXTERIOR WHERE LOCATED ON OR NEAR EXTERIOR WALL AND PAINTED SAFETY YELLOW WHERE LOCATED ON THE ROOF.
H. ALL PIPE HANGERS AND SUPPORTS SHALL BE STANDARD PRODUCTS OF GRINNELL, FEE AND MASON, OR ELCON. HANGER SPACING SHALL BE IN ACCORDANCE WITH MSS-SP-64.
I. SLEEVES
1) PROVIDE, SET, AND PROPERLY LOCATE PIPE SLEEVES AS REQUIRED FOR THIS WORK. ALL SLEEVES SHALL BE OF SUFFICIENT STRENGTH TO ALLOW PIPE MOVEMENT DUE TO EXPANSION AND CONTRACTION AND TO ACCOMMODATE PIPE INSULATION.
2) INTERIOR PARTITIONS: 16 GAUGE GALVANIZED STEEL, PACK BETWEEN PIPE AND SLEEVE WITH FIRE SAFING AND GULK AT EACH END WITH FIRE RESISTANT SEALANT.
3) ROOF, PROSET OR EQUAL, MANUFACTURED PVC SCHEDULE 40 PIPE SLEEVE WITH WATERPROOF SEAL, COORDINATE WITH ROOFING CONTRACTOR AND FLASH AS REQUIRED TO MAINTAIN ROOF WARRANTY.
4) PLUMBING VENTS: FLASH ROOF VENT INTO ROOFING SYSTEM AS REQUIRED BY THE ROOFING CONTRACTOR TO MAINTAIN EXISTING ROOF WARRANTY. ALL PLUMBING VENT TERMINALS SHALL TERMINATE A MINIMUM OF 12" ABOVE ROOF OR EQUAL TO HEIGHT OF PARAPET, WHICHEVER IS GREATER.
J. PROVIDE CHROME PLATED BRASS FITTINGS ON ALL PIPE ENTERING FINISHED AREAS.
I. GAS PIPING LABELING:
A. ALL ELEVATED PRESSURE GAS PIPING SHALL BE LABELED EVERY 40 FEET WITH SIGNS INDICATING "ELEVATED PRESSURE".
B. INSULATION AND DUCT LINING:
A. ALL INSULATIONS AND ACCESSORIES SHALL HAVE A FIRE HAZARD CLASSIFICATION WITH A FLAME SPREAD RATINGS OF NOT OVER 25, A FUEL CONTRIBUTION RATINGS OF NOT OVER 50, AND A SMOKE DEVELOPED RATINGS OF NOT OVER 50, IN ACCORDANCE WITH NFPA.
B. PIPE INSULATION - ABOVE GRADE:
1) THE PIPING INSULATION USED SHALL HAVE A THERMAL CONDUCTIVITY OF 0.21 Btu per in./hr./sq.ft./°F OR LESS.
2) FIBERGLASS INSULATION WITH FACTORY APPLIED VAPOR BARRIER, ASJ JACKET, FACTORY APPLIED PRESSURE SEALING LONGITUDE LAP JOINT, NO STAPLES, ZESTON PREMOLDED PVC FITTING COVERS. INSTALLATION SHALL BE IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS.
3) FLEXIBLE CLOSED CELL ELASTOMERIC THERMAL INSULATION, UNSLIT OR PRESLIT WITH PRESSURE SENSITIVE ADHESIVE STRIP, VAPOR CLOSURE AND VAPOR SEALING, EQUAL TO ARMSTRONGS AP ARMAFLEX OR ARMAFLEX 2000.
4) FOR NON CIRCUITING SYSTEMS, THE FIRST 8 FEET OF INLET AND OUTLET PIPING BETWEEN THE TANK AND THE HEAT TRAP (INCLUDING THE HEAT TRAP) MUST BE INSULATED.
5) INSULATION SCHEDULE:
a) DOMESTIC COLD WATER 1/2"
b) DOMESTIC HOT WATER 1-1/2"
c) HOT WATER REGULATORING 1-1/2"
d) CONDENSATE DRAINS INSIDE BUILDINGS 1/2"
e) REFRIGERANT SUCTION 1-1/2" FOR PIPING UP TO 1 1/2"; 2" FOR PIPING 1-1/2" AND LARGER
C. DUCTWORK: ACOUSTICAL INSULATION.
1) DUCT LINING: 2 LB./GF. THICKNESS AS SCHEDULED, AIR STREAM SIDE COATED, INSTALL PER SMACNA STANDARDS.
a) DUCT LINING SCHEDULE:
(1) RECTANGULAR SUPPLY DUCT 1/2" THROUGHOUT THE FIRST 10 FEET OF DUCT.
(2) RETURN AIR DUCT (DINING ROOMS ONLY) 1/2" THROUGHOUT THE FIRST 10 FEET OF DUCT.
D. DUCTWORK: THERMAL INSULATION, (WHERE CONCEALED ABOVE CEILING)
1) DUCT COVERING: 3/4 LB/GF. FIBERGLASS BLANKET WITH FACTORY APPLIED VAPOR BARRIER AND FACING, THICKNESS AS SCHEDULED, INSTALLATION IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS.
a) DUCT COVERING SCHEDULE: MINIMUM R-6
(1) ROUND SUPPLY DUCT (ABOVE CEILING) 2"
(2) RECTANGULAR SUPPLY DUCT (ABOVE CEILING) 2"
(3) RETURN AIR DUCT 2"
(4) OUTDOOR AIR / MAKE-UP AIR DUCT 2"
E. GREASE HOOD AND EXHAUST DUCT.
A. HOOD SHALL BE CONSTRUCTED OF 16 GAUGE STEEL OR 20 GAUGE STAINLESS STEEL IN ACCORDANCE WITH NFPA AND LOCAL CODES.
1) GREASE FILTERS SHALL BE UL LISTED ALUMINUM GREASE EXTRACTORS.
2) PROVIDE A COMPLETE AUTOMATIC MET CHEMICAL FIRE EXTINGUISHING SYSTEM FOR THE HOOD AND DUCT AS REQUIRED BY NFPA AND LOCAL CODES. ALL COOKING EQUIPMENT UNDER THE HOOD SHALL BE INTERLOCKED WITH THE SYSTEM, TO SHUTDOWN IN AN ALARM CONDITION.
a) THE GREASE HOOD FIRE SUPPRESSION SYSTEM SHALL BE EQUAL TO AMEREX KP SERIES PRE-ENGINEERED, NET CHEMICAL, STORED-PRESSURE TYPE WITH A FIXED NOZZLE AGENT DISTRIBUTION SYSTEM, THE SYSTEM SHALL BE UL LISTED AND TESTED TO UL STANDARD 300.
b) THE SYSTEM SHALL UTILIZE AN AGENT EQUAL TO AMEREX KP LIQUID FIRE SUPPRESSANT, A POTASSIUM ACETATE BASED SOLUTION THAT SUPPRESSES COOKING GREASE FIRES, SHALL HAVE A PH OF 9 OR LESS, AND SHALL NOT HARM STAINLESS STEEL SURFACES.
c) THE SYSTEM SHALL BE PROVIDED WITH A MANUAL "DUAL ACTION" TYPE FULL STATION. FULL STATION SHALL BE LOCATED NOT LESS THAN 10 FEET AND A MAXIMUM OF 20 FEET FROM THE GREASE HOOD AND THE PATH OF EGRESS. THE MANUAL ACTUATION SHALL REQUIRE A MAXIMUM FORCE OF 40 POUNDS AND A MAXIMUM MOVEMENT OF 14 INCHES TO ACTIVATE THE FIRE SUPPRESSION SYSTEM.
d) PROVIDE A GAS SHUT OFF VALVE FOR MOUNTING IN THE GAS PIPE THAT WILL SHUT OFF GAS FLOW TO EQUIPMENT UNDER THE HOOD IN AN ALARM CONDITION. PROVIDE AN ELECTRICAL SWITCH WHICH SHALL BE CAPABLE OF DE-ENERGIZING ALL ELECTRICAL DEVICES AND EQUIPMENT UNDER THE HOOD IN AN ALARM CONDITION.
B. GREASE DUCT SHALL BE CONSTRUCTED OF 16 GAUGE CARBON STEEL OR 18 GAUGE STAINLESS STEEL IN ACCORDANCE WITH NFPA AND LOCAL CODES.
a) JOINTS, SEAMS AND PENETRATIONS OF GREASE DUCTS SHALL BE MADE WITH A CONTINUOUS LIQUID TIGHT WELD OR BRAZE MADE ON THE EXTERNAL SURFACE OF THE DUCT SYSTEM.
b) DUCT JOINTS SHALL BE BUTT JOINTS, WELDED FLANGE JOINTS WITH A MAXIMUM FLANGE DEPTH OF 1/2" OR OVERLAPPING DUCT JOINTS OF EITHER THE TELESCOPING OR BELL TYPE. OVERLAPPING JOINTS SHALL BE INSTALLED TO PREVENT DRAINAGE OF GREASE OR INTERFERING WITH GRAVITY DRAINAGE TO THE INTENDED COLLECTION POINT.
2) DUCT TO HOOD CONNECTIONS SHALL BE MADE WITH LISTED AND LABELED DUCT TO HOOD COLLAR CONNECTIONS THAT ARE LABELED PER THE TERMS OF THEIR APPROVAL AND PER THE MANUFACTURERS INSTALLATION INSTRUCTIONS.
3) DUCT TO EXHAUST FAN CONNECTIONS SHALL BE FLANGED AND GASKETED AT THE BASE OF THE FAN FOR VERTICAL DISCHARGE FANS, OR SHALL BE FLANGED, GASKETED AND BOLTED TO THE INLET OF THE FAN FOR SIDE INLET EXHAUST FANS. ALL GASKETS SHALL BE RATED FOR A MINIMUM CONTINUOUS DUCT TEMPERATURE OF 1,500°F.
C. SINGLE WALL ROUND GREASE DUCT:
1) FURNISH SINGLE-WALL, FACTORY BUILT, GREASE DUCT FOR USE WITH TYPE I KITCHEN HOODS, WHICH CONFORMS TO THE REQUIREMENTS OF NFPA96. PRODUCTS SHALL BE ETL LISTED TO UL-1190 AND CANULG-9642 FOR VENTING AIR AND GREASE VAPORS FROM COMMERCIAL COOKING OPERATIONS AS DESCRIBED IN NFPA-96.
2) THE DUCT WALL SHALL BE CONSTRUCTED OF .036 AND .041 THICK STAINLESS STEEL AND BE AVAILABLE IN DIAMETERS 8" THROUGH 24".
3) ALL SUPPORTS, FAN ADAPTERS, HOOD CONNECTIONS, FITTINGS AND EXPANSION JOINTS REQUIRED TO INSTALL GREASE DUCT SHALL BE INCLUDED.
4) ROOF PENETRATIONS SHALL COMPLY WITH LISTED CLEARANCE TO COMBUSTIBLES, SEE "CLEARANCE TO COMBUSTIBLES" GUIDE FOR DETAILS. THE GREASE DUCT WILL TERMINATE AT THE FAN ADAPTER PLATE, WILL BE FULLY WELDED TO THE FAN ADAPTER PLATE AND THE FAN ADAPTER PLATE WILL BE FASTENED TO THE CURB USING A SUITABLY SIZED FASTENER PROVIDED BY OTHERS; SEE PAGE 12 OF THE "INSTALLATION, OPERATION AND MAINTENANCE MANUAL" FOR DETAILS.
5) GREASE DUCT JOINTS SHALL BE HELD TOGETHER BY MEANS OF FORMED VEE CLAMPS AND SEALED WITH 3M FIRE BARRIER 2000+. SCREWS USED TO SECURE THE VEE CLAMPS SHALL BE ETL LISTED TO UL-1190 AND CANULG-9642 STOPS AND TAPERED "LEAD IN" THREADS FOR EASY STARTING. NUTS WILL BE RETAINED BY MEANS OF A FREE-FLOATING GAGE TO ALLOW EASY ALIGNMENT.
6) SINGLE-WALL GREASE DUCT SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS "INSTALLATION, OPERATION AND MAINTENANCE MANUAL", ETL LISTING AND STATE AND LOCAL CODES.
7) GREASE DUCT INSTALLED OUTSIDE OF THE BUILDING SHALL BE PROTECTED AGAINST ACCIDENTAL DAMAGE OR VANDALISM.
8) SUPPORT VERTICALLY INSTALLED GREASE DUCT FROM THE BUILDING STRUCTURE USING RIGID STRUCTURAL SUPPORTS. ANCHOR SUPPORTS TO THE STRUCTURE BY WELDING OR BOLTING STEEL EXPANSION ANCHORS OR CONCRETE INSERTS. SUPPORT HORIZONTALLY INSTALLED GREASE DUCT FROM THE BUILDING STRUCTURE USING ABOVE METHOD. 1/2" THREADED RODS AND SADDLES MAY ALSO BE USED FOR THE SUPPORT OF HORIZONTAL GREASE DUCT.
9) FANS SHALL BE SUPPORTED INDEPENDENTLY FROM THE GREASE DUCT SECTIONS, PROTECT GREASE DUCT FROM TWISTING OR MOVEMENT CAUSED BY FAN TORQUE OR VIBRATION.
I. PLUMBING:
A. PROVIDE AN APPROVED WATER HAMMER ARRESTOR FOR EACH PLUMBING FIXTURE SUPPLY AS REQUIRED BY FIXTURE MANUFACTURER.
B. ALL EXPOSED PIPE SHALL BE CHROME PLATED BRASS PIPE, NO FERROUS PIPE.
C. PROVIDE CLEANOUTS AT EACH CHANGE OF DIRECTION AND AT 100 FOOT INTERVALS IN STRAIGHT RUNS.
D. PROVIDE ACCESS PANELS FOR ALL CONCEALED VALVES AND TRAPS.
E. CLEANOUTS:
1) VINYL TILE FLOOR: JR SMITH #4140, OR EQUAL.
2) QUARRY TILE FLOOR: JR SMITH #4200, OR EQUAL.
3) CARPETED FLOOR: JR SMITH #4200, OR EQUAL.
4) UNFINISHED FLOOR: JR SMITH #4020, OR EQUAL.
5) WALL: JR SMITH #4472, OR EQUAL, 24" ABOVE THE FLOOR.
6) GRADE: JR SMITH #4256, OR EQUAL, WITH HEAVY DUTY CAST IRON BODY AND COVER.
F. PROVIDE DIELECTRIC UNIONS WITH APPROPRIATE END CONNECTIONS TO MATCH THE PIPE SYSTEM IN WHICH INSTALLED (SCHEDULED, SOLDERED, OR FLANGED). PROVIDE DIELECTRIC UNIONS ON ALL PIPING CONNECTIONS TO HOT WATER HEATERS AND EXPANSION TANKS.
G. ALL SEWER PIPING LOCATED INSIDE THE BUILDING SHALL BE INSTALLED WITH THE FOLLOWING SLOPES.
1) INSTALL 2-1/2" AND SMALLER PIPE AT 1/4" PER FOOT FALL.
2) INSTALL 3" AND LARGER PIPE AT 1/8" PER FOOT FALL.
H. ALL SEWER PIPING LOCATED EXTERIOR TO THE BUILDING SHALL BE INSTALLED WITH THE FOLLOWING SLOPES.
1) INSTALL 4" AND SMALLER PIPE AT A MINIMUM OF 2% SLOPE.
2) INSTALL 6" AND LARGER PIPE AT A MINIMUM OF 1% SLOPE.
3) INSTALL ALL GREASE WASTE PIPING AT 1/4" PER FOOT FALL.
I. DUCTWORK:
A. ALL DUCTWORK, UNLESS OTHERWISE INDICATED, SHALL BE FABRICATED FROM GALVANIZED SHEET STEEL COMPLYING WITH ASTM A 521, LOCKFORMING QUALITY, WITH 60 ZINC COATING IN ACCORDANCE WITH ASTM A 525, AND MILL PREFERENTIALLY FOR EXPOSED LOCATIONS.
B. WHERE DUCTWORK IS INDICATED TO BE EXPOSED TO VIEW IN OCCUPIED SPACES, PROVIDE MATERIALS WHICH ARE FREE FROM VIBRATION INCLUDING FITTING, SEAM MARKS, ROLLER MARKS, STAINS AND DISCOLORATIONS, AND OTHER IMPERFECTIONS, INCLUDING THOSE WHICH WOULD IMPAIR PAINTING.
C. DUCTWORK, METAL GAUGES, REINFORCING, ETC. SHALL BE CONSTRUCTED IN ACCORDANCE WITH SMACNA "HVAC D

