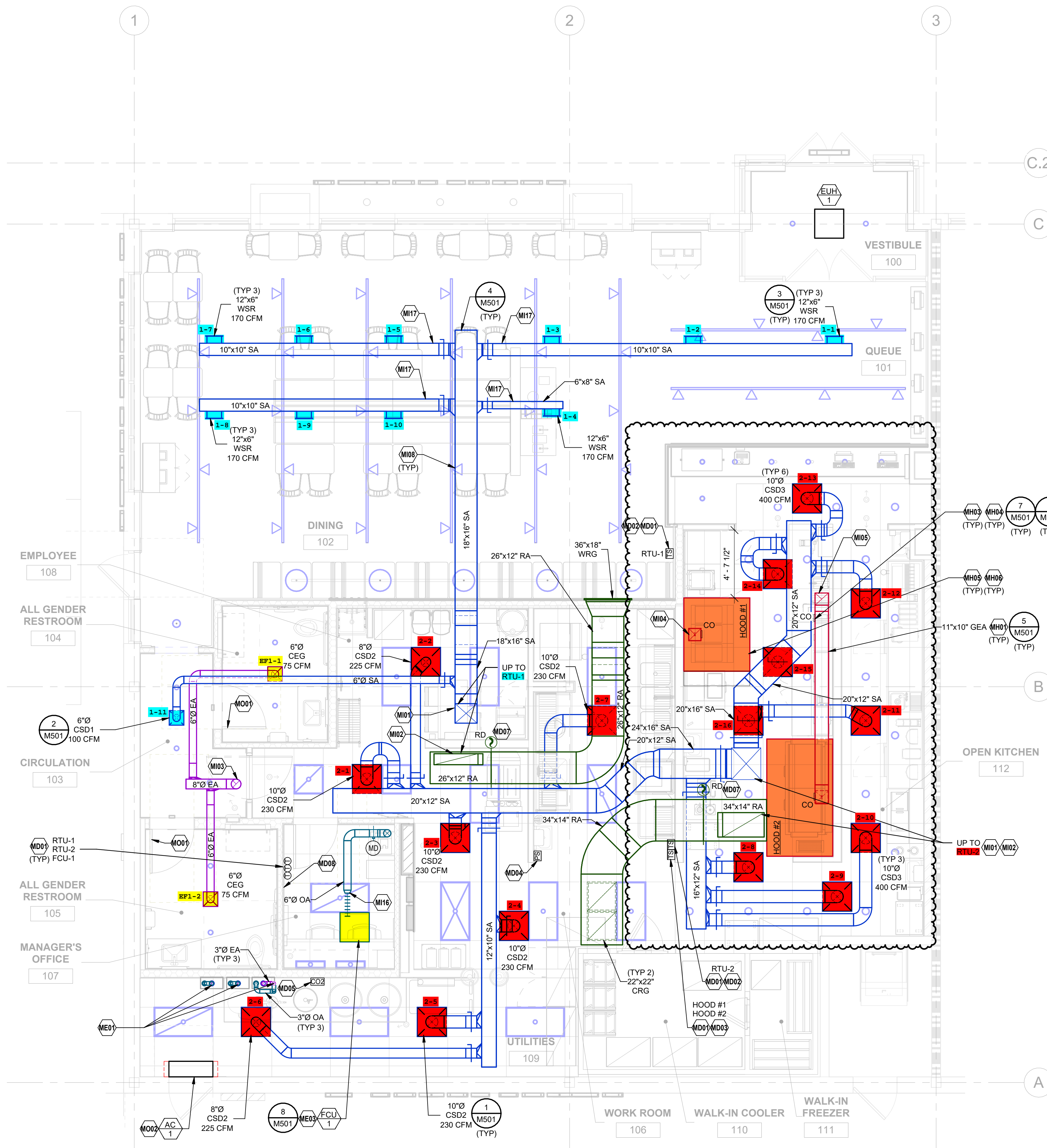


MECHANICAL GENERAL NOTES:

- DO NOT ROUTE ANY DUCTWORK OR PIPING ABOVE ELECTRICAL PANELS.
- REFER TO SHEET M001 FOR ADDITIONAL GENERAL NOTES AND REQUIREMENTS.
- REFER TO DETAILS AND SCHEDULES SHEETS FOR FURTHER INFORMATION.
- MOUNT ALL THERMOSTATS AND SENSORS CONTROLLING HVAC EQUIPMENT AT 48" AFF UNLESS OTHERWISE NOTED.

MECHANICAL PLAN NOTES:

- MD01 MOUNT THERMOSTATS, HUMIDITY SENSORS, AND TEMPERATURE SENSOR(S) ON WALL. THERMOSTATS AND SENSOR(S) SHALL BE LABELED TO MATCH THE UNIT TAG AND CORRESPOND TO THE ELECTRICAL LEGEND IN THE ELECTRICAL PANELBOARD SERVING THE EQUIPMENT. COORDINATE COLOR WITH ARCHITECT.
- MD02 COMBINATION TEMPERATURE SENSOR AND HUMIDITY SENSOR.
- MD03 MOUNT TEMPERATURE SENSOR PROVIDED WITH KITCHEN EXHAUST HOODS ON WALL.
- MD04 INSTALL HOOD FIRE SUPPRESSION MANUAL PULL STATION. COORDINATE EXACT LOCATION AND REQUIREMENTS WITH FIRE SUPPRESSION SYSTEM INSTALLER AND THE AUTHORITY HAVING JURISDICTION.
- MD05 CARBON DIOXIDE SENSOR WITH REMOTE ALARM REPEATER FURNISHED BY OWNER'S CO2 VENDOR AND LOCATED AT 12" AFF. THE SENSOR SHALL BE EQUIPPED WITH A LOCAL AUDIBLE AND VISUAL ALARM. THE LOW-LEVEL ALARM SHALL ACTIVATE THE LOCAL AUDIBLE AND VISUAL ALARM IF THE BUILDING HAS A FIRE ALARM. PROVIDE THE APPROPRIATE FIRE ALARM INTERFACE MODULE TO INTERLOCK WITH THE BUILDING FIRE ALARM SYSTEM. THE HIGH-LEVEL CO2 ALARM SHALL SIGNAL BUILDING FIRE ALARM WHEN EQUIPPED.
LOW LEVEL ALARM - 0.5% = 5,000 PPM
HIGH LEVEL ALARM - 3.0% = 30,000 PPM.
- MD07 INSTALL DUCT SMOKE DETECTOR IN RETURN AIR PLENUM.
- MD08 INSTALL EMERGENCY ALARM IN MANAGER'S OFFICE TO INDICATE CARBON MONOXIDE AND CARBON DIOXIDE DETECTION IN MECHANICAL ROOM. PROVIDE LIGHT IN OFFICE WITH TAG FOR EACH ALARM.
- ME01 PROVIDE COMBUSTION AIR AND EXHAUST PIPE AND ROUTE TO CONCENTRIC VENT THROUGH ROOF.
- ME03 REFRIGERANT PIPING UP TO CU-1 ON ROOF, REF 1/M150.
- MH01 TYPE I GREASE HOOD EXHAUST DUCTWORK SHALL BE MINIMUM 16 GAUGE STEEL OR MINIMUM 18 GAUGE STAINLESS STEEL WITH LIQUID TIGHT WELDS.
- MH03 INSTALL ACCESS PANELS FOR CLEANING AS REQUIRED BY NFPA 96 AND LOCAL CODES. TRANSITION GREASE DUCTWORK AS REQUIRED TO HOOD AND FAN CONNECTIONS. PROVIDE 45° MAX OFFSETS AS REQUIRED TO COORDINATE WITH STRUCTURE. PROVIDE RADIUS ELBOWS WITHOUT TURNING VANES. SLOPE HORIZONTAL GREASE DUCT BACK TOWARDS HOOD AT MINIMUM OF 1/4" PER LINEAL FOOT. GREASE DUCTS SHALL BE CONTAINED IN A UL APPROVED GREASE DUCT WRAP SYSTEM.
- MH04 INSTALL 'DUCTMATE ULTIMATE DOORS' ON GREASE DUCT FOR CLEANING IN LOCATION(S) SHOWN AT A MINIMUM AND AS REQUIRED BY NFPA 96 AND LOCAL CODES.
- MH05 TYPE I HOODS SHALL BE FURNISHED COMPLETE WITH INTERNALLY PIPED FIRE SUPPRESSION SYSTEM AND EXTERNAL FOAM SUPPLY BOTTLES WITH REMOTE PULL CONTROLS AND IN COMPLIANCE WITH NFPA 96 DIVISION 23 SHALL COORDINATE COMPLETE INSTALLATION WITH FIRE PROTECTION CONTRACTOR TO MEET APPROVAL OF LOCAL INSPECTOR AND CODE COMPLIANCE INCLUDING TESTING.
- MH06 HOOD SHALL OVERHANG THE COOKING SURFACE BY AT LEAST 6" ON BOTH SIDES.
- MI01 PROVIDE SA DUCT THROUGH ROOF. FULL SIZE OF UNIT OPENING, AND CONNECT TO UNIT WITH FLEXIBLE CONNECTOR. TRANSITION 45 DEGREES THROUGH ROOF CURB.
- MI02 PROVIDE RA DUCT THROUGH ROOF. FULL SIZE OF UNIT OPENING, AND CONNECT TO UNIT WITH FLEXIBLE CONNECTOR. TRANSITION 45 DEGREES THROUGH ROOF CURB.
- MI03 PROVIDE EA DUCT THROUGH ROOF. TRANSITION TO EXHAUST FAN INLET SIZE WITHIN CURB.
- MI04 10"x10" GREASE EXHAUST DUCT UP TO KEF-1 ON ROOF.
- MI05 11"x10" GREASE EXHAUST DUCT UP TO KEF-2 ON ROOF.
- MI08 ROUTE DUCTWORK LEVEL, TIGHT TO STRUCTURE, AND ABOVE LIGHTS. COORDINATE WITH STORM DRAINAGE, STRUCTURAL, AND ELECTRICAL.
- MI16 TRANSITION 6" OUTDOOR AIR DUCT TO 4" FLEXIBLE DUCTWORK AND CONNECT TO UNIT.
- MI17 DUCTWORK TO BE ROUTED THROUGH CEILING JOISTS IN SPACE. COORDINATE EXACT ROUTING WITH STRUCTURAL DRAWINGS AND FIELD CONDITIONS.
- MO01 CONTRACTOR TO COORDINATE 1" UNDERCUT ON DOOR FOR EXHAUST AIR PATH.
- MO02 AIR CURTAIN MOUNTED ABOVE DOOR. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.



1 MECHANICAL FLOOR PLAN
1/4" = 1'-0"

THE BUILDINGS HVAC SYSTEMS SHALL BE BALANCED BY NATIONAL TAB (NO EXCEPTIONS) AND CONTRACTED BY THE GENERAL CONTRACTOR.
CONTACT:
WILL TURNBROUGH
will@natortab.com
855-682-6822 ext704

ALL GREASE DUCT TO BE WATER TESTED BY ENVIROMATIC AT MECHANICAL CONTRACTOR'S EXPENSE. CONTACT OWNER'S NATIONAL ACCOUNT VENDOR:
ENVIROMATIC
DON PFLEDERER
1.800.325.8475
inspections@enviromatic.com

Bergmeyer
CONSULTANTS:
380 E 20th Street
Columbus, OH 43215
380.900.8887
www.bergmeyer.com

HENDERSON
ENGINEERS
8345 LENAIA DRIVE, SUITE 300
LENEA, KS 66214
TEL 913.742.5000 FAX 913.742.5001
WWW.HENDERSONENGINEERS.COM
2520201406
CT. CORPORATE NO. PEC.0020284

SEAL SIGNATURE:

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IT IS NOT TO BE USED FOR CONSTRUCTION PURPOSES

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1	HEI	2025-07-21	IFC SET
1	HEI	2025-06-06	BID/PERMIT SET

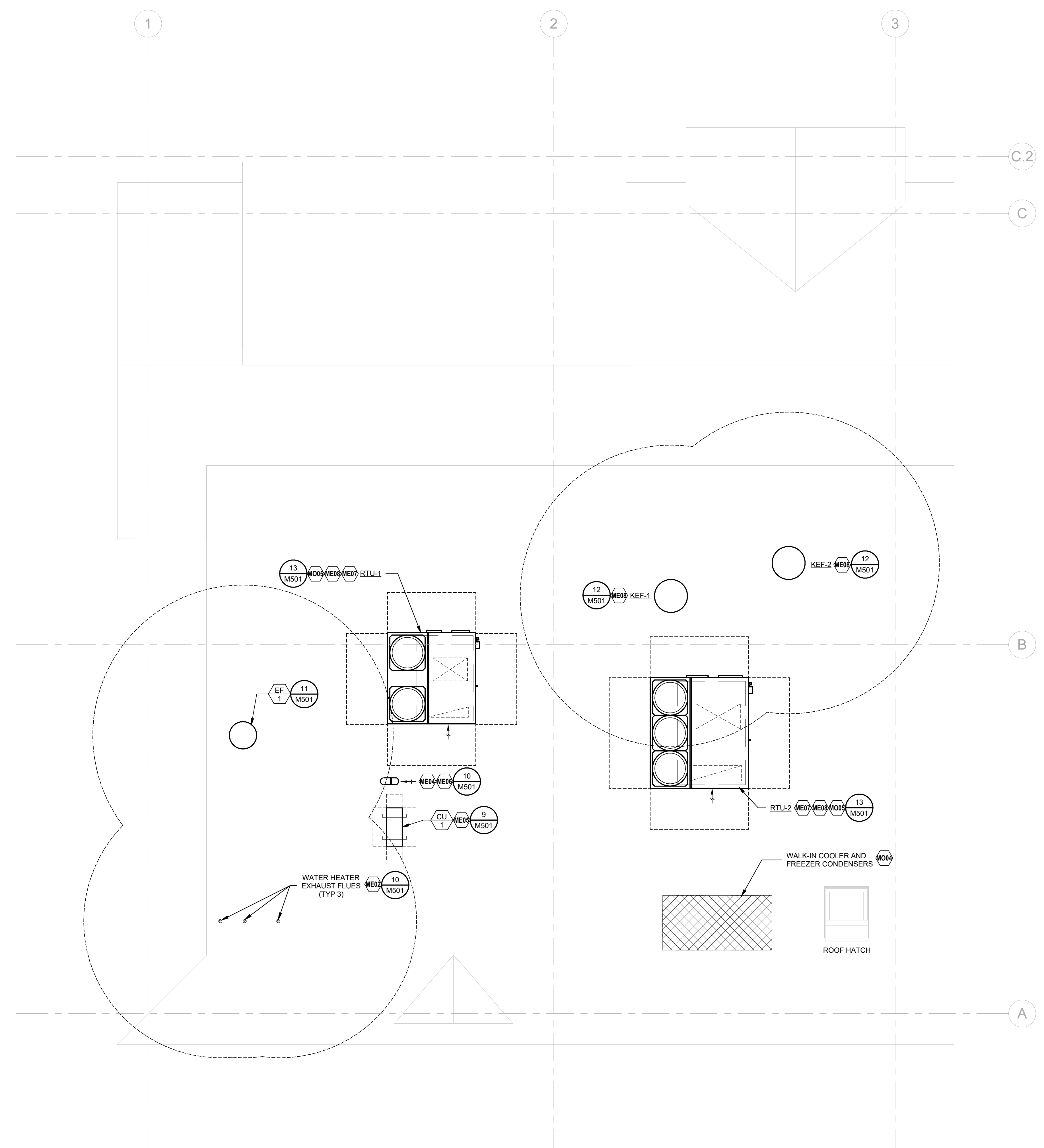
SHAKE SHACK

SHAKE SHACK SHOPS AT STONEBRIDGE
2053 HIGHLAND AVE, UNIT E 120
CHESHIRE, CT 06410
SHACK #1730
IFC SET

MECHANICAL FLOOR PLAN
DRAWN BY: Author
CHECKED BY: Checker
JOB NO: 2025040

M101

- MECHANICAL PLAN NOTES:**
- ME02 PROVIDE WATER HEATER CONCENTRIC VENT KIT SPECIFIED IN THE WATER HEATER INSTALLATION MANUAL.
 - ME04 MAINTAIN ALL OUTSIDE AIR INTAKES A MINIMUM OF 10'-0" RADIUS FROM EXHAUST.
 - ME05 CONTRACTOR SHALL VERIFY WITH EQUIPMENT SUPPLIER EXACT ROUTING AND SIZE OF INSULATED REFRIGERANT PIPING. SINGLE LINESET SHOWN FOR CLARITY. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.
 - ME06 TURN DOWN 6"Ø INTAKE AND END OPEN OVER ROOF (MIN. 24") WITH INSECT SCREEN.
 - ME07 CONTRACTOR SHALL COORDINATE WITH NATIONAL TAB TO PROVIDE UV-PH1 INDOOR AIR PURIFICATION SYSTEM, MODEL PHI-PKG-24V. INSTALL IN UNIT BLOWER COMPARTMENT PER MANUFACTURER'S INSTRUCTIONS.
 - ME08 ROOF MECHANICAL EQUIPMENT TO BE INSTALLED ON EXISTING CURBS BY LANDLORD.
 - MO04 AREA RESERVED FOR REFRIGERATION CONDENSER(S) PROVIDED BY KITCHEN EQUIPMENT CONTRACTOR. COORDINATE EQUIPMENT LOCATION AND CONDENSER INSTALLATION WITH KITCHEN EQUIPMENT CONTRACTOR.
 - MO05 REFERENCE PLUMBING DRAWINGS FOR CONDENSATE DRAIN ROUTING AND TERMINATION REQUIREMENTS.



1 MECHANICAL ROOF PLAN
1/4" = 1'-0"

Bergmeyer

380 E 20th Street
Los Angeles, CA 90012
380 900 8887
www.bergmeyer.com

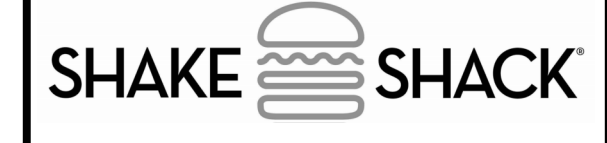
CONSULTANTS:

HENDERSON ENGINEERS
8345 LENEVA DRIVE, SUITE 300
LENEXA, KS 66214
TEL 913.742.5000 FAX 913.742.5001
WWW.HENDERSONENGINEERS.COM
252001406
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SHAKE SHACK SHOPS AT
STONEBRIDGE

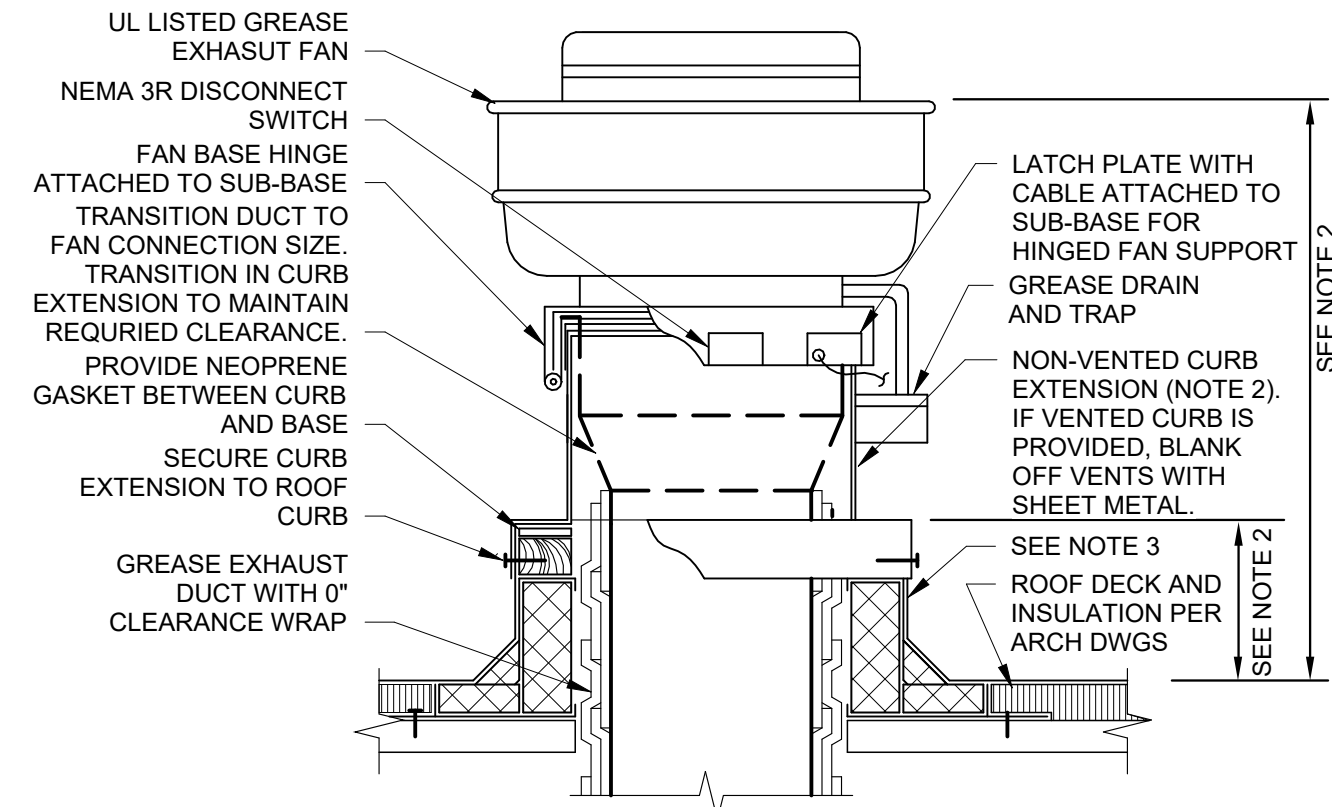
2053 HIGHLAND AVE, UNIT E 120
CHESHIRE, CT 06410
SHACK #1730

IFC SET

MECHANICAL ROOF PLAN

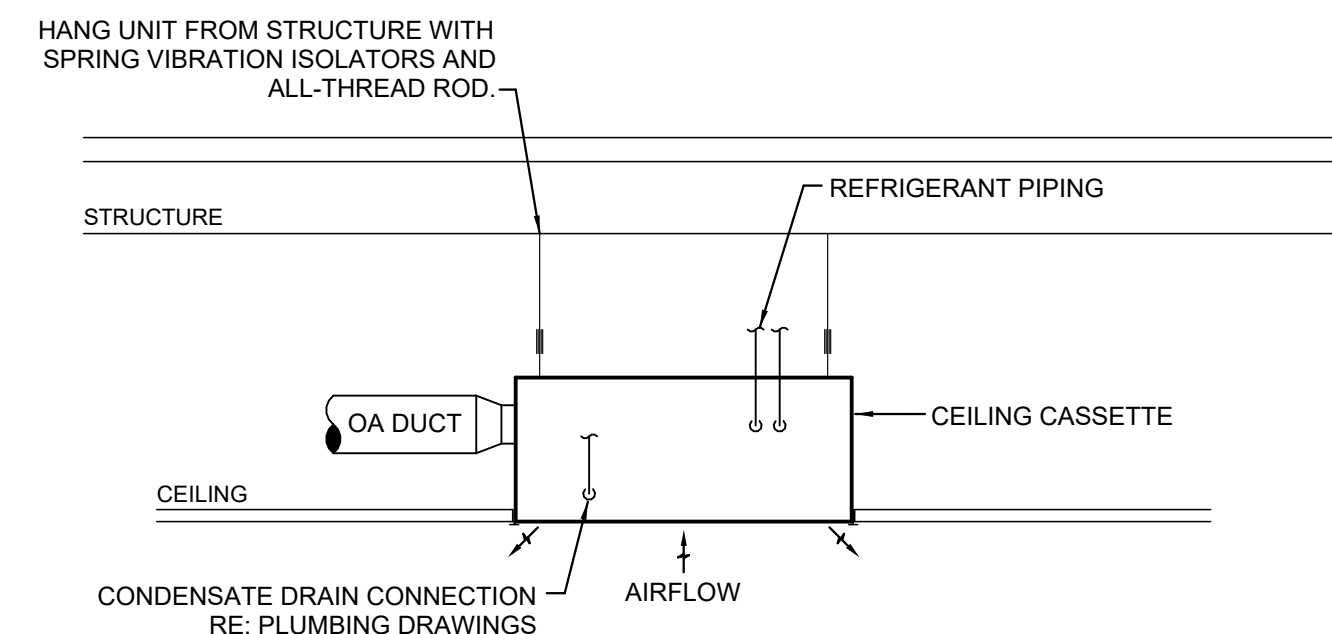
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JOB NO: 20250040

M150



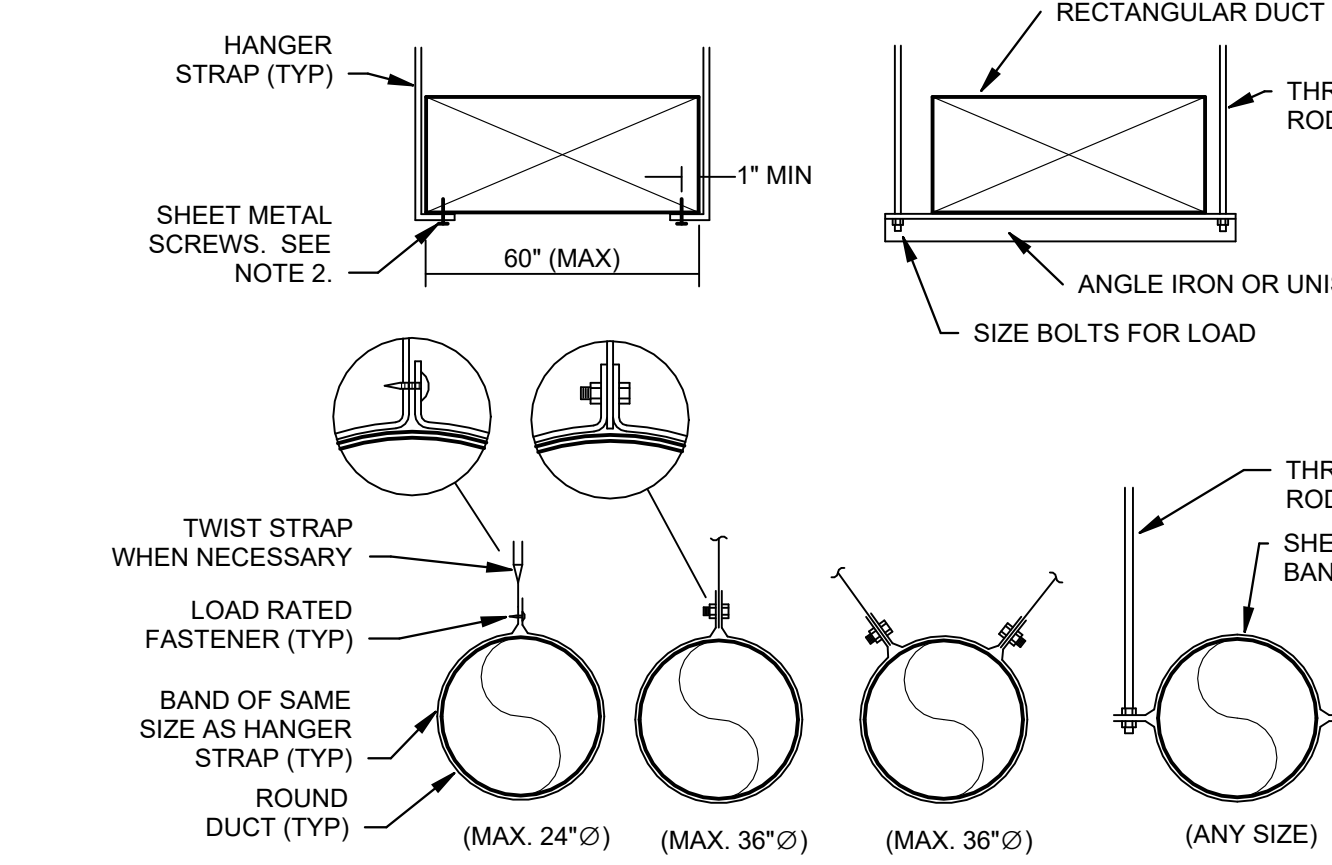
- NOTES:
- ARRANGEMENT SHOWN IS SCHEMATIC, ADJUST TO SUIT FIELD CONDITIONS AND MEET LOCAL CODE.
 - PROVIDE CURB EXTENSION MADE FROM NON-COMBUSTIBLE MATERIAL OF HEIGHT REQUIRED TO MOUNT FAN BASE A MINIMUM 18 INCHES ABOVE COMBUSTIBLE CURB MATERIAL AND DISCHARGE GREASE OUTLET A MINIMUM OF 40 INCHES ABOVE ROOF SURFACE OR ANY ADJACENT BUILDING STRUCTURE WITHIN 10 FEET OF OUTLET, WHICHEVER IS HIGHER.
 - PREFABRICATED INSULATED ROOF CURB WITH TREATED WOOD NAILER, CANT, AND STEP AS REQUIRED TO ACCOMMODATE ROOF INSULATION, FRAME AND SECURE CURB TO ROOF WITH METHOD CONSISTENT WITH ROOF CONSTRUCTION. ROOF CURB SHALL BEAR ON ROOF STRUCTURE. FOR SLOPED ROOFS, PROVIDE CURB WITH DIMENSIONS CAPABLE OF COMPENSATING ROOF SLOPE TO ENSURE FAN IS INSTALLED LEVEL. REFER TO ARCHITECTURAL DRAWINGS AND CURB MANUFACTURER'S DETAILS FOR MORE INFORMATION.
 - HIGH WIND STRAPPING: PROVIDE STAINLESS STEEL STRAPS OF LENGTH, WIDTH, THICKNESS, AND SPACING SUFFICIENT TO SECURE FAN TO CURB TO WITHSTAND WIND SPEED REQUIREMENTS PER LOCAL CODE. WRAP STRAPS OVER FAN AND SECURELY ATTACH TO OPPOSITE SIDE OF THE CURB.

12 UPBLAST GREASE EXHAUST FAN DETAIL NTS



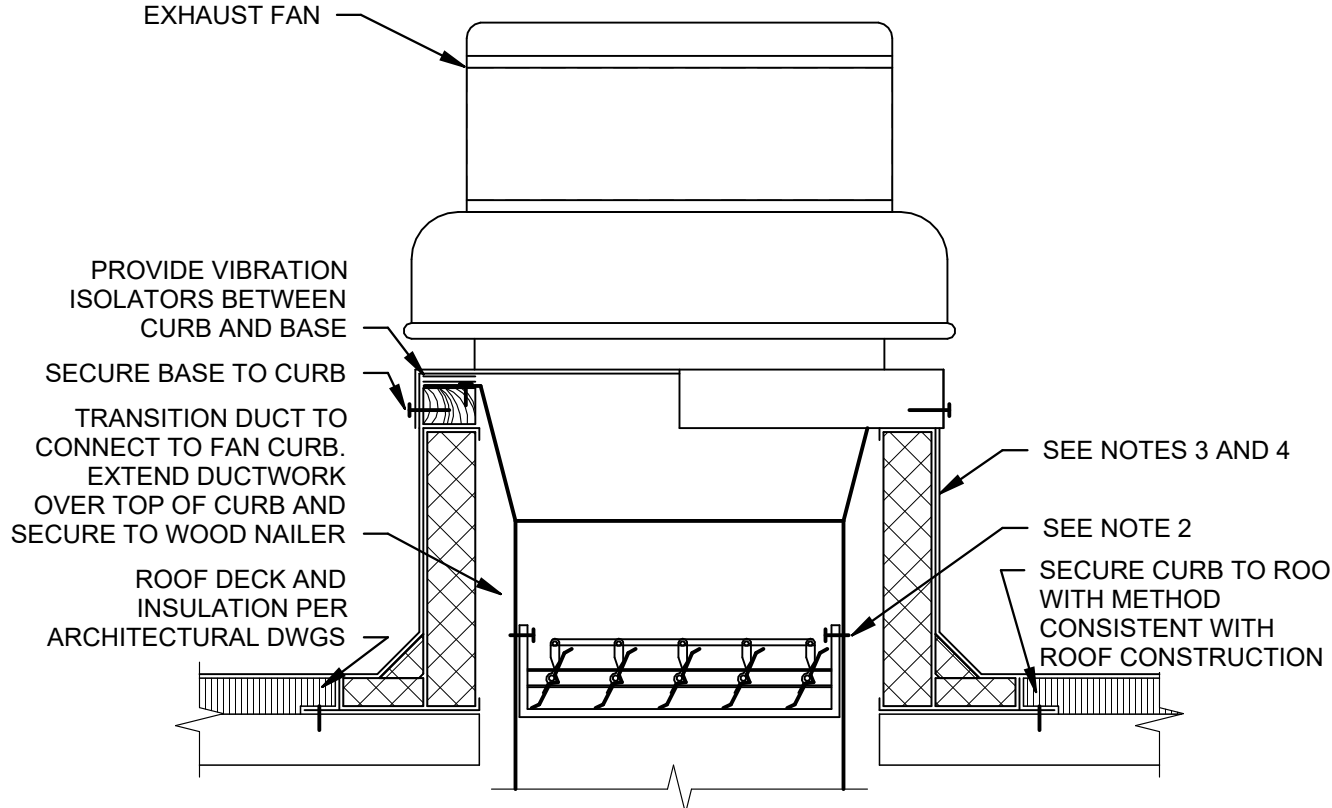
- NOTES:
- ARRANGEMENT SHOWN IS SCHEMATIC, ADJUST TO SUIT FIELD CONDITIONS AND MEET LOCAL CODE REQUIREMENTS.

8 CEILING CASSETTE DETAIL NTS



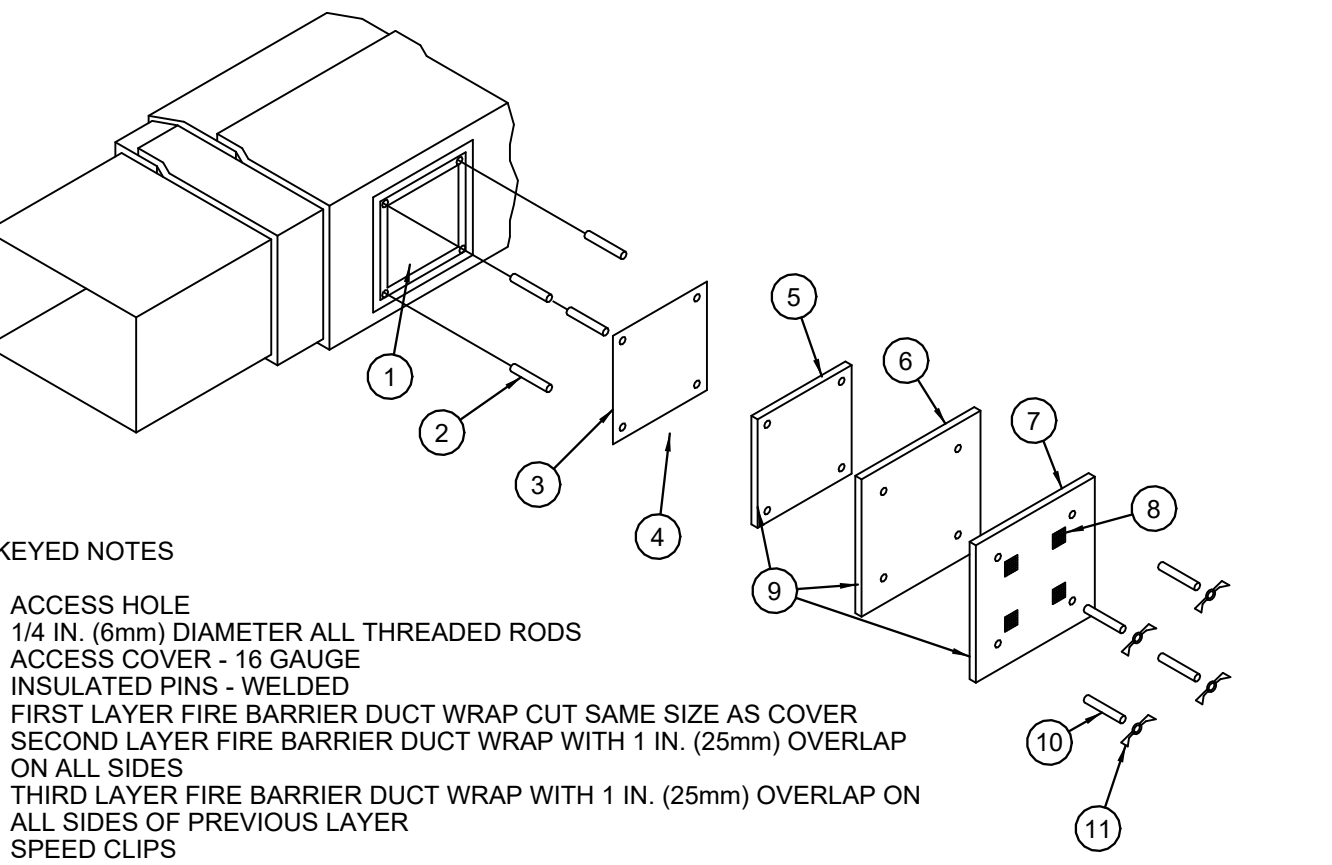
- NOTES:
- USE THREADED ROD FOR RECTANGULAR DUCTS LARGER THAN 60" WIDE.
 - OMIT SHEET METAL SCREWS IF HANGER STRAP IS CONTINUOUS AND LOOPS UNDER ENTIRE RECTANGULAR DUCT.
 - FOR ROUND DUCTS LARGER THAN 36" Ø, USE TWO HANGER RODS TO SUPPORT DUCT FROM EACH SIDE.
 - HANGERS MUST NOT DEFORM DUCT SHAPE.

