

## Division 23: HEATING, VENTILATING, AND AIR CONDITIONING

### 1. GENERAL INSTRUCTIONS

#### A. 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. Borneo thoroughly familiar with all its contents, section, or both. Work required under this division includes all material, equipment, appliances, transportation, services, 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 which 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 – Plumbing	Division 15
3. Division 23 – HVAC	Division 15
4. Division 24 – Electrical	Division 16
5. Division 27 – Communications	Division 16
6. Division 28 – Electronic Safety and Security	Division 16

Furnish: "to supply and deliver to the project site, ready for unloading, unpacking, assembly, 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, starting 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, include 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 involvement by and obligations to the Architect.

AHJ: 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 value," "equivalent," or "equal" are 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 SITE 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 best 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 grades 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, crates, paper, stickers, and/or ancillary material not used in backfilling, etc. Clean equipment installed under this contract to present a neat and clean installation at the termination of the work.

Repair or replace public and private property damaged as a result of work performed under this contract to the satisfaction of authorities and regulations having jurisdiction. Provide all safety lights, guards, and warning signs required for the performance of the work and for the safety of the public.

#### 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 5 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 herein. Contractor shall furnish the General Contractor with information where chases and openings 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.

Figured dimensions shall be taken in preference to scale dimensions. Contractor shall take his own measurements at the building, as variations 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 adopted by the local AHJ, including any amendments and standards set forth by the following:

- National Electrical Code (NEC)
- National Fire Protection Association (NFPA)
- Underwriters Laboratories (UL)
- Occupational Safety and Health Administration (OSHA)
- American Society of Mechanical Engineers (ASME)
- American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE)
- American National Standards Institute (ANSI)
- American Society of Testing and Materials (ASTM)
- 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, or 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 internal 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 base 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 return 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:

- 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.
- Proposed substitution is consistent with the Contract Documents and will produce identical results, including functional clearances, maintenance service, and sourcing of replacement parts.
- Proposed substitution has been approved by all authorities having jurisdiction.
- Same warranty will be furnished for proposed substitution as for specified Work.
- If accepted substitution fails to perform as required, Contractor shall replace substitute material or system with that originally specified and bear costs incurred thereby.
- 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 bids unless written request for approval to bid has been received by the Engineer at least ten (10) calendar days prior to the date for 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 transmitting 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 these 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 include the materials, performance criteria, and accessories that are being proposed. General product catalog data not specifically noted to be copies of the specified product will be rejected and returned without review.

Submittals and shop drawings shall not contain the firm name, logo, seal, or signature of the Engineer. They shall not be parts 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 firm 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 controls, include short circuit current ratings. Mark out inapplicable 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 prepared and ready for review. If electronic submittal procedures are not defined in Division 01, Contractor shall include the website, 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 program. Do not include submittals in the contract documents. 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 deviations from the drawings and specifications, errors in dimensions, details, 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. Contractor the Architect for written authorization and Engineer for the necessary release agreement form and to specify 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 below.

See Division 01 and General Conditions for additional information.

#### 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 operational 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 the Engineer's review, at the time the drawings, start-up, rubber stamping, and testing are completed, and mailing envelopes are not considered approved binds. Final approval of systems installed under this contract will be withheld until this equipment brochure is received and deemed complete by the Architect and Engineer. Instruct workmen to save required literature shipped with the equipment itself for inclusion in this brochure.

Include Record Drawings as described above.

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:

- Listed in accordance with UL 484 or UL 60325-2-4/0CSA C22.2 No. 60325-3-4-0.
- The nameplate shall include a symbol indicating that a flammable refrigerant is used, as specified by the product listing.
- 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:

- Utilize a set point, nonadjustable in the field, to generate an output signal to initiate mitigation actions.
- Field recalibration of refrigerant detection system shall not be permitted.
- Be capable of detecting the presence of a specified refrigerant corresponding to the refrigerant designation of the refrigerant contained in the refrigeration system.
- Have access for replacement of refrigerant detection system components.
- Have self-diagnostic capabilities.
- Energize air circulation fans of the equipment upon failure of a self-diagnostic check.
- 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:

- One set of spare filters 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.
- Furnish one complete set of belts for each fan.
- 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 date, time, attendees and subject of training. The Contractor and the Owner's representative shall sign the certification letter indicating agreement that the training has been provided.

Schedule training with Owner with at least 7 days advance notice.

#### 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.

#### 2. 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. INCIDENTS/DAMAGE

Repair streets, sidewalks, drives, paving, walks, 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 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 refinish 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 unfinished areas and where otherwise shown.

##### E. STRUCTURAL/SUPPORT 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. ACCESS PANELS AND DOORS

Refer to Architectural documents for specification of access panels and doors.

##### G. 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 10 gauge galvanized steel sleeves for sleeves 6 inches and smaller. Provide galvanized steel metal sleeves for larger than 6 inches. Schedule 40 PVC sleeves are acceptable for installation in areas where the Architect, plus a duplication of this time for resubmittal, if required. Only resubmit these sections requested for resubmittal.

Seal elevated floor, exterior wall and roof penetrations watertight and weathertight with non-shrink, non-hardening commercial sealant. Pack with mineral wool and seal 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 stoppings. 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 curb or curbs where pipes and/or ductwork penetrate elevated slabs or 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 piping penetrations.

Provide box frames for rectangular openings welded 12 gauge galvanized steel attached to forms and of a maximum dimension established by the Architect. Notify the General Contractor or Architect before installing 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 seals. Provide cast iron "wall pipes" with integral waterstop ring manufactured by Jay R. Smith, Joasm, Wade, Watts or Zum. Provide modular mechanical sleeve seals, manufactured by Calpic, Metraflex, or Thunderrine / 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 waterstop ring manufactured by Jay R. Smith, Joasm, Wade, Watts or Zum.

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 pipe with retaining studs. Seal watertight with silicone caulk.

Provide 12 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.

##### H. 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: Hilli, RectolSeal, Specified Technologies Inc., United States Gypsum Company, or 3M corp.

Through and Membrane Penetration Firestopping 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 condition, 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.

##### I. MOTORS AND STARTERS

Provide motors and starting equipment where not furnished with the equipment package. Motors shall have copper windings, Class B insulation, and standard squirrel cage with starting torque characteristics suitable for the equipment served. Motors controlled by variable frequency drives shall be rated for voltage peaks and minimum rise times in accordance with NEMA MG1, Part 31. Motors 5 horsepower and larger controlled by variable frequency drives shall be provided with a shaft grounding system option to Aegis SGR Bearing Protection Ring, Inpro/Seal Current Diverter Ring (CDR) or approved equal. Motors for air handling equipment shall be selected for quiet operation. Each motor shall be checked for proper rotation after electrical connection has been completed. Provide drip-proof enclosure for locations protected from weather and not in air stream of fan, and totally enclosed fan cooled enclosure for motors exposed to weather. Motors shall be manufactured by Century, General Electric, Louis Allis, Westinghouse, or approved equal.

Provide every motor, except fractional horsepower single phase motors with an approved type of "built-in" thermal overload protection, with a motor starter. Each starter shall be provided with overload heaters sized to the motor rating, and every three phase motor starter shall have overload heaters in each phase. Ambient compensated heaters shall be installed whenever necessary. Unless otherwise specified, motor starters shall be furnished by the Division 23 Contractor for installation and connection by the Division 26 Contractor. Starters shall be Allen-Bradley, Clark, Furnas, Square D, or approved equal.

##### 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 maps for mechanical equipment (from the equipment nameplate) to ensure proper installation.

Provide power and communication wiring with transient protection in accordance with IEEE C62.41.2. 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 in 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 circuit wires 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 sized 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 that 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, 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 installations.

##### 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 and/or replacing any damages resulting therefrom.

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 equivalent 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 completed data to the Architect for evaluation and approval before final inspection of the project.

Balance air systems to within plus or minus 10 percent for terminal devices and branch lines and plus or minus 5 percent for main ducts and air handling equipment of the amount of air shown on the drawings. TAB Contractor shall record space temperatures and make adjustments in airflow to each diffuser to obtain uniform temperature (no greater than +/- 3 F) in spaces. Document temperatures and adjustments in tab report. Adjust equipment to operate as intended by the specification. TAB report shall include a report summary/remarks section in accordance with the procedural standard that provides both system set up and a summary of deficiencies as defined by the procedural standard.

TAB Contractor shall be responsible to calibrate, set, and adjust automatic temperature control sensors, actuators and control devices. Check proper sequencing of interlock systems, and operation of safety controls, adjust thermostats, and control setpoints, limits and time based adjustment to operate in accordance with the performance requirements of the Construction Documents. Adjust pumps, fans, etc. for proper and efficient operation. Certify to Architect that adjustments have been made and that system is operating satisfactorily. Control, set, and adjust automatic temperature controls. Check proper sequencing of interlock systems, and operation of safety controls.

Division 23 contractor shall align bearings and replace bearings that have dirt or foreign material in them with new bearings without additional cost to the Owner.

##### M. VIBRATION IS

# MECHANICAL SHEET INDEX

M001	MECHANICAL GENERAL INFORMATION
M101	MECHANICAL FLOOR PLAN
M150	MECHANICAL ROOF PLAN
M501	MECHANICAL DETAILS
M590	MECHANICAL SPECIFICATIONS
M591	MECHANICAL SPECIFICATIONS
M601	MECHANICAL SCHEDULES
M630	MECHANICAL ENERGY CODE COMPLIANCE
M701	CAPTIVE/VAIRE DRAWINGS
M702	CAPTIVE/VAIRE DRAWINGS
M703	CAPTIVE/VAIRE DRAWINGS
M704	CAPTIVE/VAIRE DRAWINGS
M705	CAPTIVE/VAIRE DRAWINGS
M706	CAPTIVE/VAIRE DRAWINGS

## RESPONSIBILITY MATRIX

DESCRIPTION	FURNISHED		INSTALLED		REMARKS
	GC	OWNER	GC	OWNER	
<b>DIVISION 23: HEATING, VENTILATING, AND AIR CONDITIONING</b>					
<b>23.1 HVAC DUCTWORK AND PIPING IDENTIFICATION</b>					
HVAC DUCTWORK SYSTEM IDENTIFICATION	•		•		
PIPING SYSTEM IDENTIFICATION	•		•		
UTILITY SHUT OFF IDENTIFICATION IN KITCHEN	•		•		
VALVE TAGS AND CHART	•		•		
HVAC DAMPER IDENTIFICATION	•		•		
<b>23.2 ROOF CURBS</b>					
EXHAUST FAN CURBS		•		•	
ROOFTOP UNIT CURBS		•		•	
CONDENSING UNIT CURBS		•		•	
KITCHEN EXHAUST FAN CURBS		•		•	
<b>23.3 HVAC DUCTWORK SYSTEM COMPONENTS</b>					
HVAC DUCTWORK	•		•		
GREASE DUCTWORK	•		•		
OUTSIDE AIR DUCTWORK	•		•		
SUPPLY AND RETURN AIR DUCTWORK	•		•		
RESTROOM EXHAUST AIR DUCTWORK	•		•		
INSULATION AND FIRE WRAP	•		•		
DAMPERS	•		•		
SMOKE DETECTORS	•		•		
SUPPLY, RETURN, AND EXHAUST GRILLS AND REGISTERS	•		•		
<b>23.4 MECHANICAL PIPING SYSTEM COMPONENTS</b>					
WALK-IN COOLER AND FREEZER CONDENSER REFRIGERANT LINE SETS	•		•		A
REFRIGERANT PIPING FOR HVAC EQUIPMENT	•		•		
VALVES AND ACCESSORIES (E.G. AIR VENTS)	•		•		
<b>23.5 HVAC EQUIPMENT</b>					
RESTROOM EXHAUST FAN	•		•		
KITCHEN EXHAUST FAN WITH CURB EXTENSION	•		•		
DUCTED AND NON-DUCTED HEATING AND COOLING UNITS	•		•		
WALK-IN COOLER AND FREEZER CONDENSING UNITS	•		•		A
<b>23.6 KITCHEN EXHAUST WITH FIRE SUPPRESSION SYSTEM</b>					
HOOD CONTROL PANEL	•		•		
REMOTE HOOD SWITCHES IN OFFICE	•		•		
KITCHEN EXHAUST HOOD	•		•		
STRUCTURAL SUPPORT	•		•		
ELECTRICAL AND CONTROL WIRING	•		•		
TANK SYSTEM	•		•		B
TANK SYSTEM WIRING AND UTILITIES CONNECTION	•		•		
TANK SYSTEM GAS VALVE	•		•		
PULL STATION	•		•		
<b>23.7 MECHANICAL SAFETY SENSORS</b>					
CO2 MONITOR	•		•		
<b>23.8 COMMISSIONING ACTIVITIES</b>					
GREASE EXHAUST WATER LEAKAGE TEST	•		•		
TEST AND BALANCE (TAB) REPORT	•		•		

- GENERAL NOTES:  
 1. INFORMATION CONTAINED WITHIN IS BASED ON OUR INTERPRETATION OF THE FINAL EXECUTED WORK LETTER.  
 2. CONTRACTOR TO CONFIRM ALL SCOPE WITH FINAL WORK LETTER PRIOR TO PROCUREMENT OF EQUIPMENT.

- REMARKS:  
 A. WALK-IN COOLER AND FREEZER CONDENSING UNITS FURNISHED AND INSTALLED BY OWNER VENDOR.  
 B. GENERAL CONTRACTOR TO COORDINATE TANK INSTALLATION TIME WITH OWNER VENDOR AND FACILITATE SYSTEM SIGN-OFF.

## SUBMITTAL MATRIX

GENERAL CONTRACTORS TO ALSO REVIEW ARCHITECTURAL SPECIFICATIONS AS NOTED IN PLANS IN PLAN SECTION 700 OF THE ARCHITECTURAL PACKAGE FOR REQUIRED SUBMITTALS THAT MIGHT NOT BE LISTED BELOW.

SUBMITTAL DESCRIPTION	Required Review Time (Business Days)	Architect of Record	Shake Shack	Physical Sample Required	Submit for Record	Submit for Record Only
Diffusers, Grills & Registers	5	X			X	
Ductwork Layout (if there are significant changes in field)	5	X			X	
HVAC Equipment (if Captive Air - Submitted by Owner Vendor directly to Owner/AOR prior to construction)	5	X			X	
MEP Tests, Start-Up, and Programming Reports	5	X			X	

## GENERAL NEW NOTES:

- PRIOR TO SUBMITTING BID, VISIT THE JOB SITE AND BECOME FULLY ACQUAINTED WITH THE EXISTING CONDITIONS OF THE PROJECT. REVIEW THE GENERAL NOTES, SPECIFICATIONS AND OTHER DRAWINGS OR ADDITIONAL REQUIREMENTS WHICH MAY NOT BE SPECIFICALLY CALLED OUT IN THIS PORTION OF THE CONSTRUCTION DOCUMENTS. NOTIFY ARCHITECT, ENGINEER AND/OR OWNER OF CONFLICTS OR DISCREPANCIES PRIOR TO SUBMISSION OF BID.
- EXISTING CONDITIONS WERE TAKEN FROM ORIGINAL DRAWINGS AND SITE VISITS AND MAY NOT REFLECT EXACT "AS-BUILT" CONDITIONS. FIELD VERIFY EXISTING CONDITIONS PRIOR TO SUBMITTING FINAL BIDS. COORDINATE NEW WORK AND DEMOLITION WITH OTHER DISCIPLINES AND EXISTING CONDITIONS PRIOR TO CONSTRUCTION.
- COORDINATE THE INSTALLATION OF THE MECHANICAL SYSTEMS WITH OTHER TRADES TO ENSURE A NEAT AND ORDERLY INSTALLATION. INSTALL DUCTWORK AND PIPING AS TIGHT TO STRUCTURE AS POSSIBLE. COORDINATE WITH OTHER TRADES TO AVOID CONFLICTS. COORDINATE INSTALLATION OF DUCTWORK AND PIPING TO AVOID CONFLICTS WITH ELECTRICAL PANELS, LIGHTING FIXTURES, ETC. ANY MODIFICATIONS REQUIRED DUE TO LACK OF COORDINATION WILL BE THE RESPONSIBILITY OF THE CONTRACTOR AT NO EXTRA COST TO THE OWNER.
- WHERE SHUTDOWN OF EXISTING SYSTEMS IS REQUIRED DURING NEW WORK, COORDINATE SHUTDOWN TIME AND DURATION WITH THE OWNER TO MINIMIZE DOWNTIME. NOTIFY OWNER SEVEN (7) DAYS PRIOR TO INTERRUPTION OF SERVICE.
- DURING INSTALLATION OF NEW WORK, AVOID DAMAGING EXISTING SURFACES AND EQUIPMENT TO REMAIN. REPAIR DAMAGE CAUSED DURING CONSTRUCTION AT NO EXTRA COST TO THE OWNER.
- PROVIDE TEMPORARY BARRIERS TO CONTAIN DUST AND DEBRIS RESULTING FROM THE PERFORMANCE OF THE WORK TO THE AREA WHERE WORK IS BEING PERFORMED.
- ALL MECHANICAL EQUIPMENT SHOWN ON THE MECHANICAL PLANS SHALL BE PROVIDED BY DIVISION 23 UNLESS OTHERWISE NOTED.
- NEW MECHANICAL EQUIPMENT, DUCTWORK AND PIPING ARE SHOWN AT APPROXIMATE LOCATIONS. FIELD MEASURE FINAL DUCTWORK AND PIPING LOCATIONS PRIOR TO FABRICATION AND MAKE ADJUSTMENTS AS REQUIRED TO FIT THE DUCTWORK AND PIPING WITHIN THE AVAILABLE SPACE. VERIFY THAT FINAL EQUIPMENT LOCATIONS MEET MANUFACTURER'S RECOMMENDATIONS REGARDING SERVICE CLEARANCE AND PROPER AIRFLOW CLEARANCE AROUND EQUIPMENT.
- REFER TO ARCHITECTURAL DRAWINGS FOR RELATED CONSTRUCTION DETAILS AS APPLICABLE TO THE HVAC SYSTEM. VERIFY CHASES AND PENETRATIONS SHOWN ON ARCHITECTURAL DRAWINGS THAT ARE INTENDED FOR DUCTWORK AND PIPING MEET REQUIREMENTS.
- COORDINATE LOCATION OF ROOF MOUNTED HVAC EQUIPMENT AND ROOF PENETRATIONS WITH THE ARCHITECTURAL AND STRUCTURAL DRAWINGS.
- INDOOR AIR QUALITY MEASURES: PROTECT INSIDE OF (INSTALLED AND DELIVERED) DUCTWORK AND HVAC UNITS FROM EXPOSURE TO DUST, DIRT, PAINT AND MOISTURE. REPLACE INSULATION THAT HAS BECOME WET AT ANY TIME DURING CONSTRUCTION. DRYING THE INSULATION IS NOT ACCEPTABLE. SEAL ANY TEARS OR JOINTS OF INTERNAL FIBERGLASS INSULATION. REMOVE DEBRIS FROM CEILING/RETURN AIR PLENUM INCLUDING DUST. AN INDEPENDENT, PROFESSIONAL DUCT CLEANING COMPANY SHALL VACUUM CLEAN ANY DUCTWORK CONNECTED TO HVAC UNITS THAT WERE OPERATED DURING THE CONSTRUCTION PERIOD AFTER NEW FILTERS ARE INSTALLED AND PRIOR TO TURNING SYSTEM OVER TO THE OWNER. THE INTERNAL SURFACES AND ASSOCIATED COILS OF ANY HVAC UNITS THAT WERE OPERATED SHALL ALSO BE CLEANED.
- INSTALL DUCTWORK AND PIPING PARALLEL TO BUILDING COLUMN LINES UNLESS OTHERWISE SHOWN OR NOTED.
- OVERHEAD HANGERS AND SUPPORTS FOR EQUIPMENT, DUCTWORK AND PIPING SHALL BE FASTENED TO BUILDING JOISTS OR BEAMS. DO NOT ATTACH HANGERS AND SUPPORTS TO THE ABOVE FLOOR SLAB OR ROOF EXCEPT WHERE CONCRETE INSERTS IN CONCRETE SLABS ARE ALLOWED BY THE SPECIFICATIONS.
- COORDINATE LOCATION OF EQUIPMENT SUPPORTS WITH LOCATION OF EQUIPMENT ACCESS PANELS/DOORS TO ENABLE SERVICE OF EQUIPMENT AND/OR FILTER REPLACEMENT.
- SEAL PENETRATIONS THROUGH THE BUILDING COMPONENTS IN ACCORDANCE WITH THE CONTRACT SPECIFICATIONS. FIREPROOF PENETRATIONS THROUGH FIRE RATED COMPONENTS IN ACCORDANCE WITH U.L. REQUIREMENTS.
- COORDINATE THE EXACT MOUNTING SIZE AND FRAME TYPE OF DIFFUSERS, REGISTERS AND GRILLES WITH THE SUPPLIER TO MEET THE CEILING, WALL AND DUCT INSTALLATION REQUIREMENTS.
- ADJUST LOCATION OF CEILING DIFFUSERS, REGISTERS AND GRILLES AS REQUIRED TO ACCOMMODATE FINAL CEILING GRID AND LIGHTING LOCATIONS.
- PAINT PORTIONS OF DUCTWORK AND INSULATION THAT ARE EXPOSED TO VIEW BY THE INSTALLATION OF DIFFUSERS, REGISTERS AND GRILLES IN CEILINGS OR WALLS FLAT BLACK. PORTIONS THAT INCLUDE BOTH THE INTERIOR OF UNLINED DUCTWORK AND THE EXTERIOR OF DUCTWORK AND INSULATION.
- DUCTWORK CROSSING FIRE RATED WALLS OR OTHER FIRE RATED ASSEMBLIES SHALL BE MINIMUM 26 GAUGE SHEET METAL.
- PROVIDE FIRE OR FIRE/SMOKE DAMPERS, AS APPLICABLE, IN DUCTWORK AT CEILINGS AND WALLS AT LOCATIONS SHOWN ON THE PLANS. FIRE AND FIRE/SMOKE DAMPERS SHALL CONFORM TO NFPA AS APPLICABLE. COORDINATE SLEEVE LENGTH WITH REQUIREMENTS OF INSTALLED LOCATION.
- PROVIDE WALL OR DUCT ACCESS PANELS OR DOORS FOR ACCESS TO FIRE AND FIRE/SMOKE DAMPERS. ACCESS PANEL OR DOOR SHALL BE MINIMUM SIZE OF 10" BY 10" AND SHALL BE INSTALLED WITHIN 12" OF DAMPER. PROVIDE A REMOVABLE DUCT SECTION WHERE DUCT SIZE IS TOO SMALL FOR A 10" BY 10" ACCESS DOOR.
- LOCATE AND SET THERMOSTATS AND HUMIDISTATS AT LOCATIONS SHOWN ON PLANS. VERIFY EXACT LOCATIONS WITH ARCHITECT PRIOR TO INSTALLATION. DEVICE MOUNTING HEIGHT SHALL MEET ALL REQUIREMENTS UNLESS OTHERWISE NOTED ON PLANS. PROVIDE INSULATED BACKING FOR THERMOSTATS MOUNTED ON EXTERIOR BUILDING WALLS. INSTALL WIRING IN CONDUIT PROVIDED BY DIVISION 26. AT A MINIMUM, PROVIDE CONDUIT IN THE WALL FROM THE JUNCTION BOX TO 6" ABOVE THE CEILING.
- COORDINATE THE LOCATION AND ELEVATION OF WALL-MOUNTED DEVICES WITH PRESENTATION BOARDS, DISPLAY CABINETS, SHELVES OR OTHER COMPONENTS SHOWN ON THE ARCHITECTURAL DRAWINGS THAT ARE TO BE INSTALLED UNDER OTHER DIVISIONS. CONTRACTOR WILL NOT BE RESPONSIBLE FOR RELOCATION OF WALL-MOUNTED DEVICES CAUSED BY A LACK OF COORDINATION.
- PROVIDE A MANUAL BALANCING DAMPER IN EACH DUCT TAKEOFF FROM SUPPLY, RETURN, OUTDOOR AND EXHAUST AIR DUCTS.
- PROVIDE A PREFABRICATED 45 DEGREE, HIGH EFFICIENCY, RECTANGULAR/ROUND BRANCH DUCT TAKEOFF FITTING FOR BRANCH DUCT CONNECTIONS AND TAKE-OFFS TO INDIVIDUAL DIFFUSERS, REGISTERS AND GRILLES. PROVIDE WITH INTEGRAL MANUAL BALANCING DAMPER AND LOCKING QUADRANT WHERE INDICATED ON PLANS.
- BRANCH DUCTWORK TO AIR OUTLETS SHALL BE SAME SIZE AS OUTLET NECK SIZE UNLESS OTHERWISE NOTED.
- REFER TO SPECIFICATIONS FOR DUCTWORK AND PIPING INSULATION REQUIREMENTS. DUCT SIZES ON MECHANICAL PLANS INDICATE CLEAR INSIDE AIRFLOW DIMENSIONS. INCREASE SHEET METAL SIZES ACCORDINGLY TO ACCOUNT FOR THICKNESS OF DUCT LINER.
- FLEXIBLE DUCTWORK SHALL NOT EXCEED 5'-0" IN LENGTH AND SHALL BE INSTALLED AND SUPPORTED TO AVOID SHARP BENDS AND SAGGING. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
- RIGIDLY SUSPEND UNIT HEATER FROM STRUCTURE WITH SUPPORTING ANGLES AND ALL-THREAD HANGING RODS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
- PROVIDE EQUIPMENT VENTS AND FLUES PER EQUIPMENT MANUFACTURERS RECOMMENDATIONS AND EQUIPMENT SPECIFICATIONS. KEEP PENETRATIONS THROUGH ROOF A MINIMUM OF 10'-0" FROM HVAC EQUIPMENT FRESH AIR INLETS AND 2'-0" FROM ROOF PARAPETS.
- PROVIDE A NEW SET OF AIR FILTERS IN UNITS PRIOR TO TESTING, ADJUSTING AND BALANCING AND BEFORE TURNING SYSTEM(S) OVER TO OWNER.
- FULLY CHARGE EXISTING REFRIGERANT SYSTEMS BEING REUSED FOR THIS PROJECT IN ACCORDANCE WITH MANUFACTURER'S WRITTEN INSTRUCTIONS. CHARGE SYSTEMS WITH NEW REFRIGERANT MATCHING EXISTING.
- TEMPORARY INSTALLATIONS OF INFECTION CONTROL MEASURES DURING CONSTRUCTION SHALL BE COORDINATED WITH THE FACILITY'S INFECTION CONTROL STAFF. PRIOR TO CONSTRUCTION PROVIDE ALL REQUIRED TEMPORARY INSTALLATIONS, INCLUDING DETAILS OF THE INFECTION CONTROL MEASURES SUCH AS TEMPORARY BARRIERS AND MEMBRANES, PORTABLE EXHAUST FANS AND TEMPORARY DUCTWORK. TEMPORARY INSTALLATIONS MUST NOT HAVE A NEGATIVE IMPACT ON EXISTING SYSTEMS NOR CAUSE UNSAFE CONDITIONS. TEMPORARY INSTALLATIONS SHALL MAINTAIN ADEQUATE EGRESS AND SHALL NOT OBSTRUCT EXISTING EXITS. CREATE A FIRE HAZARD OR REDUCE REQUIRED FIRE RESISTANCE. TEMPORARY VENTILATION SYSTEMS SHALL NOT CAUSE THE AIR BALANCE OF ADJACENT ROOMS OR SPACES TO BE IMPACTED OR ALTER THE PERFORMANCE OF PERMANENT BUILDING VENTILATION SYSTEMS. AIRFLOW MEASUREMENTS SHALL BE TAKEN TO VERIFY ADJACENT ROOMS OR SPACES ARE NOT IMPACTED.

