



# **Design Criteria for CSA Kitchen Suppression Assessments (CKH2 & FEKH2)**

This manual shall be studied and used as the bases of design criteria for CSA exams on kitchen hood suppression systems. This manual outlines generic fictional design criteria for selecting components, sizing piping, establishing distances, and other related criteria. The objective of this material is to evaluate if the user can understand and apply the design limitations outlined within. The exam will also include specific information related to code requirements from NFPA documents and the local jurisdiction which are not covered within this manual.

You will need this manual for the test. Make sure it is bound as no loose papers are allowed into the exam.

Some of the information and images within this manual and on CSA assessments may be copied from actual pre-engineered systems, such as Range Guard by Badger Fire Protection, or other systems. However, the information used in this manual has been modified from actual products. Use the criteria within this manual for the assessments.

Information within this book shall be considered fictitious and shall not be used for any actual field installations.

Revised  
March 22, 2013

**Note to Proctor: This material is allowed in kitchen hood assessments**

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March 22, 2013 – Corrected typo of ° for “ in two places.

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## Overview:

The criteria used within this manual are fictitious (not true) and shall not be used for the actual installation of any such systems. The information is used to evaluate if the individual can understand and apply the general design criteria for kitchen hood systems of the various manufacturers. Even though some of the information may resemble that from a hood system you are familiar with, it may not be accurate for actual installations. CSA test questions will be based on the information within this manual, recognized standards, and local requirements. The local jurisdiction will generally require designers and installers to provide evidence of factory training and qualifications for a respective type or brand of system in addition to CSA assessments. Contact your local jurisdiction for additional information.

## Nozzles:

There are five basic nozzles in the CSA kitchen suppression system. A Plenum / Duct / Appliance nozzle or PDA nozzle; a Wok / Radiant Gas nozzle or WRG; a Range nozzle or R; a Fryer nozzle or FY; a Hickory / Mesquite nozzle or HM. There are also one-piece and two-piece nozzles. The one-piece nozzle has a 3/8" NPT female connection while each two-piece nozzle has a 3/8" NPT male connection. Each nozzle incorporates a stainless steel strainer so no additional strainer is required in the system. The flow number represents a measure of its flow or discharge rate. The nozzle designation is stamped on each nozzle for easy identification. A swivel adapter may be used with any one-piece nozzle. However, the PDA-S swivel nozzle may be used interchangeably only with a two-piece PDA nozzle.

| Nozzle Type                   | One-Piece Part No. | Two-Piece Part No. | Flow No. |
|-------------------------------|--------------------|--------------------|----------|
| PDA                           | 112233             | 122233             | 1        |
| WRG                           | 112244             | 122244             | 1        |
| R                             | 112255             | 122255             | 1        |
| FY (or 2-piece Plenum Nozzle) | 113322             | 123322             | 2        |
| HM                            | 112266             | 122266             | 3        |
| PDA-S                         | 112236             | 122236             | 1        |

All CSA nozzles are required to have foil disk caps as supplied by the manufacturer for the respective nozzle.