4 DUCT HANGER LOWER ATTACHMENT DETAILS NTS



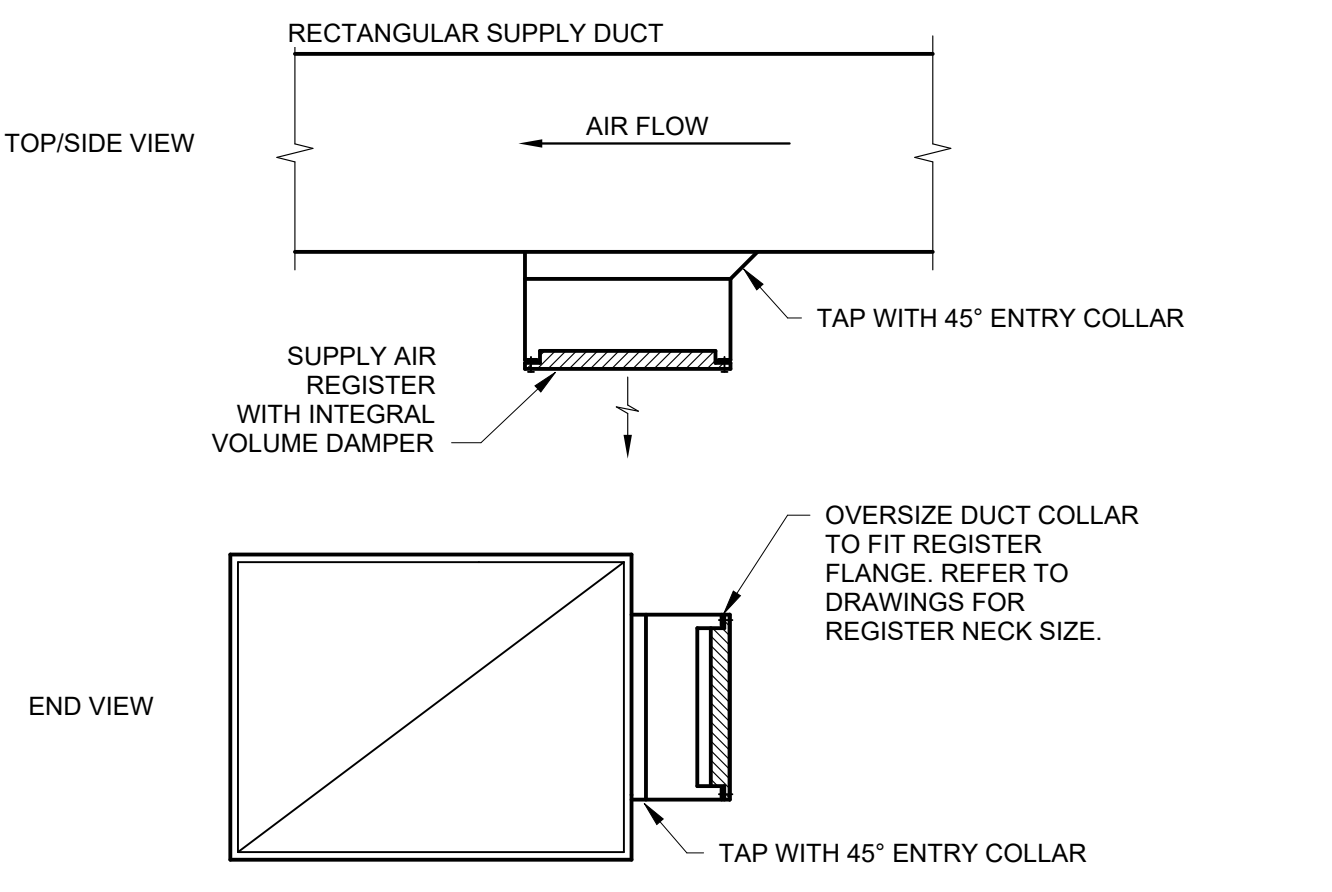
- NOTES:
- ARRANGEMENT SHOWN IS SCHEMATIC, ADJUST TO SUIT FIELD CONDITIONS AND MEET LOCAL CODE.
 - IF DAMPER IS SPECIFIED IN EQUIPMENT SCHEDULE, INSTALL DAMPER AT BASE OF CURB AND SECURE FROM ABOVE TO ALLOW SERVICE THROUGH TOP OF CURB.
 - PREFABRICATED INSULATED ROOF CURB WITH TREATED WOOD NAILER, CANT, AND STEP AS REQUIRED TO ACCOMMODATE ROOF INSULATION, FRAME AND SECURE CURB TO ROOF WITH METHOD CONSISTENT WITH ROOF CONSTRUCTION. ROOF CURB SHALL BEAR ON ROOF STRUCTURE. REFER TO ARCHITECTURAL DRAWINGS AND CURB MANUFACTURER'S DETAILS FOR MORE INFORMATION.
 - FOR SLOPED ROOFS, PROVIDE CURB WITH DIMENSIONS CAPABLE OF COMPENSATING ROOF SLOPE TO ENSURE FAN IS INSTALLED LEVEL.
 - HIGH WIND STRAPPING: PROVIDE STAINLESS STEEL STRAPS OF LENGTH, WIDTH, THICKNESS, AND SPACING SUFFICIENT TO SECURE FAN TO CURB TO WITHSTAND WIND SPEED REQUIREMENTS PER LOCAL CODE. WRAP STRAPS OVER FAN AND SECURELY ATTACH TO OPPOSITE SIDE OF THE CURB.

11 ROOF MOUNTED DOWNBLAST FAN DETAIL NTS



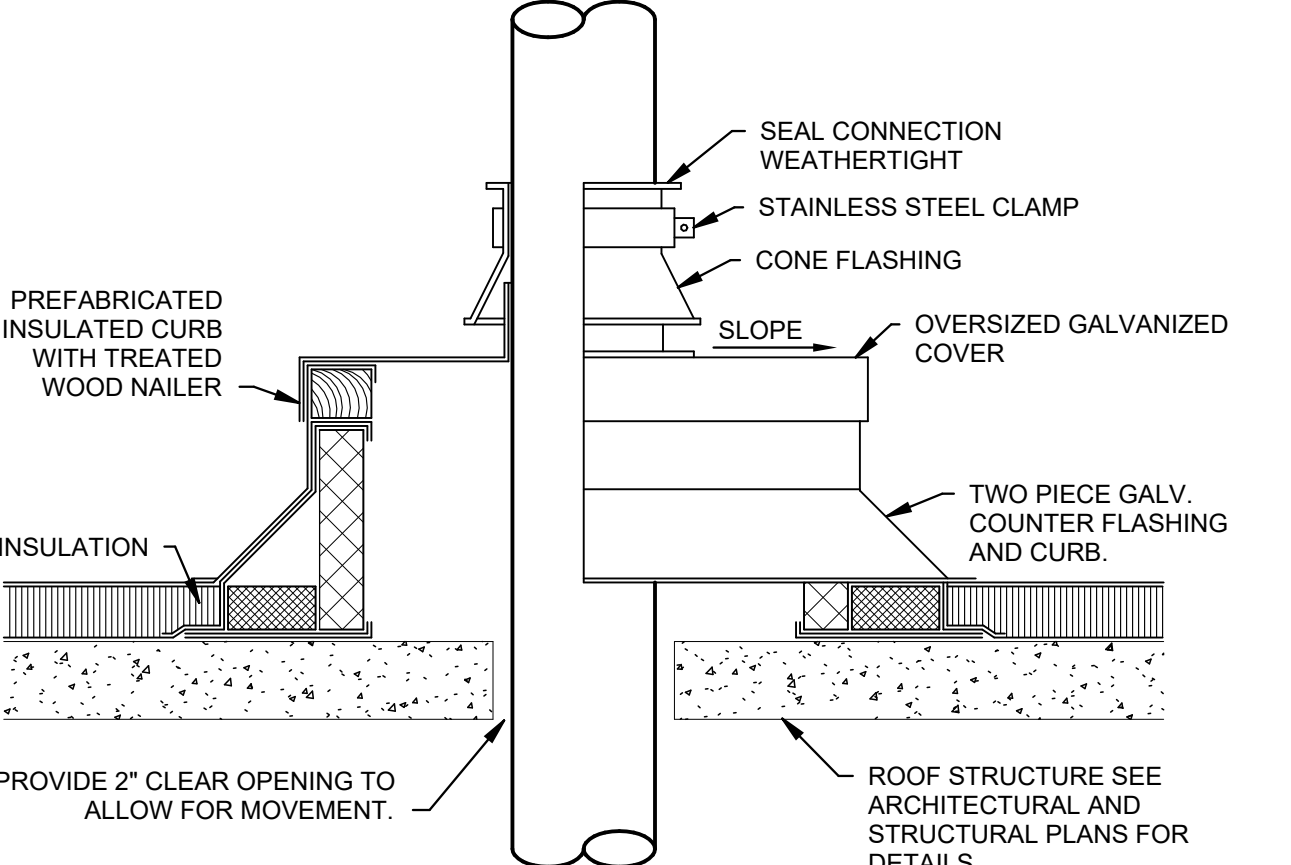
- KEYED NOTES
- ACCESS HOLE
 - 1/4 IN. (6mm) DIAMETER ALL THREADED RODS
 - ACCESS COVER - 16 GAUGE
 - INSULATED PINS - WELDED
 - FIRST LAYER FIRE BARRIER DUCT WRAP CUT SAME SIZE AS COVER
 - SECOND LAYER FIRE BARRIER DUCT WRAP WITH 1 IN. (25mm) OVERLAP ON ALL SIDES
 - THIRD LAYER FIRE BARRIER DUCT WRAP WITH 1 IN. (25mm) OVERLAP ON ALL SIDES OF PREVIOUS LAYER
 - SPEED CLIPS
 - ALUMINUM TAPE COVERING ALL EXPOSED EDGES
 - SPOOL PIECES FOR THREADED RODS
 - 1/4 IN. (6mm) DIAMETER WING NUTS
- NOTES:
- FOR REFERENCE ONLY. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.
 - AT CONTRACTOR'S OPTION, A LISTED UL 1978 GREASE ACCESS DOOR PRODUCT MAY BE SUBSTITUTED FOR THE ACCESS DOOR PICTURED IN THIS DETAIL. DOOR SHALL BE RATED FOR UP TO 2,000 PSI AND MEET NFPA STANDARDS. BOLTS SHALL BE LONG ENOUGH FOR DUCT WRAP SYSTEM (WHEN USED). INSTALL IN ACCORDANCE WITH MANUFACTURER'S LITERATURE.

7 GREASE DUCT CLEANOUT ACCESS DOOR DETAIL NTS

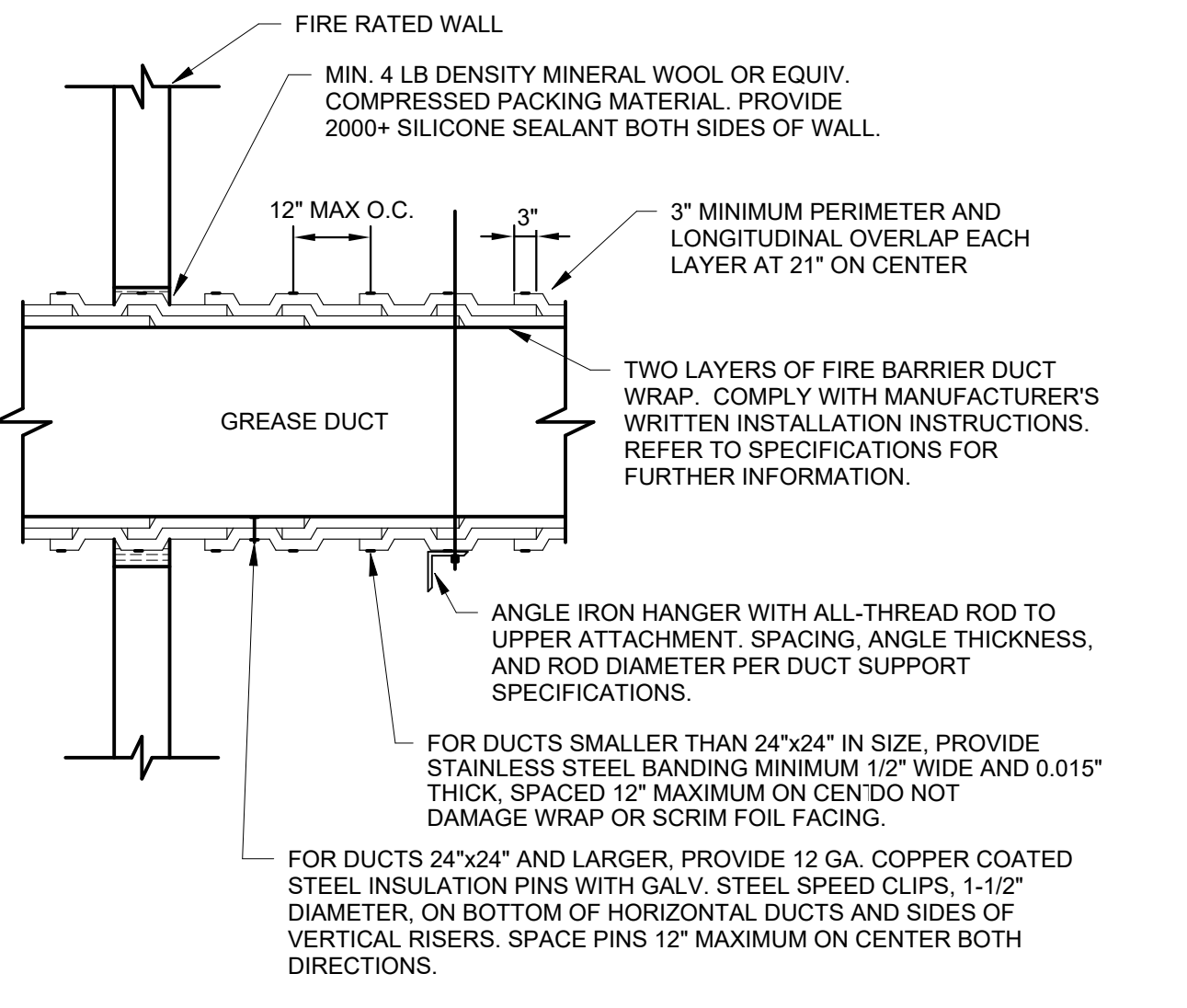


- NOTES:
- POSITION ADJUSTABLE LOUVERS DURING TESTING AND BALANCING FOR OCCUPANT COMFORT AND TO DECREASE DRAFTS IN THE SPACE.

3 REGISTER MOUNTING TO RECTANGULAR DUCT DETAIL NTS

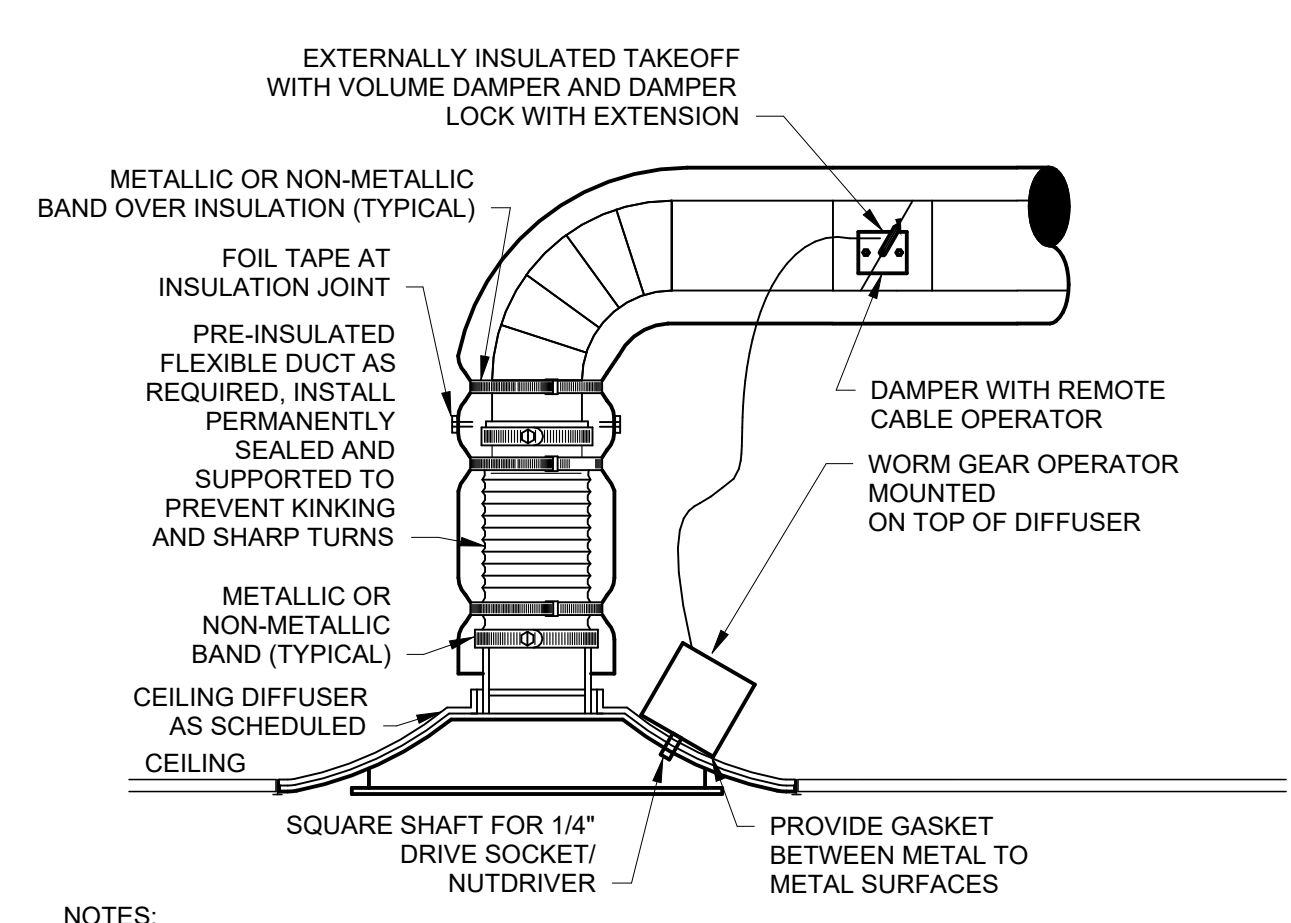


10 ROUND DUCT PENETRATION THROUGH ROOF DETAIL NTS



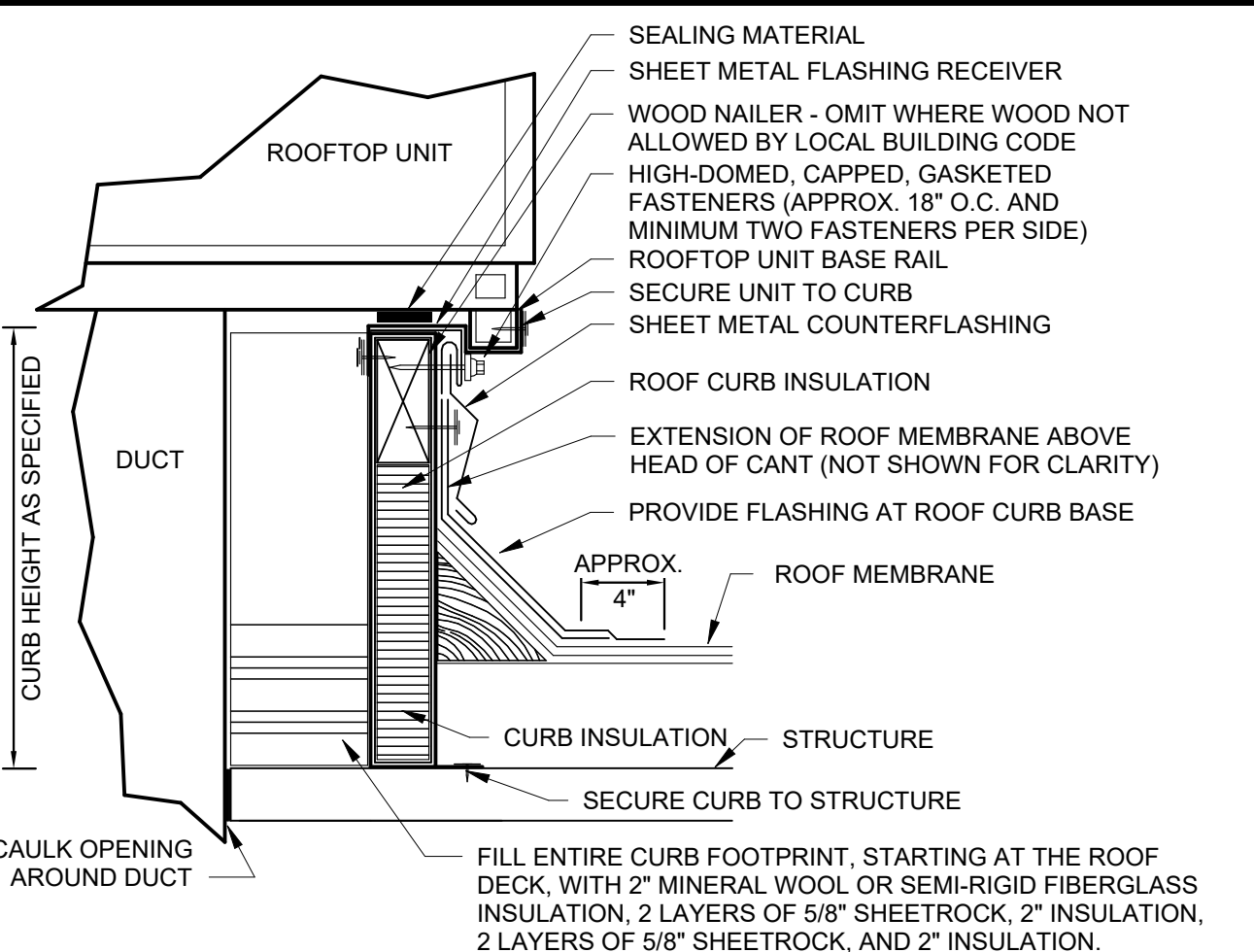
- NOTES:
- INSTALL GREASE EXHAUST AND FIRE RATED DUCT WRAP IN ACCORDANCE WITH THE MANUFACTURER'S APPROVED INSTRUCTIONS AND UL LISTED INSTALLATION DETAILS. TECHNIQUES THAT DIFFER FROM THE ABOVE METHOD ARE ACCEPTABLE IF THEY ARE UL TESTED AND APPROVED.

6 GREASE DUCT FIRE WRAP INSULATION INSTALLATION DETAIL NTS



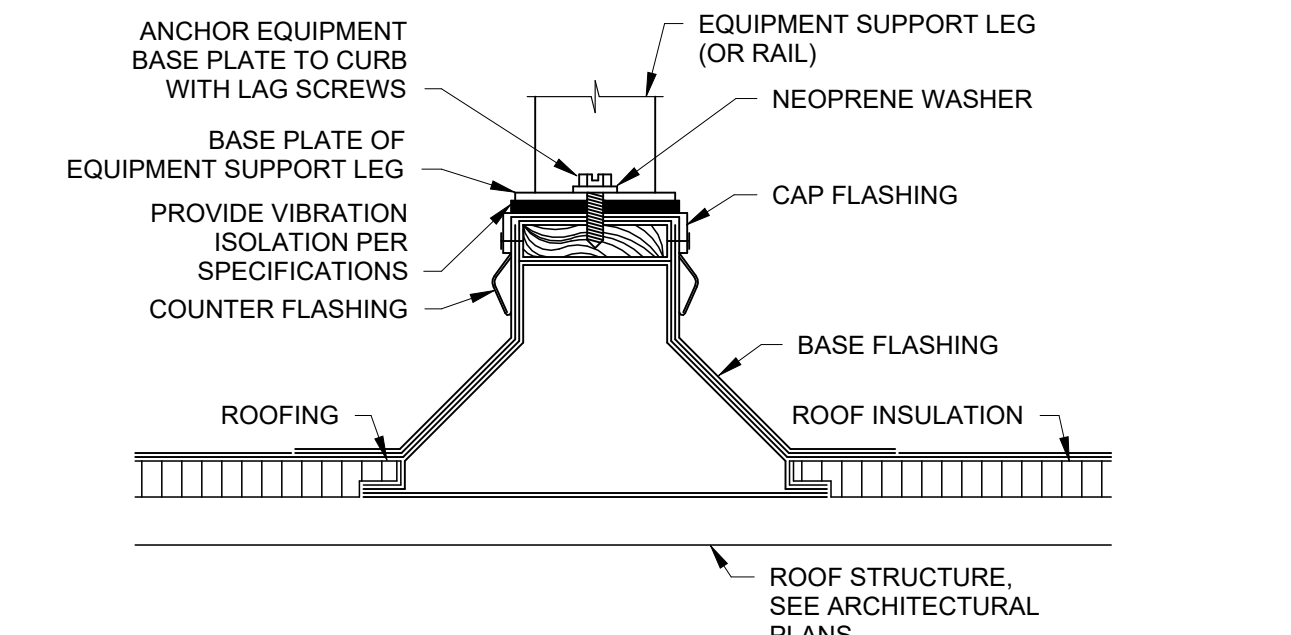
- NOTES:
- FLEXIBLE DUCT LENGTH MAY NOT EXCEED 5'-0". EXTEND RIGID DUCT AS REQUIRED.
 - REFER TO SPECIFICATIONS FOR FLEXIBLE DUCTWORK INSTALLATION REQUIREMENTS.

2 CEILING DIFFUSER DETAIL NTS



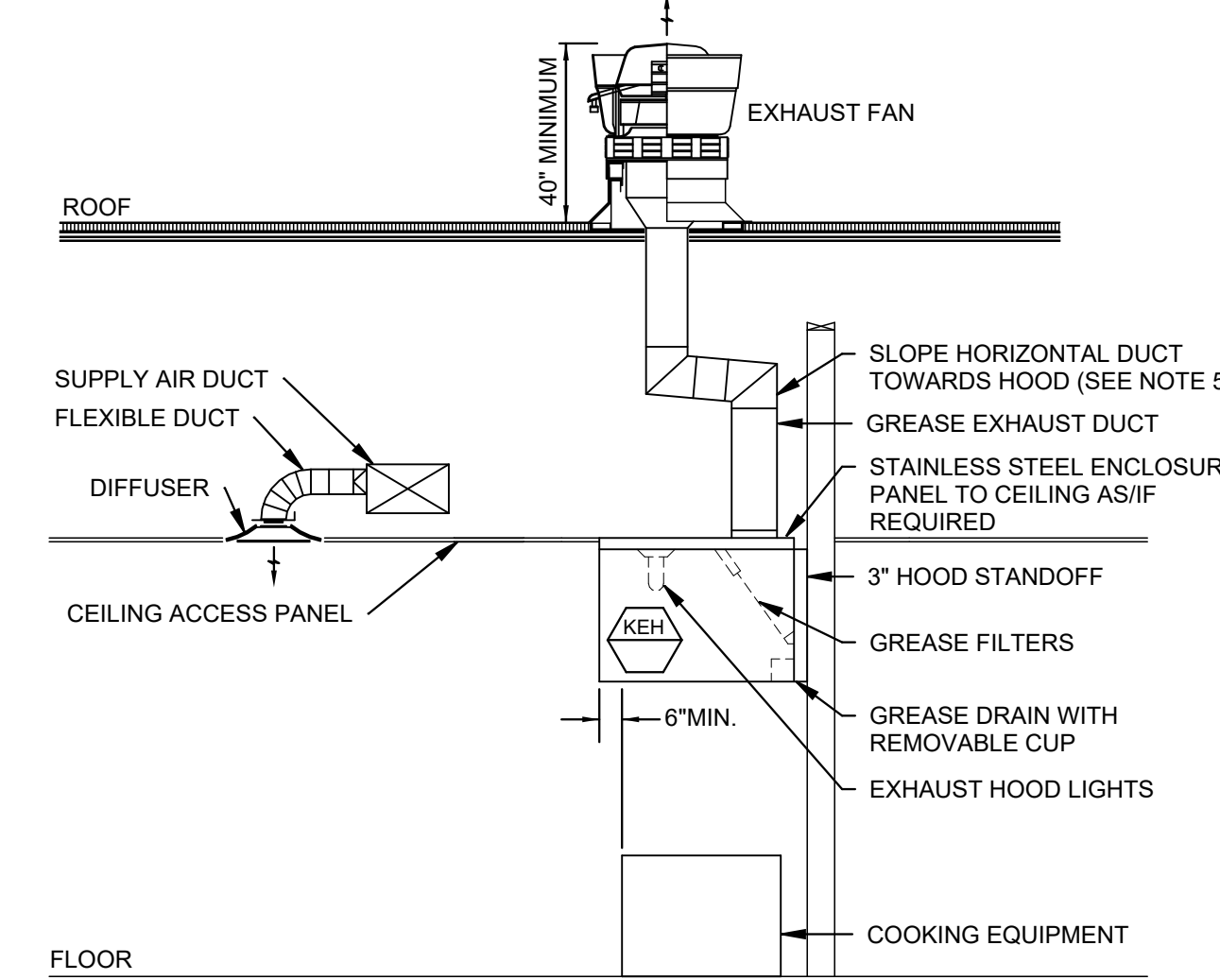
- NOTES:
- CUT METAL DECKING TO ALLOW CURB INSTALLATION ON STEEL FRAMING, AFTER CURB IS SET IN PLACE, TRIM REMAINING METAL DECKING AND INSTALL WITHIN CURB. TACK WELD DECKING TO SUPPORT STEEL. DO NOT WELD INTERIOR DECKING TO ROOF CURB. PROVIDE ADDITIONAL CROSS FRAMING TO SUPPORT INTERIOR DECKING AND FILL MATERIAL AS REQUIRED.
 - REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS FOR ROOF CURBS, ANCHORING AND SEISMIC/WIND RESISTANCE.

13 ROOF CURB DETAIL NTS



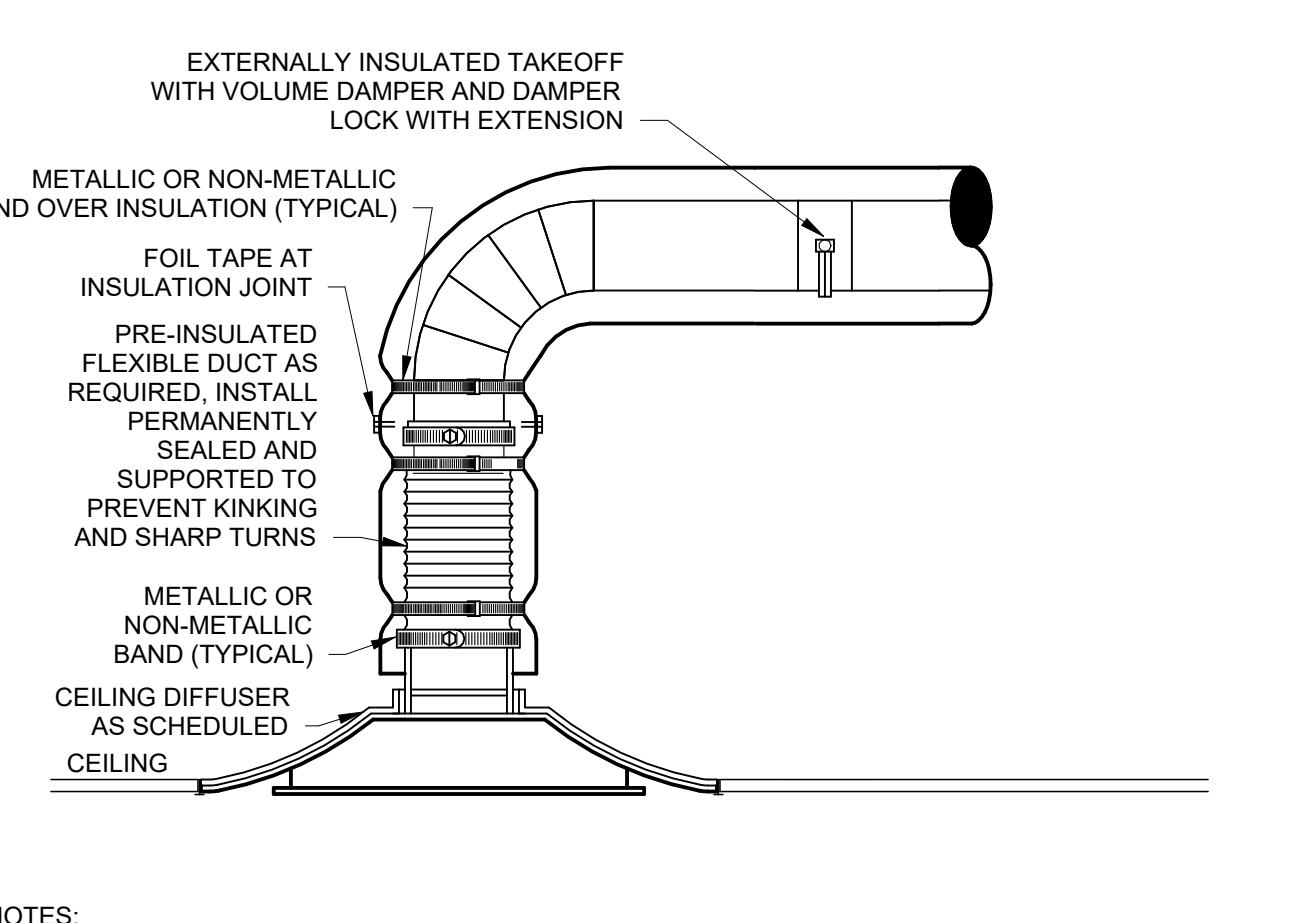
- NOTES:
- REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS FOR EQUIPMENT SUPPORTS, ANCHORING AND SEISMIC/WIND RESISTANCE.

9 ROOF EQUIPMENT SUPPORT RAIL DETAIL NTS



- NOTES:
- SUBMIT SHOP DRAWINGS OF ALL HOOD SYSTEMS TO CITY FOR APPROVAL PRIOR TO INSTALLATION.
 - TOTAL HOOD SYSTEM TO BE IN COMPLETE CONFORMANCE WITH NFPA, AND ALL LOCAL CODES AND REGULATIONS.
 - COORDINATE ALL FIRE PROTECTION SYSTEMS WITH FIRE PROTECTION CONTRACTOR WHO SHALL ALSO BE RESPONSIBLE FOR ALL PERMITS AND TESTING REQUIRED.
 - PROVIDE WRAP SYSTEM WHERE APPROVED BY LOCAL CODES IN LIEU OF RATED ENCLOSURE.
 - PROVIDE ACCESS PANELS AS REQUIRED BY LOCAL CODE AND PER PLAN.
 - HOODS SHALL EXTEND MINIMUM 6" BEYOND ALL OPEN SIDES AND FRONT EDGE OF FOOD COOKING EQUIPMENT BEING SERVED.

5 KITCHEN EXHAUST HOOD ELEVATION DETAIL NTS



- NOTES:
- FLEXIBLE DUCT LENGTH MAY NOT EXCEED 5'-0". EXTEND RIGID DUCT AS REQUIRED.
 - REFER TO SPECIFICATIONS FOR FLEXIBLE DUCTWORK INSTALLATION REQUIREMENTS.

1 CEILING DIFFUSER DETAIL NTS

Bergmeyer

CONSULTANTS

8345 LENEVA DRIVE, SUITE 300
LENEVA, KS 66214
TEL 913.742.5000 FAX 913.742.5001
WWW.HENDERSONENGINEERS.COM
2550201406
CT. CORPORATE NO. PEC.000284

3011
07/18/2025

HENDERSON ENGINEERS

8345 LENEVA DRIVE, SUITE 300
LENEVA, KS 66214
TEL 913.742.5000 FAX 913.742.5001
WWW.HENDERSONENGINEERS.COM
2550201406
CT. CORPORATE NO. PEC.000284

SEAL SIGNATURE:

STATE OF KANSAS
Professional Engineer
07/18/2025

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1	HEI	2025-07-21	IFC SET
HEI	2025-06-06	BID/PERMIT SET	

SHAKE SHACK

SHAKE SHACK SHOPS AT STONEBRIDGE

2053 HIGHLAND AVE, UNIT E 120
CHESHIRE, CT 06410
SHACK #1730

IFC SET

MECHANICAL DETAILS

DRAWN BY: Author
CHECKED BY: Checker
JOB NO: 2025040

M501

Division 23: HEATING, VENTILATING, AND AIR CONDITIONING

A. GENERAL INSTRUCTIONS

1. GENERAL REQUIREMENTS

All requirements under Division 01 and the general and supplementary conditions of these specifications apply to this section and division. Where the requirements of this section and division exceed those of Division 01, this section and division take precedence. Become thoroughly familiar with all its contents as to requirements that affect this division, section, or both. Work required under this division, section, or both, is to be done in accordance with the drawings, specifications, and labor required to complete the entire system as required by the drawings and specifications, or reasonably inferred to be necessary to facilitate the function of each system as implied by the design and the equipment specified.

The specifications and drawings for the project are complementary, and any portion of work described in one shall be provided as if described in both. In the event of discrepancies, notify the Engineer and request clarification prior to proceeding with the work involved. Drawings are graphic representations of the work upon which the contract is based. They show the materials and their relationship to one another, including sizes, shapes, locations, and connections. They convey the scope of work, indicating the intended general arrangement of the systems without showing all of the exact details as to elevations, offsets, control lines, and other installation requirements. Use the drawings as a guide when laying out the work and to verify that materials and equipment will fit into the designated spaces, and when installed per manufacturers' requirements, will ensure a complete, coordinated, satisfactory, and properly operating system.

B. DEFINITIONS

Division: References contained in this specification follow the numbering system defined in the Construction Specifications Institute (CSI) MasterFormat 2004 Edition. Specification Divisions 01 through 13 provided with this project may reference the CSI MasterFormat 1995 Edition. The corresponding division references between the 2004 Edition and 1995 Edition are as follows:
2004 Edition 1995 Edition
1. Division 21 – Fire Suppression Division 15
2. Division 22 – HVAC Division 15
3. Division 23 – HVAC Division 15
4. Division 24 – Electrical Division 16
5. Division 27 – Communications Division 16
6. Division 28 – Electrical Safety and Security Division 16

Furnish: "to supply and deliver to the project site, ready for unloading, unpacking, installation and similar operations."
"Install:" to perform all operations at the project site including, but not limited to, the actual unloading, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, testing, commissioning, start-up and similar operations, complete, and ready for the intended use."
"Provide:" to furnish and install.

Furnished by Owner (or Owner-Furnished) or Furnished by Others: "an item furnished by the Owner or under other divisions or contracts, and installed under the requirements of this division, complete and ready for intended use, including all items and services incidental to the work necessary for proper installation and operation. Include the installation under the warranty required by this division."

Engineer: Where referenced in this division, "Engineer" is the Engineer of Record and the Design Professional for the work under this division, and is a consultant to, and an authorized representative of the Architect, as defined in the General and/or Supplementary Conditions. When used in this division, Engineer means increased involvement by and obligations to the Engineer, in addition to the Architect. The local code and/or inspection agency (Authority) Having Jurisdiction over the work.

NRTL: Nationally recognized testing laboratory, as defined and listed by OSHA in 29 CFR 1910.7 (e.g., UL, ETL, CSA), and acceptable to the AHJ over this project. Nationally recognized testing laboratories and standards listed are used only to represent the characteristics required and are not intended to restrict the use of other NRTLs that are acceptable to the AHJ and standards that meet the specified criteria.

Substitution: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor. Substitutions include Value Engineering proposals.
1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

The terms "approved equal," "equivalent," or "equal" are to be used synonymously and shall mean "accepted by or acceptable to the Engineer as equivalent to the item or manufacturer specified." The term "approved" shall mean labeled, listed, or both, by an NRTL, and acceptable to the AHJ over this project.

C. PREBID VISIT

Prior to submitting bid, visit the site of the proposed work and become fully informed as to the conditions under which the work is to be done. Failure to comply with this requirement shall not be considered sufficient justification to request or obtain extra compensation over and above the contract price.