**MECHANICAL SYMBOLS**

- (SD) NEW SUPPLY DIFFUSER
- (RG) NEW RETURN AIR GRILLE
- EXHAUST GRILLE/FAN
- REMOTE TEMPERATURE/HUMIDITY SENSORS
- THERMOSTAT, MOUNTED AT 48" AFF
- DUCT-MOUNTED SMOKE DETECTOR
- NEW DUCTWORK
- 32"x14" SIZE OF RECTANGULAR DUCT
- 6" SIZE OF ROUND DUCT
- FLEXIBLE DUCTWORK
- FLOOR PLAN NOTE DESIGNATION
- S.A. SUPPLY AIR
- R.A. RETURN AIR
- EXHAUST AIR
- TRANSITION IN DUCT SIZE
- ELBOW WITH TURNING VANES
- MANUAL VOLUME DAMPER
- MANUAL VOLUME DAMPER
- SUPPLY AIR DUCT UP/DOWN
- RETURN AIR DUCT UP/DOWN
- EXHAUST AIR DUCT UP/DOWN
- CHANGE IN ELEVATION UP (UP) DOWN (DN) IN DIRECTION OF FLOW
- SCHEDULED MECHANICAL EQUIPMENT



**DINING ROOM DIFFUSER DETAIL**

SCALE: NONE

**AIR BALANCE SCHEDULE**

SUPPLY AIR UNIT	OUTSIDE AIRFLOW (CFM)	RETURN AIRFLOW (CFM)	SUPPLY AIRFLOW (CFM)	OA/SA %	EXHAUST AIR UNIT	EXHAUST AIRFLOW (CFM)
RTU-1	872	4,328	5,000	17.44%	KEF-1	1700
DOAS-1	2,900	0	2,900	100.0%	KEF-2	775
					EF-1, EF-2	300
<b>TOTAL</b>	<b>3,772</b>	<b>4,328</b>	<b>7,900</b>	<b>47.7%</b>	<b>TOTAL</b>	<b>2,775</b>
RESULTING BUILDING PRESSURIZATION						<b>997 CFM</b>

THE BUILDING HVAC SYSTEM SHALL BE BALANCED BY NATIONAL TAB HIRED BY THE OWNER. CONTACT Dan Hertenstein - National TAB at: 816-215-1543 - DAN@NATIONALTAB.COM

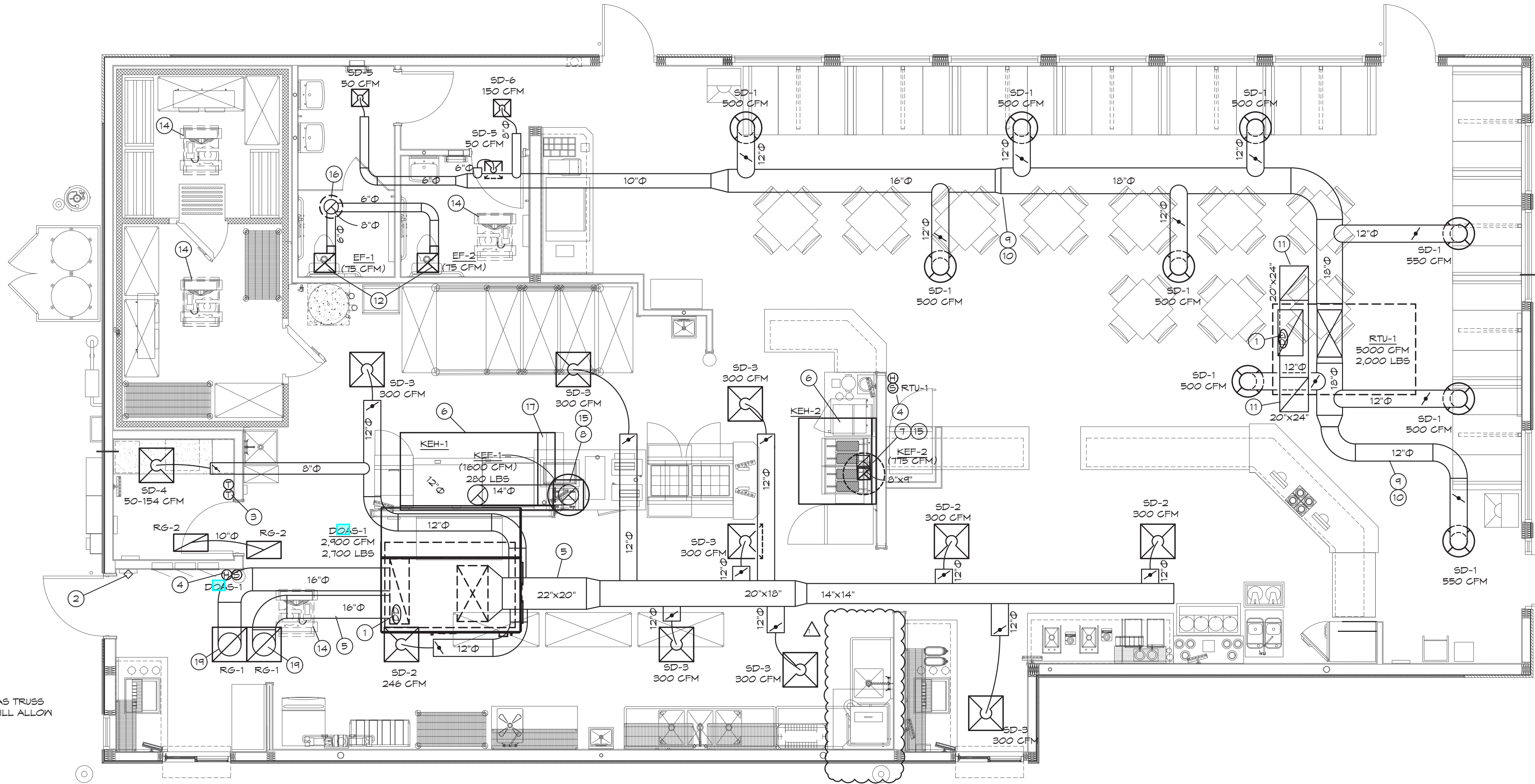
THE RTU SUPPLY FANS SHALL OPERATE IN SINGLE ZONE VAV MODE WITH 2 STAGES OF FAN CONTROL. LOW SPEED SHALL BE USED DURING PERIODS OF LOW COOLING LOAD AND VENTILATION ONLY OPERATION PER 2019 IECC REQUIREMENTS.

THE ECONOMIZER DAMPERS SHALL HAVE TWO POSITIONS DEPENDENT ON THE FAN SPEED TO MAINTAIN CONSTANT OUTDOOR AIR VOLUME AND BUILDING PRESSURE. REFER TO THE BUILDING AIR BALANCE SCHEDULE ON SHEET M2.

THE UNIT SHALL HAVE ITS FRESH AIR HEATING OPTION ENABLED TO HEAT VENTILATION AIR TO A NEUTRAL VALUE DURING COLD WEATHER OPERATION. REFER TO THE MANUFACTURERS PROGRAMMING DOCUMENTATION FOR SETUP INSTRUCTIONS.

