SYMBOLS (NOT ALL USED)

GENERAL

- N — NORTH ARROW
- 1 / M-5 — DETAIL IDENTIFICATION NUMBER; SHEET ON WHICH DETAIL IS DRAWN
- A / M-3 — SECTION OR ELEVATION IDENTIFICATION LETTER; SHEET ON WHICH SECTION OR ELEVATION IS DRAWN
- AC / 1 — EQUIPMENT ABBREVIATION (SEE ABBREVIATION LIST); EQUIPMENT NUMBER
- REVISION CLOUD
- # — KEYNOTE
- ID — REVISION
- POINT OF CONNECTION (P.O.C.)
- POINT OF DISCONNECTION (P.O.D.)

LINETYPE

- NEW WORK
- EXISTING WORK
- WORK TO BE REMOVED
- FUTURE

EQUIPMENT AIR MOVING DEVICE & COMPONENTS

- CENTRIFUGAL FAN
- PROPELLER FAN
- ROOF VENTILATOR, INTAKE
- ROOF VENTILATOR, EXHAUST
- DUCT SECTION, SUPPLY (POSITIVE)
- DUCT SECTION, RETURN (NEGATIVE)
- DUCT SECTION, EXHAUST (NEGATIVE)
- DIRECTION OF FLOW
- 24"X12" — DUCT SIZE, WHERE FIRST DIMENSION IS VISIBLE DUCT
- R — CHANGE OF ELEVATION RISE (R) DROP (D)
- DUCTWORK, DOUBLE LINE
- ACOUSTICAL LINED DUCTWORK, DOUBLE LINE SIZE SHOWN INDICATES NET INSIDE DIMENSION
- FLEXIBLE DUCTWORK, FLEXIBLE EQUIPMENT CONNECTION, DOUBLE LINE
- DUCTWORK, SINGLE LINE
- ACOUSTICAL LINED DUCTWORK, SINGLE LINE SIZE SHOWN INDICATES NET INSIDE DIMENSION
- FLEXIBLE DUCTWORK, FLEXIBLE EQUIPMENT CONNECTION, SINGLE LINE
- TERMINAL UNIT, DUAL DUCT
- TERMINAL UNIT, SINGLE DUCT
- CEILING SUPPLY DIFFUSER WITH 4-WAY BLOW PATTERN
- CEILING SUPPLY DIFFUSER WITH 3-WAY BLOW PATTERN
- CEILING RETURN REGISTER
- CEILING EXHAUST GRILLE
- CD-1 / 100 CFM — DIFFUSER/REGISTER NUMBER; AIR INLET/OUTLET IDENTIFICATION; AIRFLOW
- 1 INCH UC / 100 CFM — UNDERCUT DOOR, 1 INCH, 100 CFM
- H — HUMIDIFIER

DUCT ACCESSORIES & CONTROLS INSTRUMENTATION

- T — THERMOSTAT
- TS — TEMPERATURE SENSOR
- RT — REMOTE TEMPERATURE SENSOR
- C — CO2 SENSOR
- H — HUMIDITY SENSOR
- PM — ROOM PRESSURE MONITOR
- MRM — MULTIROOM PRESSURE MONITOR
- M — AUTOMATIC DAMPER (ELECTRIC)
- AUTOMATIC DAMPER (PNEUMATIC)
- FD — FIRE DAMPER
- COMBINATION FIRE SMOKE DAMPER (CSFD)
- BD — BACK DRAFT DAMPER
- MANUAL VOLUME DAMPER
- SMOKE DETECTOR

PIPING

- RISE OR DROP
- TEE DOWN
- 90 DEGREE ELBOW
- SLOPE — DIRECTION OF SLOPE DOWN
- CHWR — CHILLED WATER RETURN
- CHWS — CHILLED WATER SUPPLY
- CWR — CONDENSER WATER RETURN
- CWS — CONDENSER WATER SUPPLY
- HPC — HIGH PRESSURE CONDENSATE
- HPS — HIGH PRESSURE STEAM
- MPC — MEDIUM PRESSURE CONDENSATE
- MPS — MEDIUM PRESSURE STEAM
- LPC — LOW PRESSURE CONDENSATE
- LPS — LOW PRESSURE STEAM
- HHWR — HEATING HOT WATER RETURN
- HHWS — HEATING HOT WATER SUPPLY
- PC — PUMP CONDENSATE
- CD — CONDENSATE
- RL — REFRIGERAN LIQUID
- RS — REFRIGERAN SUCTION

VALVES

- BALL VALVE
- BUTTERFLY VALVE
- PLUG VALVE
- GATE/GLOBE ANGLE VALVE
- GATE/GLOBE VALVE
- TWO WAY VALVE
- THREE WAY VALVE
- CHECK VALVE
- CONTROL VALVE
- PRESSURE REDUCING VALVE
- AIR VENT AUTOMATIC
- AIR VENT MANUAL

FITTING & PIPING SPECIALTIES

- PLUG OR CAP
- REDUCER
- BALANCING COCK
- UNION, SCREWED
- UNION, FLANGED
- FLEXIBLE CONNECTOR
- PRESSURE GAUGE
- PRESSURE SWITCH
- PUMP (INDICATE USE)
- STRAINER
- THERMOMETER, TEMPERATURE SENSOR

ABBREVIATIONS (NOT ALL USED)

AFF	ABOVE FINISHED FLOOR
AHU	AIR HANDLING UNIT
AL	ALUMINUM
AMB	AMBIENT
ARCH	ARCHITECTURAL
BDD	BACKDRAFT DAMPER
BHP	BRAKE HORSEPOWER
BMS	BUILDING MANAGEMENT SYSTEM
BTU	BRITISH THERMAL UNIT
BTUH	BTU PER HOUR
°C	DEGRESS CENTRIGRADE (CELCIUS)
CBC	CALIFORNIA BUILDING CODE
CC	COOLING COIL
CD	CEILING DIFFUSER
CD	CONDENSATE DRAIN
CFC	CALIFORNIA FIRE CODE
CFM	CUBIC FOOT/FEET PER MINUTE
CFSD	COMBINATION FIRE/SMOKE DAMPER
CG	CEILING GRILLE
CHWP	CHILLED WATER PUMP
CHWR	CHILLED WATER RETURN
CHWS	CHILLED WATER SUPPLY
CLG	CEILING
CMC	CALIFORNIA MECHANICAL CODE
COND	CONDENSATE
CONN	CONNECTION
CONT	CONTINUATION
CR	CEILING RETURN
CU FT	CUBIC FEET
CU IN	CUBIC INCHES
DN	DOWN
DWG	DRAWING
EA	EXHAUST AIR
EAT	ENTERING AIR TEMPERATURE
EDB	ENTERING DRY BULB TEMPERATURE
EES	ENERGY EFFICIENCY STANDARD (TITLE 24)
EF	EXHAUST FAN
EL	ELEVATION
ELEC	ELECTRICAL
ENT	ENTERING
EQPM	EQUIPMENT
ESP	EXTERNAL STATIC PRESSURE
EWB	ENTERING WET BULB TEMPERATURE
EWT	ENTERING WATER TEMPERATURE
EXH	EXHAUST
°F	DEGREES FAHRENHEIT
(F)	FUTURE
FD	FIRE DAMPER
FF	FINAL FILTER
FLA	FULL LOAD AMPERES
FLR	FLOOR
FLX	FLXIBLE CONNECTION
FPM	FEET PER MINUTE
FPS	FEET PER SECOND
FT	FEET
GA	GAUGE
GAL	GALLON
GC	GENERAL CONTRACTOR
GPH	GALLON PER HOUR
GPM	GALLON PER MINUTE
H	HEIGHT
HC	HEATING COIL
HD	HOT DECK/HOT DUCT
HHWR	HEATING HOT WATER RETURN
HHWS	HEATING HOT WATER SUPPLY
KW	KILOWATT
L	LENGTH
(L)	LINED DUCTWORK
LAT	LEAVING AIR TEMPERATURE
LBS	POUNDS
LBD	LEAVING DRY BULB TEMPERATURE
LIN FT	LINEAR FEET
LVG	LEAVING
LWB	LEAVING WET BULB TEMPERATURE
LWT	LEAVING WATER TEMPERATURE
MAX	MAXIMUM
MB	MIXING BOX
MBH	THOUSAND BTU PER HOUR
MIN	MINIMUM
MUA	MAKE-UP AIR
NIC	NNOT IN CONTACT
NTS	NOT TO SCALE
OSA/OA	OUTSIDE AIR
OD	OUTSIDE DIAMETER
POC	POINT OF CONNECTION
POD	POINT OF DISCONNECTION
RA	RETURN AIR
RG	RETURN GRILLE
RH	REHEAT COIL
RM	ROOM
RPM	REVOLUTIONS PER MINUTE
SA	SUPPLY AIR
SF	SUPPLY FAN
SOV	SHUT OFF VALVE
SP	STATIC PRESSURE
SPEC	SPECIFICATION
SQ.FT.	SQUARE FOOT
SS	STAINLESS STEEL
TA	TRANSFER AIR
TEMP	TEMPERATURE
TF	TRANSFER FAN
TG	TRANSFER GRILLE
TV	TURNING VANES
TYP	TYPICAL
UON	UNLESS OTHERWISE NOTED
UTR	UP THROUGH ROOF
V	VOLTS
VAV	VARIABLE AIR VOLUME
VD	VOLUME DAMPER
VENT	VENTILATION AIR
W	WIDTH
W/	WITH
W/O	WITHOUT
WB	WET BULB
WC	WATER COLUMN
WG	WATER GAUGE
WMS	WIRE MESH SCREEN

GENERAL NOTES

1. ALL WORK, INSTALLATION, AND MATERIALS SHALL COMPLY WITH ALL CURRENT GOVERNING CODES, BUILDING STANDARDS, REGULATIONS, SPECIFICATIONS, AND ALL OTHER REQUIREMENTS OF THE AUTHORITIES HAVING JURISDICTION. WHERE REQUIREMENTS BETWEEN THESE VARY, THE MOST STRINGENT SHALL APPLY.
2. ALL WORK SHALL BE PERMITTED. CONTRACTOR SHALL OBTAIN AND PAY FOR ALL REQUIRED PERMITS, FEES, AND LICENSES, UNLESS OTHERWISE DEFINED BY OWNER.
3. CONTRACTOR SHALL EXAMINE THE COMPLETE SET OF DRAWINGS AND SPECIFICATIONS FOR ALL TRADES PRIOR TO SUBMITTING BID AND START OF WORK.
4. CONTRACTOR SHALL VISIT THE SITE PRIOR TO BID AND THOROUGHLY FAMILIARIZE THEMSELVES WITH THE EXISTING FIELD CONDITIONS, INCLUDING BUT NOT LIMITED TO DIMENSIONS, THE EXISTING INSTALLATIONS, POINTS OF (DIS)CONNECTION, AND REQUIRED CLEARANCES. CONTRACTOR SHALL MAKE ANY MINOR ADJUSTMENTS NECESSARY TO AVOID CONFLICTS WITH THE BUILDING STRUCTURE AND THE WORK OF OTHER TRADES. THIS SHALL BE VERIFIED PRIOR TO BID SUBMITTAL, START OF CONSTRUCTION, AND/OR FABRICATION OF MATERIALS. BY THE ACT OF SUBMITTING A BID, THE CONTRACTOR ACCEPTS THE GIVEN WORKING CONDITIONS.
5. IF DISCREPANCIES ARE ENCOUNTERED BETWEEN THE DRAWINGS, BUILDING STANDARDS, SPECIFICATIONS, AND/OR CURRENT CONDITIONS, THE ENGINEER AND ARCHITECT SHALL BE NOTIFIED WITH A REQUEST FOR CLARIFICATION, AND THE OWNER SHALL BE NOTIFIED IN WRITING PRIOR TO COMMENCEMENT OF WORK. IF WORK IS DONE WITHOUT WRITTEN APPROVAL FROM OWNER REPRESENTATIVE, THE WORK SHALL BE CONSIDERED AT-RISK, AND A NON-CONFORMABLE INSTALLATION.
6. ALL DRAWINGS AND LAYOUTS ARE DIAGRAMMATIC TO SHOW DESIGN INTENT ONLY. CONTRACTOR SHALL COORDINATE NEW WORK WITH THE WORK OF ALL OTHER TRADES AND EXISTING CONDITIONS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO INSTALL ALL WORK IN SUCH A MANNER AS TO AVOID OBSTRUCTIONS, PRESERVE HEADROOM, KEEP OPENINGS AND PASSAGEWAYS CLEAR, AND MAKE ALL EQUIPMENT REQUIRING INSPECTION, MAINTENANCE, AND REPAIR ACCESSIBLE WITHOUT EXTRA COST TO THE OWNER. NO CONSIDERATION SHALL BE GRANTED DUE TO LACK OF FAMILIARITY ON THE PART OF THE CONTRACTOR WITH ACTUAL PHYSICAL CONDITIONS, REQUIREMENTS, AND PRACTICES AT THE SITE.
7. SUBMIT ELECTRONIC PDF COPIES OF SUBMITTAL DOCUMENTS WITH DESCRIPTIVE DATA AND PROJECT-SPECIFIC PERFORMANCE FOR ALL PRODUCTS AND MATERIALS PROPOSED FOR THE PROJECT. CLEARLY INDICATE EXACT MAKE/MODEL INCLUDING ANY ACCESSORIES AND OPTIONS PROPOSED. SHOP DRAWINGS AT THE SAME SCALE AS THE CONSTRUCTION DOCUMENTS OR LARGER SHALL BE INCLUDED WITH SUBMITTALS AS REQUIRED. HARD COPY SUBMITTALS WILL NOT BE ACCEPTED. ALLOW A MINIMUM OF FIVE (5) WORKING DAYS FOR ENGINEER TO REVIEW SUBMITTALS. SUBMITTALS SHALL BE FOR A COMPLETE SYSTEM AND NOT A PARTIAL REPRESENTATION OF A SYSTEM.
8. SUBMIT REQUEST FOR INFORMATION (RFI) IN ELECTRONIC PDF FORMAT WITH PROPOSED SOLUTION INCLUDED, IF APPLICABLE. ALLOW MINIMUM OF THREE (3) WORKING DAYS FOR ENGINEER TO REVIEW AND RESPOND.
9. PREPARE COORDINATED SHOP DRAWINGS WITH ALL TRADES, INCLUDING BUT NOT LIMITED TO MECHANICAL, PLUMBING, ELECTRICAL, FIRE PROTECTION, STRUCTURAL, ETC. SHOP DRAWINGS SHALL BE SUBMITTED FOR APPROVAL PRIOR TO INSTALLATION OF NEW/RELOCATED COMPONENTS. CONTRACTOR SHALL NOT USE THE ENGINEERED CAD FILES AS SHOP DRAWINGS. SHOP DRAWINGS SHALL CONFORM TO ALL SECTIONS OF AIA 201.
10. CONTRACTOR SHALL COMPLY WITH ALL CONTRACT DOCUMENTS IN LAYING OUT AND INSTALLING THEIR WORK AND EQUIPMENT. PRIOR TO INSTALLATION, COORDINATE WORK WITH THE WORK OF ALL OTHER TRADES AND JOB CONDITIONS.
11. CONTRACTOR SHALL OBTAIN AND FOLLOW ALL LANDLORD/OWNER REQUIREMENTS, GUIDELINES, RULES, AND PROCEDURES FOR CONSTRUCTION. CONTRACTOR SHALL PROVIDE INSURANCE IN ACCORDANCE WITH THE BUILDING'S CERTIFICATE OF INSURANCE REQUIREMENTS.
12. IF ANY EQUIPMENT SUBMITTED BY THE CONTRACTOR IS DIFFERENT FROM THE BASIS OF DESIGN SPECIFIED, CHANGES SHALL BE SUBMITTED TO THE OWNER'S REPRESENTATIVE FOR APPROVAL. SUBMITTALS SHALL INDICATE ANY RESULTING CREDIT, ADDED COST, AND/OR ADJUSTMENT IN LEAD TIME. CONTRACTOR SHALL ALSO BE RESPONSIBLE FOR PAYMENT OF ALL CHARGES RESULTING FROM ADDITIONS OR CHANGES IN THE WORK OF OTHER TRADES THAT ARE NECESSARY TO ACCOMMODATE THE REQUESTED SUBSTITUTION, UNLESS APPROVED BY OWNER. CONTRACTOR WILL PROCEED AT THEIR OWN RISK IF CHANGES OCCUR WITHOUT PRIOR APPROVAL.
13. ALL PENETRATIONS OF DUCTWORK, PIPING, CONDUITS, AND VENTS THROUGH FIRE, SMOKE, OR COMBINATION FIRE/SMOKE RATED BARRIERS SHALL HAVE FIRESTOP AND/OR SMOKE SEAL PROTECTION IN ACCORDANCE WITH THE STATE MINIMUM BUILDING CODE AND AUTHORITIES HAVING JURISDICTION. FIRESTOP AND SMOKE STOP PRODUCTS SHALL BE UL LISTED.
14. ALL PENETRATIONS OF DUCTWORK, PIPING, CONDUITS, AND VENTS THROUGH NON-RATED CONSTRUCTION SHALL BY PROPERLY AND GENEROUSLY CAULKED WITH SOUND-RESISTANT AND NON-HARDENING MATERIAL, SUCH AS SILICONE.
15. COORDINATE WITH OWNER'S ROOFING CONTRACTOR PRIOR TO MAKING ANY PENETRATIONS THROUGH ROOF. ROOF WARRANTY SHALL BE MAINTAINED.
16. FLASHING, COUNTER-FLASHING, AND ROOF MEMBRANE PATCHES AT ALL ROOF OPENINGS SHALL MATCH AND BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE EXISTING ROOFING SYSTEM.
17. PROVIDE GENERAL CONTRACTOR WITH FINAL SIZES AND LOCATIONS OF ALL WALL, FLOOR, AND ROOF PENETRATIONS TO COORDINATE REQUIRED STRUCTURAL FRAMING MEMBERS.
18. COORDINATE ALL CUTTING, DRILLING, PATCHING, AND REINFORCING REQUIRED FOR WORK WITH THE GENERAL CONTRACTOR.
19. PROVIDE ACCESS PANELS/DOORS FOR ALL EQUIPMENT LOCATED IN INACCESSIBLE AREAS, SUCH AS ABOVE HARD LID CEILING OR BEHIND WALLS. ALL ACCESS PANEL/DOOR LOCATIONS SHALL BE COORDINATED WITH ARCHITECT.
20. REQUIRED ACCESS AND WORKING SPACE CLEARANCES FOR ALL EQUIPMENT AND CONTROL DEVICES MUST BE MAINTAINED TO ALLOW READY AND SAFE OPERATION, EXAMINATION, AND MAINTENANCE. REQUIRED CLEARANCES SHALL BE PER MANUFACTURER'S RECOMMENDATION AND GOVERNING CODES.
21. CONTRACTOR SHALL SECURE SITE WHILE WORK IS IN PROGRESS AND UNTIL THE WORK IS ACCEPTED BY OWNER'S REPRESENTATIVE.
22. THE CONTRACTOR IS SOLELY RESPONSIBLE TO PROVIDE METHODS OF PROCEDURE AND PERFORM ALL CONSTRUCTION MEANS AND METHODS.
23. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE, CAUSED BY THE WORK, TO EXISTING CONDITIONS OR THE WORK OF OTHER TRADES.
24. CONTRACTOR SHALL COORDINATE MOVEMENT AND STORAGE OF EQUIPMENT AND ALL OTHER COMPONENTS, INCLUDING TAKING ALL NECESSARY PRECAUTIONS TO COVER ALL EQUIPMENT/COMPONENTS TO PROTECT THEM FROM EXPOSURE TO OUTDOOR ELEMENTS, CONDITIONS OUTSIDE OF MANUFACTURER'S STORAGE CONDITIONS, AND CONSTRUCTION DEBRIS, WHETHER OR NOT EQUIPMENT IS POWERED OR IN USE.
25. ALL MATERIALS SHALL BE NEW, BEAR THE UNDERWRITERS LABORATORIES (UL) OR EQUIVALENT TESTING AGENCY LABEL, AND BE APPROVED BY THE AUTHORITIES HAVING JURISDICTION.
26. CONTRACTOR SHALL MAINTAIN RED-LINED AS-BUILT DRAWINGS DURING CONSTRUCTION TO DOCUMENT ALL CHANGES AND MODIFICATIONS TO THE CONTRACT DOCUMENTS. CONTRACTOR SHALL SUBMIT COMPLETE RED-LINED AS-BUILT DRAWINGS, UPON COMPLETION OF THE WORK, FOR REVIEW BY THE ARCHITECT/ENGINEER.
27. FURNISH FINAL CERTIFICATE OF INSPECTION OR WRITTEN EVIDENCE OF ACCEPTANCE BY INSPECTION AUTHORITIES FOR ALL WORK INSTALLED.
28. CONTRACTOR SHALL BE RESPONSIBLE FOR MATINAINING A CLEAN AND SAFE WORK ENVIRONMENT THROUGHOUT THE DURATION OF CONSTRUCTION. CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING ALL CONSTRUCTION DEBRIS, WITH ALL COSTS FOR DISPOSAL BORNE BY CONTRACTOR. UPON COMPLETION OF WORK, AREA(S) OF WORK SHALL BE LEFT IN A CLEAN CONDITION, ACCEPTABLE TO OWNER.
29. ALL CONSTRUCTION DEBRIS SHALL BE DISPOSED OF IN AN ENVIRONMENTALLY RESPONSIBLE FASHION. RECYCLABLE MATERIAL SHALL BE PROPERLY RECYCLED, AND HAZARDOUS MATERIALS SHALL BE DISPOSED OF WITH PROPER CHAIN OF CUSTODY.
30. ALL PLANS APPROVED BY GOVERNING AGENCIES SHALL BE KEPT IN A SECURE PLACE AND SHALL NOT BE USED BY WORKERS. CONTRACTOR SHALL FURNISH ALL SUBCONTRACTORS CONSTRUCTION SETS REFLECTING THE APPROVED PLANS. CONTRACTOR SHALL ALSO MAINTAIN, IN GOOD CONDITION, ONE COMPLETE SET OF PLANS WITH ALL REVISIONS, ADDENDA, AND CHANGE ORDERS. THIS COMPLETE SET SHALL REMAIN ON PREMISES AT ALL TIMES, UNDER CARE OF THE JOB SUPERINTENDENT.
31. CONTRACTOR SHALL PROVIDE A WRITTEN WARRANTY TO REPLACE OR REMEDY ALL FAULTY, IMPROPER, OR INFERIOR MATERIALS AND/OR CORRECT FAULTY INSTALLATION AT NO COST TO OWNER, INCLUDING PARTS AND LABOR, FOR A PERIOD OF ONE (1) YEAR FROM DATE OF OWNER'S WRITTEN ACCEPTANCE OF ALL WORK INSTALLED.
32. PROVIDE OWNER WITH OPERATION AND MAINTENANCE MANUALS, GUARANTEES, AND WARRANTIES FOR ALL EQUIPMENT INSTALLED IN THE PROJECT.

