SECTION 233813 - COMMERCIAL-KITCHEN HOODS

TIPS:

To view non-printing **Editor's Notes** that provide guidance for editing, click on Masterworks/Single-File Formatting/Toggle/Editor's Notes.

To read **detailed research, technical information about products and materials, and coordination checklists**, click on Masterworks/Supporting Information.

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes [**Type I**] [**and**] [**Type II**] commercial-kitchen hoods.

B. Related Requirements:

1. Section 233533 "Listed Kitchen Ventilation System Exhaust Ducts" for fire-rated ducts connecting to kitchen hoods.

1.3 DEFINITIONS

A. Listed Hood: A hood, factory fabricated and tested for compliance with UL 710 by a testing agency acceptable to authorities having jurisdiction.

B. Standard Hood: A hood, usually field fabricated, that complies with design, construction, and performance criteria of applicable national and local codes.

C. Type I Hood: A hood designed for grease exhaust applications.

D. Type II Hood: A hood designed for heat and steam removal and for other nongrease applications.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at [**Project site**] <**Insert location**>.

1. Required Attendance:

a. <**Insert personnel by title**>.

1.5 ACTION SUBMITTALS

A. Product Data: For the following:

1. Standard hoods.
2. Filters/baffles.
3. Fire-suppression systems.
4. Lighting fixtures.

B. Shop Drawings: Signed and sealed by a qualified professional engineer.

1. Shop Drawing Scale: [**1/4 inch = 1 foot (1:50)**] <**Insert scale**>.
2. Show plan view, elevation view, sections, roughing-in dimensions, service requirements, duct connection sizes, and attachments to other work.
3. Show cooking equipment plan and elevation to confirm minimum code-required overhang.
4. Indicate performance, exhaust and makeup air airflow, and pressure loss at actual Project-site elevation.
5. Show water-supply and drain piping connections.
6. Show control cabinets.
7. Show fire-protection cylinders, piping, actuation devices, and manual control devices.
8. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
9. Design Calculations: Calculate requirements for selecting seismic restraints.
10. Include diagrams for power, signal, and control wiring.
11. Duct Connections: Detail connections between ducts and hoods, including access doors and panels.
12. Piping Diagrams: Detail fire-suppression piping and components and differentiate between manufacturer-installed and field-installed piping. Include roughing-in requirements for drain connections. Show cooking equipment plan and elevation to illustrate fire-suppression nozzle locations.

a. Piping Diagram Scale: [**1/4 inch = 1 foot (1:50)**] <**Insert scale**>.

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Coordination Drawing Scale: [**1/4 inch = 1 foot (1:50)**] <**Insert scale**>.
2. Suspended ceiling assembly components.
3. Structural members to which equipment will be attached.
4. Roof framing and support members for duct penetrations.
5. Items penetrating finished ceiling including the following:

a. Lighting fixtures.

b. Air outlets and inlets.
c. Speakers.
d. Sprinklers.
e. Access panels.
f. Moldings on hoods and accessory equipment.
g. <**Insert item**>.

B. Welding certificates.

C. Manufacturer Seismic Qualification Certification: Submit certification that commercial-kitchen hoods, accessories, and components will withstand seismic forces defined in Section 230548 "Vibration and Seismic Controls for HVAC." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified[**and the unit will be fully operational after the seismic event**]."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Field quality-control reports.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Grease Filters/Baffles: [**One**] <**Insert number**> complete set(s).

1.8 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D 1.1M, "Structural Welding Code - Steel," for hangers and supports; and AWS D9.1/D9.1M, "Sheet Metal Welding Code," for joint and seam welding.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 HOOD MATERIALS

A. Stainless-Steel Sheet: ASTM A 666, Type 304.

1. Minimum Thickness: [**0.037 inch (0.94 mm)**] [**0.050 inch (1.3 mm)**] <**Insert dimension**>.
2. Finish: Comply with SSINA's "Finishes for Stainless Steel" for recommendations for applying and designating finishes.

a. Finish shall be free from tool and die marks and stretch lines and shall have uniform, directionally textured, polished finish indicated, free of cross scratches. Grain shall run with long dimension of each piece.