D. MATERIAL AND WORKMANSHIP

Provide new material, equipment, and apparatus under this contract unless otherwise stated herein, of best quality normally used for the purpose in good commercial practice, and free from defects. Install material and equipment in accordance with the manufacturer's installation instructions. Model numbers listed in the specifications or shown on the drawings are not necessarily intended to designate the required trim, written descriptions of the trim govern model numbers.
Pipe, pipe fittings, pipe specialties and valves shall be manufactured in plants located in the United States or certified to meet the specified ASTM and ANSI standards.
Work performed under this contract shall provide a neat and "workmanlike" appearance when completed, to the satisfaction of the Architect and Engineer. Workmanship shall be the finest possible by experienced mechanics. Installations shall comply with applicable codes and laws.
The complete installation shall function as designed and intended with respect to efficiency, capacity, noise level, etc. Abnormal noise caused by rattling equipment, piping, ducts, air devices, and squeaks in rotating components shall not be acceptable. Materials and equipment shall be of commercial specification grade in quality. Light duty and residential grade equipment shall not be accepted unless otherwise indicated.
Remove from the premises waste material present as a result of work, including cartons, crating, paper, stickers, and/or excavation material not used in installing, etc. Clean equipment installed under this contract to present a neat and clean installation at the termination of the work.

E. MANUFACTURERS

In other articles where lists of manufacturers are introduced, subject to compliance with requirements, provide products by one of the manufacturers specified.
Where a list is provided, manufacturers are listed alphabetically and not in accordance with any ranking or preference.
Where manufacturers are not listed, provide products subject to compliance with requirements from manufacturers that have been actively involved in manufacturing the specified product for no less than 3 years.

F. COORDINATION

Coordinate work with that of other trades so that the various components of the systems are installed at the proper time, will fit the available space, and will allow proper service access to those items requiring maintenance. Components which are installed without regard to the above shall be relocated at no additional cost to the Owner.

Unless otherwise indicated, the General Contractor shall provide chases and openings in building construction required for installation of the systems specified and for coordination with information where chases and openings are required. Existing systems are required. Contractor shall keep informed as to the work of other trades engaged in the construction of the project and shall execute work in a manner as to not interfere with or delay the work of other trades.

Various dimensions shall be taken in preference to scale dimensions. Contractor shall take his own measurements at the building, as dimensions may occur. Contractor shall be held responsible for errors that could have been avoided by proper checking and inspection. Provide materials with trim that will properly fit the types of ceiling, wall, or floor finishes actually installed. Model numbers listed in the specifications or shown on the drawings are not intended to designate the required trim.

G. ORDINANCES AND CODES

Work performed under this contract shall, at a minimum, be in conformance with applicable national, state and local codes having jurisdiction. Equipment furnished and associated installation work performed under this contract shall be in strict compliance with current applicable codes set forth by the local AHJ, including any amendments and standards as set forth by the following:
1. National Electrical Code (NEC)
2. National Fire Protection Association (NFPA)
3. Underwriters Laboratories (UL)
4. Occupational Safety and Health Administration (OSHA)
5. American Society of Mechanical Engineers (ASME)
6. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE)
7. American National Standards Institute (ANSI)
8. American Society of Testing and Materials (ASTM)
9. Other national standards and codes where applicable.

Where the contract documents exceed the requirements of the referenced codes, standards, etc., the contract documents shall take precedence. Where conflicts between various codes, ordinances, rules, and regulations exist, comply with the most stringent.

Promptly bring all conflicts observed between codes, ordinances, rules, regulations, referenced standards, and these documents to the attention of the Architect and Engineer for final resolution. Contractor will be held responsible for any violation of the law.

Procure and pay for permits and licenses required for the accomplishment of the work herein described. Where required, obtain, pay for, and furnish certificates of inspection to Owner.

H. PROTECTION OF EQUIPMENT AND MATERIALS

Store and protect from damage equipment and materials delivered to job site. For materials and equipment susceptible to changing weather conditions, dampness, or temperature variations, store inside in conditioned spaces. For materials and equipment not susceptible to these conditions, cover with waterproof, tear-resistant, heavy tarp or polyethylene plastic as required to protect from plaster, dust, dirt, paint, water, physical damage. Replace insulation that has become wet at any time during construction. Drying the insulation is not acceptable. Seal any tears or joints of interior fiberglass insulation. Equipment and material damaged by construction activities shall be rejected and Contractor shall furnish new equipment and material of a like kind at his own expense.

Keep premises broom clean of foreign material created during work performed under this contract. Piping, equipment, etc. shall have a neat and clean appearance at the termination of the work. Remove debris from ceiling/return air plenum, including dust.

Plug, seal, or cap open ends of ductwork and piping systems while stored and installed during construction when not in use to prevent the entrance of debris into the systems. Remove temporary protection prior to starting equipment and turning the system over to the owner.

I. SUBSTITUTIONS

Materials, products, equipment, and systems described in the Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by the proposed substitution. The use of bid shall include only the products from manufacturers, specifically named in the drawings and specifications. To request a substitution, request the Substitution Request Form from the Architect or Engineer. Complete and send the Substitution Request Form for each material, product, equipment, or system that is proposed to be substituted. The burden of proof of the merit of the proposed substitution is upon the proposer.

Unless stated otherwise in writing to the Engineer by the Contractor, Contractor warrants to the Engineer, Architect, and Owner the following:
1. Proposed substitution has been fully investigated and determined to meet or exceed the specified Work in all respects unless stated otherwise in the substitution request.
2. Proposed substitution is consistent with the Contract Documents and will produce indicated results, including functional clearances, maintenance service, and sourcing of replacement parts.
3. Proposed substitution has received necessary approval of authorities having jurisdiction.
4. Same warranty will be provided for proposed substitution as for specified Work.

5. If accepted substitution fails to perform as approved, Contractor shall replace substitute material or system with that originally specified and bear costs incurred thereby.
6. Coordination, installation and changes in the Work as necessary for accepted substitution will be complete in all respects. No substitutions will be considered unless the Substitution Request Form is completed and attached with the appropriate substitution documentation. No substitution will be considered prior to receipt of a properly written request for approval to bid has been received by the Engineer at least ten (10) calendar days prior to the date of receipt of bids.

If the proposed substitution is approved prior to receipt of bids, such approval will be stated in an addendum. Bidders shall not rely upon approvals made in any other way. Verbal approval will not be given. No substitutions will be considered after the contract is awarded unless specifically provided in the contract documents.

J. SUBMITTALS

Assemble and submit for review shop drawings, material lists, manufacturer product literature for equipment to be furnished, and items requiring coordination between contractors under this contract. Provide submittals in sufficient detail so as to demonstrate compliance with these contract documents and the design concept. Prior to transmittal submittals, verify that the equipment submitted is mutually compatible and suitable for the intended use, will fit the available space, and maintain manufacturer recommended service clearances. If the size of equipment furnished makes necessary any change in location or configuration, submit a shop drawing showing the proposed layout.

Transmit submittals as early as required to support the project schedule. Allow for two weeks Engineer review time, plus to/from mailing time via the Architect, plus a duplication of this time for resubmittal, if required. Only resubmit those sections requested for resubmittal. Submittals shall contain the project name, applicable specification section, submittal date, equipment identification acronym as used on the drawings, and the Contractor's stamp. The stamp shall certify that the submittal has been checked by the Contractor, complies with the drawings and specifications, and is coordinated with other trades. Manufacturer product literature shall include shop drawings, product data, performance sheets, samples and other submittals required by this division. Highlight, mark, list, or indicate the materials, performance criteria, and accessories that are being proposed. General product catalog data not specifically noted to be part of the specified product will be rejected and returned without review.

Submittals and shop drawings shall not contain the firm name, logo, or signature of the Engineer. They shall not be copies of the work product of the Engineer. If the Contractor desires to use elements of such product, refer to paragraph "Electronic Drawing Files" for procedures to be used.

Separate submittals according to individual specification sections. Illegible submittals will be rejected and returned without review. Catalog data shall be properly identified, indexed and tabbed. A hard copy format or a single PDF file for each specification section is acceptable. Each item or model number shall be clearly marked and accessories indicated. Label the catalog data with the equipment identification acronym or number as used on the drawings and include performance curves, capacities, sizes, weights, materials, finishes, wiring diagrams, electrical requirements and deviations from specified equipment or materials. For equipment with motor starters or VFDs, include short circuit current ratings. Mark out inoperable items. Shop drawings will be returned without review if the above mentioned requirements are not met.

Provide the quantity of submittals required by Division 01. If not indicated and hard-copy sets are provided, submit a minimum of six (6) copies. Refer to Division 01 for acceptance of electronic submittals for this project. For electronic submittals, Contractor shall submit the documents in accordance with the procedures specified in Division 01. Contractor shall notify the Architect and Engineer that the submittals have been submitted and are available for review. For hard copy submittals, Contractor shall provide the following: user name, and password information needed to access the submittals. For submittals sent by e-mail, Contractor shall copy the designated representatives of the Architect and Engineer. Contractor shall allow for the Engineer review time as specified above in the construction schedule. Contractor shall submit only the documents required to purchase the materials and/or equipment in the electronic submittal.

The checking and subsequent acceptance of submittals by the Engineer and/or Architect shall not relieve the Contractor from responsibility for errors in dimension, detail, size of members, or quantities, omissions of components or fittings, coordination of electrical requirements; and not coordinating items with actual building conditions and adjacent work. Proceed with the procurement and installation of equipment only after receiving approved shop drawings relative to each item.

K. ELECTRONIC DRAWING FILES

In preparation of shop drawings or record drawings, Contractor may, at his option, obtain electronic drawing files in AutoCAD or DXF format on CD-ROM disk, DVD disk, flash drive or direct download, as desired, from the Engineer for a shipping and handling fee of \$200 for a drawing set up to 12 sheets and \$15 per sheet for each additional sheet. Contact the Architect for wiring authorization and authorization for the receiving and shipping method and drawing format. In addition to payment, the written authorization from the Architect and release agreement form from the Engineer must be received before electronic drawing files will be sent.

L. RECORD DRAWINGS (AS-BUILT DRAWINGS)

During progress of the work in this division, Contractor shall maintain an accurate record of all changes made during the installation of the system. Upon completion of the work, accurately transfer all record information to three identical sets of the approved shop drawings. Insert one set into each copy of the manual described above.

M. OPERATION AND MAINTENANCE INSTRUCTIONS

During the course of construction, collect and compile a complete brochure of equipment furnished and installed on this project. Include operation and maintenance instructions, manufacturer's catalog sheets, wiring diagrams, parts lists, approved submittals and shop drawings, warranties, and descriptive literature as furnished by the equipment manufacturer. Include an inside cover sheet that lists the project name, date, Owner, Architect, Engineer, General Contractor, Sub-Contractor, and an index of contents.

Submit three copies of literature bound in approved binders with index and tabs separating equipment types to the Architect, for Engineer's review, at the termination of the work. Paper clips, staples, rubber bands, loose-leaf binding, and mailing envelopes are not considered approved under this contract shall be withheld until the equipment literature is received and deemed complete by the Architect and Engineer. Instruct workers to save required literature shipped with the equipment itself for inclusion in this brochure.

OPERATION AND MAINTENANCE INSTRUCTIONS

Refer to Division 01 for acceptance of electronic manuals for this project. For electronic manuals, refer to paragraph "Submittals" for requirements.

N. FLAMMABLE REFRIGERANTS

Equipment with refrigeration systems using Group A2L refrigerants shall meet all requirements of ASHRAE Std 15 and this section. Listing and Installation Requirements:
1. Listed in accordance with UL 484 or UL 60335-2-40/CSA C22.2 No. 60335-2-40.
2. The nameplate rating indicating that a flammable refrigerant is used, as specified by the product listing.
3. A label indicating a flammable refrigerant is used shall be placed adjacent to service ports and other locations where service involving components containing refrigerant is performed, as specified by the product listing.

Refrigeration systems shall have an integral refrigerant detection system that meets the following requirements as documented in ASHRAE Std 15:
1. Utilize a set point, nonadjustable in the field, to generate an output signal to initiate mitigation actions.
2. Field recalibration of refrigerant detection system shall not be permitted.
3. Be capable of detecting the presence of a specified refrigerant corresponding to the refrigerant designation of the refrigerant nameplate on the condenser fans of the equipment upon failure of a self-diagnostic check.
4. Have access for replacement of refrigerant detection system components.
5. Have self-diagnostics to determine operational status of the sensing element.
6. Energize all condenser fans of the equipment upon failure of a self-diagnostic check.
7. Generate an output signal in not more than 30 seconds when exposed to a refrigerant concentration of 25% LFL (+0%, -1%).

Manufacturer's refrigeration mitigation action shall be completed in not more than 15 seconds after the initiation of the output signal of the equipment's integral refrigerant detection system and shall be maintained for at least 5 minutes after the output signal has reset.

O. SPARE PARTS

Furnish to Owner, with receipt, the following spare parts for the equipment furnished for this project:
1. One set of spare parts of each type required for each unit. In addition to the spare set of filters, install new filters prior to testing, adjusting, and balancing work and before turning system over to Owner.
2. Furnish one complete set of belts for each fan.
3. Furnish three operating keys for each type of air outlet and inlet that require them.

P. TRAINING

At a time mutually agreed upon between the Owner and Contractor, provide the services of a factory trained and authorized representative to train Owner's designated personnel on the operation and maintenance of the equipment provided for this project.

Provide training to include, but not be limited to, an overview of the system and/or equipment as it relates to the facility as a whole; operation and maintenance procedures and schedules related to startup and shutdown, troubleshooting, servicing, preventive maintenance and appropriate operator intervention; and review of data included in the operation and maintenance manuals.

Submit a certification letter to the Architect stating that the Owner's designated representative has been trained as specified herein. Letter shall include dates, duration of training, the Contractor and the Owner's representative shall sign the certification letter indicating agreement that the training has been provided.

Q. WARRANTIES

Warrant each system and each element thereof against all defects due to faulty workmanship, design, or material for a period of 12 months from date of Substantial Completion, unless specific items are noted to carry a longer warranty in the construction documents or manufacturer's standard warranty exceeds 12 months. Remedy all defects, occurring within the warranty period(s), as stated in the General Conditions and Division 01.

Warranties shall include labor and material, including travel expenses. Make repairs or replacements without any additional costs to the Owner, and to the satisfaction of the Owner, Architect, and Engineer.

Perform the remedial work promptly, upon written notice from the Engineer or Owner.

At the time of Substantial Completion, deliver to the Owner all warranties, in writing and properly executed, including term limits for warranties extending beyond the one year period and any actions the Owner must take in order to maintain warranty status. Each warranty instrument shall be addressed to the Owner and state the commencement date and term.

R. GENERAL MATERIALS AND INSTALLATION

A. BUILDING OPERATION

Comply with the schedule of operations as outlined in the architectural portions of this specification. Accomplish work requiring interruption of building operation at a time when the building is not in operation and only with written approval of building Owner and/or tenant. Coordinate interruption of building operation with the Owner and/or tenant a minimum of seven (7) days in advance of work.

B. COINCIDENTAL DAMAGE

Repair streets, sidewalks, drives, paving, walls, finishes, and other facilities damaged in the course of the work. Repair materials shall match existing construction. Repair work shall meet all requirements of the Owner, local authorities having jurisdiction, and meet the satisfaction of the Architect.

C. CUTTING AND PATCHING

Conform to the requirements in Division 01. Cut walls, floors, ceilings, and other portions of the facility as required to install work under this division. Obtain permission from the Architect prior to cutting. Do not cut or disturb structural members without prior approval from the Architect and Structural Engineer. For post-tension slabs, x-ray slab and closely coordinate all core drill locations with Architect and Structural Engineer prior to performing any work. Obtain approval from Architect and Structural Engineer for all core drills and penetrations at least four days prior to performing work. Penetrations shall be made as small as possible while maintaining required clearances between the building element penetrated and the system component. Patch around openings to match the adjacent construction including fire ratings, if applicable. Repair and refresh areas disturbed by work to the condition of adjoining surfaces in a manner satisfactory to the Architect.

D. ROUGH-IN

Coordinate without delay all roughing-in with other divisions. Conceal piping, conduit, and rough-in except in unfinished areas and where otherwise shown.

E. STRUCTURALSUPPORT SYSTEMS

Structural steel used for support of equipment, ductwork and piping shall be new, clean, and conform to ASTM Designation A-36. Support mechanical components from the building structure. Do not support mechanical components from ceilings, other mechanical or electrical components, and other non-structural elements.

F. PRE-ENGINEERED ROOF EQUIPMENT SUPPORTS AND CURBS

Provide prefabricated equipment support rails and roof curbs manufactured by AES Industries, Custom Curb, Inc., Pace Company, Thybar or approved equal. Provide with fully milred raised cant step to match roof insulation thickness, welded, minimum 16 gauge galvanized steel shell, internally reinforced to load bearing factors of equipment being supported, minimum 1-1/2 inch thick, 3 pound rigid insulation internal to shell to maintain continuous roof insulation where required, factory installed wood nailer, and minimum 18 gauge jacket with counterflashing when equipment does not fully cover the equipment support. Provide sloped roof equipment supports to enable level installation. Provide rigid backing material behind cant to maintain cant slope. Provide multiple support rails to uniformly support the equipment. Attach to roof structure according to manufacturer's installation instructions.

Attach equipment directly to pre-engineered roof equipment support using one of the following methods:
1. Rail Equipment Supports: Secure each equipment support leg to the rail with a minimum of 4 points of connection per leg.
2. Roof Curbs: Secure each corner of the equipment to the curb nailer using a minimum of 4 lag screws, located along the length of the equipment. Alternatively, Secure equipment to the curb using hold-down brackets. Provide minimum 6 inch long, 14 gauge galvanized steel brackets sized to wrap around top of curb and under equipment base rail with sufficient horizontal offset to cover overlap gap between the equipment rail and curb. Secure bracket to equipment and curb nailer using a minimum of 8 points of connection per bracket. Provide one bracket at each corner along the length of the unit.
3. Hold-Down Brackets: Coordinate with the curb manufacturer to determine the quantity and size of hold-down brackets and fasteners, with installation instructions for each to meet a Building Design Risk Category of II and a Design Wind Speed of XXXX mph.
4. Submitt signed and sealed drawings that indicate the design and installation requirements of pre-engineered roof supports can withstand the design criteria listed. Include installation requirements for anchoring to the roof structure. The Engineer is not responsible and will not provide the seal and signature. Deliver submittals to the local AHJ for approval prior to installation of the contractor provided, pre-engineered roof supports.
5. Provide seismic restraints in accordance with Article "Seismic Controls for MEPF Systems."

G. ACCESS PANELS AND DOORS

Refer to Architectural documents for specification of access panels and doors.
H. PENETRATIONS
Provide sleeves for pipes passing through above grade concrete or masonry walls, concrete floor or roof slabs. Sleeves are not required for core drilled holes in existing masonry walls, concrete floors or roofs. Provide 40 PVC galvanized steel sleeves for sleeves 6 inches and smaller. Provide galvanized sheet metal sleeves for larger than 6 inches. Schedule 40 PVC sleeves are acceptable for installation in areas without return air plenums.
Sleeve elevated floor, exterior wall and roof penetrations watertight and weathertight with non-shrink, non-hardening commercial sealant. Pack with mineral wool and seal both ends with minimum of 1/2 inch of sealant.
Seal around penetrations of fire rated assemblies. Coordinate fire ratings and locations with the architectural drawings. Refer to architectural specifications for fire stopplings. Provide a product schedule for UL listing, location, wall or floor rating and installation drawing for each penetration fire stop system.
Extend pipe insulation for insulated pipe through floor, wall, and roof penetrations, including fire rated walls and floors. The vapor barrier shall be maintained. Size sleeve for a minimum of 1 inch annular clear space between inside of sleeve and outside of insulation.
Provide prefabricated roof curbs where pipes and/or ductwork penetrate elevated slabs to the roof to the exterior. Provide cover over curb of weather-resistant material and seal duct or pipe penetrations through the cover. Provide pipe collar of weather-resistant material with stainless steel pipe clamps for pipe penetrations.

Provide box frames for rectangular openings welded 12 gauge galvanized steel attaching to forms and of a maximum dimension established by the Architect. Notify the General Contractor or Architect before installed any box openings not shown on the Architectural or Structural drawings.
Seal concrete or masonry exterior wall penetrations below grade with "wall pipes" and mechanical sleeve seals. Provide cast iron "wall pipes" with integral waterproof ring manufactured by Jay R. Smith, Josam, Wade, Walls or Zurm. Provide modular mechanical sleeve seals, manufactured by Calpico, Metraflex, or Thundershield / Link Seal.

Seal elevated concrete slab with water proof membrane penetrations with "wall pipes" and water proof sealant. Secure waterproof membrane flashing between "wall pipe" clamping flange and clamping ring. Provide cast iron "wall pipes" with integral waterproof ring manufactured by Jay R. Smith, Josam, Wade, Walls or Zurm.

Provide sleeves for horizontal pipe passing through or under foundation. Sleeves shall be cast iron soil pipe two nominal pipe sizes larger than the pipe served.

Provide Schedule 40 PVC pipe sleeves for vertical pressure pipe passing through concrete slab on grade. Sleeves shall be one nominal pipe size larger than the pipe served and two pipe sizes larger than pipe served for ductile iron pipes with restraining rods. Seal water-tight with silicone caulk.
Provide 1/2 inch thick cellular foam insulation around perimeter of non-pressure pipe passing thru concrete slab on grade. Insulation shall extend to 2 inches above and below the concrete slab.

I. FIRESTOPPING

Sealants and accessories shall have fire-resistance ratings indicated, as established by testing identical assemblies in accordance with UL 2079 or ASTM E 814, or other NRTL acceptable to AHJ.
Manufacturers: Hilti, RectorSeal, Specified Technologies Inc., United States Gypsum Company, or 3M corp.

Through and Membrane Penetration Sealing Systems Product Schedule: Provide UL listing, location, wall or floor rating, and installation drawing for each penetration fire stop system.
Where project conditions require modification to qualified testing and inspecting agency's illustrations for a particular firestopping control, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Include qualifications data for testing agency.

J. ELECTRICAL WIRING

High voltage wiring is defined as 50 Volts or higher. Low voltage wiring is defined as less than 50 Volts. Line voltage wiring shall be provided by Division 26. Line voltage control and interlock wiring for mechanical systems shall also be provided by Division 26. Low voltage control wiring shall be provided by Division 23. Furnish wiring diagrams to Division 26 as required for proper equipment hookup. Coordinate with Division 26 the actual wire sizing aprns for mechanical equipment (from the equipment nameplate) to ensure proper installation.
Provide power and communication wiring with transient protection in accordance with IEEE CR2 412. All control and interlock wiring shall comply with the NEC. Control wiring shall be sized to accommodate the voltage drop associated with the distance between the control device and the controller. Control wiring not installed in conduit shall be UL rated for plenum installation. All NEC Class 1 (line voltage) wiring shall be UL listed or approved raceway according to the NEC and Division 26 requirements. Maximum allowable voltage for control wiring shall be 120 V. All low-voltage wiring shall meet NEC Class 2 requirements. Low-voltage power circuits shall be sub-fused when required to meet Class 2 current limit.
Conduit for Control Wiring: EMT with compression fittings, cold rolled steel, zinc coated or zinc-coated rigid steel with threaded connections.
Pull and Junction Boxes: Size according to number, size, and position of entering raceway as required by National Electrical Codes. Enclosure type shall be suited to location.

Install wiring parallel to building lines wherever possible. Conceal all control wiring in finished rooms. Do not install Class 2 wiring in raceway containing Class 1 wiring. Boxes and panels containing high voltage wiring and equipment may not be used for low-voltage wiring except for the purpose of interfacing the two wires (e.g., relays and transformers). All wire-to-device and wire-to-wire connections shall be made at a terminal block or terminal strip. All runs of communication wiring shall be unshielded length when length is commercially available. Verify the integrity of the entire network following the cable installation. Use appropriate test measures for each particular cable. Label all wiring and cabling at each end within 2 inches of termination with the controller termination number. Label control devices used in the system with permanent labels using the identifiers that match the record documents.

K. EQUIPMENT FURNISHED BY OTHERS

Provide necessary equipment and accessories that are not provided by the equipment supplier or Owner to complete installation of equipment furnished by others in locations as indicated on the drawings, specified herein, or both. Equipment and accessories not provided by the equipment supplier may include, but not be limited to, fuses, vents, intakes, associated roof jacks and caps to outdoors, dampers, in-line fans, roof fans, and control interlocks, etc. as required for proper operation of the complete system in accordance with the manufacturer's instructions.
Contractor shall be responsible for correct rough-in dimensions and shall verify them with Architect and/or equipment supplier prior to service installation.

L. SYSTEM TESTING, ADJUSTING, AND BALANCING

Upon completion of each phase of the installation, test each system in conformance with local code requirements and as noted below. Furnish labor and equipment required to test each system installed under this contract. Assume all costs involved in making the tests and repairing any and/or replacing any damaged equipment.
Final system testing, balancing and adjustments (TAB) shall be performed by a Contractor certified by the National Environmental Balancing Bureau (NEBB), Associated Air Balance Council (AABC), or Testing, Adjusting and Balancing Bureau (TABB). TAB shall be performed in accordance with the most current edition of the certified agencies' procedural standard for testing, adjusting and balancing and shall comply with the strictest interpretation of that standard for execution and reporting of all TAB work.

Test, adjust, and balance equipment and systems included in the scope of work. Prepare testing and balancing report log using forms equipped with the standard forms available from the TAB certification standard being followed. Adjust equipment to deliver specified flow amounts on the drawings. For air systems, include airflow supply quantities, entering and leaving temperatures, and pressures at design flow. Include fan and unit test readings, motor voltage and amp draws, etc., and submit six copies of the final compilation of data to the Architect for evaluation and approval before final inspection of the project.

M. VIBRATION ISOLATION

Provide vibration isolation equipment and materials by a single manufacturer. If type and deflection for specific equipment is not specified within the contract documents, reference ASHRAE Handbook "HVAC Applications" or provide per manufacturer's recommendations. Approved manufacturers include Caldyn, Kinetics Noise Control, Mason Industries, Inc., Vibration Eliminator Co., Inc., Vibration Mounting and Controls, or Vibro-Acoustics, provided their systems are in compliance with the specified design and performance requirements.

General Requirements: Select vibration isolators by the weight distribution to produce uniform deflection. Vibration isolators shall have either known un-deflected heights or calibration markings so that, after adjustment, the static deflection can be verified, thus determining that the load is within the proper range of the isolator. Isolators shall operate in the linear portion of their load versus deflection curve. Spring isolators shall have a permanent set of 10% of the rated load. Coated vibration isolators with factory-applied paint. Coat vibration isolators exposed to weather and other corrosive environments with factory-applied corrosion resistance protection. Install and adjust vibration isolators in accordance with manufacturers written instructions.

Pipe connections: Provide flexible connectors for piping system connections on equipment side of shutoff valves for all pumps, mechanical equipment supported or suspended by spring isolators, and where indicated on drawings. Fabricate flexible piping between supporting equipment and equipment to be isolated. Provide 1/2" minimum diameter, 15 percent strain, flexible piping connectors or braided hose type as recommended by the manufacturer for the application.
Isolator Types:
1. Type WP (Waffle Pads): Provide 5/16 inch thick neoprene pads ribbed or waffled on both sides. Manufacture pads with bridge bearing quality neoprene and select for a minimum diameter of 50 and designed for 15 percent strain, with a static deflection of 0.05 inches. Incorporate steel load-spreading plates where required between the equipment and the neoprene pad to provide selected deflection. If the isolator is bolted to the structure, install a neoprene mounting sleeve under the bolt head between the steel washer and the base plate to prevent metal to metal contact. Provide Mason Industries Type WY or equal.

2. Type SPNH (Spring and Neoprene Hangers): Provide a steel hanger box containing a laterally stable, double-deflecting neoprene isolator in series with a steel spring. Design springs so the ratio of the horizontal to vertical spring constant is between one and two. The spring diameter shall be not less than 80 percent of the compressed height of the spring at rated load. Loaded springs shall operate within the linear portion of their load versus deflection curve over a deflection range of not less than 50 percent above design deflection. Spring diameter and hanger box hole size shall be large enough to permit the hanger rod to swing through a 30 degree arc. Include a neoprene bushing to prevent contact between the longer hanger rod and hanger box and short-circuiting the isolation function. The neoprene element shall have a maximum diameter of 50 and designed for 15 percent strain, with a static deflection of not less than 0.4 inches. Unless otherwise specified, the static deflection of SPNH hangers shall be 2 inches. Provide SPNH hangers with 1 inch static deflection for water source heat pumps and fan-powered VAV terminal units. When Plumber do not coat the spring and hanger box with a maximum diameter of 50 and designed for 15 percent strain, without encountering obstructions. Provide Mason Industries Type 30N or equal.

3. Type NR (Neoprene Bushing): Provide neoprene, rubber-in-shear bushings for lightweight (less than 100 pounds), suspended equipment (neoprene from structure with all thread rod and angle iron or Unistrut. Select for a maximum diameter of 50 and designed for 15 percent strain, with a static deflection of 0.15 inches. Provide Mason Industries Type HMBH or equal.

N. AIR FILTERS

Provide AAF/Flanders PrePleat 13, Camfil AP-Thirteen, pleated, throwaway type filters, minimum MERV 13, or similar as manufactured by Air Filter, Inc., Bioclimatic, Columbus, Koch, or approved equal, unless otherwise indicated.

Temporary filters used to protect openings in ductwork and inside equipment when permanent HVAC equipment is used during the construction period shall be pleated, throwaway type filters, minimum MERV 6.

O. REFRIGERANT AND OIL

Provide full refrigerant and oil charge in new air conditioning refrigeration systems, and maintain it for full term of the guarantee.
P. IDENTIFICATION
Provide manufacturer's standard pre-printed, semi-rigid snap-on or permanent adhesive, pressure-sensitive vinyl pipe markers. Color code pipe markers to comply with ANSI A13.1.
Install pipe markers on each HVAC piping system and include arrows to show normal direction of flow.
Locate pipe markers and color bands wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance access shafts, tunnels, plenums and other interior non-occupied locations.

Identify refrigerant piping located in areas other than the room or space where the refrigerant equipment is located in accordance with ANSI/ASHRAE A13.1. Indicate the refrigerant designation and safety group classification of refrigerant used in the piping system. For Group A2L refrigerant piping include the following statement: "WARNING - Risk of Fire, Flammable Refrigerant".
Provide plastic laminate or brass valve tag on every valve, cock and control device in each HVAC piping system; exclude check valves, valves within factory-installed equipment units, and shutoff valves at HVAC terminal

Where access to dampers through a hard ceiling is required, provide a concealed, remote cable-operated, butterfly-type volume damper assembly with external worm gear operator. Damper assembly shall include duct casing with rolled bead stiffeners, reinforced blade, self-lubricating bearing, and remote operator mounting plate. External operator shall attach to damper as a single piece with no linkage adjustment required. Damper shall be adjustable through the diffuser frame with standard 1/4 inch nutdriver or flat screwdriver. Provide dampers compatible with the controllers used, with range adjustments to come after installation. Transmitters and transducers shall have offset and span adjustments, temperature compensation, shock and vibration immunity, and zeroing capability. Accuracy requirements shall include the combined effects of linearity, hysteresis, repeatability, and the transmitter.

Provide remote cable actuator by Metropolitan Air Technology model RT-250, Young's Regulator model 5020-1200, or approved equal. Provide rectangular dampers by Metropolitan Air Technology model RT-200, Young's Regulator model 820-1200, or approved equal. Provide remote cable actuator by Metropolitan Air Technology model RT-WGA, Young's Regulator model 270-275, or approved equal.

Round or oval ductwork shall be FlaktGroup Senco, United, Hercules Industries or equal, sheetmetal, with smooth interior surface, with low pressure (duct pressure class up to and including 2 inches w.g.) Round ductwork gauge per the following table (reference SMACNA HVAC Duct construction standards for gauges when pressures exceed 2 inches w.g.):

Size	Duct Gauge	Fitting Gauge
14" & under	26	24
15" thru 20"	24	22
28" thru 36"	22	20
38" thru 50"	20	20
52" thru 60"	18	18

Lewis & Lambert, Link Industries Lindsaf Safe, Franec Corporation, or approved equal factory-manufactured round ductwork and fittings may be substituted for specified round branch ductwork, all Contractors option. Heavy liquid joint sealant may be omitted on factory-manufactured round ductwork.

Low pressure (duct pressure class up to and including 2 inches w.g.) Fittings 24 inches in diameter and less shall be prefabricated, spot-welded and internally sealed. Continuously weld fittings larger than 24 inches in diameter. Fitting gauge shall be 22 gauge for 36 inch fittings and under, 20 gauge for larger sizes. 90 degree tees shall be conical type. Seal longitudinal and transverse ductwork joints airtight with heavy liquid sealant according to manufacturer's instructions. Provide grease thickness in medium pressure (duct pressure class 3 inches to 6 inches w.g.) ductwork as recommended by SMACNA.

If permanent HVAC equipment is used during the construction period, provide temporary filters at all openings in the ductwork and internal equipment to protect the system from dust, dirt, paint, and moisture. Replace and maintain filters when needed, but not less than every month. On the day of Substantial Completion, clean the unit and ductwork and provide a new set of filters in the unit. Refer to section "Air Filters" for filter requirements.

An independent, professional duct cleaning company shall vacuum clean all internal surfaces of equipment, coils, and ductwork connected to permanent HVAC units that are operated during the construction period. Conduct cleaning after new air filters are installed and prior to turning the system over to the owner.

C. FLEXIBLE DUCT
 Low pressure (duct pressure class up to and including 2 inches w.g.) and medium pressure (duct pressure class 2.1 inch to 6 inches w.g.) flexible duct shall be Flexform 58, Thermaflex type GMK, M&K, JPL type Silver Jacket, or equal (fire retardant polyethylene) protective vapor barrier, U.L. 181 Class 1, acoustical insulated duct, R-6 fiberglass insulation, Provide CPE liner with steel wire helix mechanically locked or permanently bonded to the liner.

Flexible duct runs shall not exceed 5 feet in length, and shall be installed fully extended and straight as possible avoiding tight turns. Install flexible duct in accordance with manufacturer's instructions. Support flexible duct at maximum 5 feet on center and within 6 inches of bends. Bends shall not exceed a centerline radius of one duct diameter. Duct sag shall not exceed 1/2 inch. Supporting material in direct contact with the rigid metal duct shall not be less than 1-1/2 inches in width.

Connect flexible duct to duct metal duct or air devices as recommended by the manufacturer. At a minimum, install two wraps of duct tape around the inner core connection and a metallic or non-metallic clamp over the tape and two wraps of duct tape or a clamp over the outer jacket. Duct clamps shall be labeled in accordance with UL-181B and marked 181B-C. Duct tape shall be labeled in accordance with UL 181B and marked 181B-FX.

D. PLASTIC FLUE GAS VENTS

Provide UL 1738 listed plastic flue gas vents, with positive or negative flue pressures complying with NFPA 211 and suitable for condensing gas appliances. Provide PVC system by IPEX "System 1738", or Polypropylene system by Centrotherm "Imoflue" or equal by Nova Flex Group "Z-DENS".

Where plastic gas vents are installed in a return air plenum, wrap the vent with fire rated plenum insulation. Reference Article "Plenum Insulation" for plenum-rated fire wrap. Coordinate vent material compatibility with the appliance manufacturer's installation instructions prior to purchasing and installation.

E. AIR DEVICES

Provide air devices as scheduled on drawings, manufactured by Carnes, Krueger, Metalaire, Nalor Industries, Price, Tiltus, or Tittle & Bailey. Select air devices to limit room noise level to no higher than NC-30 unless otherwise shown. Provide devices with a soft plastic gasket to make an airtight seal against the mounting surface. Coordinate final location, frame, and mounting type of air devices with Architectural reflected ceiling plans.

Submit complete shop drawings including information on noise level, pressure drop, throw, CFM for each air device, styles, borders, etc. Clearly marked with specified equipment number. Submit samples of each air device as requested by the Engineer.

Provide wall return air grilles and exhaust air registers with horizontal 35 or 45 degree angle vision-proof bars. Provide concealed fasteners for wall mounted registers and grilles. Provide floor supply air registers of aluminum heavy duty type with one degree deflection. Provide opposed blade dampers for supply air registers and exhaust air registers unless indicated otherwise.

Provide ceiling mounted air devices of lay-in or surface mounted type as required to be compatible with ceiling construction. Provide ceiling diffusers and grilles with white enamel finish unless noted otherwise.

F. CONTROL DAMPERS

Provide factory fabricated, parallel blade control dampers sized as shown on the drawings and as specified. Individual damper sections shall not be larger than 48 inches x 60 inches with maximum blade width of 6 inches. Frame construction shall be minimum 16 gauge galvanized steel for rectangular dampers, 20 gauge for round. 18 inch thick for aluminum, with flanges for duct mounting. Provide elastomeric or neoprene seals, mechanically actuated and field replaceable. Provide a minimum of one damper actuator per section. Test damper performance in accordance with AMCA 500-D.

Provide modulating dampers with linear flow characteristics. Size modulating dampers based on the smaller of 1,500 FPM through the damper or full open air pressure drop of 0.1 inches W.C. Size two-position dampers full size and select to minimize pressure drop.

Motorized dampers used for ventilation air intake, exhaust air, or relief air shall be Class I with leakage rates not to exceed 4.0 CFM/square foot in full closed position at 1 inch W.G. pressure differential across the damper. Control dampers for other applications shall be Class II leakage. All smoke control dampers shall conform to UL 555S and shall be provided with end switches for remote indication of damper blade position.

Provide dampers as manufactured by Greenheck, GESCO, Pottorff, Nalor, or Ruskin. Reference manufacturer with model number for outside air, exhaust air and relief air dampers is Ruskin CD-50 constructed of aluminum, fire and smoke control applications is Ruskin FS0-60 constructed of galvanized steel, and all other applications is Ruskin DUK-356 constructed of galvanized steel.

Provide damper operator for each automatic damper with sufficient capacity to operate the damper under all conditions and to guarantee tight close-off of dampers against system pressure encountered. Each operator shall be provided with spring return for normally closed or normally open position for fail safe operation to account for fire, low temperatures, or power interruption as required by the control systems specified on the drawings. Damper operators shall be manufactured by Belimo, Johnson Controls or approved equal. Provide transformer for damper motors if different voltages are required.

G. EXHAUST AIR SYSTEMS

Provide roof mounted exhaust fans as scheduled on the drawings, or equal ACME, Carnes, Cook, Greenheck, Pennbray, or Twin City Fans complete with aluminum housing, aluminum centrifugal wheel, motor with integral thermal overload protection, disconnect switch mounted inside the housing, bird screen, backdraft damper, and pre-engineered roof curb. Three phase fans shall be furnished with magnetic starters with push button station.

H. KITCHEN EXHAUST AIR SYSTEMS

Install kitchen grease exhaust package furnished by the owner. System includes kitchen hood and grease exhaust fan(s)/pollution control unit.

Provide ducts connecting Type 1 exhaust hoods to exhaust fans made of #16 gauge black iron with continuously welded joints and clean-out doors. Provide at least one opening that is minimum size of 20 inches x 20 inches for personnel entry. Where an opening of this size is not possible, provide access openings at each change in direction and at 12 foot intervals. Locate openings on sides of duct 1-1/2 inches minimum from bottom and fit with grease-light covers of same material and duct. Support systems for ducts 24 inch and larger in any dimension shall be designed for the weight of the duct plus 800 pounds at any point in the duct system. Provide transition at connection to fan with opening size equal to or greater than the venturi opening of the fan inlet. Provide gasket at flanged connection to fan rated for 1500 degrees Fahrenheit and grease applications.