MECHANICAL NOTES

1. ALL DRAWINGS AND LAYOUTS ARE DIAGRAMMATIC TO SHOW DESIGN INTENT ONLY. LOCATIONS OF DUCTWORK, PIPING, AND EQUIPMENT ARE APPROXIMATE. DUCT/PIPE OFFSETS, TRANSITIONS, SUPPORTS, AND HANGERS MAY NOT BE INDICATED. CONTRACTOR SHALL PROVIDE ALL TRANSITIONS AND FITTINGS NECESSARY FOR COMPLETE AND FUNCTIONING SYSTEMS. IF FIELD CONDITIONS DIFFER SIGNIFICANTLY FROM THOSE SHOWN ON THE DRAWINGS AND AFFECT MECHANICAL WORK, INFORM ENGINEER OF RECORD IMMEDIATELY AND CONFIRM FURTHER DIRECTION BEFORE PROCEEDING WITH THE WORK IN THAT AREA.
2. DUE TO STRUCTURAL CONDITIONS, DUCTWORK OR PIPING INTERFERENCE, EXISTING OBSTRUCTIONS, OR OTHER REASONS, THE CONTRACTOR MAY WANT TO INSTALL WORK IN A MANNER DIFFERENT FROM THAT SHOWN IN THE CONTRACT DOCUMENTS. SUCH CHANGES SHALL BE PRESENTED TO THE ENGINEER OF RECORD AND OWNER'S REPRESENTATIVE FOR APPROVAL BEFORE PROCEEDING, AND THE RECORD DRAWING SHALL BE ACCURATELY REVISED TO SHOW THE CHANGES AS COMPLETED.
3. ALL DUCT DIMENSIONS SHOWN ON DRAWINGS ARE NET CLEAR INSIDE DIMENSIONS AFTER INSULATION/LINING HAS BEEN INSTALLED.
4. PIPING ANCHORAGE, SUPPORT, AND THERMAL EXPANSION DEVICES ARE TO BE PROVIDED BY THE CONTRACTOR TO MEET ALL CODE REQUIREMENTS. PIPING SUPPORTS AND THERMAL EXPANSION DEVICES SHALL BE INCORPORATED INTO THE SHOP DRAWINGS. SHOP DRAWINGS SHALL BE SUBMITTED TO THE STRUCTURAL ENGINEER FOR APPROVAL.
5. ALL DUCTWORK AND PIPING SHALL BE ROUTED TIGHT TO STRUCTURE.
6. WHERE DEMOLITION DOES NOT ALLOW FOR MAINTAINING EXISTING HVAC SERVICE, CONTRACTOR SHALL PROVIDE TEMPORARY COOLING AND/OR HEATING WITH SUFFICIENT CAPACITY TO MAINTAIN COMFORT COOLING AND/OR HEATING, AT NO ADDITIONAL COST TO OWNER.
7. DUCTWORK, PIPING, AND FITTINGS SHALL CONFORM TO THE REQUIREMENTS OF THE WORKING PRESSURES INDICATED IN THE SPECIFICATIONS.
8. ALL DUCTWORK SHALL BE CONSTRUCTED, ERECTED, AND TESTED IN ACCORDANCE WITH THE MOST RESTRICTIVE OF LOCAL REGULATIONS AND PROCEDURES DETAILED IN THE ASHRAE HANDBOOK OF FUNDAMENTALS AND THE APPLICABLE STANDARDS ADOPTED BY SMACNA. PROVIDE RECTANGULAR DUCTS OF GALVANIZED STEEL AND PREFABRICATED SPIRAL LOCKSEAM DUCTS AND FITTINGS.
9. DUCTWORK SHALL BE CONSTRUCTED AND INSTALLED IN ACCORDANCE WITH CHAPTER 6 OF THE IMC.
10. AT THE TIME OF ROUGH INSTALLATION AND DURING STORAGE ON THE CONSTRUCTION SITE, ALL DUCT AND OTHER RELATED AIR DISTRIBUTION COMPONENT OPENINGS SHALL BE COVERED WITH TAPE, PLASTIC, SHEET-METAL, OR OTHER METHODS ACCEPTABLE TO THE ENFORCING AGENCY TO REDUCE THE AMOUNT OF DUST, WATER, AND DEBRIS WHICH MAY ENTER THE SYSTEM.
11. ALL PIPING AND ASSOCIATED FITTINGS AND VALVES SHALL BE OF SIMILAR MATERIAL PER CODE, UNLESS APPROVED OTHERWISE. DISSIMILAR MATERIALS SHALL BE CONNECTED OR FASTENED BY DIELECTRIC MEANS APPROPRIATE.
12. ALL PIPING AND DUCTWORK SHALL BE INSULATED CONSISTENT WITH THE REQUIREMENTS OF THE IECC AND CHAPTER 6 OF THE IMC.
13. FLEXIBLE CONNECTIONS SHALL BE PROVIDED AT ALL EQUIPMENT CONNECTIONS, UNLESS OTHERWISE NOTED.
14. ALL MECHANICAL EQUIPMENT PADS SHALL EXTEND A MINIMUM OF 6" BEYOND THE FOOTPRINT OF THE UNIT ON ALL SIDES. MECHANICAL EQUIPMENT PADS LOCATED ON THE ROOF SHALL BE A MINIMUM OF 8" HIGH FOR FLASHING.
15. SUPPORT ALL SUSPENDED MECHANICAL EQUIPMENT WITH FULLY THREADED RODS AND VIBRATION ISOLATORS PER THE ASHRAE HANDBOOK OF HVAC APPLICATIONS.
16. ALL SUSPENDED CEILING MECHANICAL FIXTURES SHALL BE SUPPORTED BY ADDITIONAL INDEPENDENT 12 GAGE WIRES ATTACHED TO EACH CORNER OF FIXTURES. (ASCE 7 SECTION 13.5.6.2.2, CISCA)
17. FIRE DAMPERS AND/OR SMOKE DAMPERS AND THE NECESSARY ACCESS PANELS SHALL BE PROVIDED FOR ALL DUCTS PENETRATING FIRE AND/OR SMOKE BARRIERS/PARTITIONS, AS REQUIRED BY CODE. SEE ARCHITECTURAL DRAWINGS FOR THE EXACT LOCATIONS OF FIRE AND/OR SMOKE RATED BARRIERS/PARTITIONS.
18. SMOKE DETECTORS AND REMOTE ANNUNCIATOR ARE SUPPLIED BY MECHANICAL CONTRACTOR. SMOKE DETECTORS SHALL BE INSTALLED AND INTERLOCKED FOR SHUTDOWN IN ACCORDANCE WITH DIVISION 23. SEE SPECIFICATIONS.
19. ALL DUCT SMOKE DETECTORS INDICATED ON MECHANICAL DRAWINGS ARE FOR REFERENCE ONLY AND SHALL BE FURNISHED, INSTALLED AND WIRED UNDER ELECTRICAL WORK DIVISION "260000" OF SPECIFICATION.
20. MATERIALS EXPOSED WITHIN DUCTWORK OR PLENUMS SHALL HAVE A MAXIMUM FLAME SPREAD INDEX OF 25 AND MAXIMUM SMOKE-DEVELOPMENT RATING OF 50, WHEN TESTED IN ACCORDANCE WITH ASTM E84.
21. ALL NEW THERMOSTATS SHALL COMPLY WITH THE LATEST BUILDING ENERGY EFFICIENCY STANDARDS REFERENCE JOINT APPENDIX JA5.
22. ROOM THERMOSTATS SHALL BE CAPABLE OF BEING SET TO MAINTAIN SPACE TEMPERATURE SET POINTS FROM 55°F TO 85°F AND BE CAPABLE OF OPERATING THE HEATING AND COOLING IN SEQUENCE. THERMOSTATS SHALL BE ADJUSTABLE TO PROVIDE A TEMPERATURE RANGE OF UP TO 10°F BETWEEN HEATING AND COOLING SETPOINTS. CONTROLS SHALL HAVE CAPABILITY OF LIMITING HEATING SETPOINT ADJUSTMENT TO A MAXIMUM OF 70°F AND LIMITING COOLING SETPOINT ADJUSTMENT TO A MINIMUM OF 78°F.
23. THERMOSTATS SHALL BE LOCATED PER CBC FOR ADA COMPLIANCE AND CENTERED DIRECTLY ABOVE LIGHT SWITCHES UNLESS OTHERWISE NOTED. COORDINATE WITH ARCHITECT PRIOR TO INSTALLATION.
24. CO_2 SENSORS SHALL BE LOCATED BETWEEN 3' TO 6' AFF. COORDINATE WITH ARCHITECT PRIOR TO INSTALLATION.
25. CONTRACTOR SHALL COORDINATE ALL NEW EQUIPMENT DESIGNATIONS WITH OWNER.
26. PROVIDE STEEL SUPPORTS FOR ALL WORK AS REQUIRED FOR A COMPLETE INSTALLATION IN ACCORDANCE WITH APPLICABLE CODES AND STANDARDS. PROVIDE SUPPLEMENTARY FRAMING AS REQUIRED FOR ATTACHMENT OF HANGERS, SUPPORTS, AND ANCHORS. DESIGN SUPPLEMENTAL FRAMING UNDER DIRECT SUPERVISION OF STRUCTURAL ENGINEER LICENSED IN THE STATE OF TEXAS AND SUBMIT FOR ARCHITECT/ENGINEER REVIEW.
27. CONTRACTOR SHALL COORDINATE AND PROVIDE STRUCTURAL MOUNTING FOR ALL EQUIPMENT SHOWN ON THE PLANS OR SPECIFIED, INCLUDING THOSE SHOWN SPECIFICALLY ON THE DETAIL SHEET(S).
28. CONTRACTOR SHALL COORDINATE VOLTAGE AND PHASE OF EACH PIECE OF EQUIPMENT REQUIRING POWER WITH THE ELECTRICAL CONTRACTOR.
29. PROVIDE MANUAL BALANCING DAMPER AT EACH SUPPLY/RETURN/EXHAUST BRANCH DUCT AS FAR FROM AIR INLET/OUTLET AS POSSIBLE. PROVIDE MANUAL BALANCING DAMPER WITH REMOTE CONTROL WHEN IS LOCATED ABOVE GYPBOARD CEILING.
30. ALL BRANCH DUCT SIZES SHALL MATCH AIR INLET/OUTLET NECK SIZE UON.

CODES AND STANDARDS

CODES
- 2015 INTERNATIONAL BUILDING CODE (IBC)
- 2015 INTERNATIONAL ENERGY CONSERVATION CODE (IECC)
- 2015 INTERNATIONAL MECHANICAL CODE (IMC)
- 2015 INTERNATIONAL PLUMBING CODE (IPC)
- 2017 NATIONAL ELECTRICAL CODE (NEC)

STANDARDS
- AMERICAN SOCIETY OF HEATING, REFRIGERATING & AIR CONDITIONING ENGINEERS (ASHRAE) HANDBOOKS AND STANDARDS:
  - ASHRAE 2019 HANDBOOK, HVAC APPLICATIONS
  - ASHRAE 2020 HANDBOOK, HVAC SYSTEMS AND APPLICATIONS
  - ASHRAE 2021 HANDBOOK, FUNDAMENTALS
  - ASHRAE 2018 HANDBOOK, REFRIGERATION
- AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) STANDARDS
- SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION (SMACNA) STANDARDS
- NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) CODES AND STANDARDS
  - NFPA 70: NATIONAL ELECTRICAL CODE (NEC), 2017
  - NFPA 72: NATIONAL FIRE ALARM AND SIGNALING CODE, 2019
- OCCUPATIONAL SAFETY AND HEALTH ASSOCIATION (OSHA)
- ENVIRONMENTAL PROTECTION AGENCY (EPA)
- AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
- UNDERWRITERS LABORATORY (UL)

MECHANICAL SHEET INDEX

RESPONSIBILITY MATRIX

DESCRIPTION	FURNISHED: GENERAL CONTRACTOR	FURNISHED: OWNER	FURNISHED: LANDLORD	INSTALLED: GENERAL CONTRACTOR	INSTALLED: OWNER	INSTALLED: LANDLORD	REMARKS
DIVISION 23: HEATING, VENTILATING, AND AIR CONDITIONING							
23.1 HVAC DUCTWORK AND PIPING IDENTIFICATION							
23.1.1 HVAC DUCTWORK SYSTEM IDENTIFICATION	●			●			
23.1.2 PIPING SYSTEM IDENTIFICATION	●			●			
23.1.3 UTILITY SHUT OFF IDENTIFICATION IN KITCHEN	●			●			
23.1.4 VALVE TAGS AND CHART	●			●			
23.1.5 HVAC DAMPER IDENTIFICATION	●			●			
23.2 ROOF CURBS							
23.2.1 EXHAUST FAN CURBS	●			●			GENERAL CONTRACTOR SCOPE OF WORK TO INCLUDE RIGGING, CURBS, AND ACCESSORIES
23.2.2 ROOFTOP UNIT CURBS	●			●			GENERAL CONTRACTOR SCOPE OF WORK TO INCLUDE RIGGING, CURBS, AND ACCESSORIES
23.2.3 CONDENSING UNIT CURBS	●			●			GENERAL CONTRACTOR SCOPE OF WORK TO INCLUDE RIGGING, CURBS, AND ACCESSORIES
23.2.4 MAKE UP AIR AND DOAS UNIT CURBS		●		●			GENERAL CONTRACTOR SCOPE OF WORK TO INCLUDE RIGGING, CURBS, AND ACCESSORIES
23.2.5 KITCHEN EXHAUST FAN CURBS		●		●			GENERAL CONTRACTOR SCOPE OF WORK TO INCLUDE RIGGING, CURBS, AND ACCESSORIES
23.3 HVAC DUCTWORK SYSTEM COMPONENTS							
23.3.1 HVAC DUCTWORK	●			●			
23.3.2 INSULATION AND FIRE WRAP	●			●			GENERAL CONTACTOR SCOPE OF WORK TO INCLUDE TENANT FIT OUT FROM LANDLORD POINT OF CONNECTION
23.3.3 DAMPERS	●			●			
23.3.4 SMOKE DETECTORS	●			●			
23.3.5 SUPPLY, RETURN, AND EXHAUST GRILLS AND REGISTERS	●			●			
23.4 MECHANICAL PIPING SYSTEM COMPONENTS							
23.4.1 WALK-IN COOLER AND FREEZER REFRIGERATION		●			●		WALK-IN COOLER AND FREEZER SUPPLIED BY VENDOR NO. 27 GENERAL CONTRACTOR SCOPE OF WORK TO INCLUDE PIPING INSTALLATION AND FINAL CONNECTION
23.4.2 REFRIGERATION FOR OTHER HVAC EQUIPMENT	●			●			
23.4.3 CHILLED WATER	●			●			
23.4.4 CONDENSER WATER	●			●			
23.4.5 HEATING HOT WATER	●			●			
23.4.6 VALVES AND ACCESSORIES (E.G. AIR VENTS)	●			●			
23.5 HVAC EQUIPMENT							GENERAL CONTRACTOR SCOPE OF WORK TO INCLUDE RIGGING FOR ALL ROOFTOP EQUIPMENT
23.5.1 SUPPLY FAN	●			●			
23.5.2 TOILET EXHAUST FAN	●			●			
23.5.3 KITCHEN EXHAUST FAN		●		●			SUPPLIED BY VENDOR NO. 26
23.5.4 DUCTED AND NON-DUCTED HEATING AND COOLING UNITS	●			●			
23.5.5 MAKE UP AIR AND DOAS UNITS		●		●			SUPPLIED BY VENDOR NO. 26
23.5.6 ELECTRIC PATIO HEATERS	●			●			
23.5.7 HVAC CONDENSING UNITS	●			●			
23.5.8 REFRIGERATION CONDENSING UNITS		●		●			
23.5.9 RGF PHI SYSTEM	●			●			GENERAL CONTRACTOR TO PURCHASE FROM VENDOR NO. 12 VENDOR SUBSTITUTION IS NOT PERMITTED
23.6 KITCHEN EXHAUST WITH FIRE SUPPRESSION SYSTEM							
23.6.1 HOOD CONTROL PANEL		●		●			SUPPLIED BY VENDOR NO. 26
23.6.2 KITCHEN EXHAUST HOOD		●		●			SUPPLIED BY VENDOR NO. 26
23.6.3 STRUCTURAL SUPPORT	●			●			
23.6.4 ELECTRICAL AND CONTROL WIRING	●			●			
23.6.5 ANSUL SYSTEM		●		●			SUPPLIED BY VENDOR NO. 26 GENERAL CONTRACTOR TO COORDINATE AND FACILITATE SYSTEM SIGN-OFF
23.6.6 ANSUAL WIRING AND UTILITIES CONNECTION	●			●			
23.6.7 ANSUAL GAS VALVE		●		●			SUPPLIED BY VENDOR NO. 26
23.7 COMMISSIONING ACTIVITIES							
23.7.1 GREASE EXHAUST WATER LEAKAGE TEST	●			●			GENERAL CONTRACTOR TO PURCHASE FROM VENDOR NO. 10 VENDOR SUBSTITUTION IS NOT PERMITTED
23.7.2 TESTING AIR BALANCE (TAB) REPORT	●			●			GENERAL CONTRACTOR TO PURCHASE FROM VENDOR NO. 12 VENDOR SUBSTITUTION IS NOT PERMITTED

zebra

ZEBRA PROJECTS, INC.
14614 N KIERLAND BLVD, SUITE N 300
SCOTTSDALE, ARIZONA 85254

PHONE: 480.912.1169 www.zbr.co.uk

Consultant Logo:

INFRASTRUCTURE FACTOR CONSULTING, INC.
2361 Rosecrans Ave. Suite 368, El Segundo, CA 90245
P: 310.725.1500 F: 310.725.0215 www.iFactor.com

STORE NO:
TX 1382

SHAKE SHACK

SHAKE SHACK - SUGAR LAND
2515 TOWN CENTER BOULEVARD,
SUGAR LAND, TX 77479

REVISION

△	DATE	DESCRIPTION
	10/01/21	PERMIT/BID
A	06/23/22	REVISION A
1	10/20/22	REVISION 1
2	12/01/22	REVISION 2

STATUS:
PERMIT/BID

STATE OF TEXAS
OTHON ESTRADA, JR.
141839
LICENSED
PROFESSIONAL ENGINEER
09/30/2021

FIELD VERIFICATION:
The contractor shall verify all figured dimensions and condition at the project site and notify Zebra Projects, INC. of any dimensional errors, or omissions or discrepancies before beginning or fabricating any work. Do not scale these drawings.

SHEET NAME:
MECHANICAL - NOTES, SYMBOLS AND ABBREVIATIONS

DATE: 06/23/22
PROJECT NO: 33875
DRAWN: AM
SCALE: NTS

SHEET NO:
M001

COMcheck Software Version 4.1.5.3

Mechanical Compliance Certificate

Project Information

Energy Code:	2015 IECC
Project Title:	Shake Shack - Sugar Land
Location:	Sugar Land, Texas
Climate Zone:	2a
Project Type:	New Construction

Construction Site:
Highway 6 and Town Centre Blvd.
Sugar Land, TX 77479

Owner/Agent:
Shake Shack
22 Varick Street, Suite 301
New York, NY 10014

Designer/Contractor:
iFactor Consulting, Inc.
2361 Rosecrans Ave., #368
El Segundo, CA 90245
310-725-1500

Additional Efficiency Package(s)

Credits: 1.0 Required 1.0 Proposed
Reduced Lighting Power, 1.0 credit

Mechanical Systems List

Quantity **System Type & Description**

1 RTU-1 (Single Zone):
Heating: 1 each - Central Furnace, Gas, Capacity = 81 kBtu/h
Proposed Efficiency = 81.00% Et, Required Efficiency: 80.00 % Et or 78% AFUE
Cooling: 1 each - Single Package DX Unit, Capacity = 162 kBtu/h, Air-Cooled Condenser, Air Economizer
Proposed Efficiency = 12.00 EER, Required Efficiency: 10.80 EER + 12.2 IEER
Fan System: FAN SYSTEM 1 | Dining Area -- Compliance (Brake HP method) : Passes

Fans:
FAN 1 Supply, Single-Zone VAV, 4400 CFM, 5.0 motor nameplate hp, 2.1 design brake hp (2.1 max. BHP), 89.5 fan efficiency grade

1 RTU-2 (Single Zone):
Heating: 1 each - Central Furnace, Gas, Capacity = 142 kBtu/h
Proposed Efficiency = 81.00% Et, Required Efficiency: 80.00 % Et or 78% AFUE
Cooling: 1 each - Single Package DX Unit, Capacity = 155 kBtu/h, Air-Cooled Condenser, Air Economizer
Proposed Efficiency = 12.00 EER, Required Efficiency: 10.80 EER + 12.2 IEER
Fan System: FAN SYSTEM 1 | Dining Area -- Compliance (Brake HP method) : Passes

Fans:
FAN 1 Supply, Single-Zone VAV, 4400 CFM, 5.0 motor nameplate hp, 2.1 design brake hp (2.1 max. BHP), 89.5 fan efficiency grade

2 Water Heater 1:
Gas Instantaneous Water Heater, Capacity: 0 gallons, Input Rating: 199 kBtu/h w/ Circulation Pump
Proposed Efficiency: 0.95 EF, Required Efficiency: 0.62 EF

Mechanical Compliance Statement

Compliance Statement: The proposed mechanical design represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed mechanical systems have been designed to meet the 2015 IECC requirements in COM*check* Version 4.1.5.3 and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

Othon Estrada Jr — Name - Title
Signature
09/28/2021 — Date

COMcheck Software Version 4.1.5.3

Inspection Checklist

Energy Code: 2015 IECC

Requirements: 100.0% were addressed directly in the COM*check* software

Text in the "Comments/Assumptions" column is provided by the user in the COMcheck Requirements screen. For each requirement, the user certifies that a code requirement will be met and how that is documented, or that an exception is being claimed. Where compliance is itemized in a separate table, a reference to that table is provided.

Section # & Req.ID	Plan Review	Complies?	Comments/Assumptions
C103.2 [PR2][1]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the mechanical systems and equipment and document where exceptions to the standard are claimed. Load calculations per acceptable engineering standards and handbooks.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** M001, M603
C103.2 [PR3][1]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the service water heating systems and equipment and document where exceptions to the standard are claimed. Hot water system sized per manufacturer's sizing guide.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** P001
C406 [PR9][1]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the additional energy efficiency package options.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** M001, M002, M602, M603, M701

Additional Comments/Assumptions:

1 High Impact (Tier 1) | 2 Medium Impact (Tier 2) | 3 Low Impact (Tier 3)

Section # & Req.ID	Footing / Foundation Inspection	Complies?	Comments/Assumptions
C403.2.4.5, C403.2.4.6 [FO9][1]	Snow/ice melting system sensors for future connection to controls. Freeze protection systems have automatic controls installed.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.

Additional Comments/Assumptions:

1 High Impact (Tier 1) | 2 Medium Impact (Tier 2) | 3 Low Impact (Tier 3)

Section # & Req.ID	Plumbing Rough-In Inspection	Complies?	Comments/Assumptions
C404.5, C404.5.1, C404.5.2 [PL6][1]	Heated water supply piping conforms to pipe length and volume requirements. Refer to section details.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
C404.5, C404.5.1, C404.5.2 [PL6][1]	Heated water supply piping conforms to pipe length and volume requirements. Refer to section details.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
C404.5, C404.5.1, C404.5.2 [PL6][1]	Heated water supply piping conforms to pipe length and volume requirements. Refer to section details.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** P111
C404.6.1, C404.6.2 [PL3][1]	Automatic time switches installed to automatically switch off the recirculating hot-water system or heat trace.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** P502, P701
C404.6.3 [PL7][1]	Pumps that circulate water between a heater and storage tank have controls that limit operation from startup to <= 5 minutes after end of heating cycle.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
C404.6.3 [PL7][1]	Pumps that circulate water between a heater and storage tank have controls that limit operation from startup to <= 5 minutes after end of heating cycle.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
C404.6.3 [PL7][1]	Pumps that circulate water between a heater and storage tank have controls that limit operation from startup to <= 5 minutes after end of heating cycle.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** P502, P701
C404.7 [PL8][1]	Water distribution system that pumps water from a heated-water supply pipe back to the heated-water source through a cold-water supply pipe is a demand recirculation water system. Pumps within this system have controls that start the pump upon receiving a signal from the action of a user of a fixture or appliance and limits the temperature of the water entering the cold-water piping to 104°F.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
C404.7 [PL8][1]	Water distribution system that pumps water from a heated-water supply pipe back to the heated-water source through a cold-water supply pipe is a demand recirculation water system. Pumps within this system have controls that start the pump upon receiving a signal from the action of a user of a fixture or appliance and limits the temperature of the water entering the cold-water piping to 104°F.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.

1 High Impact (Tier 1) | 2 Medium Impact (Tier 2) | 3 Low Impact (Tier 3)

Section # & Req.ID	Plumbing Rough-In Inspection	Complies?	Comments/Assumptions
C404.7 [PL8][1]	Water distribution system that pumps water from a heated-water supply pipe back to the heated-water source through a cold-water supply pipe is a demand recirculation water system. Pumps within this system have controls that start the pump upon receiving a signal from the action of a user of a fixture or appliance and limits the temperature of the water entering the cold-water piping to 104°F.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** P111, P502

Additional Comments/Assumptions:

1 High Impact (Tier 1) | 2 Medium Impact (Tier 2) | 3 Low Impact (Tier 3)

Section # & Req.ID	Mechanical Rough-In Inspection	Complies?	Comments/Assumptions
C402.2.6 [ME41][1]	Thermally ineffective panel surfaces of sensible heating panels have insulation >= R-3.5.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
C403.2.13 [ME71][2]	Unenclosed spaces that are heated use only radiant heat.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
C403.2.3 [ME55][2]	HVAC equipment efficiency verified.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Mechanical Systems list for values.*
C403.2.4.7 [ME113][2]	Fault detection and diagnostics installed with air-cooled unitary DX units having economizers.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.2.4.7 [ME113][2]	Fault detection and diagnostics installed with air-cooled unitary DX units having economizers.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
C403.2.6.1 [ME59][1]	Demand control ventilation provided for spaces >500 ft2 and >25 people/1000 ft2 occupant density and served by systems with air side economizer, auto modulating outside air damper control, or design airflow >3,000 cfm.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
C403.2.6.2 [ME115][1]	Enclosed parking garage ventilation has automatic contaminant detection and capacity to stage or modulate fans to 50% or less of design capacity	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
C403.2.7 [ME57][1]	Exhaust air energy recovery on systems meeting Table C403.2.7(1) and C403.2.7(2).	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
C403.2.8 [ME116][1]	Kitchen exhaust systems comply with replacement air and conditioned supply air limitations, and satisfy hood rating requirements and maximum exhaust rate criteria.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** M701
C403.2.9 [ME60][1]	HVAC ducts and plenums insulated. Where ducts or plenums are installed in or under a slab, verification may need to occur during Foundation Inspection.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** M603
C403.2.9 [ME10][1]	Ducts and plenums sealed based on static pressure and location.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** M603
C403.2.9.1.3 [ME11][1]	Ductwork operating >3 in. water column requires air leakage testing.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.

1 High Impact (Tier 1) | 2 Medium Impact (Tier 2) | 3 Low Impact (Tier 3)

Section # & Req.ID	Mechanical Rough-In Inspection	Complies?	Comments/Assumptions
C403.2.9.1.3 [ME11][1]	Ductwork operating >3 in. water column requires air leakage testing.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
C403.3 [ME62][1]	Air economizers provided where required, meet the requirements for design capacity, control signal, ventilation controls, high-limit shut-off, integrated economizer control, and provide a means to relieve excess outside air during operation.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** M701
C403.3 [ME62][1]	Air economizers provided where required, meet the requirements for design capacity, control signal, ventilation controls, high-limit shut-off, integrated economizer control, and provide a means to relieve excess outside air during operation.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** M701
C403.4.4.6 [ME110][1]	Multiple zone VAV systems with DDC of individual zone boxes have static pressure setpoint reset controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply. *See the Mechanical Systems list for values.*
C403.4.4.6 [ME110][1]	Multiple zone VAV systems with DDC of individual zone boxes have static pressure setpoint reset controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply. *See the Mechanical Systems list for values.*
C408.2.2.1 [ME53][1]	Air outlets and zone terminal devices have means for air balancing.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** M603
C403.5, C403.5.1, C403.5.2 [ME123][1]	Refrigerated display cases, walk-in coolers or walk-in freezers served by remote compressors and remote condensers not located in a condensing unit, have fan-powered condensers that comply with Sections C403.5.1 and refrigeration compressor systems that comply with C403.5.2..	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.

Additional Comments/Assumptions:

1 High Impact (Tier 1) | 2 Medium Impact (Tier 2) | 3 Low Impact (Tier 3)

Section # & Req.ID	Final Inspection	Complies?	Comments/Assumptions
C303.3, C408.2.5.3 [FI8][1]	Furnished O&M manuals for HVAC systems within 90 days of system acceptance.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C403.2.2 [FI27][1]	HVAC systems and equipment capacity does not exceed calculated loads.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** M603
C403.2.4.1 [FI47][1]	Heating and cooling to each zone is controlled by a thermostat control. Minimum one humidity control device per installed humidification/dehumidification system.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** M703
C403.2.4.1 [FI47][1]	Heating and cooling to each zone is controlled by a thermostat control. Minimum one humidity control device per installed humidification/dehumidification system.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** M703
C403.2.4.1.2 [FI38][1]	Thermostatic controls have a 5 °F deadband.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** M603
C403.2.4.1.3 [FI20][1]	Temperature controls have setpoint overlap restrictions.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
C403.2.4.2 [FI39][1]	Each zone equipped with setback controls using automatic time clock or programmable control system.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** M603
C403.2.4.2.1, C403.2.4.2.2 [FI40][1]	Automatic Controls: Setback to 55°F (heat) and 85°F (cool); 7-day clock, 2-hour occupant override, 10-hour backup	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** M603
C403.2.4.2.3 [FI41][1]	Systems include optimum start controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** M602
C403.2.4.2.3 [FI41][1]	Systems include optimum start controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** M602
C404.3 [FI11][1]	Heat traps installed on supply and discharge piping of non-circulating systems.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
C404.4 [FI25][2]	All piping insulated in accordance with section details and Table C403.2.10.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** P002

1 High Impact (Tier 1) | 2 Medium Impact (Tier 2) | 3 Low Impact (Tier 3)

zebra
ZEBRA PROJECTS, INC.
14614 N KIERLAND BLVD. SUITE N 300
SCOTTSDALE, ARIZONA 85254
PHONE: 480.912.1169 www.zbr.co.uk

Consultant Logo:
INFRASTRUCTURE FACTOR CONSULTING, INC.
2361 Rosecrans Ave, Suite 368, El Segundo, CA 90245
P: 310.725.1500 F: 310.725.0215 www.iFactor.com

STORE NO:
TX 1382

SHAKE SHACK
SHAKE SHACK - SUGAR LAND
2515 TOWN CENTER BOULEVARD,
SUGAR LAND, TX 77479

REVISION

△	DATE	DESCRIPTION
	10/01/21	PERMIT/BID
A	06/23/22	REVISION A
1	10/20/22	REVISION 1
2	12/01/22	REVISION 2

STATUS:
PERMIT/BID

STATE OF TEXAS
OTHON ESTRADA, JR
141639
LICENSED
PROFESSIONAL ENGINEER
09/30/2021

FIELD VERIFICATION:
The contractor shall verify all figured dimensions and condition at the project site and notify Zebra Projects, INC. of any dimensional errors, or omissions or discrepancies before beginning or fabricating any work. Do not scale these drawings.