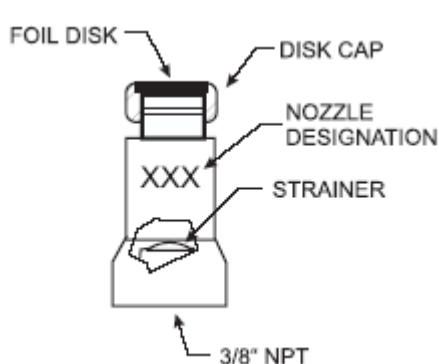


Figure 1 Section View for One-Piece Nozzle

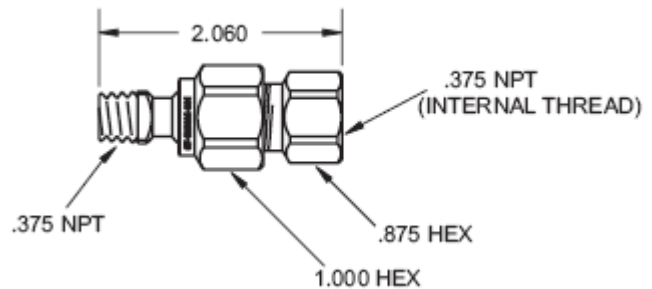


Figure 2 One-Piece Nozzle Swivel Adapter

| Hazard   | Perimeter Max.               | Diameter Max.                     | Length                          | Nozzle / Flow No. |
|--|------------------------------|-----------------------------------|---------------------------------|-------------------|
| Duct   | 50"                          | 15.25"                            | Unlimited                       | PDA / 1           |
| Duct   | 100"                         | 23.8"                             | Unlimited                       | 2-PDA / 2         |
| Hazard   | Length Max.                  | Width Max.                        | Filters                         | Nozzle / Flow No. |
| Plenum   | 10"                          | 4'                                | "V" Bank or Single              | PDA / 1           |
| Hazard   | Hazard Size Inches           | Nozzle Height Inches              | Notes Inches                    | Nozzle / Flow No. |
| Four-Burner Range                                | 28 x 28                      | 20 to 42                          | Within 9 rad. Of mid point      | R / 1             |
| Flat Cooking Surface-Griddle                     | 42 x 30                      | 13 to 48                          | 3 Offset                        | PDA / 1           |
| Single Vat Deep Fat Fryer (Drip Boards 1 to 6    | 18 x 18                      | 27 to 45                          | 45° to 90°                      | FY / 2            |
| Single Vat Deep Fat Fryer (Drip Boards < 1"      | 24 x 24                      | 27.5 to 46                        | within perimeter                | FY / 2            |
| Split Vat Deep Fat Fryer                         | 14 x 15                      | 27 to 45                          | 45° to 90°                      | FY / 2            |
| Split Vat Deep Fat Fryer (Low Proximity)         | 14 x 15                      | 1 to 27                           | Within perimeter                | PDA / 1           |
| Woks   | 14 to 28 Dia.<br>3 to 8 Dia. | 35 to 56                          | Within 2 of mid point           | WRG / 1           |
| Upright Broilers (Salamanders)                   | 30.25 x 34                   |                                   | Top 4 of broiler comp.          | PDA / 1           |
| Closed Top Chain Broilers                        | 28 x 29                      | See ???                           | See???                          | PDA / 1           |
| Open Top Chain Broilers                          | 28 x 29                      | See ???                           | See ???, 2 Nozzles              | PDA / 1 ea.       |
| Pumice Rock (Lava, Ceramic) Charbroiler          | 22 x 23                      | 24 to 48                          | 45° to 90°;<br>2 layers of rock | FY / 2            |
| Natural/Mesquite Charcoal Charbroiler            | 24 x 24                      | 24 to 48                          | 45° to 90°;<br>6 charcoal depth | PDA / 1           |
| Electric Charbroiler (Open Grid)                 | 24 x 21                      | 24 to 48                          | 45° to 90°;                     | WRG / 1           |
| Gas Radiant Charbroiler                          | 24 x 21                      | 24 to 48                          | 45° to 90°;                     | WRG / 1           |
| Mesquite/Hickory Charbroiler (chips, wood, logs) | 30 x 24                      | 24 to 48                          | 45° to 90°;<br>10 fuel depth    | HM / 3            |
| Natural/Mesquite/Hickory Charcoal Charbroiler    | 30 x 24                      | 24 to 48                          | 45° to 90°;<br>10 fuel depth    | HM / 3            |
| Tilt Skillet and Braising Pan                    | 24 x 24                      | 27.5 to 46<br>within<br>perimeter |                                 | FY / 2            |

| Nozzle Identification       | Nozzle Part No. | Flow No. |
|-----------------------------|-----------------|----------|
| PDA (Plenum/Duct/Appliance) |                 | 1        |
| FY (Fryer)                  |                 | 2        |
| WRG (Wok/Radiant Gas)       |                 | 1        |
| R (Range)                   |                 | 1        |

|                       |  |   |
|-----------------------|--|---|
| HM (Hickory/Mesquite) |  | 3 |
|-----------------------|--|---|

## **Control Heads:**

### **Mechanical Control Head**

P/N's M607, M063, and M176

The mechanical control head is used on systems equipped with fusible link detectors. When a fusible link detector operates, the release of tension in the fusible link cable allows the control head to actuate. A spring-loaded plunger depresses the check stem in the cylinder valve, discharging the contents of the cylinder. The control head also releases tension in a cable to an optional tandem control head or gas shut-off valve, causing operation of these devices. The control head is equipped with a local manual release handle integral with the control head cover plate. To manually operate the system locally, pull the ring pin out and rotate the handle clockwise. A mechanical, remote manual release may also be used with the mechanical control head.