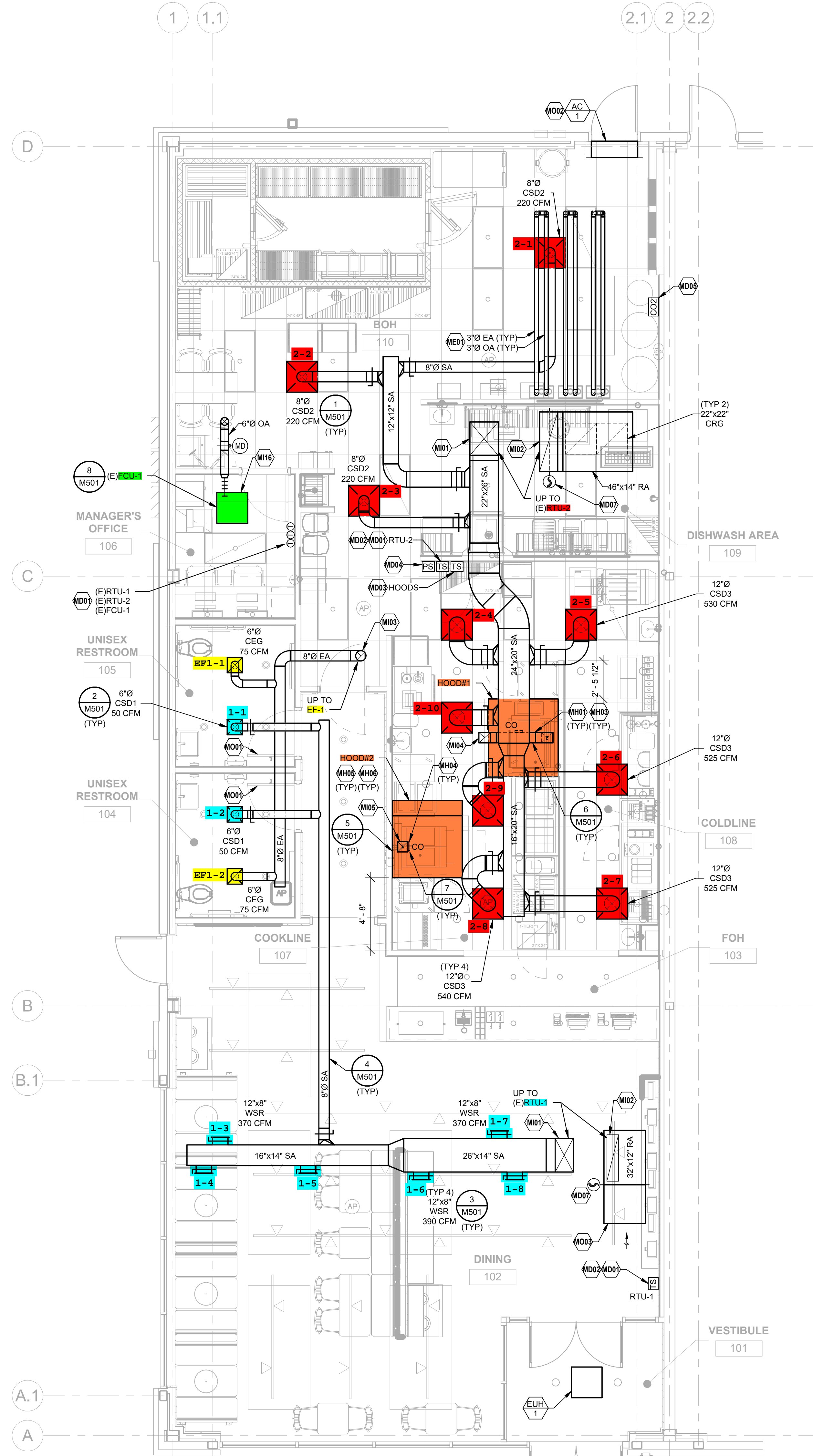
# MECHANICAL SYMBOLS

THIS IS A MASTER LEGEND AND NOT ALL SYMBOLS OR ABBREVIATIONS ARE USED.

V3.02

STANDARD MOUNTING HEIGHT	HVAC DUCTWORK AND ACCESSORIES	PIPING SYMBOLS
THERMOSTATS (USER ADJUSTABLE) (TOP OF DEVICE) 46"		
CONTROLS (TOP OF DEVICE) 46"		
INSTALL DEVICES AT THE MOUNTING HEIGHTS SHOWN ABOVE UNO IN THE CONSTRUCTION DOCUMENTS. MOUNTING HEIGHTS LISTED ABOVE OR ELSEWHERE IN THE CONSTRUCTION DOCUMENTS ARE AFF OR AFG TO TOP OF THE DEVICE UNO. ALL DEVICES SHALL BE INSTALLED IN COMPLIANCE WITH CURRENT ADA AND LOCAL REQUIREMENTS.		
ANNOTATION		
MECHANICAL PLAN NOTE CALLOUT		
MECHANICAL EQUIPMENT DESIGNATION (CONTRACTOR FURNISHED AND INSTALLED UNLESS NOTED OTHERWISE)		
CONNECTION POINT OF NEW WORK TO EXISTING		
DETAIL REFERENCE. UPPER NUMBER INDICATES DETAIL NUMBER LOWER NUMBER INDICATES SHEET NUMBER		
SECTION CUT DESIGNATION		
DEDICATED EQUIPMENT ACCESS TILE		
ACCESS PANEL		
ABBREVIATIONS		
AC AIR CONDITIONING		
ACC AIR COOLED CHILLER		
ACQU AIR COOLED CONDENSING UNIT		
L LAT LOUVER		
LAU LEAVING AIR		
LFB LEAVING DRY BULB		
LFP LOW PRESSURE		
LWB LEAVING WET BULB		
LWT LEAVING WATER TEMPERATURE		
MAU MAKE-UP AIR UNIT		
MAX MAXIMUM		
MD MOTORIZED DAMPER		
MFR MANUFACTURER		
MIN MINIMUM		
N/A NOT APPLICABLE		
NC NORMALLY CLOSED		
NFO NORMALLY OPEN		
NOM NOMINAL		
NO NOISE CRITERIA		
NF NOT IN CONTRACT		
OA OUTSIDE AIR		
OB OUTSIDE AIR		
OC OUTSIDE AIR		
OD OUTSIDE AIR		
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PA PIPE ANCHOR		
PAV PIPE ANCHOR		
PAW PIPE ANCHOR		
PB PIPE BEND		
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MECHANICAL FLOOR PLAN  
1/4" = 1'-0"

**MECHANICAL PLAN NOTES:**

- MD01 MOUNT THERMOSTATS, HUMIDITY SENSORS, AND TEMPERATURE SENSORS (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.
- ME01 PROVIDE COMBUSTION AIR AND EXHAUST PIPE AND ROUTE TO CONCENTRIC VENT THROUGH ROOF.
- MH01 TYPE I GREASE HOOD EXHAUST DUCTWORK SHALL BE MINIMUM 18 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 PROPER GREASE DUCT WRAP SYSTEM.
- MH04 INSTALL DUCTWATER ULTIMATE COOKS' 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 9"x8" GREASE EXHAUST DUCT UP TO KEF-1 ON ROOF.
- MI05 8"x8" GREASE EXHAUST DUCT UP TO KEF-2 ON ROOF.
- MI16 TRANSITION 8" OUTDOOR AIR DUCT TO 4" FLEXIBLE DUCTWORK AND CONNECT TO UNIT.
- MO01 CONTRACTOR TO COORDINATE 1" UNDERCUT ON DOOR FOR EXHAUST AIR PATH.
- MO02 AIR CURTAIN MOUNTED ABOVE DOOR. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.
- MO03 PROVIDE 1/4" GALVANIZED CONSTRUCTION HARDWARE CLOTH SCREEN OVER OPEN END OF RETURN DUCT. PROVIDE DUCT LINER IN BOOT. RETURN AIR DUCT SHALL BE MINIMUM 36" HORIZONTAL EXTENSION FOR SOUND ATTENUATION.

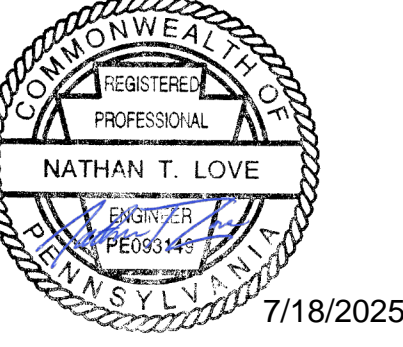
THE BUILDINGS HVAC SYSTEMS SHALL BE BALANCED BY NATIONAL TAB (NO EXCEPTIONS) AND CONTRACTED BY THE GENERAL CONTRACTOR.

CONTACT:  
WILL TURNBOUGH  
will@natortab.com  
855-682-6822 ext704

ALL GREASE DUCT TO BE WATER TESTED BY ENVIRONMENTAL MECHANICAL CONTRACTOR'S EXPENSE. CONTACT OWNER'S NATIONAL ACCOUNT VENDOR.

ENVIRONMENTAL  
DON PFLEDERER  
1.800.325.8476  
inspections@environmental.com

**HENDERSON**  
ENGINEERS  
8345 LENEKA DRIVE, SUITE 300  
LENEKA, KS 66214  
TEL 913.742.5000 FAX 913.742.5001  
WWW.HENDERSONENGINEERS.COM  
2450004630



**Brian S. Thomas,**  
Architect

DP3 Architects, Ltd.  
15 South Main Street, Suite 400  
Greenville, SC 29601  
864.232.8200  
www.dp3architects.com

**SHAKE SHACK**  
SHAKE SHACK #1695  
MECHANICSBURG, PA

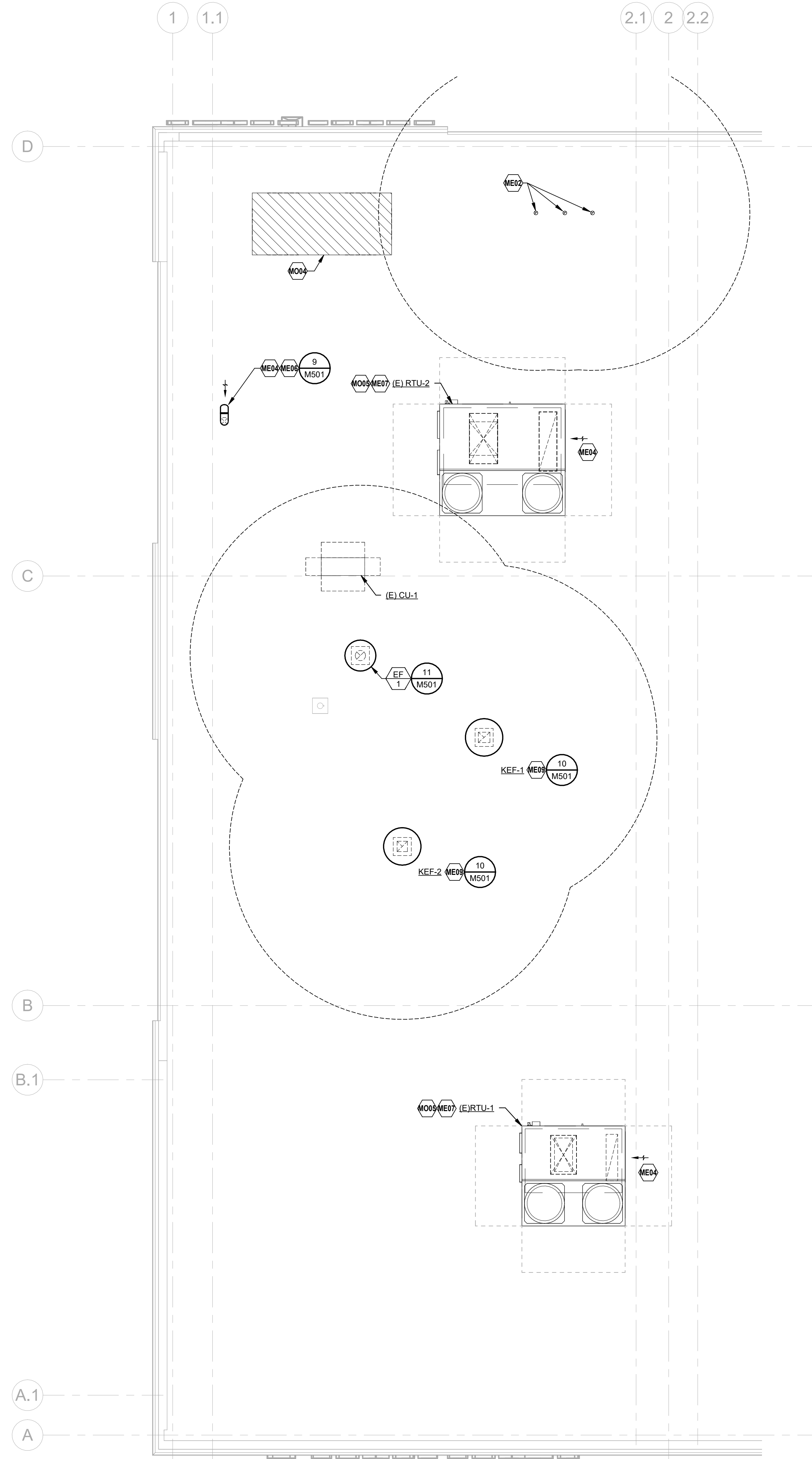
Project Number 2450004630  
Drawn By DJ  
Checked By JH  
Date 01/27/2025

Revisions  
1 27 JAN 2025 ISSUE FOR PERMIT  
21 JUL 2025 ISSUE FOR CONSTRUCTION

Drawing  
**MECHANICAL FLOOR PLAN**

**M101**

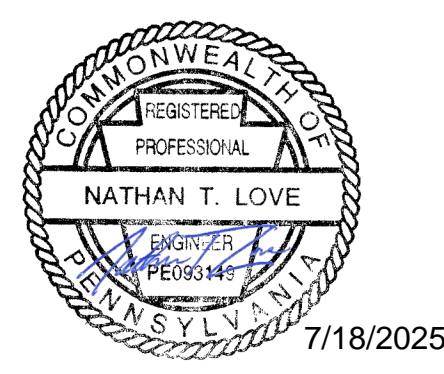
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MECHANICAL ROOF PLAN  
1/4" = 1'-0"

- 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, TYPICAL.
  - ME06 TURN DOWN 8"Ø INTAKE AND END OPEN OVER ROOF (MIN. 24") WITH INSECT SCREEN.
  - ME07 CONTRACTOR SHALL COORDINATE WITH NATIONAL TAB TO PROVIDE UV-PHI INDOOR AIR PURIFICATION SYSTEM, MODEL PH4-PKG-24V. INSTALL IN UNIT SLOWER COMPARTMENT PER MANUFACTURER'S INSTRUCTIONS.
  - ME09 REFERENCE THE MECHANICAL RESPONSIBILITY MATRIX ON SHEET M001 FOR CURB AND EQUIPMENT FURNISHING AND INSTALLATION.
  - 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.

**HENDERSON ENGINEERS**  
8345 LENEKA DRIVE, SUITE 300  
LENEKA, KS 66214  
TEL 913.742.5000 FAX 913.742.5001  
WWW.HENDERSONENGINEERS.COM  
2450004630



Brian S. Thomas,  
Architect

DP3 Architects, Ltd.  
15 South Main Street, Suite 400  
Greenville, SC 29601  
864.232.8200  
www.DP3architects.com

**SHAKE SHACK**  
SHAKE SHACK #1695  
MECHANICSBURG, PA

Project Number 2450004630  
Drawn By DJ  
Checked By JH  
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Revisions	
1	27 JAN 2025 ISSUE FOR PERMIT
2	21 JUL 2025 ISSUE FOR CONSTRUCTION

Drawing  
MECHANICAL  
ROOF PLAN

M150

NATHAN T. LOVE



## B. DUCTWORK

Provide galvanized steel ductwork and housings as shown on drawings. Construct ductwork including fittings and transitions in conformance with current SMACNA standards relative to gauge, bracing, joints, etc. Minimum thickness of duct shall be 26-gauge sheet metal. Reinforce housings and ductwork over 30 inches with 1-1/4 inch angles not less than 5'-0" on centers, and close if required for sufficient rigidity to prevent vibration. Support horizontal runs of duct from strap iron hangers on centers not to exceed 8'-0". Do not support ceiling grid, conduits, pipes, equipment, etc. from ductwork. Coordinate routing of ductwork with other contractors such that piping, electrical conduit, and associated supports are not routed through the ductwork.