3. Concealed Stainless-Steel Surfaces: ASTM A 480/A 480M, No. 2B finish (bright, cold-rolled, unpolished finish).
4. Exposed Surfaces: ASTM A 480/A 480M, No. 2B finish (bright, cold-rolled, unpolished).
5. Exposed Surfaces: ASTM A 480/A 480M, No. 3 finish (intermediate polished surface).
6. Exposed Surfaces: ASTM A 480/A 480M, No. 4 finish (directional satin).
7. Exposed Surfaces: ASTM A 480/A 480M, No. 6 finish (dull satin).
8. Exposed Surfaces: ASTM A 480/A 480M, No. 7 finish (reflective, directional polish).
9. Exposed Surfaces: ASTM A 480/A 480M, No. 8 finish (mirrorlike reflective, nondirectional polish).
10. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

B. Carbon-Steel Sheets: ASTM A 1008/A 1008M, cold-rolled sheets; commercial quality; with oiled, exposed matte finish.

1. Minimum Thickness: [**0.043 inch (1.09 mm)**] [**0.0478 inch (1.2 mm)**] <**Insert dimension**>.

C. Galvanized-Steel Sheet: Lock-forming quality; ASTM A 653/A 653M, G90 (Z275) coating designation.

1. Minimum Thickness: [**0.052 inch (1.32 mm)**] <**Insert dimension**>.

D. Zinc-Coated Steel Shapes: ASTM A 36/A 36M, zinc coated according to ASTM A 123/A 123M requirements.

E. Sealant: ASTM C 920; Type S, Grade NS, Class 25, Use NT. Elastomeric sealant shall be NSF certified for commercial-kitchen hood application. Sealants, when cured and washed, shall comply with requirements in 21 CFR 177.2600, for use in areas that come in contact with food.

1. Color: As selected by Architect from manufacturer's full range.
2. Backer Rod: Closed-cell polyethylene, in diameter larger than joint width.

F. Sound Dampening: NSF-certified, non-absorbent, hard-drying, sound-deadening compound for permanent adhesion to metal in minimum 1/8-inch (3-mm) thickness that does not chip, flake, or blister.

G. Gaskets: NSF certified for end-use application indicated; of resilient rubber, neoprene, or PVC that is nontoxic, stable, odorless, nonabsorbent, and unaffected by exposure to foods and cleaning compounds, and that passes testing according to UL 710.

2.3 GENERAL HOOD FABRICATION REQUIREMENTS

A. Welding: Use welding rod of same composition as metal being welded. Use methods that minimize distortion and develop strength and corrosion resistance of base metal. Make ductile welds free of mechanical imperfections such as gas holes, pits, or cracks.

1. Welded Butt Joints: Full-penetration welds for full-joint length. Make joints flat, continuous, and homogenous with sheet metal without relying on straps under seams, filling in with solder, or spot welding.
2. Grind exposed welded joints flush with adjoining material and polish to match adjoining surfaces.
3. Where fasteners are welded to underside of equipment, finish reverse side of weld smooth and flush.
4. Coat concealed stainless-steel welded joints with metallic-based paint to prevent corrosion.
5. After zinc-coated steel is welded, clean welds and abraded areas and apply SSPC-Paint 20, high-zinc-dust-content, galvanizing repair paint to comply with ASTM A 780/A 780M.

B. For metal butt joints, comply with SMACNA's "Kitchen Ventilation Systems & Food Service Equipment Guidelines."

C. Where stainless steel is joined to a dissimilar metal, use stainless-steel welding material or fastening devices.

D. Form metal with break bends that are not flaky, scaly, or cracked in appearance; where breaks mar uniform surface appearance of material, remove marks by grinding, polishing, and finishing.

E. Sheared Metal Edges: Finish free of burrs, fins, and irregular projections.

F. In food zones, as defined in NSF, fabricate surfaces free from exposed fasteners.

G. Cap exposed fastener threads, including those inside cabinets, with stainless-steel lock washers and stainless-steel cap (acorn) nuts.

H. Fabricate pipe slots on equipment with turned-up edges sized to accommodate service and utility lines and mechanical connections.

I. Fabricate enclosures, including panels, housings, and skirts, to conceal service lines, operating components, and mechanical and electrical devices including those inside cabinets unless otherwise indicated.

J. Fabricate seismic restraints according to SMACNA's "Kitchen Ventilation Systems & Food Service Equipment Guidelines," Appendix A, "Seismic Restraint Details."

K. Fabricate equipment edges and backsplashes according to SMACNA's "Kitchen Ventilation Systems & Food Service Equipment Guidelines."