P/N M607 does not have a microswitch. P/N M063 is equipped with one Form "C" microswitch. P/N M176 is equipped with two Form "C" microswitches. The microswitch contacts in both control heads transfer when the control head operates.

### **Electric Control Head**

P/N E175

The electric control head is used on systems that use thermostats. The control head is rated at 120 VAC, 10 amps nominal, or 24 VDC, 2 amps nominal. When electric power is applied to the control head, a solenoid releases a spring-loaded plunger which depresses the check stem in the cylinder valve, discharging the contents of the cylinder. The control head also releases tension in a cable to an optional tandem control head or gas shut-off valve, causing operation of these devices. The control head is equipped with a local manual release handle integral with the control head cover plate. To manually operate the system locally, pull the ring pin out and rotate the handle clockwise. A mechanical, remote manual release may also be used with the electric control head.

P/N E175 is equipped with two Form "C" microswitches. The microswitch contacts in the control head transfer when the control head operates. One set of contacts, which is normally closed when the control head is in the "set" position, must be wired in series with the control head solenoid coil to disconnect the power from the coil upon actuation.

### **Tandem Control Head**

P/N T082

The tandem control head is used on multiple cylinder installations. A primary control head, which may be mechanical or electric, is attached to one CSA cylinder valve. Each additional cylinder is equipped with a tandem control head. Release of cable tension from the primary control head actuates the tandem control head(s) operating all cylinder valves simultaneously. The tandem control head is not equipped with an integral manual release handle or microswitch contacts.

There is no limit to the number of Tandem Control Heads that may be used, however, there is a maximum of 30 corner pulleys and 100 feet (30.4 m) of cable measured from primary control head to the last tandem control head.

## **CO2 Control Box**

The CO2 Control Box is composed of a CO2 cartridge, spring mechanism and a discharge lever which discharges the CO2 cartridge when: (a) a fusible link actuates in any detector or (b) the Remote Manual Control is operated. The valve, with the CO2 cartridge, is connected to a Pressure Operated Actuator mounted on the system cylinder by 1/4" (.6 cm) O.D. copper tubing using compression or flare fittings. (The tubing is standard, commercially available tubing and is not supplied with the system.) When the CO2 cartridge discharges, the CO2 gas pressurizes the 1/4" (.6 cm) O.D. tubing to the Pneumatic Control Head(s), located on the system Cylinder Valve(s), and actuates the cylinder(s).

The CO2 Control Box can operate a maximum of five cylinders, regardless of size. A Pressure Operated Actuator (PA12) is required on each system cylinder; one is supplied with the CO2 Control Box. The CO2 Control Box can be mounted in any orientation.

## **Pressure Operated Actuator**

The Pressure Operated Actuator (PA12) is used only with the CO2 Control Box. It contains a piston that is driven down by the CO2 pressure when the CO2 Control Box is activated. The piston will remain in the discharged position as long as CO2 pressure is maintained. Pressure can be relieved from the Pressure Operated Actuator by depressing the schrader valve on the top of the Pressure Operated Actuator. This must be done prior to removing the Pressure Operated Actuator from the cylinder valve. A maximum of 5 Pressure Operated Actuators can be used with a single CO2 Control Box.



## Detectors

**NOTE: Detectors and Links on this page cannot be used in conjunction with the CO2 Control Box. These detectors and links must be used with the following Control Head part numbers: M607, M063, M176, E175, and T082.**

### Fusible-Link Housing Kit, P/N LK548

The fusible link housing kit consists of a fusible link housing, two ½” EMT connectors, a supply of cable crimp sleeves and an “S” hook to attach the fusible link to the 1/16” cable leading to the control head

### Fusible Links-, P/N's L661, L662, L664, and L666

Fusible links are used in conjunction with the fusible link housing kit. The fusible links are held together with a low melting alloy which melts at a predetermined temperature, allowing the two halves of the link to separate.

