

**CITY OF SACRAMENTO**

**Permit No: 9802227**

**1231 I Street, Sacramento, CA 95814**

**Insp Area: 3**

**Site Address: 2546 24TH ST SAC**

**Sub-Type: COM**

**Parcel No: 0100224009**

**Housing (Y/N): N**

**CONTRACTOR**

INTERNATIONAL FIRE EQUIPMENT  
133 OTTO CR  
SACRAMENTO, CA 95822  
Phone: 916-422-2250

**OWNER**

LOGAN MARTHA/EST OF  
2349 BURNETT WY  
SACRAMENTO CA 95818  
Phone:

**ARCHITECT**

Phone:

**Nature of Work: PRE-ENGINEERED HOOD FIRE SUPPRESSION SYSTEM**

**CONSTRUCTION LENDING AGENCY :** I hereby affirm under penalty of perjury that there is a construction lending agency for the performance of the work for which this permit is issued (Sec. 3097, Civ. C).

Lender's Name \_\_\_\_\_ Lender's Address \_\_\_\_\_

**LICENSED CONTRACTORS DECLARATION:** I hereby affirm under penalty of perjury that I am licensed under provisions of Chapter 9 (commencing with section 7000) of Division 3 of the Business and Professions Code and my license is in full force and effect.

License Class C-16 License Number 253912 Date 4-30-99 Contractor Signature [Signature]

**OWNER-BUILDER DECLARATION:** I hereby affirm under penalty of perjury that I am exempt from the contractors License Law for the following reason (Sec. 7031.5, Business and Professions Code; any city or county which requires a permit to construct, alter, improve, demolish, or repair any structure, prior to its issuance, also requires the applicant for such permit to file a signed statement that he or she is licensed pursuant to the provisions of the Contractors License Law (Chapter 9 (commencing with Section 7000) of Division 8 of the Business and Professions Code) or that he or she is exempt therefrom and the basis for the alleged exemption. Any violation of Section 7031.5 by any applicant for a permit subjects the applicant to a civil penalty of not more than five hundred dollars (\$500.00);

\_\_\_\_ I, as a owner of the property, or my employees with wages as their sole compensation, will do the work, and the structure is not intended or offered for sale (Sec. 7044, Business and Professional Code: The Contractors Law does not apply to an owner of property who builds or improves thereon, and who does such work himself or herself or through his or her own employees, provided that such improvements are not intended or offered for sale. If, however, the building or improvement is sold within one year of completion, the owner-builder will have the burden of proving that he or she did not build or improve for the purpose of sale.)

\_\_\_\_ I, as owner of the property, am exclusively contracting with licensed contractors to construct the project (Sec. 7044, Business and Professions Code: The contractors License Law does not apply to an owner of property who builds or improves thereon, and who contracts for such projects with a contractor(s) licensed pursuant to the Contractors License Law).

\_\_\_\_ I am exempt under Sec. \_\_\_\_\_ B & PC for this reason: \_\_\_\_\_

Date \_\_\_\_\_ Owner Signature \_\_\_\_\_

**IN ISSUING THIS BUILDING PERMIT,** the applicant represents, and the city relies on the representation of the applicant, that the applicant verified all measurements and locations shown on the application or accompanying drawings and that the improvement to be constructed does not violate any law or private agreement relating to permissible or prohibited locations for such improvements. This building permit does not authorize any illegal location of any improvement or the violation of any private agreement relating to location of improvements.

Date 3-20-98 Applicant/Agent Signature [Signature]

**WORKER'S COMPENSATION DECLARATION:** I hereby affirm under penalty of perjury one of the following declarations:

\_\_\_\_ I have and will maintain a certificate of consent to self-insure for workers' compensation as provided for by Section 3700 of the Labor Code, for the performance of work for which the permit is issued.

I have and will maintain workers' compensation insurance, as required by Section 3700 of the Labor Code, for the performance of the work for which this permit is issued. My workers' compensation insurance carrier and policy number are:

Carrier State Fund Policy Number 315-97 UNIT 0000951

\_\_\_\_ (This section need not be completed if the permit is for \$100 or less) I certify that in the performance of the work for which this permit is issued, I shall not employ any person in any manner so as to become subject to the workers' compensation laws of California and agree that if I should become subject to the workers' compensation provisions of Section 3700 of the Labor Code, I shall forthwith comply with those provisions.