SHEET NAME:
MECHANICAL COMCHECK FORMS

DATE: 06/23/22
PROJECT NO: 33875
DRAWN: AM
SCALE:

SHEET NO:
M002

Section # & Req.ID	Final Inspection	Complies?	Comments/Assumptions
C404.6.1 [FI12][3]	Controls are installed that limit the operation of a recirculation pump installed to maintain temperature of a storage tank. System return pipe is a dedicated return pipe or a cold water supply pipe.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** P502
C408.2.1 [FI28][1]	Commissioning plan developed by registered design professional or approved agency.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** Not applicable per exception 1
C408.2.3.1 [FI31][1]	HVAC equipment has been tested to ensure proper operation.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** Not applicable per exception 1
C408.2.3.2 [FI10][1]	HVAC control systems have been tested to ensure proper operation, calibration and adjustment of controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** Not applicable per exception 1
C408.2.3.3 [FI32][1]	Economizers have been tested to ensure proper operation.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** Not applicable per exception 1
C408.2.4 [FI29][1]	Preliminary commissioning report completed and certified by registered design professional or approved agency.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** Not applicable per exception 1
C408.2.5.1 [FI7][3]	Furnished HVAC as-built drawings submitted within 90 days of system acceptance.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
C408.2.5.3 [FI43][1]	An air and/or hydronic system balancing report is provided for HVAC systems.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** M603
C408.2.5.4 [FI30][1]	Final commissioning report due to building owner within 90 days of receipt of certificate of occupancy.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** Not applicable per exception 1

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Project Title: Shake Shack - Sugar Land
Data filename: P:\SHK-21-003\Mechanical\COMCHECK\shk21003-Updated.cck
Report date: 09/30/21
Page 10 of 10

zebra

ZEBRA PROJECTS, INC.
14614 N KIERLAND BLVD. SUITE N 300
SCOTTSDALE, ARIZONA 85254

PHONE: 480.912.1169 www.zbr.co.uk

Consultant Logo:

INFRASTRUCTURE FACTOR CONSULTING, INC.
2361 Rosecrans Ave, Suite 368, El Segundo, CA 90245
P: 310.725.1500 F: 310.725.0215 www.iFactor.com

STORE NO:
TX 1382

SHAKE SHACK

SHAKE SHACK - SUGAR LAND
2515 TOWN CENTER BOULEVARD,
SUGAR LAND, TX 77479

REVISION

△	DATE	DESCRIPTION
	10/01/21	PERMIT/BID
A	06/23/22	REVISION A
1	10/20/22	REVISION 1
2	12/01/22	REVISION 2

STATUS:
PERMIT/BID

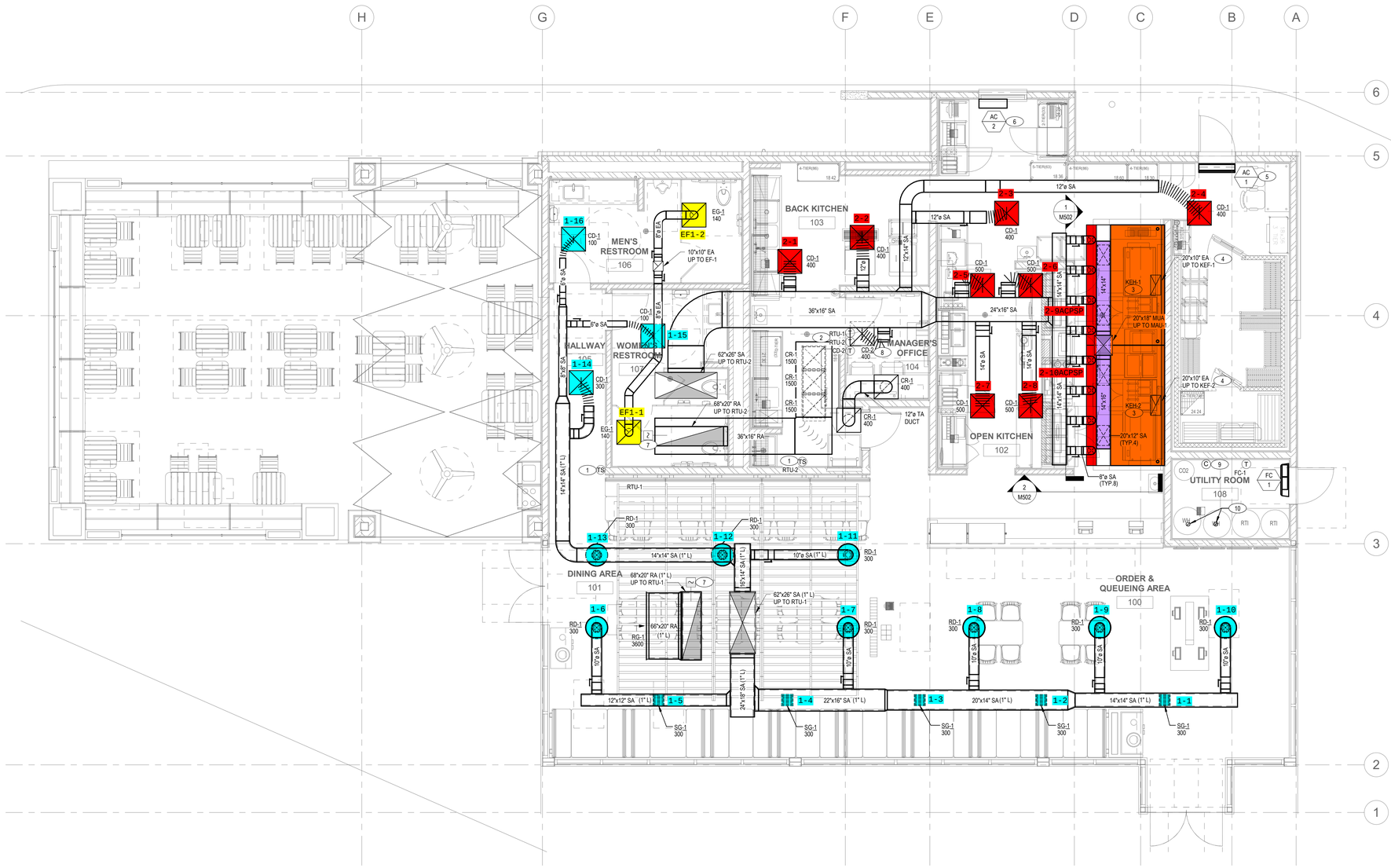
09/30/2021

FIELD VERIFICATION:
The contractor shall verify all figured dimensions and condition at the project site and notify Zebra Projects, INC. of any dimensional errors, or omissions or discrepancies before beginning or fabricating any work. Do not scale these drawings.

SHEET NAME:
MECHANICAL COMCHECK FORMS

DATE: 06/23/22
PROJECT NO: 33875
DRAWN: AM
SCALE:

SHEET NO:
M003



MECHANICAL FLOOR PLAN 1

SCALE: 1/4" = 1'-0"

KEY NOTES

1. MOUNT REMOTE TEMPERATURE AND HUMIDITY SENSOR AT 48" ABOVE FINISHED FLOOR. COORDINATE FINAL LOCATION WITH ARCHITECT.
2. MOUNT THERMOSTAT CONTROLLER AT 48" ABOVE FINISHED FLOOR.
3. KITCHEN HOOD AND HOOD FIRE SUPPRESION SYSTEM FURNISHED BY CAPTIVEAIRE AND INSTALLED BY CONTRACTOR. REFER TO KITCHEN EQUIPMENT DRAWINGS FOR ADDITIONAL INFORMATION. HOOD FIRE ALARM CONNECTIONS INSTALLED BY FIRE ALARM CONTRACTOR. COORDINATE WITH FIRE PROTECTION CONTRACTOR PRIOR TO INSTALLATION FOR REQUIREMENTS.
4. TYPE 1 GREASE EXHAUST DUCT FROM KITCHEN EXHAUST HOOD TO KITCHEN EXHAUST FAN. DUCT TO BE FIRE WRAPPED TO MAINTAIN 0" CLEARANCE TO COMBUSTIBLES.
5. PROVIDE AIR CURTAIN MOUNTED ABOVE DELIVERY DOOR.
6. PROVIDE AIR CURTAIN MOUNTED ABOVE TAKE-OUT WINDOW.
7. DUCT SMOKE DETECTOR TO BE SUPERVISED BY FIRE ALARM SYSTEM.
8. PROVIDE MOTORIZED VAV DIFFUSER WITH LCD THERMOSTAT.
9. PROVIDE CO2 SENSOR FOR UTILITY ROOM. SENSOR SHALL BE MK9 DETECTOR SET, CO2 SAFETY SYSTEM SET.
10. CONCENTRIC COMBUSTION AND FLUE PIPE UP TO ROOF.

GENERAL NOTES

1. PROVIDE MANUAL BALANCING DAMPER FOR ALL BRANCH DUCTWORK FOR PROPER BALANCING OF ALL AIR SYSTEMS WETHER ON DRAWINGS OR NOT.

zebra

ZEBRA PROJECTS, INC.
14614 N KIERLAND BLVD. SUITE N 300
SCOTTSDALE, ARIZONA 85254

PHONE: 480.912.1169 www.zbr.co.uk

Consultant Logo:

INFRASTRUCTURE FACTOR CONSULTING, INC.
2361 Rosecrans Ave. Suite 368, El Segundo, CA 90245
P: 310.725.1500 F: 310.725.0215 www.iFactor.com

STORE NO:
TX 1382

SHAKE SHACK

SHAKE SHACK - SUGAR LAND
2515 TOWN CENTER BOULEVARD,
SUGAR LAND, TX 77479

REVISION

	DATE	DESCRIPTION
	10/01/21	PERMIT/BID
A	08/23/22	REVISION A
1	10/20/22	REVISION 1
2	12/01/22	REVISION 2

STATUS:
PERMIT/BID

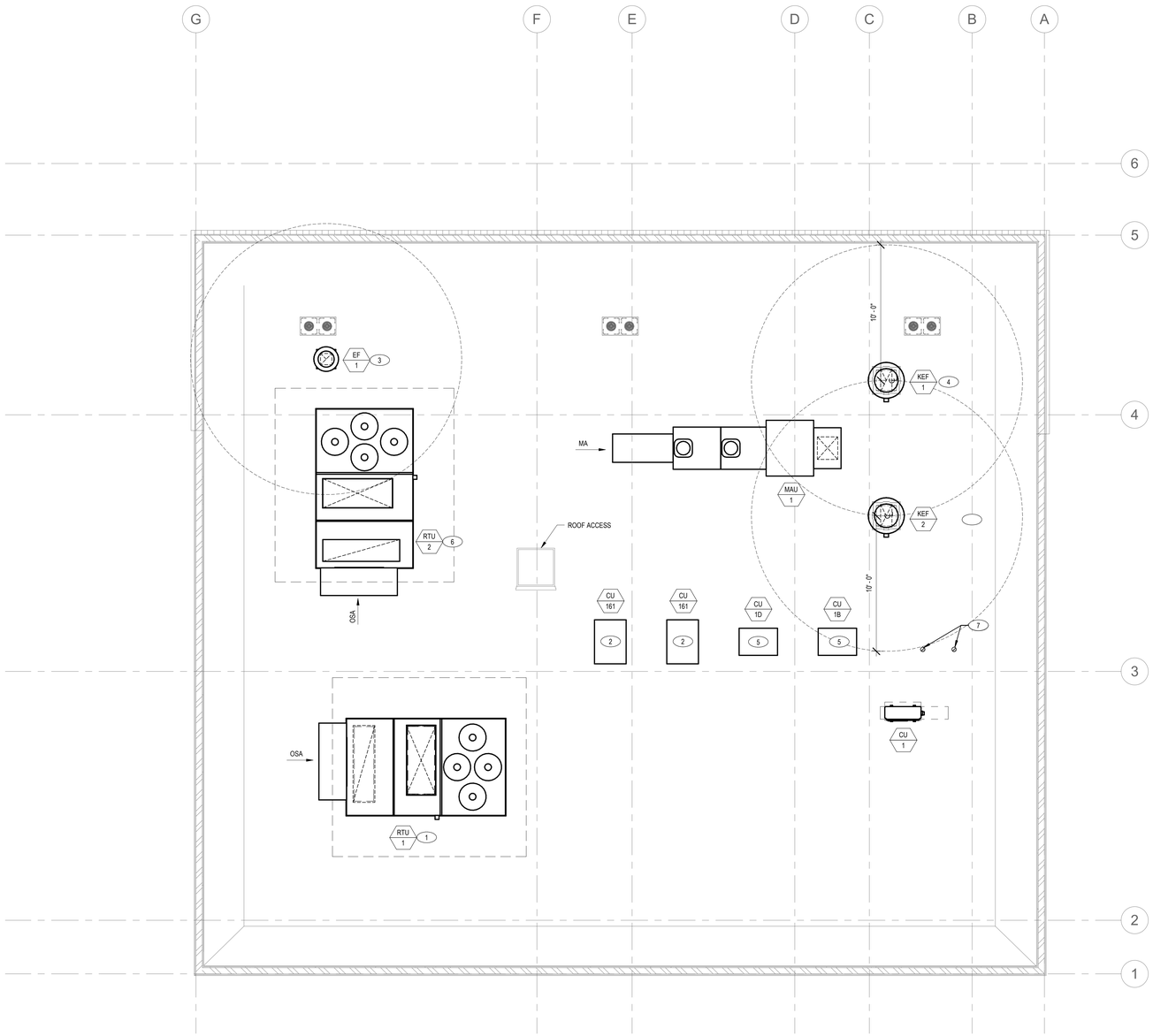
STATE OF TEXAS
OTHON ESTRADA, JR.
141839
LICENSED
PROFESSIONAL ENGINEER
09/30/2021

FIELD VERIFICATION:
The contractor shall verify all figured dimensions and condition at the project site and notify Zebra Projects, INC. of any dimensional errors, or omissions or discrepancies before beginning or fabricating any work. Do not scale these drawings.

SHEET NAME:
MECHANICAL FLOOR PLAN

DATE: 06/23/22
PROJECT NO: 33875
DRAWN: AM
SCALE: 1/4" = 1'-0"

SHEET NO:
M111



MECHANICAL ROOF PLAN 1

SCALE: 1/4" = 1'-0"

KEY NOTES

#	
1	RTU SERVING DINING.
2	CUSTARD MACHINE CONDENSING UNIT BY OTHERS.
3	RESTROOM EXHAUST FAN.
4	KITCHEN EXHAUST FAN FURNISHED BY CAPTIVEAIRE AND INSTALLED BY MECHANICAL CONTRACTOR.
5	COOLER/FREEZER CONDENSING UNITS BY OTHERS.
6	RTU SERVING KITCHEN.
7	PROVIDE LOCHINVAR CONCENTRIC COMBUSTION AIR AND FLUE PIPE TERMINATION ON ROOF FOR EACH WATER HEATER. PROVIDE WITH RAINCAP AND INSTALL PER MANUFACTURERS RECOMMENDATION.

zebra

ZEBRA PROJECTS, INC.
14614 N KIERLAND BLVD. SUITE N 300
SCOTTSDALE, ARIZONA 85254

PHONE: 480.912.1169 www.zbr.co.uk

Consultant Logo:

INFRASTRUCTURE FACTOR CONSULTING, INC.
2361 Rosecrans Ave. Suite 368, El Segundo, CA 90245
P: 310.725.1500 F: 310.725.0215 www.iFactor.com

STORE NO:
TX 1382

SHAKE SHACK
SHAKE SHACK - SUGAR LAND
2515 TOWN CENTER BOULEVARD,
SUGAR LAND, TX 77479

REVISION

△	DATE	DESCRIPTION
	10/01/21	PERMIT/BID
A	06/23/22	REVISION A
1	10/20/22	REVISION 1
2	12/01/22	REVISION 2

STATUS:
PERMIT/BID

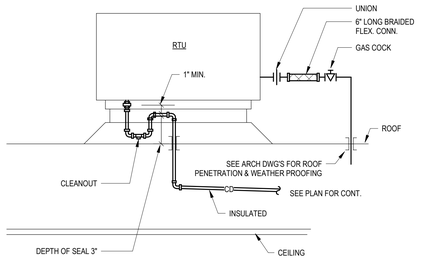
STATE OF TEXAS
OTHON ESTRADA, JR.
141639
LICENSED
PROFESSIONAL ENGINEER
09/30/2021

FIELD VERIFICATION:
The contractor shall verify all figured dimensions and condition at the project site and notify Zebra Projects, INC. of any dimensional errors, or omissions or discrepancies before beginning or fabricating any work. Do not scale these drawings.

SHEET NAME:
MECHANICAL ROOF PLAN

DATE: 06/23/22
PROJECT NO: 33875
DRAWN: AM
SCALE: 1/4" = 1'-0"

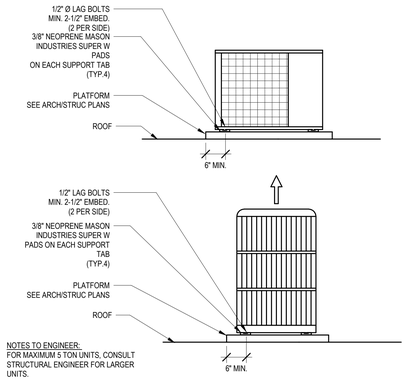
SHEET NO:
M112



NOTES:

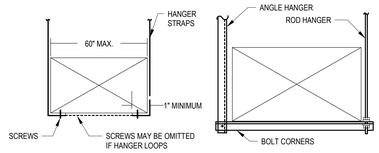
ALL EXPOSED PIPING SHALL BE POLISHED CHROME PLATED

9 RTU GAS/COND. DRAIN CONNECTION
NTS



NOTES TO ENGINEER:
FOR MAXIMUM 5 TON UNITS, CONSULT STRUCTURAL ENGINEER FOR LARGER UNITS.

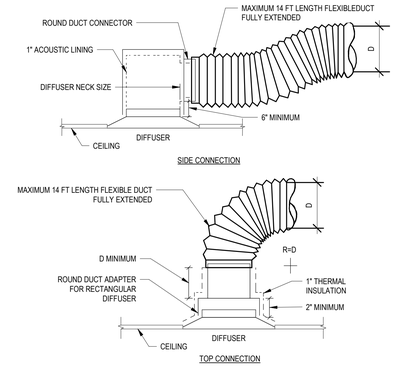
8 CONDENSING UNIT DETAIL
NTS



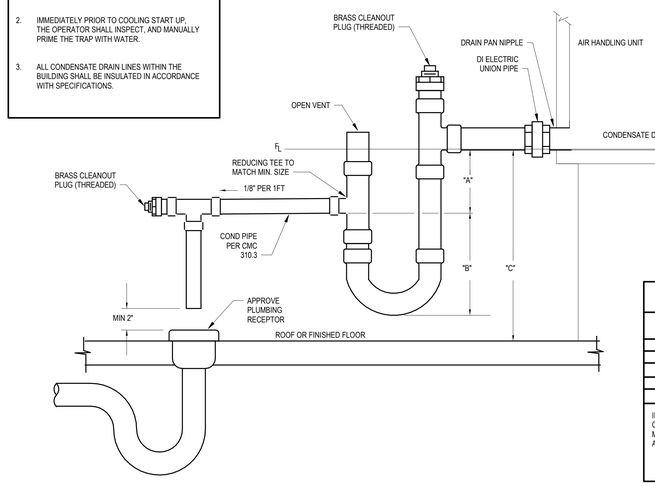
NOTES:

1. APPLICABLE FOR DUCT SIZE UP TO ITS CROSS SECTIONAL AREA OF MAXIMUM 6 SQ. FT.
2. FOR HANGERS SIZE ANS SPACING, SEE SMACNA HVAC DUCT CONSTRUCTION STANDARDS TABLE 5-1.
3. FOR UPPER ATTACHMENT TO BUILDING, SEE SMACNA HVAC DUCT CONSTRUCTION STANDARDS FIG. 5-1 TO 5-4. WITH SPECIFIC BUILDING STRUCTURAL ENGINEER APPROVAL. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS WITH DETAILS AND SUPPORT LOCATIONS.
4. ALL DUCT HANGER AND ATTACHMENTS SHALL BE REVIEWED AND APPROVED BY SEOR BEFORE FABRICATION AND INSTALLATION.

6 RECTANGULAR DUCT SUPPORT
NTS



3 DIFFUSER CONNECTION DETAIL
NTS



NOTES:

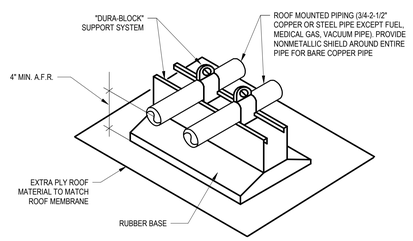
1. TYPE "L" COPPER CONDENSATE DRAIN PIPETO RECEPTOR.
2. IMMEDIATELY PRIOR TO COOLING START UP, THE OPERATOR SHALL INSPECT, AND MANUALLY PRIME THE TRAP WITH WATER.
3. ALL CONDENSATE DRAIN LINES WITHIN THE BUILDING SHALL BE INSULATED IN ACCORDANCE WITH SPECIFICATIONS.

MINIMUM CONDENSATE DRAIN SIZE CMC 310.3	
TONS	NOM. PIPE SIZE
0 - 20	3/4"
21 - 40	1"
41 - 90	1-1/4"
91-125	1-1/2"
126-250	2"

IF DRAIN PAN NIPPLE IS LARGER THAN CODE MINIMUM, THEN TRAP SHALL MATCH DRAIN PAN NIPPLE. REDUCE AFTER TRAP TO MATCH MINIMUM SIZE.

7 CONDENSATE TRAP DETAIL
NTS

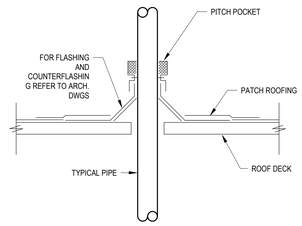
WOODEN BLOCKS SHALL NOT BE USED AS PIPING SUPPORTS ON THE ROOF



NOTE:

SUPPORTS SHALL BE INSTALLED A MAXIMUM 8'-0" O.C. AND AT EACH CHANGE OF DIRECTION OF PIPING.

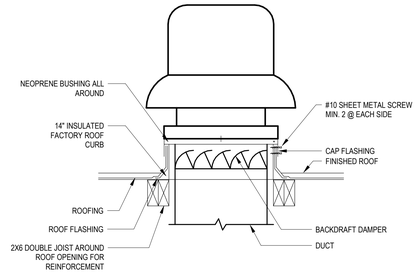
5 ROOF PIPE SUPPORT
NTS



NOTES:

1. PROVIDE PITCH POCKET CONSTRUCTION. ADDITIONAL FLASHING OR WEATHER CAP AS REQUIRED FOR WATERPROOF CONSTRUCTION. DO NOT MECHANICALLY FASTEN PIPE TO STRUCTURE IN ANY WAY.
2. SPACE BETWEEN PIPE AND SLEEVE SHALL BE FREE OF ANY FOREIGN MATERIALS.
3. PIPE SHALL NOT CONTACT STRUCTURE, AND WEDGES SHALL NOT BE USED TO MAINTAIN PIPE IN POSITION.
4. PIPE TO BE CENTERED IN OPENING; PROVIDE ADDITIONAL CLEARANCE FOR POSITIONAL CHANGE OF PIPE DUE TO LOADING OF PIPE OR OPERATION OF SYSTEM.

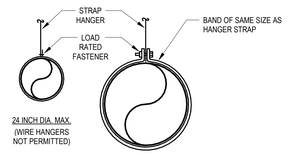
4 PIPE THROUGH ROOF
NTS



NOTES:

1. DUCT SHALL BE 1" SMALLER THAN ROOF OPENING.
2. ROOF OPENING SHALL CONFORM TO MANUFACTURER'S CURB SIZE

2 EXHAUST FAN MOUNTING DETAIL
NTS



NOTES:

1. APPLICABLE FOR DUCT SIZE UP TO MAXIMUM 32"Ø.
2. FOR HANGER SIZE AND SPACING. SEE SMACNA HVAC DUCT TABLE 5-2. FOR TRAPEZE ALLOWABLE LOAD SEE TABLE 5-3.
3. FOR UPPER ATTACHMENT TO BUILDING SEE SMACNA HVAC DUCT CONSTRUCTION STANDARDS FIG. 5-1 TO 5-4, WITH SPECIFIC BUILDING STRUCTURAL ENGINEER APPROVAL. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS WITH DETAILS AND SUPPORT LOCATIONS.
4. ALL DUCT HANGER AND ATTACHMENTS SHALL BE REVIEWED AND APPROVED BY SEOR BEFORE FABRICATION AND INSTALLATION.

HORIZONTAL ROUND DUCT SUPPORT DETAIL
1 NTS

zebra
ZEBRA PROJECTS, INC.
14614 N KIERLAND BLVD. SUITE N 300
SCOTTSDALE, ARIZONA 85254
PHONE: 480.912.1169 www.zbr.co.uk
Consultant Logo:
INFRASTRUCTURE FACTOR CONSULTING, INC.
2361 Rosecrans Ave. Suite 368, El Segundo, CA 90245
P: 310.725.1500 F: 310.725.0215 www.iFactor.com

STORE NO:
TX 1382

SHAKE SHACK
SHAKE SHACK - SUGAR LAND
2515 TOWN CENTER BOULEVARD.
SUGAR LAND, TX 77479

REVISION

△	DATE	DESCRIPTION
	10/01/21	PERMIT/BID
A	06/23/22	REVISION A
1	10/20/22	REVISION 1
2	12/01/22	REVISION 2

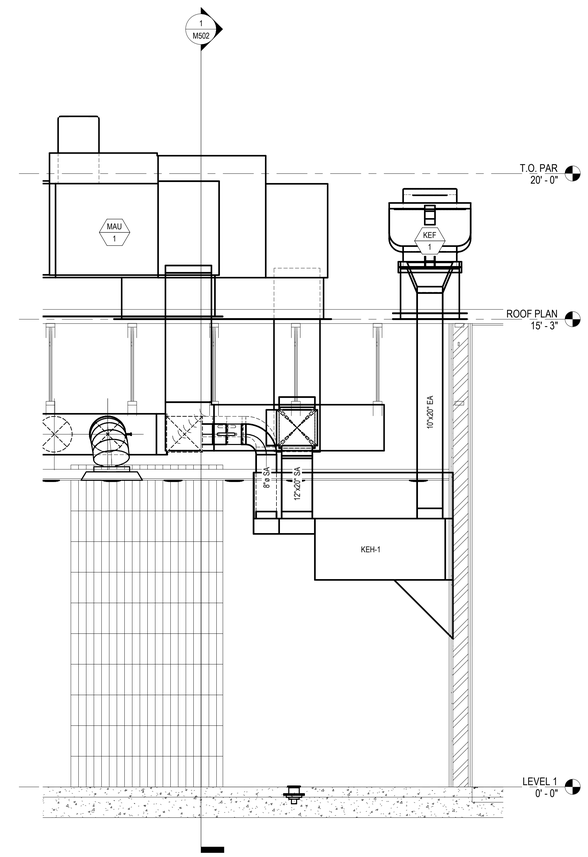
STATUS:
PERMIT/BID

FIELD VERIFICATION:
The contractor shall verify all figured dimensions and condition at the project site and notify Zebra Projects, INC. of any dimensional errors, or omissions or discrepancies before beginning or fabricating any work. Do not scale these drawings.