**OUTDOOR AIR CALCULATIONS**

UNIT	Area (sqft)	OCCUPANCY CLASSIFICATION	Occupant Density #/1000 sqft	People outdoor airflow rate in breathing zone, (Rp) cfm/person	Area outdoor airflow rate in breathing zone, (Ra) cfm/sqft	Exhaust airflow rate cfm/sqft	Breathing zone outdoor airflow (Vbz)	Zone air distribution effectiveness (Ez)	Zone outdoor airflow (cfm)
RTU-1	884	Dining rooms	10	7.5	0.19		623	0.8	719
	173	Corridors	0	0	0.06		10	0.8	13
<b>Total</b>									<b>792</b>



**MECHANICAL FLOOR PLAN**  
SCALE: 1/4" = 1'-0"

**MECHANICAL PLAN NOTES:**

- 1 LOCATION OF DUCT MOUNTED SMOKE DETECTOR. PROVIDE REMOTE ENUNCIATOR AUDIO/VISUAL. VERIFY LOCATION WITH FIRE MARSHAL PRIOR TO INSTALLATION. REFER TO SPEC SHEET M203 FOR ADDITIONAL INFORMATION.
- 2 LOCATION OF MANUAL PULL STATION. INSTALL PER THE MANUFACTURERS REQUIREMENTS.
- 3 LOCATION OF RTU AND THERMOSTATS. GC TO LABEL EACH THERMOSTAT.
- 4 LOCATION OF RTU TEMPERATURE SENSOR MOUNTED 7'-0" AFF.
- 5 ALL KITCHEN DUCTWORK IS INTENDED TO BE ROUTED THROUGH OR BETWEEN TRUSSES. COORDINATE EXACT ROUTING WITH TRUSSES DURING INSTALLATION.
- 6 EXHAUST HOOD PROVIDED BY OTHERS. INSTALLED BY THIS CONTRACTOR PER THE MANUFACTURERS INSTRUCTIONS.
- 7 TRANSITION AND CONNECT 10" GREASE DUCT TO EXHAUST HOOD WITH AS SHOWN. ROUTE DUCT UP AND CONNECT TO EXHAUST FAN. OFFSET AS NECESSARY TO MISS ROOF STRUCTURE, AND TO MAINTAIN 10'-0" CLEARANCE FROM ALL OUTDOOR AIR INTAKES, AND 5'-0" FROM PARAPET WALLS. ALL GREASE DUCT IS TO BE INSTALLED WITH DUCT WRAP AS DETAILED AND PER THE MANUFACTURERS REQUIREMENTS FOR 0' CLEARANCE TO COMBUSTIBLES.
- 8 TRANSITION AND CONNECT 14" GREASE DUCT TO COLLAR ON EXHAUST HOOD. ROUTE DUCT UP AND CONNECT TO EXHAUST FAN. OFFSET AS NECESSARY TO MISS ROOF STRUCTURE, AND TO MAINTAIN 10'-0" CLEARANCE FROM ALL OUTDOOR AIR INTAKES, AND 5'-0" FROM PARAPET WALLS. REFER TO DETAIL ON SHEET M2. ALL GREASE DUCT IS TO BE INSTALLED WITH DUCT WRAP AND ACCESS DOORS AS DETAILED AND PER THE MANUFACTURERS REQUIREMENTS FOR 0' CLEARANCE TO COMBUSTIBLES.
- 9 COORDINATE DUCT ROUTING WITH LIGHTING.
- 10 EXPOSED DUCTWORK SHALL BE OF PAINTLOCK CONSTRUCTION AND PAINTED PER THE DIRECTION OF ARCHITECT.
- 11 RETURN AIR DUCT LOCATED BETWEEN ROOF TRUSSES. OPEN END OF DUCTWORK TURNED UP TOWARD STRUCTURE WITH A MINIMUM 8" CLEARANCE TO DECK.
- 12 SUPPORT EXHAUST FAN FROM STRUCTURE AS REQUIRED BY THE MANUFACTURER.
- 13 COORDINATE WITH STRUCTURAL TO BLOCK OUT JOISTS AS REQUIRED TO RUN DUCT THROUGH STRUCTURE.
- 14 MOUNT CONDENSING UNIT ON ROOF AS DETAILED AND AS REQUIRED BY THE MANUFACTURER. CONNECT REFRIGERANT PIPING AS REQUIRED BY THE MANUFACTURER. SEE ARCHITECTURAL PLANS FOR MOUNTING DETAIL.
- 15 GC TO INSTALL CAPTIVE AIR WBE WINDBAND EXTENSION FOR KEF-1 AND KEF-2 PROVIDED BY KITCHEN EQUIPMENT SUPPLIER.
- 16 ROUTE 8" EXHAUST DUCT UP THROUGH ROOF TO ROOF CAP. MAINTAIN 10'-0" CLEARANCE TO ALL OUTDOOR AIR INTAKES.
- 17 HOOD SHALL BE PROVIDED WITH FACTORY PRE-WIRE PACKAGE AND A PRE-ENGINEERED UL-300 FIRE SUPPRESSION SYSTEM. SEE HOOD DRAWINGS FOR DETAILS.

**MECHANICAL GENERAL NOTES:**

1. COORDINATE ALL WORK WITH OTHER TRADES AND EXISTING CONDITIONS AS REQUIRED TO PROPERLY INSTALL ALL SYSTEMS AS INTENDED, WITHIN THE CONFINES OF THE SPACES AVAILABLE, AND WITHOUT INTERFERENCES.
2. THIS CONTRACTOR SHALL PERFORM ALL WORK INDICATED AND/OR AS REQUIRED FOR THE PROPER INSTALLATION AND OPERATION OF THE MECHANICAL SYSTEMS.
3. REFER TO ARCHITECTURAL REFLECTED CEILING PLANS FOR EXACT LOCATIONS OF DIFFUSERS.
4. INSTALL ALL DUCT, PIPE, ETC. AS HIGH AS POSSIBLE.
5. DUCT SIZES SHOWN ARE ACTUAL SHEET METAL SIZES AND INCLUDE A 1/2 INCH ALLOWANCE FOR DUCT LINER WHERE APPLICABLE.
6. PROVIDE FLEXIBLE CONNECTION BETWEEN DUCTWORK AND ROOFTOP UNITS, EXHAUST FANS, AND OTHER MOTORIZED EQUIPMENT.
7. NO DUCT SHALL BE ROUTED OVER THE TOP OF ELECTRICAL PANELS.
8. ALL EXPOSED DUCT WORK SHALL BE PAINTED. REFER TO ARCHITECTURAL PLANS FOR DETAILS.

BC PROJECT #: 22111  
VIRGINIA PE COA #0407006723

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County of Prince William  
**REVIEWED**  
Building Development Division

11/02/2023 4:31:57 PM  
Robert C. Welborn

**BC ENGINEERS**  
INCORPORATED

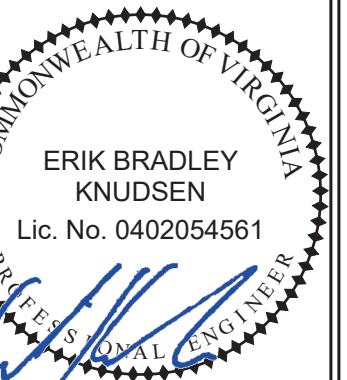
5720 Reeder Shawnee, KS 66203 (913)262-1772

All work shall comply with  
VA Uniform Statewide Building Code

**BDS**  
BAKER DESIGN GROUP PA  
1024 E. 1st Street N. Wichita, KS 67214 316.267.7142  
rodger@bakerdesigngroup.com

**FREDDY'S FROZEN CUSTARD**  
8074 ASHTON AVE.  
MANASSAS, VA 20109

7/26/2023



**MECHANICAL FLOOR PLAN**

DATE  
01/09/23  
REV 2 - 07/28/23

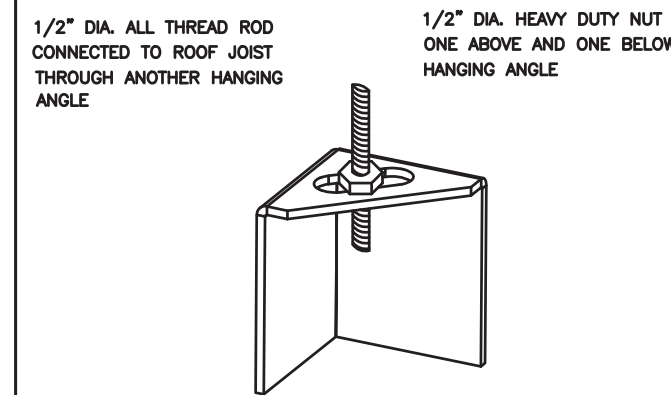
DRAWN BY:

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SHEET NO.

**M1**

**ND-2 HANGING ANGLE DETAIL**



**HANGING ANGLE LOCATIONS**

HOOD STYLE	DIM FROM REAR	DIM FROM FRONT (24\"/>	
CANOPY ND2	4.166"	2.246"	2.246"
ND2-PSP-F	4.166"	2.246"	2.246"
BACKSHELF BD-2	4.166"	2.246"	-
VHB/VHB-G	36"X36"	42"X42"	48"X48"
FRONT/BACK DIMS BY SIZE	2.246"	2.246"	2.246"

**CALCULATIONS UTILIZED**

EXHAUST CFM=LENGTH OF HOOD X CFM/LIN.FT. (LOAD)  
 SUPPLY CFM=EXHAUST CFM X PERCENTAGE REQUIRED  
 TOTAL DUCT AREA=144 X (CFM/3600)  
 DUCT LENGTH= (TOTAL DUCT AREA / DUCT DEPTH)

**BUILDING CODES**

CAPTIVE-AIRE HOODS ARE BUILT IN COMPLIANCE WITH:  

 ETL LISTED TO UL 706-2011 & 3054804-002  
 Listed under ETL File number 3054804-001/002

**CLEARANCE TO COMBUSTIBLES**

CAPTIVE-AIRE HOODS HAVE OPTIONAL CLEARANCE REDUCTION SYSTEMS AVAILABLE AS FOLLOWS:

MATERIAL	CLEARANCE REDUCTION SYSTEM
NON-COMBUSTIBLE	NONE REQUIRED
LIMITED-COMBUSTIBLE	3" UNINSULATED STANDOFF
COMBUSTIBLE	1" INSULATED STANDOFF

**GENERAL NOTES**

- INSTALLATION**
- ALL ELECTRICAL "FIELD" CONNECTIONS AND RELATED INTERCONNECTIONS BY ELECTRIC CONTRACTORS.
  - ALL PLUMBING "FIELD" CONNECTIONS AND RELATED INTERCONNECTIONS BY PLUMBING CONTRACTORS.
  - HANGING BRACKETS LOCATED AND WELDED AS SHOWN ON PLANS. ALL OTHER HANGER MATERIALS PROVIDED BY INSTALLING CONTRACTORS.
  - ALL CONNECTIONS FROM CAPTIVE-AIRE ARE DUCT PER MECHANICAL CONTRACTORS'S PLANS.
  - COOKING EQUIPMENT TO SHUTOFF IN EVENT OF FIRE.
  - EXHAUST FANS TO TURN ON IN EVENT OF FIRE.
  - ALL LIGHTS FIXTURE SHOWN INSTALLED BY CAPTIVE-AIRE ARE FACTORY PREMIED. INTERCONNECTIONS BETWEEN HOODS AND TO SWITCHES BY ELECTRICAL CONTRACTORS.
  - LAMPS FOR LIGHT FIXTURES BY INSTALLING CONTRACTORS.
  - SEISMIC RESTRAINTS ARE RESPONSIBILITY OF INSTALLING CONTRACTOR.
  - INSTALLING CONTRACTORS ASSUME ALL RELATED RESPONSIBILITY FOR VERIFICATION OF DIMENSIONAL DATA CONTAINED ON THESE DOCUMENTS FOR ACCURACY, INTEGRATION AND ADMINISTRATION OF CODE REQUIREMENTS IN EFFECT PRIOR TO ANY RELEASE FOR PRODUCTION OF EQUIPMENT SHOWN.
- BALANCE**
- KITCHEN HOODS MUST BE BALANCED WITH KITCHEN.
  - KITCHEN SHALL BE NEGATIVE WITH RESPECT TO DINING AREA.
  - RESTAURANT SHALL BE POSITIVE WITH RESPECT TO AMBIENT PRESSURE.
- ADDITIONAL**
- WRITTEN HOOD DIMENSIONS HAVE PRECEDENCE OVER SCALE.
  - SIGNED AND "APPROVED" COPIES OF THIS DOCUMENT MUST BE RECEIVED BY THE FACTORY PRIOR TO COMMENCEMENT OF FABRICATION.