Date 3-20-98 Applicant Signature [Signature]

**WARNING: FAILURE TO SECURE WORKER'S COMPENSATION COVERAGE IS UNLAWFUL AND SHALL SUBJECT AN EMPLOYER TO CRIMINAL PENALTIES AND CIVIL FINES UP TO ONE HUNDRED THOUSAND DOLLARS (\$100,000) IN ADDITION TO THE COST OF COMPENSATION, DAMAGES AS PROVIDED FOR IN SECTION 3706 OF THE LABOR CODE, INTEREST AND ATTORNEY'S FEE.**

**THIS PERMIT SHALL EXPIRE BY LIMITATION IF WORK IS NOT COMMENCED WITHIN 180 DAYS.**

# MEMORANDUM

Sacramento Fire Department

To: BUILDING DEPARTMENT

Date: 3-26-98

From: Gordon Duncan,  
Fire Marshal

Subject: FIRE SYSTEM INSPECTION

A final inspection of the newly installed fire system at:

2546 29<sup>th</sup> ST

has been conducted by Inspector C. Pack

on 3-20-98.

Permit Number 98-02227-C

The system is acceptable by this Department.

K.T. Hood  
Type Inspection

R. Woodman  
By: Ross L. Woodman,  
Fire Prevention Officer II

98-40  
F. D. Reference Number



This set of plans and specifications must be kept on the job at all times and it is unlawful to make any changes or alterations from the same without written permission from the Building Inspection Division.

The approval of this plan and specification SHALL NOT be held to permit or approve the violation of any City Ordinance or State Law.



**FIRST...WITH THE BEST**

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## Design, Installation & Maintenance Manual

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**MANUAL PART NO.: 27000**  
**MANUAL ISSUE DATE: 31, MAY 1996**

**BADGER FIRE PROTECTION, INC.**

9802227

**ISSUED**

MAR 20 1998

CITY OF SACRAMENTO  
DEVELOPMENT SERVICES DIV

**ADDRESS**  
4251 Seminole Trail  
Route 29 North  
Charlottesville, VA 22911

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**ORDER/TECHNICAL SUPPORT PHONE**  
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<http://www.badgerfire.com>

## General Introduction

### Introduction

This manual covers the design, installation, operation and maintenance of the Range Guard® wet chemical fire suppression system. Range Guard is specifically designed and Listed for the suppression of fires in commercial kitchen cooking appliances, plenums, hoods and ducts. Each Range Guard system operates automatically or may be operated manually.

The Range Guard System uses a liquid chemical called Karbaloy® as its agent. Karbaloy, a solution of potassium carbonate in water, suppresses fires through a patented process involving: (1) the saponification of surface grease (turning it into combustion-resistant soap), (2) the cooling effects of water vaporization, (3) the inerting effects of resultant steam formation and (4) the interruption of the chemical chain reaction of combustion.

### System Temperature Limitations

The operating temperature limits for system cylinders and the nitrogen cartridge are 0° F (-18° C) minimum and 120° F (49° C) maximum. In shipment or storage, system cylinders and nitrogen cartridges shall not be exposed to less than 0° F (-18° C) or more than 120° F (49° C).

### Agency Approvals

The Range Guard wet chemical system complies with the requirements of the following agencies:

- Underwriters Laboratories, Inc. (UL300)
- Underwriters Laboratories of Canada (ULC/ORD-1254C.6)
- California State Fire Marshal's Office
- New York City Department of Buildings Materials & Equipment Acceptance Division. (MEA 199-95-E)
- Building Officials & Code Administrators International (BOCA Research Report 80-3)
- ISO 9001 Registered

Before proceeding with any Range Guard system design, installation, or maintenance procedure, the requirements of this manual must be fully understood. Components not described in this manual are not recognized by Badger Fire Protection, Inc. (BFPI) as Range Guard components and must **NOT** be used in the Range Guard system. The Range Guard fire suppression system is to be installed, inspected and maintained in accordance with NFPA 17A, Standard for Wet Chemical Extinguishing Systems, NFPA 96, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations, and this manual.

## Cylinders

### Cylinders

Range Guard systems have available five different cylinder sizes: 5 Quart (4.7L), 2-1/2 gallon (9.5L), 4 gallon long (15L), 4 gallon short (15L) and 6 gallon (22.7L). The cylinder size is

expressed in terms of the Karbaloy® capacity. Each cylinder is pressurized with nitrogen or air to 175 psig (1205 kPa), at 70° F (21°C).