Provide pre-engineered roof duct supports by Cooper B-Line, Elite Components, ERICO, FNNW, Miro, PHD Manufacturing, PHP Systems, Roof Top Box, Unistrut (Akroak), Za Foster, or approved equal. Support ductwork on the roof with pre-engineered roof duct supports that rest on top of the roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with embedded support fixtures as required to support the duct. Provide steel pedestal type supports with minimum 18x18 inch thermoplastic or rubber base or 4 inch wide closed-cell polyethylene block with flange as required. Maintain minimum 6 inches clearance under duct to finished roof surface.

Construct non-VAV supply ducts to meet SMACNA positive pressure of 2 inches w.g. Construct Return, Outdoor and Exhaust ductwork upstream of fans to meet SMACNA negative pressure of 1 inch w.g. Construct exhaust ductwork downstream of fans to meet SMACNA positive pressure of 1 inch w.g.

Provide mill phosphatized or galvanized finish for exposed ductwork to be field painted. Shop treated sheet metal shall have galvanized metal primer applied in the shop after fabrication and prior to shipping.

Seal ductwork with heavy liquid sealant, Hardcoat Ironprip 601 or COWI-181, Design Polymer DP 1010 or DP-1030, Ductmate ProSeal or Fibersel, United McGill United Seal WB or Uni-Mastic duct sealer or approved equal, applied according to sealant manufacturer's instructions. Seal all longitudinal and transverse ductwork joints airtight to meet SMACNA Seal Class A. Tapes and mastics shall be listed and labeled in accordance with UL 181A.

Provide radius elbows, turns, and offsets with a minimum centerline radius of 1-1/2 times the duct width. Where space does not permit full radius elbows, provide short radius elbows with a minimum of two continuous splitter vanes. Vanes shall be the entire length of the bend. Provide mirrored elbows where space does not permit radius elbows, where shown on the drawings, or at the option of the contractor with the engineer's approval. Mirrored elbows less than 45 degrees shall not require turning vanes. Mirrored elbows 45 degrees and greater shall have single thickness turning vanes of same gauge as ductwork, rigidly fastened with guide strips in ductwork. Vanes for mirrored elbows shall be provided in all supply and exhaust ductwork and in return and outside air ductwork that has an air velocity exceeding 1000 fpm. Do not install vanes in grease ductwork. The use of square throat, radius heel elbows is prohibited. Remove and replace all installed elbows of this type with an approved elbow at an additional cost to the owner.

Connect ducts to vibrating equipment and when transitioning between two different metallic duct materials (e.g., aluminum to galvanized steel) by means of flexible connectors. Flexible connectors shall be neoprene coated glass cloth canvas connections, Duro-Dyne, Egan, Ventabloc or equal. Flexible connectors shall have a flame spread of 25 or less and smoke developed rating not higher than 50. Make airtight joints and install with minimum 1-1/2 inches slack.

Provide balancing dampers type where shown on drawings and wherever necessary for complete control of air flow. Dampers shall be constructed in accordance with SMACNA HVAC Duct Construction Standards. Dampers shall be manufactured by Casco, Greenheck, Louvers & Dampers, Nalor Industries, Potluff, Ruskin, Tamco, or approved equal. Rectangular volume dampers shall be opposed blade interlocking type. Round volume dampers shall be single-blade type consisting of circular blade mounted to a shaft. Balancing dampers shall be provided with locking hand quadrant.

Dampers shall be galvanized steel for standard air systems, aluminum for wet or non-corrosive environments and stainless steel for corrosive environments. Bearings shall be corrosion resistant, molded synthetic. Axles shall positively lock into the damper blade. Provide extended shafts and stand-off brackets for dampers installed in ductwork that is wrapped with insulation.

Provide balancing dampers at branch takeoffs from main ducts. For round branch ductwork takeoffs from rectangular mains, provide prefabricated 45 degree, high efficiency, rectangular/round branch takeoff fittings with integral manual balancing dampers and locking hand quadrant. Flexmaster model STO with BO3 option or equal. Omit damper at takeoff fitting when damper is located further downstream on branch.

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 blade assemblies, reinforced blade, self-lubricating bearing, and remote operator mounting bracket. Remote 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 positive, direct, two-way damper control with no sleeves, springs or screw adjustments to come loose after installation. Provide cable control to the damper in the remote operator location. Install damper in branch duct with diffuser frame and diffuser neck. Install remote operator on the back of the diffuser frame or side of a slot diffuser plenum. Support cable assembly to avoid bends and links in cable at manufacturer recommended intervals. Where approved by architect, a ceiling cup with cover plate may be used for access to cable operator. Provide round dampers by Metropolitan Air Technology model RT-200, Young's Regulator model 8020-1200, 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 control by Metropolitan Air Technology model RT-WGA, Young's Regulator model 270-275, or approved equal.

Round or oval ductwork shall be Fiat/Group Sampo, United, Heraulus Industries or equal, sheetmetal, with smooth interior surface, with low pressure (duct pressure class up to and including 2 inches w.g.) Round ductwork gauges 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 24"	24	22
25" thru 36"	22	20
36" thru 50"	20	18
52" thru 60"	18	16

Lewis & Lambert, Linc Industries Lindab Seal, Hranec Corporation, or approved equal factory-manufactured round ductwork and fittings may be substituted for round branch ductwork, at Contractors option. Heavy liquid sealant used 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 welded 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 less shall be conical type. Seal longitudinal and transverse ductwork joints airtight with heavy liquid sealant applied 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 inside 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 ducts shall be Fibertex type GRM, MAE, JPL type Silver Jacket, or equal (fire retardant polyethylene) protective vapor barrier, UL-181 Class 1, acoustically 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 center and within 6 inches of both ends. Bends shall not exceed a centerline radius of one duct diameter. Duct sag shall not exceed 1/2 inch supporting with in direct contact with the duct shall not be less than 1-1/2 inches in width.

Connect flexible duct to rigid 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-F.

## 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 "InnoFlue" 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 aluminum insulation. Reference Article "Plenum Insulation" for plenum-rated fire wrap. Coordinate vent material compatibility with the plenum manufacturer's installation instructions prior to purchasing and installation.

## E. AIR DEVICES

Provide air devices as scheduled on drawings, manufactured by Carnes, Krueger, Metaltaire, Nalor Industries, Price, Tivus, or Tuttle & 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 all 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 mark 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 0 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 elastic or neoprene seals, mechanically attached 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 duct 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.C. 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, CESCO Potluff, 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 FSD-60 constructed of galvanized steel, and all other applications is Ruskin CD-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 to allow 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, Penrnbury, 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 I 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 by 20 inches for personnel entry. Where an opening of this size is not possible, provide access opening 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-tight covers of same material as 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 E2336 where required to comply with IMC. Insulation shall be flexible wrap enclosure rated for minimum 2000 degrees Fahrenheit and zero clearance to combustibles. Insulation shall be fire resistant and low bio-persistent fiber totally encapsulated on all sides with aluminum foil. Insulation shall be as manufactured by Certaintec, Thermal Ceramics, Linflex 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. 2. Wet-bulb temperature shall be calculated using dry-bulb temperature and humidity and shall be accurate to +/- 2 degrees Fahrenheit. 3. Enthalpy shall be calculated using dry-bulb temperature and humidity and shall be accurate to +/- 3 BTU/lb over the range of 20 to 85 BTU/lb. 4. 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. 5. Pressure transmitters at a minimum shall be accurate to +/- 1 percent full scale with drift less than 1 percent full scale per year.

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 Coporation of America or owner approved testing and UL classified. Air leakage 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 Air. 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 finger holder welded to hood with integral drip trap and UL classified. Air exhaust 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 hood nozzles, wet chemical cylinders, piping, etc., and accessories to provide an approved, 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 sensing element acting at the exhaust hood duct collar winded 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. ELECTRIC UNIT HEATERS

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

### B. 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, AHRI 410 and NSF 37. Unit housing shall be constructed of galvanized steel, or galvanized steel with powder coated finish or stainless steel. Unit shall have air adjustment built into 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 copper, and stainless steel type overwrap tube 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 contactor, motor contactor, solid-state phase controller, toggle 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 filter banks. Furnish unit with built-in line voltage thermostat wired to air curtain junction box. Furnish with magnetic-type automatic duct switch, start-stop pushbutton switch, factory-installed time-delay relay, and mounting brackets and accessories. Furnish unit with remote 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, hard-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 L with H55 temper, straight piping lengths as manufactured by Reftek or Refrigerant Coupling Systems (RCS). Bends shall be made by factory trained personnel using tools approved by the manufacturer. Provide brazing rod for flexible systems. Provide 1/2 inch diameter, 1/8 inch wall thickness, including the following:
 

- Supply, return, and exhaust systems.
- Metal ducts, liners, and fittings.
- Nonmetal ducts and fittings.
- Air-duct accessories, including volume dampers, fire and smoke dampers, turning vanes, sound attenuators, and flexible connectors.

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 or field insulated with flexible unicellular 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 AS 8, Classification BAq-5; Silver (Ag) 40.4-46.0 percent, Zinc (Z) 23.0-27.0 percent, and Copper (Cu) 29.0-31.0 percent.
- AWS AS 8, Classification BCu-P-5; Phosphorus (P) 4.8-5.2 percent, Silver (Ag) 14.5-15.5 percent, and Copper (Cu) remainder.

Braze mechanical joints. Solder joints connecting to refrigerant vanes 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 materials.

Insulate refrigerant lines with flexible elastomeric insulation, Armetex or equal. Insulate suction and liquid lines between the expansion valve and the evaporator, and between the condenser and the expansion valve. 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 sealer. 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 refrigeration lines with dry nitrogen at a suitable pressure before making final connection at the condensing unit or coil to ensure against dirt, scale, or other foreign material 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 1 PSIG. Repeat the latter two steps for a single 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 trouble-shooting 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 sequence 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:

- LCD or LED display screen.
- Button or touchscreens interface.
- Display temperature.
- Display temperature setpoint.
- Adjust temperature setpoint.
- Limit temperature setpoint adjustment within plus or minus 3 degrees F.
- Display operating mode.
- Adjust operating mode.
- Adjust schedule, minimum seven day occupied/unoccupied.
- Security lockout.
- 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. Remote 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 TR21/TR21-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:

- Dry-bulb temperature sensors at a minimum shall be accurate to +/- 2 degrees Fahrenheit over the range of 40 to 80 degrees Fahrenheit.
- Wet-bulb temperature shall be calculated using dry-bulb temperature and humidity and shall be accurate to +/- 2 degrees Fahrenheit.
- Enthalpy shall be calculated using dry-bulb temperature and humidity and shall be accurate to +/- 3 BTU/lb over the range of 20 to 85 BTU/lb.
- 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.
- 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:

- Wired connection.
  - Temperature sensor.
  - Humidity sensor.
  - Rectangular volume dampers.
  - Blank capacitor.
- 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 show 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 timeswitches Intermatic Series FMD120 or equal programmable type with 7-day programming with up to two "ons" and "offs" per day. Battery backup shall provide 48 hours of 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 V 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. Contacts shall be single coil, electrically operated, mechanically held, double-break, silver-to-silver type protected by arcing contacts. Positive locking shall be obtained without the use of hooks, latches, or 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 Intertek 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

### General

#### 1.1 Summary

- Section includes Cx process requirements for the following HVAC systems, assemblies, and equipment:
  - Air handling units (Supply fans, return fan, packaged units, roof top units, specialized fans)
  - Exhaust fans
  - Fan coil units and terminal units
  - Condensing units
  - Make-Up air units
  - Electrostatic precipitator (ESP)
  - Ductwork and piping
  - Variable Frequency Drives
  - Condensate Pumps
- Default Requirements:
  - Section 019113 "General Commissioning Requirements" for general Cx process requirement and CxA responsibilities.

#### 1.2 Informal Submittals

- Construction Checklists: Draft construction checklists will be created by CxA for Contractor review.
- 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."
  - Refrigerant piping, including the following:
    - Refrigerant piping, fittings, and specialties.
    - Refrigerant charge.
    - General duty and specialty valves.
  - Meters and gages.
  - Air ductwork systems, including the following:
    - Supply, return, and exhaust systems.
    - Metal ducts, liners, and fittings.
    - Nonmetal ducts and fittings.
    - Air-duct accessories, including volume dampers, fire and smoke dampers, turning vanes, sound attenuators, and flexible connectors.
  - Duct-mounted access doors and panels.
  - Exhaust fans.
  - Electrostatic precipitator (ESP)
  - Make-Up air unit.
  - Air-handling equipment, including the following:
    - Fans and motors.
    - Indoor air-handling units with and without coils, dampers, and filters.
    - Outdoor air-handling units with and without coils, dampers, and filters.

### Execution

#### 3.1 Construction Checklists

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

#### 3.2 Construction Checklist Review

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

#### 3.3 Cx Testing Preparation

- 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.
- 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).

**COMcheck Software Version COMcheckWeb**  
**Mechanical Compliance Certificate**

**Project Information**

Energy Code: 2018 IECC  
 Project Title: Shake Shack - Mechanicsburg  
 Location: Philadelphia, Pennsylvania  
 Climate Zone: 4a  
 Project Type: Alteration

Construction Site: 5401 Carlisle Pike Mechanicsburg, Pennsylvania 17050  
 Owner/Agent: SHAKE SHACK  
 Designer/Contractor: HENDERSON ENGINEERS 8345 LENEKA DRIVE, SUITE 300 LENEKA, Kansas 66214 913.742.5000 WWW.HENDERSONENGINEERS.COM

**Mechanical Systems List**

**Quantity System Type & Description**

3 WH 1-3: Gas Instantaneous Water Heater, Capacity: 0 gallons, Input Rating: 199 kBtu/h No minimum efficiency requirement applies.

**Mechanical Compliance Statement**

Compliance Statement: The proposed mechanical alteration project 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 2018 IECC requirements in COMcheck version COMcheckWeb and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

DALTON JUENEMANN - DESIGNER *Dalton Juennemann* 01/03/2025  
 Name - Title Signature Date

**COMcheck Software Version COMcheckWeb**  
**Inspection Checklist**  
 Energy Code: 2018 IECC

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
C103.2 [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.

**Additional Comments/Assumptions:**

Section # & Req.ID	Plumbing Rough-In Inspection	Complies?	Comments/Assumptions
C404.5, C404.5.1, C404.5.2 [PL4]	Heated water supply piping conforms to pipe length and volume requirements. Refer to section details.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
C404.6.3 [PL7]	Pumps that circulate water between a heater and storage tank have controls that limit operation from startup to <= 5 minutes after end of heating cycle.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
C404.7 [PL8]	Demand recirculation water systems have controls that start the pump upon receiving a signal from the action of a user of a fixture or appliance and limits the temperature of the water entering the cold-water piping to 104°F.	<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:**

Section # & Req.ID	Mechanical Rough-In Inspection	Complies?	Comments/Assumptions
C402.2.6 [ME41]	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.
C403.7.2 [ME115]	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.
C403.7.5 [ME116]	Kitchen exhaust systems comply with replacement air and conditioned supply air limitations, and satisfy hood rating requirements and maximum exhaust rate criteria.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
C403.4.4 [ME63]	Heating for vestibules and air curtains with integral heating include automatic controls that shut off the heating system when outdoor air temperatures > 45°F. Vestibule heating and cooling systems controlled by a thermostat in the vestibule with heating setpoint <= 60F and cooling setpoint >= 80F.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
C408.2.2.1 [ME53]	Air outlets and zone terminal devices have means for air balancing.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
C403.5.1, C403.5.2 [ME123]	Refrigerated display cases, walk-in coolers or walk-in freezers served by remote compressors and remote condensers not located in a condensing unit, have fan-powered condensers that comply with Sections C403.5.1 and refrigeration compressor systems that comply with C403.5.2.	<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:**

Project Title: Shake Shack - Mechanicsburg Report date: 01/03/25  
 Data filename: Page 1 of 6

Section # & Req.ID	Rough-In Electrical Inspection	Complies?	Comments/Assumptions
C405.6 [EL26]	Low-voltage dry-type distribution electric transformers meet the minimum efficiency requirements of Table C405.6.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	
C405.7 [EL27]	Electric motors meet the minimum efficiency requirements of Tables C405.7(1) through C405.7(4). Efficiency verified through certification under an approved certification program or the equipment efficiency ratings shall be provided by motor manufacturer (where certification programs do not exist).	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	
C405.8.2.1 [EL28]	Escalators and moving walks comply with ASME A17.1/CSA B44 and have automatic controls configured to reduce speed to the minimum permitted speed in accordance with ASME A17.1/CSA B44 or applicable local code when not conveying passengers.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	
C405.9 [EL29]	Total voltage drop across the combination of feeders and branch circuits <= 5%.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	

**Additional Comments/Assumptions:**

1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)  
 Project Title: Shake Shack - Mechanicsburg Report date: 01/03/25  
 Data filename: Page 5 of 6

1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)  
 Project Title: Shake Shack - Mechanicsburg Report date: 01/03/25  
 Data filename: Page 2 of 6

Section # & Req.ID	Final Inspection	Complies?	Comments/Assumptions
C404.3 [FI11]	Heat traps installed on supply and discharge piping of non-circulating systems.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
C404.4 [FI25]	All piping insulated in accordance with section details and Table C403.11.3.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met.
C408.1.1 [FI7]	Building operations and maintenance documents will be provided to the owner. Documents will cover manufacturers' information, specifications, programming procedures and means of illustrating to owner how building, equipment and systems are intended to be installed, maintained, and operated.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	

**Additional Comments/Assumptions:**

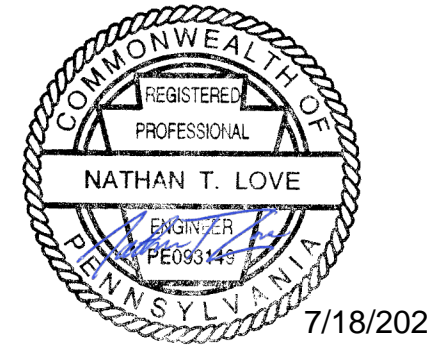
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 Project Title: Shake Shack - Mechanicsburg Report date: 01/03/25  
 Data filename: Page 6 of 6

1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)  
 Project Title: Shake Shack - Mechanicsburg Report date: 01/03/25  
 Data filename: Page 3 of 6

Project Title: Shake Shack - Mechanicsburg Report date: 01/03/25  
 Data filename: Page 3 of 6

1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)  
 Project Title: Shake Shack - Mechanicsburg Report date: 01/03/25  
 Data filename: Page 4 of 6

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 Data filename: Page 4 of 6



Brian S. Thomas,  
 Architect

DP3 Architects, Ltd.  
 15 South Main Street, Suite 400  
 Greenville, SC 29601  
 864.232.8200  
 www.DP3architects.com

**Project**

**SHAKE SHACK**  
 SHAKE SHACK #1695  
 MECHANICSBURG, PA

Project Number: 2450004630  
 Drawn By: DJ  
 Checked By: JH  
 Date: 01/27/2025

**Revisions**  
 1 27 JAN 2025 ISSUE FOR PERMIT  
 21 JUL 2025 ISSUE FOR CONSTRUCTION

**Drawing**

MECHANICAL  
 ENERGY CODE  
 COMPLIANCE

M630

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**FIRE SYSTEM INFORMATION - JOB#7104794**

FIRE SYSTEM NO	TAG	TYPE	SIZE	MAX FP	DESIGN FP	INSTALLATION	
						SYSTEM	LOCATION ON HOOD
1		TANK FS	4.0/4.0	40	36	FIRE CABINET RIGHT	RIGHT, HOOD 2

**GAS VALVE(S)**

FIRE SYSTEM NO	TAG	TYPE	SIZE	SUPPLIED BY
1		SC ELECTRICAL	1.000	CAPTIVEAIRE SYSTEMS

**NOTES**

- FIELD PIPE DROPS AS SHOWN
- PIPING, ELBOWS, TEES, AND NOZZLES SUPPLIED BY CAS.
- FIELD INSTALLED DROP: FACTORY WILL PROVIDE QTY 2 60IN LONG PIECES OF CHROME PLATED PIPING SHIPPED LOOSE TO BE FIELD-INSTALLED.
- SHIP LOOSE DROP: 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 FIRE SYSTEM COMPLIES WITH U.L. 300 REQUIREMENTS.
- OL-F NOZZLE PART NUMBER REPLACES 3070-3/8H-10-SS

JOB #: 7104794.  
JOB NAME: SHAKE SHACK-1543-MECHANICSBURG, PA(KITCHEN).