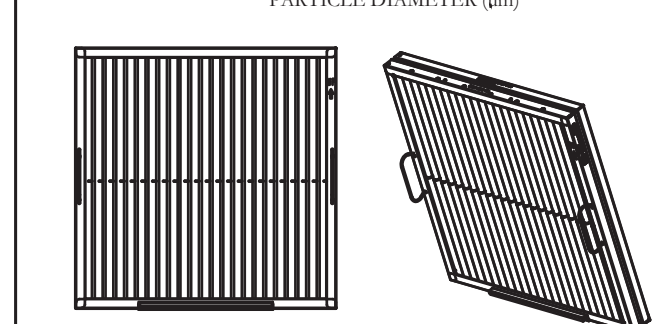
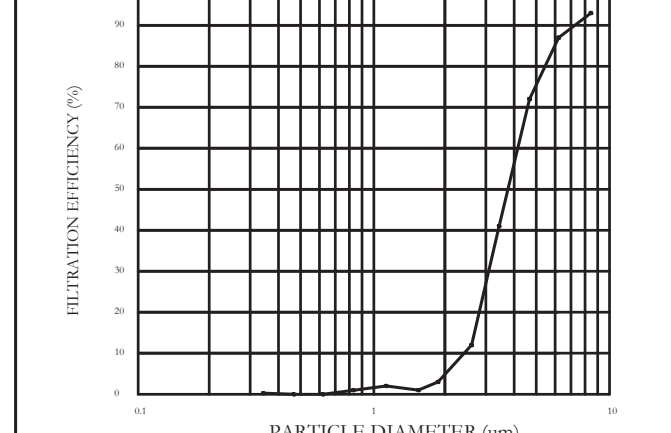
**INSTALLATION**

- ALL ELECTRICAL "FIELD" CONNECTIONS AND RELATED INTERCONNECTIONS BY ELECTRIC CONTRACTORS.
- ALL PLUMBING "FIELD" CONNECTIONS AND RELATED INTERCONNECTIONS BY PLUMBING CONTRACTORS.
- HANGING BRACKETS LOCATED AND WELDED AS SHOWN ON PLANS. ALL OTHER HANGER MATERIALS PROVIDED BY INSTALLING CONTRACTORS.
- ALL CONNECTIONS FROM CAPTIVE-AIRE ARE DUCT PER MECHANICAL CONTRACTORS'S PLANS.
- COOKING EQUIPMENT TO SHUTOFF IN EVENT OF FIRE.
- EXHAUST FANS TO TURN ON IN EVENT OF FIRE.
- ALL LIGHTS FIXTURE SHOWN INSTALLED BY CAPTIVE-AIRE ARE FACTORY PREMIED. INTERCONNECTIONS BETWEEN HOODS AND TO SWITCHES BY ELECTRICAL CONTRACTORS.
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- INSTALLING CONTRACTORS ASSUME ALL RELATED RESPONSIBILITY FOR VERIFICATION OF DIMENSIONAL DATA CONTAINED ON THESE DOCUMENTS FOR ACCURACY, INTEGRATION AND ADMINISTRATION OF CODE REQUIREMENTS IN EFFECT PRIOR TO ANY RELEASE FOR PRODUCTION OF EQUIPMENT SHOWN.

**INSTALLATION**

- WRITTEN HOOD DIMENSIONS HAVE PRECEDENCE OVER SCALE.
- SIGNED AND "APPROVED" COPIES OF THIS DOCUMENT MUST BE RECEIVED BY THE FACTORY PRIOR TO COMMENCEMENT OF FABRICATION.

**INSTALLATION**



Captive-Aire Captrate Solo Filter  
 ETL Listed Grease Extracting Filters  
 Made From 430 Stainless Steel

**HOOD INFORMATION - JOB#5330815**

HOOD NO	TAG	MODEL	MANUFACTURER	LENGTH	MAX CEILING TEMP	TYPE	APPLIANCE DUTY	DESIGN CFM/FT	TOTAL EXH CFM	EXHAUST RISER DIA	EXHAUST RISER VEL	SP	HOOD CONSTRUCTION	HOOD END TO END	HOOD ROW	PATENT NUMBERS
1	ITEM 533A	5424 ND-2	CAPTIVEAIRE	8' 6"	450 DEG	I	MEDIUM	200	1700	14"	1700	-0.828"	430 SS W/HEX EXPOSED	ALONE	FRONT	EXHAUST HOODS ND-2/BD-2/SND-2 (CANADA) - CA PATENT 2520435 C.
2	ITEM 533B	5424 ND-2	CAPTIVEAIRE	3' 0"	450 DEG	I	MEDIUM	155	775	4"	10"	775	430 SS W/HEX EXPOSED	ALONE	ALONE	

**HOOD INFORMATION**

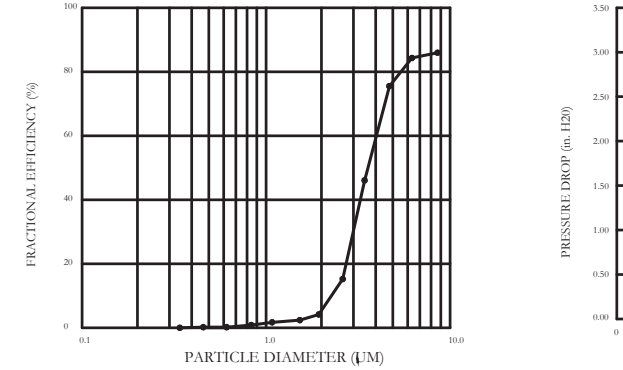
HOOD NO	TAG	TYPE	QTY	HEIGHT	LENGTH	EFFICIENCY @ 7 MICRONS	LIGHTS	WIRE GUARD	LOCATION	SIZE	UTILITY CABINETS	ELECTRICAL	SWITCHES	FIRE HOOD SYSTEM	HOOD WEIGHT
1	ITEM 533A	CAPTRATE SOLO FILTER	6	16"	16"	85% SEC. FILTER SPEC	3	RECESSED ROUND	NO	LEFT	12"X54"X24"	DCV-2011	1 LIGHT 1 FAN	NO	541 LBS
2	ITEM 533B	CAPTRATE SOLO FILTER	3	16"	16"	85% SEC. FILTER SPEC	2	RECESSED ROUND	NO					NO	310 LBS
3			0											NO	161 LBS

**HOOD OPTIONS**

HOOD NO	TAG	OPTION
1	ITEM 33A	FIELD WRAPPER 1800" HIGH FRONT, LEFT, RIGHT. LEFT QUARTER END PANEL 23" TOP WIDTH, 0" BOTTOM WIDTH, 23" HIGH 430 SS. RIGHT QUARTER END PANEL 23" TOP WIDTH, 0" BOTTOM WIDTH, 23" HIGH 430 SS. RISER SENSOR INSTALL 3IN DBL.
2	ITEM 33B	FIELD WRAPPER 1800" HIGH FRONT, LEFT, RIGHT. RIGHT END PANEL 27" TOP WIDTH, 24" BOTTOM WIDTH, 39.5" HIGH 430 SS. LEFT QUARTER END PANEL 23" TOP WIDTH, 0" BOTTOM WIDTH, 23" HIGH 430 SS. RISER SENSOR INSTALL 3IN DBL.
3	ITEM 75	FIELD WRAPPER 1800" HIGH FRONT, LEFT, RIGHT.

**SPECIFICATION: CAPTRATE® GREASE-STOP® SOLO FILTER**

THE CAPTRATE GREASE-STOP SOLO FILTER IS A SINGLE-STAGE FILTER FEATURING A UNIQUE S-Baffle DESIGN IN CONJUNCTION WITH A SLOTTED REAR Baffle DESIGN, TO DELIVER EXCEPTIONAL FILTRATION EFFICIENCY. FILTER IS STAINLESS STEEL CONSTRUCTION, AND SIZED TO FIT INTO STANDARD 2-INCH DEEP HOOD CHANNELS. UNITS SHALL INCLUDE STAINLESS STEEL HANDLES AND A FASTENING DEVICE TO SECURE THE TWO COMPONENTS WHEN ASSEMBLED. GREASE EXTRACTION EFFICIENCY PERFORMANCE SHALL REMOVE AT LEAST 75% OF GREASE PARTICLES FIVE MICRONS IN SIZE, AND 85% GREASE PARTICLES SEVEN MICRONS IN SIZE AND LARGER, WITH A CORRESPONDING PRESSURE DROP NOT TO EXCEED 10 INCHES OF WATER GAUGE. THE CAPTRATE GREASE-STOP SOLO WAS TESTED TO ASTM STANDARD ASTM F2919-05. MANUFACTURER APPROVED FOR USE IN SOLID FUEL APPLICATIONS AS A SPARK ARRESTER.