**Note:** It is recommended that cylinders be stored upright.



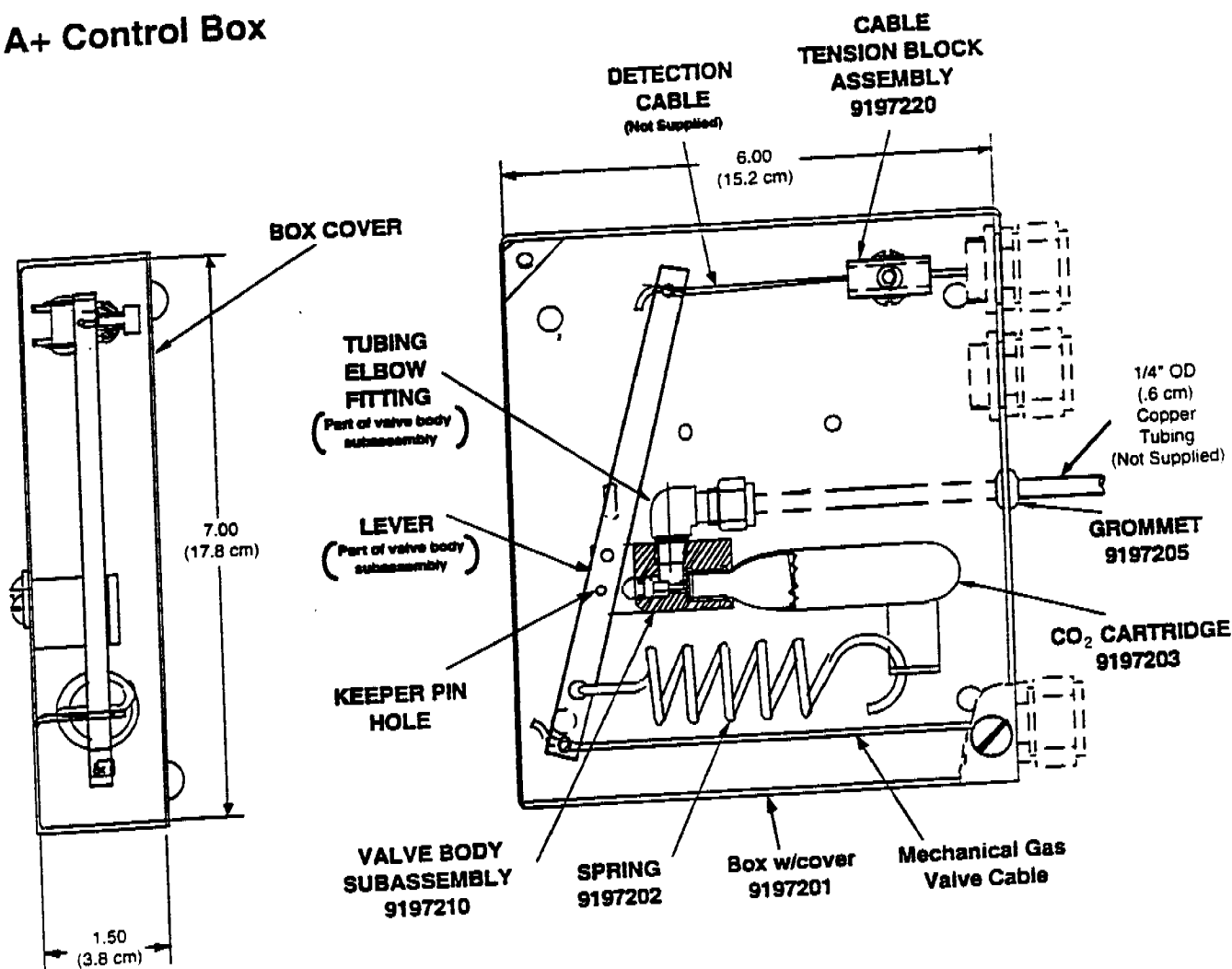
**4 GALLON (LONG) (15L)**    **6 GALLON (22.7L)**    **4 GALLON (SHORT) (15L)**    **2-1/2 GALLON (9.5L)**    **5 QUART (4.7L)**