Fusible links are available in four temperature ratings:

| P/N  | Fusible Link Rating | Max. Exposure Temp. | Load Rating               |
|------|---------------------|---------------------|---------------------------|
| L661 | 165°F               | 100°F               | 10 lb. min. to 40 lb max. |
| L662 | 212°F               | 150°F               | 10 lb. min. to 40 lb max. |
| L664 | 360°F               | 300°F               | 10 lb. min. to 40 lb max. |
| L666 | 500°F               | 440°F               | 10 lb. min. to 40 lb max. |

There are two temperature designations which apply to both fusible links and quartzoid bulb links. One temperature is called the rating temperature and the other is called the maximum exposure temperature.

The rating temperature, which is stamped on the fusible link, is the temperature at which the link will separate when new. However, continual exposure to cycling ambient temperatures may cause a degradation of the link over time. Therefore, the fusible links must be replaced semiannually with a new link having the proper temperature rating.

The maximum exposure temperature is the maximum ambient air temperature in which a fusible link may be installed. The maximum air temperature at the point of link installation must not exceed the maximum exposure temperature shown in the table.

### Quartzoid Bulb Link

P/N QB643 rated at 400°F (204°C) and P/N QB644 rated at 500°F (260°C)

The quartzoid bulb link is used in conjunction with the fusible link housing kit. The quartzoid bulb link consists of a glass bulb, filled with liquid and a small air bubble, and a metal housing. Temperature rise expands the liquid in the bulb and compresses the air bubble. When a predetermined temperature is reached, the expanding liquid breaks the glass bulb and allows the housing pieces to separate. Quartzoid bulb links are available with a 400°F (204°C) and 500°F (260°C) temperature rating. The maximum exposure temperature for the quartzoid bulb link is 375°F (191°C) and 475°F (246°C) respectively.

The loop marked “A” should be installed toward the control head. Quartzoid bulb links have an unlimited life expectancy, before operation, and need not be changed on a semiannual basis. However, the local authority having jurisdiction may rule otherwise. On periodic inspection, the quartzoid bulb link must be wiped clean of grease and dirt.

## **Thermostats and CO2 Detector**

Thermostats are electric heat detectors. Thermostats are equipped with resettable, normally open contacts which close when a predetermined temperature is reached. Thermostats are constructed to compensate for rate of temperature rise, if the temperature rise is great enough, the detector contacts will close at a temperature somewhat below the set point.

Thermostats are available in the following set points:

| <b>P/N</b> | <b>Set Point</b> | <b>Max. Exposed Temperature</b> |
|------------|------------------|---------------------------------|
| TS140      | 140°F            | 80°F                            |
| TS190      | 190°F            | 100°F                           |
| TS225      | 225°F            | 125°F                           |
| TS325      | 325°F            | 225°F                           |
| TS450      | 450°F            | 350°F                           |
| TS600      | 600°F            | 500°F                           |

## **CO2 Control Box Detector**

The CO2 Control Box detector consists of a plated steel bracket 11-3/4’ (29.8 cm) long, 2 cable crimps and 2 “S” Hooks to connect the fusible link to the detection system cable. This detector is only used with the CO2 Control Box. This detector can be used with either a fusible link (P/N L903) or quartzoid bulb.

## Remote Manual Controls

### Mechanical, Remote Manual Release,

P/N MR572

The mechanical, remote manual release is provided as a means of manually actuating the system from a remote location. The mechanical, remote manual release is used only with the Mechanical or Electric Control Heads and cannot be used with the CO2 Control Box. The mechanical, remote manual release is attached to the primary control head with 1/16" cable. To actuate the system at the mechanical, remote manual release, pull out the ring pin and pull hard on the handle. Each manual release is supplied with a separate nameplate. This nameplate must be attached to the mounting surface 1" above or below the pull station.

**NOTE: This Remote Manual Release is only for use with the Mechanical Control Heads, part numbers M607, M063, M176 and Electric Control Head part number E175. This Remote Manual Release cannot be used with the CO2 Control Box.**

### Remote Manual Controls for CO2 Control Box

There are two types of Surfaced Mounted Remote Manual Controls available for use with the CO2 Control Box, End-of-Line and in-Line. Each is used as a means to actuate the system manually from a remote location. This is accomplished by removing the pull pin, releasing the tension in the detection cable, allowing the Control Box to activate the cylinder.