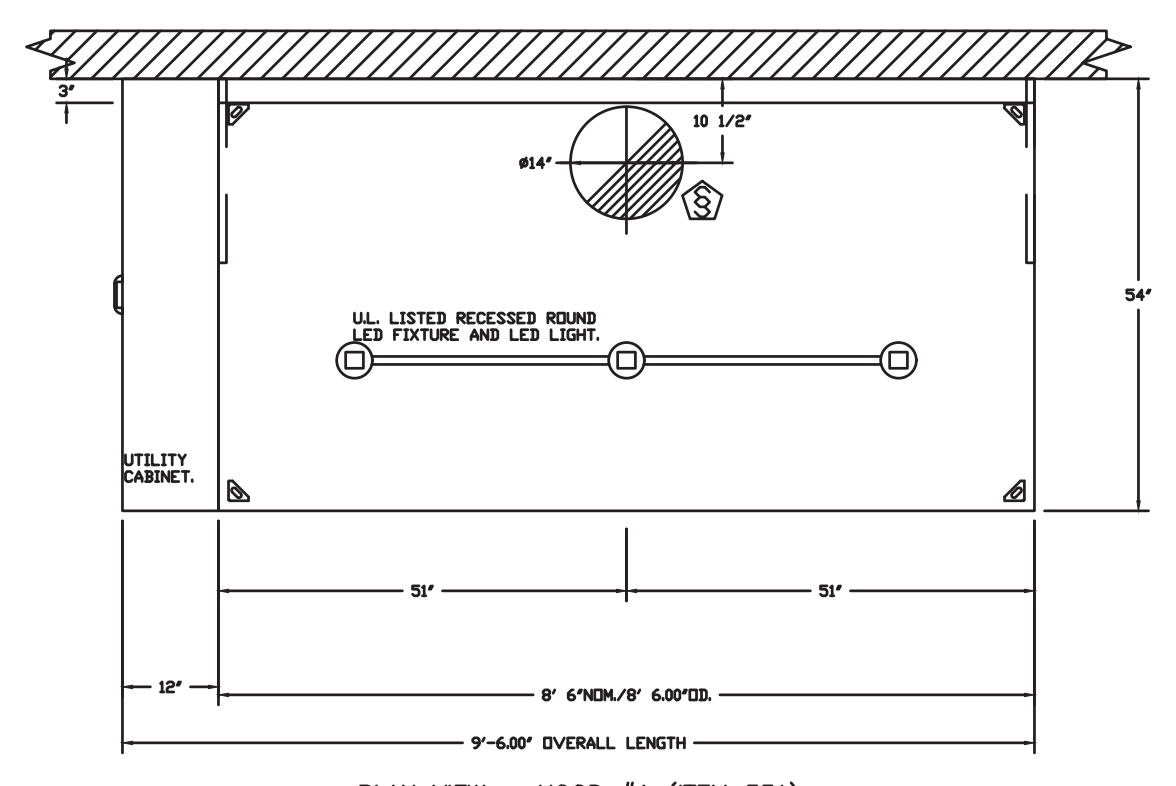


**CAPTIVE FILTERS ARE BUILT IN COMPLIANCE WITH:**

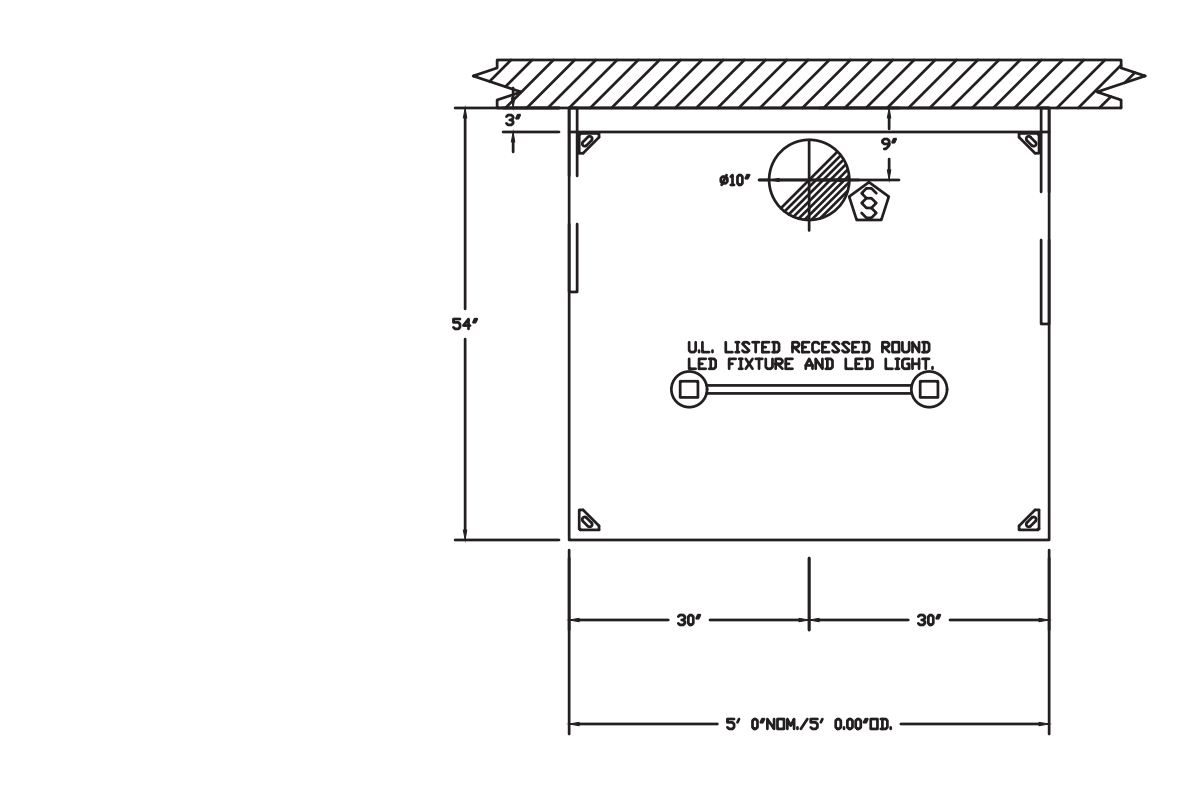
NFPA 99, NSF STANDARD 82, NSF STANDARD 1046, INT. TECH. CODE (IMC), UL-C-36495

**GENERAL NOTES**

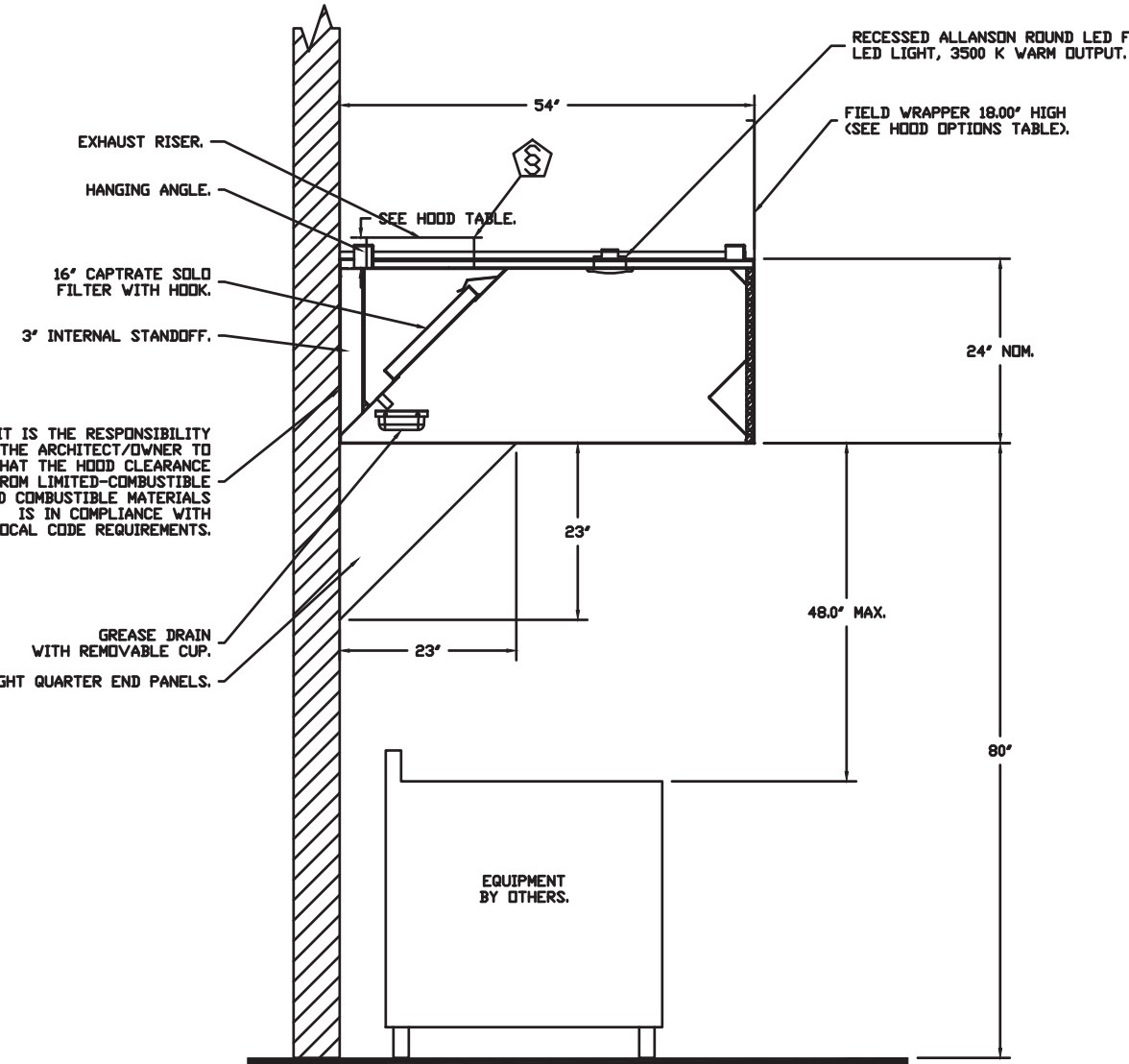
- IT IS THE RESPONSIBILITY OF THE ARCHITECT/OWNER TO ENSURE THAT THE HOOD CLEARANCE FROM LIMITED-COMBUSTIBLE AND COMBUSTIBLE MATERIALS IS IN COMPLIANCE WITH LOCAL CODE REQUIREMENTS.
- GREASE DRAIN WITH REMOVABLE CUP. LEFT AND RIGHT QUARTER END PANELS.



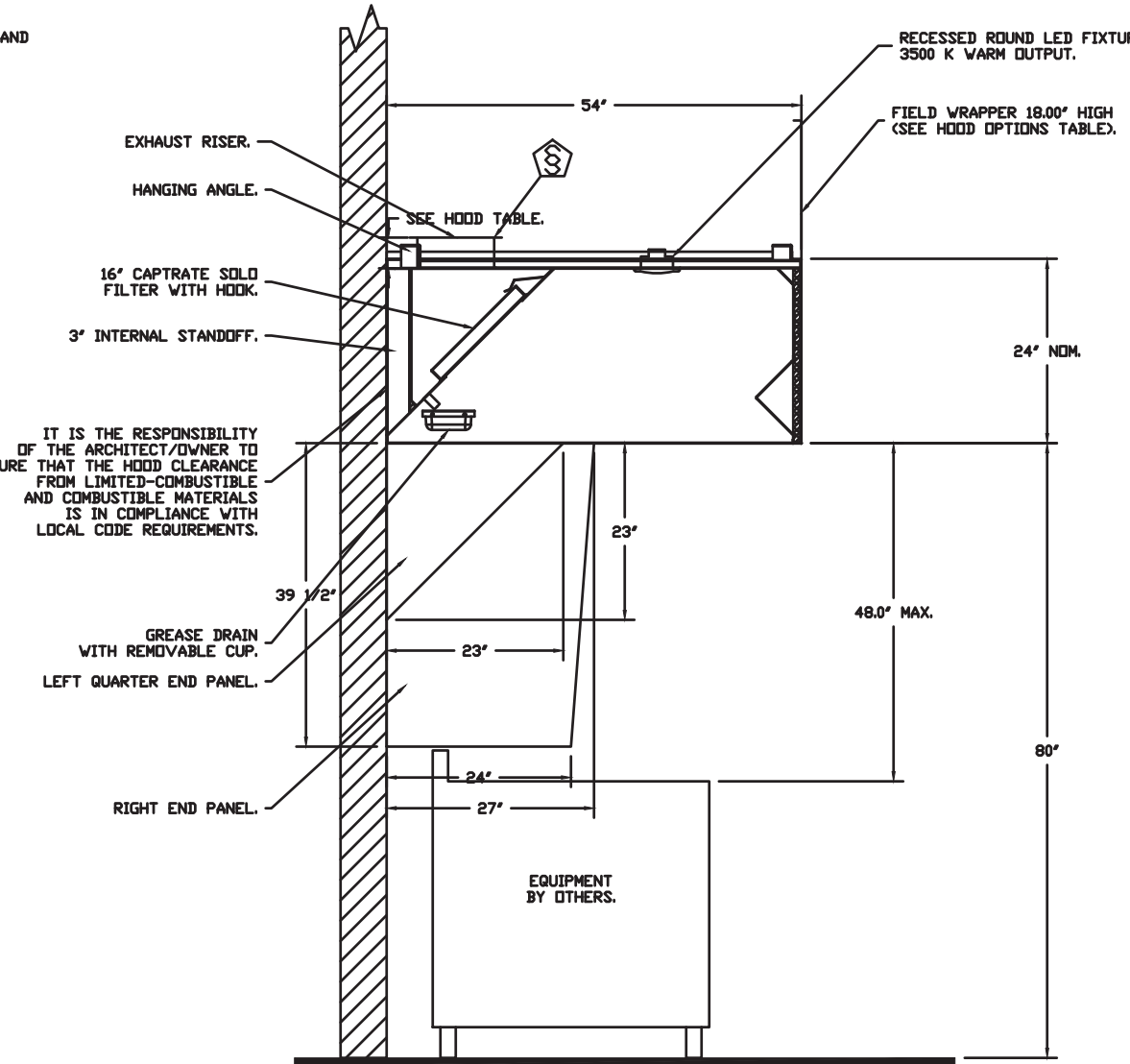
PLAN VIEW - HOOD #1 (ITEM 33A)  
 8' 6.00" LONG 5424ND-2



PLAN VIEW - HOOD #2 (ITEM 33B)  
 5' 0.00" LONG 5424ND-2



SECTION VIEW - MODEL 5424ND-2  
 HOOD - #1 (ITEM 33A)



SECTION VIEW - MODEL 5424ND-2  
 HOOD - #2 (ITEM 33B)

**SYSTEM DESIGN VERIFICATION (SDV)**

IF ORDERED, CAS SERVICE WILL PERFORM A SYSTEM DESIGN VERIFICATION (SDV) ONCE ALL EQUIPMENT HAS HAD A COMPLETE START UP PER THE OPERATION AND INSTALLATION MANUAL. TYPICALLY, THE SDV WILL BE PERFORMED AFTER ALL INSPECTIONS ARE COMPLETE.

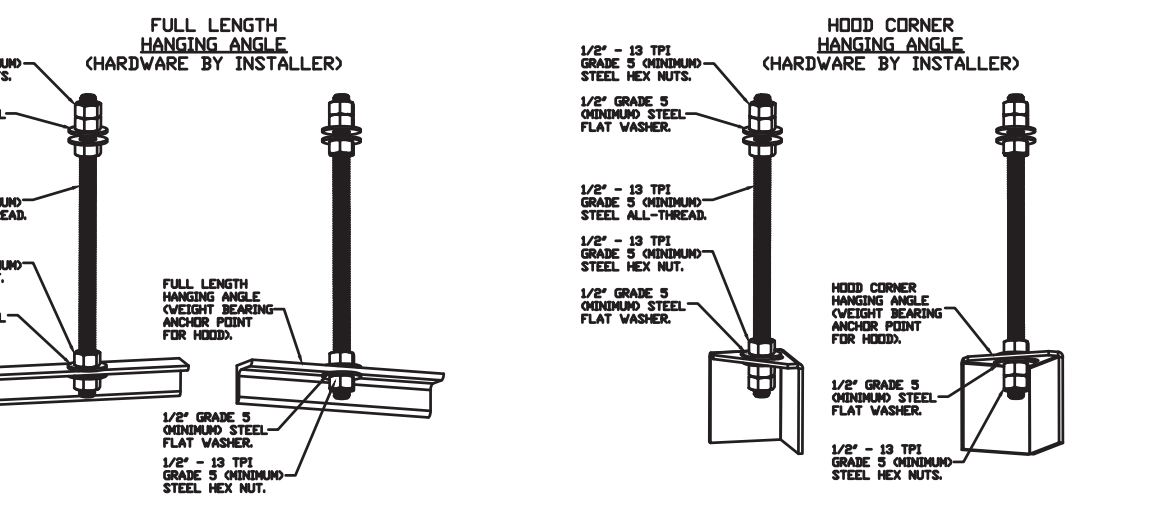
ANY FIELD RELATED DISCREPANCIES THAT ARE DISCOVERED DURING THE SDV WILL BE BROUGHT TO THE ATTENTION OF THE GENERAL CONTRACTOR AND CORRESPONDING TRADES ON SITE. THESE ISSUES WILL BE DOCUMENTED AND FORWARDED TO THE APPROPRIATE SALES OFFICE. IF CAS SERVICE HAS TO RESOLVE A DISCREPANCY THAT IS A FIELD ISSUE, THE GENERAL CONTRACTOR WILL BE NOTIFIED AND BILLED FOR THE WORK. SHOULD A RETURN TRIP BE REQUIRED DUE TO ANY FIELD RELATED DISCREPANCY THAT CANNOT BE RESOLVED DURING THE SDV, THERE WILL BE ADDITIONAL TRIP CHARGES.

