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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2023

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SECTION 21 23 00.00 98

WET-CHEMICAL FIRE-EXTINGUISHING SYSTEMS
07/20

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NOTE: This specification covers the requirements for pre-engineered wet chemical fire extinguishing systems for protection of cooking equipment, including exhaust hoods, ducts, and related work. Conform system requirements to NFPA 17A, "Wet Chemical Extinguishing Systems."

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Recommended changes to a NASAKSC Master Specification Section should be submitted as a Criteria Change Request (CCR) to the appropriate Technical Proponent (TP) through the SpecsIntact Help Desk.

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NOTE: Do not indicate on project drawings locations of piping, fusible links, or discharge nozzles, but do indicate on the drawings the following information:

a. Location and detail of each hood, plenum, and duct to be protected.

b. Location, type, height, and size of each cooking appliance to be protected.

c. Location of fire alarm panel.

d. Method of electrical or fuel shut-off, such as shunt trip breakers or extinguishing system operated solenoid valves. NFPA 96 requires that the electrical power and fuel to all protected appliances be shut off upon actuation of the extinguishing system. Additionally, shut off any gas appliance under the same hood as protected appliances. NFPA 96 requires the shut off equipment be of the type that requires manual resetting prior to the fuel or power being restored. This includes power outages.

e. Location of remote manual actuation stations.

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PART 1 GENERAL

1.1 REFERENCES

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NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text are automatically deleted from this section of the project specification when you choose to reconcile references in the publish print process.

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The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM A53/A53M	(2022) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A106/A106M	(2019a) Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service

FM GLOBAL (FM)

FM APP GUIDE	(updated on-line) Approval Guide http://www.approvalguide.com/

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 17A	(2024) Standard for Wet Chemical Extinguishing Systems
NFPA 70	(2023) National Electrical Code
NFPA 72	(2022; ERTA 22-1) National Fire Alarm and Signaling Code
NFPA 96	(2024) Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations

UNDERWRITERS LABORATORIES (UL)

UL 300	(2005) Fire Testing of Fire Extinguishing Systems for Protection of Restaurant Cooking Areas
UL Fire Prot Dir	(2012) Fire Protection Equipment Directory

1.2 SYSTEM REQUIREMENTS

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NOTE: If Section 23 00 00 AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEMS is not included in the project specification, insert applicable requirements therefrom and delete the following paragraph.
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[Section 23 00 00 AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEMS applies to work specified in this section.]

1.2.1 Design Requirements

Provide new [and] [modify existing] pre-engineered wet chemical fire extinguishing system for protection of [new] [and] [existing] cooking equipment including exhaust hoods, ducts, and related work. Provide equipment, materials, installation, workmanship, inspection, and testing in strict accordance with the required and advisory provisions of the manufacturer's installation manual, NFPA 17A and NFPA 96, except as modified herein. In each system include materials, accessories, and equipment necessary to provide each system complete and ready for use. Provide each system with full consideration to blind spaces, piping, electrical equipment, ducts, and other construction and equipment in accordance with detailed working drawings submitted for approval. Provide devices and equipment for fire protection service that are UL Fire Prot Dir listed or FM APP GUIDE approved for use with wet chemical fire extinguishing systems and meet the requirements of UL 300. In the NFPA publications referred to herein, consider the advisory provisions to be mandatory, and interpret reference to the "authority having jurisdiction" to mean the Kennedy Space Center, Fire Protection Engineer.

1.2.2 Detail Drawings

Submit electrical wiring diagrams and dimensioned or scaled piping layout

showing components, pipe sizes, manual activation stations, pipe lengths, nozzles, electrical power and gas isolation devices, and valve locations in relation to cooking appliances and fusible link locations.

1.3 SUBMITTALS

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NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project.

A “G” following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a “G”. Only delete an existing “G” if the submittal item is not complex and can be reviewed through the Contractor’s Quality Control system. Only add a “G” if the submittal is sufficiently important or complex in context of the project.

An "S" following a submittal item indicates that the submittal is required for the Sustainability Notebook to fulfill federally mandated sustainable requirements in accordance with Section 01 33 29 SUSTAINABILITY REPORTING.