L. Fabricate enclosure panels to ceiling and wall as follows:

1. Fabricate panels on [**one**] [**two**] [**three**] [**four**] [**all exposed**] side(s) with same material as hood, and extend from ceiling to top of hood canopy and from canopy to wall.
2. Wall Offset Spacer: Minimum of 3 inches (75 mm).
3. Wall Shelves and Overshelves: Fabricate according to SMACNA's "Kitchen Ventilation Systems & Food Service Equipment Guidelines," with minimum 0.0625-inch- (1.58-mm-) thick, stainless-steel shelf tops.

2.4 TYPE I EXHAUST HOOD FABRICATION

A. <Double click here to find, evaluate, and insert list of manufacturers and products.>

B. Weld all joints exposed to grease with continuous welds, and make filters/baffles or grease extractors and makeup air diffusers easily accessible for cleaning.

1. Fabricate hoods according to NSF 2, "Food Equipment."
2. Hoods shall be listed and labeled, according to UL 710, by a testing agency acceptable to authorities having jurisdiction.
3. Hoods shall be designed, fabricated, and installed according to NFPA 96.
4. Include access panels as required for access to fire dampers and fusible links.
5. Duct Collars: Minimum 0.0598-inch- (1.5-mm-) thick steel at least 3 inches (75 mm) long, continuously welded to top of hood and at corners.[**Fabricate a collar with a 0.5-inch- (13-mm-) wide duct flange.**]
6. Duct-Collar Fire Dampers: Collar and damper shall comply with UL 710 testing and listing required for the entire hood.
    a. Collar: Minimum 0.0598-inch- (1.5-mm-) thick stainless steel, at least 3 inches (75 mm) long, continuously welded to top of hood and at corners.[**Fabricate a collar with a minimum 0.5-inch- (13-mm-) wide duct flange.**]
    b. Blades: Minimum 0.1046-inch- (2.7-mm-) thick stainless steel, counterbalanced to remain closed after actuation.
    c. Blade Pivot and Spring: Stainless steel.
    d. Fusible Link: Replaceable, 212 deg F (100 deg C) rated.
7. Makeup Air Fire Dampers: Labeled, according to UL 555, by a testing agency acceptable to authorities having jurisdiction.

a. Fire Rating: 1-1/2 hours.
b. Frame: SMACNA [**Type A**] [**Type B**], with blades in airstream; fabricated with roll-formed, [**galvanized**] [**stainless**] steel; with mitered and interlocking corners.
c. Blades: Roll-formed, interlocking or folded, minimum 0.034-inch- (0.86-mm-) thick, galvanized-steel sheet.
d. Horizontal Dampers: Include a blade lock and stainless-steel closure spring.
e. Fusible Link: Replaceable, [**165 deg F (74 deg C)**] [**212 deg F (100 deg C)**] rated.

C. Hood Configuration: Exhaust [**only**] [**and makeup air**].

1. Makeup air shall be introduced by [**induction**] [**combination of induction and diffusion**] inside canopy. If makeup air is not heated, insulate interior of makeup air plenum with high-density insulation having maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.
2. Makeup air shall be introduced through [**front**] [**and**] [**bottom**] of canopy through [**perforated diffusers**] [**supply-air registers with adjustable guide vanes**].
3. Makeup air shall be introduced through laminar-flow-type, perforated metal panels on front of hood canopy.
4. Makeup air shall be introduced through laminar-flow-type, perforated metal diffusers mounted in the ceiling in front of hood canopy. Furnish laminar-flow-type diffusers with baked [**white**] <**Insert color**> enamel finish and volume-control dampers.
5. Makeup air shall be introduced through plenum at rear of hood, extending down below appliance cooking surfaces.

D. Hood Style: [**Wall-mounted canopy**] [**Single-island canopy**] [**Double-island canopy**] [**Back shelf**] [**Eyebrow**] [**Pass over**].

E. Filters/Baffles: Removable, [**stainless-steel**] [**aluminum**][**, with spring-loaded fastening**]. Fabricate stainless steel for filter frame and removable collection cup and pitched trough. Exposed surfaces shall be pitched to drain to collection cup. Filters/baffles shall be tested according to UL 1046, "Safety for Grease Filters for Exhaust Ducts," by an NRTL acceptable to authorities having jurisdiction.