■ Table 1c

Cylinder Size	Part No.	Charged Weight Lbs	Diameter Inches	Height to Center of Discharge Port Inches	Overall Height Inches	Overall Height With Mech Actuator* Inches	Overall Height With Pneumatic Control Head Inches
5 Quart (4.7L)	97422	28.5 (12.9 Kgs)	7-1/2 (19 cm)	16 (41 cm)	17 (43 cm)	28-1/4 (71.8 cm)	18-3/4 (47.6 cm)
2-1/2 Gallon (9.5L)	97250	53 (24 Kgs)	9 (23 cm)	21-3/8 (54 cm)	22-3/8 (57 cm)	33-5/8 (85.4 cm)	24-1/8 (61.3 cm)
4 Gallon-S (15L)	97157	80 (36.3 Kgs)	12 (30.5 cm)	19-1/4 (49 cm)	20-1/4 (51 cm)	31-1/2 (80 cm)	22 (55.9 cm)
4 Gallon-L (15L)	96823	88 (40 Kgs)	8-1/4 (21 cm)	35-3/4 (91 cm)	36-3/4 (93 cm)	48 (122 cm)	38-1/2 (97.8 cm)
6 Gallon (22.7L)	96776	110 (50 Kgs)	10-3/16 (26 cm)	35-1/8 (89 cm)	36-1/8 (92 cm)	47-3/8 (120 cm)	37-7/8 (96.2 cm)

\* Measured with cover fully open to allow normal servicing of the system.

**A+ Control Box**



**A+ CONTROL BOX: 97200**  
**FIGURE 7c**

**A+ Control Box**

The A+ Control Box (shown in Figure 7c) is composed of a CO<sub>2</sub> cartridge, spring mechanism and a discharge lever which discharges the CO<sub>2</sub> cartridge when: (a) a fusible link actuates in any detector or (b) the Remote Manual Control is operated. The valve, with the CO<sub>2</sub> cartridge, is connected to a Pneumatic Control Head 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 CO<sub>2</sub> cartridge discharges, the CO<sub>2</sub> gas pressurizes the 1/4" (.6 cm) O.D. tubing to the Pneumatic Control Head(s), located on the system Cylinder Valve, and actuates the cylinder(s).

The A+ Control Box can operate a maximum of five cylinders, regardless of size. A Pneumatic Control Head (99429) is required on each system cylinder, one is supplied with the A+ Control Box.

One 1/2" (1.3 cm) Liquid Seal Adapter, 3/8" (1.0 cm) Liquid Seal Adapter and one vent plug is supplied with each A+ Control Box.

The A+ Control Box can be mounted in any orientation.