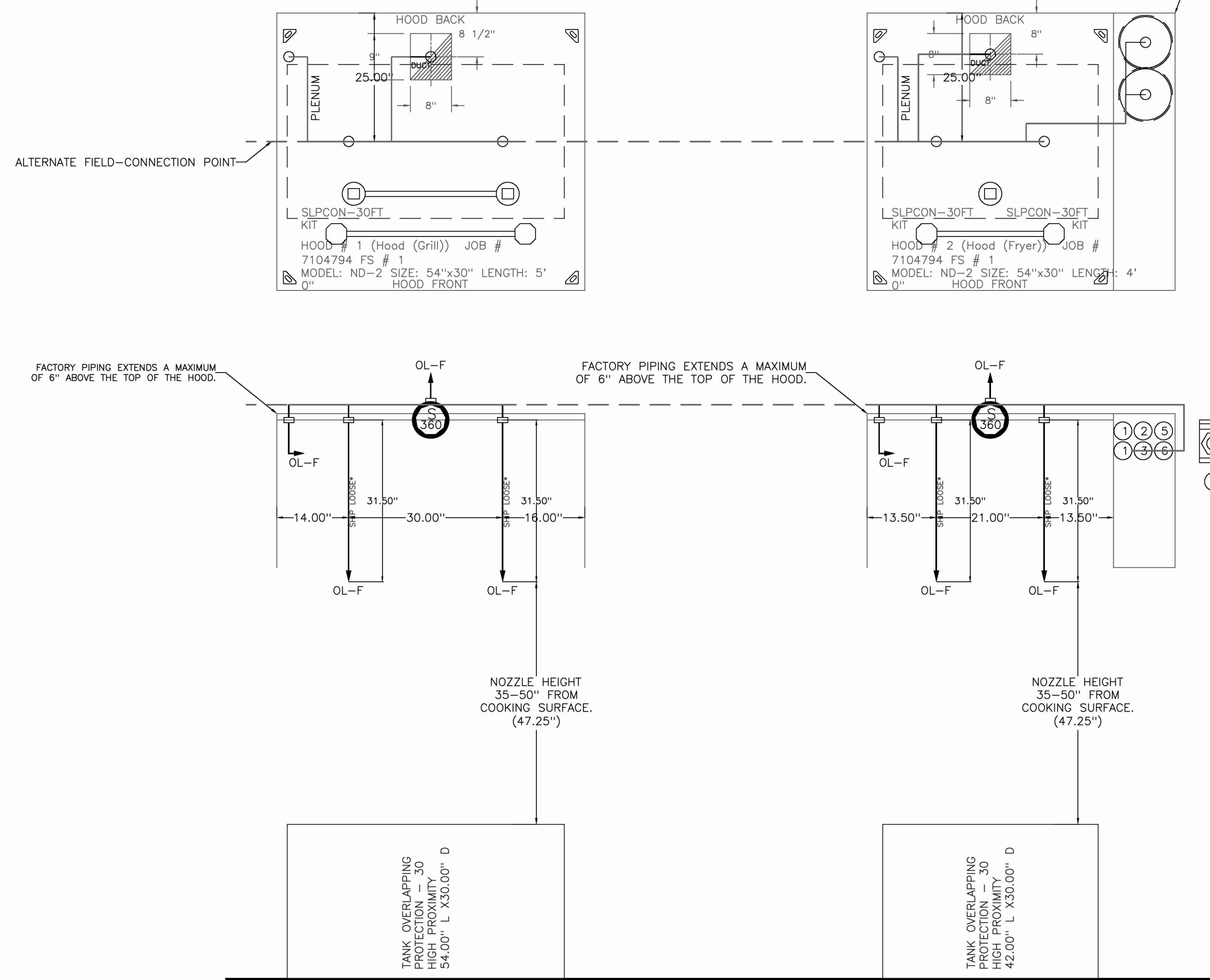
SYSTEM SIZE: TANK-SP-2 DESIGN FP: 36, MAXIMUM FP: 40.  
HOOD # 1 SIZE: 5' 0.00" LONG x 54" WIDE x 30" HIGH.  
RISER # 1 SIZE: 9" x 8"  
HOOD # 1 METAL BLOW-OFF CAPS INCLUDED.  
HOOD # 2 4' 0.00" LONG x 54" WIDE x 30" HIGH.  
RISER # 1 SIZE: 8" x 8"  
HOOD # 2 METAL BLOW-OFF CAPS INCLUDED.

- 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**

- 1 4 GALLON TANK.
- 2 PRIMARY ACTUATOR RELEASE.
- 3 SECONDARY ACTUATOR RELEASE.
- 4 PRESSURE SUPERVISION SWITCH.
- 5 PRIMARY HOSE ASSEMBLY.
- 6 SECONDARY HOSE ASSEMBLY.
- 7 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

REVISIONS	
DESCRIPTION	DATE

**CAPTIVEAIRE**

Eastern PA Mechanical  
225 E. City Line Avenue, Suite #103, Bala Cynwyd, PA, 19004 PHONE: (267) 604-4128 EMAIL: reg108@captiveaire.com

Seal

FOR REFERENCE ONLY

**Brian S. Thomas, Architect**

DP3 Architects, Ltd.  
15 South Main Street, Suite 400  
Greenville, SC 29601  
864.232.8200  
www.DP3architects.com

Project

**SHAKE SHACK #1695 MECHANICSBURG, PA**

Project Number 2450004630  
Drawn By DJ  
Checked By JH  
Date 01/27/2025

Revisions  
1 27 JAN 2025 ISSUE FOR PERMIT  
21 JUL 2025 ISSUE FOR CONSTRUCTION

DATE: 10/15/2024

DWG.#: 7104794

DRAWN BY: joe.shiiba

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

MASTER DRAWING

SHEET NO. 3

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**CAPTIVEAIRE DRAWINGS**

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**EXHAUST FAN INFORMATION -- JOB#7104794**

FAN UNIT NO	TAG	QTY	FAN UNIT MODEL #	MANUFACTURER	CFM	ESP	RPM	MOTOR ENCL	HP	BHP	PHASE	VOLT	FLA	DISCHARGE VELOCITY	WEIGHT (LBS)	SONES
1	KEF(GRILL)	1	DU50HFA	CAPTIVEAIRE	750	1,000	1423	TEAO-ECM	0.500	0.2980	1	208	3.8	285 FPM	79	14
2	KEF(FRYER)	1	DU50HFA	CAPTIVEAIRE	700	1,000	1408	TEAO-ECM	0.500	0.2890	1	208	3.8	266 FPM	79	13.6

**FAN OPTIONS**

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

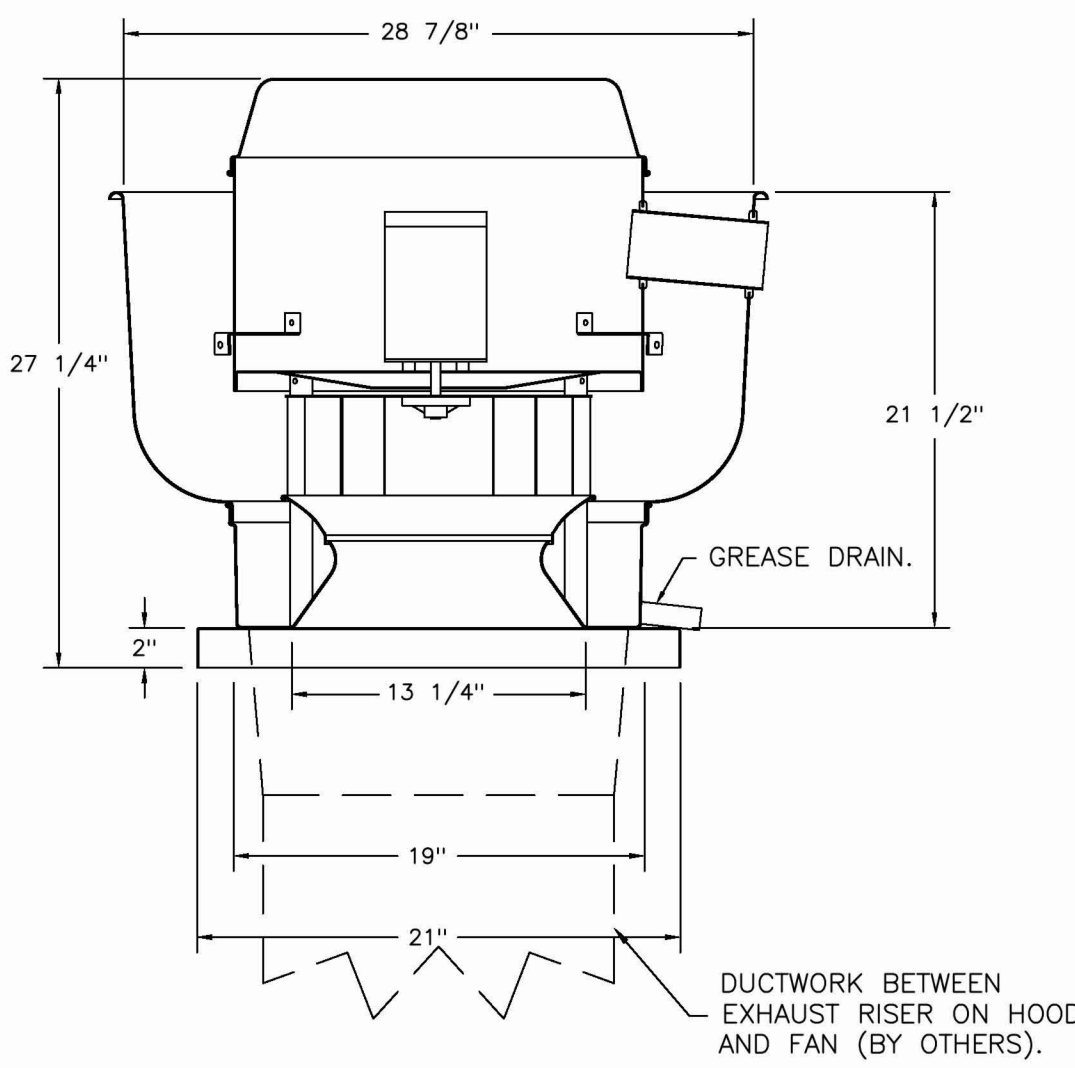
**FAN ACCESSORIES**

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

**CURB ASSEMBLIES**

NO	DN FAN	TAG	WEIGHT	ITEM	SIZE
1	# 1	KEF(FRYER)	31 LBS	CURB	19.500"W X 19.500"L X 20.000"H HINGED.
2	# 2	KEF(FRYER)	31 LBS	CURB	19.500"W X 19.500"L X 20.000"H HINGED.

FANS #1 (KEF(GRILL)), #2 (KEF(FRYER)) - DU50HFA EXHAUST FAN



TOP VIEW

**FEATURES:**

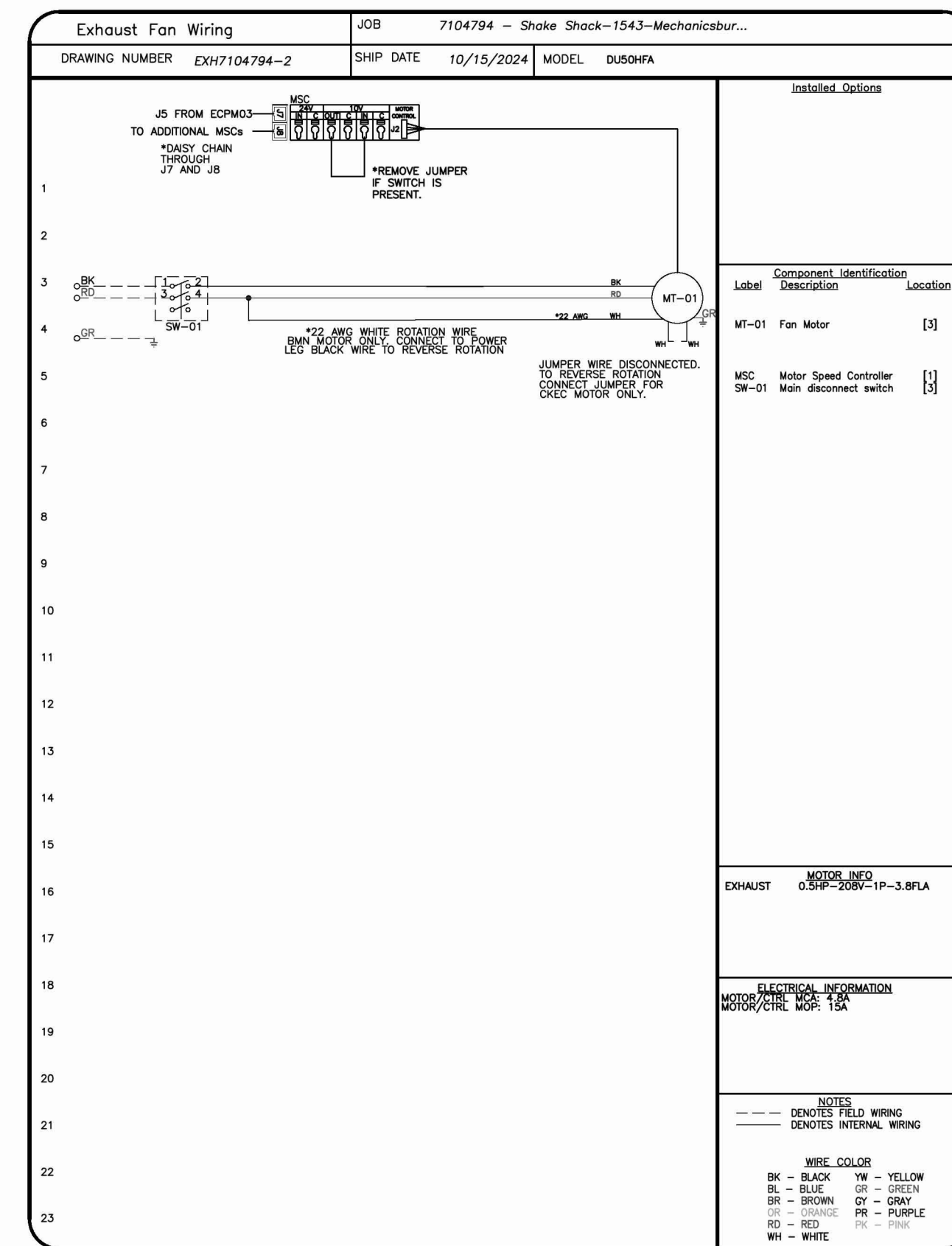
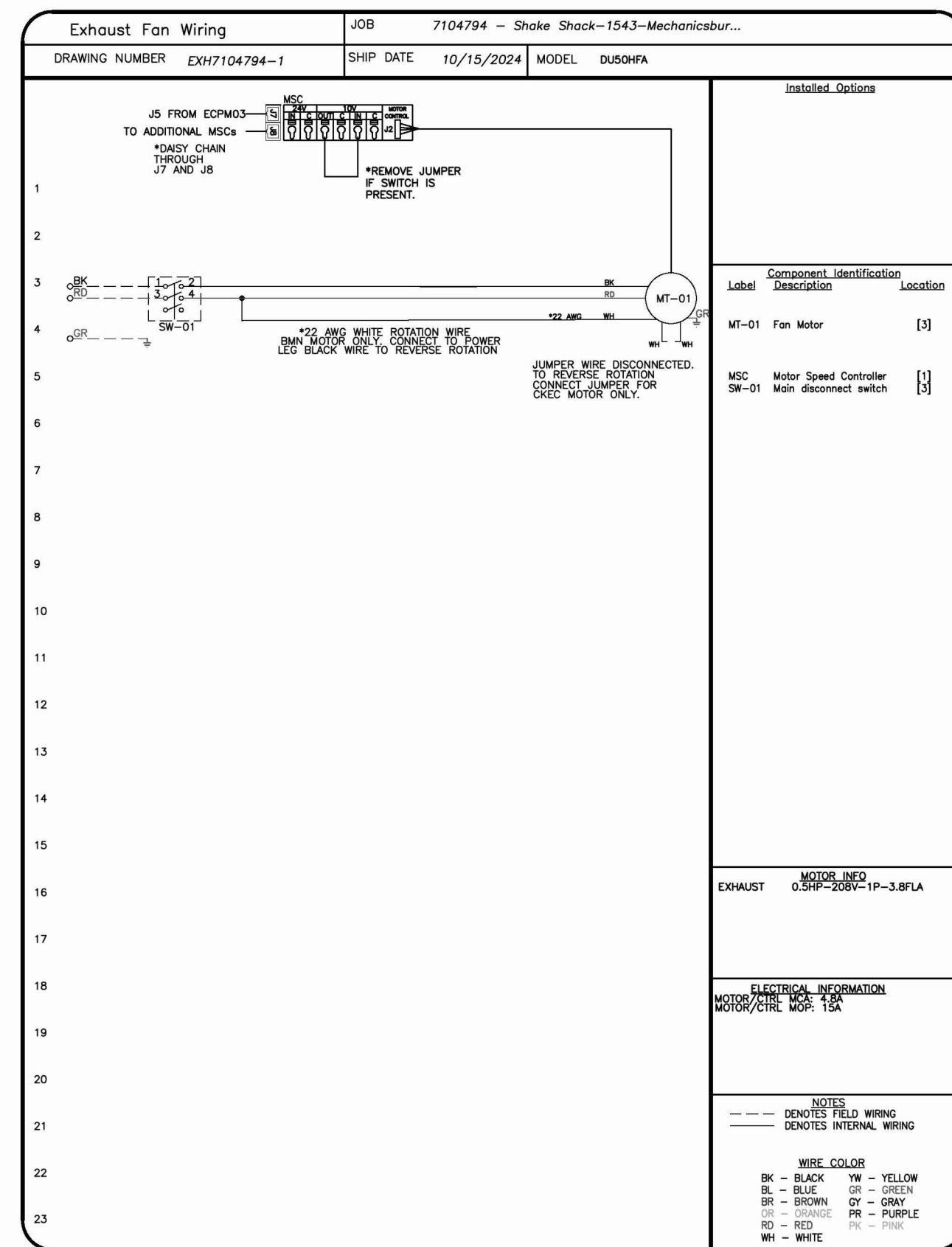
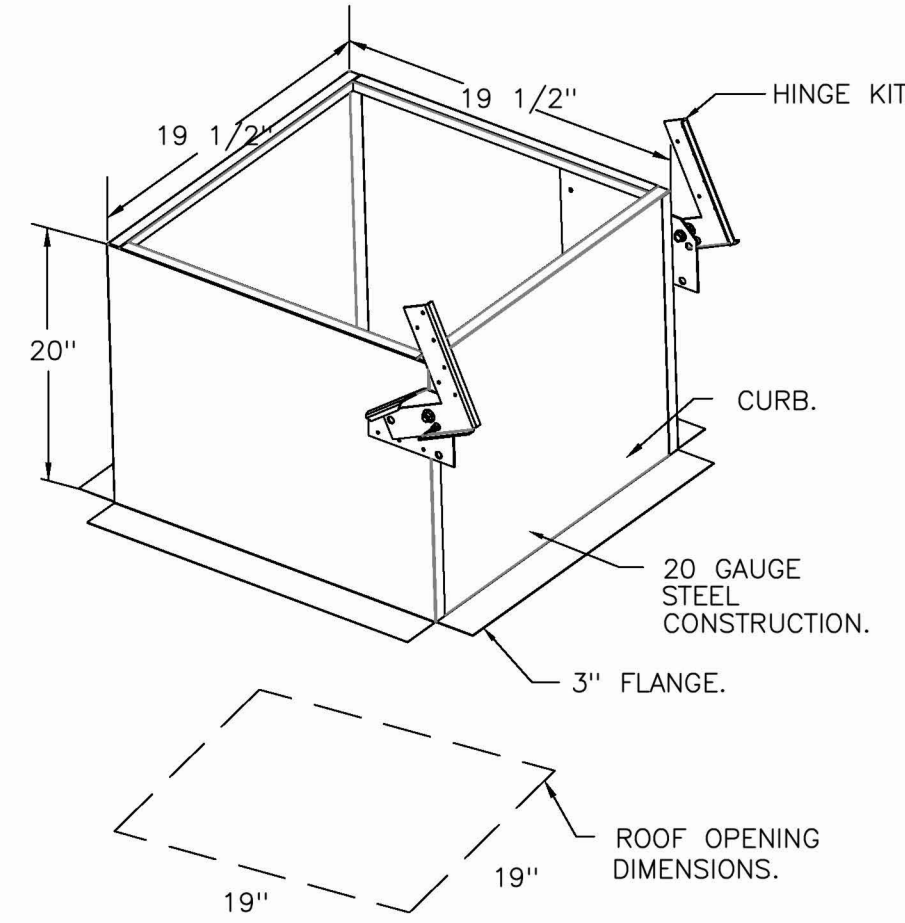
- DIRECT DRIVE CONSTRUCTION (NO BELTS/PULLEYS).
- ROOF MOUNTED FANS.
- RESTAURANT MODEL.
- UL755 AND UL752 AND ULC-5645
- VARIABLE SPEED CONTROL.
- INTERNAL WIRING.
- THERMAL OVERLOAD PROTECTION (SINGLE PHASE).
- HIGH HEAT OPERATION 300°F (149°C).
- GREASE CLASSIFICATION TESTING.
- NEMA 3R SAFETY DISCONNECT SWITCH.