If an End-of-Line Remote Manual Control is not applicable, it can be converted to an In-Line Remote Manual Control by using an In-Line Kit. An In-Line Kit uses a Tee Pulley and Corner Pulley Bearing to modify the End-of-Line Remote Manual Control.

**NOTE: These Remote Manual Controls are only for use with the CO2 Control Box. These Remote Manual Controls cannot be used with the Mechanical or Electric Control Head.**

### Flush Mounted Remote Manual Control for CO2 Control Box

The Flush Mounted Remote Manual Control provides a means to operate the system manually from a remote location. It is designed to be mounted to a wall stud and is provided with a cover plate.

Two types of Flush Mounted Remote Manual Controls are available for use with the CO2 Control Box. The End-of-Line Remote Manual Control is designed for use at the end of the

detection line. The In-Line Remote Manual Control is designed for installation within the detection line. A Tee Pulley is included with the In-Line Remote Manual Control.

**NOTE: These Remote Manual Controls are only for use with the CO2 Control Box. These Remote Manual Controls cannot be used with the Mechanical or Electric Control Head.**

## Miscellaneous Accessories

### Corner Pulley and Detection Cable

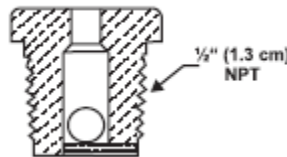
The Corner Pulley can be used in both low and high temperature environments. The pulley contains steel ball bearings and the body is cast aluminum. A 1/16" (.2 cm) diameter stainless steel 7x7 strand cable is used for the detection line. It is installed in 1/2" (1.3 cm) EMT.

### Vent Plug

A Vent Plug is used in the discharge piping near a Range Guard cylinder to prevent pressure build-up in the discharge pipe system, caused by heat, from rupturing the foil seals on each nozzle.

The Vent Plug is to be installed in the discharge piping so that it faces the ceiling or the wall.

**CAUTION: NEVER INSTALL VENT PLUG FACING DOWN OR AT THE FLOOR.**



### Pneumatic Release

The Pneumatic Release can be used to release the stem of a spring loaded gas shut off valve. When a system discharges, pressure on the piston within the Pneumatic Release causes the piston to move, thereby retracting a normally protruding pin. The pin is used as a support for a cable linkage to the gas valve stem. Retraction of the pin removes support for the linkage allowing it to pull away, thus releasing the valve stem which now moves to the closed position under the force of the valve closing spring. The Pneumatic Release is screwed on the upper end of a 12" (30.5 cm) maximum length of vertical black pipe using a pipe reducer from vertical pipe size to 1/8" NPT to accommodate the pneumatic connection. The 12" (30.5 cm) vertical riser is fastened to a tee which may be located wherever convenient in the

discharge pipe. The purpose of the riser is to provide an air cushion during discharge preventing the entrance of wet chemical into the Pneumatic Release.

## Gas Valves

### Mechanical Gas Valve

The Listed valve has a spring, normally urging it into the closed position, and a control stem with which the valve may be held open against the force of the spring.

Only Mechanical Gas Valves that are specifically listed and identified by part number in this manual may be used with the Range Guard system.

Mechanical Gas Valves must be operated using either a Pneumatic Release, directly off the discharge lever on the CO2 Control Box or directly off the actuating cam on the Mechanical, Electric or Tandem Control Head. There is no other method for closing Mechanical Gas Valves. When using a Pneumatic Release or CO2 Control Box a maximum of 16 corner pulleys and 50 feet (15.2 m) of cable are to be used with Mechanical Gas Valves. When using Mechanical Control Heads, part numbers M607, M063, M176, Tandem Control Head part number T082 and Electric Control Head part number E175, a maximum of 30 corner pulleys and 100 feet (30.4 m) of cable are to be used with Mechanical Gas Valves.

**Note: When using a Mechanical, Electric or Tandem Control Head a cable block (included with valve) is required.**

**CAUTION: TEE PULLEYS CAN NOT BE USED TO OPERATE DUAL GAS VALVES.**

**Additional Sections still under development and changes may be made. Check back at least two weeks prior to your assessment to see if additional material has been added that could be on a test.**  
**CSA is not responsible for participants who have not obtained a current manual.**