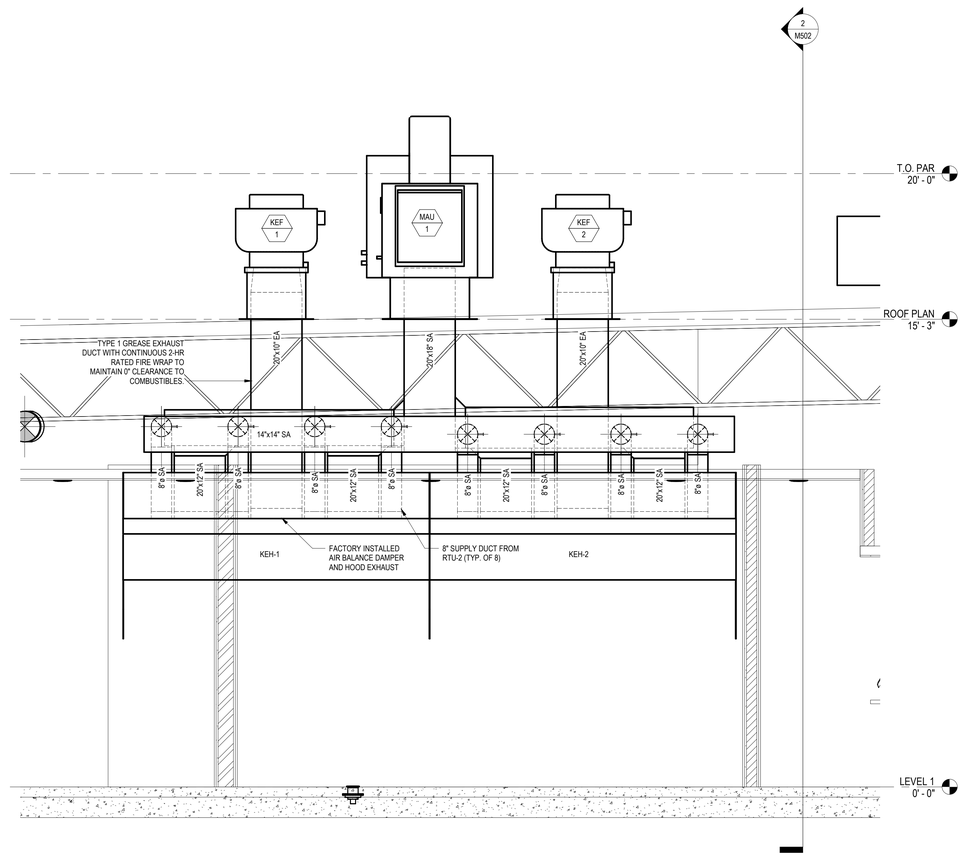
SHEET NAME:
MECHANICAL DETAILS

DATE: 06/23/22
PROJECT NO: 33875
DRAWN: AM
SCALE: As indicated

SHEET NO:
M501



2 MECHANICAL HOOD ELEVATION 2
1/2" = 1'-0"



1 MECHANICAL HOOD ELEVATION
1/2" = 1'-0"

zebra

ZEBRA PROJECTS, INC.
14614 N KIERLAND BLVD. SUITE N 300
SCOTTSDALE, ARIZONA 85254

PHONE: 480.912.1169 www.zbr.co.uk

Consultant Logo:

INFRASTRUCTURE
FACTOR
CONSULTING, INC.
2361 Rosecrans Ave. Suite 368, El Segundo, CA 90245
P: 310.725.1500 F: 310.725.0215 www.iFactor.com

STORE NO:
TX 1382

SHAKE SHACK

SHAKE SHACK - SUGAR LAND
2515 TOWN CENTER BOULEVARD,
SUGAR LAND, TX 77478

REVISION

	DATE	DESCRIPTION
	10/01/21	PERMIT/BID
A	06/23/22	REVISION A
1	10/20/22	REVISION 1
2	12/01/22	REVISION 2

STATUS:
PERMIT/BID

STATE OF TEXAS
OTHON ESTRADA, JR.
141639
LICENSED
PROFESSIONAL ENGINEER
09/30/2021

SHEET NAME:
MECHANICAL DETAILS

DATE:	PROJECT NO:
06/23/22	33875
DRAWN: AM	SCALE: 1/2" = 1'-0"

SHEET NO:
M502

Enviromatic Corporation Of America, Inc. Since 1971

Atlanta, Austin, Chicago, Columbus, Dallas, Denver, Des Moines, Houston, Kansas City, Mpls, Orlando, St Louis

TOLL FREE
800-325-VIRO(8476)

Water Leak Testing of New and Existing Grease exhaust vent systems.
Summary: A high pressure multi-nozzle spinjet in conjunction (where needed) with a 15 degree or wider single nozzle lance is to be passed through all new grease exhaust vent systems with the water spray contacting all interior portions of the duct. This is to check for any liquid leakage in the system plus to check for adequate access and other problems that can be repaired during the construction or leak testing phase. All water used in the test must be collected in some fashion for discharge to a sanitary drain.

1. The water testing job shall to be scheduled after the welded grease exhaust system with the hood and all access plates installed. The leaktesting can be done in multi stages for tall multi story runs or multi story multi duct runs, but there must be one final test of all connection joints.
2. All testing is to be done before any fire-wrap is installed or with fire wrap removed.
3. Testing Contractor shall verify water availability, building access, electrical availability, amount of high pressure hose needed to reach all areas of system, and any needed roof access with Job Superintendent when scheduling job.
4. The testing company should also re-verify during job reminder phone call that is to be made by Testing Contractor to the Job site Superintendent the working day before the job is scheduled.
5. A water source where a hose can be connected shall be available
6. A high pressure washer with minimum capabilities of 1000PSI @ 3GPM. (minimum requirements to run a multi nozzle duct cleaner(known as a spinjuet or roto-nozzle)
7. Adequate high pressure hose along with a 6” or 12” spinjet (or Roto-nozzle) shall be required.
8. The work should normally start at the intake(Hood) portion of the system (or at the electrostatic precipitator where applicable). The leaktest may start from other areas of the system depending on layout.
9. The nozzles shall progress through the system at a rate of approximately one foot every five seconds until it reaches the end point.
10. With the hood in place, the Testing Company shall collect the wastewater similar to a routine cleaning with the hood taped and clamped up with at least two mil or thicker clear poly (Plastic) funneling into a large watertight brute (or similar) bucket.
11. A water vacuum shall be used to make sure all excess water is removed from hood and ductwork when done.
12. The general contractor's welder shall be on-site during the leaktesting with proper welding equipment(A MIG welder is highy recommended), a bright portable light, with access to all parts of the system.
13. A spotter with the welder shall access the outside of the ductwork to spot any leaks.
14. If the duct leaks, the leaks shall be repaired and the test is to be redone
15. Additional leaks shall continue to be repaired and re-tested until no leaks exist.
16. When testing is completed, The Testing Company shall dry out the duct, remove the plastic and return system to same condition as found (with leaks repaired).
17. The Testing Company will take pictures of the system and procedure, then e-mail them to Enviromatic to verify the job is done correctly.
18. A leaktest form shall be filled out and signed that system is liquid tight as specified by NFPA96 guidelines.
19. The leaktest form shall note number of leaks found, number of re-testing required in needed, rough drawing of the system with access plate locations and where the leaks were found and repaired. The form shall have signature lines for both the job site representative and the testing company representative.
20. If any sealant (EX: JB Weld, epoxies,etc) is found in a welded duct, the test shall immediately fail and the leaktesting will cease immediately until all sealant is removed to bare metal or bare welds.
21. For listed ducts with sealed joints, only the listed sealant shall be used. The leaktesting will progress in the same manner as the welded ducts EXCEPT leakage requiring sealant repairs will need to cure for the required time before re-testing.

FireMaster® FastWrap® XL

Datasheet Code US: 714-236

* Commonly referred to test method CA Section 01350 is CDPH Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers Version 1.1, Feb 2010

Grease Duct Enclosure System
Air Ventilation Duct Enclosure System
Product Data & Installation Guide

1. Product Description

Thermal Ceramics FireMaster® FastWrap XL is a flexible blanket composed of high temperature fibers classified for applications to 2192°F (1200°C) and fully encapsulated in a durable glass fiber reinforced foil facing for easy handling and installation. Thermal Ceramics FastWrap XL is UL and ULC Listed for 1 and 2 hour fire resistive enclosure protection, zero clearance for kitchen exhaust ducts, electrical circuit protection, and as a component in UL firestop designs for fire resistance rated floors, ceilings, and walls. The core fibers in FastWrap XL are manufactured using Thermal Ceramics patented Superwool® fiber which is an alkaline-earth silicate wool with low biopersistence and therefore increased safety for installers. FastWrap XL is under UL's Follow-Up Service Program to ensure the consistent quality essential to this life-safety application.

Product Features

- Thin and Lightweight at 1-1/2” (38mm) thick, 6 pcf (96 kg/m^3) density
- Contours easily to complex duct designs
- Grease duct installation UL and ULC Listed with butt joints at all seams on both layers
- Fully foil encapsulated for fast and clean installation
- Contains 2192°F (1200°C) rated fibers
- Microbial Resistance validated by UL Environment
- Good sound absorption
- Compliant to IMC, NFPA 96, UMC, CMC, CNBC

2. Applications

- 2 hour enclosure and firestop system for kitchen exhaus duct
- Zero clearance to combustibles
- 1, 2 and 3 hour enclosure and firestop system for hazardous exhaust ducts, pressurization ducts, clothes dryer exhaust ducts, trash and linen chutes, and other fire rated HVAC ducts
- 1 hour electrical circuit integrity protection
- Engineered and tested solutions for fire protection of structural steel and storage vessels per ASTM E119, ISO 834, and UL1709

3. Specifications - Division 23 07 00 (or 15080)

CSI Spec and AutoCAD available online, www.arcat.com/sd/clients/thermcer.html.

Thermal Ceramics FireMaster FastWrap XL is a flexible high temperature insulation rated to 2192°F (1200°C) that is fully encapsulated in FSP facing. The duct enclosure system shall be listed by UL and /or ULC per ASTM E 2336, CAN/ULC S144 and ISO 6944 for 1-, 2- and 3-hour rating and zero clearance to combustibles, and tested per ASTM E84 for a flame/smoke rating less than 25/50. Insulation shall have a nominal thickness of 1-1/2 inches (38 mm) and density of 6 lbs/ft^3 (96 kg/m^3). Insulation shall have a R-Value of 7.3 at 75°F. Installation shall be in strict accordance to manufacturers published installation instructions, UL or ULC Listings, and shop drawings. FastDoor™ XL shall be used for duct access where specified or as required by code.

4. Physical Characteristics

Product	Unit	Size	Units/ Ctn.	Wt./ Ctn.
FastWrap XL	Roll	1-1/2” x 24” x 25’	1	37.5 lbs.
FastWrap XL	Roll	1-1/2” x 48” x 25’	1	75 lbs.

5. Performance Specifications

Reference Standard	Standard No.	Performance
Grease Duct Enclosure System	ASTM E2336	Pass
Section 16.1 - Non-Combustibility	ASTM E136	Pass
Section 16.2-Fire Resistance (wall)	ASTM E119	Pass
Section 16.3 - Durability Test	ASTM C518	Pass
Section 16.4 - Internal Fire Test	ASTM E2336	Pass
Section 16.5 - Fire Engulfment (duct)	ASTM E814/ E119	Pass
ULC Grease Duct Test Protocol		Pass
Standard Methods of Fire Resistance Tests - Grease Duct Assemblies	CAN/ULC S144	Pass
Grease Duct Clearances	UL 1978	Pass
Air Ventilation Duct Enclosure	ISO 6944	Pass
Surface Burning Characteristics	ASTM E84	<25/50
Thermal Resistance (R-value @ 75°F)	ASTM C518	7.3 per layer
Mold Growth	ASTM C1338	ULE Validated
Low VOCs	CA Standard 01350	ULE Validated

6. Listings/Building Code Reports

Listed Uses	Agency	Listing	Layers
Grease Duct Enclosure per ASTM E2336 and AC101 (2006, 2009, 2012 IMC, NFPA 96, UMC, CMC)	UL	G18	2
	ICC-ES	ESR 2213	
ULC Grease Duct Test Protocol and CAN/ULC S144*	ULC	FRD 4, 7*	2
Grease Duct Insulation (2003 IMC)	OPL	TC/BI 120-01	1
Through Penetration FireStop System per ASTM E814, UL 1479	UL	See Figure 2	1 or 2
	ULC		
1- or 2-hour Ventilation Duct Enclosure per ISO 6944-1985	UL	HNLJ.V1, 19, 29	1
	ULC	FRD 3, 5, 6, 18	
3-hour Ventilation Duct Enclosure per ISO 6944-1985	UL	HNLJ.V2	2
Electrical Circuit Protective System	UL	FHIT.5	2

7. Storage

Thermal Ceramics FastWrap XL must be stored in a dry warehouse environment on pallets. Pallets should not be stacked.

8. Installation

Thermal Ceramics FastWrap XL shall be installed by a qualified contractor in accordance with manufacturer's instructions and laboratory design listings.

Materials and Equipment

- Thermal Ceramics FastWrap XL blanket
- Aluminum foil tape
- Glass filament reinforced tape (optional)
- Carbon steel or stainless steel banding material, minimum 1/2” (13mm) wide, minimum 0.015” (0.4mm) thick, with steel banding clips
- Hand banding tensioner and crimping tool
- Minimum 12 gage (3mm) steel insulation pins; steel speed clips, minimum 1-1/2” (38mm) square or 1-1/2” (38mm) diameter, or equivalent sized cup-head pins;
- Capacitor discharge stud gun
- Thermal Ceramics FastDoor™ XL
- An approved firestop sealant

General

Cut edges of the blanket shall be taped with aluminum foil tape to prevent exposed edges of the insulation absorbing grease and moisture in the event of a compromised grease duct joint or condensation. Overlaps and/or tightly butted joints are used to block heat transfer in the event of duct deformation resulting from thermal expansion. Filament tape is suggested to hold the blanket in place until steel banding or pinning is installed to permanently secure the blanket.

A. Installation on Grease Duct per ASTM E2336 and CAN/ULC S144 (Figure 1)

System requires two layers of insulation applied directly to the duct with tight butt joints at all seams on both layers. The first layer of insulation is cut to a length sufficient to wrap around the duct and provide a tight butt joint where the blanket ends meet. Adjacent blankets on the first layer are butted tightly together with longitudinal seams offset minimum 6” (150mm). The second layer of insulation is installed in the same method as the first layer, with seams between layers offset a minimum of 6” (150mm). Banding and/or pinning per Section D is used to permanently secure the insulation to the duct.

B. Installation on HVAC Duct per ISO 6944 (Figure 1)

System requires one layer of insulation applied directly to the duct with 3” (75mm) overlaps at all seams. The insulation is cut to a length sufficient to wrap around the duct and provide a 3” (75mm) overlap where the blanket ends meet. Adjacent blankets are installed to provide a minimum overlap of 3” (75mm). Banding and/or pinning per Section D is used to permanently secure the insulation to the duct.

C. 2 & 3 Sided Wrap Installation (Figure 4)

When space does not allow for a complete wrap applied to the duct on all four sides, the FastWrap XL is approved for 2 or 3 sided installations with mechanical attachment to a rated concrete or CMU assembly. (See Figure 4 for installation details.)

D. Mechanical Attachment Methods

1) **Banding (Figure 1) -** Minimum 1/2” (13mm) wide carbon steel or stainless steel banding, 0.015” (0.4mm) thick, is placed around the entire perimeter of the insulated duct on maximum 10-1/2” (270mm) centers and 1-1/2” (38mm) from each blanket edge or 1-1/2” (38mm) from each collar edge when using the butt joint and collar method. The banding is placed around the blanket and tightened to firmly hold the FastWrap XL in place against the duct, but not cause any cutting or damage to the blanket.
2) **Pinning -** Pinning on all sides of the duct may be used as an alternative to banding. For ducts wider than 24” (610mm) pinning is required on the bottom of horizontal runs, or on one side of vertical runs (in addition to steel banding). When applicable, 12 Gage (0.4mm) steel pins are installed on 12” (305mm) centers along the width of the duct and 10-1/2” (270mm) centers along the length of the duct. Pins that extend beyond the outer blanket layer shall be turned down or the excessive length cut off to prevent sharp edges. Shoot through pins (cup head pins) may be used in conjunction with steel banding to prevent blanket sag.

E. Access Doors

1) **FastDoor™ XL (Figure 3) -** FastDoor XL is a UL Listed, liquid tight duct cover panel supplied complete with a single layer insulation cover per UL Listing HNKT G18. The FastDoor XL is installed per included installation instructions. No field welding is required.
2) **Field Fabricated Access Doors -** Each access door assembly has four threaded rods 1/4 inch (6mm) in diameter and 5” (127mm) in length, with one welded to each corner of the door opening. Hollow steel tubes, 4-1/2” (114mm) long are installed outside the access cover plate and over the threaded rods. Four 12 gage (3mm) and 4-1/2” (114mm) long steel insulation pins are welded to the access cover plate to allow for installation of the three layers of FastWrap XL. One layer of FastWrap XL is cut to approximately the same size as the access panel, and impaled over the insulation pins on the panel. A second layer of FastWrap XL is cut so as to overlap the first layer a minimum of 1-1/2” (38mm). It is essential that the first and second layer fit tightly against the surrounding wrap with no through openings. The third and outside layer should be cut to overlap the second insulation layer by a minimum of 1-1/2” (38mm). Minimum 1-1/2” (38mm) round or square insulation clips are installed on the insulation pins to secure the three layers of insulation to the access cover plate. All cut edges of the insulation shall be taped with minimum 3” (75mm) wide aluminum foil tape. Wing nuts and washers are installed on the four threaded rods, and tightened against the hollow steel tubes to seal the

access cover plate to the duct.

F. Through Penetration Firestop System (Figure 2) - When the duct penetrates a fire rated assembly an approved fire stop system must be employed. Figure 2 provides a complete list of UL / ULC firestop design listings which can be found in the Certifications Directory at www.ul.com for US systems and www.ulc.ca for Canadian systems. Prior to installing any firestop system the surfaces of all openings and penetrating items must be clean and dry. The FastWrap XL core blanket (or mineral wool where allowed by the firestop design listing) must be compressed into the annular space. The packing material must be recessed a minimum depth from the surface of the concrete or gypsum assembly. The recessed opening must be filled with a minimum thickness of an approved firestop sealant. The packing material type and compression, minimum recess (typically 1/4” (6mm)), and approved firestop sealant and thickness (typically 1/4” (6mm)) shall be as specified in an approved UL / ULC firestop design listing. When there is not sufficient annular space around the duct to run the FastWrap XL enclosure system continuous through the fire rated assembly, the enclosure may terminate above and below the floor/ceiling assembly or on either side of a wall assembly as shown in Figure 2. When this method is used, the FastWrap XL must be mechanically attached on either side of the fire rated assembly using one of the attachment methods described in Section D, spaced a maximum of 1-1/2” (38mm) from the fire rated assembly.

G. Support Hanger Systems

1) **Grease ducts:** Trapeze support hangers shall be spaced on maximum 60 in. (1500 mm) centers. Hanger rods or straps shall be anchored with steel drop in or wedge expansion type masonry anchors. No additional protection is required for hangers and supports meeting the requirements of the Table below.

Hanger Cross Section	Maximum Perimeter, in (mm)	Trapeze Support (or equivalent Yield Strength), in (mm)
3⁄8 in (10 mm) threaded rod	148 (3759)	2 (51) x 2 (51) x 1⁄8 (3) in angle

2) **HVAC ducts:** Trapeze support hangers shall be spaced on maximum 60 in. (1500 mm) centers. Hanger rods or straps shall be anchored with steel drop in or wedge expansion type masonry anchors. No additional protection is required for hangers and supports meeting the requirements of the Table below.

Hanger Cross Section	Max. Perimeter, in (mm)	Trapeze Support (or equivalent Yield Strength), in (mm)
1 in x 16 gage strap (25 mm x 1.5 gage strap)	100 (2540)	
1⁄4 in (6 mm) threaded rod	50 (1270)	1½ (38) x 1½ (38) x 3⁄16 (5) angle
3⁄8 in (10 mm) threaded rod	150 (3810)	1½ (38) x 1½ (38) x 3⁄16 (5) angle
1⁄2 in (12.7 mm) threaded rod	218 (5540)	2 (51) x 2 (51) x 1⁄4 (6) angle

9. Maintenance and Repair

No maintenance is required when installed in accordance with Thermal Ceramics (TC) installation instructions. If damage is limited to the foil facing, aluminum foil tape can be used to repair the foil facing. If an area of blanket is found to be damaged the following procedure must be in-corporated. If the damaged area is larger than 8” (203mm) x 8” (203mm) the entire wrap section must be removed and replaced according to TC installation instructions. If the damaged area is small (less than 8” (203mm) x 8” (203mm)), the damaged area must be cut away and replaced with a new section 1” (25mm) larger in length and width than the cut out, such that the new section can be compressed tightly into the cut out area. All cut edges of the new section must be taped and sealed with aluminum foil tape. The new section must be held in place with either pinning or banding per TC installation i nstructions.

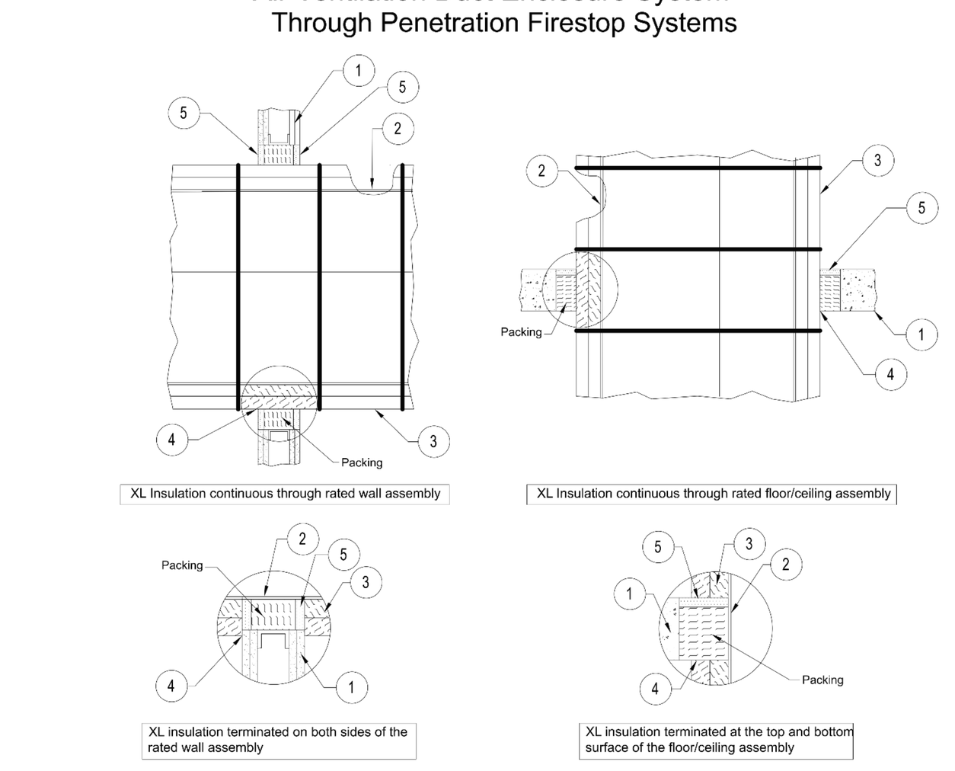
10. Limitations

Thermal Ceramics FireMaster FastWrap XL shall be installed in accordance with these installation instructions and appropriate laboratory design listings. The integrity of FastWrap XL systems is limited to the quality of the installation.

* For personal protective equipment recommendations, please see SDS.

Thermal Ceramics, FireMaster, and FastWrap are trademarks of Morgan Advanced Materials. FireMaster products are manufactured by Thermal Ceramics and are distributed by authorized distributors.