**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.

**OPTIONS**

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



REVISIONS	
DESCRIPTION	DATE

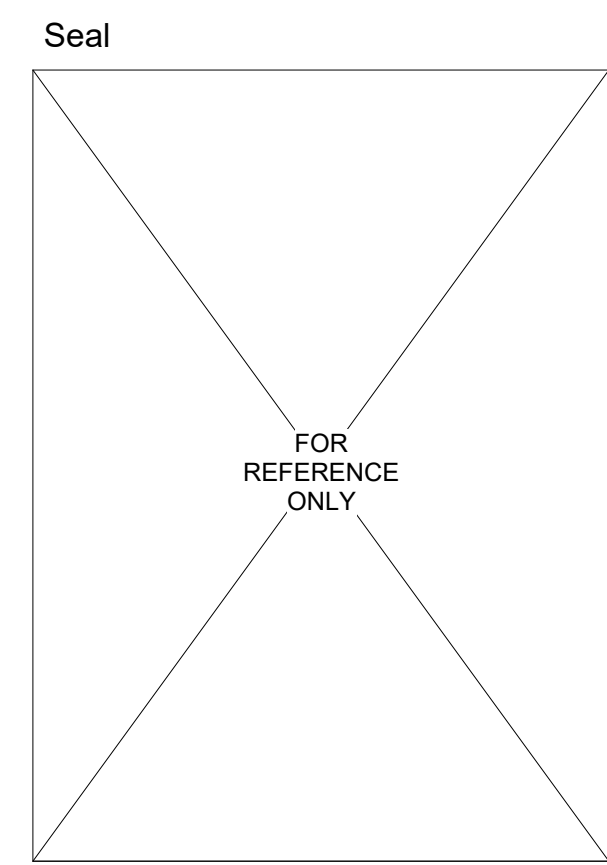
**CAPTIVEAIRE**

Eastern PA Mechanical  
www.captiveaire.com  
225 E. City Line Avenue, Suite #103, Bala Cynwyd, PA, 19004 PHONE: (267) 604-4128 EMAIL: reg108@captiveaire.com

Shake Shack-1543-Mechanicsburg, PA(Kitchen)

**DATE:** 10/15/2024  
**DWG.#:** 7104794  
**DRAWN BY:** joe.shiiba  
**SCALE:** 3/4" = 1'-0"  
**MASTER DRAWING**

**SHEET NO.**  
4



Brian S. Thomas,  
Architect

DP3 Architects, Ltd.  
15 South Main Street, Suite 400  
Greenville, SC 29601  
864.232.8200  
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Project

**SHAKE SHACK**  
SHAKE SHACK #1695  
MECHANICSBURG, PA

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Drawing

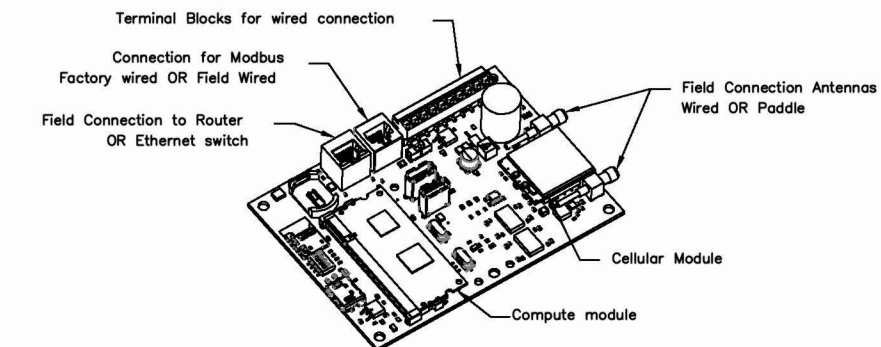
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ELECTRICAL PACKAGE -- JOB#7104794												
NO	TAG	PACKAGE #	LOCATION	SWITCHES		OPTION	FANS CONTROLLED					
				LOCATION	QUANTITY		FAN TAG	TYPE	HP	VOLT	FLA	
1		SC-320110MA	UTILITY CABINET RIGHT	UTILITY CABINET RIGHT	1 LIGHT	SMART CONTROLS THERMOSTATIC CONTROL W/ RELAT ON/OFF WITH SUPPLY	KEF(GRILL)	EXHAUST	1	0.50	208	3.8
				HOOD # 2	1 FAN		KEF(FRYER)	EXHAUST	1	0.50	208	3.8

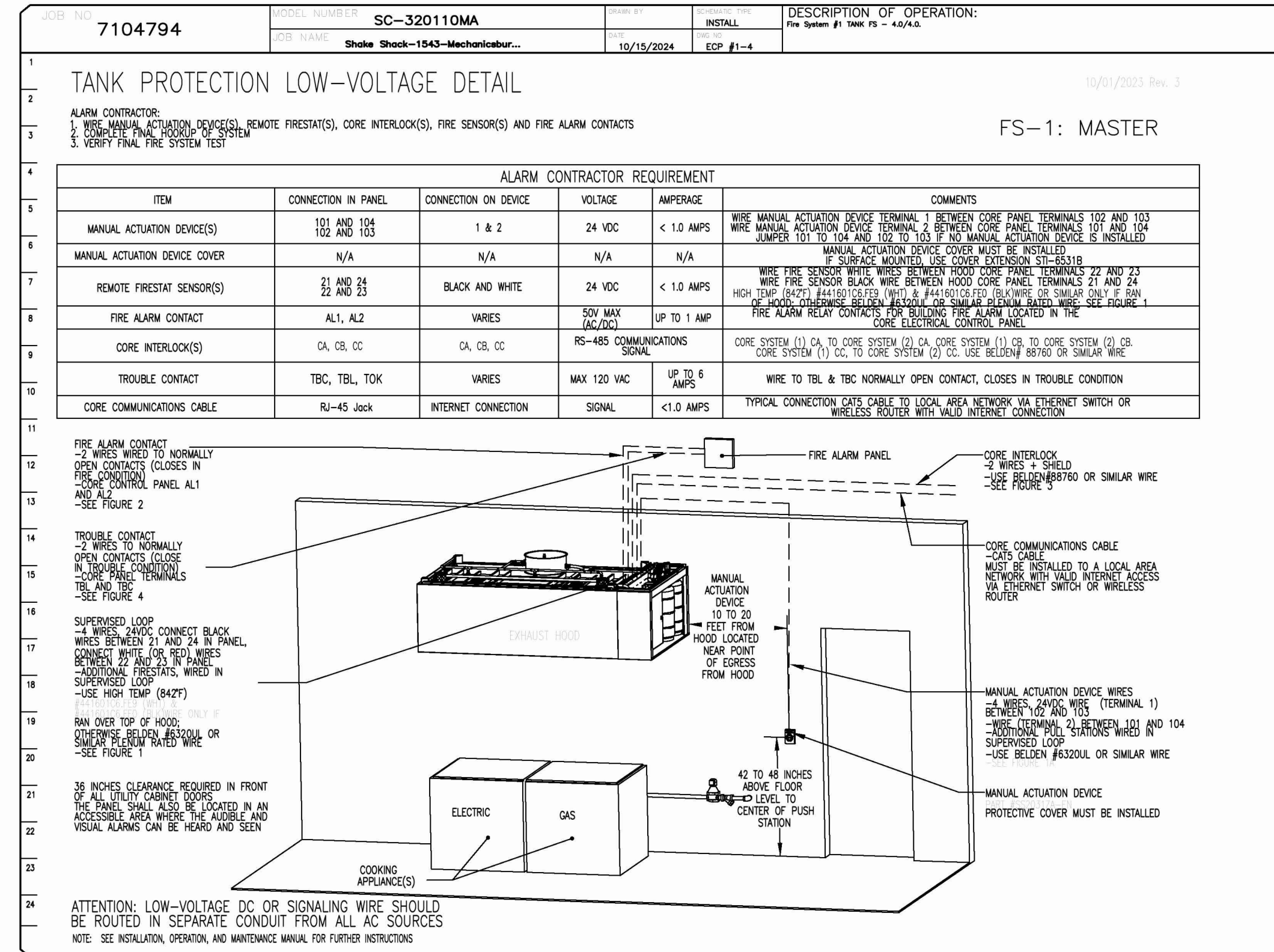
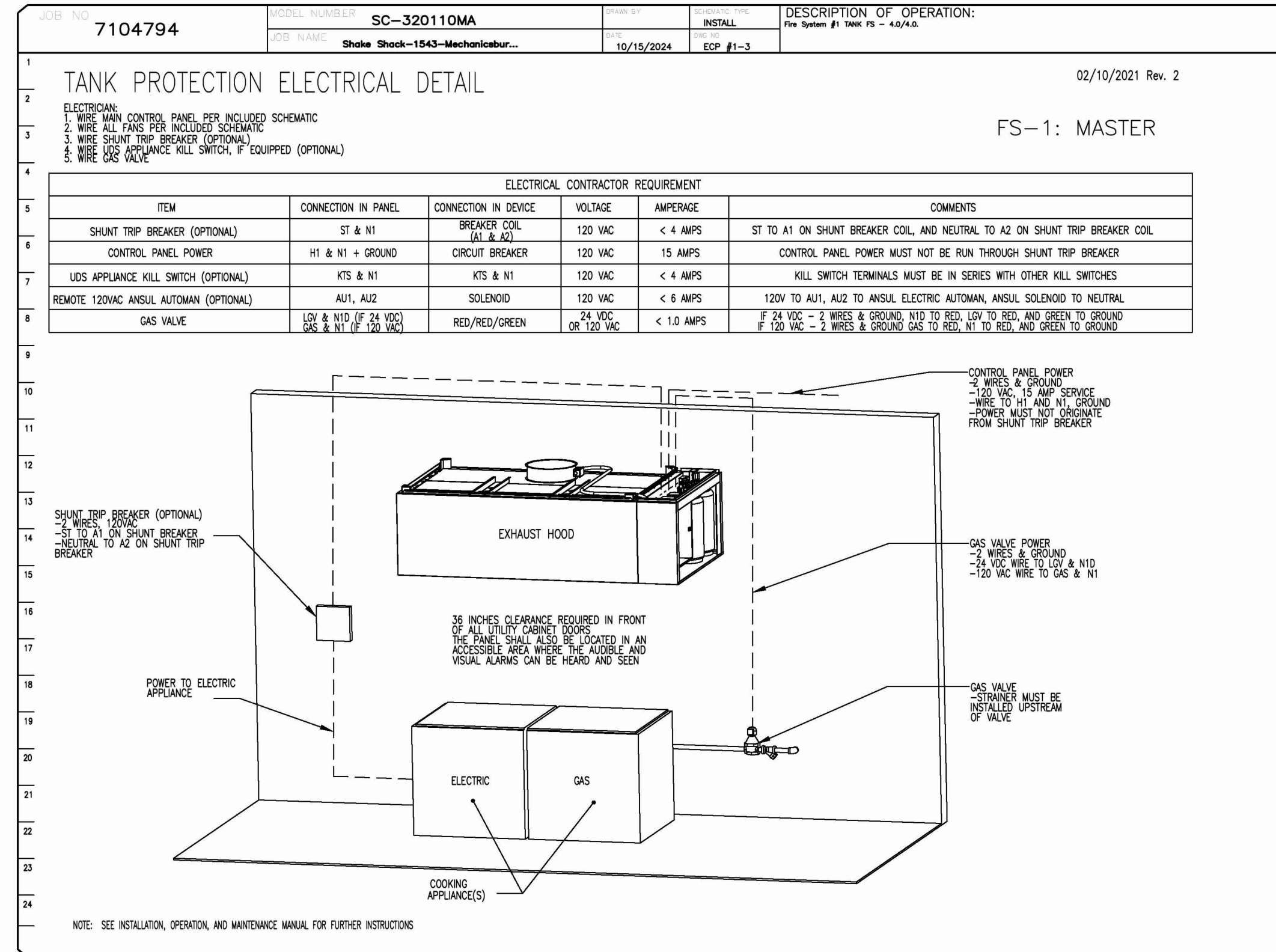
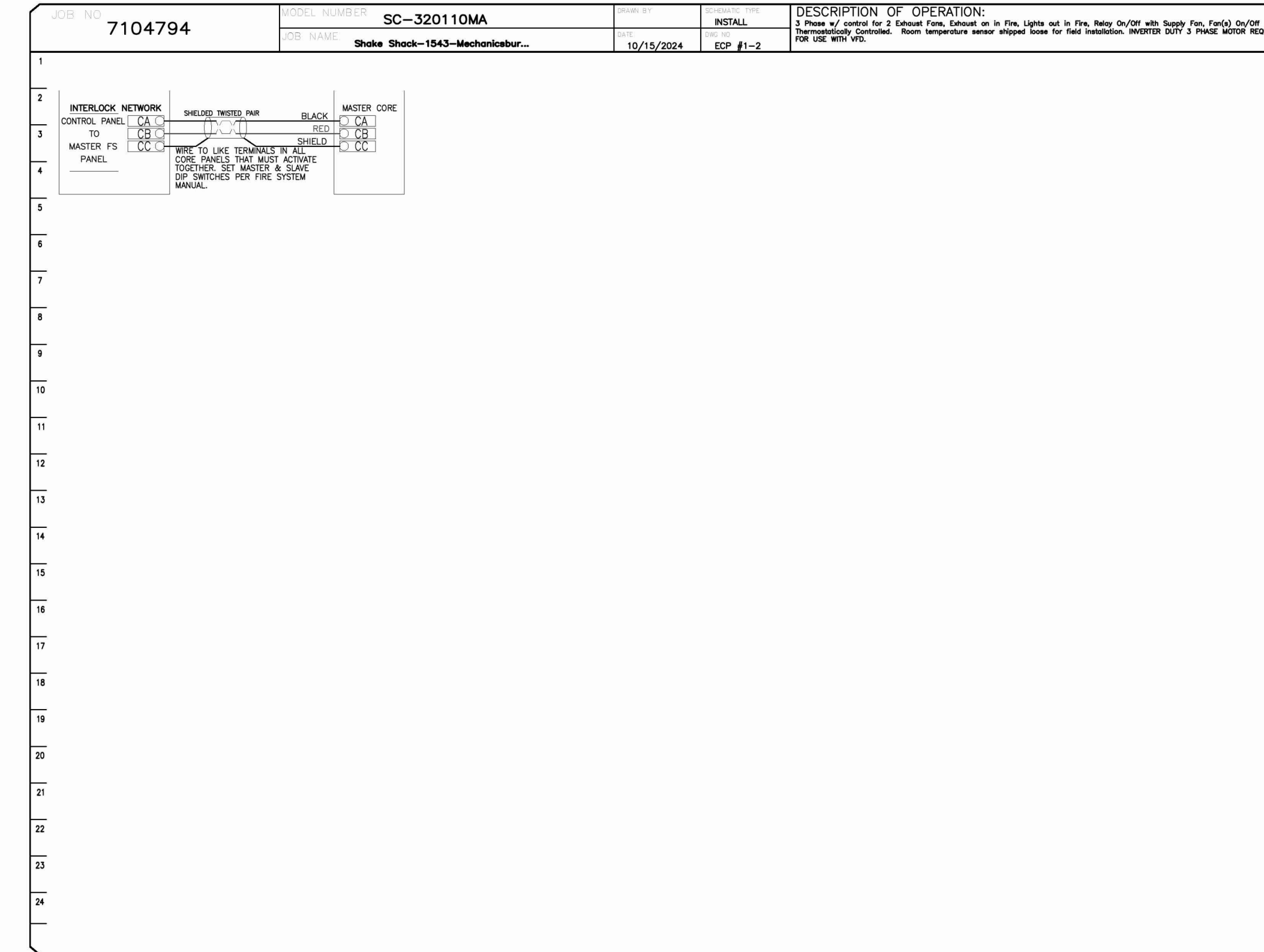
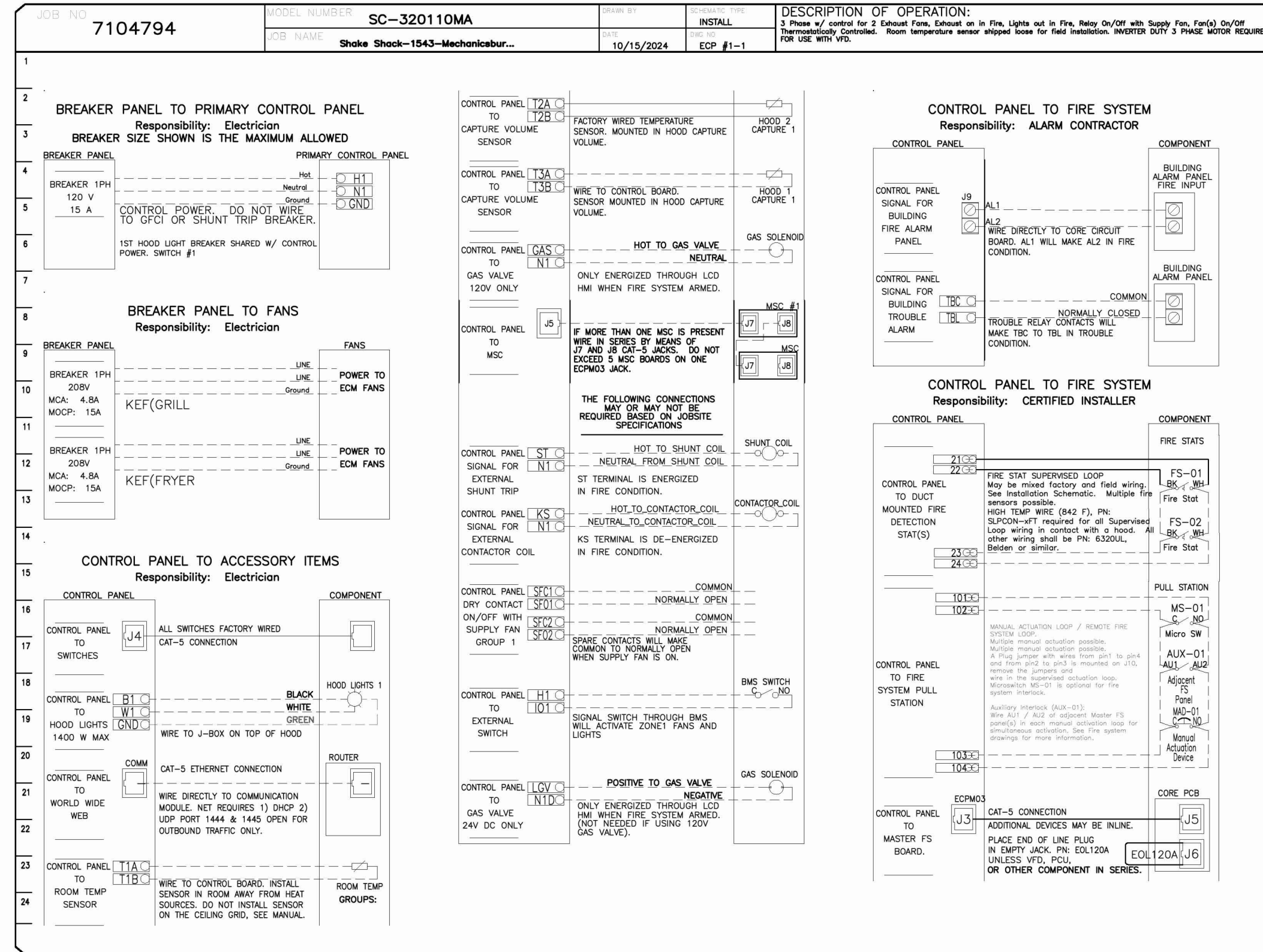


**CASlink Monitor and Control**

— Hood control panel to support communications to cloud-based Building Management Systems.  
 — Hood Control Panel to allow cloud-based Building Management System to monitor real time parameters outlined in MONITOR in the points list.  
 — Hood Control Panel to allow cloud-based Building Management System to control parameters outlined as CONTROL in the points list.  
 — Hood Control Panel to allow cloud-based Building Management System to implement SYSTEM ECONOMIZER control strategies for fully integrated Building Management.

**MONITORING AND CONTROL POINTS LIST**

SC Package	Function	SC Package	Function
Room Temperature	MONITOR	Room Temperature(s)	MONITOR
Duct Temperature(s)	MONITOR	Duct Temperature(s)	MONITOR
Main Discharge Temperature	MONITOR	Main Discharge Temperature	MONITOR
Return Air Discharge Temperature	MONITOR	Return Air Discharge Temperature	MONITOR
Fan Speed	MONITOR	Controler Faults	MONITOR
Fan Amperage	MONITOR	Fan Status	MONITOR
Fan Power	MONITOR	Fan Faults	MONITOR
VFD Faults	MONITOR	Fan Filter Clog Percentages	MONITOR
Controler Faults	MONITOR	Fire Condition	MONITOR
Fan Status	MONITOR	Building Pressure	MONITOR
Fan Filter Clog Percentages	MONITOR	Light Buttons(s)	MONITOR & CONTROL
Fire Condition	MONITOR	Wash Button	MONITOR & CONTROL
CORE Fire System	MONITOR		
Building Pressure	MONITOR		
Pressure Buttons	MONITOR & CONTROL		
Fan Status	MONITOR & CONTROL		
Light Buttons	MONITOR & CONTROL		
Wash Button	MONITOR & CONTROL		



**REVISIONS**

NO.	DESCRIPTION	DATE
1		
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**CAPTIVEAIRE**  
 Eastern PA Mechanical  
 225 E. City Line Avenue, Suite #103, Bala Cynwyd, PA, 19004 PHONE: (267) 604-4128 EMAIL: reg108@captivaire.com

**DATE:** 10/15/2024  
**DWG.#:** 7104794  
**DRAWN BY:** joe.shiiba  
**SCALE:** 3/4" = 1'-0"  
**MASTER DRAWING**

**SHEET NO.**  
5

Seal

FOR REFERENCE ONLY

Brian S. Thomas, Architect

DP3 Architects, Ltd.  
 15 South Main Street, Suite 400  
 Greenville, SC 29601  
 864.232.8200  
 www.DP3architects.com