Enclose duct in fireproof enclosure per locally adopted mechanical code or, if approved by local code official, in fire rated wrap insulation. Insulation shall be minimum two-hour rated duct wrap insulation for Type I hood grease exhaust duct applications and shall conform to ASTM E2338 where required to comply with IMC. Insulation shall be flexible wrap enclosure rated for minimum 2000 degrees Fahrenheit and for zero clearance to combustibles. Insulation shall be non-mineral wool, passive, low bio-persistent fiber totally encapsulated on all sides with aluminum foil. Insulation shall be as manufactured by CertainTeed, Thermal Ceramics, Unifrax or 3M. Slope duct back towards hood at minimum of 1/4 inch per linear foot. Horizontal ducts that exceed 75 feet in length shall be sloped not less than 1 inch per foot. At Contractor's option, a UL listed concentric ductwork package that complies with UL 1978 standard for grease ducts may be used in lieu of the welded black iron duct for connecting hood to exhaust fan. Ductwork package shall be as manufactured by CaptiveAire, DuraVent, Enerveq, Metal-Fab/Schöbeler, Saikirk, or approved equal. Provide manufacturers UL listing number and verification certificate as a part of the shop drawing submittal. Install duct package in strict conformance with manufacturer's instructions and recommendations.

All portions of grease duct systems shall be tested for leakage in accordance with the "Grease Duct Test" paragraph of the IMC. Leakage tests shall be by water leakage type or equivalent test methods as approved by the local code official to determine that all joints are liquid tight. Water leakage test shall be performed by Environmental Corporation of America or other approved testing contractor. Tests shall be performed in the presence of the local code official. Any joints found defective shall be repaired and retested until satisfactory results are obtained. The contractor shall submit a copy of the grease duct leakage test report to the architect/engineer complete with the approval signature of the local code official.

Install owner provided exhaust hoods by Captive Aire. Conform with NFPA Bulletin 96 and UL Standard 710. Construct hood of 18 gauge stainless steel with welds polished. Hood shall contain full length stainless steel filter holder welded to hood with integral drip trap and UL classified, X-Air stainless steel filters installed at 45 degrees from horizontal. Provide vapor proof incandescent lights, and control panel with pilot lights and switches for fan and lights. Hood package shall include 3 inch filter panel at wall, and stainless steel closure panels from top of hood to finished ceiling.

Install Amerex, Ansul, Pyrochem, or approved equal wet chemical type fire extinguishing system for each hood as scheduled on drawings complete with nozzles, wet chemical cylinders, piping, etc. and nozzles, wet chemical cylinders, piping, etc. and nozzles, operating system. Provide manual pull station(s) at locations shown on the drawings. System shall be in full conformance with NFPA-96.

Install mechanical or electrical gas shutoff valve to shutoff fuel or power source to cooking equipment upon detection of fire. Valve shall have a clearly marked open/closed indicator.

Install a wall mounted thermostat with remote sensing element at the exhaust hood duct collar wired in parallel with the normal fan on-off control to ensure that the hood's associated exhaust fan is energized when the cooking appliances served by the hood are activated. The thermostat set point shall be 95 degrees Fahrenheit (adjustable). The installation shall be in compliance with the International Mechanical Code.

4. HVAC EQUIPMENT

A. ROOFTOP UNITS (GAS FIRED HEAT) 3-25 TONS

Provide electric cooling, gas heating rooftop units as scheduled on the drawings, manufactured by Aasn, Carrier, Dakin, Lennox, Johnson Controls, Trane, or York, with features as noted in the RTU schedule and in the RTU Control Matrix, and complete with factory installed direct-drive hermetic compressors with internal spring vibration isolation, built-in motor thermal overload protection, crankcase heater, and fan speed adjusters to come after installation. Units shall have offset and span adjustments, temperature compensation, shock and vibration immunity, and zeroing capability. Accuracy requirements shall include the combined effects of linearity, hysteresis, repeatability, and the transmitter.

Provide electric cooling, gas heating rooftop units as scheduled on the drawings, manufactured by Aasn, Carrier, Dakin, Lennox, Johnson Controls, Trane, or York, with features as noted in the RTU schedule and in the RTU Control Matrix, and complete with factory installed direct-drive hermetic compressors with internal spring vibration isolation, built-in motor thermal overload protection, crankcase heater, and fan speed adjusters to come after installation. Units shall have offset and span adjustments, temperature compensation, shock and vibration immunity, and zeroing capability. Accuracy requirements shall include the combined effects of linearity, hysteresis, repeatability, and the transmitter.

B. ELECTRIC UNIT HEATERS

Provide electric unit heaters as scheduled on the drawings, manufactured by Berko, Branch, Indecoco, Markel, QMark, or Raywall. Standard type propeller unit heaters with side/under mounting brackets and hardware for horizontal airflow. Furnish heater fan motors complete with a manual motor starter with automatic thermal cutoffs sized to the motor load, disconnect switch, and other code required safety devices. Provide unit-mounted thermostat and manual summer/winter changeover switch.

C. SPLIT DUCTLESS AIR-CONDITIONING SYSTEMS

Provide split ductless system consisting of evaporator section for wall or ceiling mounting as indicated and remote condensing section consisting of condenser coils, fan, compressor, and expansion valve. Evaporator section shall be factory assembled pre-wired consisting of furniture-grade steel with baked-enamel finish, front access, with direct-drive centrifugal fans, 2-speed motor, and cleanable foam filter. Evaporator coil fan in use. Provide electric programmable type thermostat. Provide condenser coils complete with manufacturer's year guarantee plus an additional four year guarantee on the compressors and heat exchangers. For units equipped with an economizer assembly, the assembly shall be covered with minimum 5 year manufacturer warranty, certified to operate through 80,000 damper opening and closing cycles, and certified to meet leakage requirements specified under the section, "Control Dampers."

Provide concrete base for units located on ground. Provide pre-engineered roof equipment support rails for units located on roof. Securely attach units to rail.

Provide refrigerant piping sized as recommended by equipment manufacturer with foamed plastic insulation on the suction line as specified in this section.

Control System: Unit-mounted panel with contactors, control transformer with circuit breaker, solid-state temperature- and humidity-control modules. Provide solid-state, unit-mounted control panel with start-stop switch, adjustable humidity set point, and adjustable temperature set point. Refer to sequence of operation.

D. AIR CURTAINS

Provide air curtains manufactured by Berner, Marley, Mars, or Powered Air, of sizes and capacities shown on drawings. Units shall comply with AMCA 220, AHRF 410 and NSF 37. Unit housing shall be constructed of aluminum, aluminumized steel, or galvanized steel with powder coated/odized finish, with steel mounting brackets. Unit shall have air adjustment by way of multi-speed motors or adjustable intake louvers. Unit shall have an adjustable integral discharge nozzle. Units shall have statically and dynamically balanced fans with direct drive fan drives. Motors shall be single speed resiliently mounted, continuous duty, with permanently sealed pre-lubricated ball bearings, and internal disconnect.

Electric heating coils shall comply with UL 1995, with galvanized steel frame, resistance wires of 80 percent nickel, 20 percent chromium, disk-type overload thermal protection with automatic reset and thermal cutoff, serviceable thru terminal box with removing heater. Provide secondary protection of load-carrying, manually reset or replaceable thermal cutoffs factory wired in series with each heater stage. Control panel shall be unmounted with disconnecting means and overcurrent protection and include magnetic conductor mercury contactor, solid-state relays pulse controller, logic switches one per step, step controller, time-delay relay, pilot lights one per step, and airflow proving switch.

Furnish unit with washable panel filters with welded galvanized steel mounting frames, gasketed, with fasteners for bolting together built-up door banks. Furnish unit with built-in line voltage thermostat wired to air curtain junction box. Furnish with magnetic-type automatic filter switch, start-stop pushbutton switch, factory-installed time-delay relay, and mounting brackets and accessories. Furnish unit with motor control panel complete with motor starter, 115V transformer with primary and secondary fuses, terminal strip, and NEMA 250 enclosure.

5. PIPING AND PIPING SPECIALTIES

A. REFRIGERANT PIPING AND INSULATION

Copper Tubing: ASTM B280, Type ACR, hand-drawn straight lengths, and soft-annealed coils, seamless copper tubing. Tubing shall be factory cleaned, ready for installation, and have ends capped to protect cleanliness of pipe interiors prior to shipping.

Bendable Copper Tubing: ASTM B280, ACR Type I, with H55 temper, straight piping lengths as manufactured by Reftekk or Refrigerant Coupling Systems (RCS). Bends shall be made by factory trained personnel using tools approved by the manufacturer. Provide brazing equipment and qualified personnel for brazing. Tubing shall be factory cleaned, ready for installation, and have ends capped to protect cleanliness of pipe interiors prior to shipping. Bend tubing in accordance with manufacturer's instructions using tools that are acceptable to the manufacturer.

Refrigerant Line Kits: Soft-annealed copper tubing with pipe diameters as recommended by the manufacturer and of length as required for the installation. Tubing shall be factory of field insulated with flexible urethane insulation with thickness as specified below.

Fittings: wrought-copper fittings: ANSI B16.22, streamlined pattern.

Solder: filler metals: ASTM B32, 95.5 Tin-Antimony.

Brazing filler metals:

- AWS A5.8, Classification BA9-5: Silver (Ag) 44.0-46.0 percent, Zinc (Z) 23.0-27.0 percent, and Copper (Cu) 29.0-31.0 percent.
- AWS A5.8, Classification BCuP-5: Phosphorus (P): Silver (Ag) 14.5-15.5 percent, and Copper (Cu) remainder.

Brake mechanical joints. Solder joints connecting to refrigerant valves and specialties. Continuously purge the pipe and fittings during brazing with an inert gas per manufacturer's recommendation (e.g., dry nitrogen) to prevent formation of scale. Maintain purge until the joint is cool to the touch. Provide temporary cap or cover on completed joints with open ends to prevent entry of contaminating nitrogen.

Insulate refrigerant lines with flexible elastomeric insulation, Armaflex or equal. Insulate suction and liquid lines between the expansion valve, evaporator, and compressor with 1/2 inch thick insulation on pipes less than 1 inch in size and 1 inch thick for pipes 1 inch and larger. Insulate hot gas and liquid lines between the compressor, condenser, and expansion valve with 1 inch thick insulation on pipes less than 1-1/2 inch and 1-1/2 inch thick for pipes 1-1/2 inch and larger. Piping insulation shall have a flame spread of 25 or less, and a smoke developed rating of 50 or less when tested in accordance with ASTM E84. Coat insulation that is exposed to the elements with a protective sealant. Install and support piping to keep noise and vibration to a minimum. Support and secure piping to Unistrut type supports so that no vibration passes to the building structure. Pipe attachments shall be copper-plated or have nonmetallic coating for electrolytic protection where attachments are in direct contact with copper tubing. Install a support within one foot of each change of direction. Mount pipe hangers around the outside of the insulation with saddles to prevent hangers from rupturing the insulation. Replace insulation that is cut or broken by the hangers.

Run refrigerant lines parallel and perpendicular to wall and floor lines and to appear straight and in good order. Pitch suction lines down slightly (1 inch in 20 feet) towards the compressor. Provide oil traps at the base of vertical suction risers over 6 feet high. Install liquid line sight glasses in liquid lines nearest the expansion valve. Factory mount expansion valves with the sensing bulb shipped loose. Field mount expansion valve bulb after refrigerant piping is complete (damage may occur if bulbs come in contact with heat).

For systems of 5 ton capacity and smaller, the contractor shall have the option to provide copper refrigerant tubing line set sized as recommended by equipment manufacturer and of length as required for the installation. Provide quick-connect flare tubing compression fittings, solder connections, or brazed connections as recommended by the manufacturer to match the connections of the condensing unit and evaporator coil.

B. SYSTEM EVACUATION AND CHARGING

Blow out refrigerant lines with dry nitrogen at a suitable pressure before making final connection at the condensing unit or coil to ensure no dirt, scale, or other foreign material is being in the lines. Draw a vacuum to 29 inches of mercury. Break this vacuum by charging dry refrigerant gas into the system, raising the pressure to 0.9 PSIG. Repeat the latter two steps for a triple evacuation before the final evacuation is started. Make final evacuation by reducing the system absolute pressure to a maximum of 0.5 millimeters (500 microns) and allowing the pump to run at this pressure for a minimum of two hours.

Repeat the proper amount of refrigerant charge per the manufacturer's recommendations. Record the amount of refrigerant by weight charged into the system for each circuit recorded to the nearest 1/4 pound on tags and attach tags to the liquid line near the condensing unit. Refrigerant shall be supplied by the HVAC Contractor.

6. TEMPERATURE CONTROLS

A. GENERAL REQUIREMENTS

Provide a complete temperature control system including control panels, controllers, control power transformers, thermostats, sensors, time switches, override timers, actuators, relays, and wiring as required to control the systems as specified on the drawings.

Submit shop drawings of equipment provided for temperature control. Submit operation and maintenance data, including troubleshooting maintenance guide, step-by-step procedures indexed for each controller and thermostat function, inspection period, cleaning methods and materials, and calibration tolerances.

Provide integrated wiring diagrams showing interconnections between field-installed equipment and package wiring furnished with the HVAC equipment. Control wiring shall be sized to accommodate the voltage drop associated with the distance between the control device and the controller.

Provide supervision and on-job checkout service as required to ensure that installation and operation of the temperature control system meets requirements of the drawings, specifications, and sequences of operation. The system shall be guaranteed for a period of one year following the acceptance of the system by the Architect/Engineer. Correct defects occurring during this period at no additional cost to the Owner.

Install control devices with top of device at 48 inches AFF to meet ADA requirements unless otherwise noted on the plans.

B. THERMOSTAT CONTROL EQUIPMENT

Provide thermostat control equipment with sufficient communication, programming, input and output connections, and modulating or staging capability to meet the sequence of operations. Provide thermostats with the features as indicated:

1. LCD or LED display screen.
2. Button or touchscreen interface.
3. Display temperature.
4. Display temperature setpoint.
5. Display operating mode.
6. Limit temperature setpoint adjustment within plus or minus 3 degrees F.
7. Display operating mode.
8. Adjust operating mode.
9. Adjust schedule, minimum seven day operation/unoccupied.
10. Security lockout.
11. At contractor's option where multiple sensors are shown, the sensors may be provided with the thermostat in a single device.

Seven day programmable, occupied/unoccupied thermostats for on/off or multiple stages of heating and cooling systems shall be used. One thermostat with multi-stage capability as required to match scheduled unit cooling/heating stages.

Remote sensors integrated with the seven-day programmable thermostat shall be Honeywell TR121/RT21-H remote sensor or equal.

C. SENSORS AND RELAYS

Manufacturers and model numbers are listed for reference as to quality and features required for the sensors and relays. Provide general-purpose type sensing elements for use in input and output sensors. Provide transmitters or transducers with sensor as required, compatible with the controllers used, with range suitable for the systems encountered. Transmitters and transducers shall have offset and span adjustments, temperature compensation, shock and vibration immunity, and zeroing capability. Accuracy requirements shall include the combined effects of linearity, hysteresis, repeatability, and the transmitter.

Provide sensors that meet the following minimum performance:

- i. Dry-bulb temperature sensors at a minimum shall be accurate to +/- 2 degrees Fahrenheit over the range of 40 to 80 degrees Fahrenheit.
- ii. Wet-bulb temperature shall be calculated using dry-bulb temperature and humidity and shall be accurate to +/- 2 degrees Fahrenheit.
- iii. Enthalpy shall be calculated using dry-bulb temperature and humidity and shall be accurate to +/- 3 BTU/lb over the range of 20 to 36 BTU/lb.
- iv. Humidity sensors at a minimum shall be accurate within +/- 3 percent full range between 20 and 95 percent, with drift less than 1 percent full scale per year.
- v. Pressure transmitters at a minimum shall be accurate to +/- 1 percent full scale with drift less than 1 percent full scale per year.

Provide remote sensors where indicated on the drawings and integrate them with the thermostat control equipment. Remote sensors shall have the following features:

1. Wired connection.
2. Temperature sensor.
3. Humidity sensor.
4. Blank faceplate.
5. At contractor's option where multiple remote sensors are shown for a single unit, the sensors may be provided in a single device.

Smoke detectors furnished and installed as indicated in this section or as scheduled on the plans (or heat detectors, if permitted by code) shall shut down each associated unit supply fan upon activation where required by code. Provide remote visual and audible alarm device in an approved location if smoke detectors are not connected to a fire alarm panel and label device as "Air Duct Detector Trouble".

Provide 24 Volt or 120 Volt Intermittent Intermittent Series FMD200 or equal programmable type with 7-day programming with up to two "on" and "off" set days. Battery backup, built-in memory retention. Override timer switches shall be spring wound, 6-hour, normally open type. Coordinate 120 V wiring of timeswitch with electrical contractor if 120 Volts model is provided.

Provide relays with contact rating, configuration, and coil voltage that is suitable for the application. Relay shall be general purpose, enclosed plug-in type and protected by a heat and shock resistant duct cover. Number of contacts and operational function shall be as required. Transient suppression shall be provided as an integral part of the relay. Contactors shall be single coil, electrically operated, mechanically held, double-break, silver-silver type protected by arcing contacts. Positive locking shall be obtained without the use of hooks, latches, or semi-permanent magnets. Operating and release times shall be 100 milliseconds or less.

Provide magnetic contacts for sensing open doors or windows as required per the drawings with rating and configuration that is suitable for the application by Interlogix or approved equal. Number of contacts and operational function shall be as required to meet the sequence of operation. Contacts shall be UL listed and factory tested. The magnetic contacts shall be designed for easy installation and shall be replaceable without damaging the door or window.

D. WIRING

Provide electrical and control wiring as specified under the section "Electrical Wiring."

7. COMMISSIONING

A. GENERAL

1. Summary

- a. Section includes Cx process requirements for the following HVAC systems, assemblies, and equipment:
 - i. Air handling units (Supply fans, return fan, packaged units, roof top units, specialized fans)
 - ii. Exhaust fans
 - iii. Fan coil units and terminal units
 - iv. Condensing units
 - v. Make-Up air units
 - vi. Electrostatic precipitator (ESP)
 - vii. Ductwork and piping
 - viii. Variable Frequency Drives
 - ix. Condensate Pumps
- b. Related Requirements:
 - i. Section 019113 "General Commissioning Requirements" for general Cx process requirement and CxA responsibilities.
 - ii. Informational Submittals

a. Construction Checklists: Draft construction checklists will be created by CxA for Contractor review.
 b. Construction Checklists: Installation and Performance Test checklists for systems, assemblies, subsystems, equipment, and components to be part of the Cx process and according to requirement in Section 019113 "General Commissioning Requirement."

- i. Refrigerant piping, including the following:
 - a. Refrigerant piping, fittings, and specialties.
 - b. Refrigerant charge.
 - c. General duty and specialty valves.
 - d. Meters and gauges.
- ii. Air distribution systems, including the following:
 - a. Supply, return, and exhaust systems.
 - b. Metal ducts, liners, and fittings.
 - c. Nonmetal ducts and fittings.
 - d. Air-duct accessories, including volume dampers, fire and smoke dampers, turning vanes, sound attenuators, and flexible connections.
 - e. Duct-mounted access doors and panels.
 - f. Kitchen exhaust system, including the following:
 - a. Exhaust and makeup air system.
 - b. Nonmetallic ducts, liners, and fittings.
 - c. Air-duct accessories, including volume dampers, fire and smoke dampers, turning vanes, sound attenuators, and flexible connections.
 - d. Duct-mounted access doors and panels.
 - e. Exhaust fans.
 - f. Electrostatic precipitator (ESP)
- iii. Air-handling equipment, including the following:
 - a. Fans and motors.
 - b. Indoor air-handling units with and without coils, dampers, and filters.
 - c. Outdoor air-handling units with and without coils, dampers, and filters.

B. EXECUTION

1. Construction Checklists

- a. Complete detailed construction checklists (prefunctional checklists) prepared by the CxA for HVAC systems, assemblies, subsystems, equipment, and components.
 - i. Air and hydronic distribution systems, including the following:
 - a. Supply, return, outdoor-air, and exhaust-air distribution systems.
 - b. Hydronic systems.
 - c. Automatic dampers.
 - d. Variable frequency drives.
 - e. Control valves.
 - ii. Heating and cooling terminal and unitary equipment, including the following:
 - a. Unit heaters.
 - b. Fan coil units.
 - c. Electric heating.
 - iii. TAB verification.

2. Construction Checklist Review

- a. Review and provide written comments on draft construction checklists. CxA will create required draft construction checklists and provide item to Contractor.
- b. Return draft construction checklist review comments within 5 days of receipt.
- c. When review comments have been resolved, the CxA will provide final construction checklists marked "Approved for Use, (date)."
- d. Use only construction checklists marked "Approved for Use, (date)."

3. Cx Testing Preparation

- a. Certify that HVAC systems, subsystems, and equipment have been installed, calibrated, and started and that they are operating according to the Contract Documents and approved submittals.
- b. Set systems, subsystems, and equipment into operating mode to be tested according to approved test procedures (for example, normal shutdown, normal auto position, normal manual position, unoccupied cycle, and alarm conditions).

4. Cx Tests Common to HVAC Systems

- a. Comply with construction checklist requirements, including installation checks, startup, and performance tests requirements for HVAC systems and equipment.
- b. Measure capacities and effectiveness of systems, assemblies, subsystems, equipment and components, including operational and control functions, to verify compliance with acceptance criteria.
- c. Coordinate schedule with, and perform Cx activities at the direction of CxA.
- d. Provide technicians, instrumentation, tools, and equipment to perform and document the following:
 - i. Construction checklist verification tests
 - ii. Construction checklist verification tests demonstrations
 - iii. Cx test demonstrations.

5. Start-Up Documentation Common to All Systems

- a. The following Start-Up Documentation (Checklists and Tests) shall be considered common to all systems:
 - i. Checklist shall proceed from lower level devices to larger components to the entire system operation.
 - ii. Verify labeling is allowed and specific and visible.
 - iii. Verify prerequisites procedures are done.
 - iv. Inspect for damage and ensure none is present.
 - v. Verify system is installed per the manufacturer's recommendations.
 - vi. Verify system has undergone Start-Up per the manufacturer's recommendations.
 - vii. Verify that access is provided for inspection, operation and repair.
 - viii. Verify that access is provided for eventual replacement of the equipment.
 - ix. Verify that record drawings, submittal data and O&M documentation accurately reflect the installed systems.
 - x. Verify all gauges and test ports are provided as required by contract documents and manufacturer's recommendations.
 - xi. Verify all records and test results are provided as required by contract documents and manufacturer's recommendations.
 - xii. Verify that the installation ensures safe operation and maintenance.
 - xiii. Verify all rotating and moving parts are properly lubricated.
 - xiv. Verify all monitoring and control equipment is installed and ready for operation.
 - xv. Verify all monitoring and ensure all alarms are active and set per requirements.
- b. Mechanical Identification
 - a. Include all applicable "Start-Up Checks Common to All Systems".
 - b. Start-Up Checks: Perform the following checks:

3.7 Mechanical Insulation

- A. Include all applicable "Start-Up Checks Common to All Systems"
- B. Start-Up Checks: Examine all piping, systems and equipment specified to be insulated.
 1. Ensure quality of insulation. Patch and repair all insulation damaged after installation.
 2. Ensure the integrity of vapor barrier around all cold surfaces.

3.8 Piping General

- A. Include all applicable "Start-Up Checks Common to All Systems"
- B. Start-Up Checks: These procedures apply to all installed piping systems, including underground site utilities.
 1. Inspect all piping for proper installation, adequate support (with appropriate vibration isolation where applicable) and adequate isolation valves for required service.
 2. Provide notifications of pipe cleaning and flushing activities.
 3. Flush and clean all piping and clean all strainers. Provide documentation of all related procedures.
 4. Ensure adequate drainage is provided at low points and venting is provided at high points.
 5. Ensure facilities to effectively drain and fill the system are in place.
 6. Ensure air is thoroughly removed from the system as applicable.
 7. Provide notification of pressure testing.
 8. Pressure and/or leak test all applicable systems in accordance with the requirements in the applicable Division 23 specification.
 9. Sterilize applicable piping systems as specified in the individual sections and as required by regulatory authorities.
 10. Submit pressure test reports that document the pressure testing results with certification of the results. Include drawings/diagrams indicating sections of pipe that are tested with the corresponding report.
 11. Set and adjust fill, pressure, or level controls to the required setting.

3.9 AC Motors

- A. Include all applicable "Start-Up Checks Common to All Systems"
- B. Start-Up Checks: Perform the following checks during start-up and as specified in manufacturer's instructions:
 1. Verify proper alignment, installation, and rotation.
 2. Verify properly sized overloads are in place.
- C. Start-Up Tests: Perform the following tests, measurements, or procedures during start-up and as specified in the manufacturer's instruction:
 1. Measure voltage available to all phases. Measure amps and RPM after motor has been placed in operation and is under load.
 2. Record all motor nameplate data.

3.9 Packaged Heating and Cooling Units

- A. Include all applicable "Start-Up Checks Common to All Systems"
- B. Refer to AC Motors in this section.
- C. General: Provide the services of a factory-authorized service representative to test and inspect unit installation, provide startup service, and to demonstrate and train Owner's maintenance personnel as required by the Owner.
- D. Start-Up Checks: Perform the following inspections/checks during start-up:
 1. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.
 2. Install new filters after start-up.

3.10 Terminal Units

- A. Include all applicable "Start-Up Checks Common to All Systems"
- B. Start-Up Checks: Perform the following inspections/checks during start-up:
 1. After construction is completed, including painting if applicable, clean unit exposed surfaces.
 2. Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.
 3. Verify adequate access for maintenance.
 4. Check power and control voltages.
 5. Check rotation of fan where applicable.
 6. Check operation of water leak sensors.
 7. Check calibration and operation of the controlling elements.
 8. Check control valves for required close-off and fail position.
 9. Install new filter units for terminals requiring same.

3.11 Fans and ESPs

- A. Include all applicable "Start-Up Checks Common to All Systems"
- B. General: Provide the services of a factory-authorized service representative to test and inspect ESP installation, provide startup service, and to demonstrate and train Owner's maintenance personnel as required by the Owner.
- C. Start-Up Checks: Perform the following inspections/checks during start-up:
 1. Inspect the field assembly of components and installation of the units, piping, ductwork, and electrical connections.
 2. Clean unit cabinet interiors to remove foreign material and construction dirt and dust. Vacuum clean fan wheel, fan cabinet, coils entering air face. Ensure volatile inerts are contained and kept out of occupied spaces.
 3. Adjust and lubricate dampers and linkages for proper damper operation.
 4. Verify the unit is secure on mountings and supporting devices and connections for ductwork, and electrical are complete.
 5. Verify proper thermal overload protection is installed in motors, starters, and disconnects.
 6. Ensure vibration isolation integrity is maintained with the fan installation and associated connections.
 7. Lubricate bearings, pulleys, belts, and other moving parts with factory-recommended lubricants.
 8. Stroke all dampers to ensure free and full travel.

3.12 Ductwork Accessories

- A. Include all applicable "Start-Up Checks Common to All Systems"
- B. Start-Up Checks: Perform the following checks during start-up and as specified:
 1. Cleaning: Clean factory-finished surfaces. Repair any marred or scratches surfaces with manufacturer's touch-up paint.
- C. Start-Up Tests: In addition to specifications, perform the following as a minimum:
 1. Operate installed ductwork accessories to demonstrate compliance with requirements. Test for air leakage while system is operating. Repair or replace faulty accessories, as required to obtain proper operation and leak proof performance.
 2. Label access doors in accordance with Division 21 Section "Mechanical Identification"
 3. Adjusting: Adjust ductwork accessories for proper settings, install fusible links in-fire dampers and adjust for proper action.

8. ALTERNATES

A. DESCRIPTION

Refer to the architectural portion of the specification for list of alternates. Applicable sections of the base specifications shall apply to all work required by the alternate unless otherwise specified. Determine whether or not and how each alternate affects work, include labor, materials, equipment, and transportation services necessary for and incidental to the completion of work under each particular alternate. Furnish separate bid for each alternate applicable to work, stating the amount to be added or deducted from the base bid.

END OF SECTION 23



380 E 20th Street
Los Angeles, CA 90012
310.337.1090
www.bergmeyer.com

3875 N High St.
Columbus, OH 43215
380.900.8887

Shelburne St.
Boston, MA 02210
617.542.1025

CONSULTANTS:

8345 LENEVA DRIVE, SUITE 300
LENEVA, IN 46214
TEL 913.742.5000 FAX 913.742.5001
WWW.HENDERSONENGINEERS.COM
2520201496
CT. CORPORATE NO. PEC.0002084

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SHAKE SHACK SHOPS AT STONEBRIDGE

2053 HIGHLAND AVE, UNIT E 120
CHESHIRE, CT 06410
SHACK #1730

75% REVIEW SET

MECHANICAL SPECIFICATIONS

DRAWN BY:	Author
CHECKED BY:	Checker
JOB NO:	20250040

M592

ROOFTOP UNIT CONTROL MATRIX					
CONTROL FEATURE		UNITS	RTU-1 SETPOINT OR Y/N	RTU-2 SETPOINT OR Y/N	NOTES
SETPOINTS					
COOLING - OCCUPIED SETPOINT		F	75	75	
COOLING - UNOCCUPIED SETPOINT		F	80	80	
DEAD BAND - MINIMUM HEATING AND COOLING TEMPERATURE SETPOINT DIFFERENCE		F	5	5	
HEATING - OCCUPIED SETPOINT		F	70	70	
HEATING - UNOCCUPIED SETPOINT		F	60	60	
DEHUMIDIFICATION SETPOINT - HUMIDITY SENSOR FEEDBACK		% RH	50%	50%	B
PROGRAMMED CONTROL FEATURES					
HVAC SYSTEM OCCUPIED/UNOCCUPIED MODE - PROGRAMMABLE THERMOSTAT			Y	Y	B
REMOTE COMBINATION TEMPERATURE AND HUMIDITY SENSOR			Y	Y	
EQUIPMENT ACCESSORIES AND CONTROL MODULES					
OUTSIDE AIR DAMPER - MOTOR OPERATED (MODULATING)			Y	Y	L
OUTSIDE AIR FLOW MONITORING STATION			Y	Y	F
INTEGRATED ECONOMIZER - DIFFERENTIAL ENTHALPY ENABLE (OA ENTHALPY < RA ENTHALPY)			Y	Y	E
ECONOMIZER FAULT DETECTION AND DIAGNOSTICS (FDD) SYSTEM			Y	Y	F, G
RELIEF - BAROMETRIC DAMPER			Y	Y	H
RELIEF - VARIABLE VOLUME POWERED EXHAUST FAN		IN, W.C.	N	Y	H
COOLING COIL (DX - VARIABLE SPEED)			Y	Y	M
DEHUMIDIFICATION - HOT GAS REHEAT			Y	Y	O
HEATING COIL (NATURAL GAS)			Y	Y	M
SUPPLY FAN CONTROL METHODS					
ON DURING OCCUPIED HOURS			Y	Y	
CYCLE WITH LOADS DURING UNOCCUPIED HOURS			Y	Y	
OPTIMUM START SEQUENCE			Y	Y	T
VARIABLE VOLUME - STAGED FAN CONTROL IN RESPONSE TO ACTIVE COOLING COIL STAGES			Y	Y	M, Q
SAFETIES, INTERLOCKS, AND ALARMS					
GAS VALVE SAFETY			Y	Y	F
RETURN AIR SMOKE DETECTOR - SAFETY SHUTDOWN			Y	Y	B
LOW LIMIT FREEZE/STAT - FREEZE PROTECTION SAFETY SHUTDOWN			Y	Y	F
DIFFERENTIAL PRESSURE SWITCH - FILTER CHANGE ALARM			Y	Y	F
FIRE ALARM CONTROL PANEL - SAFETY SHUTDOWN INTERLOCK			Y	Y	F
KITCHEN EXHAUST SYSTEM INTERLOCK			Y	Y	S

DIV. 23 CONTRACTOR SHALL PROVIDE CONTROL PANEL(S), WIRING, THERMOSTAT(S), TEMPERATURE SENSOR(S), HUMIDISTAT(S), AND/OR CO2 SENSOR(S) WHERE SHOWN ON THE DRAWINGS AND AS REQUIRED TO FACILITATE THE SCHEDULED CONTROL MODES OF OPERATION. EACH UNIT SHALL CONTROL BASED ON ITS OWN INTERNAL SAFETIES, TIME DELAYS, AND SEQUENCES UNLESS NOTED OTHERWISE. COORDINATE WITH OWNER FINAL BUILDING AND EQUIPMENT SCHEDULES DURING STARTUP. REFERENCE DIVISION SPECIFICATIONS FOR INDIVIDUAL DEVICE REQUIREMENTS.

- NOTES:**
- B. DIVISION 23 CONTRACTOR SHALL PROVIDE DEVICE.
 - E. IF SETPOINT VALUE IS LISTED, IT INDICATES ECONOMIZER HIGH-LIMIT SHUTOFF. UNIT SHALL BE IN ECONOMIZER IF CONDITIONS ARE LESS THAN SETPOINT. THE FOLLOWING SENSORS SHALL DETERMINE ECONOMIZER ON POINT.
 - OUTSIDE AIR TEMPERATURE, DIVISION 23 PROVIDED AS PART OF ECONOMIZER CONTROL MODULE.
 - RETURN AIR TEMPERATURE, DIVISION 23 PROVIDED AS PART OF ECONOMIZER CONTROL MODULE.
 - OUTSIDE AIR HUMIDITY, DIVISION 23 PROVIDED AS PART OF ECONOMIZER CONTROL MODULE.
 - RETURN AIR HUMIDITY, DIVISION 23 PROVIDED AS PART OF ECONOMIZER CONTROL MODULE.
 - F. DEVICE SHALL BE FACTORY MOUNTED AND PRE-WIRED FOR OPERATION SUBJECT TO THE ONBOARD CONTROLLER.
 - G. PROVIDE UNIT WITH AN FDD SYSTEM CONSISTING OF PERMANENTLY INSTALLED OUTSIDE AIR, SUPPLY AIR, AND RETURN AIR TEMPERATURE SENSORS. THE UNIT CONTROLLER SHALL AT A MINIMUM BE CAPABLE OF PROVIDING SYSTEM STATUS OF ECONOMIZER, COMPRESSOR, HEATING, MIXED AIR LOW LIMIT ALARM, AND SENSOR VALUES. EACH OPERATING MODE SHALL BE CAPABLE OF INDEPENDENTLY OPERATING FOR TESTING. THE SYSTEM SHALL REPORT FAULTS TO AN APPLICATION ACCESSIBLE BY SERVICE PERSONNEL. THE FOLLOWING FAULTS SHALL BE DETECTED: AIR TEMPERATURE SENSOR FAILURE, ECONOMIZER ENABLE/DISABLED WHEN ECONOMIZER SHOULD BE OFF, RESPECTIVELY, DAMPER NOT MODULATING, AND EXCESS OUTSIDE AIR.
 - H. POWERED EXHAUST FAN SHALL STAGE ON AND OFF ACCORDING TO DAMPER POSITION.
 - L. EQUIPMENT MANUFACTURER SHALL PROVIDE MODULATING DAMPER AND CONTROLS CAPABLE OF ADJUSTING THE DAMPER POSITION TO MAINTAIN THE SCHEDULED OUTSIDE AIR ON THE DRAWINGS ACROSS ALL FAN SPEEDS. DIV. 23 CONTRACTOR SHALL PROGRAM MULTIPLE DAMPER POSITION SETPOINTS IN THE FIELD DURING TESTING AND BALANCING TO MAINTAIN MINIMUM VENTILATION WHEN NOT IN ECONOMIZER. DAMPER SHALL BE CLOSED DURING UNOCCUPIED HOURS.
 - M. UNITARY CONTROLLER SHALL MODULATE AND/OR CYCLE SUPPLY FAN SPEED SETTING AND COIL CAPACITY STAGES SUBJECT TO THE INTERNAL SAFETIES AND SEQUENCES TO MAINTAIN SCHEDULED SETPOINTS.
 - O. DEHUMIDIFICATION SEQUENCE SHALL BE BASED ON RETURN AIR HUMIDITY.
 - S. INTERLOCK RTU WITH KITCHEN EXHAUST HOOD SYSTEM(S) TO SHUT DOWN UPON SIGNAL FROM HOOD FIRE EXTINGUISHING SYSTEM. INTERLOCK RTU WITH KITCHEN EXHAUST FAN TO ENERGIZE WHEN HOOD SYSTEM IS ENERGIZED FOR PRESSURIZATION.