F. Removable Water-Wash Grease Extractor: Stainless steel, tested with hood according to UL 710.

G. Stationary Water-Wash Grease Extractor: Integral, automatically self-cleaning, spraying hot water and detergent over the entire length of exhaust plenum. Fabricate to supply 140 deg F (60 deg C) water at 1.25 gpm/ft. (0.26 L/s per m) of hood length, at 40- to 60-psig (276- to 414-kPa) inlet pressure.

1. Water Piping: ASTM A 270/A 270M, Type 304 stainless steel.
2. Fabricate to drain water and detergent to a collection trough having stainless-steel drain fittings.
3. Single, [**hood**] [**wall**]-mounting control panel with a solid-state, programmable controller shall control all hoods on Project. Wash cycle shall be factory set to operate for 10 minutes after fans stop.
4. Detergent shall be supplied by an adjustable-flow, 120-V ac injection pump from a reservoir with a minimum capacity of 2.5 gal. (9.5 L).

H. Water-mist option shall supply a maximum of 0.1 gpm/ft. (0.02 L/s per m) of hood length through stainless-steel piping and nozzles.

1. Water Piping: ASTM A 270/A 270M, Type 304 stainless steel.

I. Lighting Fixtures: [**Recessed**] [**Surface-mounted**], [**fluorescent**] [**incandescent**] fixtures and lamps with lenses sealed vapor tight. Wiring shall be in conduit on hood exterior. Number and location of fixtures shall provide a minimum of 70 fc (753 lx) at 30 inches (762 mm) above finished floor.

1. Light switches shall be mounted [**on front panel of hood canopy**] [**on wall adjacent to hood**] [**in hood control panel**].
2. Lighting Fixtures: [**Fluorescent**] [**Incandescent**] complying with UL 1598.

J. Comply with hood control requirements in Section 230923 "Direct Digital Control (DDC) System for HVAC" and Section 230993.11 "Sequence of Operations for HVAC DDC."

K. Hood Controls: [**Hood**] [**Wall**]-mounting control cabinet, [**factory wired to control groups of adjacent hoods, and**]fabricated of stainless steel.

1. Exhaust Fan: On-off switches shall start and stop the exhaust fan. [**Interlock exhaust fan with makeup air supply fan to operate simultaneously.**]Interlock exhaust fan with fire-suppression system to operate fan(s) during fire-suppression-agent release and to remain in operation until manually stopped. Include red pilot light to indicate fan operation. Motor starters shall comply with Section 262913 "Enclosed Controllers."
2. Exhaust Fan Interlock: Factory wire the exhaust fan starters in a single control cabinet for adjacent hoods to operate together.
3. Photocell and Temperature Control: Cycle makeup air and exhaust-air fans on and off, based on temperature at hood discharge and opacity of smoke in hood. Interlock fan control with fire-suppression system to operate during fire-suppression-agent release and to remain in operation until manually stopped. Provide air-purge fan and conduit to photocell and reflector to avoid grease accumulation that will negatively affect performance of system.
4. Photocell and Temperature Control: Change speed (off, low, and high) of makeup air and exhaust-air fans with speed switch, based on temperature at hood discharge and opacity of smoke in hood. Interlock fan control with fire-suppression system to operate at high speed during fire-suppression-agent release and to remain in high-speed operation until manually stopped. Provide air-purge fan and conduit to photocell and reflector to avoid grease accumulation that will negatively affect performance of system. Controller shall limit exhaust-duct velocity between <**Insert minimum velocity**> and <**Insert maximum velocity**>. Controller shall limit supply quantity to <**Insert minimum quantity**> for proper operation of makeup air unit.
5. Photocell and Temperature Control: Vary speed of makeup air and exhaust-air fans with variable-frequency controllers, based on temperature at hood discharge and opacity of smoke in hood. Interlock fan control with fire-suppression system to operate at high speed during fire-suppression-agent release and to remain in high-speed operation until manually stopped. Provide air-purge fan and conduit to photocell and reflector to avoid grease accumulation that will negatively affect performance of system. Controller shall limit exhaust-duct velocity between <**Insert minimum velocity**> and <**Insert maximum velocity**>. Controller shall limit supply quantity to <**Insert minimum quantity**> for proper operation of makeup air unit.