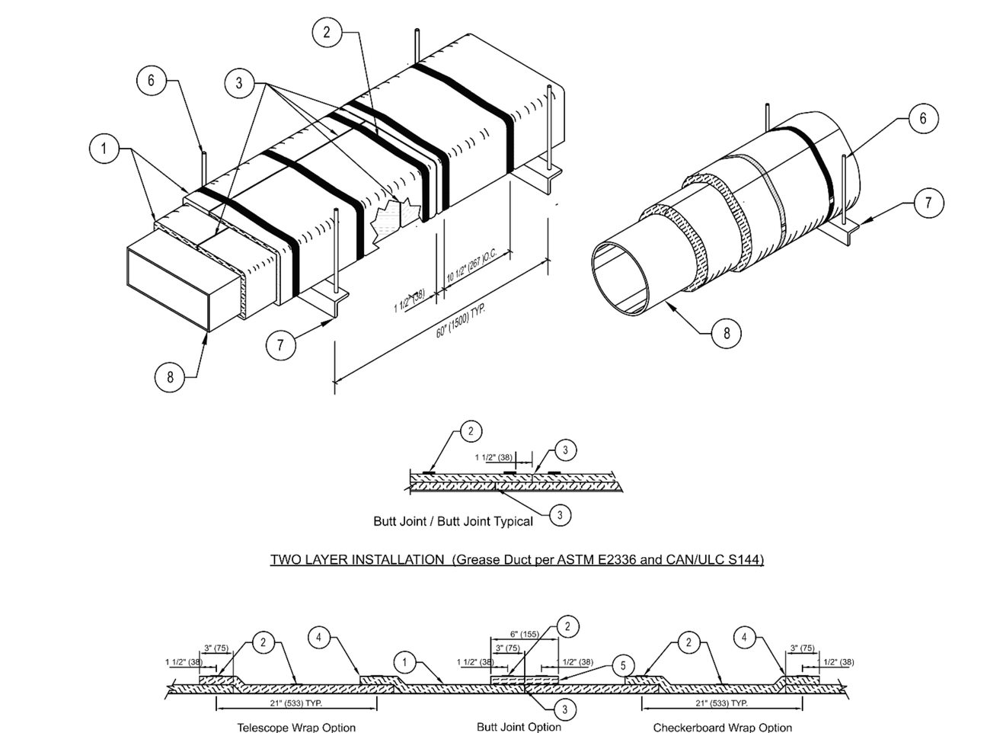
Commercial Kitchen Grease Duct Enclosure System
Air Ventilation Duct Enclosure System
Through Penetration Firestop Systems

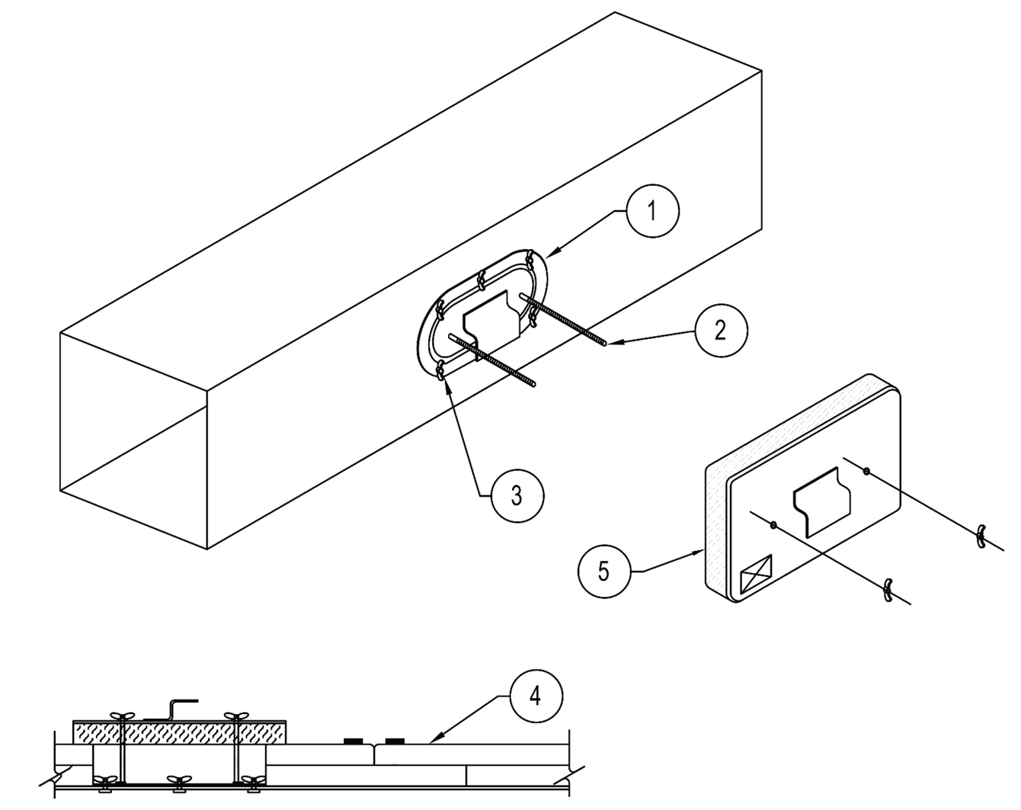


Firestop Designs per ASTM E814 / UL 1479 - Consult UL / ULC Directories for System Details						
UL Listing	F- & T-Rating	(1) Floor/Wall	(2) Penetrant	(3) Enclosure Per	(4) Termination	(5) Firestop Sealant Details
C-AJ-7012	2-hour	Concrete/CMU	84x24; 26 Ga Duct	V19; FRD3; 5; 18	wrap through	1/2 in; STI; Tremco
C-AJ-7014	3-hour	Concrete/CMU	84x24; 26 Ga Duct	V2;	wrap through	1/2 in; STI; Tremco
C-AJ-7019	1 or 2-hour	Concrete/CMU	84x24; 26 Ga Duct	V19; FRD3, 5, 18	terminate at	1/4 in; STI; Tremco
C-AJ-7021	2-hour	Concrete/CMU	49x24; 16 Ga Duct	G18; FRD4; 7	terminate at	1/4 in; STI; Tremco
C-AJ-7095	2-hour	Concrete/CMU	39x39; 22 Ga Duct	V19; FRD3, 5, 18	wrap through	1/4 in; STI Hilti; Rectorseal; Tremco
C-AJ-7098	2-hour	Concrete/CMU	49x24; 16 Ga Duct	G18; FRD4; 7	wrap through	1/4 in; STI; Hilti; Rectorseal; Tremco
F-C-7036	1 or 2-hour	Wood/Gyp Floor	24x12; 16 Ga Duct	G18; FRD4; 7	wrap through	1/4 in; STI; Hilti; Rectorseal; Tremco
F-C-7055	1-hour	Wood/Gyp Floor	4 Dia; 30 Ga Duct	V29; FRD28	wrap through	1/4 in; STI
W-J-7086	2-hour	Concrete/CMU Wall	100x100; 26 Ga Duct	V19; FRD3;5; 18	terminate at	1/4 in; STI
W-L-7121	1 or 2-hour	Gyp Wall	30x30; 16 Ga Duct	G18; FRD4; 7	wrap through	1/4 in; STI; Hilti; Rectorseal; Tremco
W-L-7145	1 or 2-hour	Gyp Wall	100x100; 26 Ga Duct	V19; FRD3; 5; 18	terminate at	5/8 in; STI

The integrity of Thermal Ceramics duct systems is limited to the quality of the installation.
XL003-5

Grease and HVAC Duct Enclosure System
1 or 2 Hour Shaft Alternative / Zero Clearance to Combustibles



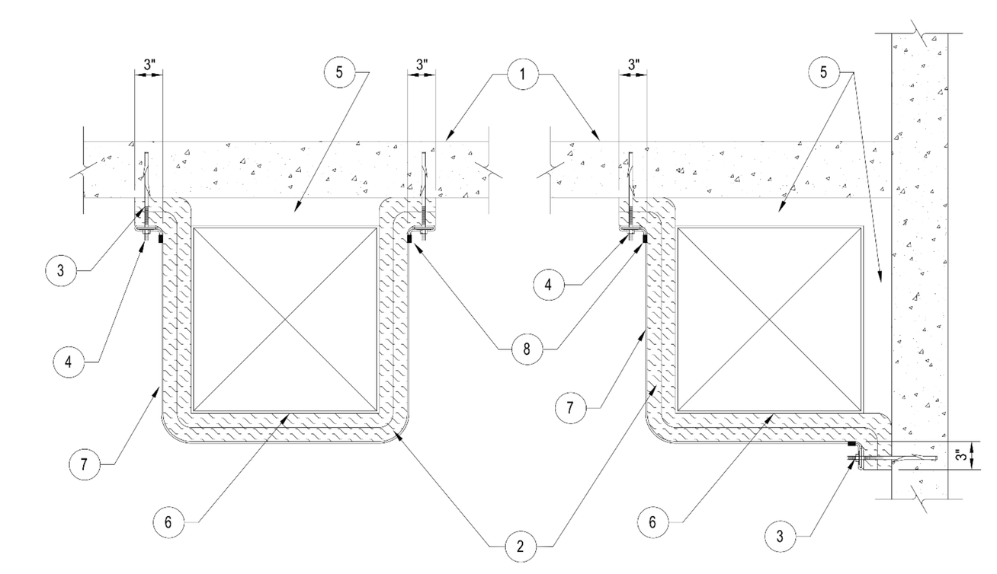


ASTM E 2336 Compliant Enclosure and Door System

FIGURE 3	
1	UL listed FastDoor XL access panel
2	All Thread Rods and wing nuts
3	Retainer Clips with threaded nut and wing bolts
4	Insulation layers as required by UL or ITS Listings
5	FastDoor XL; 1-1/2 inch thick single layer insulation

FastDoor XL1 Access Doors Sizes	
Available Opening Sizes	Ordering Code
10" x 4" Door Opening	*434-6970-033-99X1
10" x 6" Door Opening	434-6970-034-99X1
12" x 8" Door Opening	434-6970-035-99X1
12" x 12" Door Opening	434-6970-036-99X1
16" x 12" Door Opening	434-6970-037-99X1
20" x 20" Door Opening	434-6970-038-99X1
*Special Order; Curved and SS Available	

Commercial Kitchen Grease Duct Enclosure System
Air Ventilation Duct Enclosure System
1 Or 2 Or 3 Hour Shaft Alternative / Zero Clearance to Combustibles
2 and 3 Sided Wrap Detail for Attaching to Walls and/or Ceilings



Note: Ducts must be independently supported per code

LEGEND	
1	Rated Concrete floor/ceiling, or wall - with rating equal or greater than enclosure rating
2	Two layers of XL Insulation for Grease Duct Enclosures (install per UL G18)) One layer of XL Insulation for Air Ventilation Duct Enclosures (install per UL V19) Two layers of XL Insulation for 3-hr Air Ventilation Duct Enclosure (install per UL V2)
3	Concrete fastener system
4	3/16" (5) thick x 2" (50) -3" (75) wide bar stock perforated 12" (305) o.c.
5	8" (203) maximum Air Gap
6	Duct
7	Steel banding min. 1/2" (13) wide by 0.015" (0.4) thick.
8	Banding clip

The integrity of Morgan Thermal Ceramics duct systems is limited to the quality of the installation.
XL005-4

zebra
ZEBRA PROJECTS, INC.
14614 N KIERLAND BLVD, SUITE N 300
SCOTTSDALE, ARIZONA 85254
PHONE: 480.912.1169 www.zbr.co.uk

Consultant Logo:
INFRASTRUCTURE FACTOR CONSULTING, INC.
2361 Rosecrans Ave. Suite 368, El Segundo, CA 90245
P: 310.725.1500 F: 310.725.0215 www.iFactor.com

STORE NO: TX 1382

SHAKE SHACK
SHAKE SHACK - SUGAR LAND
2515 TOWN CENTER BOULEVARD,
SUGAR LAND, TX 77479

REVISION

△	DATE	DESCRIPTION
	10/01/21	PERMIT/BID
A	06/23/22	REVISION A
1	10/20/22	REVISION 1
2	12/01/22	REVISION 2

STATUS: PERMIT/BID

STATE OF TEXAS — OTHON ESTRADA, JR. — 141839 — LICENSED PROFESSIONAL ENGINEER — 09/30/2021

FIELD VERIFICATION:
The contractor shall verify all figured dimensions and condition at the project site and notify Zebra Projects, INC. of any dimensional errors, or omissions or discrepancies before beginning or fabricating any work. Do not scale these drawings.

SHEET NAME: **MECHANICAL GREASE DUCT DETAILS**

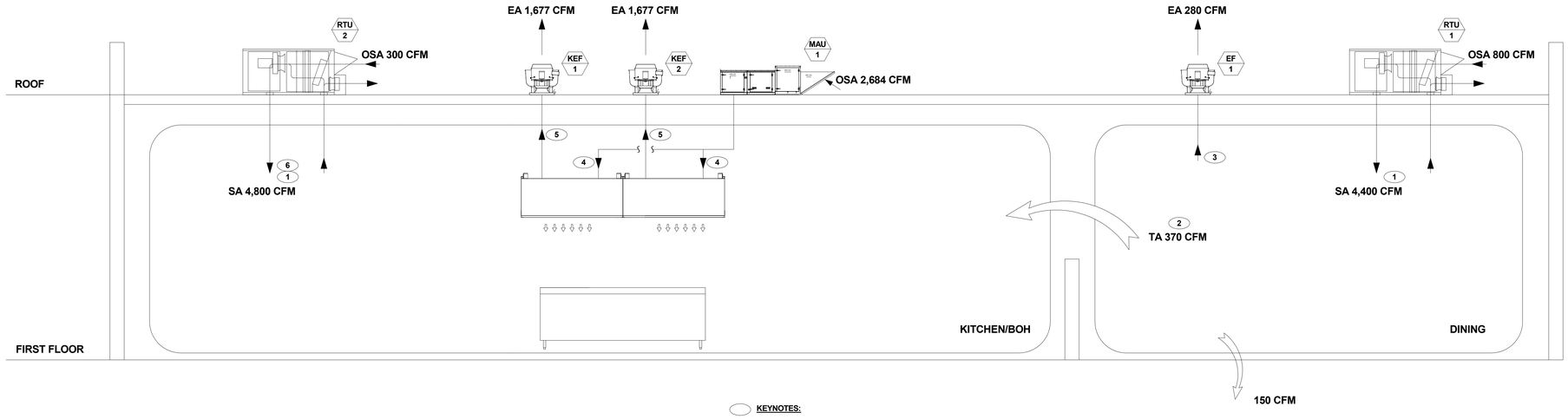
DATE: 06/23/22	PROJECT NO: 33875
DRAWN: AM	SCALE: NTS

SHEET NO: **M503**

AIR BALANCE TABLE AT DESIGN

	HVAC SUPPLY (CFM)	HVAC RETURN (CFM)	HVAC OSA (CFM)	HOOD OSA (CFM)	HOOD EXHAUST (CFM)	GENERAL EXHAUST (CFM)	AREA SERVED
RTU-1	4,400	3,600	800	-	-	-	DINING
RTU-2	4,800	4,500	300	-	-	-	BOH
MUA-1	-	-	-	2,684	-	-	KEH-1/2
KEF-1	-	-	-	-	1,677	-	KEH-1
KEF-2	-	-	-	-	1,677	-	KEH-2
EF-1	-	-	-	-	-	280	RESTROOMS
TOTAL	9,200	8,100	1,100	2,684	3,354	280	
OSA			3,784		-3,634		

TOTAL PRESSURIZATION DIFFERENCE = +150



KEYNOTES:

1. TOTAL OF AIR INLETS / OUTLETS.
2. TRANSFER AIR TO KITCHEN FROM ADJACENT SPACE.
3. TOTAL OF RESTROOM EXHAUST FANS.
4. MAKE UP AIR TO SUPPLY KITCHEN HOOD.
5. KITCHEN HOOD EXHAUST.
6. INCLUDES SUPPLY TO KITCHEN HOOD.

zebra

ZEBRA PROJECTS, INC.
14614 N KIERLAND BLVD. SUITE N 300
SCOTTSDALE, ARIZONA 85254

PHONE: 480.912.1169 www.zbr.co.uk

Consultant Logo:

INFRASTRUCTURE FACTOR CONSULTING, INC.
2361 Rosecrans Ave. Suite 368, El Segundo, CA 90245
P: 310.725.1500 F: 310.725.0215 www.iFactor.com

STORE NO:
TX 1382

SHAKE SHACK

SHAKE SHACK - SUGAR LAND
2515 TOWN CENTER BOULEVARD,
SUGAR LAND, TX 77479

REVISION

△	DATE	DESCRIPTION
	10/01/21	PERMIT/BID
A	06/23/22	REVISION A
1	10/20/22	REVISION 1
2	12/01/22	REVISION 2

STATUS:
PERMIT/BID

STATE OF TEXAS
OTHON ESTRADA, JR.
141839
LICENSED
PROFESSIONAL ENGINEER
06/23/2022

SHEET NAME:
MECHANICAL AIRFLOW DIAGRAMS

DATE: 06/23/22
PROJECT NO: 33875
DRAWN: AM
SCALE: 3/8" = 1'-0"

SHEET NO:
M601

GENERAL

1. ALL ROOF TOP UNITS SHALL SHUT DOWN UPON ALARM FROM KITCHEN EXHAUST HOOD FIRE EXTINGUISHING SYSTEM.

RTU-1 AND RTU-2

1. DURING OCCUPIED HOURS, UNITS SUPPLY FANS SHALL RUN CONTINUOUSLY AND OUTDOOR AIR DAMPER AND RETURN AIR DAMPER SET TO MINIMUM POSITION TO MAINTAIN MINIMUM VENTILATION.

2. WHEN FREE COOLING IS NOT AVAILABLE, THE COMPRESSORS WILL BE CONTROLLED BY THE ZONE THERMOSTAT. WHEN FREE COOLING IS AVAILABLE, THE OUTDOOR-AIR DAMPER IS MODULATED BY ECONOMIZER CONTROL TO PROVIDE A 50 DEG-F TO 55 DEG-F MIXED-AIR TEMPERATURE INTO THE ZONE. AS THE MIXED AIR TEMPERATURE FLUCTUATES ABOVE 55 DEG-F OR BELOW 50 DEG-F, DAMPERS WILL BE MODULATED (OPEN OR CLOSE) TO BRING THE MIXED-AIR TEMPERATURE BACK WITHIN CONTROL.

3. IF MECHANICAL COOLING IS UTILIZED WITH FREE COOLING, THE OUTDOOR-AIR DAMPER WILL MAINTAIN ITS CURRENT POSITION AT THE TIME THE COMPRESSOR IS STARTED. IF THE INCREASE IN COOLING CAPACITY CAUSES THE MIXED-AIR TEMPERATURE TO DROP BELOW 45 DEG-F, THEN THE OUTDOOR-AIR DAMPER POSITION WILL BE DECREASED TO THE MINIMUM POSITION. IF THE MIXED-AIR TEMPERATURE CONTINUES TO FALL, THE OUTDOOR-AIR DAMPER WILL CLOSE. CONTROL RETURNS TO NORMAL ONCE THE MIXED-AIR TEMPERATURE RISES ABOVE 48 DEG-F.

4. THE POWER EXHAUST FANS WILL BE ENERGIZED AND DE-ENERGIZED AS THE OUTDOOR-AIR DAMPER OPENS AND CLOSES. FOR ECONOMIZER OPERATION, THERE MUST BE A THERMOSTAT CALL FOR THE FAN.

5. IF THE UNIT IS OCCUPIED AND THE FAN IS ON, THE DAMPER WILL OPERATE AT MINIMUM POSITION. OTHERWISE, THE DAMPER WILL BE CLOSED. WHEN THE ECONOMIZER IS IN THE OCCUPIED MODE AND A CALL FOR COOLING EXISTS, THE CONTROL WILL FIRST CHECK FOR INDOOR FAN OPERATION. IF THE FAN IS NOT ON, THEN COOLING WILL NOT BE ACTIVATED.

6. IF THE FAN IS ON, THEN THE CONTROL WILL OPEN THE ECONOMIZER TO THE MINIMUM POSITION. IF FREE COOLING CAN BE USED AS DETERMINED FROM THE APPROPRIATE CHANGEOVER COMMAND (65°F DRY BULB), THEN THE CONTROL WILL MODULATE THE DAMPERS OPEN TO MAINTAIN THE MIXED-AIR TEMPERATURE SET-POINT AT 50 DEG-F TO 55 DEG-F. IF THERE IS A FURTHER DEMAND FOR, THEN THE CONTROL WILL BRING ON COMPRESSOR STAGE 1 TO MAINTAIN THE MIXED-AIR TEMPERATURE SET-POINT.

MAKE UP AIR UNIT (MAU-1)

1. MAKE-UP UNIT SUPPLY AIR FAN SHALL BE ENERGIZED AND THE OUTSIDE AIR DAMPER SHALL OPEN 100% WHEN EXHAUST FAN KEF-1 AND KEF-2 ARE ENERGIZED.

2. MAKE-UP UNIT SUPPLY AIR FAN SHALL BE DE-ENERGIZED BY ANY KITCHEN EXHAUST HOOD FIRE EXTINGUISHING SYSTEM, SMOKE DETECTOR ALARMS, OR UPON ALARM FROM DUCT MOUNTED SMOKE DETECTOR OF MAU-1.

3. MECHANICAL COOLING OR GAS HEAT SHALL ENABLE TO MAINTAIN THE DISCHARGE AIR TEMPERATURE BETWEEN 75 DEG-F (ADJ.) AND 60 DEG-F (ADJ.).

KITCHEN EXHAUST FANS (KEF-1 & KEF-2)

1. KEF-1 AND KEF-2 SHALL BE ENERGIZED BY CONTACTORS IN HOOD CONTROL PANEL. COORDINATE INSTALLATION WITH ELECTRICAL CONTRACTOR.

2. INTERLOCK THE MAKEUP AIR UNIT WITH KEF-1 AND KEF-2 SO THE MAKEUP AIR UNIT SUPPLY AIR FAN IS ENERGIZED WHEN THE EXHAUST FANS ARE ENERGIZED.

3. UPON ALARM FROM KITCHEN EXHAUST HOOD FIRE EXTINGUISHING SYSTEM, EXHAUST FANS SHALL CONTINUE TO RUN.

4. NORMAL TEMPERATURE TEST: EXHAUST FANS SHALL OPERATE CONTINUOUSLY WHILE EXHAUSTING AIR AT 300 DEG-F UNTIL ALL FAN PARTS HAVE REACHED THERMAL EQUILIBRIUM AND WITHOUT ANY DETERIORATING EFFECTS TO THE FAN WHICH WOULD CAUSE UNSAFE OPERATION.

RESTROOM EXHAUST FAN (EF-1)

1. EXHAUST FAN SHALL OPERATE CONTINUOUSLY DURING OCCUPIED HOURS AND SHALL BE SHUT DOWN DURING UNOCCUPIED HOURS.

KITCHEN EXHAUST HOODS (KEH-1 & KEH-2)

1. THE ELECTRICAL PACKAGE, TYPICALLY FP, IS DESIGNED TO THERMOSTATICALLY ACTIVATE THE EXHAUST FANS FOR AN EXHAUST HOOD WHENEVER ELEVATED TEMPERATURES ARE SENSED IN THE EXHAUST SYSTEM. THIS OPTION WILL MEET THE REQUIREMENTS OF BY PROVIDING A THERMOSTAT(S) MOUNTED IN THE DUCT OR HOOD RISER TO SENSE INCREASED EXHAUST TEMPERATURES.

2. CONTROLS SHALL BE LISTED BY ETL (UL 508A). THE CONTROL ENCLOSURE SHALL BE NEMA 1 RATED AND LISTED FOR INSTALLATION INSIDE OF THE EXHAUST HOOD UTILITY CABINET. THE CONTROL ENCLOSURE MAY BE CONSTRUCTED OF STAINLESS STEEL OR PAINTED STEEL.

3. TEMPERATURE PROBES(S) LOCATED IN THE DUCT RISER SHALL BE CONSTRUCTED OF STAINLESS STEEL.

4. A ROOM TEMPERATURE SENSOR IS ALSO PROVIDED FOR FIELD INSTALLATION IN THE KITCHEN SPACE IN ORDER TO START THE FAN(S) BASED ON THE TEMPERATURE DIFFERENTIAL BETWEEN THE ROOM AND THE EXHAUST AIR IN THE DUCT, RATHER THAN FIXED SET-POINTS. THE SYSTEM IS FACTORY PRE-SET TO ACTIVATE THE FANS AT 10 DEG-F ABOVE THE ROOM TEMPERATURE.

5. ONCE THE DUCT TEMPERATURE REACHES THE ACTIVATION POINT, THE EXHAUST FANS WILL BE ACTIVATED. THE CONTROLS ALSO PROVIDE HYSTERESIS TO PREVENT CYCLING OF THE FANS AFTER THE COOKING APPLIANCES HAVE BEEN TURNED OFF AND THE HEAT IN THE EXHAUST SYSTEM IS REDUCED. THE HYSTERESIS IS FACTORY SET 2 DEGREES AND WILL KEEP THE EXHAUST RUNNING UNTIL THE TEMPERATURE FALLS 2 DEGREES BELOW THE ACTIVATION SET POINT. A HYSTERESIS TIMER ALSO EXISTS TO KEEP THE FANS RUNNING FOR AT LEAST 30 MIN AFTER BEING ACTIVATED BY THE TEMPERATURE RISE.

6. THE ACTIVATION AND HYSTERESIS SETTINGS MAY BE FIELD ADJUSTED ON THE BOARD LCD INTERFACE LOCATED INSIDE THE CONTROL ENCLOSURE TO MEET APPLICATION NEEDS. THE PANEL IS FACTORY CONFIGURED TO SHUT DOWN SUPPLY FANS, TURN ON THE EXHAUST FANS AND TURN OFF THE HOOD LIGHTS IN A FIRE CONDITION.

SEQUENCE OF OPERATION | 1

zebra

ZEBRA PROJECTS, INC.
14614 N KIERLAND BLVD. SUITE N 300
SCOTTSDALE, ARIZONA 85254

PHONE: 480.912.1169 www.zbr.co.uk

Consultant Logo:

INFRASTRUCTURE FACTOR CONSULTING, INC.
2361 Rosecrans Ave. Suite 368, El Segundo, CA 90245
P: 310.725.1500 F: 310.725.0215 www.iFactor.com

STORE NO:
TX 1382

SHAKE SHACK

SHAKE SHACK - SUGAR LAND
2515 TOWN CENTER BOULEVARD,
SUGAR LAND, TX 77479

REVISION

	DATE	DESCRIPTION
△	10/01/21	PERMIT/BID
A	06/23/22	REVISION A
1	10/20/22	REVISION 1
2	12/01/22	REVISION 2	

STATUS:
PERMIT/BID

STATE OF TEXAS
OTHON ESTRADA, JR.
141839
LICENSED
PROFESSIONAL ENGINEER
09/30/2021

FIELD VERIFICATION:
The contractor shall verify all figured dimensions and condition at the project site and notify Zebra Projects, INC. of any dimensional errors, or omissions or discrepancies before beginning or fabricating any work. Do not scale these drawings.

SHEET NAME:
CONTROLS

DATE: 06/23/22
PROJECT NO: 33875
DRAWN: AM
SCALE: 3/8" = 1'-0"

SHEET NO:
M602

SPECIFICATION TABLE OF CONTENTS

SECTION 230000 - ENERGY CONSERVATION

A. HVAC SYSTEMS AND EQUIPMENT CAPACITIES DO NOT EXCEED CALCULATED LOADS.

B. THEROMSTATIC CONTROLS.
1. THERMOSTATIC CONTROLS SHALL HAVE A 5 DEG-F DEADBAND.
2. THERMOSTATIC CONTROLS SHALL BE CAPABLE OF OPERATING THE DOWN TO 55 DEF-F OR UP TO 85 DEG-F.
3. EACH ZONE SHALL BE PROVIDED WITH AUTOMATIC TIME CLOCK OR PROGRAMMABLE CONTROLS FOR STARTING AND STOPPING THE SYSTEM FOR SEVERN DIFFERENT DAILY SCHEDULES PER WEEK.

SECTION 230500 - COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. DRAWINGS AND GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND SUPPLEMENTARY CONDITIONS, AND DIVISION-1 SPECIFICATION SECTIONS, APPLY TO THIS SECTION.

1.2 SCOPE OF WORK

A. PROVIDE LABOR, INCLUDING FIELD ERECTION AND SUPERVISION, MATERIALS, EQUIPMENT AND ANCILLARIES, AND COORDINATE, PROCURE, FABRICATE, DELIVER, ERECT OR INSTALL, INTERFACE WITH EXISTING WORK, START, DEBUG AND TEST ALL SYSTEMS AS NECESSARY TO PROVIDE THE OWNER WITH A COMPLETE OPERATING FACILITY IN CONFORMANCE WITH THE CONTRACT DOCUMENTS AND IN CONFORMITY WITH REQUIREMENTS OF ALL AUTHORITIES HAVE JURISDICTION.