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Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Submit detailed computer-generated drawings in DWG or DGN format of the pre-engineered wet chemical fire extinguishing system. In details include electrical wiring diagrams, and dimensioned or scaled isometric piping layout showing components, pipe size, pipe lengths, nozzles and valve locations in relation to cooking appliances and fusible link locations and submit for approval.

Submit Factory Installation Drawings for approval ten days prior to start of installation.

Submit Record (As-Built Conditions) computer generated drawings for approval ten (10) days prior to the acceptance testing phase of the project, as described in the paragraph entitled, "Formal Tests and Inspection," of this section.

Submit .DXF or .DWG format computer generated shop drawings, schematics and Record Drawings[; G].

SD-03 Product Data

Submit Manufacturers Catalog Data for the following items:

Agent[; G]

Storage Cylinder[; G]

Fusible Links[; G]

Regulator[; G]

Electrical Equipment and Gas Line Shut-Off Devices[; G]

Release Mechanisms[; G]

Metal Blow-Off Caps[; G]

Discharge Nozzle[; G]

Piping and Fittings[; G]

Manual Actuators[; G]

Remote Manual Pull Stations[; G]

Manufacturer's Installation Manuals[; G]

Pulley Elbows[; G]

SD-06 Test Reports

Provide testing of the system in accordance with paragraph entitled, "Field Quality Control," of this section.

Prepare a Test Procedure and Test Record Forms[; G] for conducting and recording complete test on the suppression system in accordance with manufacturer's requirements and these specifications. Submit the test procedure for approval to the Contracting Officer at least 30 days prior to the preliminary system test described in the paragraph entitled, "Preliminary Tests," of this section. In the test procedure identify the initial condition, each step or function in the test, required test results, and provide for recording test results on all equipment devices, and wiring to be tested. On test record forms also identify spaces for verification signature of official witnesses and dates of the test.

SD-07 Certificates

Qualifications of Factory Trained Installer[; G]

SD-08 Manufacturer's Instructions[; G]

Fire Extinguishing System[; G]

Submit the extinguishing system manufacturer's installation manual.

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals[; G]

1.4 ELECTRICAL WORK

Conform associations to Section [26 05 00.00 40 COMMON WORK RESULTS FOR ELECTRICAL][_____], except for control [and fire alarm] wiring. [Fire alarm system is specified in Section 28 31 00.00 98FIRE DETECTION AND ALARM.] Provide control [and fire alarm wiring,] [including connections to fire alarm systems,] under this section in accordance with NFPA 70 and NFPA 72. Provide wiring in rigid metal conduit or intermediate metal conduit, except electrical metallic tubing conduit can be provided in dry locations not enclosed in concrete or where not subject to mechanical damage.

1.5 QUALITY ASSURANCE

1.5.1 Qualifications of Factory Trained Installer

Qualifications of System Technician: Prepares installation shop drawings, and Record Drawings of as-built conditions, by or under the supervision of an individual who is experienced with the types of works specified herein, and is currently certified by the National Institute for Certification in Engineering Technologies [_____] as an engineering technician with minimum Level-III certification in Special Hazard Systems and Factory Training for the hardware to be installed. Submit data for approval showing the name and certification of all involved individuals with such qualifications at or prior to submittal of drawings.

Submit Record Drawings of as-built conditions for approval 21 days prior to the acceptance testing phase of the project as described in the paragraph entitled, "Formal Tests and Inspections," of this section. Provide (2) sets electronically and hard copies of all new and revised software and drawings with the submittal. On Record Drawings document final system configuration including deviations from and amendments to the drawings, and field installation changes, concealed and visible.

1.5.2 Components

Provide components in the installation that are not more than one year old.

Provide devices and equipment for fire protection service that are UL Fire Prot Dir or FM APP GUIDE approved for their intended use and function.

1.6 DELIVERY, STORAGE, AND HANDLING

Deliver, store, protect, and handle products to site in such a manner as to prevent damage caused by dirt, debris, and weather. During storage of materials do not impact safety or work operations in areas adjacent to the storage site.

Deliver materials to the job site in sealed, original containers, each bearing the manufacturer's labels.

Do not accept materials that arrive at the site without labels, opened, damaged, or containing less material than specified for use.

Store materials in a well-ventilated area at temperatures not exceeding 54.4 degrees C 130 degrees F or less than 0 degrees C 32 degrees F.