DURING THE SDV, CAS SERVICE WILL ADDRESS ANY DISCREPANCY THAT IS THE FAULT OF THE MANUFACTURER. SHOULD A RETURN TRIP BE REQUIRED, THE GENERAL CONTRACTOR AND APPROPRIATE SALES OFFICE WILL BE NOTIFIED. THERE WILL BE NO ADDITIONAL CHARGES FOR MANUFACTURER DISCREPANCIES.

**\*\*\* NOTE \*\*\***  
 ALL WALLS AND STRUCTURES THAT COME WITHIN 18\"/>

**\*\*\* NOTE \*\*\***  
 HOOD MANUFACTURER RECOMMENDS NO RETURNS OR 4-WAY DIFFUSERS WITHIN 10 FEET OF HOOD IN ALL DIRECTION.

**\*\*\* NOTE \*\*\***  
 MAKEUP AIR SHALL BE DELIVERED INTO SPACE IN MANNER THAT WILL NOT DISRUPT HOODS ABILITY TO CAPTURE AND CONTAIN.



**ASSEMBLY INSTRUCTIONS**

HANGING ANGLE MUST BE SUPPORTED WITH 1/2" - 13 TPI GRADE 5 CHINA/NO ALL-THREAD SANDWICH HANGING ANGLES AND CEILING ANCHOR POINTS WITH 1/2" GRADE 5 CHINA/NO STEEL FLAT WASHERS AND 1/2" - 13 TPI GRADE 5 CHINA/NO HEX NUTS AS SHOWN. MUST USE DOUBLED HEX NUT CONFIGURATION ABOVE CEILING ANCHORS. SINGLE HEX NUT BENEATH HANGING ANGLE IS ACCEPTABLE FOR FULL LENGTH HANGING ANGLES. MAINTAIN 1/4" OF EXPOSED THREADS BENEATH BOTTOM HEX NUT. TORQUE ALL HEX NUTS TO 57 FT-LBS.

**REVISIONS**

NO.	DESCRIPTION	DATE

www.captiveaire.com  
 www.captiveaire.com



Freddy's - Manassas, VA  
 MANASSAS, VA, 20110

DATE: 2/16/2022

DWG.#: 5330815

DRAWN BY: michael.co

SCALE: 1/2" = 1'-0"

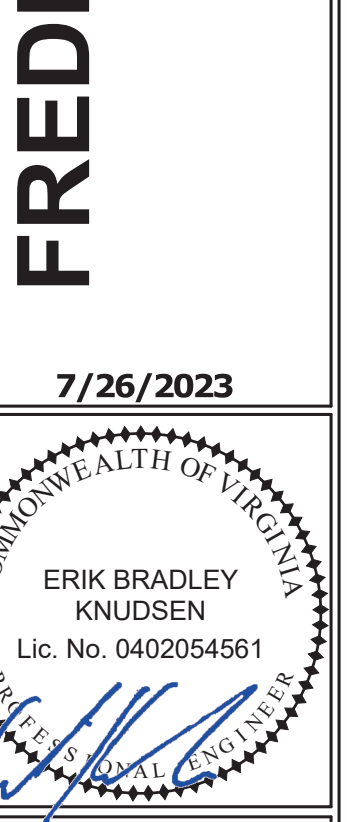
MASTER DRAWING

SHEET NO. 1

**BDG**  
 BAKER DESIGN GROUP PA  
 1024 E. 1st Street N. Wichita, KS 67214  
 316.267.7142  
 rodriguez@bakergroup.com

**FREDDY'S FROZEN CUSTARD**  
 8074 ASHTON AVE.  
 MANASSAS, VA 20109

7/26/2023



DATE: 2/16/2022

DWG.#: 5330815

DRAWN BY: michael.co

SCALE: 1/2" = 1'-0"

MASTER DRAWING

SHEET NO. 1

DATE: 01/09/23

REV 1 - 07/28/23

MECHANICAL HOOD PLANS

DRAWN BY:

CHECKED BY:

SHEET NO. M3

BC PROJECT #: 22111  
 VIRGINIA PE COA #0407006723  
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 5720 Reeder Shawnee, KS 66203 (913)282-1772

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FAN UNIT NO.	TAG	QTY	FAN UNIT MODEL #	MANUFACTURER	CFM	ESP	RPM	MOTOR ENCL.	HP	BHP	PHASE	VOL.T	FLA	DISCHARGE VELOCITY	WEIGHT (LBS)	SDNES
1	ITEM 74.1	1	CASRE18D	CAPTIVEAIR	1700	1.400	1110	DIP-PREMIUM	1.000	0.6590	3	208	3.8	986 FPM	282	13.9
2	ITEM 74.2	1	BUSOFA	CAPTIVEAIR	725	1.250	1530	TEAD-ECM	0.500	0.3750	1	115	6.2	295 FPM	101	16.4

**DOAS/RTU FAN SCHEDULE - JOB#5330815**

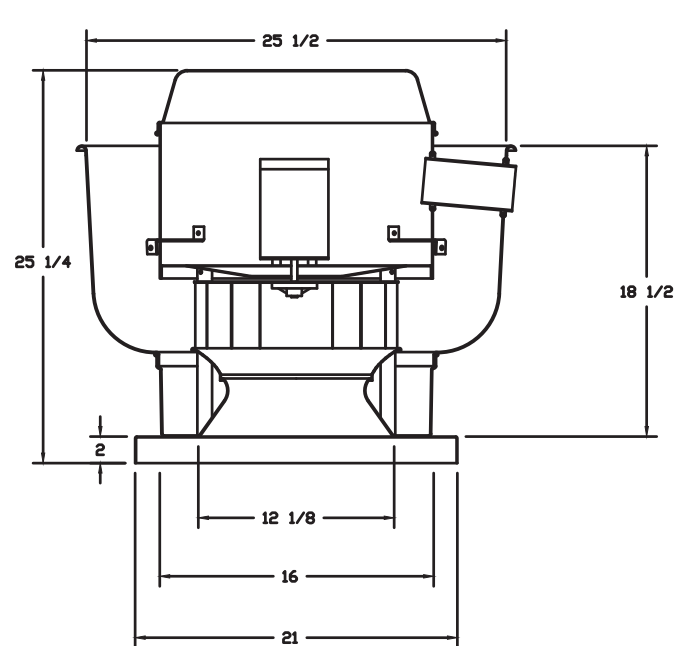
FAN UNIT NO.	TAG	QTY	DOAS/RTU MODEL #	MANUFACTURER	BLOWER	RETURN AIR CFM	MAX OUTSIDE AIR CFM	TOTAL CFM	WEIGHT (LBS)	ESP	HP	#	VOLT	MCA	MDCP	COOLING INFORMATION		REHEAT INFORMATION		GAS HEAT INFORMATION		NOTES													
																DISCHARGE DB	LEAVING AIR WB	DISCHARGE DB	DESIRED WB	GAS INPUT BTUS	OUTPUT BTUS		TEMP REISE												
4	ITEM 74.3	1	CASRTU3-1300-15-20T-DOAS	CAPTIVEAIR	15P-3	0	2900	2900	2536	0.500	2.00	3	208	76.4A	80A	81.9T	75.6T	81.9T	75.6T	49.0T	46.0T	26.40	101.7	18.2	780T	55.1T	68.2	129.6	146.6	LBS/HR	NATURAL	254254	203403	64T	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15

NOTES:  
 1. INVERTER SCROLL COMPRESSOR WITH INTEGRATED OIL SENSOR. DIGITAL OR STAGED SCROLL NOT AN APPROVED MODEL.  
 2. DIRECT DRIVE PLENUM BLOWER. BELT DRIVEN BLOWERS ARE NOT ACCEPTABLE.  
 3. INTEGRATED MONITORING VIA CELLULAR CONNECTION BY MANUFACTURER.  
 4. REFRIGERATION PRESSURE MONITORING ON HIGH AND LOW PRESSURE SIDE OF SYSTEM INCLUDED THROUGH DIGITAL INTERFACE.  
 5. CO MOTOR CONDENSING FAN.  
 6. ELECTRONIC EXPANSION VALVE. TXV NOT ACCEPTABLE.  
 7. SUCTION LINE ACCUMULATOR.  
 8. FACTORY COMMISSIONING WITH 5 YEAR PARTS WARRANTY, 25 YEAR WARRANTY ON STAINLESS STEEL HEAT EXCHANGER.  
 9. AVERAGING INTAKE, EVAP AND DISCHARGE TEMPERATURE SENSORS (DISCHARGE SENSOR TO BE FACTORY MOUNTED WITHIN UNIT).  
 10. 5" EXTERIOR DUAL-WALL CONSTRUCTION W/ R-13 INSULATION-MINIMUM 20GA EXTERIOR W/ 16GA BASE.  
 11. SUPPLY CFM MONITORING INTEGRAL TO UNIT WITH CFM MEASUREMENT INCLUDED THROUGH DIGITAL INTERFACE.  
 12. FULLY MODULATING HOT GAS REHEAT.  
 13. HAIL GUARD FOR CONDENSING COIL.  
 14. DOWN DISCHARGE/DOWN RETURN.  
 15. 80% EFFICIENT FURNACE, WITH MODULATING INDUCER TO MAINTAIN CONSTANT COMBUSTION EFFICIENCY ACROSS FIRING RANGE. 61 TURNDOWN WITH NG AND 54 TURNDOWN WITH LP.

**FAN OPTIONS**

FAN UNIT NO.	TAG	QTY	DESCRIPTION
1	ITEM 74.1	1	UTILITY SET GREASE CUP
		1	REHEAT DISCHARGE EXTENSION ASSEMBLY WITH HARDWARE
2	ITEM 74.2	1	2 YEAR PARTS WARRANTY
		1	UPBLAST FAN WHEEL ACCESS PORT
3	ITEM 75.1	1	36" TALL STRAIGHT WIND BAND EXTENSION (3 CHIPS LOOSE)
		1	GUY LINE EYE BOLTS - USED FOR 3 GUY LINE TIE OFF POINTS
4	ITEM 74.3	1	ECH WIRING PACKAGE - PWM SIGNAL FROM ECM33 PREWIRE (TELCO MOTOR), CCW ROTATION
		1	2 YEAR PARTS WARRANTY

FAN #3 BUSOFA - EXHAUST FAN (ITEM 74.2)

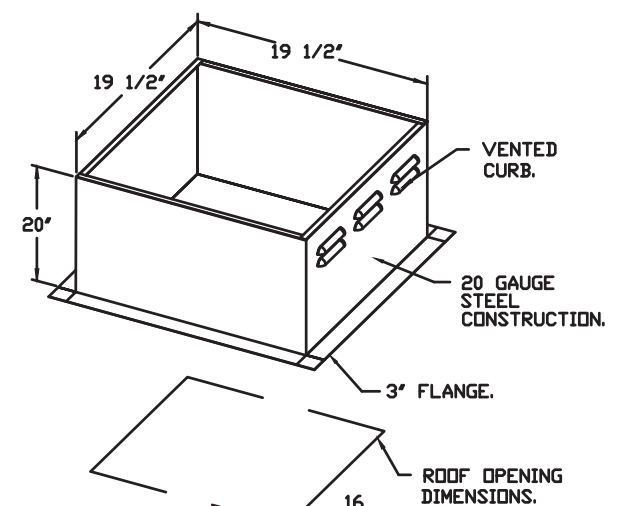


**FEATURES:**

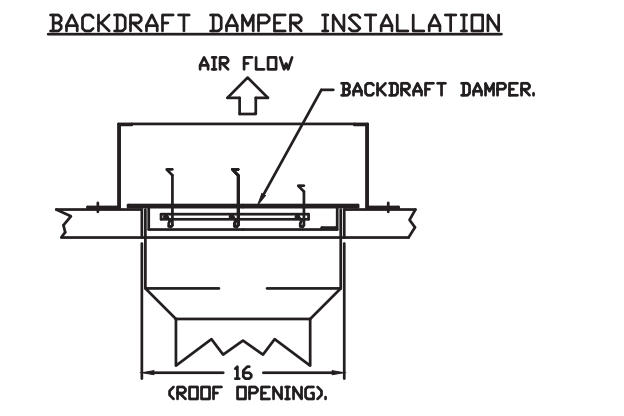
- DIRECT DRIVE CONSTRUCTION ON BELTS/PULLEYS.
- ROOF MOUNTED FANS.
- UL795.
- VARIABLE SPEED CONTROL.
- INTERNAL WIRING.
- THERMAL OVERLOAD PROTECTION (SINGLE PHASE).
- NEMA 3R SAFETY DISCONNECT SWITCH.