B. THE WORK SHALL INCLUDE, BUT NOT BE LIMITED TO, THE FOLLOWING:
1. DEMOLITION AND REMOVAL OF MECHANICAL WORK
2. DUCTWORK AND AIR OUTLETS.
3. AIR-CONDITIONING AND EXHAUST SYSTEMS.
4. KITCHEN HOOD AND EXHAUST SYSTEMS.
5. MAKEUP AIR SYSTEMS.
6. THERMAL INSULATION.
7. COORDINATION WITH OTHER TRADES FOR LOCATION OF DUCTWORK AND TO INFORM THE GENERAL CONTRACTOR (VIA DIMENSIONAL DRAWINGS) OF THE EXACT SIZE AND LOCATION OF ALL ROOF AND WALL OPENINGS.
8. MISCELLANEOUS STEEL WORK, SUPPORTS AND HANGERS AND CUTTING AND PATCHING OF ROOF, WALLS AND PARTITIONS.
9. RECORD DRAWINGS.
10. CONTROLS.
11. TESTING, ADJUSTING, AND BALANCING.

C. RELATED WORK INCLUDED IN THIS SECTION AND IN OTHER SECTIONS.
1. GENERAL CONTRACTOR IS RESPONSIBLE FOR ALL WORK DESCRIBED IN THE CONSTRUCTION DOCUMENTS.
2. REFER TO THE RESPONSIBILITY MATRIX FOR ADDITIONAL INFORMATION.

1.3 SUBMITTALS

A. PROVIDE CONTRACTOR SUBMITTAL MATERIAL WITH DESCRIPTIVE DATA FOR ALL PRODUCTS AND MATERIALS, INCLUDING BUT NOT LIMITED TO THE FOLLOWING, PRIOR TO INSTALLATION. ALL SUBMITTALS SHALL BE HIGHLIGHTED TO INDICATE SPECIFIC PRODUCTS OR MATERIALS BEING USED. ALLOW MIN 5 DAYS FOR ENGINEER TO REVIEW SUBMITTALS.
1. COORDINATED LAYOUT PLANS, SHOWING WORK OF ALL TRADES, INCLUDING BUT NOT LIMITED TO DUCTWORK; HVAC, REFRIGERANT, PLUMBING, FIRE PROTECTION PIPING; ELECTRICAL CONDUITS AND BUS DUCTS; EQUIPMENT. DRAWINGS SHALL BE 1/4 SCALE.
2. DUCTWORK ACCESSORIES.
3. DUCTWORK TYPICAL CONSTRUCTION.
4. DUCT SEALING.
5. REFRIGERANT PIPING.
6. DAMPERS.
7. DIFFUSERS, GRILLES AND REGISTERS.
8. CERTIFIED ACOUSTICAL TEST PERFORMANCE DATA FOR DIFFUSERS, REGISTERS, GRILLES AND TERMINAL AIR UNITS.
9. AIR AND WATER TEST AND BALANCE.
10. COMPLETE FORMS PROPOSED FOR USE IN COMPILING AND RECORDING TEST AND BALANCE DATA.
11. CONTROL DEVICES AND SYSTEMS.
12. CONTROL SEQUENCE AND SYSTEM DRAWINGS.
13. FIRE PROTECTION SYSTEM LAYOUTS IN CODE COMPLIANCE.
14. VIBRATION ISOLATION.
15. ONE SET OF AS-BUILT REPRODUCIBLE DRAWINGS.

B. PROVIDE 1 COPY OF APPROVED SUBMITTALS TO THE OFFICE OF THE BUILDING ENGINEER.

1.4 PRODUCT SUBSTITUTIONS

A. THE CONTRACTOR SHALL CERTIFY THE FOLLOWING ITEMS ARE CORRECT WHEN USING SUBSTITUTED PRODUCTS OTHER THAN THOSE SCHEDULED OR SHOWN ON THE DRAWINGS AS A BASIS OF DESIGN:
1. THE PROPOSED SUBSTITUTION DOES NOT AFFECT DIMENSIONS SHOWN ON DRAWINGS.
2. THE CONTRACTOR SHALL PAY FOR CHANGES TO BUILDING DESIGN, INCLUDING ENGINEERING DESIGN, DETAILING, STRUCTURAL SUPPORTS, AND CONSTRUCTION COSTS CAUSED BY PROPOSED SUBSTITUTION.
3. THE PROPOSED SUBSTITUTION HAS NO ADVERSE EFFECT ON OTHER TRADES, CONSTRUCTION SCHEDULE, OR SPECIFIED WARRANTY REQUIREMENTS.
4. MAINTENANCE AND SERVICE PARTS AVAILABLE LOCALLY ARE READILY OBTAINABLE FOR THE PROPOSED SUBSTITUTE.

B. THE CONTRACTOR FURTHER CERTIFIES FUNCTION, APPEARANCE, AND QUALITY OF PROPOSED SUBSTITUTION ARE EQUIVALENT OR SUPERIOR TO SPECIFIED ITEM.

C. THE CONTRACTOR AGREES THAT THE TERMS AND CONDITIONS FOR THE SUBSTITUTED PRODUCT THAT ARE FOUND IN THE CONTRACT DOCUMENTS APPLY TO THIS PROPOSED SUBSTITUTION.

1.5 MAINTENANCE MANUALS AND AS-BUILT DRAWINGS

A. PROVIDE FOUR (4) COPIES OF OPERATING AND MAINTENANCE MANUAL FOR OWNER'S USE FOR EACH PIECE OF EQUIPMENT WITHIN 90 DAYS OF ACCEPTANCE. EACH ITEM SHALL BE CROSS-REFERENCED AND NUMBERED WITH AS-BUILT DRAWING DESCRIPTIONS.

B. SOFT COPY OF AS-BUILT DRAWINGS ON AUTOCAD AND PDF AND ONE SET OF HARD COPY SHALL BE DELIVERED TO OWNER WITHIN 90 DAYS OF SYSTEM ACCEPTANCE.

1.6 GUARANTEES

A. GUARANTEE: ALL MATERIALS, APPARATUS AND WORKMANSHIP INSTALLED UNDER THIS SECTION SHALL BE UNCONDITIONALLY GUARANTEED FOR A PERIOD OF ONE YEAR FROM THE DATE OF ACCEPTANCE OF WORK BY THE OWNER AGAINST FAILURE DUE TO FAULTY MATERIAL OR WORKMANSHIP. THE CONTRACTOR SHALL CORRECT DEFECTS AT NO ADDITIONAL COST TO THE OWNER. LABOR AND REPLACEMENT OF PARTS TO BE ACCOMPLISHED AT NO COST TO OWNER.

1.7 SEISMIC SUPPORT

A. CONTRACTOR SHALL SUPPORT AND BRACE ALL NEW HVAC, PLUMBING AND FIRE PROTECTION SYSTEMS IN ACCORDANCE WITH REQUIREMENTS SPECIFIED.

1.8 PRODUCT HANDLING

A. PROTECTION: PROTECT MATERIALS AND EQUIPMENT FROM DAMAGE DURING SHIPPING, STORAGE AND HANDLING. REMOVE FROM THE SITE ANY WET OR DAMAGED DUCT LINER OR INSULATION.

B. STORAGE: WHERE POSSIBLE, STORE MATERIALS AND EQUIPMENT INSIDE AND PROTECT FROM THE WEATHER. WHERE NECESSARY TO STORE OUTSIDE, STORE ABOVE GRADE AND ENCLOSE WITH WATERPROOF WRAPPING.

C. REPLACEMENT: IN THE EVENT OF DAMAGE, IMMEDIATELY REPAIR ALL DAMAGED AND DEFECTIVE WORK TO THE APPROVAL OF THE ENGINEER AT NO ADDITIONAL COST TO THE OWNER.

1.9 CONTRACT DRAWINGS

A. CONTRACT DRAWINGS FOR MECHANICAL WORK ARE DIAGRAMMATIC, INTENDED TO CONVEY THE SCOPE OF THE WORK AND INDICATE GENERAL ARRANGEMENT OF EQUIPMENT, DUCTS, PIPING AND APPROXIMATE SIZES AND LOCATIONS OF EQUIPMENT AND OUTLETS. DO NOT SCALE DRAWINGS FOR MEASUREMENTS.

B. CONSULT KITCHEN, MECHANICAL, PLUMBING, ARCHITECTURAL, STRUCTURAL AND ELECTRICAL CONTRACT DRAWINGS AND SPECIFICATIONS TO BECOME FAMILIAR WITH ALL CONDITIONS AFFECTING THE WORK, COORDINATE INTERCONNECTING WORK WITH OTHER TRADES AFFECTED, AND VERIFY ALL SPACES IN WHICH THE WORK WILL BE INSTALLED.

C. WHERE JOB CONDITIONS REQUIRE REASONABLE CHANGES IN ORDER TO COORDINATE INSTALLATION WITH OTHER TRADES, THESE CHANGES SHALL BE MADE WITHOUT EXTRA COST TO THE OWNER.

1.10 DEMOLITION

A. PROTECT ADJACENT MATERIALS INDICATED TO REMAIN. INSTALL AND MAINTAIN DUST AND NOISE BARRIERS TO KEEP DIRT, DUST, AND NOISE FROM BEING TRANSMITTED TO ADJACENT AREAS. REMOVE PROTECTION AND BARRIERS AFTER DEMOLITION OPERATIONS ARE COMPLETE.

B. LOCATE, IDENTIFY, AND PROTECT MECHANICAL SERVICES PASSING THROUGH DEMOLITION AREA AND SERVING OTHER AREAS OUTSIDE THE DEMOLITION LIMITS. MAINTAIN SERVICES TO AREAS OUTSIDE DEMOLITION LIMITS. WHEN SERVICES MUST BE INTERRUPTED, INSTALL TEMPORARY SERVICES FOR AFFECTED AREAS.

C. MATERIALS AND EQUIPMENT TO BE SALVAGED: REMOVE, DEMOUNT, AND DISCONNECT EXISTING MECHANICAL MATERIALS AND EQUIPMENT INDICATED TO BE REMOVED AND SALVAGED, AND DELIVER MATERIALS AND EQUIPMENT TO THE ONWER.

D. REPAIR OR REPLACE EQUIPMENT OR MATERIALS DAMAGED DURING DEMOLITION TO SATISFACTION OF OWNER'S DESIGNATED REPRESENTATIVE.

1.11 INTERRUPTION OF EXISTING UTILITY SERVICE:

A. COORDINATE THE SHUT-OFF AND DISCONNECTION OF UTILITY SERVICES WITH THE OWNER AND THE UTILITY COMPANY.

B. NOTIFY THE OWNER'S REPRESENTATIVE OWNER'S PROJECT REPRESENTATIVE AT LEAST 5 DAYS PRIOR TO COMMENCING DEMOLITION OPERATIONS.

1.12 SCHEDULING:

A. SUBMIT SCHEDULES INDICATING PROPOSED METHODS AND SEQUENCE OF OPERATIONS FOR DEMOLITION PRIOR TO COMMENCEMENT OF WORK. INCLUDE COORDINATION FOR SHUT-OFF OF UTILITY SERVICES AND DETAILS FOR DUST AND NOISE CONTROL.

B. COORDINATE SEQUENCING WITH CONSTRUCTION PHASING AND OWNER OCCUPANCY.

1.13 MAINTENANCE OF EXISTING UTILITY SERVICES

A. UNINTERRUPTED NORMAL USE OF THE EXISTING FACILITIES MUST BE MAINTAINED DURING THE TIME REQUIRED TO PERFORM THE COMPLETE INSTALLATION OF THE WORK INDICATED IN THE CONTRACT DOCUMENTS. IT IS MANDATORY THAT THE EXISTING BUILDINGS BE MAINTAINED IN SERVICE.

B. INVESTIGATE EXISTING CONDITIONS AND THE LOCATION OF ALL EXISTING EQUIPMENT AND THE LOCATION OF ALL EXISTING SERVICES BEFORE STARTING.

C. IF A SERVICE IS DISTURBED, IMMEDIATELY WITHOUT REGARD FOR WORKING HOURS, PLACE THE SERVICE BACK INTO OPERATION.

D. SUFFICIENT ADVANCE NOTICE SHALL BE GIVEN TO THE OWNER AND ITS PERMISSION OBTAINED PRIOR TO INTERRUPTION OF PRESENT SERVICES. IT SHOULD BE ASSUMED THAT DISRUPTION OF UTILITIES AND SERVICES WILL BE DONE AT OTHER THAN NORMAL WORKING HOURS. NO ADDITIONAL OR EXTRA PAYMENT WILL BE AUTHORIZED TO COMPLY WITH THESE REQUIREMENTS.

E. REPAIR, REPLACE AND MAINTAIN IN SERVICE ANY UTILITIES, FACILITIES, OR SERVICES (UNDERGROUND, OVERGROUND, INTERIOR OR EXTERIOR) DAMAGED, BROKEN OR OTHERWISE RENDERED INOPERATIVE DURING THE COURSE OF CONSTRUCTION IN THE EXISTING BUILDING.

F. ALL OPENINGS MUST BE SECURELY COVERED, OR OTHERWISE PROTECTED, TO PREVENT INJURY DUE TO CARELESSLY OR MALICIOUSLY DROPPED TOOLS OR MATERIALS, GRIT, DIRT, OR ANY FOREIGN MATTER. DAMAGED WORK SHALL BE REPAIRED OR REPLACED UNTIL WORK IS FULLY AND FINALLY ACCEPTED.

G. PROTECT HEATING EQUIPMENT AND ALL SIMILAR ITEMS OF EQUIPMENT FROM DIRT, GRIME, PLASTER, PAINT AND WATER DURING ALL PHASES OF CONSTRUCTION. THIS PROTECTION SHALL BE PROVIDED BY COVERING WITH TRANSPARENT PLASTIC SHEETING.

H. MAKE ALL CONNECTIONS TO EXISTING SYSTEM PIPING AND EQUIPMENT SYSTEMS DURING DESIGNATED PERIODS UPON APPROVAL OF THE OWNER AND AT NO INCREASE IN THE CONTRACT SUM.

I. DO NOT INTERRUPT EXISTING UTILITIES UTILIZED BY THE OWNER, EXCEPT AS APPROVED BY THE OWNER. INTERRUPTIONS MUST BE SCHEDULED TO SUIT THE OWNER'S REQUIREMENTS.

J. VERIFY ALL EXISTING WORK. WHERE EXISTING CONNECTIONS ARE PARTIAL, PROVIDE ALL NECESSARY MATERIALS, LABOR AND EQUIPMENT REQUIRED TO MODIFY EXISTING WORK. IN ADDITION, MAINTAIN INTEGRITY OF THE EXISTING SYSTEMS. RECTIFY ANY CONTAMINATION, DEGRADATION OF CLEANLINESS OR DAMAGE TO THE EXISTING SYSTEMS TO THE SATISFACTION OF THE OWNER.

1.14 INSTALLATION OF THE WORK

A. THE CONTRACT DRAWINGS INDICATE THE GENERAL ARRANGEMENTS FOR THE HVAC, KITCHEN, PLUMBING, AND FIRE PROTECTION SYSTEMS.
1. DRAWINGS ARE DIAGRAMMATIC AND DO NOT INDICATE NECESSARY OFFSETS, OBSTRUCTIONS OR STRUCTURAL CONDITIONS.
2. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO INSTALL THE WORK IN SUCH A MANNER THAT IT WILL BE AT THE HIGHEST ELEVATION POSSIBLE, CONFORM TO THE STRUCTURE, AVOID OBSTRUCTIONS, MAINTAIN HEADROOM, LEAVE ADEQUATE CLEARANCES FOR LIGHT FIXTURES, RETURN AIR PATHWAYS, MAINTENANCE AND REPAIRS, AND PROVIDE CLEARANCE AND ACCESS AS REQUIRED BY CODES. NOTHING SHALL BE INSTALLED BELOW CEILING LEVEL WITHOUT ARCHITECT'S WRITTEN CONSENT.
3. ABOVE ITEMS TO BE PERFORMED AT NO ADDITIONAL COST TO THE OWNER.
4. PROCEED AS RAPIDLY AS THE BUILDING CONSTRUCTION WILL PERMIT.
5. THOROUGHLY CLEAN ITEMS BEFORE INSTALLATION. CAP OPENINGS TO EXCLUDE DIRT UNTIL FINAL CONNECTIONS HAVE BEEN MADE.
6. CUT MATERIALS ACCURATELY, WORK INTO PLACE WITHOUT SPRINGING OR FORCING, PROPERLY CLEAR WINDOWS, DOORS AND OTHER OPENINGS. EXCESSIVE CUTTING OR OTHER WEAKENING OF THE BUILDING STRUCTURE WILL NOT BE PERMITTED.
7. MANUFACTURER'S DRAWINGS AND INSTRUCTIONS SHALL BE FOLLOWED IN ALL CASES WHERE THE MAKERS OF DEVICES AND EQUIPMENT FURNISH DIRECTIONS OR DETAILS NOT SHOWN ON THE DRAWINGS OR DESCRIBED IN THE SPECIFICATIONS.
8. DRAWINGS ARE NOT INTENDED TO BE SCALED, BUT SHALL BE FOLLOWED WITH SUFFICIENT ACCURACY TO COORDINATE WITH OTHER WORK AND STRUCTURAL LIMITATIONS.
9. SEISMIC DESIGN: THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ANCHORS, SUPPORTS AND CONNECTIONS OF MECHANICAL WORK TO THE BUILDING STRUCTURE TO PREVENT DAMAGE AS A RESULT OF AN EARTHQUAKE, INCLUDING MANUFACTURED EQUIPMENT, THE CONNECTION AND INTEGRITY OF SHOP FABRICATED AND FIELD FABRICATED MATERIALS AND EQUIPMENT. ALL SUPPORTS, EQUIPMENT AND CONNECTIONS THERETO SHALL BE DESIGNED TO CONFORM TO REQUIREMENTS OF THE CALIFORNIA ADMINISTRATIVE CODE, OR OTHER GOVERNING CODES.
10. ALL WORK SHALL BE PROPERLY SUPPORTED FROM BUILDING STRUCTURE AND/OR FRAMING IN AN APPROVED MANNER, INDEPENDENT OF THE CEILING SUPPORT SYSTEM. WHERE OVERHEAD CONSTRUCTION DOES NOT PERMIT DIRECT FASTENING OF SUPPORTS, FURNISH ADDITIONAL FRAMING.
11. ALL EQUIPMENT SHALL BE SECURELY FASTENED TO BUILDING CONSTRUCTION WITH APPROVED SUPPORTS.
12. REFER TO ARCHITECTURAL DRAWINGS FOR EXACT LOCATION OF DIFFUSERS, GRILLES, REGISTERS, AND THERMOSTATS (IF DEPICTED). IF THERMOSTATS ARE NOT DEPICTED SPECIFICALLY ON ARCHITECT'S DRAWINGS, OBTAIN ARCHITECT'S APPROVAL FOR LOCATIONS PRIOR TO INSTALLATION.
13. COORDINATE THE WORK OF THIS SECTION WITH THE WORK OF OTHER SECTIONS IN AMPLE TIME FOR PROPER INSTALLATION AND CONNECTION.
14. CAREFULLY CHECK SPACE REQUIREMENTS, INCLUDING SERVICING SPACE REQUIREMENTS, WITH OTHER SECTIONS TO ENSURE THAT ALL EQUIPMENT AND MATERIALS CAN BE INSTALLED IN THE SPACES ALLOTTED THERETO.
15. PREPARE DRAWINGS, ATTEND MEETINGS, OBTAIN ALL APPROVALS REQUIRED BY ALL AUTHORITIES HAVING JURISDICTION, CONDUCT REQUIRED TESTS AND OBTAIN REQUIRED PERMITS.

B. GENERAL:
1. PAINTING
a. PAINT:
1) BEST GRADE FOR ITS PURPOSE.
2) DELIVER IN ORIGINAL SEALED CONTAINERS.
3) APPLY IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
4) COLORS: TO MATCH EXISTING OR AS SELECTED BY ENGINEER.
b. GALVANIZED IRON PRIMER.
c. HOT DIPPED GALVANIZED OR DIPPED IN ZINC CHROMATE.
d. ZINC CHROMATE WITH FINISH TO MATCH SURROUNDINGS.
2. CLEANING:
a. BRUSH AND CLEAN WORK PRIOR TO CONCEALING, PAINTING AND ACCEPTANCE.
b. PAINTED EXPOSED WORK SOILED OR DAMAGED: CLEAN AND REPAIR TO MATCH ADJOINING WORK BEFORE FINAL ACCEPTANCE.
c. REMOVE DEBRIS FROM INSIDE AND OUTSIDE OF MATERIAL AND EQUIPMENT.
3. CUTTING AND PATCHING: AS REQUIRED FOR NEW WORK

1.15 CONTROL AND DEVICES

A. ALL CONTROL DEVICES NOT SPECIFIED TO BE FURNISHED AND INSTALLED UNDER THE ELECTRICAL SECTIONS SHALL BE PROVIDED UNDER THIS SECTION.

1.16 PROJECT CLOSE-OUT

A. AFTER FINAL OPERATION FOR INSPECTION AND ACCEPTANCE DELIVER ALL COPIES OF OPERATION INSTRUCTIONS, MAINTENANCE MANUALS AND PARTS DESCRIPTIONS TO THE ENGINEER.

B. ALL TOOLS SUPPLIED WITH THE EQUIPMENT FOR MAINTENANCE SHALL BE TAGGED AND TEMPORARILY SECURED TO THE UNIT, OR TURNED OVER TO THE OWNER.

1.17 ELECTRICAL

A. GENERAL:
1. ALL ELECTRICAL MATERIAL, EQUIPMENT, AND APPARATUS SPECIFIED HEREIN SHALL CONFORM TO THE REQUIREMENTS OF DIVISION 26. REFER TO THE RESPONSIBILITY MATRIX FOR ADDITIONAL INFOMRATION.
2. PROVIDE ALL MOTORS FOR EQUIPMENT SPECIFIED HEREIN. PROVIDE MOTOR STARTERS, CONTROLLERS, AND OTHER ELECTRICAL APPARATUS AND WIRING WHICH ARE REQUIRED FOR THE OPERATION OF THE EQUIPMENT SPECIFIED HEREIN.
3. SET AND ALIGN ALL MOTORS AND DRIVES IN EQUIPMENT SPECIFIED HEREIN.
4. SPECIFIC ELECTRICAL REQUIREMENTS (I.E., HORSEPOWER AND ELECTRICAL CHARACTERISTICS) FOR MECHANICAL EQUIPMENT ARE SCHEDULED ON THE DRAWINGS.

B. QUALITY ASSURANCE:
1. ELECTRICAL COMPONENTS AND MATERIALS SHALL BE UL OR ETL LISTED/LABELED AS SUITABLE FOR LOCATION AND USE - NO EXCEPTIONS.

C. STARTERS AND ELECTRICAL DEVICES:
1. MOTOR STARTER CHARACTERISTICS:
a. ENCLOSURES: NEMA 1, GENERAL PURPOSE ENCLOSURES WITH PADLOCK EARS, EXCEPT IN WET LOCATIONS SHALL BE NEMA 3R WITH CONDUIT HUBS.
b. TYPE AND SIZE OF STARTER SHALL BE AS RECOMMENDED BY MOTOR MANUFACTURER AND THE DRIVEN EQUIPMENT MANUFACTURER FOR APPLICABLE PROTECTION AND START UP CONDITION.
2. MANUAL SWITCHES SHALL HAVE PILOT LIGHTS AND ALL REQUIRED SWITCH POSITIONS FOR MULTI SPEED MOTORS. OVERLOAD PROTECTION: MELTING ALLOY OR BI METALLIC TYPE THERMAL OVERLOAD RELAYS, SIZED ACCORDING TO ACTUAL OPERATING CURRENT (FIELD MEASURED).
3. MAGNETIC STARTERS:
a. HEAVY DUTY, OIL RESISTANT, HAND-OFF-AUTO (HOA), OR AS INDICATED, AND PILOT LIGHTS, PROPERLY ARRANGED FOR SINGLE SPEED OR MULTI SPEED OPERATION AS INDICATED.
b. TRIP FREE THERMAL OVERLOAD RELAYS, EACH PHASE, SIZED ACCORDING TO ACTUAL OPERATING CURRENT (FIELD MEASURED).
c. INTERLOCKS, PNEUMATIC SWITCHES AND SIMILAR DEVICES AS REQUIRED FOR COORDINATION WITH CONTROL REQUIREMENTS OF DIVISION 23 CONTROLS SECTIONS.
d. BUILT IN PRIMARY AND SECONDARY FUSED CONTROL CIRCUIT TRANSFORMER, SUPPLIED FROM LOAD SIDE OF EQUIPMENT DISCONNECT.
e. EXTERNALLY OPERATED MANUAL RESET.
f. UNDER VOLTAGE RELEASE OR PROTECTION FOR ALL MOTORS OVER 20 HP.
4. MOTOR CONNECTIONS: LIQUID TIGHT, FLEXIBLE CONDUIT, EXCEPT WHERE PLUG IN ELECTRICAL CORDS ARE SPECIFICALLY INDICATED.

D. LOW VOLTAGE CONTROL WIRING:
1. GENERAL: 14 GAUGE, TYPE THHN, COLOR CODED, INSTALLED IN CONDUIT.
2. MANUFACTURER: GENERAL CABLE CORP., ALCAN CABLE, AMERICAN INSULATED WIRE CORP., SENATOR WIRE AND CABLE CO., OR SOUTHWIRE CO.

E. DISCONNECT SWITCHES:
1. FUSIBLE SWITCHES: FOR EQUIPMENT 1/2 HP OR LARGER, PROVIDE FUSED, EACH PHASE; HEAVY DUTY; HORSEPOWER RATED; SPRING LOADED QUICK MAKE, QUICK BREAK MECHANISM; DEAD FRONT LINE SIDE SHIELD; SOLDERLESS LUGS SUITABLE FOR COPPER OR ALUMINUM CONDUCTORS; SPRING REINFORCED FUSE CLIPS; ELECTRO SILVER PLATED CURRENT CARRYING PARTS; HINGED DOORS; OPERATING LEVER ARRANGED FOR LOCKING IN THE "OPEN" POSITION; ARC QUENCHERS; CAPACITY AND CHARACTERISTICS AS INDICATED.
2. NON FUSIBLE SWITCHES: FOR EQUIPMENT LESS THAN 1/2 HORSEPOWER, SWITCH SHALL BE HORSEPOWER RATED; TOGGLE SWITCH TYPE WITH THERMAL OVERLOAD QUANTITY OF POLES AND VOLTAGE RATING AS REQUIRED.

PART 2 - EXECUTION

2.1 GENERAL

A. WORKMANSHIP SHALL BE PERFORMED BY LICENSED JOURNEYMEN OR MASTER MECHANICS AND SHALL RESULT IN AN INSTALLATION CONSISTENT WITH THE BEST PRACTICES OF TRADES.