6. High-Temperature Control: Alarm shall sound and cooking equipment shall shut down before hood discharge temperature rises to actuation temperature of fire-suppression system.
7. Water-Wash Timer: [**24-hour clock**] [**365-day, programmable timer**] shall control sequential wash of multiple hood sections.
8. Water Mist: Solenoid valve interlocked with exhaust fan to open with hood operation.

L. Capacities and Characteristics:

1. Nominal Hood Length: <**Insert inches (mm)**>.
2. Nominal Hood Width: <**Insert inches (mm)**>.
3. Canopy Height: <**Insert inches (mm)**>.
4. Exhaust Airflow: <**Insert cfm (L/s)**>.
5. Exhaust-Air Pressure Loss: <**Insert inches wg (kPa)**>.
6. Makeup Air Airflow: <**Insert cfm (L/s)**>.
7. Makeup Air Pressure Loss: <**Insert inches wg (kPa)**>.
8. Water-Supply Connection: <**Insert NPS (DN)**>.
9. Washdown Water Flow: <**Insert gpm (L/s)**>.
10. Minimum Water Pressure: <**Insert psig (kPa)**>.
11. Mist Water Flow: <**Insert gpm (L/s)**>.
12. Sanitary Drain Connection: <**Insert NPS (DN)**>.

2.5 TYPE II EXHAUST HOOD FABRICATION

A. <Double click here to find, evaluate, and insert list of manufacturers and products.>

B. Fabricate hoods according to NSF 2, "Food Equipment."

C. Fabricate hoods to comply with SMACNA's "HVAC Duct Construction Standards: Metal and Flexible."

D. Hood Configuration: Exhaust [**only**] [**and makeup air**].

1. Makeup air shall be introduced by [**induction**] [**combination of induction and diffusion**] inside canopy. If makeup air is not heated, insulate interior of makeup air plenum with high-density insulation having maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.
2. Makeup air shall be introduced through [**front**] [**and**] [**bottom**] of canopy through supply-air registers.
3. Makeup air shall be introduced through laminar-flow-type, perforated metal panels on front of hood canopy.
4. Makeup air shall be introduced through plenum at rear of hood, extending down below appliance cooking surfaces.

E. Hood Type: [**Heat and vapor**] [**Condensate**] removal.

F. Hood Style: [**Wall-mounted canopy**] [**Single-island canopy**] [**Double-island canopy**] [**Back shelf**] [**Eyebrow**] [**Pass over**].

G. Condensate Hood Baffles: Removable, stainless-steel baffles to drain into a hood drain trough, and stainless-steel drain piping.

H. Lighting Fixtures: [**Recessed**] [**Surface-mounted**], [**fluorescent**] [**incandescent**] fixtures and lamps with lenses sealed vapor tight. Wiring shall be installed in stainless-steel conduit on hood exterior. Number and location of fixtures shall provide a minimum of 70 fc (753 lx) at 30 inches (762 mm) above finished floor.

1. Light switches shall be mounted [**on front panel of hood canopy**] [**on wall adjacent to hood**] [**in hood control panel**].
2. Lighting Fixtures: [**Fluorescent**] [**Incandescent**] complying with UL 1598.

I. Capacities and Characteristics:

1. Nominal Hood Length: <**Insert inches (mm)**>.
2. Nominal Hood Width: <**Insert inches (mm)**>.
3. Canopy Height: <**Insert inches (mm)**>.
4. Exhaust Airflow: <**Insert cfm (L/s)**>.
5. Exhaust-Air Pressure Loss: <**Insert inches wg (kPa)**>.
6. Makeup Air Airflow: <**Insert cfm (L/s)**>.
7. Makeup Air Pressure Loss: <**Insert inches wg (kPa)**>.

2.6 WET-CHEMICAL FIRE-SUPPRESSION SYSTEM

A. <Double click here to find, evaluate, and insert list of manufacturers and products.>

B. Description: Engineered distribution piping designed for automatic detection and release or manual release of fire-suppression agent by hood operator. Fire-suppression system shall be listed and labeled for complying with NFPA 17A, "Wet Chemical Extinguishing Systems," by a qualified testing agency acceptable to authorities having jurisdiction.