ROOFTOP UNIT SCHEDULE (DX COOLING, NATURAL GAS HEAT)																															
MARK	MANUFACTURER	MODEL	NOMINAL TONS	UNIT TYPE	SUPPLY FAN					COOLING COIL					GAS FIRED HEAT EXCHANGER					ELECTRICAL					NOTES						
					CFM	ESP (IN)	NOM HP	TH (MBH)	SH (MBH)	EAT (°F DB)	(°F WB)	(°F DB)	(°F WB)	REFR TYPE	MIN EFF (EER)	MIN NO STAGES	MIN OUT (MBH)	NOM INPUT (MBH)	MIN EFF (%)	EAT (°F DB)	LAT (°F DB)	MIN NO STAGES	MIN OA (CFM)	V/PH		MCA	MOC/P	DISC TYPE	WEIGHT (LBS)		
RTU 1	CAPTIVEAIRE	CAS-HVAC1-1150-18-10T	10.0	SINGLE ZONE	1800	0.8	2.00	Yes	112.1	66.7	83.6	69.0	50.0	48.2	R454B	11	14.8	3	108.3	138.3	81	40.9	96.6	2	800	208 / 3	55	60	NF	1511	A-O
RTU 1	CAPTIVEAIRE	CAS-HVAC3-1300-24-20T	20.0	SINGLE ZONE	5200	0.8	7.50	Yes	187.8	137.1	79.8	66.2	55.8	54.5	R454B	11	18.2	3	211.4	260.5	81	47.4	85.0	2	1800	208 / 3	99	110	NF	2770	A-O

BUILDING AIR BALANCE SUMMARY NORMAL OPERATION				
UNIT NO.	SUPPLY (CFM)	OUTDOOR (CFM)	EXHAUST (CFM)	PERCENT O/A/S/A
RTU-1	1,800	800	--	44%
RTU-2	5,200	1,800	--	35%
FCU-1	420	40	--	10%
KEF-1	--	--	1,188	--
KEF-2	--	--	875	--
EF-1	--	--	150	--
TOTALS	7,420	2,640	2,213	--
TOTAL AIRFLOW AVAILABLE FOR PRESSURIZATION (CFM)				427
PERCENT POSITIVE PRESSURIZATION				16.2%

BUILDING AIR BALANCE SUMMARY ECONOMIZER MODE					
UNIT NO.	SUPPLY (CFM)	OUTDOOR (CFM)	EXHAUST (CFM)	PERCENT O/A/S/A	
RTU-1	1,800	1,800	--	100%	
RTU-2	5,200	5,200	--	100%	
FCU-1	420	40	--	10%	
KEF-1	--	--	1,188	--	
KEF-2	--	--	875	--	
EF-1	--	--	150	--	
RELIEF RTU-1	--	--	1,000	--	
RELIEF RTU-2	--	--	3,400	--	
TOTALS	7,420	7,040	6,613	--	
TOTAL AIRFLOW AVAILABLE FOR PRESSURIZATION (CFM)				427	
PERCENT POSITIVE PRESSURIZATION				6.1%	

FAN COIL UNIT SCHEDULE (HEAT PUMP)																								
MARK	MANUFACTURER	MODEL	SUPPLY FAN					COOLING COIL					HEAT PUMP HEATING COIL					ELECTRICAL					NOTES	
			CFM	ESP (IN)	NOM HP	TH (MBH)	SH (MBH)	EAT (°F DB)	(°F WB)	(°F DB)	(°F WB)	REFR TYPE	MIN OUT (MBH)	AMBIENT (°F DB)	EAT (°F DB)	LAT (°F DB)	MIN OA (CFM)	V/PH	MCA	MOC/P	DISC TYPE	STARTER TYPE		WEIGHT (LBS)
FCU 1	CARRIER	40MBCQ18	420	0.03	0.06	11.2	9.8	76.5	63.7	55.3	54.7	R454B	9.6	5	64	65	40	208 / 1	0	0	NF	N/A	45	A-G

- *EQUIPMENT SHALL BE OBTAINED THROUGH SHAKE SHACK NATIONAL ACCOUNT. REFER TO T002 / VENDOR LIST FOR MORE INFORMATION.***
 MODEL NUMBERS SHALL NOT BE CONSIDERED COMPLETE AND MATERIAL SHALL NOT BE ORDERED BY MANUFACTURER AND MODEL NUMBERS ONLY. REVIEW THE COMPLETE DESCRIPTION, NOTES AND SPECIFICATIONS TO DETERMINE THE EXACT MATERIAL AND ACCESSORIES TO BE ORDERED. THE MANUFACTURERS LISTED ARE THE BASIS FOR THE DESIGN.
- NOTES:**
- A. EQUIPMENT FURNISHED AND INSTALLED PER THE RESPONSIBILITY SCHEDULE, REF ARCHITECTURAL DRAWINGS.
 - B. ASSOCIATED CONDENSING UNIT SHALL BE BY THE SAME MANUFACTURER.
 - C. FOR COILS EQUIPMENT SIZED FOR 100°F AMBIENT TEMPERATURE. HEAT PUMP HEATING CAPACITY BASED ON AMBIENT TEMPERATURE LISTED.
 - D. PROVIDE UNIT WITH CLEANABLE AIR FILTERS.
 - E. PROVIDE WITH 7-DAY PROGRAMMABLE THERMOSTAT WITH STAGED HEATING AND COOLING CAPABILITY AS REQUIRED FOR OPERATION OF AUXILIARY HEATING AND COOLING CONTROLS.
 - F. DISCONNECT SWITCH PROVIDED BY DIVISION 26 CONTRACTOR.
 - G. PROVIDE SINGLE POINT POWER CONNECTION.

GRILLE, REGISTER AND DIFFUSER SCHEDULE										
MARK	MANUFACTURER	SERVICE	MODEL	CONSTRUCTION TYPE	FACE TYPE	MOUNTING LOCATION	FACE SIZE (IN)	MAX NC	MAX PRESS DROP (IN W.C.)	NOTES
CEG	E.H. PRICE	EXHAUST GRILLE W/ DAMPER	80D	STEEL	EGGCRATE	SURFACE	12"x12"	30	0.06	A C D G H I
ORG	E.H. PRICE	RETURN GRILLE	80	STEEL	EGGCRATE	LAY-IN	24"x24"	30	0.06	A C D G H I
CS01	E.H. PRICE	SUPPLY DIFFUSER	SCD	STEEL	SQUARE CONE SURFACE	SURFACE	12"x12"	30	0.06	A B C D G I J
CS02	E.H. PRICE	SUPPLY DIFFUSER	SCD	STEEL	SQUARE CONE SURFACE	LAY-IN	24"x24"	30	0.06	A B C D G I J
CS03	E.H. PRICE	SUPPLY DIFFUSER	PDOR	STEEL	PERFORATED	LAY-IN	24"x24"	30	0.06	A C D G I
WRG	E.H. PRICE	RETURN GRILLE	530	STEEL	LOUVERED FACE	WALL OR DUCT (SEE PLANS)	30	0.06	A C D E G I	
WSR	E.H. PRICE	SUPPLY REGISTER W/ DAMPER	520D	STEEL	LOUVERED FACE	WALL OR DUCT	12"x6"	30	0.06	A C D E F G I

- MODEL NUMBERS SHALL NOT BE CONSIDERED COMPLETE AND MATERIAL SHALL NOT BE ORDERED BY MANUFACTURER AND MODEL NUMBERS ONLY. REVIEW THE COMPLETE DESCRIPTION, NOTES AND SPECIFICATIONS TO DETERMINE THE EXACT MATERIAL AND ACCESSORIES TO BE ORDERED. THE MANUFACTURERS LISTED ARE THE BASIS FOR THE DESIGN.
- NOTES:**
- A. EQUIPMENT FURNISHED AND INSTALLED PER THE EQUIPMENT RESPONSIBILITY SCHEDULE.
 - B. 4-WAY THROW PATTERN UNLESS OTHERWISE INDICATED BY FLOW ARROWS ON DRAWINGS.
 - C. NECK SIZE SHOWN ON DRAWINGS. PROVIDE BRANCH DUCT TO MATCH NECK SIZE UNLESS OTHERWISE SHOWN ON DRAWINGS.
 - D. BAKED ENAMEL FINISH. WHITE TO MATCH CEILING COLOR.
 - E. FRONT BLADES PARALLEL TO LONG DIMENSION.
 - F. DOUBLE DEFLECTION BARS SHALL BE ADJUSTABLE.
 - G. FRAME TYPE TO MATCH CEILING/WALL CONSTRUCTION. COORDINATE WITH ARCHITECTURAL REFLECTED CEILING/WALL PLAN.
 - H. PROVIDE OPPOSED BLADE DAMPER ADJUSTABLE FROM FACE OF DEVICE.
 - I. PROVIDE DIFFUSERS, LINEAR SLOTS, AND GRILLES WITH NO EXPOSED MOUNTING SCREWS.
 - J. PROVIDE WITH RAPID MOUNT FRAMING OPTION FOR LAY-IN TYPE DIFFUSERS INSTALLED IN A HARD CEILING.

- SEQUENCE OF OPERATIONS**
- A. FAN COIL UNIT CONTROL (FCU-1)

During occupied hours, operate fan coil unit supply fan continuously and open outdoor air damper to maintain minimum ventilation. Cycle stage(s) of DX cooling and electric heating to maintain room thermostat set point (75 degrees Fahrenheit cooling, 70 degrees Fahrenheit heating). Unit shall be shutdown upon alarm signal from FACP.

During unoccupied hours, cycle the fan coil unit supply fan and cooling or heating system to maintain unoccupied setback temperature set points. Outdoor air damper shall be closed during unoccupied hours.

Connect the Outdoor air damper to the same time clock as the restroom exhaust.
 - B. KITCHEN EXHAUST FAN CONTROL

Kitchen exhaust fan shall be energized through on-off switches at the associated exhaust hoods or cooking equipment or through a master kitchen ventilation control panel as indicated on the drawings. Kitchen fans shall be interlocked to operate with cooking appliances, make-up air and other air-handling equipment providing fresh air to the kitchen area as noted or scheduled on the drawings.
 - C. ROOFTOP UNIT CONTROL

Refer to ROOFTOP UNIT CONTROL MATRIX on Sheet M601 for required rooftop unit control options.
 - D. RESTROOM EXHAUST FAN (EF-1) CONTROL

Operate exhaust fans continuously during occupied hours and shut down during unoccupied hours. Provide a 7-day timerlock to switch each system between occupied and unoccupied operation.
 - E. AIR CURTAIN CONTROL

Interlock air curtain with door limit switch to energize when the door opens.
 - F. ELECTRIC UNIT HEATER CONTROL

Unit heater shall be activated by unit mounted thermostat to maintain room temperature setpoint (80 deg F).

CONDENSING UNIT SCHEDULE (HEAT PUMP)																	
MARK	SERVICE	MANUFACTURER	MODEL	COOLING CAPACITY			HEATING CAPACITY			ELECTRICAL					NOTES		
				REFR TYPE	TH (MBH)	MIN EFF (EER)	(SEER)	CAP (MBH)	AMBIENT (DB °F)	COP 47°F (HSPF)	MCA	MOC/P	V/PH	DISC TYPE		WEIGHT (LBS)	
CU 1	FCU 1	CARRIER	38MARBQ13AA3	R410A	11.2	12.5	20	9.6	4.6	3.43	10.5	18	25	208/1	NF	118	A-1


- *EQUIPMENT SHALL BE OBTAINED THROUGH SHAKE SHACK NATIONAL ACCOUNT. REFER TO T002 / VENDOR LIST FOR MORE INFORMATION.***
 MODEL NUMBERS SHALL NOT BE CONSIDERED COMPLETE AND MATERIAL SHALL NOT BE ORDERED BY MANUFACTURER AND MODEL NUMBERS ONLY. REVIEW THE COMPLETE DESCRIPTION, NOTES AND SPECIFICATIONS TO DETERMINE THE EXACT MATERIAL AND ACCESSORIES TO BE ORDERED. THE MANUFACTURERS LISTED ARE THE BASIS FOR THE DESIGN.
- NOTES:**
- A. EQUIPMENT FURNISHED AND INSTALLED PER THE RESPONSIBILITY SCHEDULE, REF ARCHITECTURAL DRAWINGS.
 - B. EQUIPMENT CAPACITY SCHEDULED IS MINIMUM CAPACITY THAT MUST BE PROVIDED AT AMBIENT TEMPERATURE INDICATED.
 - C. CONTRACTOR SHALL VERIFY WITH EQUIPMENT SUPPLIER EXACT QUANTITY AND SIZE OF REFRIGERANT PIPING.
 - D. PROVIDE LIQUID LINE FILTER DRYER AND SIGHT GLASS.
 - E. PROVIDE PRE-ENGINEERED ROOF EQUIPMENT SUPPORTS WITH MINIMUM HEIGHT REQUIRED TO MAINTAIN BOTTOM OF EQUIPMENT A MINIMUM OF 16 INCHES ABOVE FINISHED ROOF SURFACE. COORDINATE WITH ROOF INSULATION THICKNESS AND ROOF TAPER AT INSTALLED LOCATION.
 - F. DISCONNECT SWITCH PROVIDED BY DIVISION 26 CONTRACTOR.
 - G. STARTERS FOR ALL MOTORS SHALL BE PROVIDED INTEGRAL WITH UNIT.
 - H. COORDINATE SIZE OF CONDUCTOR TERMINATION LUGS WITH CONDUCTOR SIZES SHOWN ON ELECTRICAL DRAWINGS.
 - I. EQUIPMENT SIZED FOR 100 °F AMBIENT TEMPERATURE.

AIR CURTAIN SCHEDULE																	
MARK	AREA SERVED	MANUFACTURER	MODEL	UNIT SPECS			ELECTRICAL					NOTES					
				LENGTH (IN)	MAX AIRFLOW (CFM)	FAN QUANTITY	MOTOR HP	V/PH	DISC TYPE	STARTER TYPE	WEIGHT (LBS)						
AC 1	SERVED ENTRY	MARS	STD2	36"	1379	1	0.50	120/1	NF	N/A	38	A-H					


- MODEL NUMBERS SHALL NOT BE CONSIDERED COMPLETE AND MATERIAL SHALL NOT BE ORDERED BY MANUFACTURER AND MODEL NUMBERS ONLY. REVIEW THE COMPLETE DESCRIPTION, NOTES AND SPECIFICATIONS TO DETERMINE THE EXACT MATERIAL AND ACCESSORIES TO BE ORDERED. THE MANUFACTURERS LISTED ARE THE BASIS FOR THE DESIGN.
- NOTES:**
- A. PROVIDE INSULATED ROOF CURB WITH MINIMUM HEIGHT REQUIRED TO MAINTAIN BOTTOM OF EQUIPMENT A MINIMUM OF 16 INCHES ABOVE FINISHED ROOF SURFACE. PROVIDE SLOPED CURB IF NEEDED TO MATCH ROOF SLOPE. COORDINATE WITH ROOF INSULATION THICKNESS AND ROOF TAPER AT INSTALLED LOCATION. COORDINATE CURB TYPE WITH DRAWINGS.
 - B. PROVIDE BIRDSCREEN AND GRAVITY BACKDRAFT DAMPER.
 - C. PROVIDE FACTORY MOUNTED DISCONNECT SWITCH.
 - D. PROVIDE WITH MANUFACTURER'S FAN SPEED CONTROLLER FOR BALANCING PURPOSES.
 - E. PROVIDE WITH MANUFACTURER'S ELECTRONICALLY COMMUTATED (EC) MOTOR.
 - F. NOMINAL MOTOR HP SHALL BE NO LARGER THAN THE FIRST AVAILABLE NOMINAL MOTOR SIZE GREATER THAN THE BHP.

OUTSIDE AIR REQUIREMENTS, ASHRAE 62.1-2016 (IP)																	
SYSTEM DESIGNATION	SYSTEM TYPE	SINGLE-ZONE SYSTEMS...				MULTI-ZONE SYSTEMS ONLY				FLOOR AREA SERVED BY SYSTEM [sq] (SF)	SYSTEM AVERAGED AREA BASED OUTDOOR AIR RATE (CFM/SF)	SYSTEM POPULATION (PEOPLE)	SYSTEM AVERAGED PEOPLE BASED OUTDOOR AIR RATE (CFM/PERSON)	REQUIRED OA INTAKE FLOW [vot] (CFM)	REQUIRED DCV OA INTAKE FLOW [vot] (CFM)	DESIGN OA INTAKE FLOW (CFM)	NOTES
		ASSOCIATED VENTILATION ZONE	SINGLE ZONE WORST CASE ZONE AIR DISTRIBUTION EFFECTIVENESS (Ez)	MIN	MAX	CONTR...	BASE	MAXIMUM	SYSTEM VENTILATION EFFICIENCY [Ev]								
RTU-1	MULTIZONE (RTU-1)					0.88				1,416			64	7.50	N/A	800	ALL
RTU-2	SINGLE ZONE	OPEN KITCHEN + BOH				-				1,303		26	7.50	N/A	1,800	ALL	
FCU-1	SINGLE ZONE	OFFICE				0.80				83		2	5.00	N/A	40	ALL	
TOTALS											1,247	0	2,640				

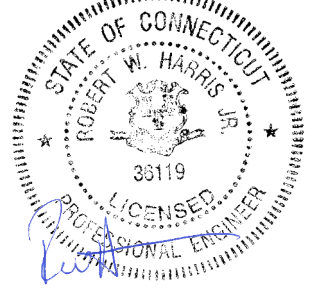
- GENERAL NOTES:**
- VENTILATION CALCULATIONS BASED ON ASHRAE STANDARD 62.1-2016.
 - SYSTEM POPULATIONS BASED ON MAX SEATING AND/OR CODE MAXIMUM VALUES.
 - SINGLE ZONE SYSTEMS (Vot = Voz): SYSTEM VENTILATION EFFICIENCY CALCULATION IS NOT REQUIRED FOR SINGLE ZONE SYSTEMS. WORST CASE AIR DISTRIBUTION EFFECTIVENESS BETWEEN HEATING AND COOLING MODES OF OPERATION IS SHOWN IN TABLE.
 - 100% OA SYSTEMS (Vot = 2.0h zone Voz): WHEN ONE AIR HANDLER SUPPLIES ONLY OUTDOOR AIR TO ONE OR MORE ZONES. EACH ZONE IS INDIVIDUALLY CALCULATED WITH ITS WORST CASE ZONE AIR DISTRIBUTION AND COOLING MODES OF OPERATION IS SHOWN IN TABLE. EFFECTIVENESS (HEATING/COOLING).
 - MULTI-ZONE RECIRCULATING SYSTEMS: ASHRAE 62.1-2016 CALCULATOR USED TO DETERMINE VENTILATION AIRFLOW IN COMPLIANCE WITH VRF AND APPENDIX A. VENTILATION RATE SHOWN IS ACTUAL IS CALCULATED WITH CORRECTION FACTORS INCLUDED. EACH ZONE IS CALCULATED WITH ITS WORST CASE ZONE AIR DISTRIBUTION EFFECTIVENESS (HEATING/COOLING) AS PART OF CALCULATIONS TO FIND EV.




CONSULTANTS:



SEAL SIGNATURE:



07/18/2025



SHAKE SHACK SHOPS AT STONEBRIDGE

2053 HIGHLAND AVE, UNIT E 120
CHESHIRE, CT 06410
SHACK #1730

IFC SET

MECHANICAL SCHEDULES

DRAWN BY: *Author*

CHECKED BY: *Checker*

JOB NO: 2025040

M601

COMcheck Software Version COMcheckWeb
Mechanical Compliance Certificate

Project Information

Energy Code: 90.1 (2016) Standard
 Project Title: SS-1730-Stone Bridge Crossing
 Location: Cheshire, Connecticut
 Climate Zone: 5a
 Project Type: New Construction

Construction Site: Highland Avenue, Cheshire, Connecticut 06410
 Owner/Agent: Shake Shack, 225 Varick Street, Suite 301, New York, New York 10014, 646-747-7200
 Designer/Contractor: Henderson Engineers, Inc., 8345 Lenexa Drive, Suite 300, Lenexa, Kansas 66214, 913-742-5000

Efficiency Packages Description	Credit

Mechanical Systems List

Quantity System Type & Description

1 RTU-1 (Single Zone)
 Heating: 1 each - Central Furnace (Heating Equip), Gas, Capacity = 112 kBtu/h
 Proposed Efficiency = 81.00% EER, Required Efficiency = 80.00 % EER (or 78% AFUE)
 Cooling: 1 each - Single Package DX Unit (Cooling Equip), Capacity = 114 kBtu/h, Air-Cooled Condenser, Air Economizer
 Proposed Efficiency = 11.00 EER, Required Efficiency = 11.00 EER
 Proposed Part Load Efficiency = 14.80 IEER, Required Part Load Efficiency = 12.70 IEER
 Fan System: RTU-1 Fan | Dining - Compliance (Motor nameplate HP and fan efficiency method) : Passes
 Fans:
 Fan 1 Supply, Single-Zone VAV, 1800 CFM, 2.0 motor nameplate hp, 0.0 fan efficiency grade, 0.0 total fan efficiency, 0.0 design fan efficiency, fan exception: Single fan <= 5HP

1 RTU-2 (Single Zone)
 Heating: 1 each - Central Furnace (Heating Equip), Gas, Capacity = 211 kBtu/h
 Proposed Efficiency = 81.00% EER, Required Efficiency = 80.00 % EER (or 78% AFUE)
 Cooling: 1 each - Single Package DX Unit (Cooling Equip), Capacity = 256 kBtu/h, Air-Cooled Condenser, Air Economizer
 Proposed Efficiency = 11.10 EER, Required Efficiency = 9.80 EER
 Proposed Part Load Efficiency = 18.20 IEER, Required Part Load Efficiency = 11.40 IEER

1 CU-1 (Single Zone)
 Spill System Heat Pump
 Heating Mode: Capacity = 18 kBtu/h
 Proposed Efficiency = 10.50 HSPF, Required Efficiency = 6.20 HSPF
 Cooling Mode: Capacity = 16 kBtu/h
 Proposed Efficiency = 20.00 SEER, Required Efficiency = 14.00 SEER
 Proposed Part Load Efficiency = 0.00, Required Part Load Efficiency = 0.00
 Fan System: FCU-1 Fan | Office - Compliance (Motor nameplate HP and fan efficiency method) : Fails: Fan 3 : FAILS
 Fan efficiency grade must be greater than or equal to 67
 Fans:
 Fan 3 Supply, Constant Volume, 420 CFM, 0.1 motor nameplate hp, 0.0 fan efficiency grade, 0.0 total fan efficiency, 0.0 design fan efficiency, fan exception: Single fan < 1 HP or < 0.89 kW

3 WH-1, WH-2, WH-3
 Gas Storage Water Heater, Capacity: 0 gallons, Input Rating: 199 kBtu/h w/ Circulation Pump
 No minimum efficiency requirement applies

Project Title: SS-1730-Stone Bridge Crossing Report date: 05/20/25
 Data filename: Page 1 of 12

Section # & Req.ID	Plumbing Rough-In Inspection	Complies?	Comments/Assumptions
7.4.4.1 [PL2]	Temperature controls installed on service water heating systems (<=120°F to maximum temperature for intended use).	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
7.4.4.2 [PL3]	Automatic time switches installed to automatically switch off the recirculating hot-water system or heat trace.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.

Additional Comments/Assumptions:

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

Project Title: SS-1730-Stone Bridge Crossing Report date: 05/20/25
 Data filename: Page 5 of 12

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 90.1 (2016) Standard requirements in COMcheckWeb and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

Eion Hindman-Curry
 Name - Title: Eion Hindman-Curry Signature Date: 05/20/2025

Project Title: SS-1730-Stone Bridge Crossing Report date: 05/20/25
 Data filename: Page 2 of 12

Section # & Req.ID	Mechanical Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
6.4.1.4, 6.4.1.5 [ME1]	HVAC equipment efficiency verified. Non-NASCA HVAC equipment labeled as meeting 90.1.	Efficiency: _____	Efficiency: _____	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	See the Mechanical Systems list for values.
6.4.3.4.1 [ME3]	Stair and elevator shaft vents have motorized dampers that automatically close.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.
6.4.3.4.2, 6.4.3.4.3 [ME4]	Outdoor air and exhaust systems have motorized dampers that automatically shut when not in use and meet maximum leakage rates. Check gravity dampers where allowed.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.4.3.4.5 [ME39]	Enclosed parking garage ventilation has automatic contaminant detection and capacity to stage or modulate fans to 50% or less of design capacity.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.
6.4.3.4.4 [ME3]	Ventilation fans >= 0.75 hp have automatic controls to shut off fan when not required.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.4.3.8 [ME3]	Demand control ventilation provided for spaces >500 ft ² and >25 people/1000 ft ² occupant density and served by systems with air side economizer, auto modulating outside air damper control, or design airflow >3,000 cfm.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Spaces where 75 percent of the supply outdoor airflow is required for makeup air that is exhausted from the space or transfer air required for makeup air that is exhausted from the space(s).
6.5.3.2.1 [ME40]	DX cooling systems >= 75 kBtu/h (>= 65 kBtu/h effective 1/2016) and chilled-water and evaporative cooling fan motor hp >= 1/2 designed to vary supply fan airflow as a function of load and comply with operational requirements.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	See the Mechanical Systems list for values.
6.4.4.1.1 [ME7]	Insulation exposed to weather protected from damage. Insulation outside of the conditioned space and associated with cooling systems is vapor retardant.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.4.4.1.2 [ME8]	HVAC ducts and plenums insulated per Table 6.8.2. Where ducts or plenums are installed in or under a slab, verification may need to occur during Foundation Inspection.	R: _____	R: _____	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.4.4.1.3 [ME9]	HVAC piping insulation thickness. Where piping is installed in or under a slab, verification may need to occur during Foundation Inspection.	_____ in.	_____ in.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.

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

Project Title: SS-1730-Stone Bridge Crossing Report date: 05/20/25
 Data filename: Page 6 of 12

COMcheck Software Version COMcheckWeb
Inspection Checklist

Energy Code: 90.1 (2016) Standard
 Requirements: 100.0% were addressed directly in the COMcheck 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
4.2.2, 6.4.4.2.1, 6.7.2 [PR2]	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.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
4.2.2, 7.7.1, 10.4.2 [PR3]	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.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
4.2.2, 8.4.1.1, 8.4.1.2, 8.7 [PR6]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the electrical systems and equipment and document where exceptions are claimed. Feeder conductors sized in accordance with approved plans and branch circuits sized for maximum drop of 3%.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.7.2.4 [PR5]	Detailed instructions for HVAC systems commissioning included on the plans or specifications for projects >=50,000 ft ² .	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.

Additional Comments/Assumptions:

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

Project Title: SS-1730-Stone Bridge Crossing Report date: 05/20/25
 Data filename: Page 3 of 12

Section # & Req.ID	Mechanical Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
6.4.4.1.4 [ME11]	Thermally ineffective panel surfaces of sensible heating panels have insulation >= R-3.5.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.4.4.2.1 [ME10]	Ducts and plenums having pressure class ratings are Seal Class A construction.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.8.1.15, 6.8.1.16 [ME10]	Electrically operated DX DOAS units meet requirements per Tables 6.8.1.15 or 6.8.1.16.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.4.4.2.2 [ME11]	Ductwork operating >3 in. water column requires air leakage testing.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.5.1.5 [ME16]	Economizer operation will not increase heating energy use during normal operation.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.5.2.3 [ME19]	Dehumidification controls provided to prevent reheating, recirculating, mixing of hot and cold airstreams or concurrent heating and cooling of the same airstream.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.5.2.4.1 [ME68]	Humidifiers with airstream mounted preheating jackets have preheat auto-shutoff value set to activate when humidification is not required.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.
6.5.2.4.2 [ME69]	Humidification system dispersion tube hot surfaces in the airstream of ducts or air-handling units insulated >= R-0.5.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.
6.5.2.5 [ME70]	Preheat coils controlled to stop heat output whenever mechanical cooling, including economizer operation, is active.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.5.2.6 [ME106]	Units that provide ventilation air to multiple zones and operate in conjunction with zone heating and cooling systems are prevented from using heating or heat recovery to warm supply air above 60°F when representative building loads or outdoor air temperature indicate that most zones demand cooling.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.5.3.6 [ME72]	Motors for fans >= 1/2 hp and < 1 hp are electronically commutated motors or have a minimum motor efficiency of 70%. These motors are also speed adjustable for either balancing or remote control.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.

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

Project Title: SS-1730-Stone Bridge Crossing Report date: 05/20/25
 Data filename: Page 7 of 12

Section # & Req.ID	Footing / Foundation Inspection	Complies?	Comments/Assumptions
6.4.3.7 [FO9]	Freeze protection and snow/ice melting system sensors for future connection to controls.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.

Additional Comments/Assumptions:

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

Project Title: SS-1730-Stone Bridge Crossing Report date: 05/20/25
 Data filename: Page 4 of 12

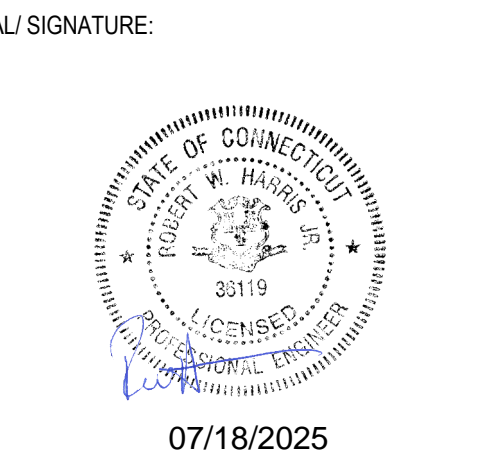
Section # & Req.ID	Mechanical Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
6.5.3.4 [ME109]	Parallel-flow fan-powered VAV air terminals have automatic controls to a) turn off the terminal fan except when space heating is required or if required for ventilation; b) turn on the terminal fan as the first stage of heating before the heating coil is activated; and c) during heating for warmup or setback temperature control, either operate the terminal fan and heating coil without primary air or reverse the terminal damper logic and provide heating from the central air handler through primary air.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.
6.5.3.7 [ME109]	Required minimum outdoor air rate is the larger of minimum outdoor air rate or minimum exhaust air rate required by Standard 62.1, Standard 170, or applicable codes or accreditation standards. Outdoor air ventilation systems shall comply with one of the following: a) design minimum system outdoor air provided < 135% of the required minimum outdoor air rate; b) dampers, ductwork, and controls allow the system to supply <= the required minimum outdoor air rate with a single set-point adjustment; or c) system includes exhaust air energy recovery complying with Section 6.5.6.1.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
6.5.3.3 [ME42]	Multiple zone VAV systems with DDC of individual zone boxes have static pressure setpoint reset controls.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.
6.5.4.2 [ME25]	HVAC pumping systems with >= 3 control valves designed for variable fluid flow (see section details).			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Exception: Requirement does not apply.
7.5.3 [ME78]	Gas-fired water-heating equipment installed in new buildings: where a singular piece of water-heating equipment >= 1,000 kBtu/h serves the entire building, thermal efficiency must be >= 90 EER; where multiple pieces of water-heating equipment serve the building with combined rating >= 1,000 kBtu/h, the combined input-capacity-weighted-average thermal efficiency - thermal efficiency must be >= 90 EER. Exclude input rating of equipment in individual dwelling units and equipment <= 100 kBtu/h.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.

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

Project Title: SS-1730-Stone Bridge Crossing Report date: 05/20/25
 Data filename: Page 8 of 12



CONSULTANTS:
HENDERSON ENGINEERS
 8345 LENEXA DRIVE, SUITE 300
 LENEXA, KS 66214
 TEL 913.742.5000 FAX 913.742.5001
 WWW.HENDERSONENGINEERS.COM
 2550010496
 CT. CORPORATE NO. PEC.0002084



SEAL SIGNATURE:
 07/18/2025

NO.	BY	DATE	DESCRIPTION
1	HEI	2025-07-21	IFC SET
	HEI	2025-06-06	BID/PERMIT SET



SHAKE SHACK SHOPS AT STONEBRIDGE

2053 HIGHLAND AVE, UNIT E 120
 CHESHIRE, CT 06410
 SHACK #1730

IFC SET

MECHANICAL ENERGY CODE COMPLIANCE

DRAWN BY: Author
 CHECKED BY: Checker
 JOB NO: 20250040

M630

FOR QUESTIONS, CALL THE
Eastern PA Mechanical
REGION 108
PHONE: (267) 504 - 4126
EMAIL: reg108@captiveaire.com

HOOD INFORMATION - JOB#7454358

HOOD NO	TAG	MODEL	MANUFACTURER	LENGTH	MAX COOKING TEMP	TYPE	APPLIANCE DUTY	DESIGN CFM/FT	TOTAL EXH CFM	EXHAUST PLENUM RISER(S)				HOOD CONSTRUCTION	HOOD CONFIG			
										WIDTH	LENG	HEIGHT	DIA		CFM	VEL	SP	END TO END
1	90 (Fryer)	5430 ND-2	CAPTIVEAIRE	5' 0"	600 DEG	I	HEAVY	175	875	9'	9'	4'	875	1556	-0.405'	430 SS WHERE EXPOSED	ALONE	ALONE
2	90 (Grill)	5430 ND-2	CAPTIVEAIRE	7' 11"	450 DEG	I	MEDIUM	150	1188	10'	11'	4'	1188	1555	-0.462'	430 SS WHERE EXPOSED	ALONE	ALONE

HOOD INFORMATION

HOOD NO	TAG	FILTER(S)				LIGHT(S)				UTILITY CABINET(S)				FIRE SYSTEM PIPING	HOOD HANGING WEIGHT		
		TYPE	QTY	HEIGHT	LENGTH	EFFICIENCY @ 7 MICRONS	QTY	TYPE	WIRE GUARD	LOCATION	SIZE	FIRE SYSTEM	SIZE			ELECTRICAL MODEL #	SWITCHES QUANTITY
1	90 (Fryer)	CAPTRATE SOLD FILTER	3	20"	16"	85% SEE FILTER SPEC	2	RECESSED ROUND	NO	LEFT	12"x54"x30"	TANK FS	4.0/4.0/4.0	SC-320110MA	1 LIGHT 1 FAN	YES	762 LBS
2	90 (Grill)	CAPTRATE SOLD FILTER	5	20"	16"	85% SEE FILTER SPEC	2	RECESSED ROUND	NO							YES	508 LBS

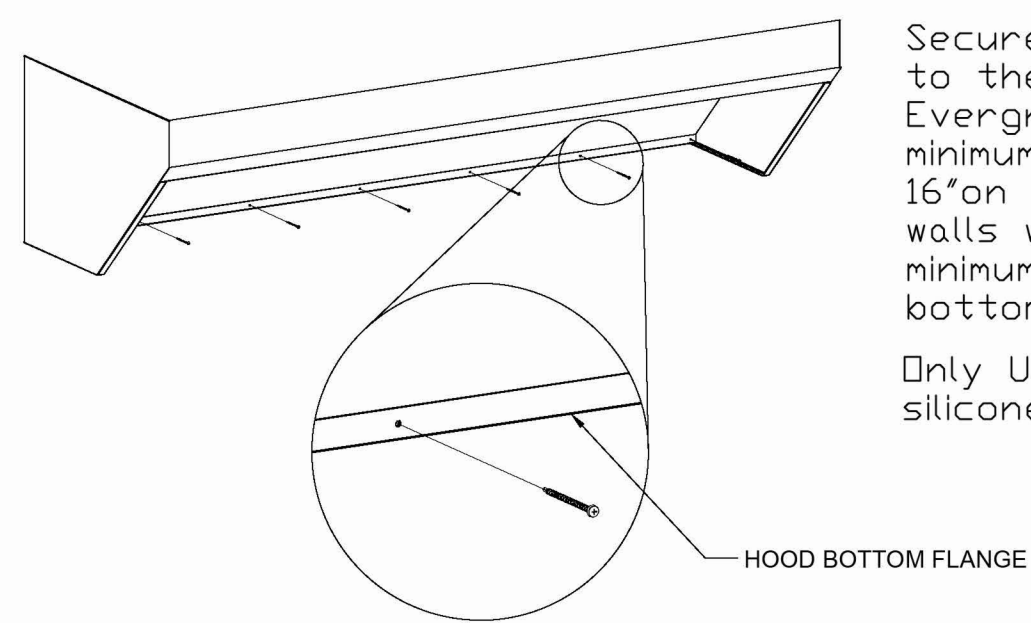
HOOD OPTIONS

HOOD NO	TAG	OPTION
1	90 (Fryer)	FIELD WRAPPER 18.00" HIGH FRONT, LEFT, RIGHT.
		RIGHT QUARTER END PANEL 23" TOP WIDTH, 0" BOTTOM WIDTH, 23" HIGH 430 SS.
		LEFT QUARTER END PANEL 23" TOP WIDTH, 0" BOTTOM WIDTH, 23" HIGH 430 SS.
		INSULATION FOR BACK OF HOOD.
2	90 (Grill)	RISER SENSOR INSTALL 6IN PLEN.
		FIELD WRAPPER 18.00" HIGH FRONT, LEFT, RIGHT.
		RIGHT END STANDOFF (FINISHED) 1" WIDE 54" LONG INSULATED.
		INSULATION FOR BACK OF HOOD.
		RISER SENSOR INSTALL 6IN PLEN.
		LEFT WIDE VERTICAL END PANEL 42" TOP WIDTH, 36" BOTTOM WIDTH, 80" HIGH INSULATED 430 SS.
		RIGHT WALL AS END PANEL.

HVAC DISTRIBUTION NOTE

SUPPLY DIFFUSERS WITHIN TEN (10) FEET OF THE EXHAUST HOOD SHOULD BE LOW-VELOCITY / NON-DIRECTIONAL

Bottom Flange Securing Detail

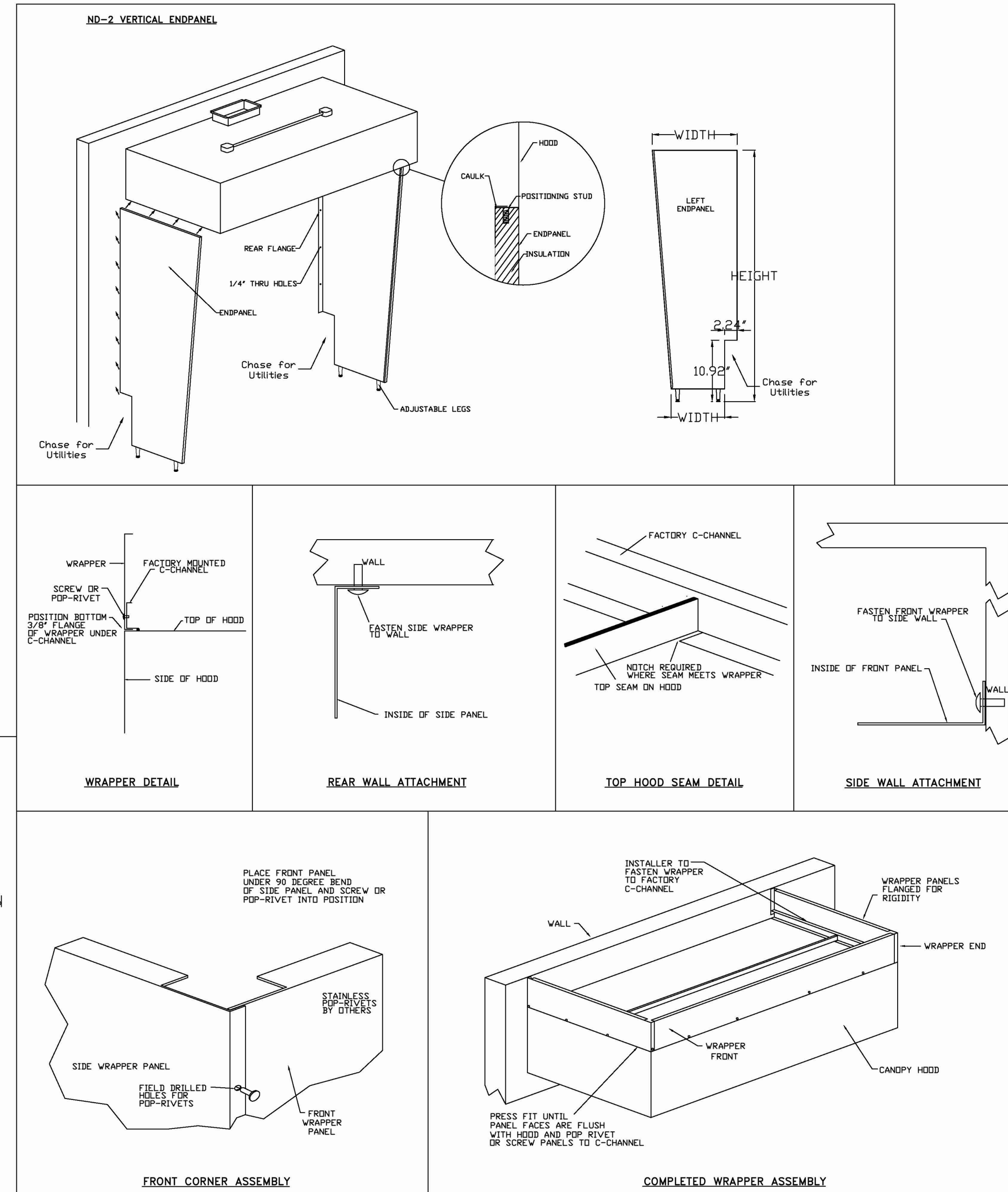


Secure the bottom of the hood to the rear wall using 1404 Evergreen Quik-Fastener. Use a minimum of 1 fastener every 16" on the bottom flange. For walls with metal studs, use a minimum of 1 fastener on the bottom flange at each stud. Only Use SIL-BOND RTV 4500 silicone sealant on hood.