**OPTIONS:**

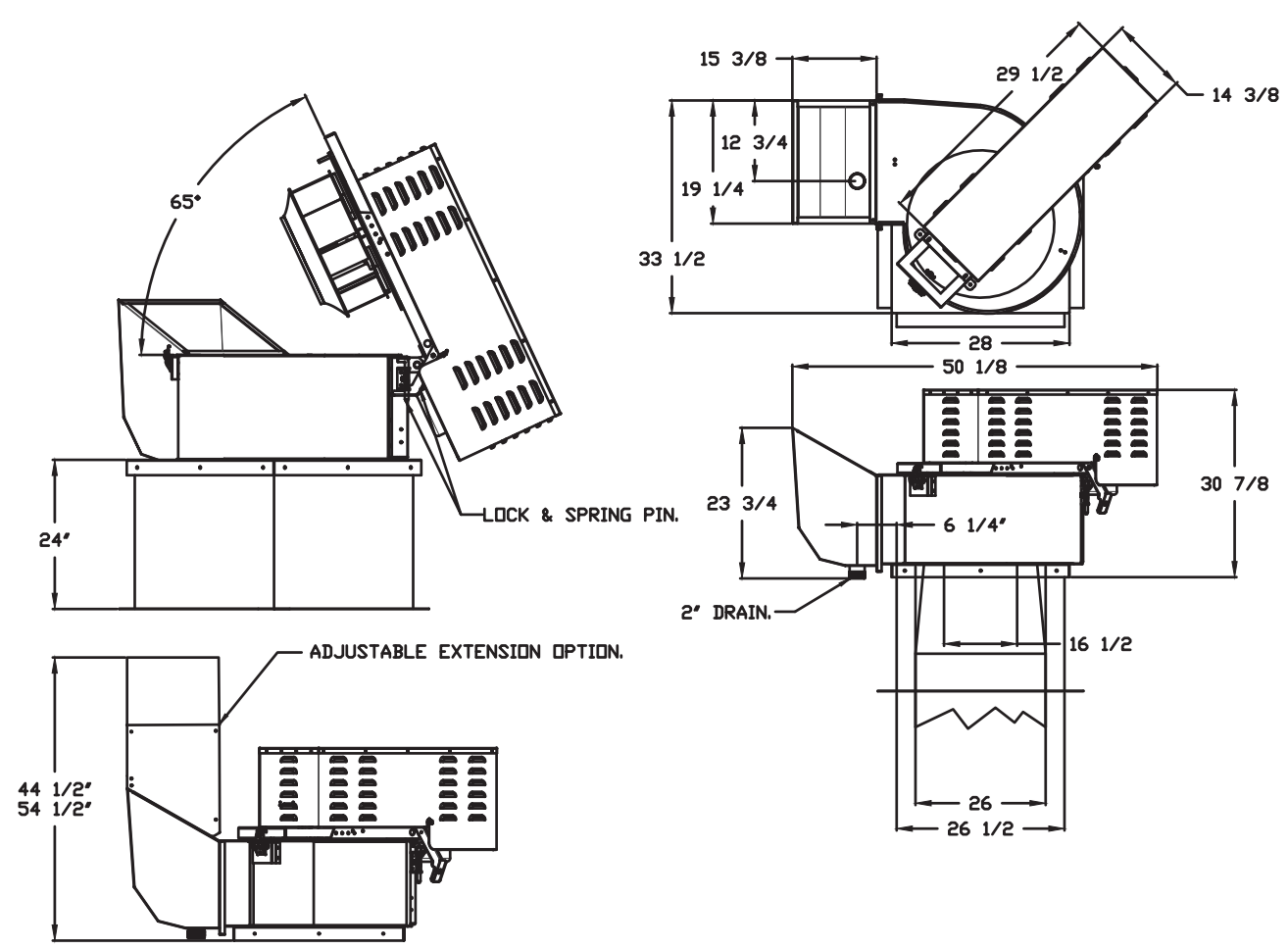
- ECH WIRING PACKAGE - EXHAUST - MANUAL OR 0-10VDC REFERENCE SPEED CONTROL - "REC" - TELCO, CCW ROTATION, 15-30" DAMPER, 2 YEAR PARTS WARRANTY.



PITCHED CURBS ARE AVAILABLE FOR PITCHED ROOFS.  
 EXAMPLE: 7/12 PITCH = 30° SLOPE.



FAN #1 CASRE18D - EXHAUST FAN (ITEM 74.1)



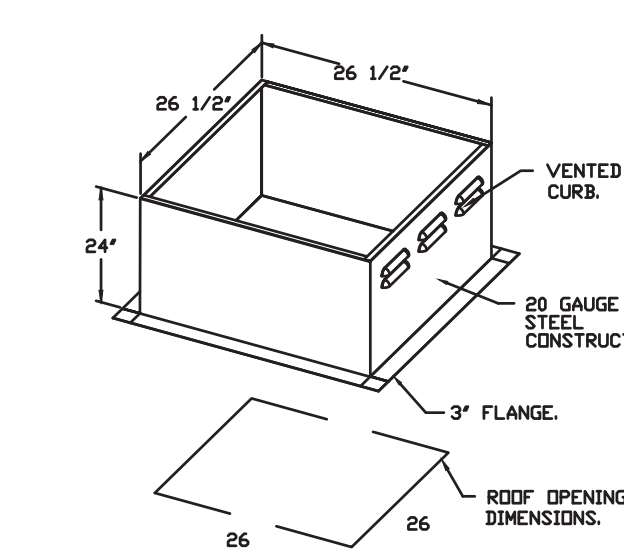
**FEATURES:**

- ROOF MOUNTED FANS.
- RESTAURANT MODEL.
- UL795 AND UL-C-5645.
- HIGH HEAT OPERATION DIRECT DRIVE 300°F (149°C).
- HEAT SLINGER.
- GREASE CLASSIFICATION TESTING.
- TILT OUT WHEEL.
- LOCKING PIN FOR POWER PACK.
- MOTOR WEATHER COVER.
- INTERLOCKED DISCONNECT SWITCH.
- NEMA 4X SAFETY DISCONNECT SWITCH.

**ABNORMAL FLARE-UP TEST BELT & DIRECT DRIVE EXHAUST FAN MUST OPERATE CONTINUOUSLY WHILE EXHAUSTING AIR AT 300°F (149°C) UNTIL ALL FAN PARTS HAVE REACHED THERMAL EQUILIBRIUM, AND WITHOUT ANY DETERIORATING EFFECTS TO THE FAN WHICH WOULD CAUSE UNSAFE OPERATION.**

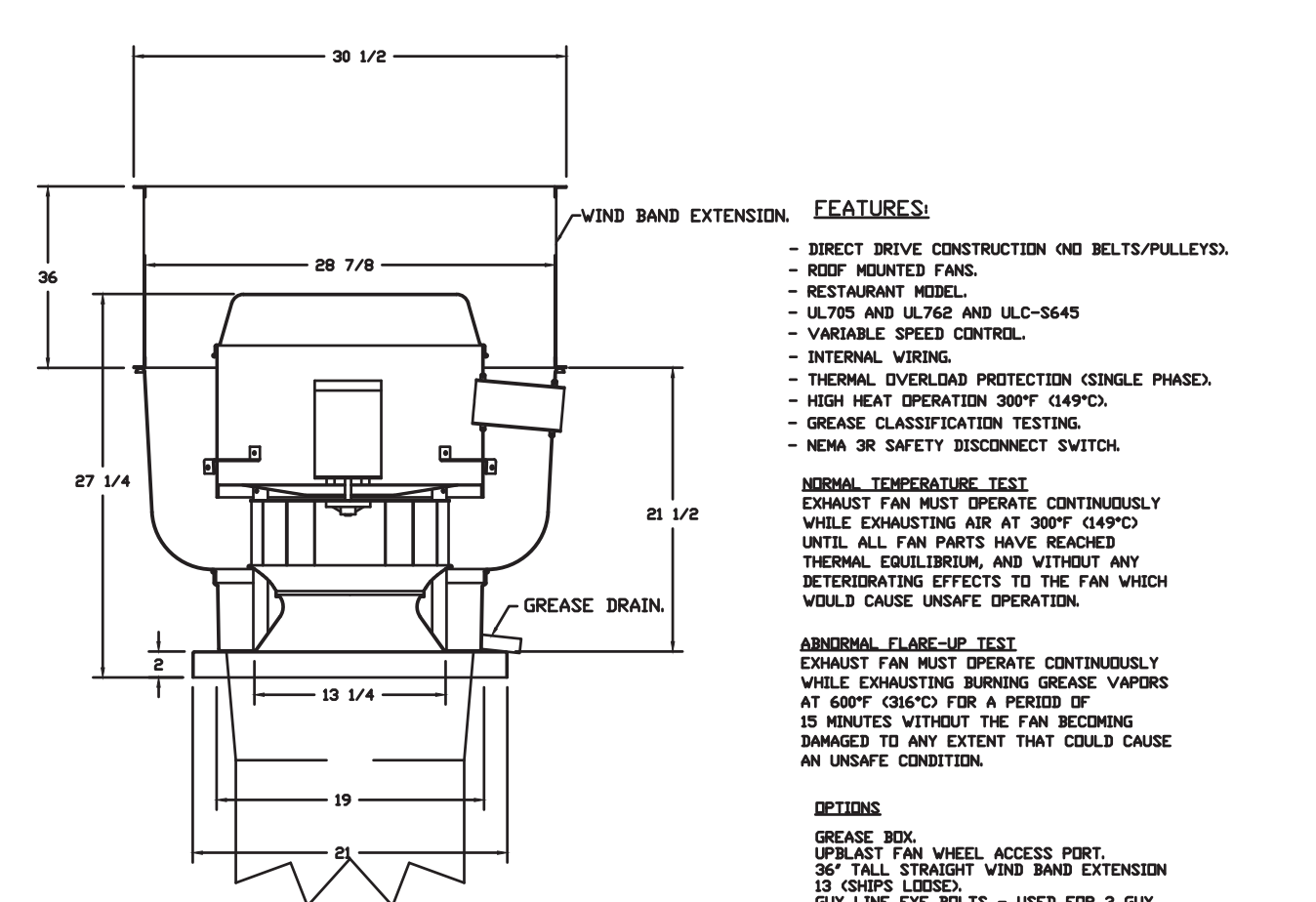
**DESIGNS:**

- UTILITY SET GREASE CUP.
- REHEAT DISCHARGE EXTENSION ASSEMBLY WITH HARDWARE.



PITCHED CURBS ARE AVAILABLE FOR PITCHED ROOFS.  
 EXAMPLE: 7/12 PITCH = 30° SLOPE.

FAN #2 BUSOFA - EXHAUST FAN (ITEM 74.2)



**FEATURES:**

- DIRECT DRIVE CONSTRUCTION ON BELTS/PULLEYS.
- ROOF MOUNTED FANS.
- RESTAURANT MODEL.
- UL795 AND UL796 AND UL-C-5645.
- VARIABLE SPEED CONTROL.
- INTERNAL WIRING.
- THERMAL OVERLOAD PROTECTION (SINGLE PHASE).
- HIGH HEAT OPERATION 300°F (149°C).
- GREASE CLASSIFICATION TESTING.
- NEMA 3R SAFETY DISCONNECT SWITCH.

**ABNORMAL FLARE-UP TEST:**

EXHAUST FAN MUST OPERATE CONTINUOUSLY WHILE EXHAUSTING BURNING GREASE VAPORS AT 600°F (316°C) FOR A PERIOD OF 15 MINUTES WITHOUT THE FAN BECOMING DAMAGED TO ANY EXTENT THAT COULD CAUSE AN UNSAFE CONDITION.