B. INSTALL WORK UNIFORM, LEVEL AND PLUMB, IN RELATIONSHIP TO LINES OF BUILDING. DO NOT INSTALL ANY DIAGONAL OR OTHERWISE IRREGULAR WORK UNLESS SO INDICATED ON DRAWINGS OR APPROVED BY ARCHITECT.

2.2 MANUFACTURER'S DIRECTIONS

A. FOLLOW MANUFACTURERS' DIRECTIONS AND RECOMMENDATIONS IN ALL CASES WHERE THE MANUFACTURERS OF ARTICLES USED ON THIS CONTRACT FURNISH DIRECTIONS COVERING POINTS NOT SHOWN ON THE DRAWINGS OR COVERED IN THESE SPECIFICATIONS.

2.3 INSTALLATION

A. COORDINATE THE WORK BETWEEN THE VARIOUS MECHANICAL SECTIONS AND WITH THE WORK SPECIFIED UNDER OTHER DIVISIONS. IF ANY COOPERATIVE WORK MUST BE ALTERED DUE TO LACK OF PROPER SUPERVISION OR FAILURE TO MAKE PROPER AND TIMELY PROVISIONS, THE ALTERNATIONS SHALL BE MADE TO THE SATISFACTION OF THE ENGINEER AND AT THE CONTRACTOR'S COST. COORDINATE WALL AND CEILING WORK WITH THE GENERAL CONTRACTOR, AND HIS SUBCONTRACTORS IN LOCATING CEILING AIR OUTLETS, WALL REGISTERS, ETC.

B. INSPECT ALL MATERIAL, EQUIPMENT, AND APPARATUS UPON DELIVERY AND DO NOT INSTALL ANY DAMAGED OR DEFECTED MATERIALS

2.4 ELECTRICAL REQUIREMENTS

A. MECHANICAL CONTRACTOR SHALL COORDINATE WITH DIVISION 26 WORK TO PROVIDE COMPLETE SYSTEMS AS REQUIRED TO OPERATE ALL MECHANICAL DEVICES INSTALLED UNDER THIS DIVISION OF WORK.

B. INSTALLATION OF ELECTRICAL CONNECTIONS: FURNISH, INSTALL, AND WIRE (EXCEPT AS MAY BE OTHERWISE INDICATED) ALL HEATING, VENTILATING, AIR CONDITIONING, PLUMBING AND FIRE PROTECTION, ETC., MOTORS AND CONTROLS IN ACCORDANCE WITH THE FOLLOWING SCHEDULE AND IN ACCORDANCE WITH EQUIPMENT MANUFACTURER'S WRITTEN INSTRUCTIONS AND WITH RECOGNIZED INDUSTRY PRACTICES, AND COMPLYING WITH APPLICABLE REQUIREMENTS OF UL, NEC, AND NECA'S "STANDARD OF INSTALLATION" TO ENSURE THAT PRODUCTS FULFILL REQUIREMENTS. CAREFULLY COORDINATE WITH WORK PERFORMED UNDER THE MECHANICAL DIVISION OF THESE SPECIFICATIONS.

C. DIVISION 23 HAS RESPONSIBILITIES FOR ELECTRICALLY POWERED OR CONTROLLED MECHANICAL EQUIPMENT WHICH IS SPECIFIED IN DIVISION 23 SPECIFICATIONS OR SCHEDULED ON DIVISION 23 DRAWINGS. THE SPECIFIC DIVISION OF RESPONSIBILITIES BETWEEN DIVISION 23 AND 26 FOR FURNISHING OR WIRING THIS EQUIPMENT IS AS FOLLOWS:
1. DIVISION 26 MECHANICAL RESPONSIBILITIES:
a. MOTORS: FURNISH AND INSTALL ALL MOTORS NECESSARY FOR MECHANICAL EQUIPMENT.
b. DISCONNECTS: PROVIDE THE DISCONNECTS WHICH ARE PART OF FACTORY WIRED DIVISION 23 EQUIPMENT. FACTORY WIRING TO INCLUDE WIRING BETWEEN MOTOR AND DISCONNECT OR COMBINATION STARTER/DISCONNECT.
c. CONTROLS: DIVISION 23 CONTRACTOR (INCLUDING THE TEMPERATURE CONTROLS SUBCONTRACTOR) IS RESPONSIBLE FOR THE FOLLOWING EQUIPMENT IN ITS ENTIRETY. THIS EQUIPMENT INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING:
1) CONTROL RELAYS NECESSARY FOR CONTROLLING DIVISION 23 EQUIPMENT.
2) CONTROL TRANSFORMERS NECESSARY FOR PROVIDING POWER TO CONTROLS FOR DIVISION 23 EQUIPMENT.
3) LINE VOLTAGE THERMOSTATS.
4) LOW OR NON-LOAD VOLTAGE CONTROL COMPONENTS.
5) REMOTE BULB THERMOSTATS.
6) NON-LIFE SAFETY RELATED VALVE OR DAMPER ACTUATORS.
7) FLOAT SWITCHES.
8) SOLENOID VALVES, EP AND PE SWITCHES.
9) REFRIGERATION CONTROLS. (DIVISION 26 PROVIDES POWER TO REFRIGERATION PANELS.)
10) PNEUMATIC THERMOSTATS
d. FIRE AND LIFE SAFETY EQUIPMENT:
1) FIRE/SMOKE DAMPERS: DIVISION 23 IS RESPONSIBLE FOR PROVIDING AND PHYSICALLY INSTALLING THE DAMPER AND FOR INSTALLING ANY REQUIRED CONTROL INTERFACE WIRING TO DIVISION 23 CONTROLS.
a) WHERE FIRE/SMOKE DAMPERS ARE PART OF AN INTEGRATED SMOKE CONTROL SYSTEM, DIVISION 23 IS RESPONSIBLE FOR PROVIDING DAMPERS WITH NECESSARY END SWITCHES FOR PROOF OF CLOSURE.
b) WHERE THESE DAMPERS ARE NOT PART OF AN INTEGRATED AREA WIDE SMOKE DETECTION SYSTEM, DIVISION 23 IS RESPONSIBLE FOR PROVIDING EACH FIRE/SMOKE DAMPER WITH A DEDICATED DUCT DETECTOR INSTALLED PER THE REQUIREMENTS OF THE BUILDING CODE. IF NOT INTEGRAL WITH THE DAMPER ASSEMBLY, THE DETECTOR IS TO BE INSTALLED BY DIV. 23 BUT WIRED FOR DAMPER CONTROL BY DIV. 26.
2) FIRE SPRINKLER SYSTEM: DIVISION 23 IS RESPONSIBLE FOR PROVIDING NECESSARY CONTROLS INCLUDING FLOW SWITCHES AND ALARM BELLS.
3) SPECIALIZED FIRE SUPPRESSION SYSTEMS: DIVISION 23 IS RESPONSIBLE FOR PROVIDING NECESSARY SYSTEM CONTROLS AND ANY REQUIRED CONTROL INTERFACE WIRING TO THESE CONTROLS. DIVISION 26 IS RESPONSIBLE FOR BRINGING POWER TO POINT OF CONNECTION WITH THE SYSTEM.

D. DIVISION 26 HAS RESPONSIBILITIES FOR ELECTRICALLY POWERED OR CONTROLLED MECHANICAL EQUIPMENT WHICH IS SPECIFIED IN DIVISION 23 SPECIFICATIONS OR SCHEDULED ON DIVISION 23 DRAWINGS. THE SPECIFIC DIVISION OF RESPONSIBILITIES BETWEEN DIVISION 23 AND 26 FOR FURNISHING OR WIRING THIS EQUIPMENT IS AS FOLLOWS:
1. DIVISION 26 ELECTRICAL RESPONSIBILITIES:
2. MOTORS: PROVIDE THE POWER WIRING FOR THE MOTORS.
3. DISCONNECTS: PROVIDE ALL DISCONNECTS NECESSARY FOR DIVISION 23 MECHANICAL EQUIPMENT WHICH ARE NOT PROVIDED AS PART OF FACTORY WIRED DIVISION 23 EQUIPMENT. PROVIDE POWER WIRING TO ALL DISCONNECTS. IN ADDITION PROVIDE POWER WIRING BETWEEN MOTOR AND DISCONNECT WHEN THE DISCONNECT IS NOT FACTORY INSTALLED. SEE ALSO VARIABLE FREQUENCY DRIVE ABOVE FOR SPECIAL WIRING REQUIREMENTS.
a. CONTROLS: DIVISION 26 CONTRACTOR IS RESPONSIBLE FOR PROVIDING POWER TO CONTROL PANELS AND CONTROL CIRCUIT OUTLETS.
b. FIRE AND LIFE SAFETY EQUIPMENT:
1) FIRE/SMOKE DAMPERS: DIVISION 26 IS RESPONSIBLE FOR POWER WIRING TO THE DAMPER AND AS FOLLOWS:
a) WHERE THESE DAMPERS ARE PART OF AN INTEGRATED SMOKE CONTROL SYSTEM DIVISION 26 IS RESPONSIBLE FOR PROVIDING THE DETECTORS AND FOR ALL FIRE DETECTION SYSTEM WIRING NECESSARY TO INTEGRATE DAMPERS AND RELATED END SWITCHES INTO THE SYSTEM.
b) WHERE THESE DAMPERS ARE NOT PART OF AN INTEGRATED AREA WIDE SMOKE DETECTION SYSTEM, DIVISION 23 IS RESPONSIBLE FOR PROVIDING EACH FIRE/SMOKE DAMPER WITH A DEDICATED DUCT DETECTOR INSTALLED PER THE REQUIREMENTS OF THE BUILDING CODE. (SEE SECTION 15880). IF NOT INTEGRAL WITH THE DAMPER ASSEMBLY, THE DETECTOR IS TO BE INSTALLED BY DIV. 23 BUT WIRED FOR DAMPER CONTROL BY DIV. 26.
2) FIRE SPRINKLER SYSTEM: DIVISION 26 IS RESPONSIBLE FOR PROVIDING POWER WIRING TO FIRE PROTECTION CONTROLS INCLUDING FLOW SWITCHES AND ALARM BELLS.
3) SPECIALIZED FIRE SUPPRESSION SYSTEMS: DIVISION 26 IS RESPONSIBLE FOR PROVIDING POWER WIRING TO SUPPRESSION SYSTEM AND ITS CONTROLS.
4. COORDINATE WITH OTHER WORK, INCLUDING WIRES/CABLES, RACEWAY AND EQUIPMENT INSTALLATION, AS NECESSARY TO PROPERLY INTERFACE INSTALLATION OF ELECTRICAL CONNECTIONS FOR EQUIPMENT WITH OTHER WORK.
5. CONNECT ELECTRICAL POWER SUPPLY CONDUCTORS TO EQUIPMENT CONDUCTORS IN ACCORDANCE WITH EQUIPMENT MANUFACTURER'S WRITTEN INSTRUCTIONS AND WIRING DIAGRAMS. MATE AND MATCH CONDUCTORS OF ELECTRICAL CONNECTIONS FOR PROPER INTERFACE BETWEEN ELECTRICAL POWER SUPPLIES AND INSTALLED EQUIPMENT.
6. MAINTAIN EXISTING ELECTRICAL SERVICE AND FEEDERS TO OCCUPIED AREAS AND OPERATIONAL FACILITIES, UNLESS OTHERWISE INDICATED, OR WHEN AUTHORIZED OTHERWISE IN WRITING BY OWNER, OR ARCHITECT/ENGINEER. PROVIDE TEMPORARY SERVICE DURING INTERRUPTIONS TO EXISTING FACILITIES. WHEN NECESSARY, SCHEDULE MOMENTARY OUTAGES FOR REPLACING EXISTING WIRING SYSTEMS WITH NEW WIRING SYSTEMS. WHEN THAT "CUTTING-OVER" HAS BEEN SUCCESSFULLY ACCOMPLISHED, REMOVE, RELOCATE, OR ABANDON EXISTING WIRING AS INDICATED.
7. COVER SPLICES WITH ELECTRICAL INSULATING MATERIAL EQUIVALENT TO, OR OF GREATER INSULATION RESISTIVITY RATING, THAN ELECTRICAL INSULATION RATING OF THOSE CONDUCTORS BEING SPLICED.
8. PREPARE CABLES AND WIRES, BY CUTTING AND STRIPPING COVERING ARMOR, JACKET, AND INSULATION PROPERLY TO ENSURE UNIFORM AND NEAT APPEARANCE WHERE CABLES AND WIRES ARE TERMINATED. EXERCISE CARE TO AVOID CUTTING THROUGH TAPES WHICH WILL REMAIN ON CONDUCTORS. ALSO AVOID "RINGING" COPPER CONDUCTORS WHILE SKINNING WIRE.

E. MOTORS AND MOTOR CONTROL EQUIPMENT: CONFORM TO THE STANDARDS OF THE NEMA. EQUIP MOTORS WITH MAGNETIC OR MANUAL LINE STARTERS WITH OVERLOAD PROTECTION. MOTOR STARTERS AND LINE VOLTAGE CONTROLS SHALL BE INSTALLED UNDER ELECTRICAL SECTION BUT LOCATED AND COORDINATED AS REQUIRED UNDER THIS SECTION OF THE WORK. STARTERS SHALL BE COMBINATION TYPE WITH NON_FUSIBLE DISCONNECT SWITCHES. ALL SINGLE PHASE FRACTIONAL HORSEPOWER MOTORS SHALL HAVE BUILT_IN OVERLOAD PROTECTION.

SECTION 230529 - HANGERS AND SUPPORTS

A. PIPE HANGERS, SUPPORTS, AND GUIDES:
1. GENERAL:
a. HANGERS AND SUPPORTS TO BE DESIGNED AND INSTALLED PER SMACNA GUIDELINES.
b. ASSURE ADEQUATE SUPPORT FOR PIPE AND CONTENTS.
c. PROVIDE RIGID INSULATION SECTION AT ALL HANGER SUPPORTS.
d. PROVIDE SEISMIC RESTRAINTS TO MEET LOCAL CODES.
e. PREVENT VIBRATION OR SWAYING.
f. PROVIDE SLEEVING FOR ALL PIPING THAT PENETRATES FLOOR SLABS.
g. PROVIDE FOR EXPANSION AND CONTRACTION.
h. SUPPORTS OF WIRE, ROPE, WOOD, CHAIN, STRAP PERFORATED BAR OR ANY OTHER MAKESHIFT DEVICE NOT PERMITTED.
i. COMPLY WITH APPLICABLE REQUIREMENTS AT ANSI B31.1.0 AND B31.2 FOR PIPING.
j. SUPPORT PIPING INDEPENDENTLY SO THAT EQUIPMENT IS NOT STRESSED BY PIPING WEIGHT OF EXPANSION.
k. HANGERS AND SUPPORTS SHALL HAVE MINIMUM SAFETY FACTOR OF THREE (3), BASED ON ULTIMATE TENSILE OR COMPRESSIVE STRENGTH, AS APPLICABLE, OF MATERIAL USED.
l. PRIME COAT EXPOSED STEEL HANGERS AND SUPPORTS. HANGERS AND SUPPORTS LOCATED IN CRAWL SPACES, PIPES SHAFTS AND SUSPENDED CEILING SPACES ARE NOT CONSIDERED EXPOSED
2. HORIZONTAL PIPING, EXCEPT AS NOTED:
a. ADJUSTABLE CLEVIS TYPE AND ROD: ALL SERVICES AT OR BELOW 250 DEG F.
b. ROLLERS OR SLIDE BASES:PIPE STAND, BRACKET, TRAPEZE OR OTHER EQUIVALENT STRUCTURAL SUPPORT. ROLLERS NOT REQUIRED WHERE SPRING HANGERS ARE CALLED FOR.
3. TRAPEZE HANGERS
a. NOT PERMITTED FOR:FIRE AND SPRINKLER PIPING.
b. GUIDE INDIVIDUAL PIPES ON TRAPEZES WITH 1/4 INCH U-BOLT OR SUPERSTRUT 702 PIPE CLAMP. INSTALL THERMAL HANGER SHIELD AT EACH SUPPORT POINT.
4. INSTALL PIPE ISOLATORS BETWEEN HANGERS AND:
a. UNINSULATED COPPER TUBING.
b. WHEREVER ANY PIPE REQUIRES SOUND AND VIBRATION ISOLATION.
5. MISCELLANEOUS STEEL: PROVIDE MISCELLANEOUS STEEL MEMBERS, BEAMS, BRACKETS, ETC., FOR SUPPORT OF WORK IN THIS DIVISION UNLESS SPECIFICALLY INCLUDED IN OTHER DIVISIONS.
6. PIPE SUPPORT SPACING: PER IMC SECTION 305.

B. DUCT HANGERS AND SUPPORTS
1. GENERAL.
a. SUPPORT HORIZONTAL DUCTS WITH HANGERS OF SIZE AND SPACING AS INDICATED IN PERTINENT SMACNA DUCT CONSTRUCTION STANDARDS. SEAL AROUND ALL SCREWS.
b. PROVIDE SEISMIC CONSTRAINTS TO MEET LOCAL CODES.
2. HORIZONTAL DUCT SUPPORTS:
a. INSTALL HANGERS AT EACH CHANGE IN DIRECTION OF DUCT.
b. STRAP HANGERS:
2) EXTEND STRAP DOWN BOTH SIDES OF DUCTS.
3) TURN UNDER BOTTOM ONE INCH MINIMUM.
4) METAL SCREW HANGERS TO:
a) BOTTOM OF DUCT.
b) UPPER AND LOWER SIDES OF DUCTS.
c) NOT MORE THAN 12 INCHES ON CENTER.
5) ANGLE HANGERS:
a) PROVIDE ANGLE HANGERS FORMED BY EXTENDED VERTICAL BRACING ANGLES.
3. RECTANGULAR DUCT SUPPORT SPACING:
a. HORIZONTAL DUCTS: 10'
b. VERTICAL DUCTS: 12'
c. TRAPEZE DUCTS: 8'
4. ROUND DUCT SUPPORT SPACING:
a. HORIZONTAL DUCTS (<40"□ DIAMETER): 10'
b. VERTICAL DUSTS: 12'
c. TRAPEZE DUCTS: 8'

C. HVAC EQUIPMENT
1. GENERAL:
a. ALL FANS SHALL BE MOUNTED ON SPRING VIBRATION ISOLATORS.
b. COORDINATE LOCATION OF ALL EQUIPMENT WITH BUILDING OWNER.

D. ATTACHMENT TO STRUCTURE:
1. STEEL BEAM ANCHORS.
a. APPROVED BEAM OR CHANNEL CLAMPS.
b. DO NOT CUT OR WELD TO STRUCTURAL STEEL WITHOUT WRITTEN APPROVAL OF OWNER.
c. OTHER METHODS AS DETAILED ON DRAWINGS.
2. STUD WALL SIDE-WALL SUPPORTS:
a. TOGGLE BOLTS.
b. STUDS WELDED TO STRUCTURAL STUDS.
c. LAG SCREWS INTO WOOD BACKING.
d. OTHER METHODS.
3. SUPPORT SPREADERS:
a. INSTALL SPREADERS SPANNING BETWEEN STRUCTURAL MEMBERS WHEN HANGERS FALL BETWEEN THEM, AND HANGER LOAD IS TOO GREAT FOR SLAB OR DECK ATTACHMENT.
b. SPREADERS MAY BE ONE OF METHODS LISTED BELOW, OR COMBINATION OF BOTH AS REQUIRED.
1) FABRICATED FROM STRUCTURAL CHANNEL:END FITTINGS BOLTED OR WELDED. SECURE TO STRUCTURAL MEMBERS AS REQUIRED BY CONSTRUCTION AND AS APPROVED BY STRUCTURAL ENGINEER.
2) FORMED CHANNELS WITH FITTINGS, SIMILAR TO SUPERSTRUT: SUBMIT MANUFACTURER'S CALCULATIONS FOR INSTALLATION.

SECTION 230553 - IDENTIFICATION

A. AN IDENTIFICATION LABEL SHALL BE PROVIDED FOR THE FOLLOWING TYPES OF EQUIPMENT:
1. ROOF TOP UNITS.
2. EXHAUST FANS.
3. MAKEUP AIR UNITS.
4. SPLIT SYSTEMS.
5. CONDENSING UNITS.
6. KITCHEN HOOD AND EXHAUST SYSTEMS.

B. IDENTIFICATION LABELS SHALL BE BY SETON, OR EQUIVALENT. PROVIDE LABELS & FLOW ARROWS ON ALL DUCT AND PIPING. @ 10' INTERVALS.

C. TEMPERATURE CONTROL PANELS SHALL BE IDENTIFIED WITH ENGRAVED PHENOLIC NAMEPLATES AND EACH CONTROL COMPONENT SHALL BE IDENTIFIED WITH ITS SETPOINTS.

D. ALL MECHANICAL EQUIPMENT INSTALLED ABOVE SUSPENDED CEILINGS SHALL BE MARKED ON THE BOTTOM WITH ITS EQUIPMENT NUMBER MATCHING THE EQUIPMENT SCHEDULE AND CONTROL GRAPHICS.

E. ALL LABELING OF EXTERIOR EQUIPMENT SHALL USE ENGRAVED PHENOLIC LABELS.

F. IDENTIFICATION SHALL CONFORM TO ANSI/ASME A13.1 WHERE APPLICABLE.

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

A. GENERAL:
1. TAB SHALL BE PERFORMED BY NATIONAL TAB, NORTH KANSAS CITY, MO (WILL TURNBOUGH 314-964-6244). NO EXCEPTIONS.
2. ADJUSTMENT: EACH PIECE OF EQUIPMENT AND ALL OF THE SYSTEMS SHALL BE ADJUSTED TO INSURE PROPER FUNCTIONING OF ALL CONTROLS, AND SHALL BE LEFT IN OPERATING CONDITION. CONTRACTOR SHALL BE RESPONSIBLE TO REPLACE EXISTING MOTOR SHEAVES AND FAN BELTS AS REQUIRED.
3. PRELIMINARY OPERATION: THE OWNER RESERVES THE RIGHT TO OPERATE ANY SYSTEMS OR EQUIPMENT PRIOR TO FINAL COMPLETION AND ACCEPTANCE OF THE WORK. SUCH PRELIMINARY OPERATION SHALL NOT BE CONSTRUED AS AN ACCEPTANCE OF ANY WORK.

B. AIR DISTRIBUTION SYSTEMS:
1. BALANCE AND ADJUST AIR DISTRIBUTION SYSTEM TO QUANTITIES INDICATED ON DRAWINGS IN ACCORDANCE WITH ASSOCIATED AIR BALANCE COUNCIL (AABC) MANUAL, LATEST EDITION.
2. BALANCING AND TESTING SHALL BE PERFORMED AND SUPERVISED BY A CERTIFIED INDEPENDENT FIRM SPECIALIZING IN TESTING AND BALANCING. FIRM SHALL BE AN APPROVED TAB CONTRACTOR. TEST REPORTS SHALL BE SUBMITTED IN BOUND FOLDERS AND ON AABC TYPE REPORT FORMS. ALL AIR INLET/OUTLET SHALL BE IDENTIFIED BY DESIGNATIONS ON DRAWINGS.
3. ALL TESTING DATA SHALL BE PROVIDED IN A MICROSOFT EXCEL COMPATIBLE FORMAT.
4. DIFFUSER AIR DELIVERY SHALL NOT BE LESS THAN NOR EXCEED BY MORE THAN 10% THE AIR DELIVERY INDICATED ON THE PLAN.
5. VOLUME DAMPERS IN AIR INLETS/OUTLETS SHALL BE USED ONLY FOR MINOR ADJUSTMENT (LESS THAN 10% OF SPECIFIED CFM WHEN AVAILABLE.)
6. CONTRACTOR SHALL PROVIDE MANUAL VOLUME DAMPERS IN DUCTS AS REQUIRED.
7. UPON COMPLETION OF THE INSTALLATION, CONTRACTOR SHALL REBALANCE ANY AIR DISTRIBUTION SYSTEM AFFECTED BY THE RENOVATION, INCLUDING TERMINAL AIR UNITS AND AIR OUTLETS.

C. ADDITIONAL NOTES:
1. KITCHEN HOODS MUST BE BALANCED WITH KITCHEN.
2. KITCHEN SHALL BE NEGATIVE WITH RESPECT TO DINING AREA.
3. RESTAURANT SHALL BE POSITIVE WITH RESPECT TO AMBIENT.
4. OWNER TO BE PROVIDED WITH BALANCING REPORT.

SECTION 230700 - HVAC INSULATION

A. MINERAL-FIBER BLANKET INSULATION: MINERAL OR GLASS FIBERS BONDED WITH A THERMOSETTING RESIN. COMPLY WITH ASTM C 553, TYPE II AND ASTM C 1290, TYPE III WITH FACTORY-APPLIED FSK JACKET. KNAUF ECO FRIENDLY OR JOHNS MANVILLE (FORMALDEHYDE FREE).

B. CLOSED CELL PIPE INSULATION: ASTM C 534 TYPE I. AEROFLEX OR ARMACELL.

C. INSULATING CEMENTS: MINERAL-FIBER, HYDRAULIC-SETTING INSULATING AND FINISHING CEMENT: COMPLY WITH ASTM C 449/C 449M.

D. MINERAL-FIBER ADHESIVE: COMPLY WITH MIL-A-3316C, CLASS 2, GRADE A. USE ADHESIVE THAT HAS A VOC CONTENT OF 80 G/L OR LESS WHEN CALCULATED ACCORDING TO 40 CFR 59, SUBPART D (EPA METHOD 24).

E. FSK AND PVDC JACKET ADHESIVE: COMPLY WITH MIL-A-3316C, CLASS 2, GRADE A FOR BONDING INSULATION JACKET LAP SEAMS AND JOINTS.

F. FSK AND METAL JACKET FLASHING SEALANTS:
1. MATERIALS SHALL BE COMPATIBLE WITH INSULATION MATERIALS, JACKETS, AND SUBSTRATES.
2. FIRE- AND WATER-RESISTANT, FLEXIBLE, ELASTOMERIC SEALANT.
3. SERVICE TEMPERATURE RANGE: MINUS 40 TO PLUS 250 DEG F.
4. COLOR: ALUMINUM.
5. FOR INDOOR APPLICATIONS, USE SEALANTS THAT HAVE A VOC CONTENT OF 250 G/L OR LESS WHEN CALCULATED ACCORDING TO 40 CFR 59, SUBPART D (EPA METHOD 24).

G. FACTORY APPLIED FSK JACKET: ALUMINUM-FOIL, FIBERGLASS-REINFORCED SCRIM WITH KRAFT-PAPER BACKING; COMPLYING WITH ASTM C 1136, TYPE II.

H. FIELD APPLIED ALUMINUM JACKET: ALUMINUM ROLL-STOCK WITH 3-MIL MOISTURE BARRIER; COMPLYING WITH ASTM C1729. PROVIDE FACTORY-FABRICATED COVERS FOR FITTINGS.