PART 2 PRODUCTS

2.1 PRE-ENGINEERED WET CHEMICAL FIRE EXTINGUISHING SYSTEMS

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NOTE: If the piping between hood and storage canisters is mounted

against	**specify**
A porous surface (gypsum wallboard, etc.) that has a painted enamel	**Galvanized malleable iron, or galvanized steel**
A stainless steel wall plate or other nonporous, prefinished surface	**Chrome plated or stainless steel**

Galvanized pipe and fittings are not permitted for use with wet chemical extinguishing systems.

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Provide systems conforming to NFPA 17A and NFPA 96, except as modified herein. Provide piping and accessories within the hood that are Schedule 40 stainless-steel or chrome plated. Provide all other piping to be [Schedule 40 malleable iron or steel, painted to match the adjacent surface][chrome plated or stainless-steel]. Exhaust hoods with grease extractors UL Fire Prot Dir listed or FM APP GUIDE approved are not required to have protection downstream of the grease extractors. Provide a wet chemical agent that is listed for the particular system and recommended by the manufacturer of the system. Provide systems for protection of new [and] [existing] cooking equipment, including exhaust hoods and ducts for cooking equipment requiring protection by NFPA 96.

Use UL 300 as a guide to list all system components as part of the manufacturer's UL approved, integrated fire suppression system. Install systems within their maximum and minimum piping and temperature limitations as established by testing laboratories, and as published in the manufacturers installation manual, to comply with their UL 300 listing.

2.2 SYSTEM CONTROLS

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NOTE: If there is no building fire alarm system, include provision for connection to the base fire alarm system in a separate specification section. Refer to Section 28 31 00 .00 98 Fire Detection and Alarm .

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Mechanically actuate each system by fusible links and by remote manual actuation stations connected to the extinguishing system release mechanisms by stainless-steel cables. Arrange each system to automatically shut off the flow of fuel and electrical power to cooking appliances as indicated automatically, shutdown makeup air units is provided, and to automatically actuate the building fire alarm system as indicated. Provide gas valves that are UL listed and are of the manual mechanical reset type. Do not shut off electrical power to hood exhaust fans unless specifically required by the UL Fire Prot Dir listing or FM APP GUIDE approval.

Provide operating instructions at all system remote manual actuation stations.

2.3 [EXISTING]BUILDING FIRE ALARM CONTROL PANEL

Discharge of the extinguishing system is to actuate the fire alarm control panel in the same manner as other actuating devices in accordance with NFPA 72. Supervise extinguishing system wiring in the same manner as other devices connected to the fire alarm system. [Refer to Section 28 31 00.00 98 FIRE DETECTION AND ALARM for related requirements.]

2.4 COMPONENTS

Provide a basic wet chemical suppression system that consists of a regulated release assembly, which includes a regulated release mechanism and a wet chemical storage cylinder housed within a single enclosure. Piping, fittings, discharge nozzles, metal blow off caps, nitrogen or CO2 cartridges, agent, fusible links, and pulley elbows. Provide additional equipment to include remote manual pull stations, mechanical gas valves, , and electrical switches for automatic electrical equipment and gas line shut-off devices.

2.4.1 Manual Actuators

Provide manual actuators that do not require a force of more than 18.1 kilograms 40 lbs or a movement of more than 355 mm 14 inches to secure operation. Provide all manual actuators with operating instructions. Permit these instructions to include the use of pictographs and have lettering at least 6.35 mm 1/4 inch in height. Identify all remote manual operating devices as to the hazard they protect.

2.4.2 Electric Dual Snap-Action Switch

Provide UL listed electric dual snap-action switch(s). Make all electrical connections to the snap action switch wiring harness in junction boxes mounted adjacent to the stainless-steel enclosure for the wet chemical suppression system.

2.4.3 Distribution Piping

Provide distribution piping that is Schedule 40 black iron, chrome-plated or stainless-steel pipe conforming to ASTM A53/A53M, or ASTM A106/A106M.

2.4.4 Wet Chemical Agent

Provide extinguishing agent that is a potassium carbonate, potassium acetate-base formulation designed for flame knockdown and securement of grease-related fires. Make the agent available in plastic container, labeled with handling and usage instructions.

2.4.5 Agent Tank

Install the agent tank in a stainless-steel enclosure. Construct the tank of deep drawn carbon steel, finished in red enamel, 5.7 liter or 11.4 liter 1.5 gallon or 3.0 gallon in size, as required by manufacturer's design. Provide tanks that have 689 kilopascal 100 psi working pressure, 2068 kilopascal 300 psi minimum burst pressure.