SHAKE SHACK #1695  
 MECHANICSBURG, PA

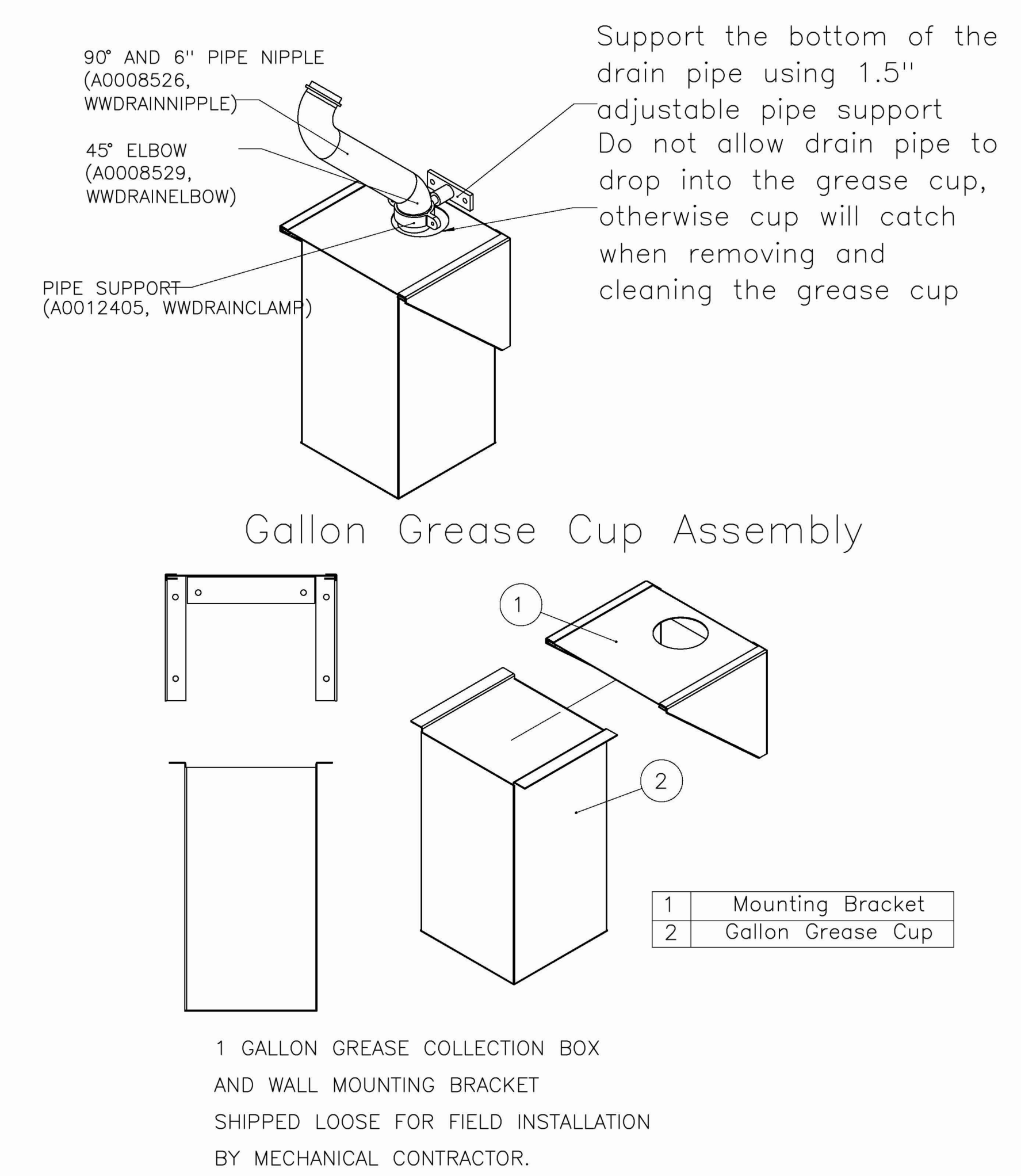
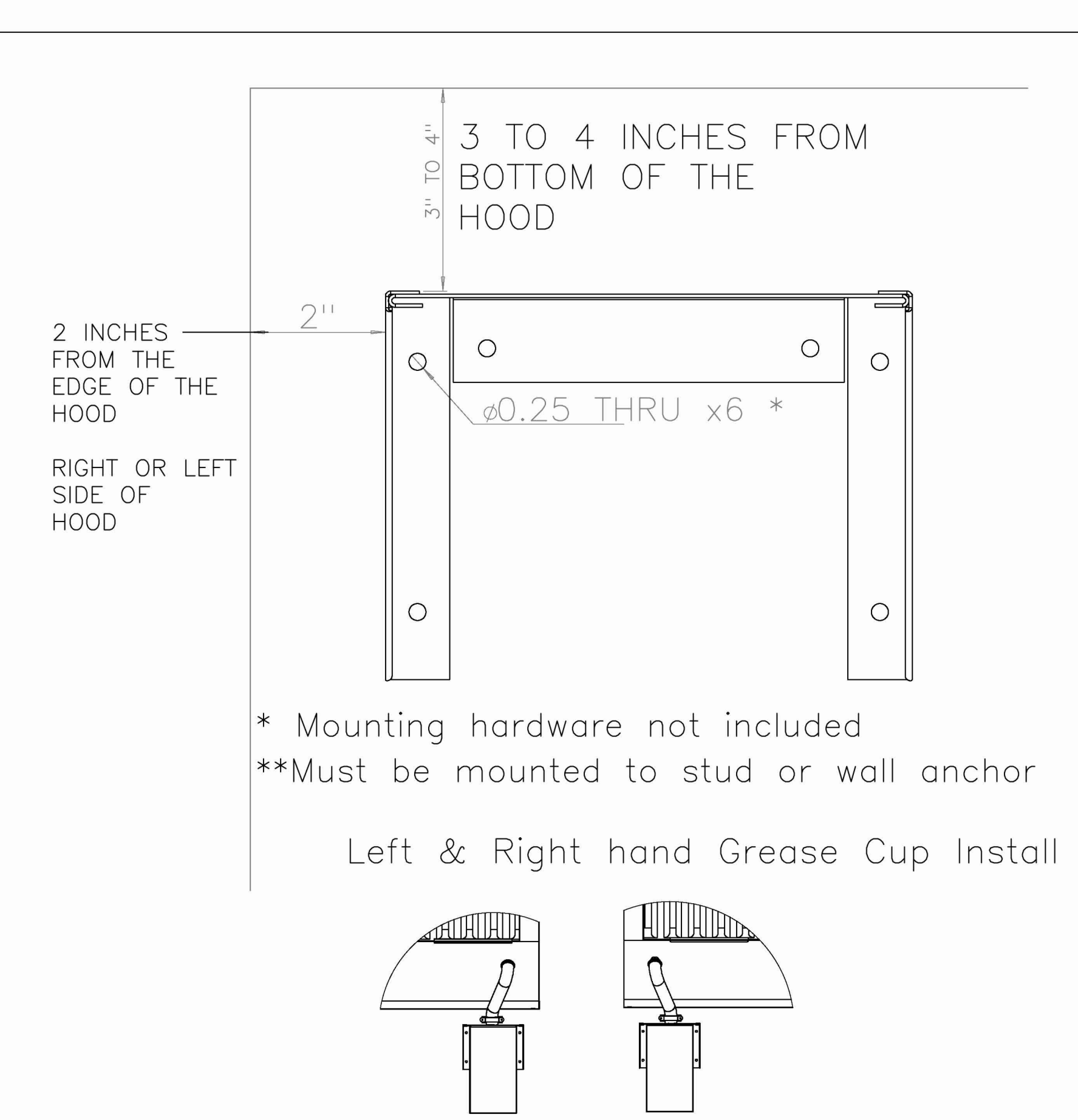
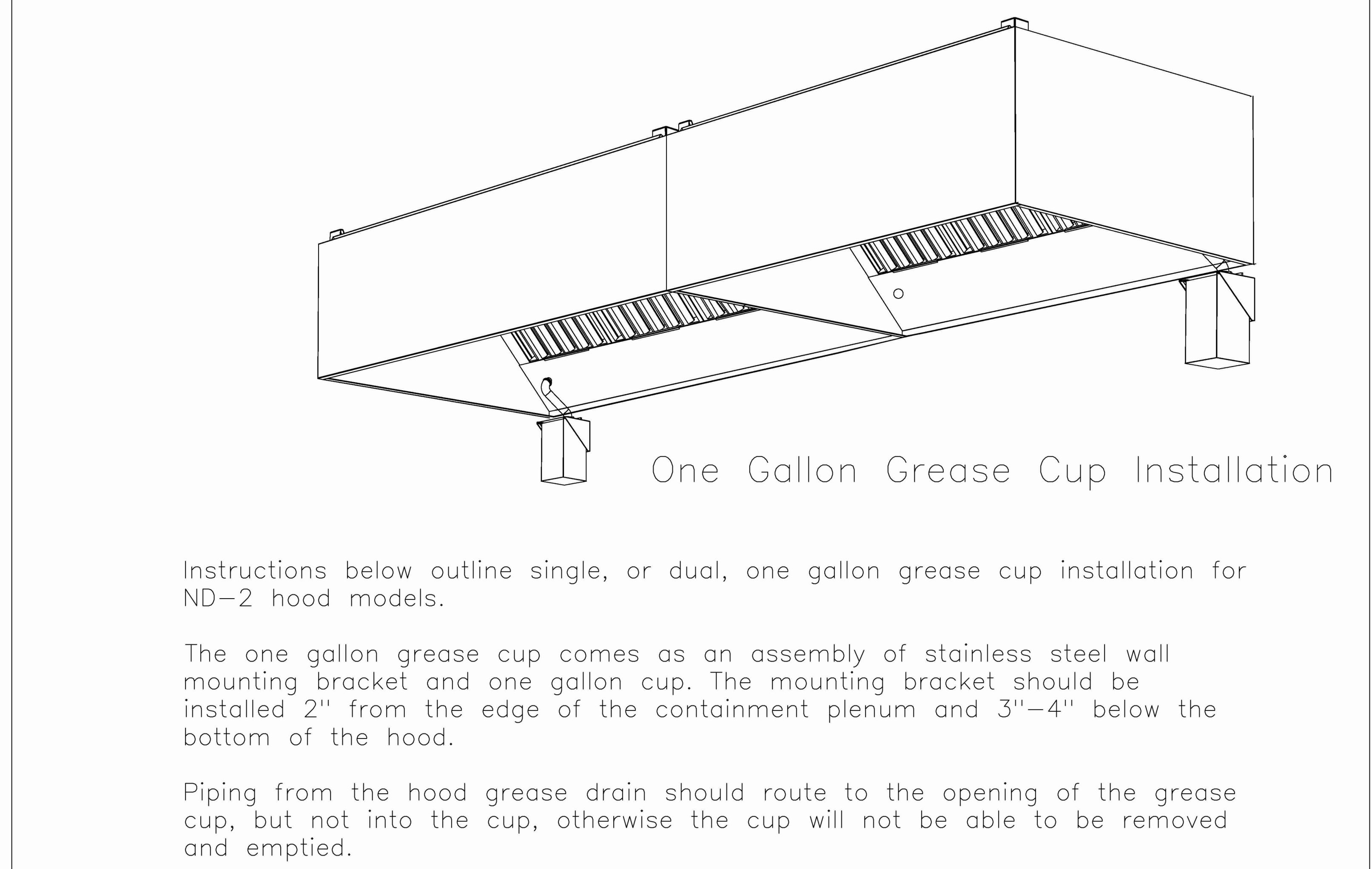
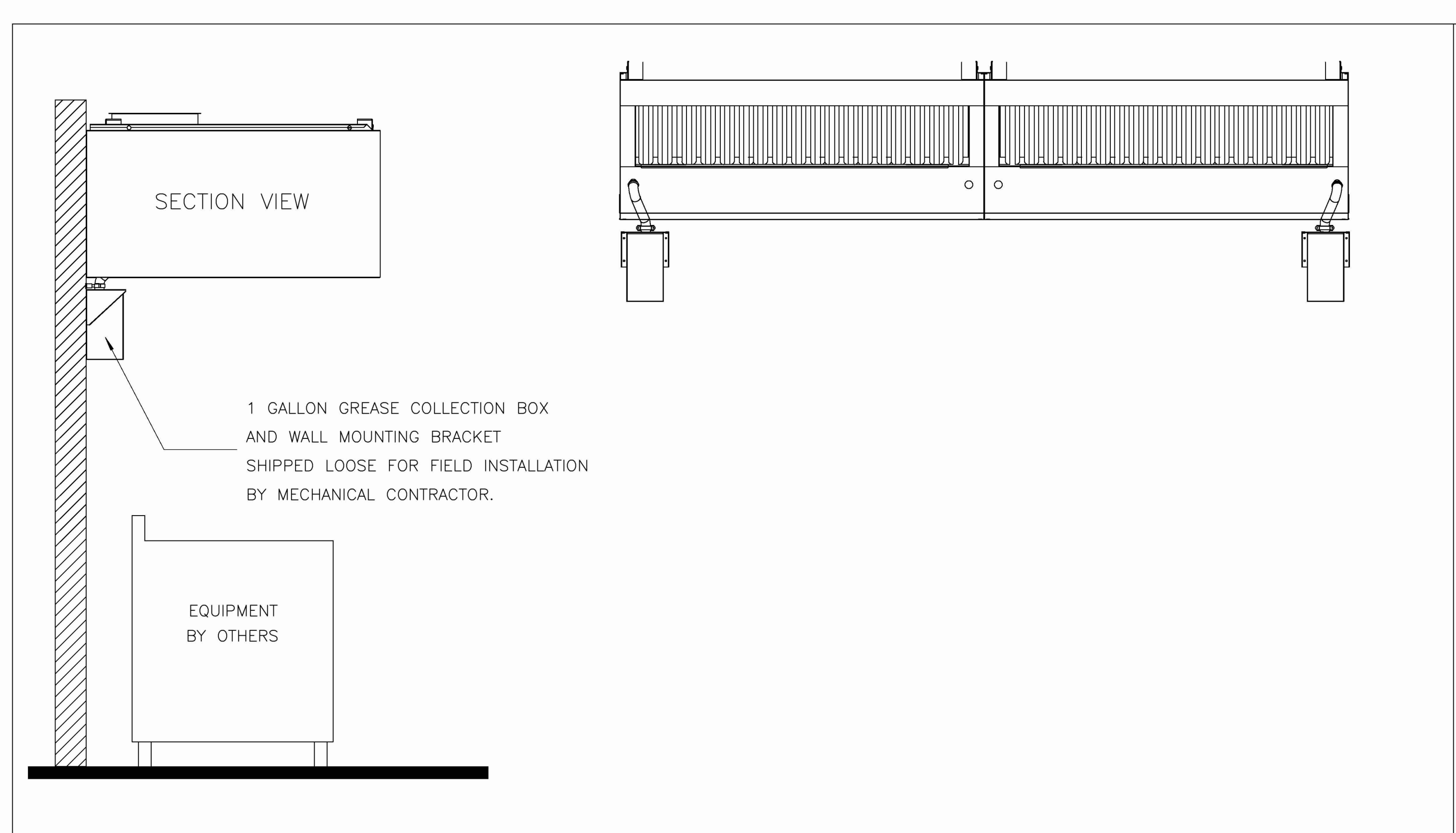
Project Number 2450004630  
 Drawn By DJ  
 Checked By JH  
 Date 01/27/2025

Revisions  
 1 27 JAN 2025 ISSUE FOR PERMIT  
 21 JUL 2025 ISSUE FOR CONSTRUCTION

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.

M705

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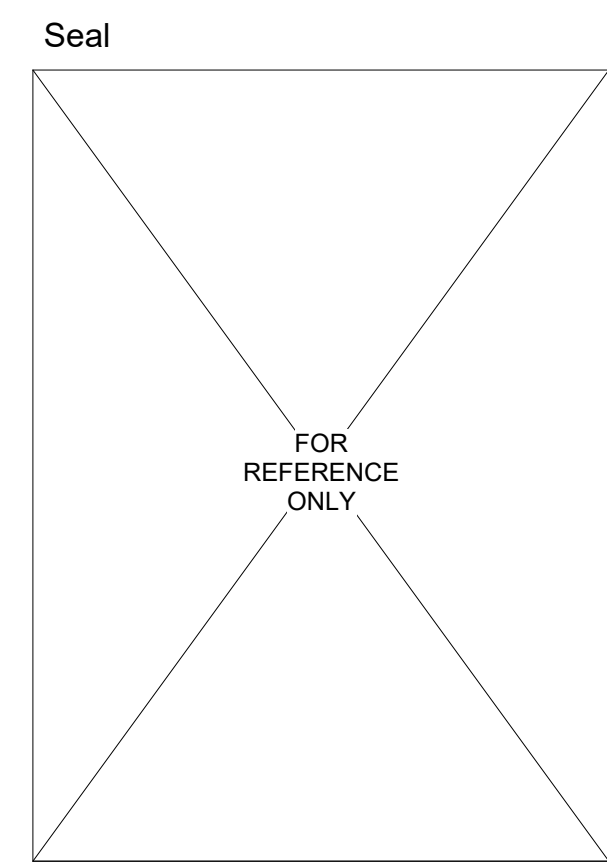
REVISIONS	
DESCRIPTION	DATE

**Eastern PA Mechanical**  
www.captiveaire.com  
225 E City Line Avenue, Suite #103, Bala Cynwyd, PA, 19004 PHONE: (267) 604-4128 EMAIL: reg.108@captiveaire.com

Shake Shack-1543-Mechanicsburg, PA(Kitchen)

**DATE:** 10/15/2024  
**DWG.#:** 7104794  
**DRAWN BY:** joe.shiiba  
**SCALE:** 3/4" = 1'-0"  
**MASTER DRAWING**

**SHEET NO.**  
6



Brian S. Thomas, Architect

DP3 Architects, Ltd.  
15 South Main Street, Suite 400  
Greenville, SC 29601  
864.232.8200  
www.DP3architects.com

Project

**SHAKE SHACK**  
SHAKE SHACK #1695  
MECHANICSBURG, PA

Project Number 2450004630  
Drawn By DJ  
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Drawing  
CAPTIVEAIRE  
DRAWINGS

M706

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	60	60	
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)	BTULB	Y	Y	E
ECONOMIZER FAULT DETECTION AND DIAGNOSTICS (FDD) SYSTEM		Y	Y	F, G
RELIEF - BAROMETRIC DAMPER		Y	N	
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
NOTES:				
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, MODULES AND SEQUENCES OF OPERATION. EACH UNIT SHALL CONTROL BASED ON ITS OWN INTERNAL SAFETIES, INTERLOCKS, 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.				
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.				
L. 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 SYSTEMS) 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.				

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
CRG	E.H. PRICE	RETURN GRILLE	80	STEEL	EGGCRATE	LAY-IN	24"x24"	30	0.06	A C D G I
CS01	E.H. PRICE	SUPPLY DIFFUSER	SCD	STEEL	SQUARE CONE	SURFACE	12"x12"	30	0.08	A B C D G I J
CS02	E.H. PRICE	SUPPLY DIFFUSER	SCD	STEEL	SQUARE CONE	LAY-IN	24"x24"	30	0.08	A B C D G I
CS03	E.H. PRICE	SUPPLY DIFFUSER	PDDR	STEEL	PERFORATED	LAY-IN	24"x24"	30	0.08	A C D G I
WSR	E.H. PRICE	SUPPLY REGISTER W/ DAMPER	520D	STEEL	LOUVERED FACE	WALL OR DUCT	(SEE PLANS)	30	0.08	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.										

PROJECT DESIGN CONDITIONS											
CLIMATE CONDITIONS			WEATHER STATION			REFERENCE			BUILDING OPERATING HOURS:		
WEATHER STATION:			CAPITAL CITY, PA, USA			2021 ASHRAE			MONDAY - FRIDAY		
CLIMATE ZONE:			4A						TBD BY OWNER		
ASHRAE HEATING:			11.0 "F DB						SATURDAY		
ASHRAE COOLING:			0.4% 92.2 "F DB 74.2 "F WB						SUNDAY		
DEHUMIDIFICATION:			1.0% 72.3 "F DP 121.3 gr/lb 80.2 "F DB						TBD BY OWNER		
SPACE / UNIT DESCRIPTION											NOTES
COOLING / DE-HUMIDIFICATION											
HEATING											
HUMIDIFICATION											
ZONE VENTILATION RESET											
SPACE OPERATING HOURS OCCUPIED / UNOCCUPIED											
DAYS OF THE WEEK											
DINING AREAS											
OFFICES											
MECHANICAL ROOM											
KITCHENBOH											
VESTIBULE											
NOTES:											
A. ZONE LEVEL SET POINT CONDITIONS SHALL BE AS SCHEDULED UNLESS OTHERWISE SCHEDULED OR NOTED ON THE DRAWINGS FOR ROOM SPECIFIC SPACE CONDITIONS.											
B. ZONE LEVEL OCCUPANCY HOUR SCHEDULE SHALL BE PER BUILDING OPERATING HOURS UNLESS OTHERWISE SCHEDULED.											
C. ZONE LEVEL CONTROLS SHALL BE CAPABLE OF OPERATING WITH INDEPENDENT OCCUPANCY SCHEDULES.											

SEQUENCE OF OPERATION									
A. FAN COIL UNIT CONTROL									
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. Duct mounted smoke detectors shall shutdown unit upon alarm.									
During unoccupied hours, cycle the fan coil unit supply fan and cooling or heating system to maintain unoccupied setback temperature set points. Outdoor motorized air damper shall be closed during unoccupied hours.									
Connect the Outdoor motorized air damper to the same time clock as the rest room 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 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 timeclock 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. Units scheduled with heating coils shall cycle the stages of heat to maintain room temperature setpoint.									
F. ELECTRIC UNIT HEATER CONTROL									
Unit heater shall be activated by unit mounted thermostat to maintain room temperature setpoint.									

ROOFTOP UNIT SCHEDULE (DX COOLING, NATURAL GAS HEAT)																															
SCHEDULE FOR REFERENCE ONLY. UNIT PROVIDED BY LANDLORD.																															
MARK	MANUFACTURER	MODEL	NOMINAL TONS	UNIT TYPE	SUPPLY FAN				COOLING COIL				GAS FIRED HEAT EXCHANGER				ELECTRICAL														
					CFM	ESP (IN)	NOM HP (V/N)	VFD (Y/N)	TH (MBH)	SH (MBH)	EAT ("F DB)	LAT ("F DB)	REFR TYPE (EER)	MIN EFF (IEER)	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	MOCP	DISC TYPE	WEIGHT (LBS)	NOTES			
(E)RTU-1	CAPTIVEAIRE	CAS-HVAC2-150-18-10T	10.0	SINGLE ZONE	2400	0.8	3.00	Yes	104.6	73.2	81.5	67.3	53.8	53.1	R454	11	18.6	3	96.2	(118.8)	81	47.9	85.0	2	900	208 / 3	61	70	NF	1978	A-P
(E)RTU-2	CAPTIVEAIRE	CAS-HVAC3-1200-24-15T	15.0	SINGLE ZONE	4400	0.8	5.00	Yes	173.8	126.4	79.3	65.7	53.2	52.6	R454	12	18.8	3	141.4	(174.6)	81	55.3	85.0	2	1100	208 / 3	75	90	NF	2623	A-P
*EQUIPMENT FURNISHED AND INSTALLED PER THE RESPONSIBILITY SCHEDULE. REF ARCHITECTURAL DRAWINGS. EQUIPMENT SHALL BE OBTAINED THROUGH SHAKE SHACK NATIONAL ACCOUNT. REFER TO T.12 / VENDOR LIST FOR MORE INFORMATION. MODEL NUMBERS AND NOMINAL TONS LISTED 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. REFER TO ROOFTOP UNIT CONTROL MATRIX FOR ADDITIONAL UNIT FEATURES, COMPONENTS, MODULES, ACCESSORIES, AND CONTROLS THAT SHALL BE PROVIDED WITH THE EQUIPMENT.																															
B. EQUIPMENT SIZED FOR 100°F AMBIENT TEMPERATURE.																															
C. PROVIDED WITH 2" MERV 13, EFFICIENT PLEATED THROWAWAY AIR FILTERS.																															
D. PROVIDED WITH FACTORY MOUNTED DISCONNECT INSTALLED ON SERVICE SIDE OF UNIT.																															
E. STARTERS FOR ALL MOTORS SHALL BE FURNISHED INTEGRAL WITH UNIT.																															
F. PROVIDED WITH FACTORY MOUNTED VARIABLE FREQUENCY DRIVE TO FACILITATE MODULATING FAN SPEED CONTROL.																															
G. COORDINATE SIZE OF CONDUCTOR TERMINATION LUGS WITH CONDUCTOR SIZES SHOWN ON ELECTRICAL DRAWINGS.																															
H. PROVIDED WITH 125 VAC, 20 AMP DUPLEX CONVENIENCE RECEPTACLE MOUNTED TO UNIT READY FOR FIELD WIRING WITH A COVER UL LISTED FOR WET AND DAMPER LOCATIONS WHEN IN USE.																															
I. SPECIFIED FAN ESP ACCOUNTS FOR DUCT LOSSES EXTERNAL TO UNIT.																															
J. PROVIDED WITH MOTOR HORSEPOWER TO OVERCOME INTERNAL UNIT STATIC PRESSURE DROP PLUS SPECIFIED EXTERNAL STATIC PRESSURE DROP. NOMINAL MOTOR HP SHALL BE NO LARGER THAN THE FIRST AVAILABLE NOMINAL MOTOR SIZE GREATER THAN THE REQUIRED BHP.																															
K. PROVIDED WITH 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.																															
L. SCHEDULED WEIGHT IS THE MAXIMUM ALLOWABLE OPERATING WEIGHT OF THE EQUIPMENT AND CURB.																															
M. COOLING COIL LAT IS LEAVING AIR TEMPERATURE OF COIL.																															
N. PROVIDE GUARDS TO PROTECT CONDENSER COIL FROM HAIL OR OTHER DAMAGE.																															
O. PROVIDED WITH HEATER TO MEET OR EXCEED SCHEDULED MINIMUM MBH OUTPUT. NOMINAL KW IS BASED ON LISTED MANUFACTURER'S STANDARD PRODUCT. COORDINATE EQUIPMENT POWER SUPPLY WITH ELECTRICAL CONTRACTOR IF DIFFERENT FROM THAT SCHEDULED.																															
P. SELECT EQUIPMENT FOR ELEVATION OF FEET ABOVE SEA LEVEL.																															