I. TYPE OF INSULATION
1. DUCT INSULATION: MINERAL-FIBER BLANKET INSULATION. R-6 VALUE. PROVIDE WEATHERPROOF JACKET ON OUTDOOR DUCT. EXTERNALLY INSULATE ALL DUCT WHEN CONCEALED ABOVE CEILING SPACES.
2. PIPING: PROVIDE THICKNESS PER IMC TABLE 403.2.10
a. CONDENSATE: CLOSED-CELL TYPE.
b. REFRIGERANT PIPING: CLOSED-CELL PIPE INSULATION. PROVIDE WEATHERPROOF JACKET ON OUTDOOR PIPING.

J. ADDITIONAL PIPING INSULATION REQUIREMENTS
1. ALL REFRIGERANT COPPER LINES MUST BE FREE OF EXTRANEOUS CHEMICALS SUCH AS CORROSIVE CLEANERS OR BUILDING MATERIALS' DUST PRIOR TO THE INSTALLATION OF THE INSULATION. THE INSULATION MUST BE CLEAN AND DRY PRIOR TO INSTALLATION.
2. REFRIGERANT PIPE SHALL BE SEALED WHILE SLIPPING ON INSULATION TO PREVENT FOREIGN MATTER FROM ENTERING THE TUBE.

SECTION 230800 - COMMISSIONING

A. MECHANICAL CONTRACTOR SHALL ALLOCATE ADEQUATE TIME IN THEIR PROPOSAL TO ASSIST IN ALL COMMISSIONING ACTIVITIES AS PRESCRIBED. CONSULT WITH THE GENERAL CONTRACTOR TO DETERMINE THE SPECIFIC COMMISSIONING SCOPE OF WORK.

B. COMMISSIONING WILL BE PERFORMED FOR THE FOLLOWING SYSTEMS:
1. AIR HANDLING EQUIPMENT INCLUDING PACKAGED EQUIPMENT AND EXHAUST FANS.
2. SPLIT SYSTEMS.
3. KITCHEN HOOD, EXHAUST, AND MAKEUP AIR SYSTEMS.
4. CONTROLS.

SECTION 232300 - REFRIGERANT PIPING

A. COPPER PIPE AND FITTINGS
1. COPPER TYPE: ASTM B 280, TYPE L (STRAIGHT LENGH) ACR.
2. WROUGHT-COPPER FITTINGS: ASME B16.22.
3. WROUGHT-COPPER UNIONS: ASME B16.22.
4. BRAZING FILLER METALS: AWS A5.8.

B. PIPE JOINT CONSTRUCTION
1. BRAZED JOINTS: CONSTRUCT JOINTS ACCORDING TO AWS'S "BRAZING HANDBOOK," CHAPTER "PIPE AND TUBE."

C. HANGERS AND SUPPORTS
1. PIPING HANGERS AND SUPPORTS MUST ACCOMMODATE EXPANSION AND CONTRACTION, VIBRATION, DEAD LOAD OF PIPING AND ITS CONTENTS, AND SEISMIC-BRACING REQUIREMENTS.

D. INSTALL HANGERS FOR COPPER TUBING WITH THE FOLLOWING MAXIMUM SPACING AND MINIMUM ROD SIZES:
1. NPS 1/2: MAXIMUM SPAN, 60 INCHES; MINIMUM ROD SIZE, 1/4 INCH.
2. NPS 5/8: MAXIMUM SPAN, 60 INCHES; MINIMUM ROD SIZE, 1/4 INCH.
3. NPS 1: MAXIMUM SPAN, 72 INCHES; MINIMUM ROD SIZE, 1/4 INCH.

E. SUPPORT MULTI-FLOOR VERTICAL RUNS AT LEAST AT EACH FLOOR.

SECTION 233113 - METAL DUCTS

A. GENERAL: ALL SAFING, DUCTS, DAMPERS, ACCESS DOORS, JOINTS, HANGERS, STIFFENERS, FIRE DAMPERS AND FIRE RETARDING MATERIALS, IN ACCORDANCE WITH REQUIREMENTS OF SMACNA, "HVAC DUCT CONSTRUCTION STANDARDS," LATEST EDITION, AND ALL OTHER AUTHORITIES HAVING JURISDICTION AND AS DESCRIBED HEREIN. ALL SHEET METAL WORK SHALL HAVE A PRESSURE CLASSIFICATION AS FOLLOWS:
1. SUPPLY DUCT BETWEEN MAIN LOOP AND INLET TO TERMINAL AIR UNIT - 4 INCHES W.G.
2. SUPPLY DUCTS DOWNSTREAM OF TERMINAL AIR UNITS, AIR HANDLING UNITS AND FANS -2 INCHES W.G.
3. RETURN AND EXHAUST AIR DUCTS - 2 INCHES W.G.

B. DUCTWORK: UNLESS OTHERWISE SPECIFIED.
1. COLD ROLLED "COMMERCIAL" QUALITY HOT DIPPED GALVANIZED IN ACCORDANCE WITH ASTM NO. A653. G90.
2. DIMENSIONS SHOWN ON DRAWINGS ARE CLEAR INSIDE DIMENSIONS.
3. FITTINGS: SAME GAUGE AND CONSTRUCTION AS DUCTS. ELBOWS SHALL HAVE CENTERLINE RADIUS NOT LESS THAN 1.5 TIMES WIDTH.
4. DUCT SUPPORTS AS REQUIRED.
5. DUCTS WITH TRANSVERSE AND LONGITUDINAL BRACINGS IN ACCORDANCE WITH SMACNA.
6. DUCTWORK SHALL BE SEALED. JOINTS AND SEAMS SHALL COMPLY WITH SECTION603.9 OF THE IMC.

C. KITCHEN COOKING HOOD AND GREASE EXHAUST.
1. TYPE I GREASE HOOD EXHAUST DUCTWORK OF MINIMUM 16 GAUGE COLD ROLLED STEEL, OR 18 GA. STAINLESS STEEL WITH LIQUID TIGHT WELDS OR AS NOTED ON PLANS ZERO CLEARANCE U.L. LISTED PREFABRICATED ROUND GREASE DUCT, WITH ACCESS PANELS FOR GREASE CLEANING AS REQUIRED BY NFPA 96 AND LOCAL CODES.
2. SLOPE DUCT BACK TOWARDS HOOD AT MINIMUM OF 1/4" PER LINEAL FOOT MAINTAINING 18" CLEARANCE TO COMBUSTIBLE MATERIALS WHERE REQUIRED.
3. INSTALL GREASE DUCTS IN AN APPROVED FIRE-RATED ENCLOSURE SEPARATED FROM THE EXHAUST DUCT BY A MINIMUM OF 6" AND MAXIMUM 12" VENTILATED ENCLOSURE TO THE OUTSIDE AIR IF REQUIRED BY CODE.
4. AS AN OPTION, IF APPROVED BY LOCAL CODES, PROVIDE AN APPROVED WRAP SYSTEM IN LIEU OF THE RATED DUCT ENCLOSURE SYSTEM. DUCT WRAP SYSTEM SHALL MEET UL REQUIREMENTS FOR GREASE DUCT ENCLOSURES.

SECTION 233300 - AIR DUCT ACCESSORIES

A. ACCESS DOORS:
1. FURNISH ACCESS DOOR OF SUFFICIENT SIZE AS REQUIRED, FOR ACCESS, INSPECTION, MAINTENANCE, AND REPLACEMENT TO ALL INSTRUMENTS, CONTROLS AND EQUIPMENT.

B. DAMPERS:
1. FURNISH ALL DAMPERS WITH LOCKING MECHANISM NECESSARY FOR PROPER CONTROL AND BALANCING OF AIR DISTRIBUTION AS FOLLOWS:
a. ALL DUCTS WHICH SPLIT IN 2 OR MORE BRANCHES TO SERVE SUPPLY DIFFUSERS.
b. AT EACH SUPPLY AND RETURN BRANCH DUCT, AS FAR AWAY FROM EACH OUTLET AND INLET AS POSSIBLE.
c. ADJUSTABLE AND ACCESSIBLE.
d. ADDITIONALLY AS INDICATED.

C. FIRE/SMOKE DAMPERS SHALL BE DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH NFPA STANDARD 90A AND UL STANDARD 555 AND SHALL BE SO LABELED WITH A PERMANENT IDENTIFICATION. FIRE/SMOKE DAMPER SHALL BE LEAKAGE CLASS II, RATED FOR DYNAMIC USE, 165 DEG. FUSIBLE LINK, PROVIDED WITH FACTORY ELECTRIC ACTUATOR AND FACTORY INSTALLED AND PREWIRED DUCT MOUNTED SMOKE DETECTOR & REMOTE CEILING MTD. LED ANUNCIATOR. FIRE/SMOKE DAMPERS SHALL BE CSFM LISTED FOR BOTH FIRE AND SMOKE. RUSKIN OR APPROVED EQUAL.

D. TURNING VANES: GALVANIZED STEEL, DOUBLE THICKNESS TURNING VANES WITH 2 IN. INSIDE RADIUS FOR ALL SQUARE ELBOWS, UNLESS OTHERWISE NOTED.

E. DUCT MTD. SMOKE DETECTORS SHALL BE "SYSTEM SENSOR" DH400 OR EQUIVALENT. PROVIDE SHEET METAL COVER FOR EXTERNALLY MOUNTED DETECTORS.

F. MOTORIZED DAMPERS SHALL BE 'RUSKIN' CD-50 LOW LEAKAGE TYPE WITH ACTUATORS BY 'BELIMO' UNLESS OTHERWISE NOTED

SECTION 233713 - DIFFUSERS, REGISTERS AND GRILLES

A. ALL DIFFUSERS, GRILLES AND REGISTERS SHALL BE OF TYPE AND CAPACITY AS INDICATED ON DRAWINGS. STEEL AND/OR EXTRUDED ALUMINUM CONSTRUCTION WITH BAKED ENAMEL FINISH COLOR AS SELECTED BY ARCHITECT. DIFFUSERS TO HAVE NO VISIBLE SCREW HEADS OR CONNECTORS. RETURN GRILLES AND EXHAUST REGISTERS SIMILAR TO SUPPLY.

B. BALANCING DAMPERS SHALL BE PROVIDED IN THE BRANCH DUCT AS FAR AS POSSIBLE FROM ALL SUPPLY AND RETURN AIR DEVICES. THESE SHALL BE ADJUSTABLE AND ACCESSIBLE.

C. OUTLETS FURNISHED SHALL PROVIDE FOR THE REQUIRED CAPACITY WITH NO APPARENT DRAFTS OR EXCESSIVE AIR MOVEMENT. OUTLETS WHICH CAUSE EXCESSIVE AIR MOVEMENT OR DRAFTS SHALL BE REPLACED AT NO COST TO THE OWNER.

D. SEE PLANS AND SCHEDULES FOR DIFFUSER TYPES AND MFR.

E. THE NOISE LEVEL PRODUCED SHALL COMPLY WITH ALL REQUIREMENTS OF THE ACOUSTICAL SPECIFICATION STATED HEREIN. A REPRESENTATIVE SAMPLE SHALL BE TESTED IN ACCORDANCE WITH THE PROCEDURE SPECIFIED HEREIN IN ORDER TO DEMONSTRATE SUCH COMPLIANCE. ALL MEASUREMENTS SHALL BE MADE IN ACCORDANCE WITH AIR DIFFUSION COUNCIL TEST CODE NO. 1062R3, AND ASHRAE STANDARD 36-72. TEST CONDITIONS SHALL BE IN ACCORDANCE WITH THE APPLICABLE STANDARDS. THE TEST RESULTS SHALL BE CERTIFIED BY THE TESTING AGENCY AND SUBMITTED FOR APPROVAL. THE TEST REPORT SHALL INCLUDE A COMPLETE DESCRIPTION OF THE TEST CONDITIONS, MEASUREMENT PROCEDURE AND SAMPLE CALCULATION.

F. THE SOUND POWER LEVEL (PWL RE 10-12 WATTS) OF EACH TYPE AND SIZE OF DIFFUSER SPECIFIED SHALL NOT EXCEED THE VALUES AS SCHEDULED ON DRAWINGS.

zebra

ZEBRA PROJECTS, INC.
14614 N KIERLAND BLVD, SUITE N 300
SCOTTSDALE, ARIZONA 85254
PHONE: 480.912.1169 www.zbr.co.uk

Consultant Logo:
INFRASTRUCTURE FACTOR CONSULTING, INC.
2361 Rosecrans Ave. Suite 368, El Segundo, CA 90245
P: 310.725.1500 F: 310.725.0215 www.iFactor.com

STORE NO:
TX 1382

SHAKE SHACK
SHAKE SHACK - SUGAR LAND
2515 TOWN CENTER BOULEVARD,
SUGAR LAND, TX 77479

REVISION

△	DATE	DESCRIPTION
	10/01/21	PERMIT/BID
A	06/23/22	REVISION A
1	10/20/22	REVISION 1
2	12/01/22	REVISION 2

STATUS:
PERMIT/BID

STATE OF TEXAS
OTHON ESTRADA, JR.
141839
LICENSED
PROFESSIONAL ENGINEER
09/30/2021

FIELD VERIFICATION:
The contractor shall verify all figured dimensions and condition at the project site and notify Zebra Projects, INC. of any dimensional errors, or omissions or discrepancies before beginning or fabricating any work. Do not scale these drawings.

SHEET NAME:
MECHANICAL SPECIFICATIONS

DATE: 06/23/22
PROJECT NO: 33875

DRAWN: AM
SCALE: 12" = 1'-0"

SHEET NO:
M603

PACKAGED GAS/ELECTRIC ROOFTOP UNIT SCHEDULE

ITEM	ITEM NO.	MANUFACTURER	MODEL	AREA SERVED	SUPPLY FAN				OSA (CFM)	COOLING					HEATING				ELECTRICAL (RTU)				ELECTRICAL (POWER EXHAUST)				REF.	WT. (LBS)	REMARKS
					CFM	E.S.P. (IN. WG.)	FAN RPM	FAN BHP		NOM. TOTAL (TONS)	TOTAL (MBH)	SENSIBLE (MBH)	EAT (DB/WB)	LAT (DB/WB)	EER/ IEER	OUTPUT (MBH)	EAT (DB/WB)	LAT (DB/WB)	THERMAL EFF.	V	PH	MCA	MOCP	V	PH	MCA	MOCP			
RTU	1	CARRIER	48LCD020A2A5-0N0A0	DINING	4,400	1.0	815	2.10	800	17.5	162.0	112.1	77.3/64.2	52.4/51.0	12.0/17.5	142.0	70.0	107.5	81.0%	208	3	85.9	100	208	3	17	25	R-410A	3501	1, 2, 3, 4, 5, 6, 7, 8, 9, 10
RTU	2	CARRIER	48LCD020A2A5-0N0A0	BOH	4,800	1.0	837	2.41	300	17.5	154.6	112.1	74.8/62.3	52.0/50.4	12.0/17.5	142.0	70.0	104.1	81.0%	230	3	85.9	100	208	3	17	25	R-410A	3501	1, 2, 3, 4, 5, 6, 7, 8, 9, 10

NOTES:

1. EFFICIENCY BASED ON AHRI 210/240 STANDARD RATING CONDITIONS.
2. PROVIDE WITH 3-STAGE COOLING.
3. PROVIDE WITH VENSTAR T2900 7-DAY PROGRAMMABLE THERMOSTAT WITH WALLPLATE AND ACC-TSEN REMOTE TEMPERATURE SENSOR.
4. PROVIDE WITH FACTORY FURNISHED DIRECT DRIVE - MEDIUM STATIC VFD FAN CONTROL.
5. PROVIDE WITH MICROMETL PCC-MRT69CA-D-2L2 MODULATING POWER EXHAUST FIXED DRY-BULB ECONOMIZER. PROVIDE WITH ECONOMIZER FDD. UNIT IS POWERED SEPARATELY FROM RTU.
6. PROVIDE WITH SMOKE DETECTOR FOR AUTOMATIC SHUT-DOWN OF UNIT UPON SMOKE DETECTION.
7. PROVIDE WITH MERV-13 FILTERS.
8. PROVIDE WITH FACTORY PROVIDED ROOF CURB.
9. PROVIDE WITH BACNET COMMUNICATION CARD FOR FUTURE CONNECTION.
10. PROVIDE WITH NATIONAL TAB UV-PHI INDOOR PURIFICATION SYSTEM PHI-PKG14-24V (GENERAL CONTRACTOR FURNISHED; TAB CONTRACTOR INSTALLED).

EXHAUST FAN SCHEDULE

ITEM	ITEM NO.	MANUFACTURER	MODEL	AREA SERVED	SUPPLY FAN						ELECTRICAL				WT. (LBS.)	REMARKS
					CFM	ESP	TYPE	DRIVE	RPM	HP	V	PH	HZ	FLA		
EF	1	GREENHECK	G-070-VG	RESTROOM	280	0.25	DOWNBLAST	DIRECT	1573	1/15	115	1	60	1.3	40	1, 2, 3, 4, 5
KEF	1	CAPTIVEAIRE	DU85HFA	KITCHEN HOOD	1677	1.0	UPBLAST	DIRECT	1328	0.75	208	1	60	5.2	130	6, 7, 8
KEF	2	CAPTIVEAIRE	DU85HFA	KITCHEN HOOD	1617	1.0	UPBLAST	DIRECT	1328	0.75	208	1	60	5.2	130	6, 7, 8

NOTES:

1. PROVIDE WITH VARI-GREEEN ECM WITH DIAL ONLY.
2. PROVIDE WITH 14" STANDARD CURB.
3. PROVIDE WITH NEMA-1 TOGGLE SWITCH.
4. PROVIDE WITH BACKDRAFT DAMPER, GRAVITY OPERATED.
5. EF-1 TO BE INTERLOCK WITH RTU-1.
6. PROVIDE WITH FACTORY CURB, GREASE BOX, ECM WIRING PACKAGE, AND FAN BASE CERAMIC SEAL.
7. SEE M805 FOR FIELD WIRING.
8. PROVIDE WITH UL 762 LISTING.

PACKAGED DX COOLING/GAS HEATING MAKEUP AIR UNIT SCHEDULE

ITEM	ITEM NO.	MANUFACTURER	MODEL	AREA SERVED	CFM	E.S.P. (IN. WG.)	SUPPLY FAN			COOLING				HEATING				ELECTRICAL					FILTER EFF. (%)	WT. (LBS)	REMARKS
							FAN RPM	FAN BHP	HP	EDB (°F)	EWB (°F)	LDB (°F)	LWB (°F)	INPUT (MBH)	OUTPUT (MBH)	TEMP RISE (DEG-F)	EFF.	V	PH	FLA	MCA	MOCP			
MAU	1	CAPTIVEAIRE	A2-D.250-20D-MPU	KITCHEN	2,684	0.50	1370	1.39	1.5	93	78.0	72.2	72.2	121.2	111.5	39	92%	208	3	6.6	8.3	15	MERV-13	1460	1, 2, 3, 4, 5, 6

NOTES:

1. PROVIDE WITH CASLINK BUILDING MONITORING SYSTEM FOR FUTURE CONNECTION.
2. PROVIDE WITH INLET AND MANIFOLD PRESSURE GAUGES.
3. PROVIDE WITH MOTORIZE BACKDRAFT DAMPER.
4. PROVIDE WITH FAN VFD.
5. PROVIDE WITH FACTORY PROVIDED ROOF CURB.
6. SEE M806 FOR FIELD WIRING.

KITCHEN EXHAUST HOOD SCHEDULE

ITEM	ITEM NO.	MANUFACTURER	MODEL	LENGTH X WIDTH	EXHAUST COLLAR				MAKE-UP COLLAR				AC COLLAR			HOOD CONSTRUCTION	FIRE SYSTEM	FIRE SYSTEM PIPING	WT. (LBS)	REMARKS
					CFM	LENGTH	WIDTH	ESP	CFM	LENGTH	WIDTH	ESP	CFM	DIAMETER	ESP					
KEH	1	CAPTIVEAIRE	5430 ND-2-ACPSP-F	9'-7" X 76"	1677	10"	16"	-0.55	1342	28"	10"	0.16	400	8"	0.03	430 SS	ANSUL R102	YES	916	1, 2, 3
KEH	2	CAPTIVEAIRE	5430 ND-2-ACPSP-F	9'-7" X 76"	1677	10"	16"	-0.55	1342	28"	10"	0.16	400	8"	0.03	430 SS	ANSUL R102	YES	687	1, 2, 3

NOTES:

1. PROVIDE WITH UL APPROVED MANUAL AIR VOLUME DAMPER ON EXHAUST COLLAR BY HOOD MANUFACTURER.
2. SEE M801-M805 FOR ADDITIONAL REQUIREMENTS AND FIELD WIRING.

AIR CURTAIN SCHEDULE

ITEM	ITEM NO.	MANUFACTURER	MODEL	AREA SERVED	CFM	VELOCITY	HP	ELECTRICAL				WT. (LBS)	REMARKS
								V	PH	FLA	MOCP		
AC	1	MARS	LPV236-OB	DELIVERY DOOR	900	1800	1/6	120	1	2.4	-	32	1, 2
AC	2	READY ACCESS	DTU03-2026AA	TAKE OUT WINDOW	200	1045	1/20 + 1/20	120	1	2.2	15	20	1, 3

NOTES:

1. PROVIDE WITH WALL MOUNTING BRACKET.
2. AIR CURTAIN TO BE CONTROLLED BY DOOR SWITCH.
3. PROVIDE WITH RELAY SWITCH KIT TO OPERATE UNIT WHEN WINDOW OPENS.

CONDENSING UNIT

ITEM	ITEM NO.	MANUFACTURER	MODEL	EQUIPMENT SERVED	CAPACITY (MBH)	EER	SEER	COP	REF.	ELECTRICAL				WT. (LBS)	REMARKS
										V	PH	MCA	MOCP		
CU	1	CARRIER	38MARQB09	FC-1	9.0	14.5	25	3.81	R410A	208	1	15	15	150	1, 2

FAN COIL DX SPLIT

ITEM	ITEM NO.	MANUFACTURER	MODEL	AREA SERVED	TYPE	CFM	MOTOR (WATTS)	COOLING				HEATING				ELECTRICAL				WT. (LBS)	REMARKS
								TOTAL CAP. (MBH)	SENS. CAP. (MBH)	EAT (F) (DB/WB)	LAT (F) (DB/WB)	TOTAL CAP. (MBH)	EAT (F) (DB)	LAT (F) (DB)	COP	V	PH	MCA	MOCP		
FC	1	CARRIER	40MAHBQ09	107 UTILITY ROOM	WALL HUNG	380	20	9.0	7.0	72/60	55/54	11.8	68	90	3.81	208	1	0.3	-	32	1, 2

NOTES:

1. PROVIDE WITH CONDENSATE PUMP. CONDENSATE PUMP IS POWERED FROM THE UNIT.
2. UNIT IS POWERED FROM OUTDOOR UNIT.

AIR DISTRIBUTION SCHEDULE

MARK NO.	MANUFACTURE MODEL NUMBER	NECK SIZE (IN)	CFM RANGE	MAX NC LEVEL	REMARKS
CD-1	PRICE PDS	6"	60-100	30	NOTE 1,2,3
	PRICE PDS	8"	101-200	30	NOTE 1,2,3
	PRICE PDS	10"	201-375	30	NOTE 1,2,3
	PRICE PDS	12"	376-500	30	NOTE 1,2,3
	PRICE PDS	14"	501-750	30	NOTE 1,2,3
CD-2	PRICE PPD	12"	450	30	NOTE 1,2,3,4
CR-1	PRICE PDR	6"	60-100	30	NOTE 1,2,3
	PRICE PDR	8"	101-200	30	NOTE 1,2,3
	PRICE PDR	10"	201-375	30	NOTE 1,2,3
	PRICE PDR	12"	376-500	30	NOTE 1,2,3
	PRICE PDR	22"x22"	1,500	30	NOTE 1,2,3
RD-1	PRICE RCD	10"	301-500	30	NOTE 1
SG-1	PRICE 510	10"x10"	SEE PLAN	30	NOTE 1
EG-1	PRICE 530	8"x8"	SEE PLAN	30	NOTE 1

NOTES:

1. FURNISH WITH OFF-WHITE BAKED ENAMEL FINISH UON. COORDINATE EXACT FINISHES WITH ARCH.
2. PROVIDE OPTIONAL INSULATION ON SUPPLY DIFFUSERS. OMIT INSULATION ON RETURN DIFFUSERS.
3. PROVIDE LAY IN TYPE 24x24 BORDER, OTHERWISE COORDINATE BORDER TYPE WITH ARCH. PRIOR TO ORDERING.
4. PROVIDE VAV DIFFUSER WITH ROOM LCD THERMOSTAT, TR115 ONBOARD TRANSFORMER, AND INSULATED BACKPAN.

DUCT SIZING CHART

AIRFLOW (CFM)	SIZE (IN)
190 to 299	10X6 OR 8"
300 TO 429	14X6 OR 10"
430 TO 599	16X8 OR 12"
600 TO 799	20X8 OR 14"
800 TO 999	24X10 OR 16"
1000 TO 1199	30X10 OR 18"
1200 TO 1450	30X12 OR 20"

FOR COMMERCIAL KITCHEN EXHAUST DUCT.
AIR VELOCITY SHALL NOT BE LESS THAN 500 FPM AND NOT EXCEED 2500 FPM.

DUCT SIZING CHART

AIRFLOW (CFM)	SIZE (IN)
210	10X6 OR 8"
215 TO 380	14X6 OR 10"
381 TO 610	16X8 OR 12"
610 TO 910	20X8 OR 14"
911 TO 1300	24X10 OR 16"
1301 TO 1790	30X10 OR 18"
1791 TO 2000	30X12 OR 20"

FOR LOW VELOCITY SUPPLY AND RETURN DUCT.

zebra
ZEBRA PROJECTS, INC.
14614 N KIERLAND BLVD. SUITE N 300
SCOTTSDALE, ARIZONA 85254
PHONE: 480.912.1169 www.zbr.co.uk

Consultant Logo:
INFRASTRUCTURE FACTOR CONSULTING, INC.
2361 Rosecrans Ave. Suite 368, El Segundo, CA 90245
P: 310.725.1500 F: 310.725.0215 www.iFactor.com

STORE NO:
TX 1382

SHAKE SHACK
SHAKE SHACK - SUGAR LAND
2515 TOWN CENTER BOULEVARD,
SUGAR LAND, TX 77479

REVISION

△	DATE	DESCRIPTION
	10/01/21	PERMIT/BID
A	06/23/22	REVISION A
1	10/20/22	REVISION 1
2	12/01/22	REVISION 2

STATUS:
PERMIT/BID

STATE OF TEXAS
OTHON ESTRADA, JR.
141839
LICENSED
PROFESSIONAL ENGINEER
06/23/2022

FIELD VERIFICATION:
The contractor shall verify all figured dimensions and condition at the project site and notify Zebra Projects, INC. of any dimensional errors, or omissions or discrepancies before beginning or fabricating any work. Do not scale these drawings.

SHEET NAME:
MECHANICAL SCHEDULES

DATE: 06/23/22
PROJECT NO: 33875
DRAWN: AM
SCALE: NTS

SHEET NO:
M701