CLEARANCE TO COMBUSTIBLES

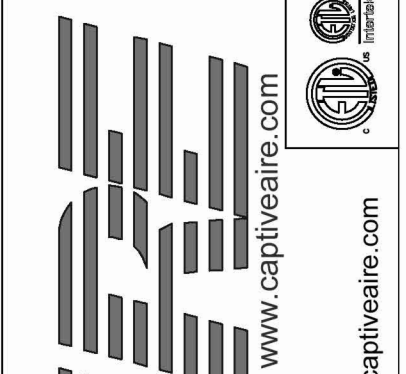
HOODS #	SURFACE	*CLEARANCE
1	TOP	18"
	FRONT	0"
	BACK	0"
	LEFT	0"
2	RIGHT	18"
	TOP	18"
	FRONT	0"
	BACK	0"
	LEFT	18"
	RIGHT	0"

- 18" CLEARANCE TO COMBUSTIBLES CONFORMS TO UL710 STANDARD.
- HOOD MOUNTED UTILITY CABINETS REQUIRE 36" SERVICE CLEARANCE.



REVISIONS

NO.	DESCRIPTION	DATE



CAPTIVEAIRE
Eastern PA Mechanical
225 E. City Line Avenue, Suite #103, Bala Cynwyd, PA, 19004
PHONE: (267) 504 - 4128
EMAIL: reg108@captiveaire.com

Shake Shack - CT - 1730 - Stonebridge (Kitchen)
Cheshire, CT, 06408

DATE: 4/7/2025
DWG.#: 7454358
DRAWN BY: EB
SCALE: 3/4" = 1'-0"
MASTER DRAWING
SHEET NO. 1

Bergmeyer
CONSULTANTS:
SEAL SIGNATURE:
FOR REFERENCE ONLY

1 HEI 2025-07-21 IFC SET
1 HEI 2025-06-06 BID/PERMIT SET

SHAKE SHACK SHOPS AT STONEBRIDGE

2053 HIGHLAND AVE, UNIT E 120
CHESHIRE, CT 06410
SHACK #1730

IFC SET

CAPTIVEAIRE DRAWINGS

DRAWN BY: Author
CHECKED BY: Checker
JOB NO: 20250040

M701

THE DOCUMENTATION CONTAINED ON THIS SHEET WAS NOT PREPARED BY HENDERSON ENGINEERS AND IS INCLUDED IN THIS SET FOR REFERENCE ONLY. HENDERSON ENGINEERS REVIEWED THE DOCUMENTATION ON THIS SHEET FOR GENERAL COMPLIANCE WITH DESIGN INTENT. SUPPLIER IS RESPONSIBLE THAT ALL FURNISHED EQUIPMENT ON THIS SHEET COMPLIES WITH APPLICABLE LOCAL, STATE, AND FEDERAL LAWS, CODES, AND REGULATIONS.

FIRE SYSTEM INFORMATION - JOB#7454358

FIRE SYSTEM NO	TAG	TYPE	SIZE	MAX FP	DESIGN FP	INSTALLATION	
						SYSTEM	LOCATION ON HOOD
1		TANK FS	4.0/4.0/4.0	60	41	FIRE CABINET LEFT	LEFT, HOOD 1

NOTES

- FIELD PIPE DROPS AS SHOWN
- PIPING, ELBOWS, TEES, AND NOZZLES SUPPLIED BY CAS.
- FIELD INSTALLED DROPS: FACTORY WILL PROVIDE QTY 2 60IN LONG PIECES OF CHROME PLATED PIPING SHIPPED LOOSE TO BE FIELD-INSTALLED.
- SHIP LOOSE DROPS: FACTORY WILL PROVIDE THE EXACT CHROME PIPE LENGTH NEEDED SHIPPED LOOSE TO BE FIELD-INSTALLED.
- RELOCATE NOZZLES IF FLOW PATTERN IS BLOCKED BY SHELVEING, SALAMANDERS, ETC.
- OVERLAPPING COVERAGE SHALL NOT BE USED ON ANY APPLIANCE WITH AN OBSTRUCTION.
- IF APPLICABLE, EXTENDED PRE-PIPED DROPS ARE SHIPPED LOOSE.
- FACTORY PIPING EXTENDS A MAXIMUM OF 6" ABOVE THE TOP OF THE HOOD.

- APPLIANCE DIMENSIONS LISTED REPRESENT THE COOKING SURFACE SIZE, NOT THE OVERALL APPLIANCE SIZE.
- THIS PRE-ENGINEERED FIRE SYSTEM COMPLIES WITH UL 300 REQUIREMENTS.

- DL-F NOZZLE PART NUMBER REPLACES 3070-3/8H-10-SS

JOB #: 7454358
JOB NAME: SHAKE SHACK - CT - 1730 - STONEBRIDGE (KITCHEN).

SYSTEM SIZE: TANK-SP-3 DESIGN FP: 41. MAXIMUM FP: 60.

HOOD # 1 5' 0.00' LONG x 54" WIDE x 30" HIGH.

RISER # 1 SIZE: 10" x 10".

HOOD # 1 METAL BLOW-OFF CAPS INCLUDED.

HOOD # 2 7' 11.00' LONG x 54" WIDE x 30" HIGH.

RISER # 1 SIZE: 10" x 11".

HOOD # 2 METAL BLOW-OFF CAPS INCLUDED.

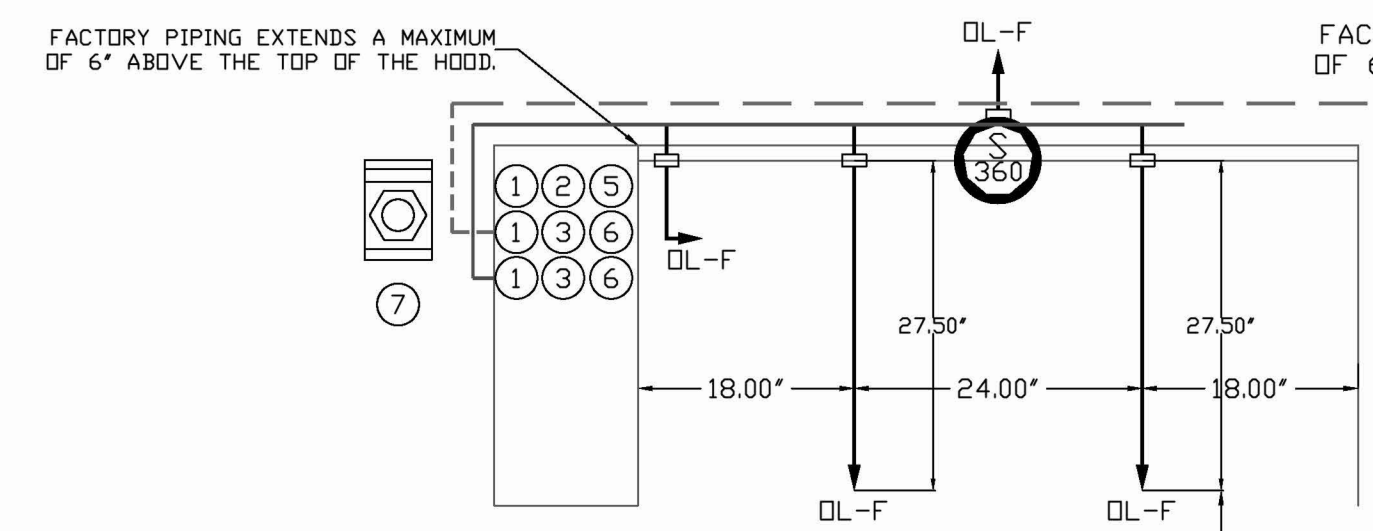
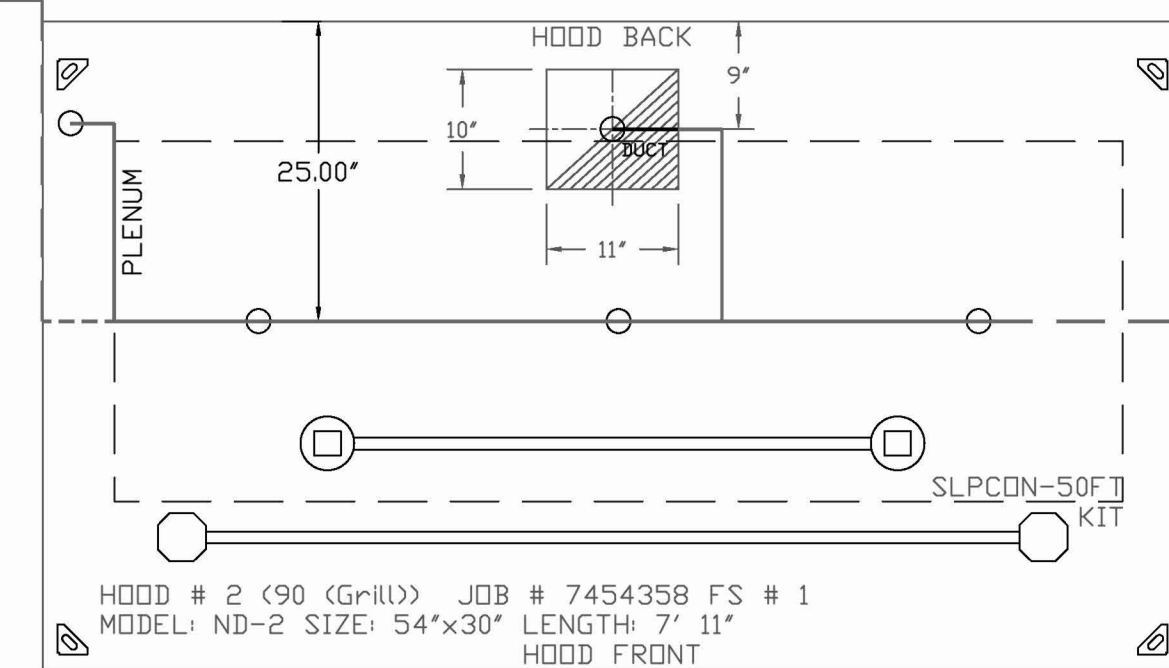
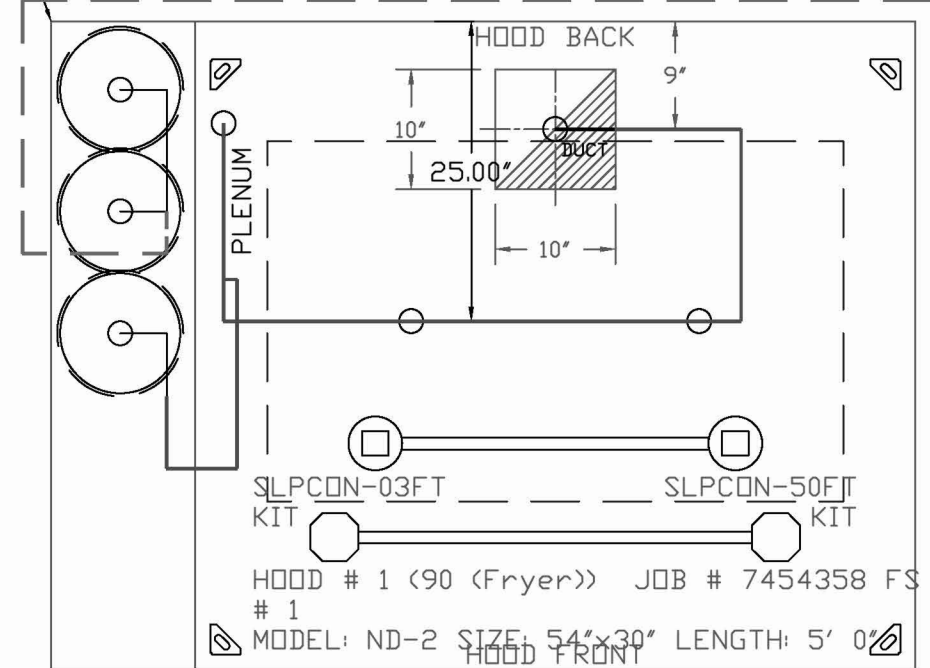
- HEAVY-DUTY APPLIANCES (RATED 600°F) WILL REQUIRE AN ADDITIONAL DOWNSTREAM FIRESTAT IN THE EVENT THAT THE DUCTWORK CONTAINS ANY HORIZONTAL RUNS OVER 25 FT IN LENGTH.
- MEDIUM TO LIGHT-DUTY APPLIANCES (RATED 450°F) WILL NOT REQUIRE ANY ADDITIONAL DOWNSTREAM DETECTION.

AGENT DISTRIBUTION PIPING LIMITATIONS	
PIPE SECTION	MAX PIPE LENGTH (FT)
MAX SUPPLY LINE TO FIRST OVERLAPPING NOZZLE	42
OVERLAPPING NOZZLE APPLIANCE BRANCH	10
DEDICATED NOZZLE APPLIANCE BRANCH	10

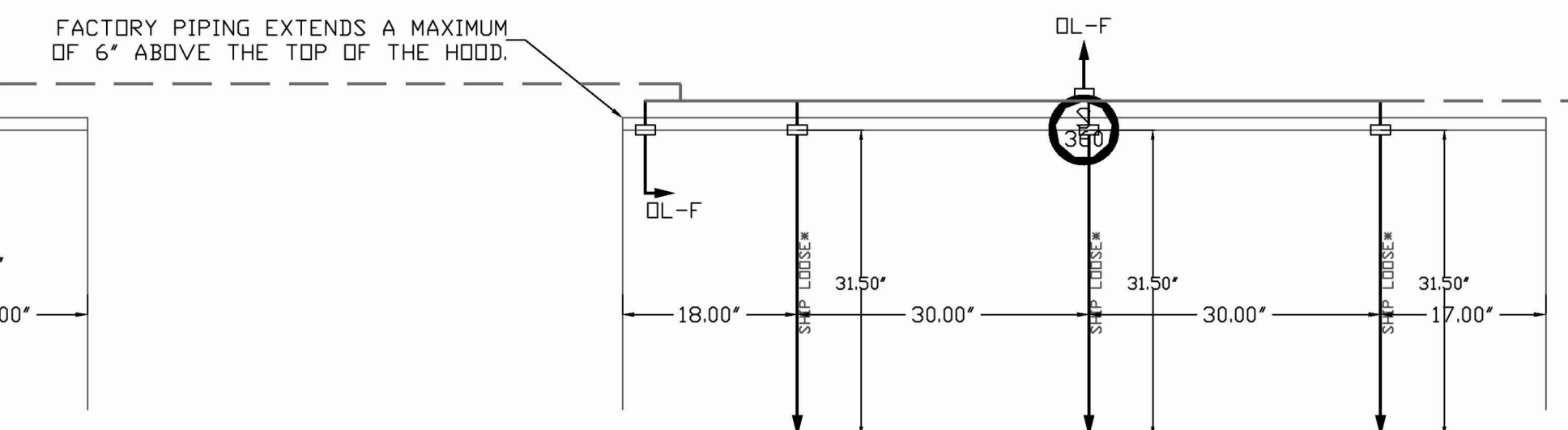
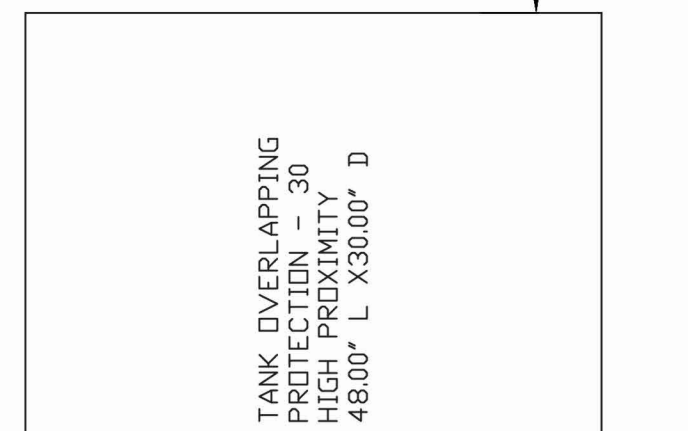
LEGEND - FIRE CABINET TANK SYSTEM

- 4 GALLON TANK.
- PRIMARY ACTUATOR RELEASE.
- SECONDARY ACTUATOR RELEASE.
- PRESSURE SUPERVISION SWITCH.
- PRIMARY HOSE ASSEMBLY.
- SECONDARY HOSE ASSEMBLY.
- REMOTE MANUAL ACTUATION DEVICE.

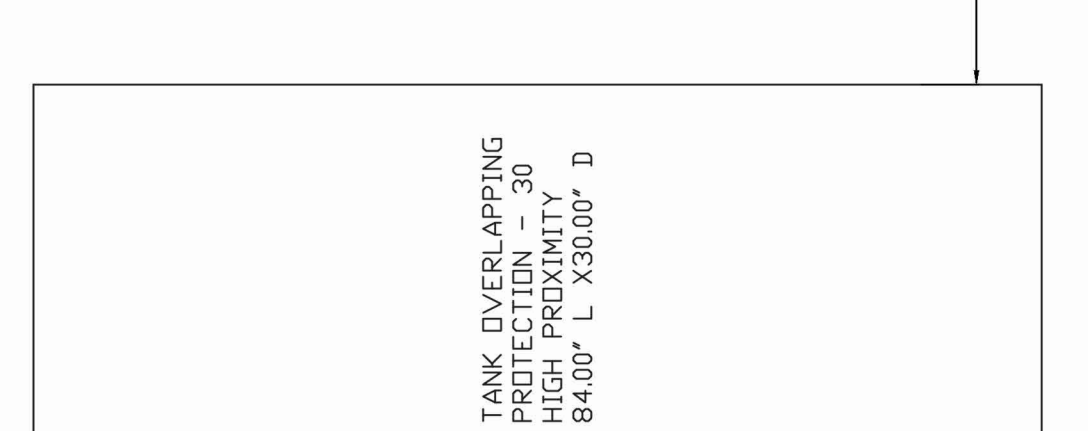
- SYSTEM REQUIRES A MINIMUM OF 7 FT OF EQUIVALENT PIPE LENGTH BETWEEN TANK AND NEAREST APPLIANCE NOZZLE FOR MOST APPLIANCES. EACH 90 DEGREE ELBOW ADDS 1.3 FT OF EQUIVALENT LENGTH. SEE MANUAL FOR DETAILS.



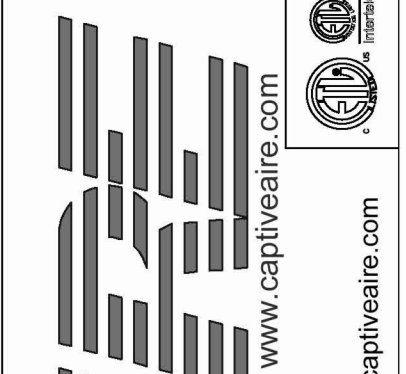
NOZZLE HEIGHT
35-50" FROM
COOKING SURFACE.
(47.25")



NOZZLE HEIGHT
35-50" FROM
COOKING SURFACE.
(47.25")



REVISIONS	
NO.	DESCRIPTION



225 E. City Line Avenue, Suite #103, Belle Cymryd, PA, 19004 PHONE: (267) 804-4128 EMAIL: reg108@captiveaire.com

Shake Shack - CT - 1730 - Stonebridge (Kitchen)
Cheshire, CT, 06408

DATE: 4/7/2025

DWG.#: 7454358

DRAWN BY: EB

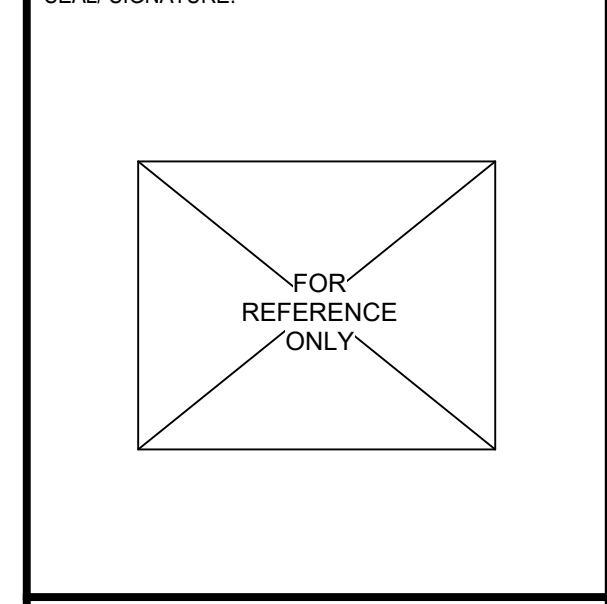
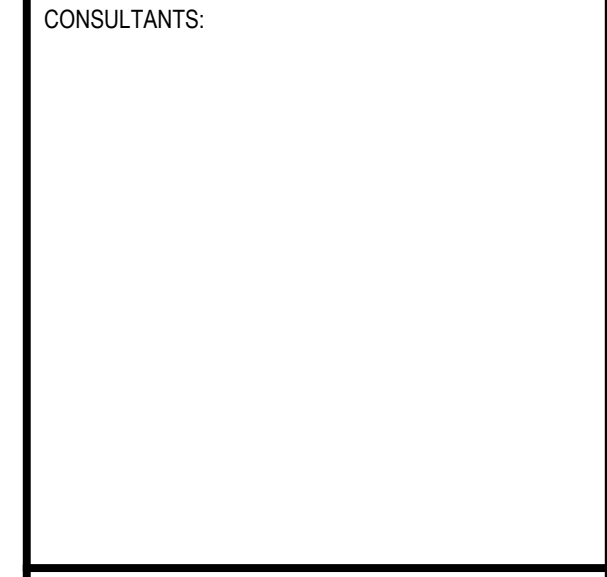
SCALE: 3/4" = 1'-0"

MASTER DRAWING

SHEET NO. 3

Bergmeyer
CONSULTANTS

SEAL SIGNATURE



NO.	BY	DATE	DESCRIPTION
1	HEI	2025-07-21	IFC SET
	HEI	2025-06-06	BID/PERMIT SET

SHAKE SHACK

SHAKE SHACK SHOPS AT STONEBRIDGE

2053 HIGHLAND AVE, UNIT E 120
CHESHIRE, CT 06410
SHACK #1730

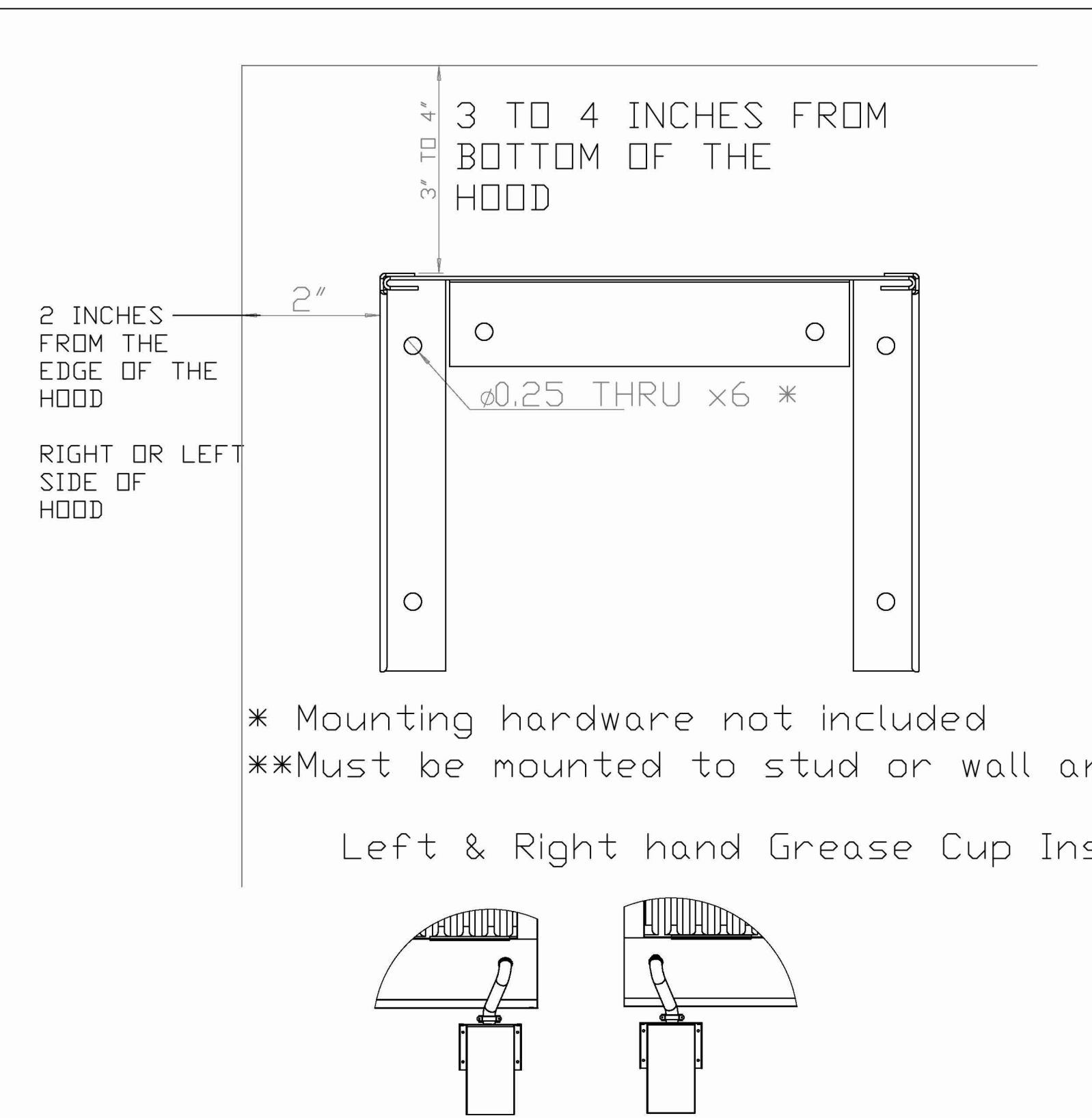
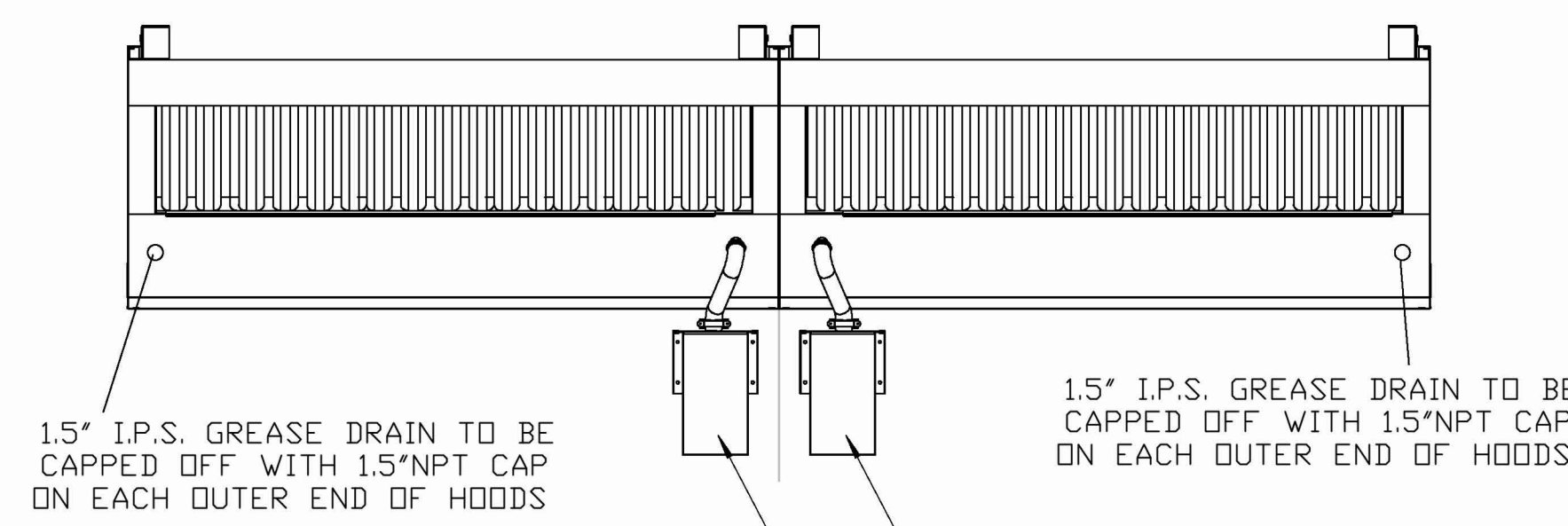
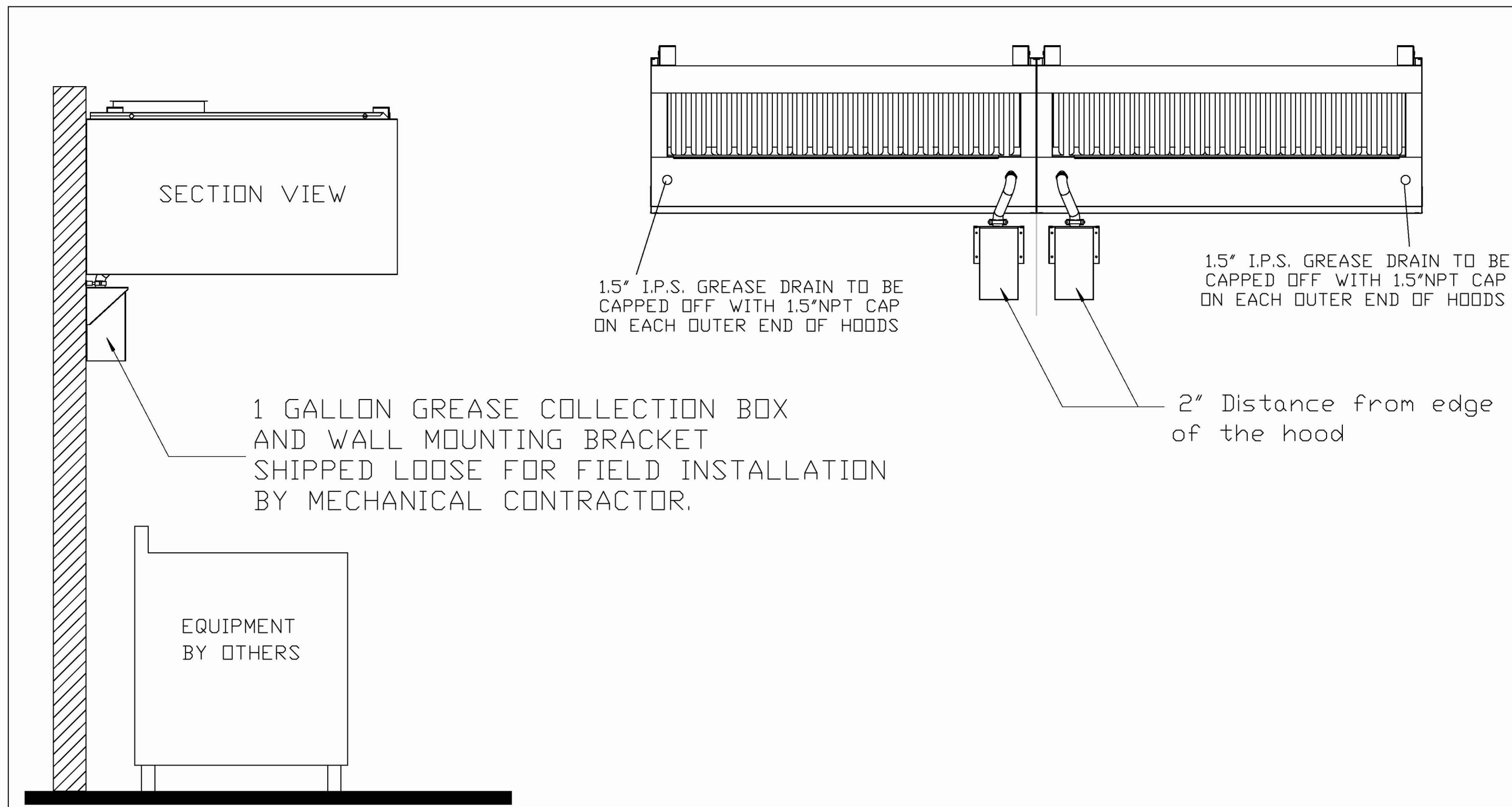
IFC SET

CAPTIVEAIRE DRAWINGS

DRAWN BY: Author
CHECKED BY: Checker
JOB NO: 2025040

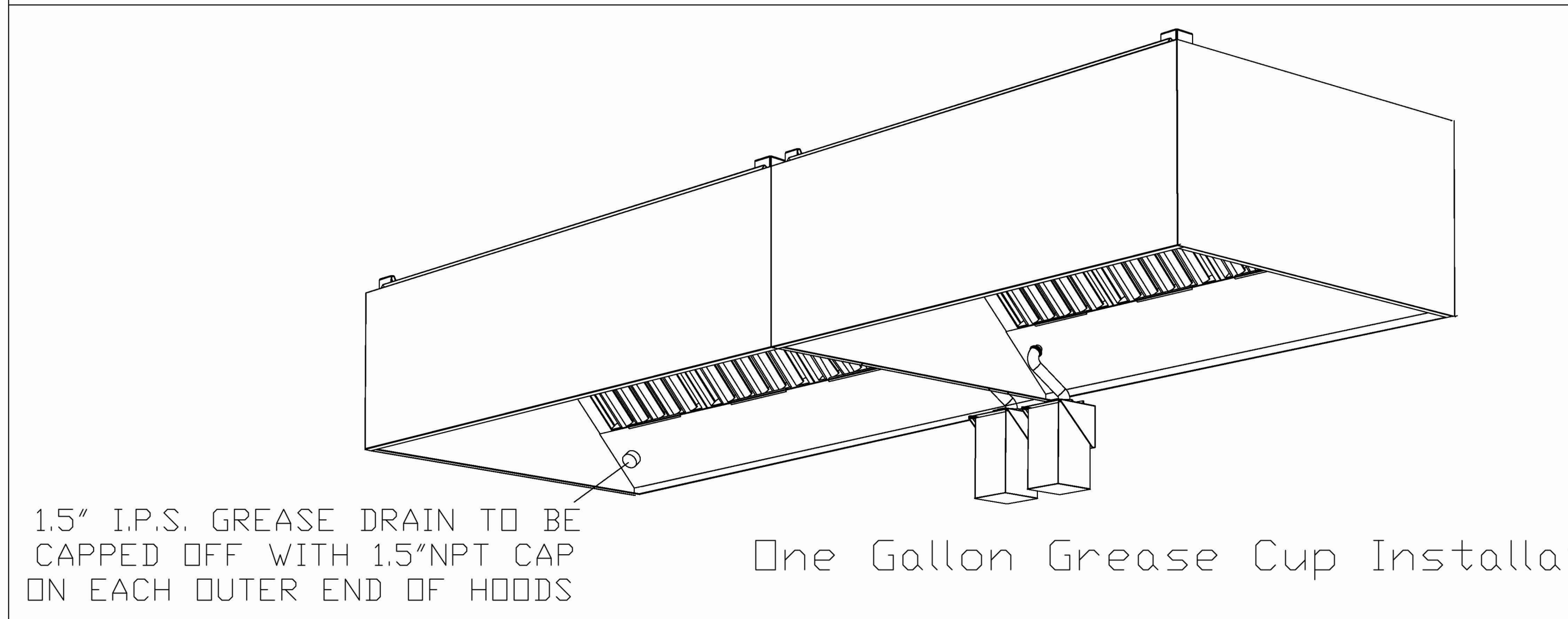
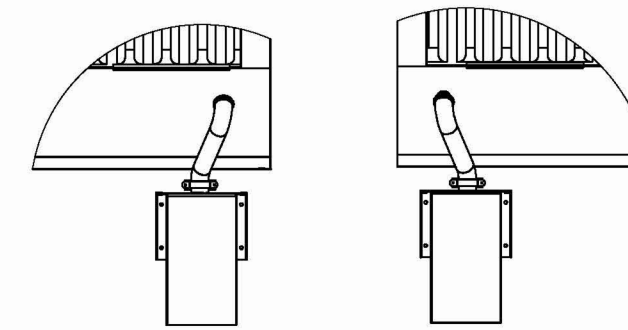
M703

THE DOCUMENTATION CONTAINED ON THIS SHEET WAS NOT PREPARED BY HENDERSON ENGINEERS AND IS INCLUDED IN THIS SET FOR REFERENCE ONLY. HENDERSON ENGINEERS REVIEWED THE DOCUMENTATION ON THIS SHEET FOR GENERAL COMPLIANCE WITH DESIGN INTENT. SUPPLIER IS RESPONSIBLE THAT ALL FURNISHED EQUIPMENT ON THIS SHEET COMPLIES WITH APPLICABLE LOCAL, STATE, AND FEDERAL LAWS, CODES, AND REGULATIONS.