BUILDING AIR BALANCE SUMMARY NORMAL OPERATION				
UNIT NO.	SUPPLY (CFM)	OUTDOOR (CFM)	EXHAUST (CFM)	PERCENT O/A/S
RTU-1	2,400	900	--	38%
RTU-2	4,400	1,100	--	25%
FCU-1	420	40	--	10%
KEF-1	--	--	700	--
KEF-2	--	--	750	--
EF-1	--	--	150	--
TOTALS	7,220	2,040	1,600	--
TOTAL AIRFLOW AVAILABLE FOR PRESSURIZATION (CFM)				440
PERCENT POSITIVE PRESSURIZATION				21.6%

BUILDING AIR BALANCE SUMMARY ECONOMIZER MODE				
UNIT NO.	SUPPLY (CFM)	OUTDOOR (CFM)	EXHAUST (CFM)	PERCENT O/A/S
RTU-1	2,400	2,400	--	100%
RTU-2	4,400	4,400	--	100%
FCU-1	420	40	--	10%
KEF-1	--	--	700	--
KEF-2	--	--	750	--
EF-1	--	--	150	--
RELIEF RTU-1	--	--	1,500	--
RELIEF RTU-2	--	--	3,300	--
TOTALS	7,220	6,840	6,400	--
TOTAL AIRFLOW AVAILABLE FOR PRESSURIZATION (CFM)				440
PERCENT POSITIVE PRESSURIZATION				6.4%

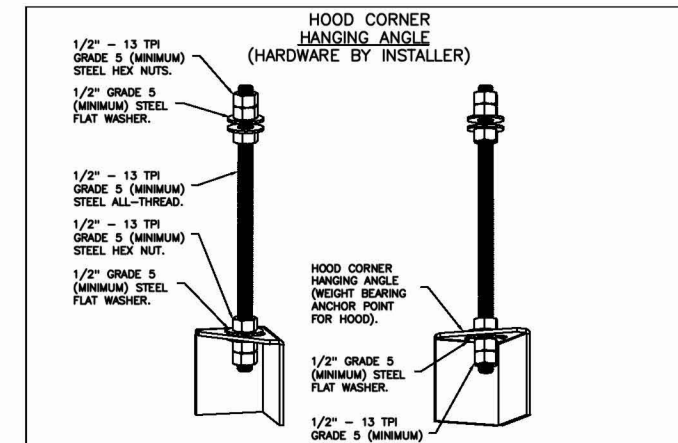
UNIT HEATER SCHEDULE (ELECTRIC)									
MARK	MANUFACTURER	MODEL	MIN OUT (MBH)	NOM (KW)	MIN NO OF STAGES	CFM	V/PH	DISC TYPE	NOTES
EUH-1	QMARK	CDF-558	17.1	5.0	1	300	208 / 1	NF	A C EFG
MODEL NUMBERS SHALL NOT BE CONSIDERED COMPLETE AND MATERIAL SHALL NOT BE ORDERED BY MANUFACTURER AND MODEL NUMBERS ONLY. 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 IN ARCHITECTURAL SET.									
B. MOUNT 8 FEET ABOVE FINISHED FLOOR WITHOUT OBSTRUCTING AIRFLOW.									
C. PROVIDE WITH UNIT MOUNTED THERMOSTAT.									
D. PROVIDE NECESSARY MOUNTING BRACKET AND ACCESSORIES FOR WALL MOUNTING.									
E. PROVIDE FACTORY MOUNTED DISCONNECT SWITCH INSTALLED ON SERVICE SIDE OF UNIT.									
F. SUPPORT UNIT AS RECOMMENDED BY UNIT MANUFACTURER.									
G. FURNISH WITH RECESSED MOUNTING ENCLOSURE.									
H. PROVIDE WITH WALL MOUNTED LINE VOLTAGE THERMOSTAT.									

FAN COIL UNIT SCHEDULE (HEAT PUMP)																									
SCHEDULE FOR REFERENCE ONLY. UNIT PROVIDED BY LANDLORD.																									
MARK	MANUFACTURER	MODEL	SUPPLY FAN				COOLING COIL				HEAT PUMP HEATING COIL				ELECTRICAL										
			CFM	ESP (IN)	NOM HP (V/N)	VFD (Y/N)	TH (MBH)	SH (MBH)	EAT ("F DB)	LAT ("F DB)	REFR TYPE (EER)	MIN EFF (IEER)	MIN NO STAGES	MIN OUT (MBH)	AMBIENT (MBH)	EAT ("F DB)	LAT ("F DB)	MIN OA (CFM)	V/PH	MCA	MOCP	DISC TYPE	STARTER	WEIGHT (LBS)	NOTES
FCU-1	CARRIER	40MBCO18	420	0.03	0.06	11.4	10.0	76.7	63.8	55.0	54.7	R410A	9.4	9.4	11	64	85	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 COOLING, 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.																									

CONDENSING UNIT SCHEDULE (HEAT PUMP)																	
SCHEDULE FOR REFERENCE ONLY. UNIT PROVIDED BY LANDLORD.																	
MARK	SERVICE	MANUFACTURER	MODEL	COOLING CAPACITY			HEATING CAPACITY			ELECTRICAL							
				REFR TYPE (MBH)	TH (EER)	(SEER)	CAP (MBH)	AMBIENT (DB °F)	COP 47°F (HSPF)	MCA	MOCP	V/PH	DISC TYPE	STARTER	WEIGHT (LBS)	NOTES	
CU-1	FCU-1	CARRIER	38MARBQ18AA3	R410A	11.4	12.5	20	9.4	11.0	3.43	10.5	18	25	208 / 1	NF	118	A-H
*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 (ELECTRIC HEAT)											
MARK	AREA SERVED	MANUFACTURER	MODEL	LENGTH (IN)	MAX AIRFLOW (CFM)	HEATING CAPACITY (KW)	UNIT SPECS			ELECTRICAL	
							FAN QUANTITY	MOTOR HP	V/PH	DISC TYPE	STARTER
AC-1	SERVED ENTRY	MARS	STD2	36"	1379	0.0	1	0.50	120 / 1	NF	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. EQUIPMENT FURNISHED AND INSTALLED PER THE RESPONSIBILITY SCHEDULE. REF ARCHITECTURAL DRAWINGS.											
B. MOUNT UNIT PER MANUFACTURER'S RECOMMENDATIONS TO FACE OF WALL AND SUPPORT VERTICALLY.											
C. PROVIDE INTEGRAL STARTER AND DISCONNECT SWITCH.											
D. REFER TO SEQUENCE OF OPERATION FOR UNIT CONTROLS.											
E. PROVIDE AIR CURTAIN WITH MAGNETIC NORMALLY CLOSED DOOR LIMIT SWITCH FOR INSTALLATION ON DOOR.											
F. PROVIDE WITH INTEGRAL THERMOSTAT.											
G. PROVIDE WITH TIME DELAY MICROSWITCH WITH ADJUSTABLE DELAY TIMES PRE MOUNTED IN THE AIR CURTAIN CONTROL PANEL.											

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HANGING ANGLE DETAILS			
HOOD STYLE / MODEL	450 DEGREES CFM/FT.	600 DEGREES CFM/FT.	700 DEGREES CFM/FT.
CANOPY ND-3	150	200	250
CANOPY ND-2 w/ END PANELS	105	140	175
SCOPED ISLAND ND-2	228	294	-
ISLAND ND-2M	269	300	350
ISLAND ND-2I	346	422	475

ETL HOOD LISTING DETAIL			
EXHAUST CFM = LENGTH OF HOOD x SPAN/4 FT. (S40)			
SUPPLY CFM = EXHAUST CFM x PERCENTAGE REQUIRED			
TOTAL DUCT AREA (sq. ft.) = 144 x CFM			
DUCT LENGTH = TOTAL DUCT AREA / DUCT WIDTH			

**CALCULATIONS UTILIZED**

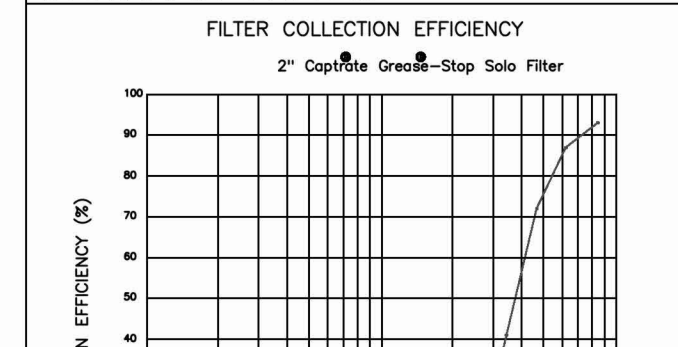
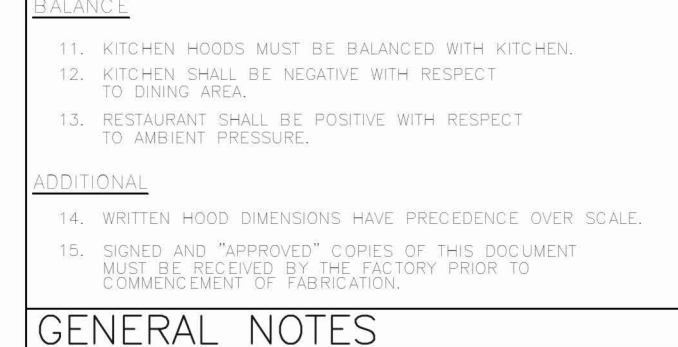
CAPTIVE-AIRE HOODS BUILT IN COMPLIANCE WITH:

Listed under ETL File number 3054804-001/002

BUILDING CODES	
CAPTIVE-AIRE HOODS HAVE OPTIONAL CLEARANCE REDUCTION SYSTEMS AVAILABLE AS FOLLOWS:	
MATERIAL	CLEARANCE REDUCTION SYSTEM
NON-COMBUSTIBLE	NONE REQUIRED
LIMITED-COMBUSTIBLE	3" UNINSULATED STANDOFF
COMBUSTIBLE	1" INSULATED STANDOFF

- CLEARANCE TO COMBUSTIBLES**
- INSTALLATION**
1. ALL ELECTRICAL "FIELD" CONNECTIONS AND RELATED INTERCONNECTIONS BY ELECTRICAL CONTRACTORS.
  2. ALL PLUMBING "FIELD" CONNECTIONS AND RELATED INTERCONNECTIONS BY PLUMBING CONTRACTORS.
  3. HANGING BRACKETS LOCATED AND WELDED AS SHOWN ON PLANS. ALL OTHER HANGING MATERIALS PROVIDED BY INSTALLING CONTRACTORS.
  4. ALL CONNECTIONS FROM CAPTIVE-AIRE HOOD PER MECHANICAL CONTRACTOR'S PLANS.
  5. EXHAUST EQUIPMENT TO SHUT OFF IN EVENT OF FIRE.
  6. EXHAUST FANS TO TURN ON IN EVENT OF FIRE.
  7. ALL LIGHT FIXTURES SHOWN INSTALLED BY CAPTIVE-AIRE AND FACTORY PROVIDED. INTERCONNECTIONS BETWEEN HOODS AND FIXTURES ARE BY ELECTRICAL CONTRACTOR. LAMPS FOR LIGHT FIXTURES BY INSTALLING CONTRACTORS.
  8. SEISMIC RESTRAINTS ARE RESPONSIBILITY OF INSTALLING CONTRACTOR.
  9. INSTALLING CONTRACTORS ASSUME ALL RELATED RESPONSIBILITY FOR VIOLATIONS OF INTERNATIONAL DATA CONTAINED ON THESE DOCUMENTS FOR ACCURACY, INTEGRATION AND COMPLETION OF THESE REQUIREMENTS IN THEIR RESPECTIVE RELEASE FOR PRODUCTION OF EQUIPMENT SHOWN.

- GENERAL NOTES**
11. KITCHEN HOODS MUST BE BALANCED WITH KITCHEN.
  12. KITCHEN SHALL BE NEGATIVE WITH RESPECT TO OUTSIDE AIR.
  13. RESTROOM SHALL BE POSITIVE WITH RESPECT TO AMBIENT PRESSURE.
  14. WRITTEN HOOD DIMENSIONS HAVE PRECEDENCE OVER SCALE.
  15. WRITER AND FABRICATOR CORNER OF THIS DOCUMENT MUST BE CHECKED BY THE FABRICATOR PRIOR TO FABRICATION.



**FILTER DETAIL**

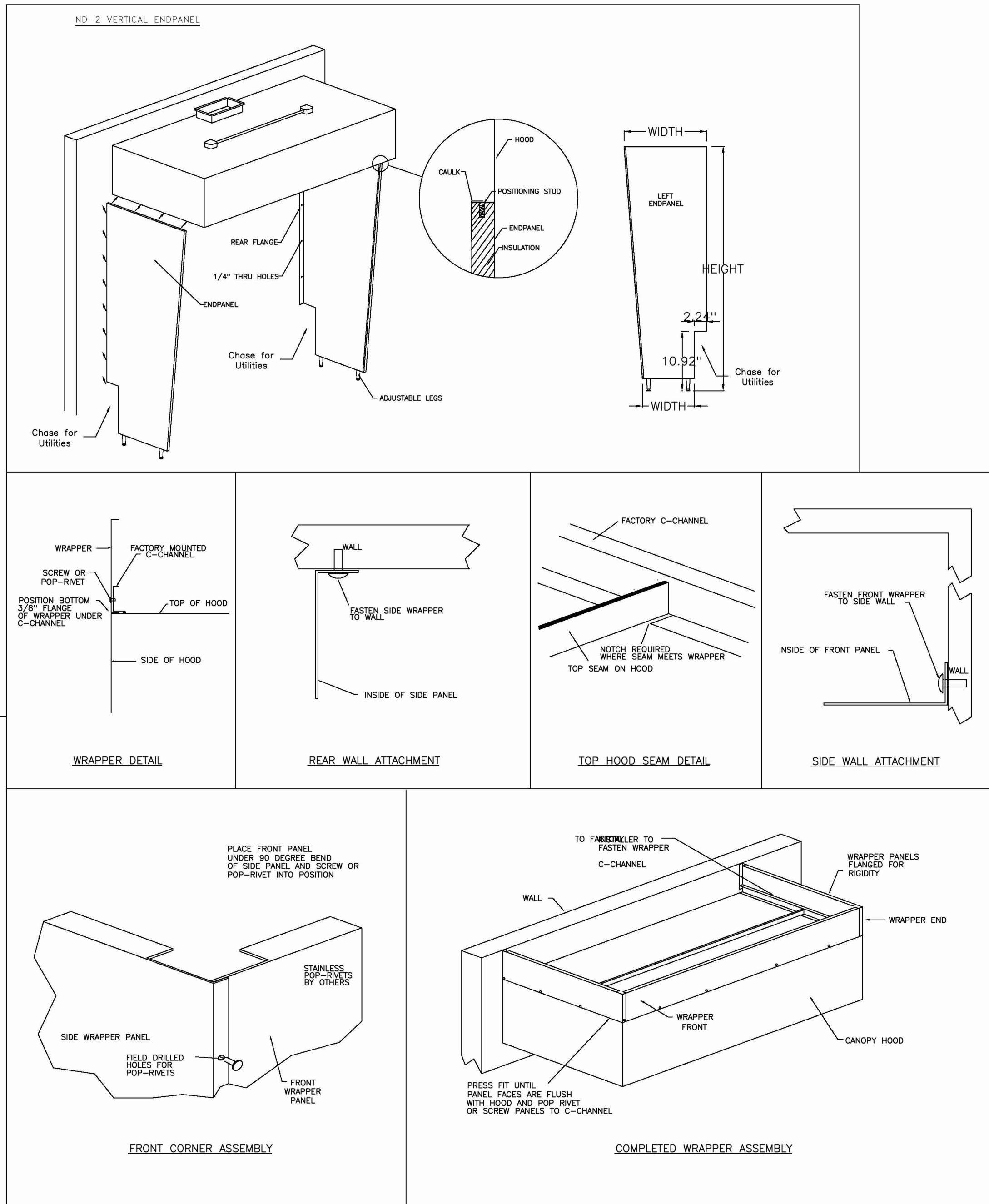
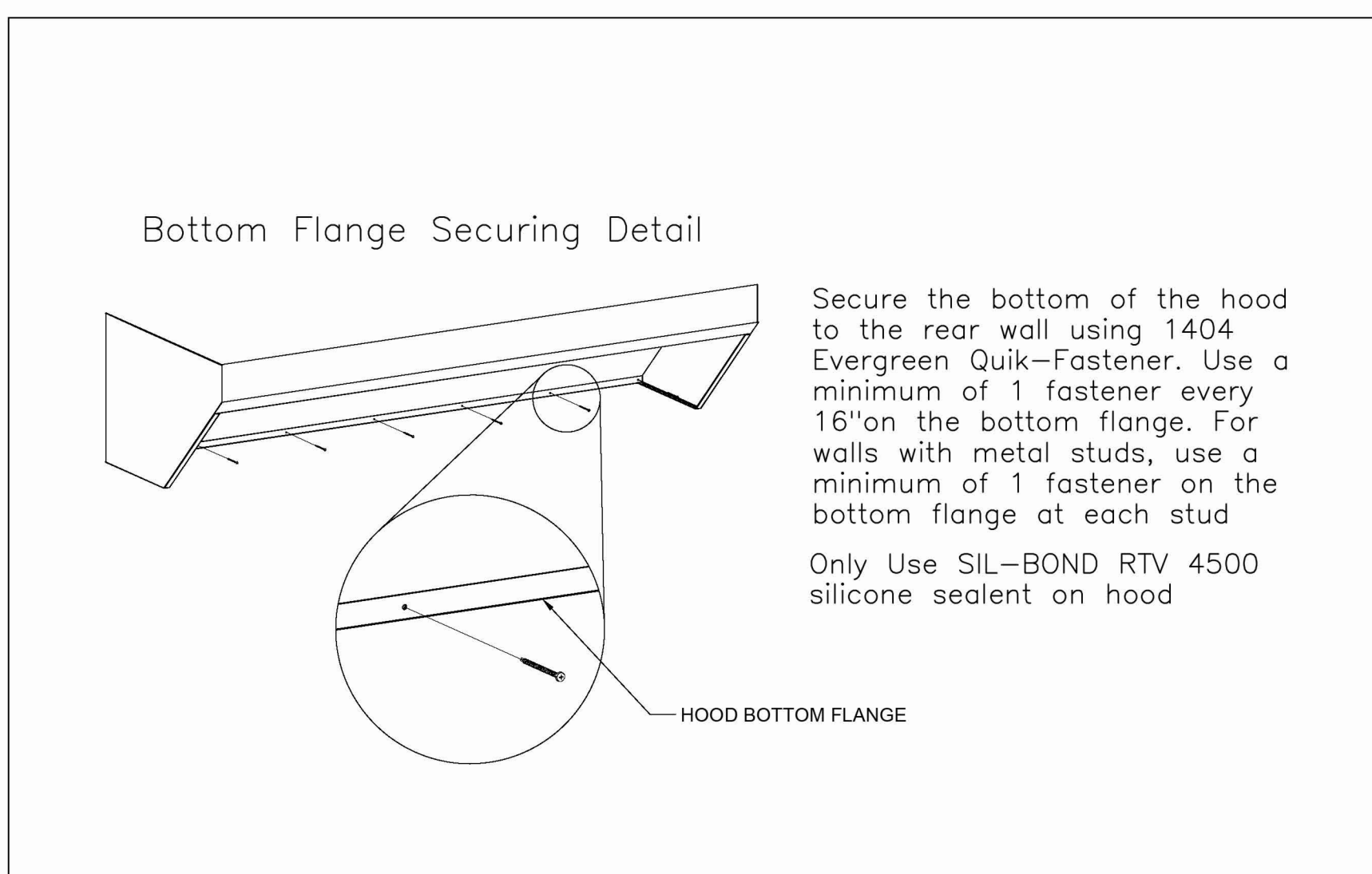
CaptiveAire Captrate Solo Filter  
ETL Listed Grease Extracting Filter  
Made From 430 Stainless Steel

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

HOOD INFORMATION -- JOB#7104794																	
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
1	Hood (Grill)	5430 ND-2	CAPTIVEAIRE	5' 0"	450 DEG	I	MEDIUM	150	750	9"	8"	4"	750	1500	-0.330"	430 SS WHERE EXPOSED	ALONE
2	Hood (Fryer)	5430 ND-2	CAPTIVEAIRE	4' 0"	600 DEG	I	HEAVY	175	700	8"	8"	4"	700	1575	-0.375"	430 SS WHERE EXPOSED	ALONE

HOOD NO	TAG	TYPE	FILTER(S)				LIGHT(S)				UTILITY CABINET(S)				HOOD HANGING WEIGHT		
			QTY	HEIGHT	LENGTH	EFFICIENCY @ 7 MICRONS	QTY	TYPE	WIRE GUARD	LOCATION	SIZE	FIRE SYSTEM	ELECTRICAL	SWITCHES			
1	Hood (Grill)	CAPTRATE SOLO FILTER	3	20"	16"	85% SEE FILTER SPEC	2	RECESSED ROUND	NO						YES	441 LBS	
2	Hood (Fryer)	CAPTRATE SOLO FILTER	2	20"	20"	85% SEE FILTER SPEC	1	RECESSED ROUND	NO	RIGHT	12"x54"x30"	TANK FS	4.0/4.0	SC-320110MA	1 LIGHT 1 FAN	YES	622 LBS

HOOD OPTIONS		OPTION
1	Hood (Grill)	FIELD WRAPPER 18.00" HIGH FRONT, LEFT, RIGHT.
		INSULATION FOR BACK OF HOOD.
		RISER SENSOR INSTALL 6IN PLEN.
		RIGHT VERTICAL END PANEL 27" TOP WIDTH, 21" BOTTOM WIDTH, 80" HIGH INSULATED 430 SS.
2	Hood (Fryer)	CFCI DUPLEX OUTLET, 20A 125V -- HOOD FRONT LEFT -- HORIZONTAL -- DIST FROM END: 3.50 DIST FROM BOTTOM: 4.00.
		LEFT WIDE VERTICAL END PANEL 42" TOP WIDTH, 36" BOTTOM WIDTH, 80" HIGH INSULATED 430 SS.
		FIELD WRAPPER 18.00" HIGH FRONT, LEFT, RIGHT.
		RIGHT QUARTER END PANEL 23" TOP WIDTH, 0" BOTTOM WIDTH, 23" HIGH 430 SS.