2.4.5.1 Tank Adaptor

Provide tank adaptor assembly that is chrome-plated steel with a 6.35 mm 1/4 inch NPT female inlet and a 19 mm 3/4 inch, NPT male outlet.

2.4.5.2 Regulated Release Mechanism

Spring-loaded mechanical/fusible link pneumatic type regulator capable of providing expellant gas supply to agent tank(s), that contains a factory installed regulator deadset at 689 kilopascal 100 psi and is compatible with mechanical and electrical gas shut-off devices.

2.4.5.3 Regulated Actuator Assembly

Provide expellant gas for additional tanks in systems requiring (three) or more tanks, complete with a factory installed regulator deadset at 689 kilopascal 100 psi.

2.4.5.4 Discharge Nozzles

Provide tested discharge nozzles which are listed for a specific application, and stamp each with flow designation and tip part number. Equip each nozzle with a metal protective cap to keep the nozzle tip orifice free of cooking grease build-up. Note: Rubber protective caps are prohibited.

2.5 IDENTIFICATION SIGNS

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NOTE: Locate remote manual actuation stations in the normal path of egress and at least 1.50 meters 5 feet from the protected cooking appliances. Avoid grouping stations for different systems together; however, when this is not possible, include identification signs.
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Provide red rigid plastic signs with engraved 6.35 mm 0.25 inch high white lettering at each remote manual actuation station. Provide sign legends to read "Fire Extinguishing System" followed by a brief description of the equipment protected.

PART 3 EXECUTION

3.1 INSTALLATION

Provide equipment, materials, installation, workmanship, inspection, and testing in accordance with the manufacturer's installation manuals and maintenance manuals NFPA 17A, except as modified herein.

3.1.1 Piping

Install piping in accordance with the manufacturers UL listing. Where possible, run piping concealed or otherwise located to minimize the potential of inadvertent damage. Install piping parallel or perpendicular to the line of buildings and within hoods.

Seal all piping, fittings, and connections with pipe tape. When applying pipe tape, start on second male thread and wrap the tape (two turns

maximum) clockwise around the threads, away from the pipe opening. Do not allow tape to overlap the pipe opening as this could cause possible blockage of the gas pressure.

Properly support piping to withstand static and dynamic loading. Install piping to prevent contact of dissimilar metals.

3.2 FIELD QUALITY CONTROL

Perform tests to determine compliance with the specified requirements in the presence of the Contracting Officer. Test, inspect, and approve piping before covering or concealing. Provide Test Procedure and Test Record Forms for approval 21 days prior to formal testing and inspection.

3.2.1 Preliminary Tests

Upon completion and before final acceptance of the work, test each piping and fittings system by discharging a minimum of one storage cylinder of same size as system cylinder of compressed air or nitrogen (do not use wet chemical) to demonstrate the reliability and proper functioning of all pressure switches, electrical and gas shutoff features, and the discharge of gas from each system discharge nozzle. Individually test remote control stations and other components and accessories to demonstrate proper functioning. In testing also include automatic and manual actuation, fuel or electrical power shutoff, and automatic actuation of the building fire alarm system. When tests have been completed and corrections made, submit a signed and dated certificate, with a request for formal inspection and tests.

3.2.2 Final Acceptance Tests and Inspection

Ensure that the Contracting Officer witnesses final acceptance tests and approves systems before acceptance. Submit Record Drawings of As-Built conditions and a written request for final acceptance inspection at least [21][_____] working days prior to inspection date. Provide an experienced technician regularly employed by the system installer to be present during the inspection. At the inspection, repeat all of the required tests as directed. Provide nitrogen or CO2 and discharge each system to demonstrate uniform distribution of the wet chemical among the nozzles. Furnish nitrogen, or CO2, and personnel for the tests. Refill and reset systems after tests have been completed.

3.3 OPERATION AND MAINTENANCE

Operation and Maintenance Manuals, grouped by technical sections consisting of manufacturer's standard catalog data, as-built schematics, testing and maintenance procedures, recommended spare parts, recommended test equipment, and safety precautions. Submit this information prior to acceptance test being performed.

-- End of Section --