* Mounting hardware not included
 **Must be mounted to stud or wall anchor

Left & Right hand Grease Cup Install

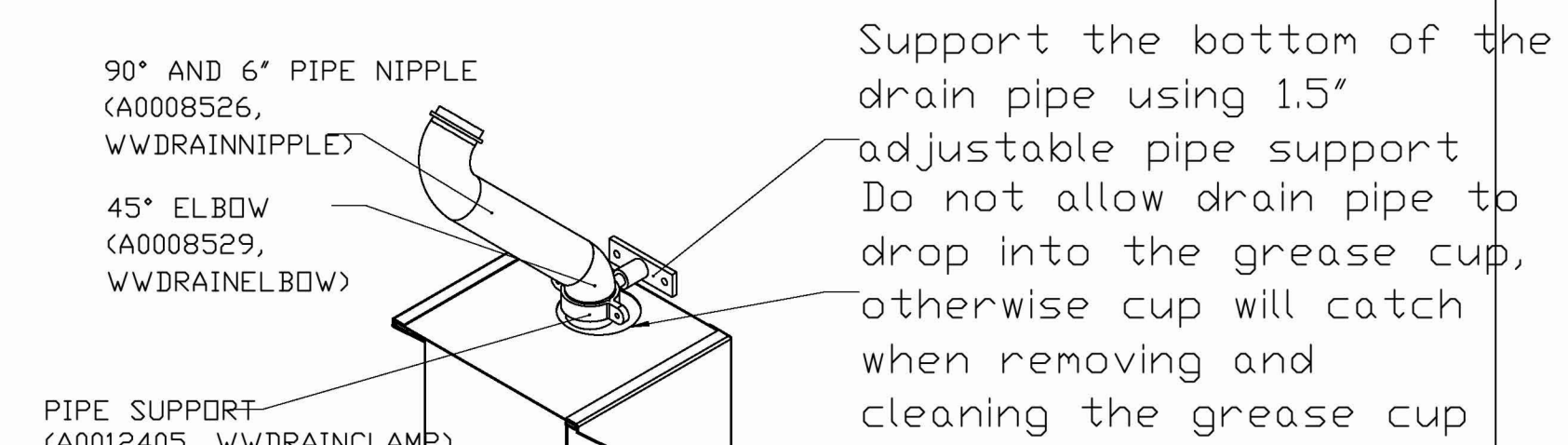


One Gallon Grease Cup Installation

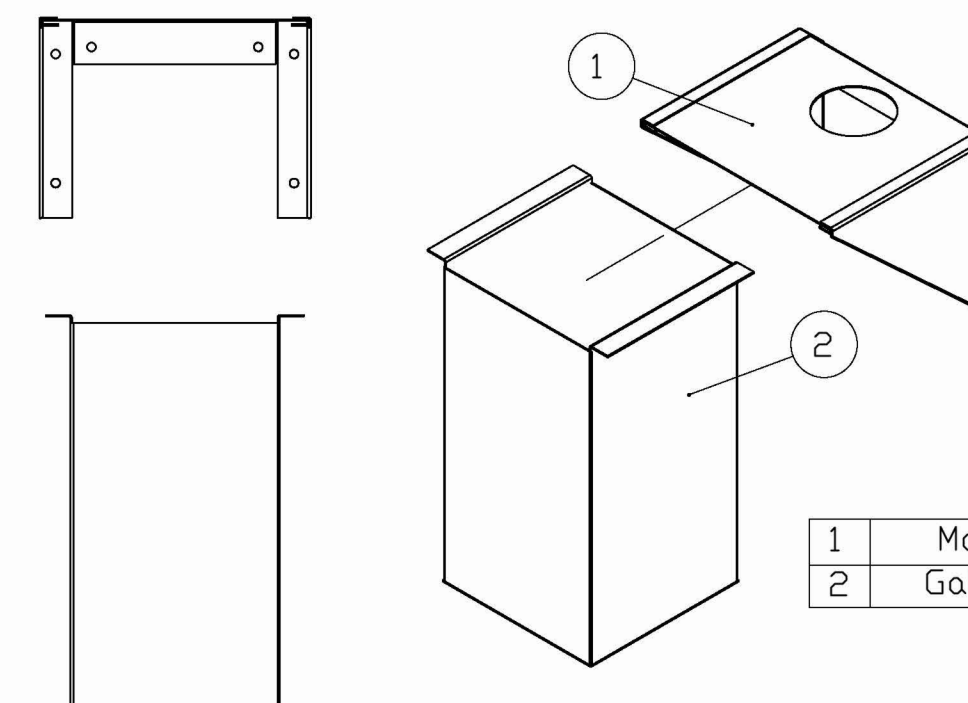
Instructions below outline single, or dual, one gallon grease cup installation for ND-2 hood models.

The one gallon grease cup comes as an assembly of stainless steel wall mounting bracket and one gallon cup. The mounting bracket should be installed 2" from the edge of the containment plenum and 3"-4" below the bottom of the hood.

Piping from the hood grease drain should route to the opening of the grease cup, but not into the cup, otherwise the cup will not be able to be removed and emptied.



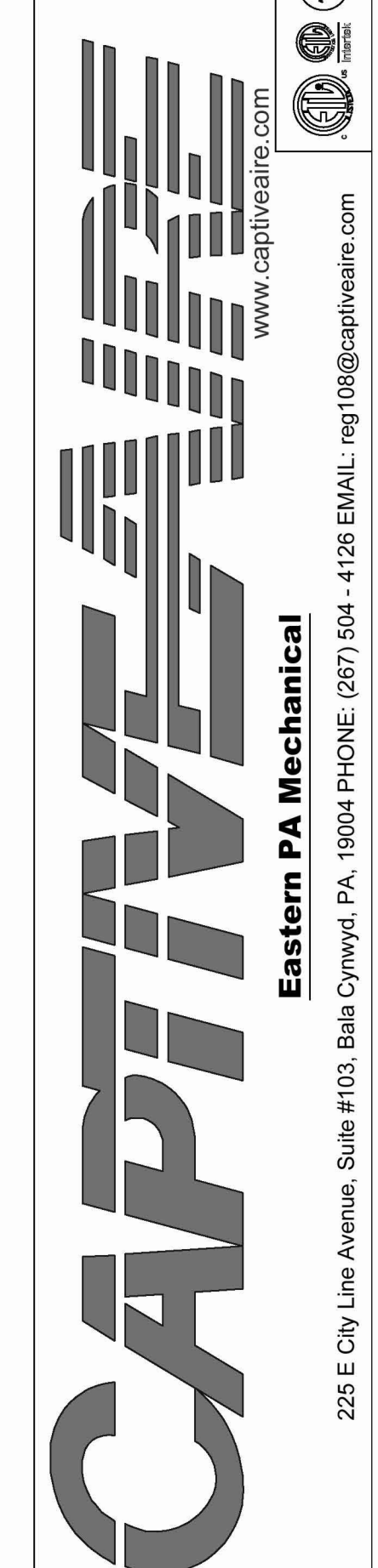
Gallon Grease Cup Assembly



- 1 Mounting Bracket
- 2 Gallon Grease Cup

1 GALLON GREASE COLLECTION BOX AND WALL MOUNTING BRACKET SHIPPED LOOSE FOR FIELD INSTALLATION BY MECHANICAL CONTRACTOR.

REVISIONS	
DESCRIPTION	DATE



Shake Shack - CT - 1730 - Stonebridge (Kitchen)
 Cheshire, CT, 06408

DATE:	4/7/2025
DWG.#:	7454358
DRAWN BY:	EB
SCALE:	3/4" = 1'-0"
MASTER DRAWING	
SHEET NO.	4

THE DOCUMENTATION CONTAINED ON THIS SHEET WAS NOT PREPARED BY HENDERSON ENGINEERS AND IS INCLUDED IN THIS SET FOR REFERENCE ONLY. HENDERSON ENGINEERS REVIEWED THE DOCUMENTATION ON THIS SHEET FOR GENERAL COMPLIANCE WITH DESIGN INTENT. SUPPLIER IS RESPONSIBLE THAT ALL FURNISHED EQUIPMENT ON THIS SHEET COMPLIES WITH APPLICABLE LOCAL, STATE, AND FEDERAL LAWS, CODES, AND REGULATIONS.

Bergmeyer
 Bergmeyer Inc.
 875 N High St.
 Columbus, OH 43215
 617.542.1025
 380.900.8887
 www.bergmeyer.com

CONSULTANTS:

SEAL SIGNATURE:

FOR REFERENCE ONLY

1	HEI	2025-07-21	IFC SET
	HEI	2025-06-06	BID/PERMIT SET
NO.	BY	DATE	DESCRIPTION

SHAKE SHACK

SHAKE SHACK SHOPS AT STONEBRIDGE

2053 HIGHLAND AVE, UNIT E 120
 CHESHIRE, CT 06410
 SHACK #1730

IFC SET

CAPTIVEAIRE DRAWINGS

DRAWN BY:	Author
CHECKED BY:	Checker
JOB NO:	20250040

M704

EXHAUST FAN INFORMATION - JOB#7454358

FAN UNIT NO	TAG	QTY	FAN UNIT MODEL #	MANUFACTURER	CFM	ESP	RPM	MOTOR ENCL.	HP	BHP	PHASE	VOLT	FLA	DISCHARGE VELOCITY	WEIGHT (LBS)	SDNS
1	KEF (FRYER)	1	DU50HFA	CAPTIVEAIRE	875	1.000	1471	TEAD-ECM	0.500	0.3260	1	208	3.8	333 FPM	79	15
2	KEF (GRILL)	1	DUB5HFA	CAPTIVEAIRE	1188	1.000	1194	TEAD-ECM	0.750	0.3050	1	208	5.2	376 FPM	90	8.8

FAN OPTIONS

FAN UNIT NO	TAG	QTY	DESCRIPTION
1	KEF (FRYER)	1	GREASE BOX
		1	FAN BASE CERAMIC SEAL - DU/DR50HFA - INSTALLED AT PLANT - FOR GREASE DUCTS
		1	ECM WIRING PACKAGE - EXHAUST - MODBUS CONTROL -MSC- (TELCD), CCW ROTATION
		1	2 YEAR PARTS WARRANTY
2	KEF (GRILL)	1	GREASE BOX
		1	FAN BASE CERAMIC SEAL - DU/DR85HFA - INSTALLED AT PLANT - FOR GREASE DUCTS
		1	ECM WIRING PACKAGE - EXHAUST - MODBUS CONTROL -MSC- (TELCD), CCW ROTATION
		1	2 YEAR PARTS WARRANTY

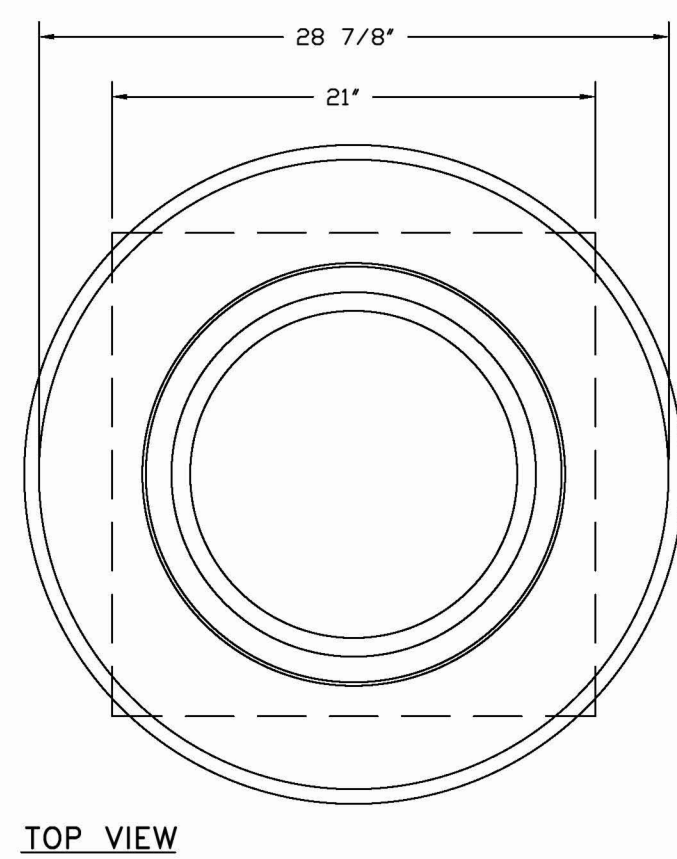
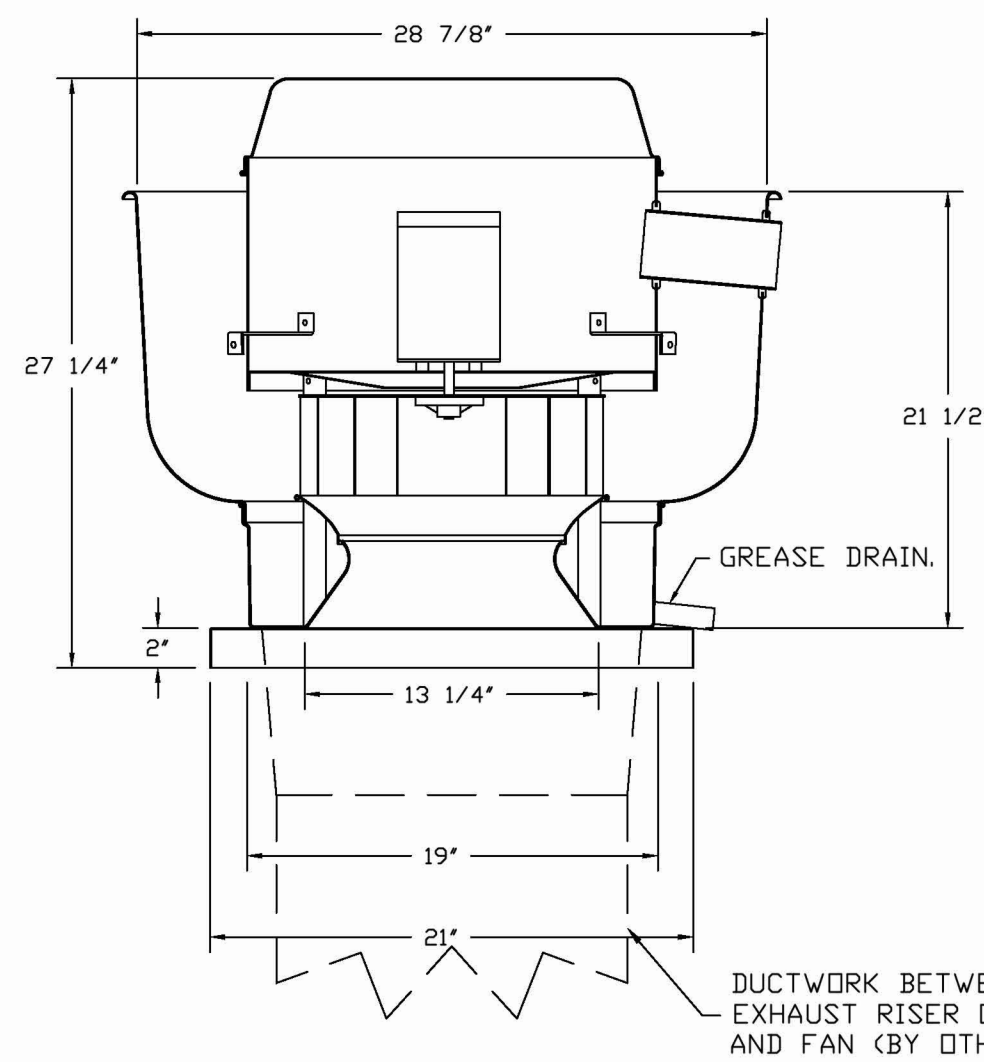
FAN ACCESSORIES

FAN UNIT NO	TAG	EXHAUST	SUPPLY					
		GREASE CUP	GRAVITY DAMPER	WALL MOUNT	SIDE DISCHARGE	GRAVITY DAMPER	MOTORIZED DAMPER	WALL MOUNT
1	KEF (FRYER)	YES						
2	KEF (GRILL)	YES						

CURB ASSEMBLIES

NO	DN FAN	TAG	WEIGHT	ITEM	SIZE
1	# 1	KEF (FRYER)	34 LBS	CURB	19.500"W X 19.500"L X 24.000"H VENTED HINGED.
2	# 2	KEF (GRILL)	41 LBS	CURB	23.000"W X 23.000"L X 24.000"H VENTED HINGED.

FAN #1 DU50HFA - EXHAUST FAN (KEF (FRYER))



TOP VIEW

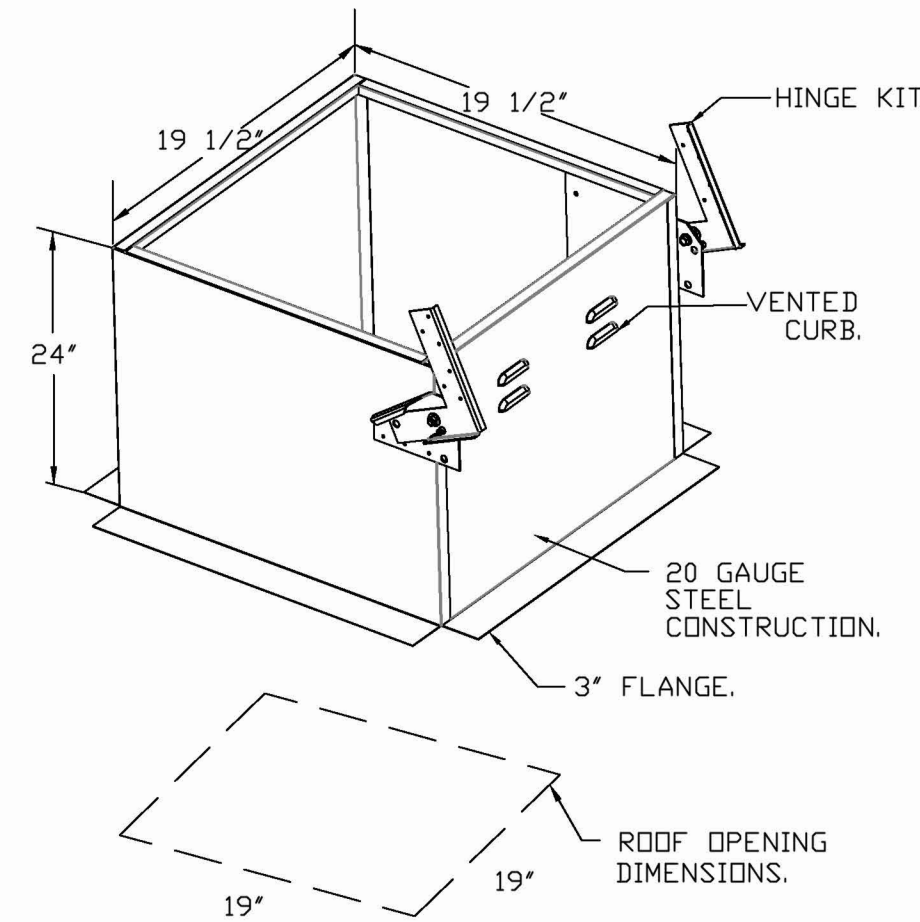
FEATURES:

- DIRECT DRIVE CONSTRUCTION (NO BELTS/PULLEYS).
- ROOF MOUNTED FANS.
- RESTAURANT MODEL.
- UL705 AND UL762 AND ILC-S645
- VARIABLE SPEED CONTROL.
- INTERNAL WIRING.
- THERMAL OVERLOAD PROTECTION (SINGLE PHASE).
- HIGH HEAT OPERATION 300°F (149°C).
- GREASE CLASSIFICATION TESTING.
- NEMA 3R SAFETY DISCONNECT SWITCH.

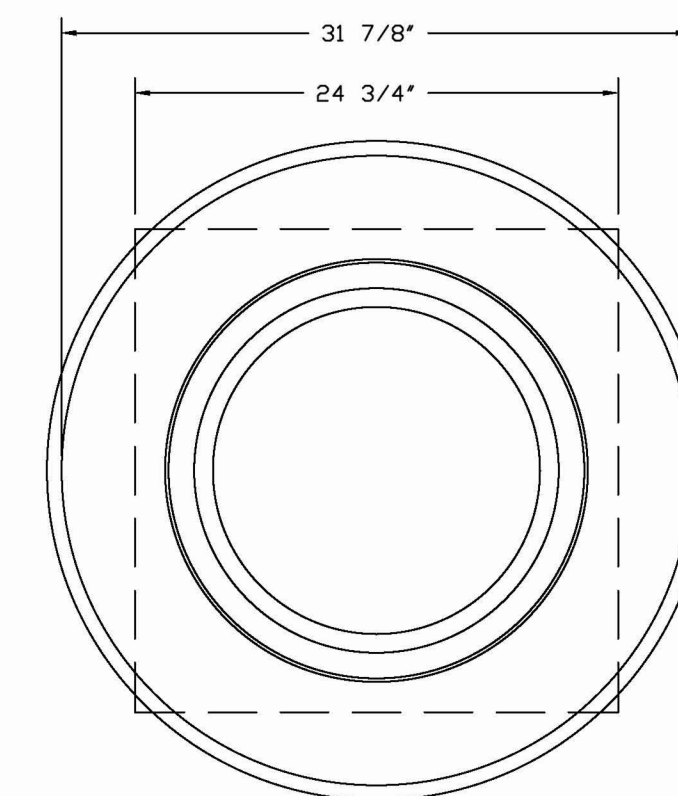
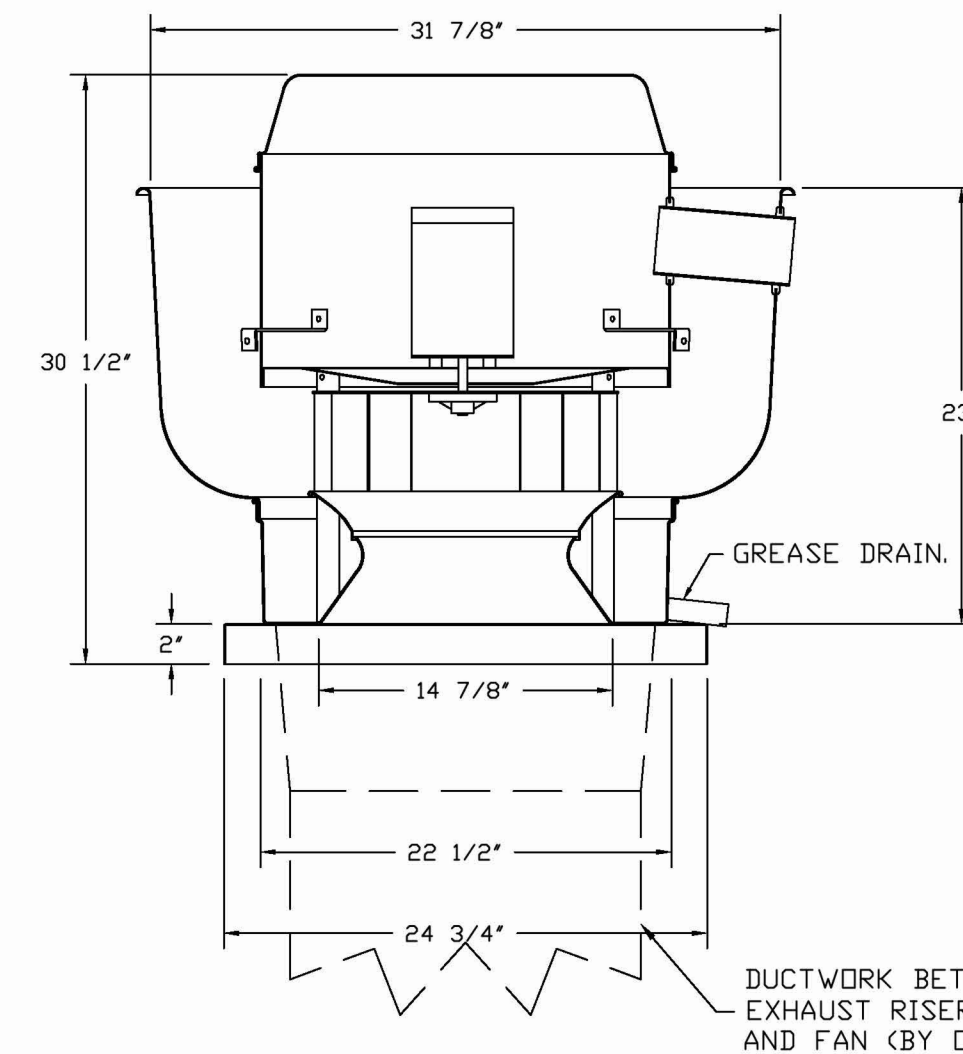
NORMAL TEMPERATURE TEST
EXHAUST FAN MUST OPERATE CONTINUOUSLY WHILE EXHAUSTING AIR AT 300°F (149°C) UNTIL ALL FAN PARTS HAVE REACHED THERMAL EQUILIBRIUM, AND WITHOUT ANY DETERIORATING EFFECTS TO THE FAN WHICH WOULD CAUSE UNSAFE OPERATION.

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

- DETAILS**
- GREASE BOX.
 - FAN BASE CERAMIC SEAL - DU/DR50HFA - INSTALLED AT PLANT - FOR GREASE DUCTS.
 - ECM WIRING PACKAGE - EXHAUST - MODBUS CONTROL -MSC- (TELCD), CCW ROTATION.
 - 2 YEAR PARTS WARRANTY.



FAN #2 DUB5HFA - EXHAUST FAN (KEF (GRILL))



TOP VIEW

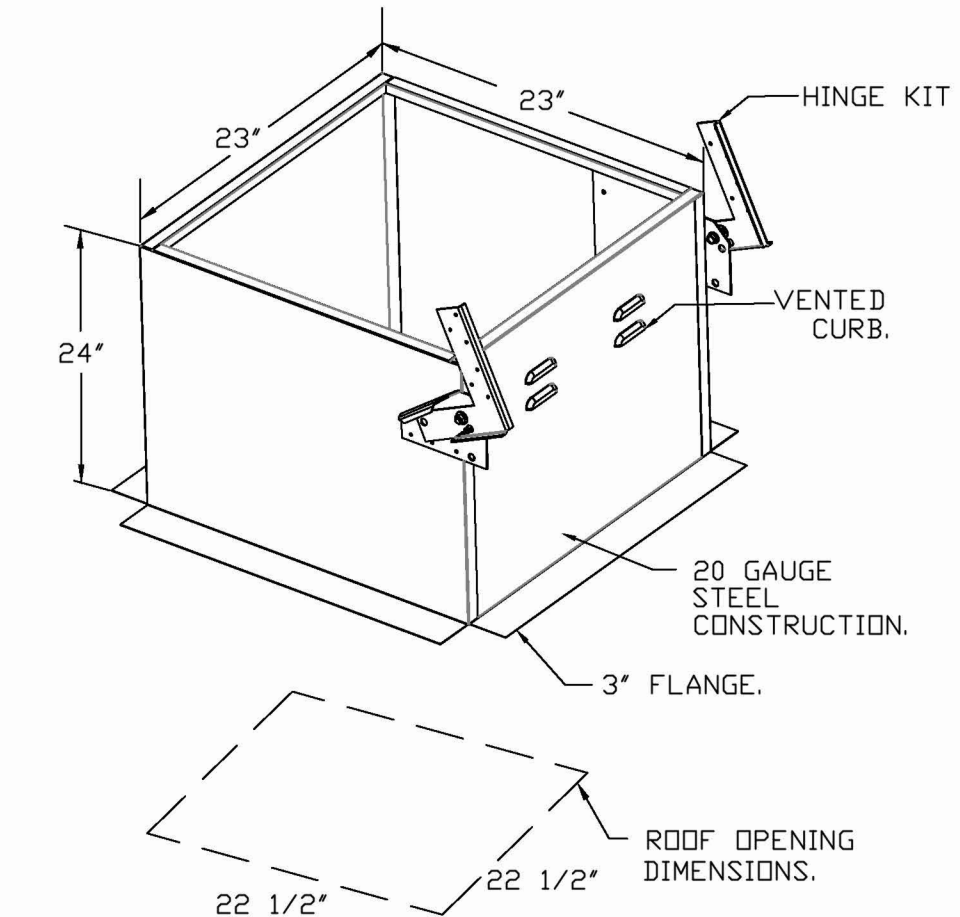
FEATURES:

- DIRECT DRIVE CONSTRUCTION (NO BELTS/PULLEYS).
- ROOF MOUNTED FANS.
- RESTAURANT MODEL.
- UL705 AND UL762 AND ILC-S645
- VARIABLE SPEED CONTROL.
- INTERNAL WIRING.
- THERMAL OVERLOAD PROTECTION (SINGLE PHASE).
- HIGH HEAT OPERATION 300°F (149°C).
- GREASE CLASSIFICATION TESTING.
- NEMA 3R SAFETY DISCONNECT SWITCH.

NORMAL TEMPERATURE TEST
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- DETAILS**
- GREASE BOX.
 - FAN BASE CERAMIC SEAL - DU/DR85HFA - INSTALLED AT PLANT - FOR GREASE DUCTS.
 - ECM WIRING PACKAGE - EXHAUST - MODBUS CONTROL -MSC- (TELCD), CCW ROTATION.
 - 2 YEAR PARTS WARRANTY.



REVISIONS	
NO.	DESCRIPTION

CAPTIVEAIRE
www.captiveaire.com

Eastern PA Mechanical
225 E. City Line Avenue, Suite #103, Bala Cynwyd, PA, 19004 PHONE: (267) 804-4128 EMAIL: reg108@captiveaire.com

Shake Shack - CT - 1730 - Stonebridge (Kitchen)
Cheshire, CT, 06408

DATE: 4/7/2025
DWG.#: 7454358
DRAWN BY: EB
SCALE: 3/4" = 1'-0"
MASTER DRAWING

SHEET NO. 5

ROOF EQUIPMENT CURBS TO BE PROVIDED BY LANDLORD. INSTALLATION OF CURBS TO BE COORDINATED BETWEEN LANDLORD, SHAKE SHACK, AND GENERAL CONTRACTOR.

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Bergmeyer

CONSULTANTS:

SEAL SIGNATURE:

FOR REFERENCE ONLY

1 HEI 2025-07-21 IFC SET
HEI 2025-06-06 BID/PERMIT SET

SHAKE SHACK

SHAKE SHACK SHOPS AT STONEBRIDGE

2053 HIGHLAND AVE, UNIT E 120
CHESHIRE, CT 06410
SHACK #1730

IFC SET

CAPTIVEAIRE DRAWINGS

DRAWN BY: Author
CHECKED BY: Checker
JOB NO: 2025040

M705

www.bergmeyer.com
380 E 20th Street
Los Angeles, CA 90012
213.337.1090

380 N High St.
Boston, MA 02210
617.542.1025
380.900.8887

DOAS/RTU FAN SCHEDULE - JOB#7454470

FAN UNIT NO	TAG	QTY	DOAS/RTU MODEL #	FAN INFORMATION				ELECTRICAL INFORMATION				COOLING INFORMATION				REHEAT INFORMATION				GAS HEAT INFORMATION				AEL MINIMUM ROOM VOLUME	NOTES																				
				MANUFACTURER	BLDWER	RETURN AIR CFM	MAX OUTSIDE AIR CFM	TOTAL CFM	WEIGHT (LBS)	ESP	HP	PHASE	VOLT	MCA	MDCP	OUTSIDE AIR DB	MIXED AIR DB	LEAVING AIR DB	DISCHARGE DB	CAPACITY	IEER	ISMR	DISCHARGE DB			W/B	DESIRED	MAX	MOISTURE REMOVAL RATE	GAS TYPE	INPUT BTUS	OUTPUT BTUS	TEMP RISE	REQUIRED INPUT GAS PRESSURE	ROOM AREA (FT ²)	AIRFLOW (CFM)	HEIGHT (FT)								
1	RTU-1	1	CAS-HVAC1-1150-18-10T	CAPTIVEAIRE	18MF-1-RTU	1000	800	1800	1511	0.800	2.00	3	208	55.1A	60A	86.1°F	76.4°F	79.9°F	68.9°F	47.6°F	47.3°F	47.1°F	114.2	MBH	63.0	MBH	14.8	5.9	70.0°F	56.9°F	45.4	MBH	71.9	MBH	45.3	LBS/HR	NATURAL	138343	112058	55°F	7 IN. W.C. - 14 IN. W.C.	345.1	621	7.2	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19
2	RTU-2	1	CAS-HVAC3-1300-24-20T	CAPTIVEAIRE	24MF-3-RTU	3400	1800	5200	2770	0.800	7.50	3	208	99A	110A	86.1°F	76.4°F	78.9°F	67.6°F	51.2°F	51.1°F	51.1°F	256.0	MBH	156.7	MBH	18.2	6.0	70.0°F	58.7°F	109.4	MBH	129.6	MBH	89.0	LBS/HR	NATURAL	260494	211000	36°F	7 IN. W.C. - 14 IN. W.C.	572.7	1031	7.2	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,18,19,20

NOTES:

- INVERTER SCROLL COMPRESSOR WITH INTEGRATED OIL SENSOR. DIGITAL OR STAGED SCROLL NOT AN APPROVED EQUAL.
- DIRECT DRIVE PLENUM BLOWER. BELT DRIVEN BLOWERS ARE NOT ACCEPTABLE.
- INTEGRATED MONITORING VIA CELLULAR CONNECTION BY MANUFACTURER.
- REFRIGERATION PRESSURE MONITORING ON HIGH AND LOW PRESSURE SIDE OF SYSTEM INCLUDED THROUGH DIGITAL INTERFACE.
- EC MOTOR CONDENSING FANS.
- ELECTRONIC EXPANSION VALVE. TXV NOT ACCEPTABLE.
- SUCTION LINE ACCUMULATOR.
- FACTORY COMMISSIONING WITH 5 YEAR PARTS WARRANTY, 25 YEAR WARRANTY ON STAINLESS STEEL HEAT EXCHANGER.
- AVERAGING INTAKE, EVAP AND DISCHARGE TEMPERATURE SENSORS (DISCHARGE SENSOR TO BE FACTORY MOUNTED WITHIN UNIT).
- 80% EFFICIENT FURNACE, WITH MODULATING INDUCER TO MAINTAIN CONSTANT COMBUSTION EFFICIENCY ACROSS FIRING RANGE. 6:1 TURNDOWN WITH NG AND 5:1 TURNDOWN WITH LP.
- SUPPLY CFM MONITORING INTEGRAL TO UNIT WITH CFM MEASUREMENT INCLUDED THROUGH DIGITAL INTERFACE.
- FULLY MODULATING HOT GAS REHEAT.
- 15 DEGREE LOW AMBIENT OPERATION.
- HALL GUARD FOR CONDENSING COIL.
- RTU ECONOMIZER WITH DIFFERENTIAL ENTHALPY CONTROL.
- BAROMETRIC RELIEF DAMPER.
- 1" EXTERIOR DUAL-WALL CONSTRUCTION W/ R-4.3 INSULATION-MINIMUM 24GA EXTERIOR W/ 18GA BARE.
- DOWN DISCHARGE/DOWN RETURN.
- MINIMUM ROOM AREA ASSUMED 7.2' SUPPLY DIFFUSER HEIGHT AND IS CALCULATED PER UL60325-2-40 4TH ED. VALUES BASED ON FACTORY CHARGE. ACTUAL SITE CHARGE MAY DIFFER.
- 2" EXTERIOR DUAL-WALL CONSTRUCTION W/ R-13 INSULATION-MINIMUM 20GA EXTERIOR W/ 14GA BARE.