**REVISIONS**

DESCRIPTION	DATE

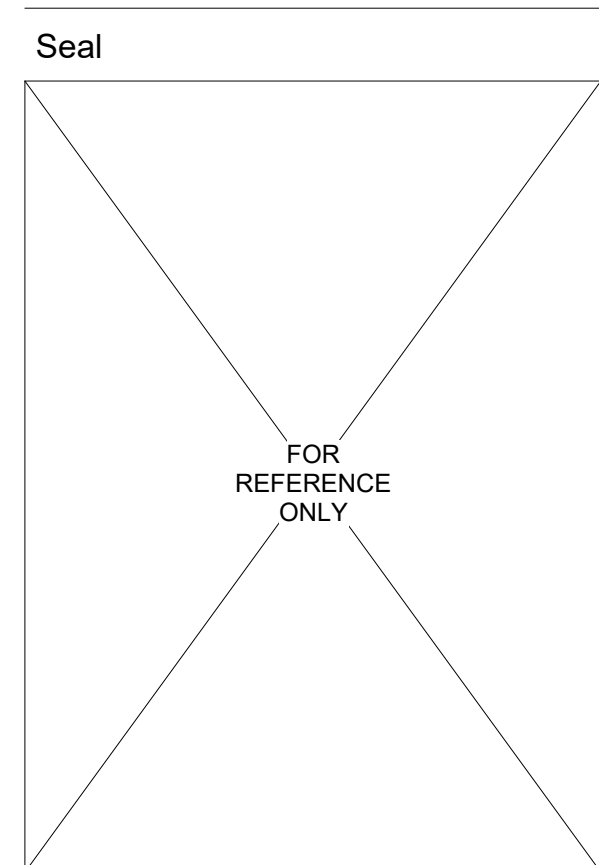
**CAPTIVEAIRE**  
www.captiveaire.com

**Eastern PA Mechanical**  
225 E. City Line Avenue, Suite #103, Baller Cymwyd, PA, 19004 PHONE: (267) 504 - 4126 EMAIL: reg108@captiveaire.com

Shake Shack-1543-Mechanicsburg, PA (Kitchen)

**DATE:** 10/15/2024  
**DWG.#:** 7104794  
**DRAWN BY:** joe.shiiba  
**SCALE:** 3/4" = 1'-0"  
**MASTER DRAWING**

**SHEET NO.**  
1



Brian S. Thomas,  
Architect

DP3 Architects, Ltd.  
15 South Main Street, Suite 400  
Greenville, SC 29601  
864.232.8200  
www.DP3architects.com

Project

**SHAKE SHACK**  
SHAKE SHACK #1695  
MECHANICSBURG, PA

Project Number 2450004630  
Drawn By DJ  
Checked By JH  
Date 01/27/2025

Revisions  
1 27 JAN 2025 ISSUE FOR PERMIT  
21 JUL 2025 ISSUE FOR CONSTRUCTION

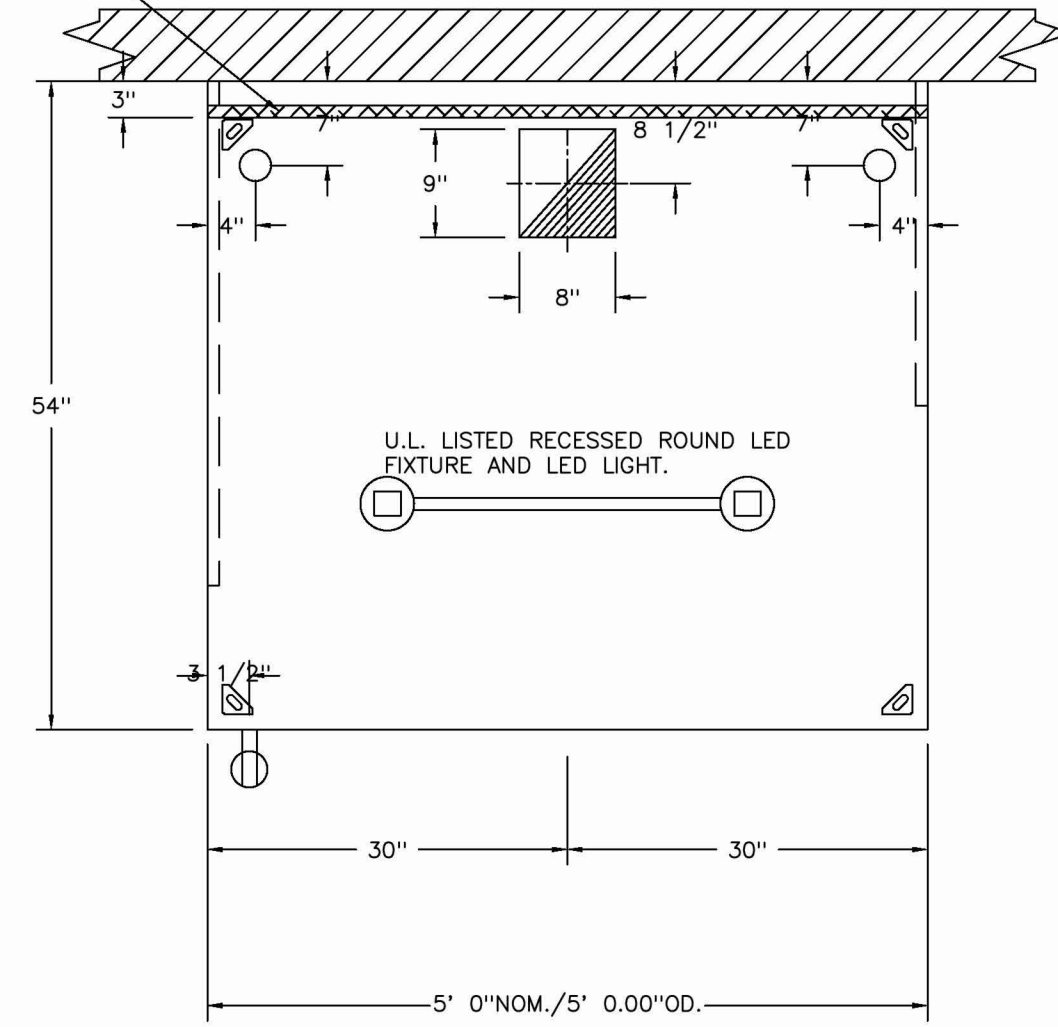
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CAPTIVEAIRE  
DRAWINGS

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M701

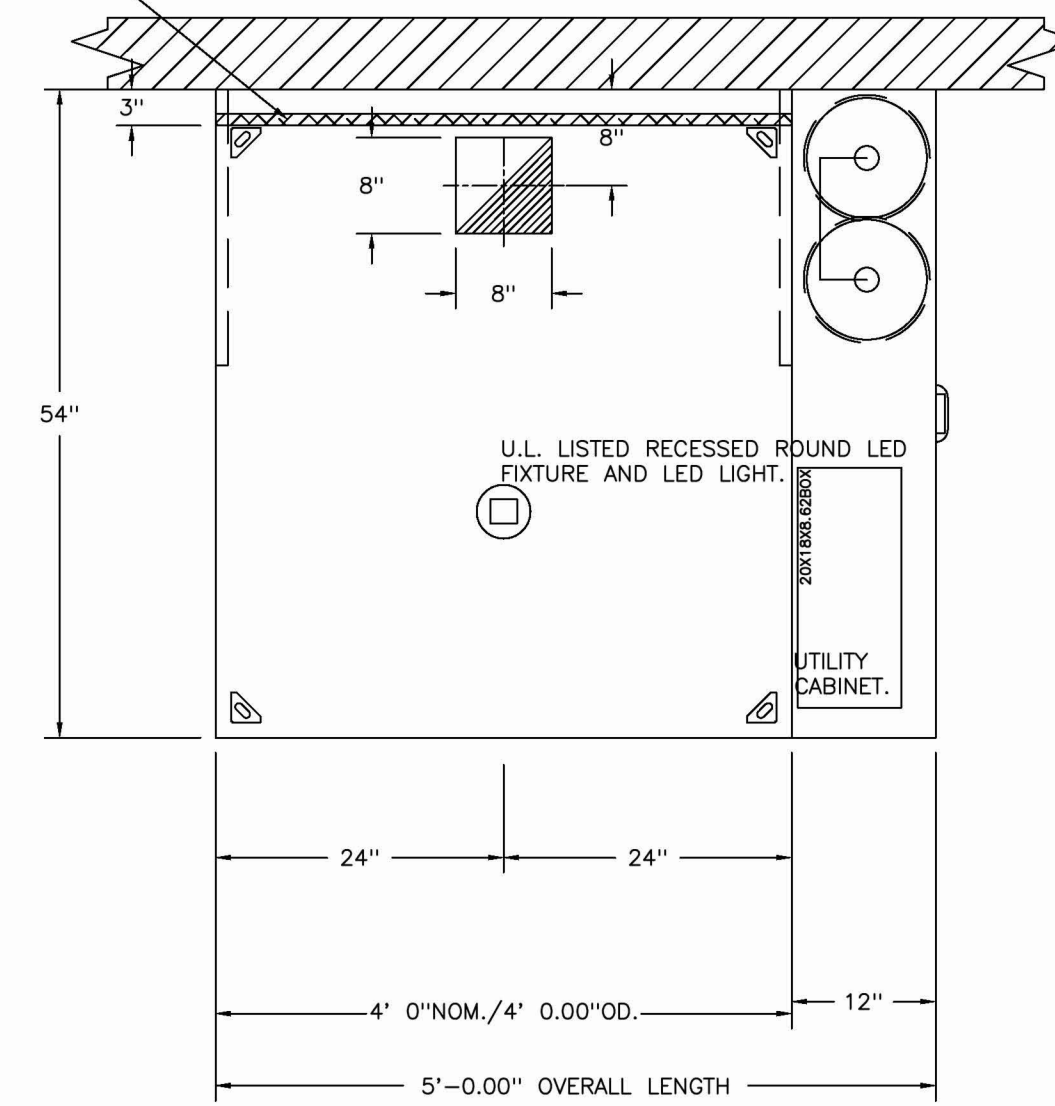
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1" LAYER OF INSULATION FACTORY  
INSTALLED IN INTERNAL BACK STANDOFF.  
MEETS 0 INCH REQUIREMENTS FOR  
CLEARANCE TO COMBUSTIBLE SURFACES.



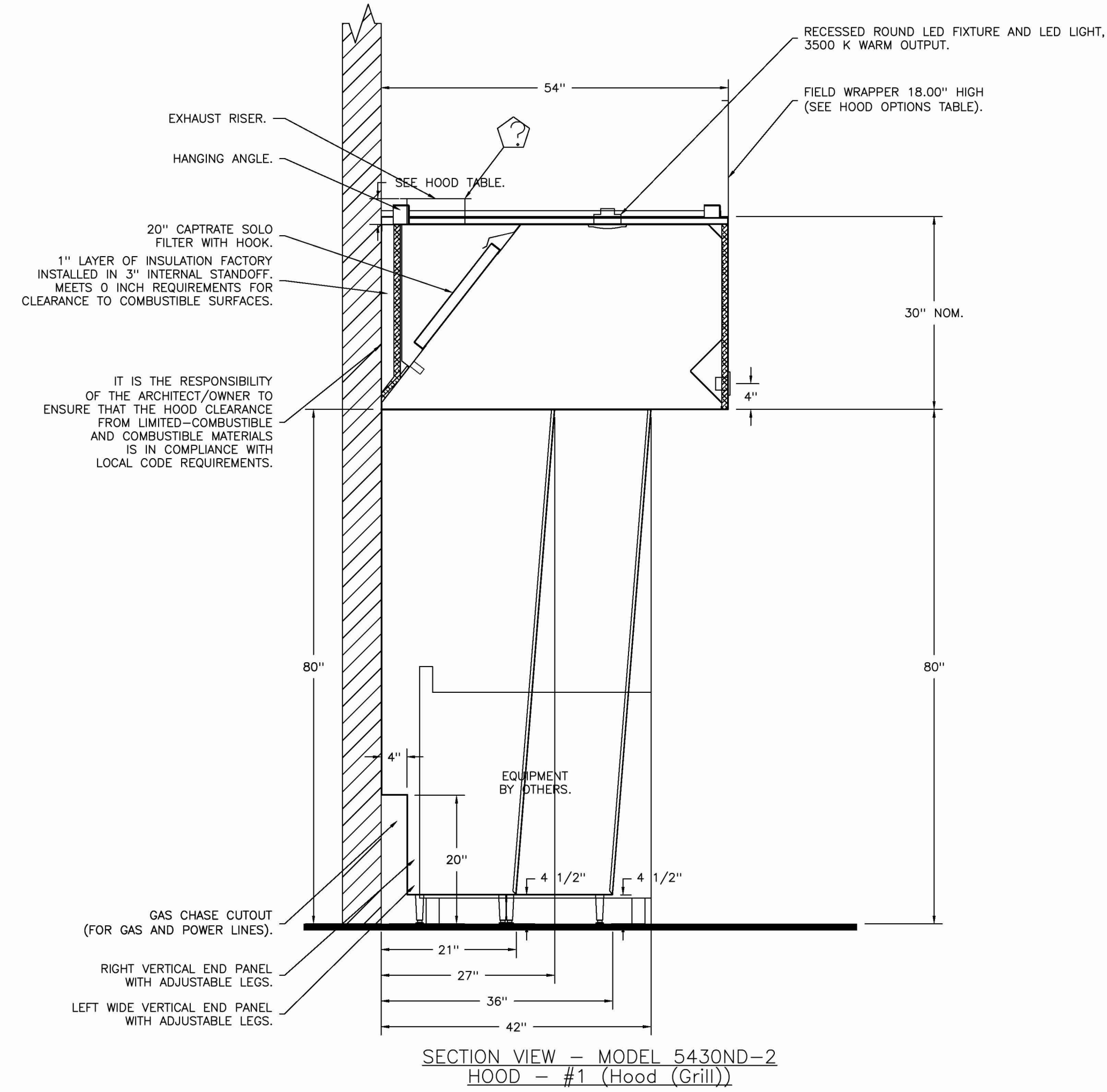
PLAN VIEW - HOOD #1 (Hood (Grill))  
5' 0.00" LONG 54.30ND-2

1" LAYER OF INSULATION FACTORY  
INSTALLED IN INTERNAL BACK STANDOFF.  
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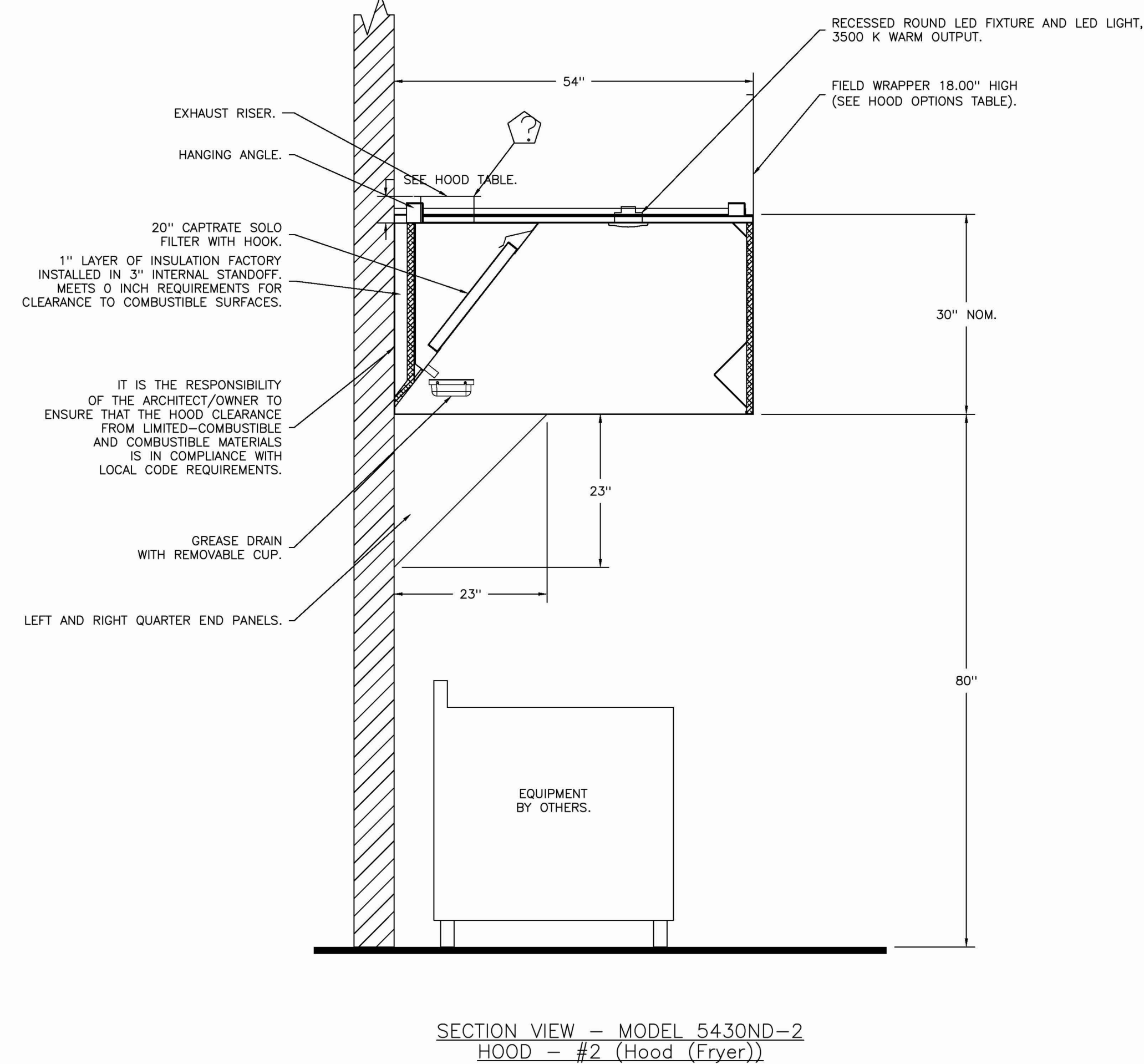


PLAN VIEW - HOOD #2 (Hood (Fryer))  
4' 0.00" LONG 54.30ND-2

(1) DUPLEX OUTLET

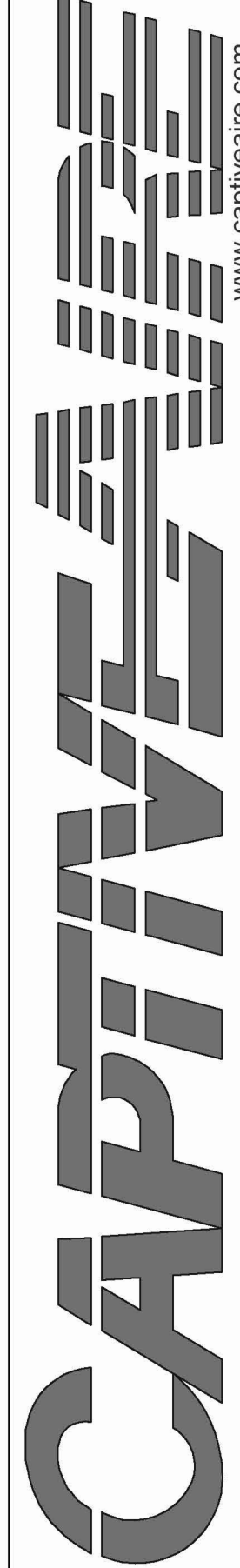


SECTION VIEW - MODEL 54.30ND-2  
HOOD - #1 (Hood (Grill))



SECTION VIEW - MODEL 54.30ND-2  
HOOD - #2 (Hood (Fryer))

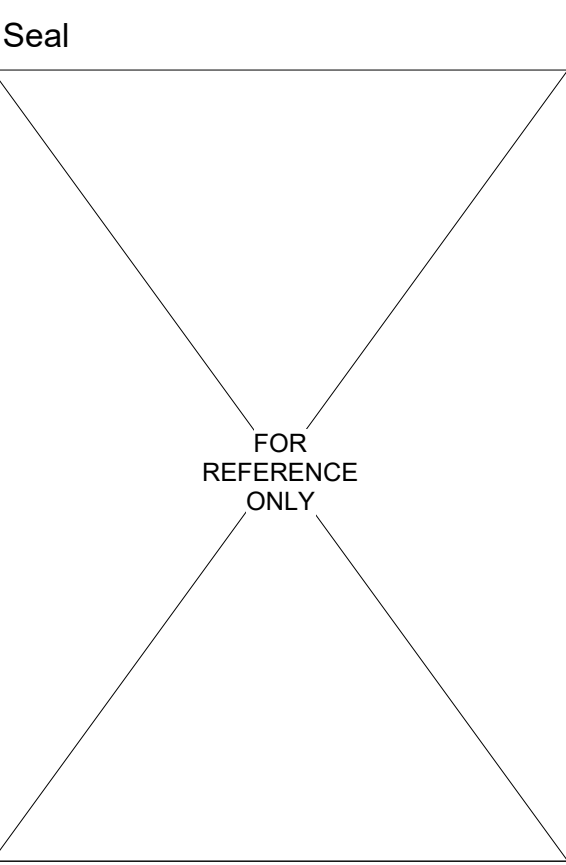
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