1. Steel Pipe, NPS 2 (DN 50) and Smaller: ASTM A 53/A 53M, Type S, Grade A, Schedule 40, plain ends.
2. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300.
3. Piping, fusible links and release mechanism, tank containing the suppression agent, and controls shall be factory installed. Controls shall be in stainless-steel control cabinet mounted on [**hood**] [**or**] [**wall**]. Furnish manual pull station for wall mounting. Exposed piping shall be covered with chrome-plated aluminum tubing. Exposed fittings shall be chrome plated.
4. Liquid Extinguishing Agent: Noncorrosive, low-pH liquid.
5. Furnish electric-operated gas shutoff valve; see [**Section 231123 "Facility Natural-Gas Piping."**] [**Section 231126 "Facility Liquefied-Petroleum Gas Piping."**]
6. Furnish electric-operated gas shutoff valve with clearly marked open and closed indicator for field installation.
7. Fire-suppression system controls shall be integrated with controls for fans, lights, and fuel supply and located in a single cabinet for each group of hoods immediately adjacent.
8. Wiring shall have color-coded, numbered terminal blocks and grounding bar. Spare terminals for fire alarm, optional wiring to start fan with fire alarm, red pilot light to indicate fan operation, and control switches shall all be factory wired in control cabinet

with relays or starters. Include spare terminals for fire alarm, and wiring to start fan with fire alarm.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for piping systems to verify actual locations of piping connections before equipment installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Coordinate equipment layout and installation with adjacent Work, including lighting fixtures, HVAC equipment, plumbing, and fire-suppression system components.

B. Complete field assembly of hoods where required.

1. Make closed butt and contact joints that do not require filler.
2. Grind field welds on stainless-steel equipment smooth, and polish to match adjacent finish. Comply with welding requirements in "General Hood Fabrication Requirements" Article.

C. Install hoods and associated services with clearances and access for maintaining, cleaning, and servicing hoods, filters/baffles, grease extractor, and fire-suppression systems according to manufacturer's written instructions and requirements of authorities having jurisdiction.

D. Make cutouts in hoods where required to run service lines and to make final connections, and seal openings according to UL 1978.

E. Securely anchor and attach items and accessories to walls, floors, or bases with stainless-steel fasteners unless otherwise indicated.

F. Install hoods to operate free from vibration.

G. Install seismic restraints according to SMACNA's "Kitchen Ventilation Systems & Food Service Equipment Guidelines," Appendix A, "Seismic Restraint Details."

H. Install trim strips and similar items requiring fasteners in a bed of sealant. Fasten with stainless-steel fasteners at 48 inches (1200 mm) o.c. maximum.

I. Install sealant in joints between equipment and abutting surfaces with continuous joint backing unless otherwise indicated. Provide airtight, watertight, vermin-proof, sanitary joints.

J. Install lamps, with maximum recommended wattage, in equipment with integral lighting.

K. Set initial temperatures, and calibrate sensors.

L. Set field-adjustable switches.

3.3 CONNECTIONS

A. Where installing piping adjacent to hoods, allow space for service and maintenance.

B. Install reduced-pressure backflow preventer on washer-water supply. Backflow preventer is specified in Section 221119 "Domestic Water Piping Specialties."

C. Install washer-water drain piping full size of hood connection to an adjacent floor drain or a floor sink.

D. Makeup Water Connection: Comply with applicable requirements for valves and accessories on piping connections to water-cooled units in Section 221119 "Domestic Water Piping Specialties."

E. Connect ducts according to requirements in Section 233300 "Air Duct Accessories." Install flexible connectors on makeup air supply duct. Weld exhaust-duct connections with continuous liquidtight joint.

F. Install fire-suppression piping for remote-mounted suppression systems according to NFPA 17A, "Wet Chemical Extinguishing Systems."

3.4 FIELD QUALITY CONTROL

A. Testing Agency: [**Owner will engage**] [**Engage**] a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections[**with the assistance of a factory-authorized service representative**]:

1. Test each equipment item for proper operation. Repair or replace equipment that is defective, including units that operate below required capacity or that operate with excessive noise or vibration.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Test water, drain, gas, and liquid-carrying components for leaks. Repair or replace leaking components.
4. Perform hood performance tests required by authorities having jurisdiction.
5. Perform fire-suppression system performance tests required by authorities having jurisdiction.

D. Commercial-kitchen hoods will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. [**Engage a factory-authorized service representative to train**] [**Train**] Owner's maintenance personnel to adjust, operate, and maintain commercial-kitchen hoods.

END OF SECTION 233813