FOR QUESTIONS, CALL THE
Eastern PA Mechanical
REGION 108
PHONE: (267) 504 - 4126
EMAIL: reg108@captiveaire.com

FAN OPTIONS

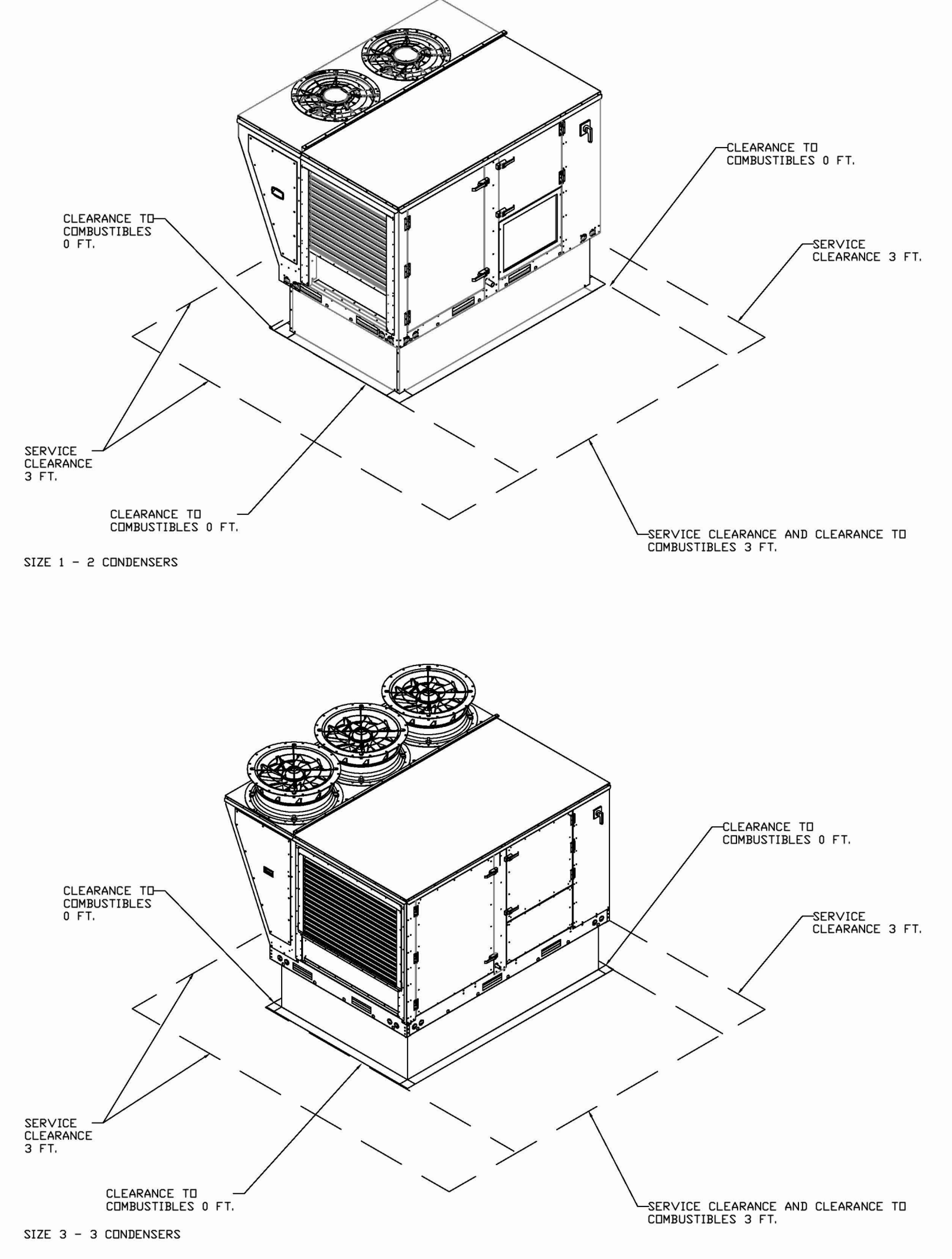
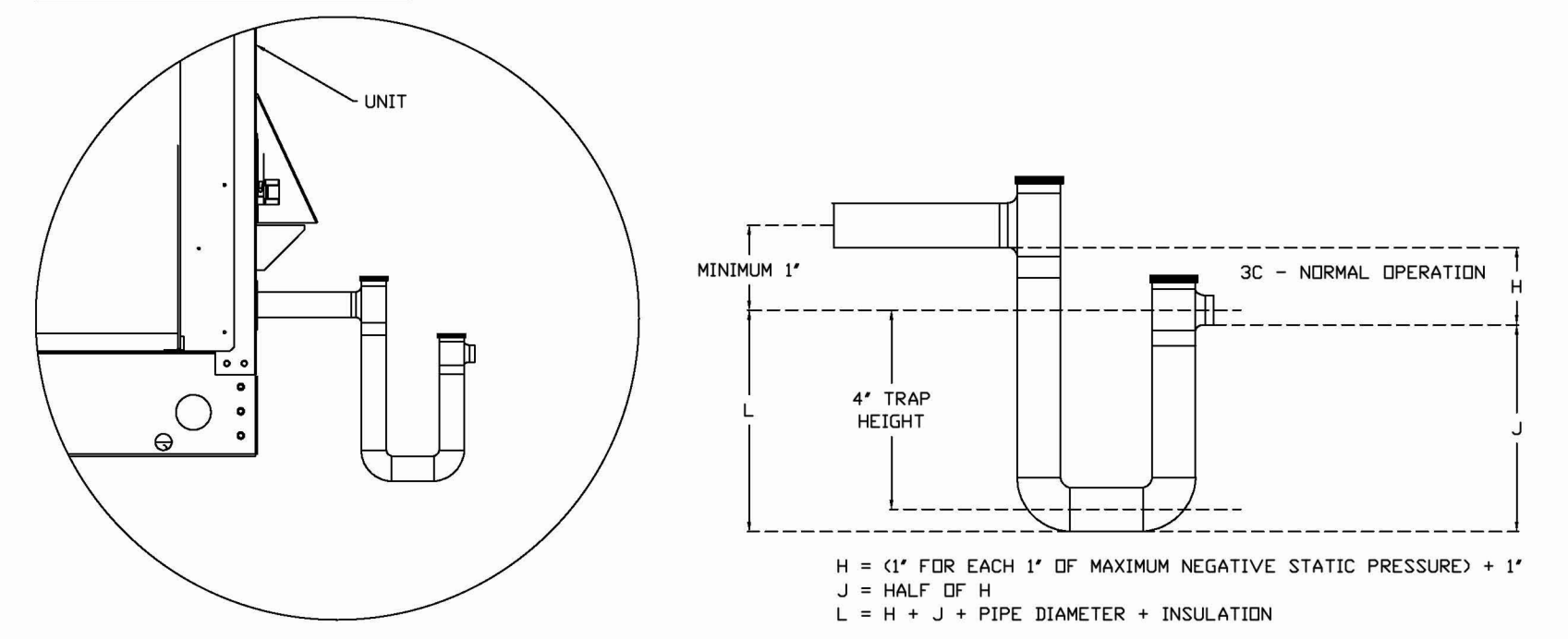
FAN UNIT NO	TAG	QTY	DESCRIPTION
1	RTU-1	1	INLET PRESSURE GAUGE, 0-35"
		1	MANIFOLD PRESSURE GAUGE, 0 TO 10" WC, 1 FURNACE
		1	COOLING OVERRIDE
		1	SINGLE POINT ELECTRICAL CONNECTION FOR RTU. 750VA TRANSFORMER USED. IF A NON-DCV PREWIRE CONTROLS THIS UNIT, THE #8B, #47, "MA", OR "E2" PREWIRE OPTION MUST BE SELECTED. DOES NOT PROVIDE SUPPLY STARTER IN PREWIRE.
		1	RTU BLOWER DOOR SWITCH
		1	2" MERV 13 FILTERS FOR RTU1 (QTY. 4)
		1	2" MERV 8 FILTERS FOR RTU1 (QTY. 4)
		1	OVERHEAT STAT
		1	TOTAL CFM MONITORING
		1	VFD FACTORY MOUNTED AND WIRED IN RTU COMMERCIAL CONTROL VESTIBULE
		1	RTU3 DOWN DISCHARGE
		1	20 TON SIZE 1 MODULATING COOLING OPTION, R454B REFRIGERANT, VARIABLE SPEED COMPRESSOR, ECM CONDENSING FANS
		1	LOW AMBIENT COOLING OPERATION - DOWN TO 0°F AMBIENT
		1	R454B LEAK DETECTOR OPTION FOR RTU3
		1	OCCUPIED SCHEDULING
		1	INTAKE FIRESTAT SET TO 135°F
		2	RTU-2
1	CASLINK BUILDING MONITORING SYSTEM - INTERNET OR CELLULAR CONNECTION REQUIRED		
1	20 TON MODULATING REHEAT OPTION - SPACE DEWPOINT CONTROL - R454B		
1	RTU3 CURB DUCT HANGER		
1	24VAC FIRE INPUT		
1	COMMERCIAL SMOKE DETECTOR/ALARM INTERLOCK - ALARM SUPPLIED BY OTHERS		
1	CLOGGED FILTER SWITCH - NOTIFICATION ON HMI		
1	RTU3 CONVENIENCE OUTLET (GFCI), 15 AMP - REQUIRES SEPARATE 120V CONNECTION. INCLUDES RECEPTACLE, COVER AND J-BOX		
1	RTU ECONOMIZER - DIFFERENTIAL ENTHALPY CONTROL		
1	RTU ECONOMIZER BAROMETRIC RELIEF		
1	RTU INTAKE/RETURN DAMPER - MANUAL CONTROL VIA HMI		
1	RTU3 DOWN RETURN		
1	2" METAL MESH FILTERS FOR RTU3 OUTDOOR INTAKE		
1	RTU3 HALL GUARD		
1	VAV PACKAGE W/ MANUAL/DDC CONTROL (S71 VFD INCLUDED)		
1	5 YEAR ENTIRE UNIT PARTS WARRANTY, 10 YEAR ENTIRE UNIT PARTS WARRANTY WITH REMOTE MONITORING AND CAPTIVEAIRE SERVICE CONTRACT, 25 YEAR STAINLESS STEEL FURNACE PARTS WARRANTY (SEE ADDITIONAL DETAILS)		
2	RTU-2		
		1	INLET PRESSURE GAUGE, 0-35"
		1	MANIFOLD PRESSURE GAUGE, 0 TO 10" WC, 1 FURNACE
		1	COOLING OVERRIDE
		1	SINGLE POINT ELECTRICAL CONNECTION FOR RTU. 750VA TRANSFORMER USED. IF A NON-DCV PREWIRE CONTROLS THIS UNIT, THE #8B, #47, "MA", OR "E2" PREWIRE OPTION MUST BE SELECTED. DOES NOT PROVIDE SUPPLY STARTER IN PREWIRE.
		1	RTU BLOWER DOOR SWITCH
		1	RTU3 DOWN DISCHARGE
		1	2" MERV 13 FILTERS FOR RTU3 (QTY. 4)
		1	2" MERV 8 FILTERS FOR RTU3 (QTY. 4)
		1	OVERHEAT STAT
		1	TOTAL CFM MONITORING
		1	VFD FACTORY MOUNTED AND WIRED IN RTU COMMERCIAL CONTROL VESTIBULE
		1	20 TON MODULATING COOLING OPTION, R454B REFRIGERANT, VARIABLE SPEED COMPRESSOR, ECM CONDENSING FANS
		1	LOW AMBIENT COOLING OPERATION - DOWN TO 0°F AMBIENT
		1	R454B LEAK DETECTOR OPTION FOR RTU3
		1	OCCUPIED SCHEDULING
		1	INTAKE FIRESTAT SET TO 135°F
1	DISCHARGE FIRESTAT SET TO 240°F		
1	CASLINK BUILDING MONITORING SYSTEM - INTERNET OR CELLULAR CONNECTION REQUIRED		
1	20 TON MODULATING REHEAT OPTION - SPACE DEWPOINT CONTROL - R454B		
1	RTU3 CURB DUCT HANGER		
1	24VAC FIRE INPUT		
1	COMMERCIAL SMOKE DETECTOR/ALARM INTERLOCK - ALARM SUPPLIED BY OTHERS		
1	CLOGGED FILTER SWITCH - NOTIFICATION ON HMI		
1	RTU3 CONVENIENCE OUTLET (GFCI), 15 AMP - REQUIRES SEPARATE 120V CONNECTION. INCLUDES RECEPTACLE, COVER AND J-BOX		
1	RTU ECONOMIZER - DIFFERENTIAL ENTHALPY CONTROL		
1	RTU INTAKE/RETURN DAMPER - MANUAL CONTROL VIA HMI		
1	ZIEHL FAN EXHAUST FOR RTU3 - MANUAL CONTROL. 3000 CFM MAX AT 0"		
1	RTU3 DOWN RETURN		
1	2" METAL MESH FILTERS FOR RTU3 OUTDOOR INTAKE		
1	RTU3 ECONOMIZER BAROMETRIC RELIEF		
1	RTU3 HALL GUARD		
1	VAV PACKAGE W/ MANUAL/DDC CONTROL (S71 VFD INCLUDED)		
1	LOAD REACTOR MOUNTED IN FAN		
1	5 YEAR ENTIRE UNIT PARTS WARRANTY, 10 YEAR ENTIRE UNIT PARTS WARRANTY WITH REMOTE MONITORING AND CAPTIVEAIRE SERVICE CONTRACT, 25 YEAR STAINLESS STEEL FURNACE PARTS WARRANTY (SEE ADDITIONAL DETAILS)		
1	EXTERIOR GAS CONNECTION PROVIDED BY FACTORY WITH QUICK SEAL AND ANTI-ROTATION BRACKET		

CURB ASSEMBLIES

NO	DN FAN	TAG	WEIGHT	ITEM	SIZE
1	# 1	RTU-1	83 LBS	CURB	41.000"W X 71.000"L X 14.000"H INSULATED.
2	# 2	RTU-2	104 LBS	CURB	59.500"W X 91.000"L X 14.000"H INSULATED.

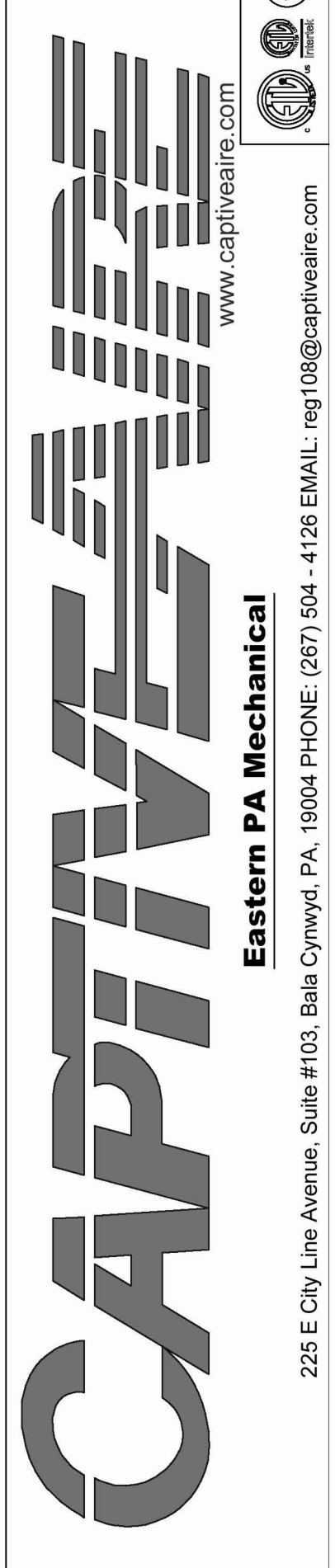
UNIT NUMBER	HMI #	HMI LOCATION	TEMP AVERAGING	MODBUS ADDRESS
FAN #1	HMI #1	- UNIT	IN UNIT	NOT AVERAGED 55
FAN #1	HMI #2	- SPACE	NOT AVERAGED	56
FAN #2	HMI #1	- UNIT	IN UNIT	NOT AVERAGED 55
FAN #2	HMI #2	- SPACE	NOT AVERAGED	56

RTU CONDENSATE DRAIN TRAP DETAIL



REVISIONS

NO.	DESCRIPTION	DATE
1	HEI	2025-07-21
2	HEI	2025-06-06



Snake Shack - CT - 1730 - Stonebridge (HVAC)
Cheshire, CT, 06408

DATE: 4/24/2025
DWG.#: 7454470
DRAWN BY: Joe.shilba
SCALE: 1/2" = 1'-0"
MASTER DRAWING
SHEET NO. 1

Bergmeyer
CONSULTANTS
360 E 20th Street
Columbus, OH 43210
213.337.1090
www.bergmeyer.com

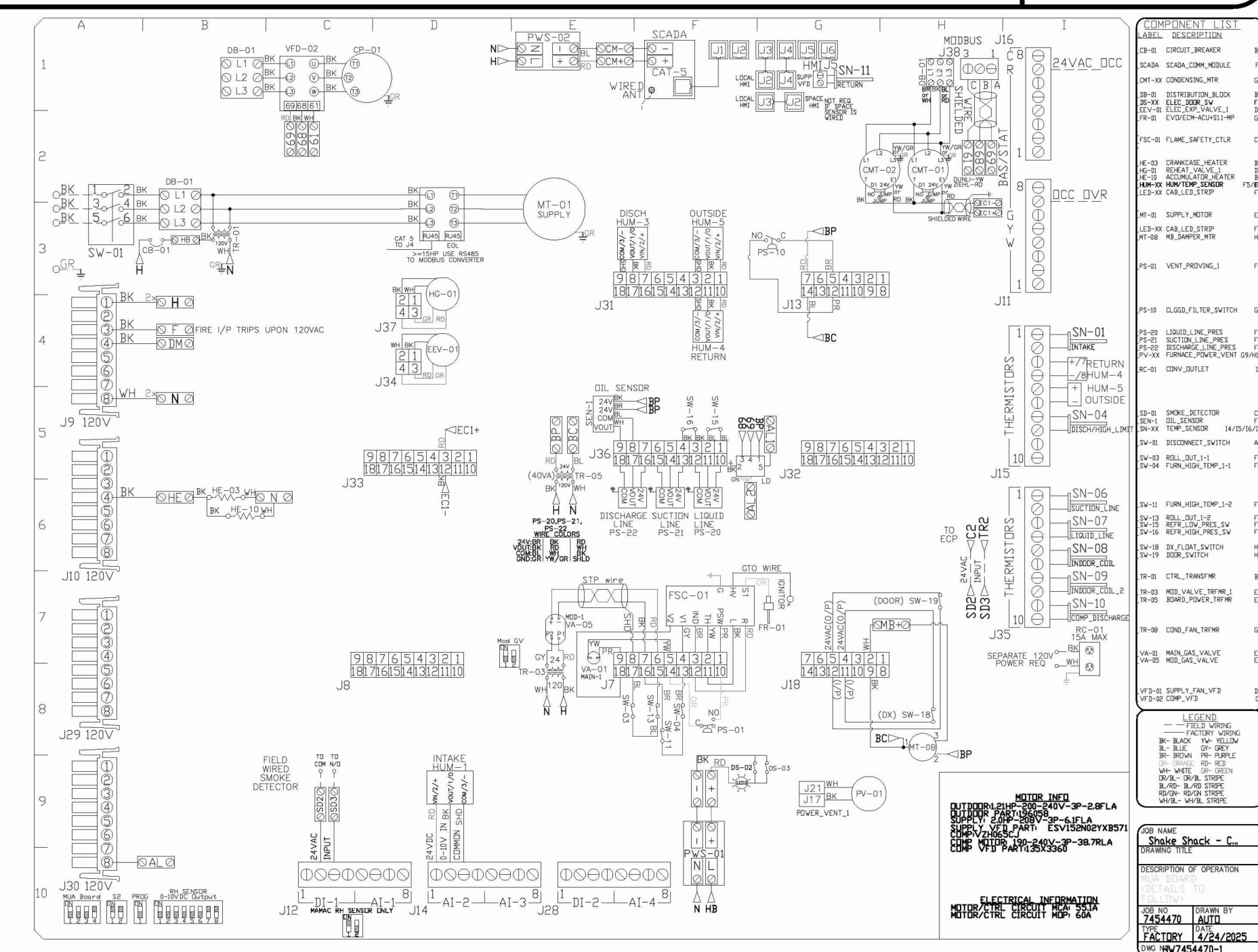
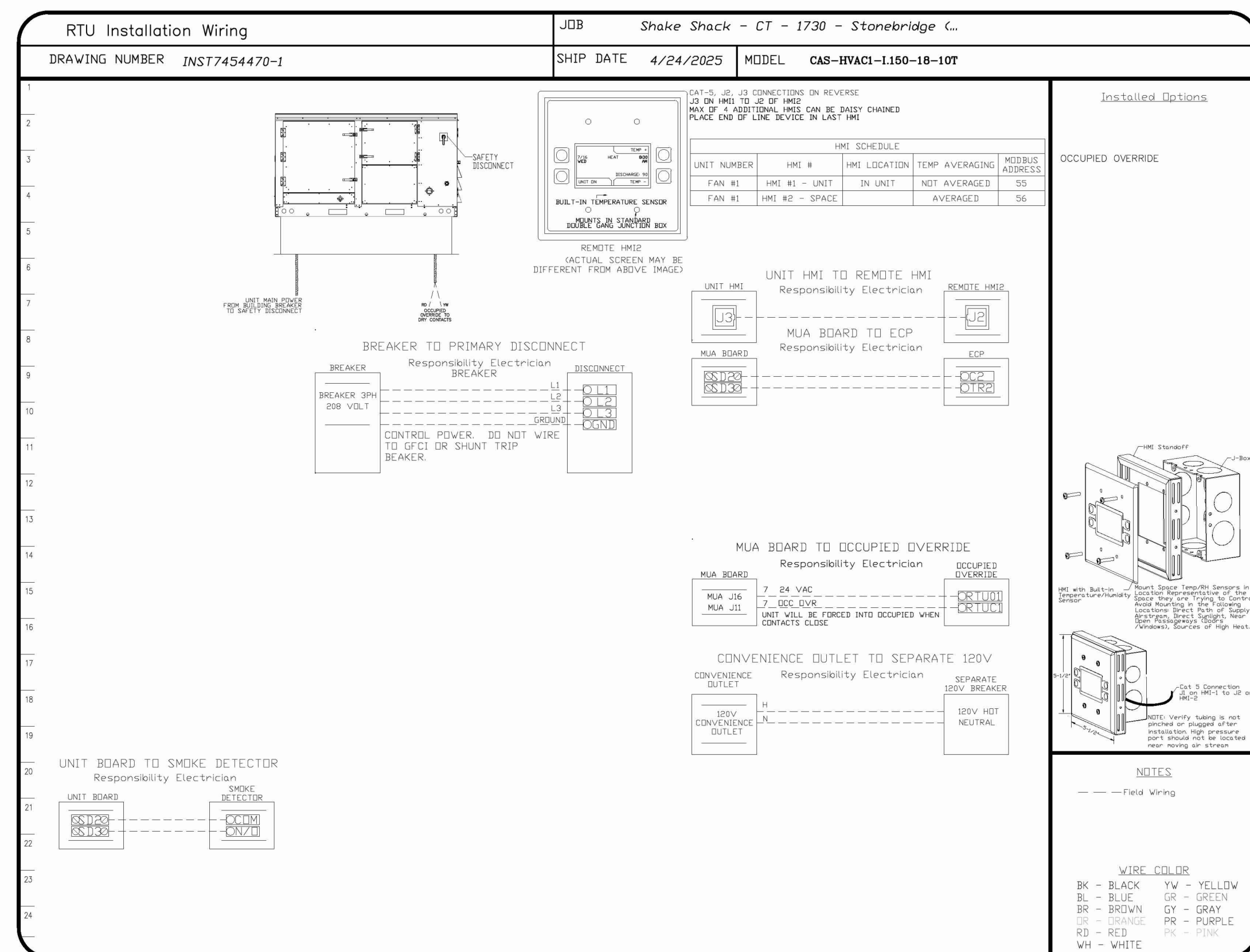
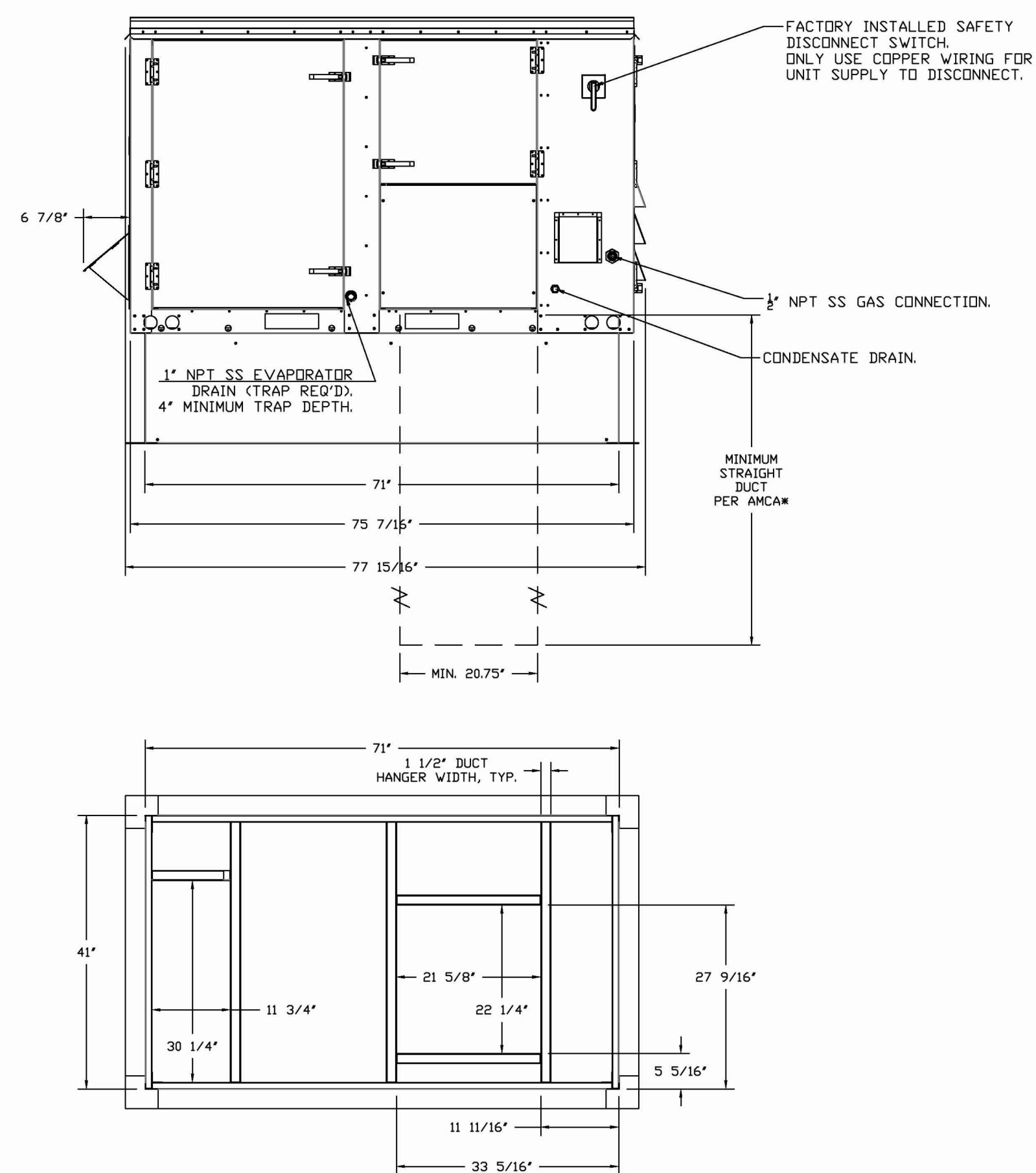
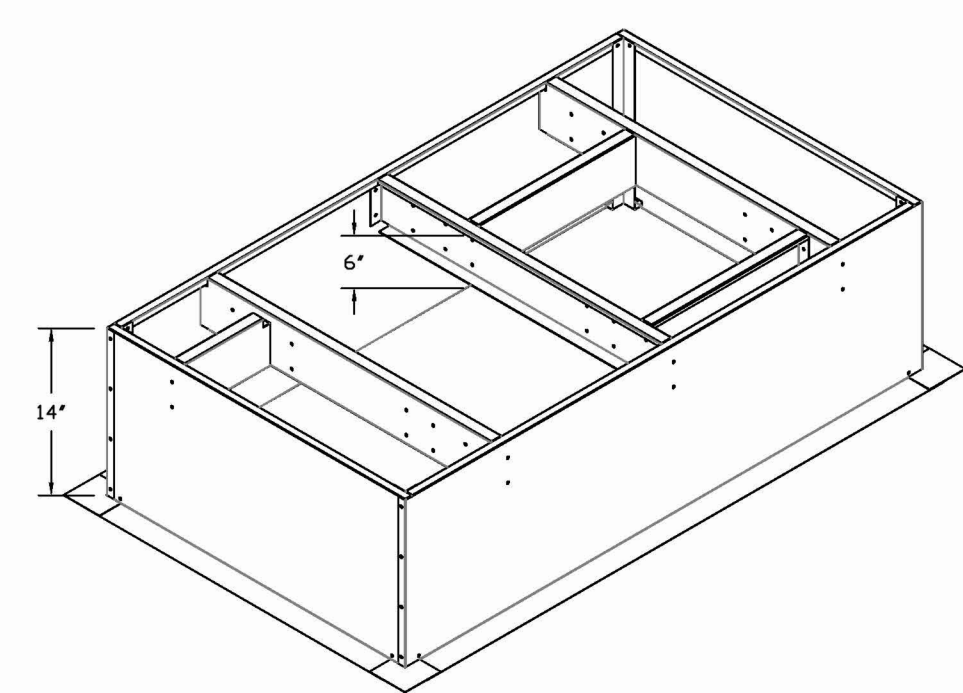
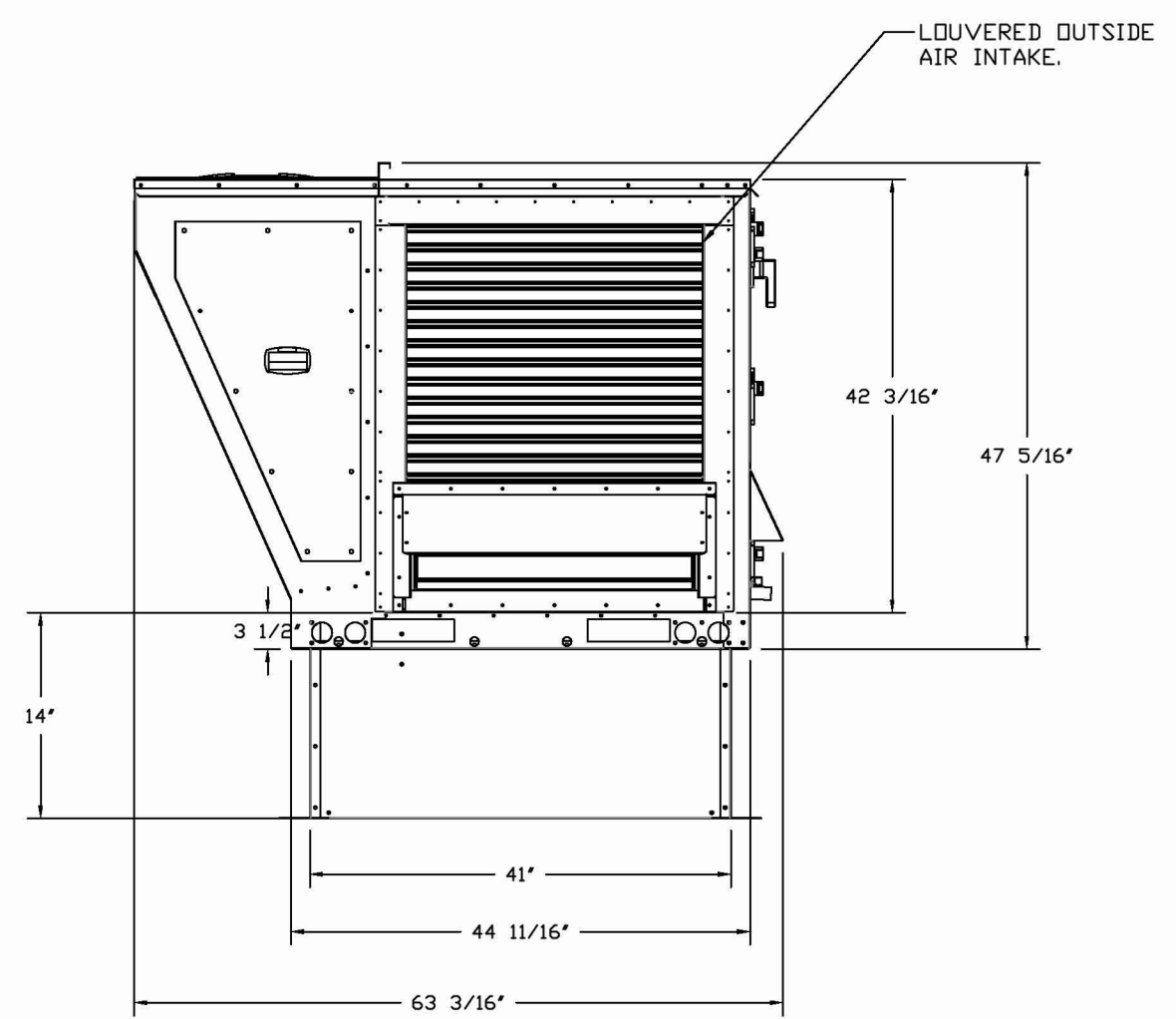
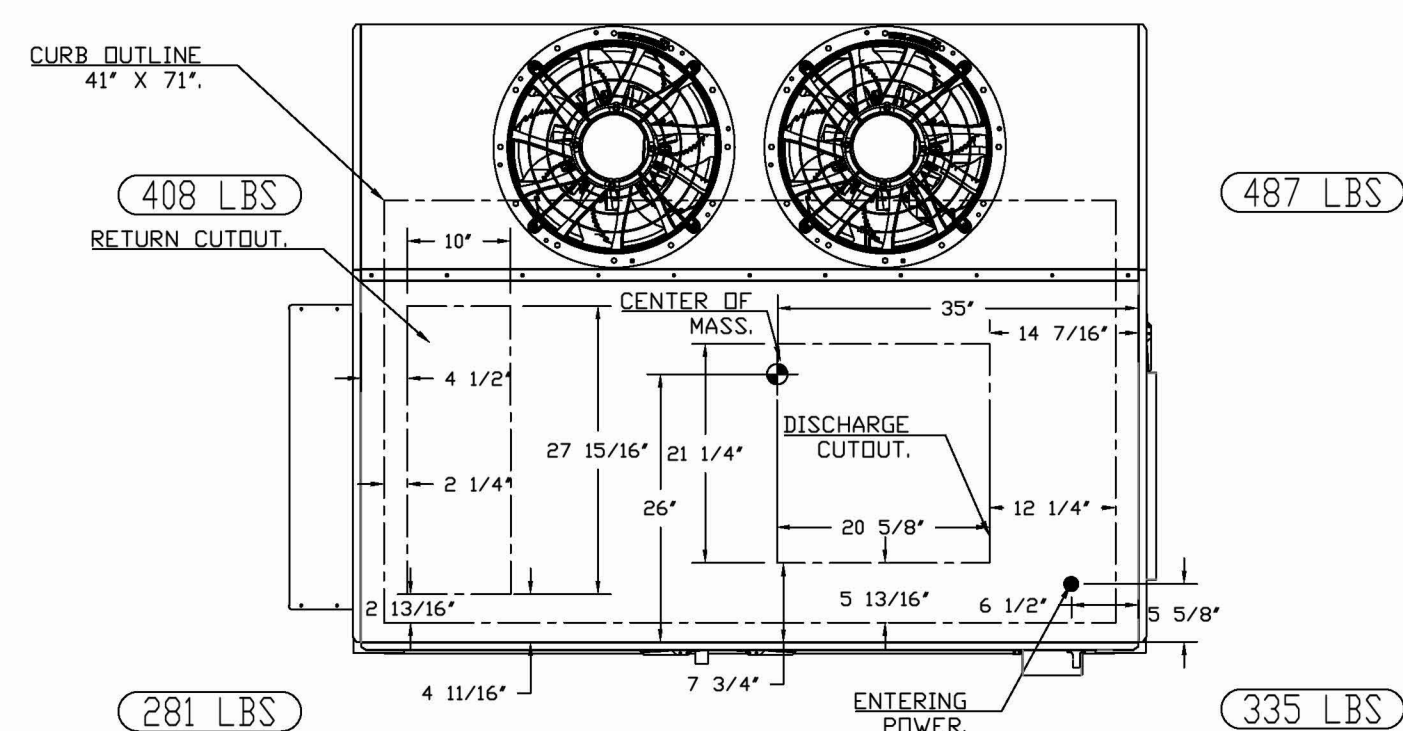
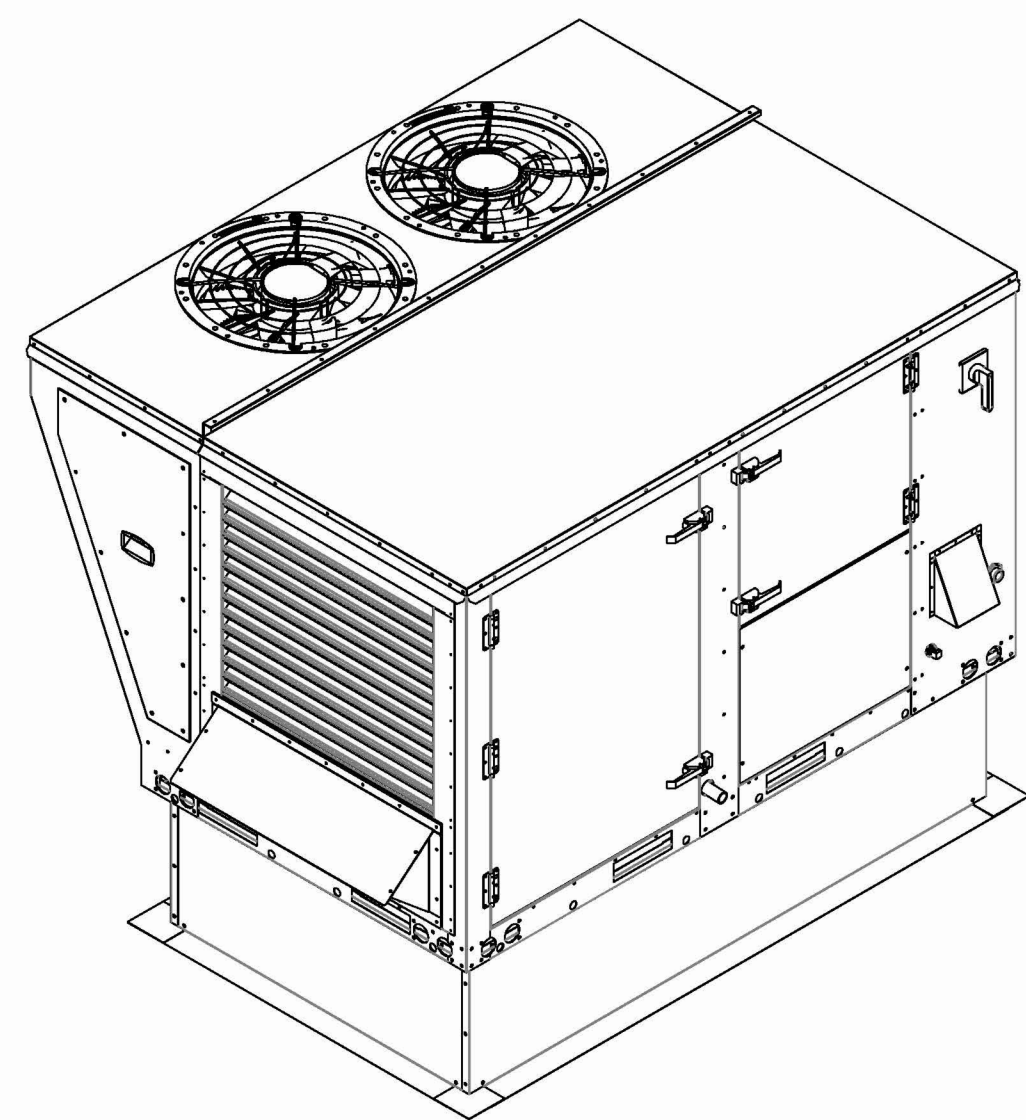
SEAL SIGNATURE:
FOR REFERENCE ONLY

NO.	BY	DATE	DESCRIPTION
1	HEI	2025-07-21	IFC SET
2	HEI	2025-06-06	BID/PERMIT SET

SHAKE SHACK
SHAKE SHACK SHOPS AT STONEBRIDGE
2053 HIGHLAND AVE, UNIT E 120
CHESHIRE, CT 06410
SHACK #1730
IFC SET

CAPTIVEAIRE DRAWINGS
DRAWN BY: Author
CHECKED BY: Checker
JOB NO: 2025040
M707

THE DOCUMENTATION CONTAINED ON THIS SHEET WAS NOT PREPARED BY HENDERSON ENGINEERS AND IS INCLUDED IN THIS SET FOR REFERENCE ONLY. HENDERSON ENGINEERS DESIGNED THE DOCUMENTATION ON THIS SHEET FOR GENERAL COMPLIANCE WITH DESIGN INTENT. SUPPLIER IS RESPONSIBLE THAT ALL FURNISHED EQUIPMENT ON THIS SHEET COMPLIES WITH APPLICABLE LOCAL, STATE, AND FEDERAL LAWS, CODES, AND REGULATIONS.



FAN #1 CAS-HVAC1-I.150-18MF-10T - HEATER (RTU-1)

- NOTES:
- DO NOT OBSTRUCT OUTSIDE AIR INLET, OUTSIDE AIR COIL OR OUTSIDE AIR FAN.
 - DENOTES CORNER WEIGHT.
 - ROOF OPENING MUST BE 2" SMALLER THAN CURB DIMENSIONS IN BOTH DIRECTIONS.
 - CONNECTION FROM BREAKER TO UNITS SAFETY DISCONNECT SWITCH TO BE COPPER WIRE ONLY.
 - EXTERIOR GAS CONNECTION PROVIDED BY FACTORY WITH QUICK SEAL AND ANTI-ROTATION BRACKET.
- *NOTE: INTEGRAL CO2 MONITORING AND CONTROL CAPABILITIES FOR ALL SPACE MOUNTED THERMOSTATS.

ROOF EQUIPMENT CURBS TO BE PROVIDED BY LANDLORD. INSTALLATION OF CURBS TO BE COORDINATED BETWEEN LANDLORD, SHAKE SHACK, AND GENERAL CONTRACTOR.

THE DOCUMENTATION CONTAINED ON THIS SHEET WAS NOT PREPARED BY HENDERSON ENGINEERS AND IS INCLUDED IN THIS SET FOR REFERENCE ONLY. HENDERSON ENGINEERS REVIEWED THE DOCUMENTATION ON THIS SHEET FOR GENERAL COMPLIANCE WITH DESIGN INTENT. SUPPLIER IS RESPONSIBLE THAT ALL FURNISHED EQUIPMENT ON THIS SHEET COMPLIES WITH APPLICABLE LOCAL, STATE, AND FEDERAL LAWS, CODES, AND REGULATIONS.

REVISIONS	
NO.	DESCRIPTION

CAPTIVE
 Eastern PA Mechanical
 225 E City Line Avenue, Suite #103, Balla Cynwyd, PA, 19004 PHONE: (267) 504-4126 EMAIL: reg103@captiveme.com

Shake Shack - CT - 1730 - Stonebridge (HVAC)
 Cheshire, CT, 06408

DATE: 4/24/2025
 DWG.#: 7454470
 DRAWN BY: Joe.shilba
 SCALE: 1/2" = 1'-0"
 MASTER DRAWING
 SHEET NO. 2

Bergmeyer
 RCS
 875 N High St.
 Columbus, OH 43215
 617.542.1025
 380.900.8887
 260 E 20th Street
 Los Angeles, CA 90012
 www.bergmeyer.com

CONSULTANTS:
 SEAL SIGNATURE:

NO.	BY	DATE	DESCRIPTION
1	HEI	2025-07-21	IFC SET
	HEI	2025-06-06	BID/PERMIT SET



SHAKE SHACK SHOPS AT STONEBRIDGE

2053 HIGHLAND AVE, UNIT E 120
 CHESHIRE, CT 06410
 SHACK #1730

IFC SET

CAPTIVEAIRE DRAWINGS

DRAWN BY: Author
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