**DESIGNS:**

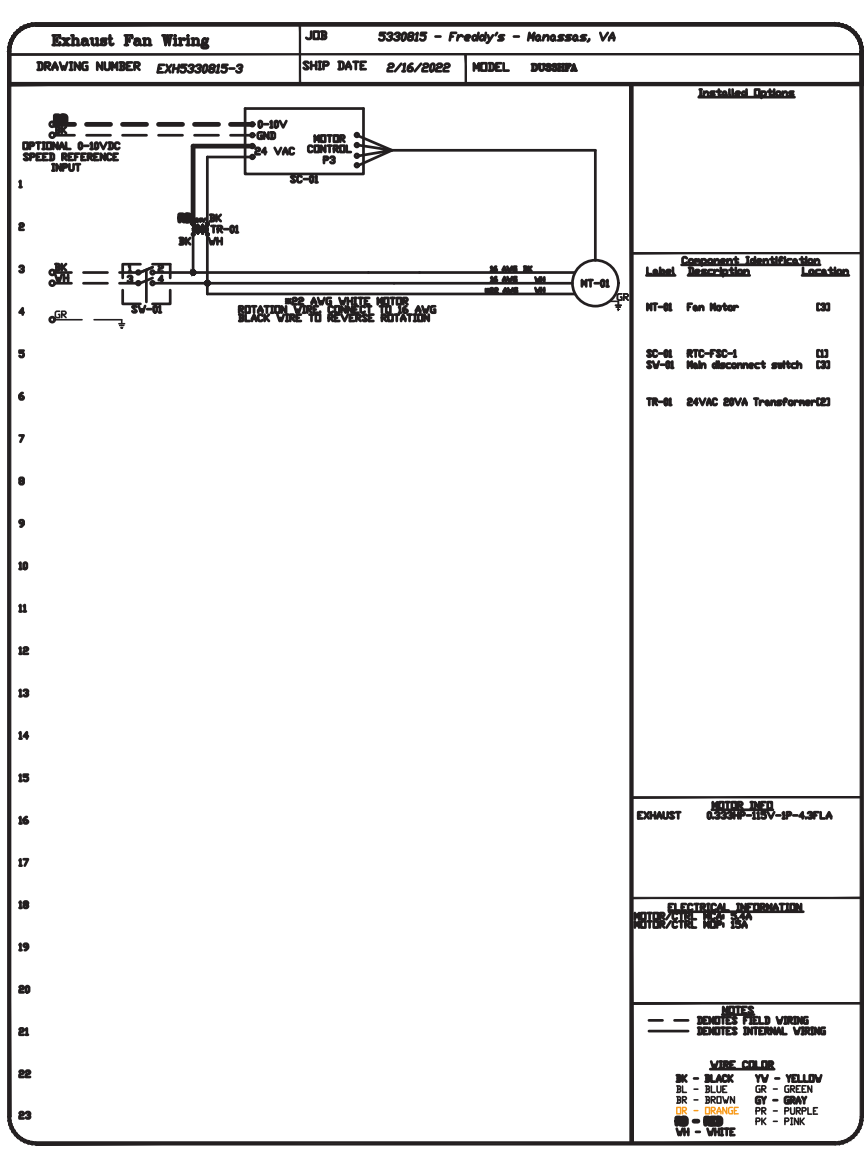
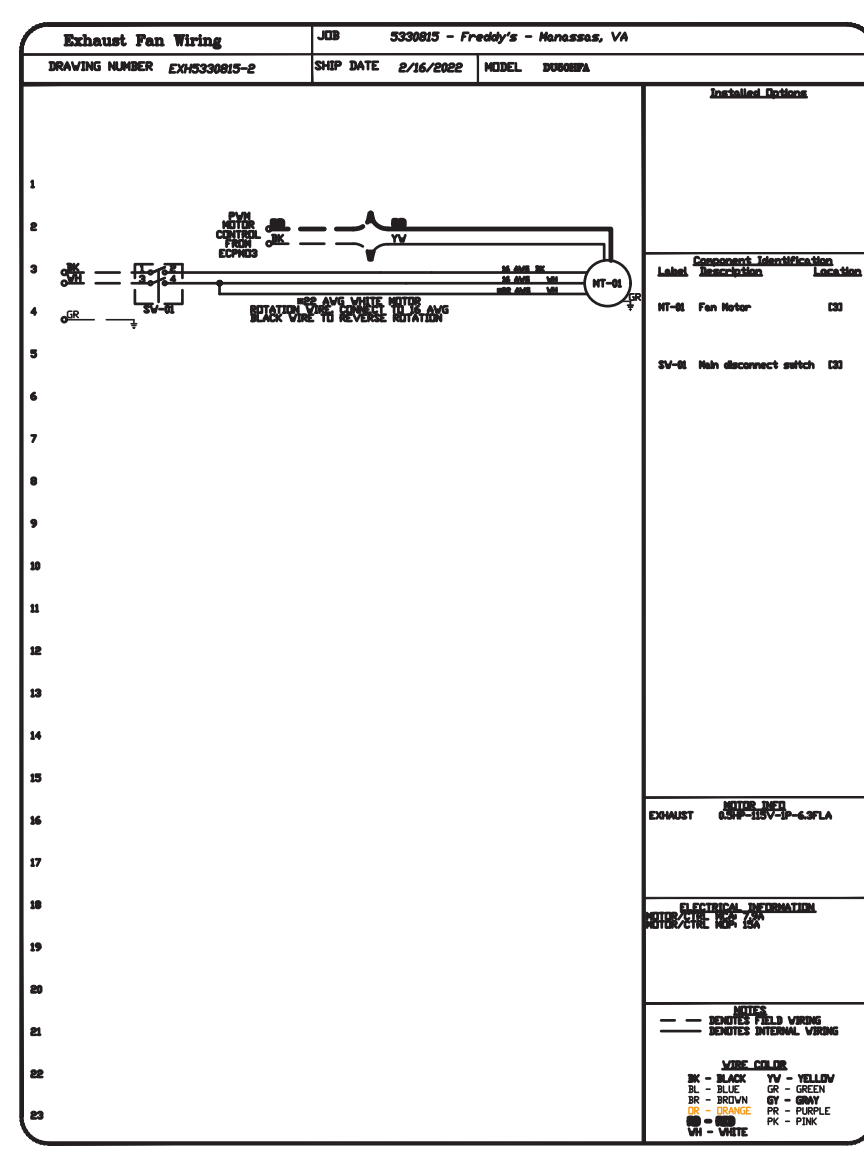
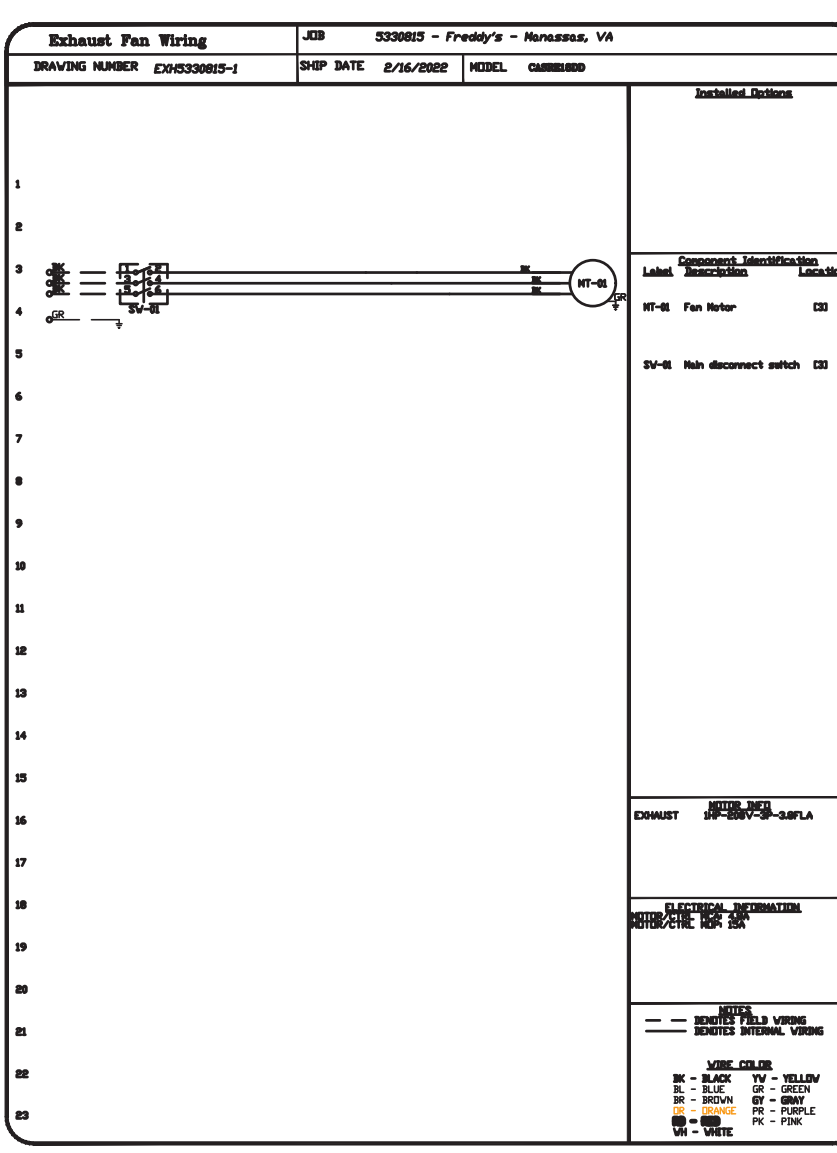
- GREASE BOX.
- UPBLAST FAN WHEEL ACCESS PORT.
- 36" TALL STRAIGHT WIND BAND EXTENSION (3 CHIPS LOOSE).
- GUY LINE EYE BOLTS - USED FOR 3 GUY LINE TIE OFF POINTS.
- ECH WIRING PACKAGE - PWM SIGNAL FROM ECM33 PREWIRE (TELCO MOTOR), CCW ROTATION.

**FAN ACCESSORIES**

FAN UNIT NO.	TAG	EXHAUST	SUPPLY
1	ITEM 74.1	GREASE CUP	GRAVITY DAMPER
2	ITEM 74.2	GRAVITY DAMPER	GRAVITY DAMPER
3	ITEM 75.1	GRAVITY DAMPER	GRAVITY DAMPER

**CURB ASSEMBLIES**

NO.	IN FAN	TAG	WEIGHT	ITEM	SIZE
1	# 1	ITEM 74.1	38 LBS	CURB	26.500"W X 26.500"L X 24.000"H ALONG LENGTH, RIGHT VENTED HINGED.
2	# 2	ITEM 74.2	31 LBS	CURB	19.500"W X 19.500"L X 20.000"H ALONG LENGTH, RIGHT VENTED HINGED.
3	# 3	ITEM 75.1	27 LBS	CURB	19.500"W X 19.500"L X 20.000"H ALONG LENGTH, RIGHT VENTED.
4	# 4	ITEM 74.3	78 LBS	CURB	59.500"W X 91.000"L X 14.000"H ALONG WIDTH, RIGHT INSULATED.



BC PROJECT #: 22111  
 VIRGINIA  
 PE COA #0407006723

County of Prince William  
 REVIEWED  
 Building Development Division  
 11/02/2023 4:31:59 PM  
 Robert C. Welborn

**BC ENGINEERS INCORPORATED**  
 5720 Reeder Shawnee, KS 66203 (913)262-1772

All work shall comply with  
 VA Uniform Statewide Building Code

**REVISIONS**

NO.	DESCRIPTION	DATE

**CAPTIVEAIR**  
 HET Foodservice  
 www.captiveair.com  
 104 W 9th St, Suite 204, Kansas City, MO 64105 PHONE: (816) 221-8875 FAX: (816) 221-8311 EMAIL: reg@captivair.com

Freddy's - Manassas, VA  
 MANASSAS, VA, 20110

DATE: 2/16/2022  
 DWG.#: 5330815  
 DRAWN BY: michael.co  
 SCALE: 1/2" = 1'-0"  
 MASTER DRAWING  
 SHEET NO. 2

**BDG**  
 BAKER DESIGN GROUP PA  
 1024 E. 1st Street N., Wichita, KS 67214 316.267.7472  
 rodriguez@bakergroup.com

**FREDDY'S FROZEN CUSTARD**  
 8074 ASHTON AVE.  
 MANASSAS, VA 20109

7/26/2023  
 COMMONWEALTH OF VIRGINIA  
 ERIK BRADLEY KNUDSEN  
 Lic. No. 0402054561

**MECHANICAL HOOD PLANS**

DATE  
 01/09/23  
 REV 1 - 07/28/23

DRAWN BY:  
 CHECKED BY:

SHEET NO.  
**M4**