Refer to page I-12 of this manual for installation limitations

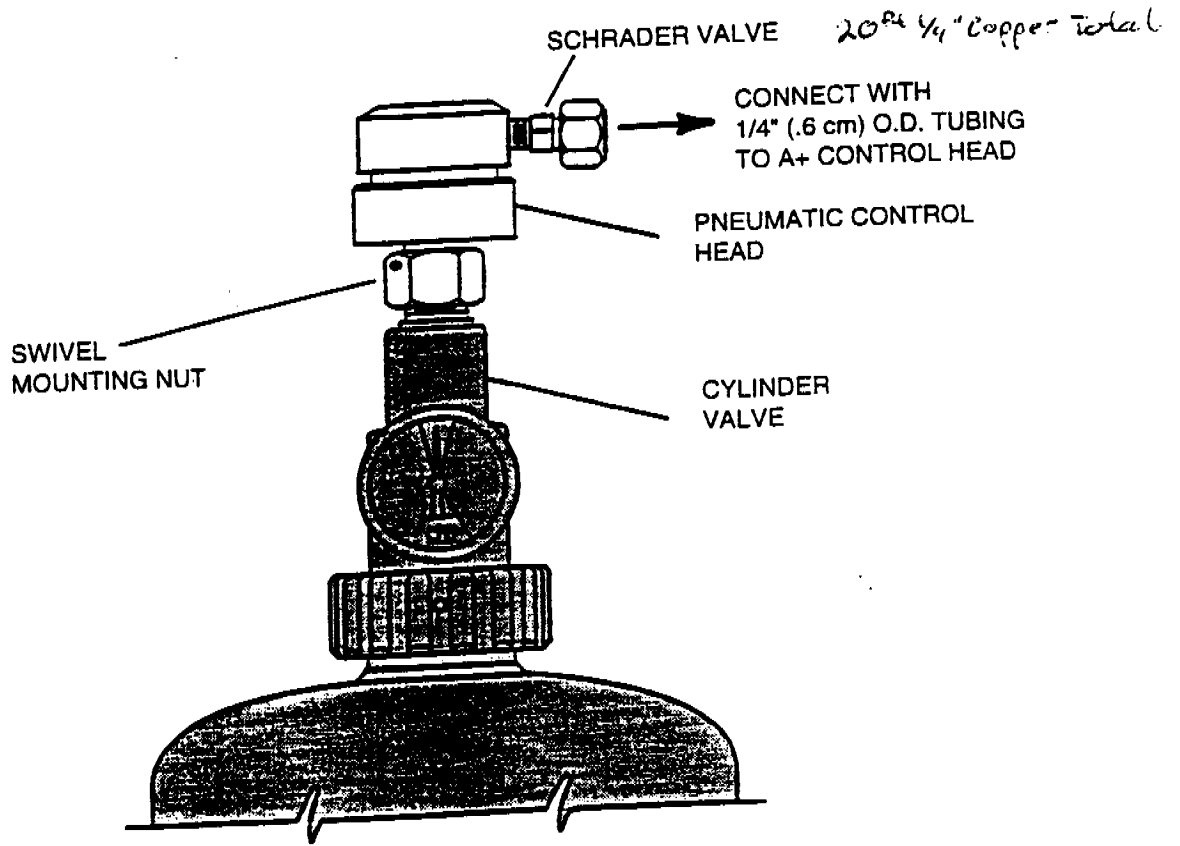
**C-8**

**Pneumatic Control Head**

**Pneumatic Control Head**

The Pneumatic Control Head is used only with the A+ Control Box. It contains a piston that is driven down by the CO<sub>2</sub> pressure when the A+ Control Box is activated. The piston will

remain in the "discharged" position as long as CO<sub>2</sub> pressure is maintained. A maximum of 5 Pneumatic Control Heads can be used with a single A+ Control Box.



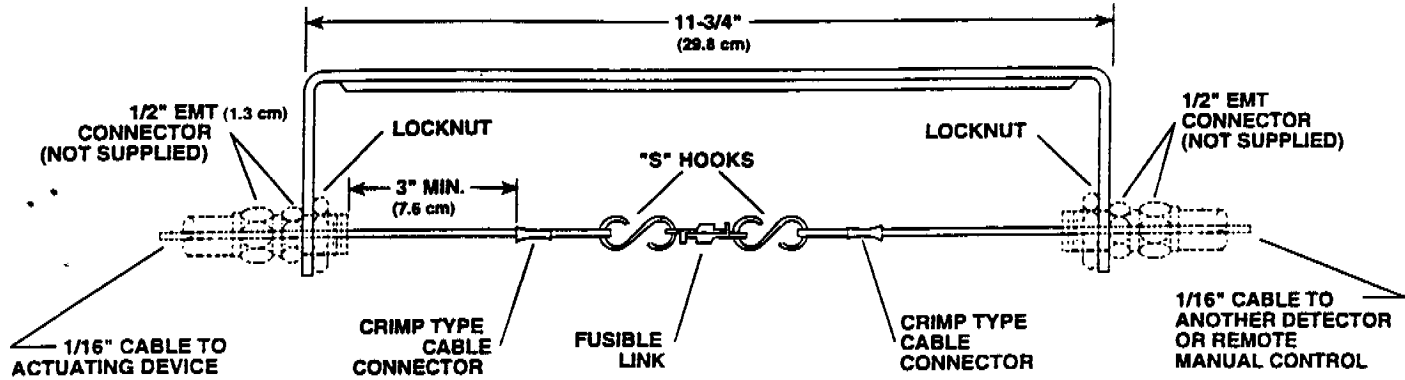
**PNEUMATIC CONTROL HEAD 99429  
FIGURE 8c**

## C-10

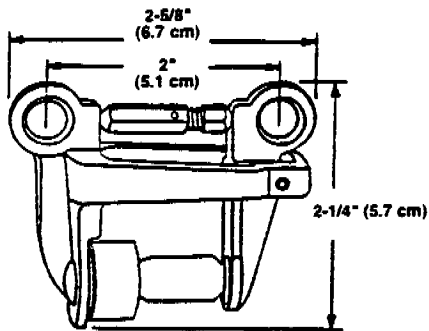
### Detector

#### Detector

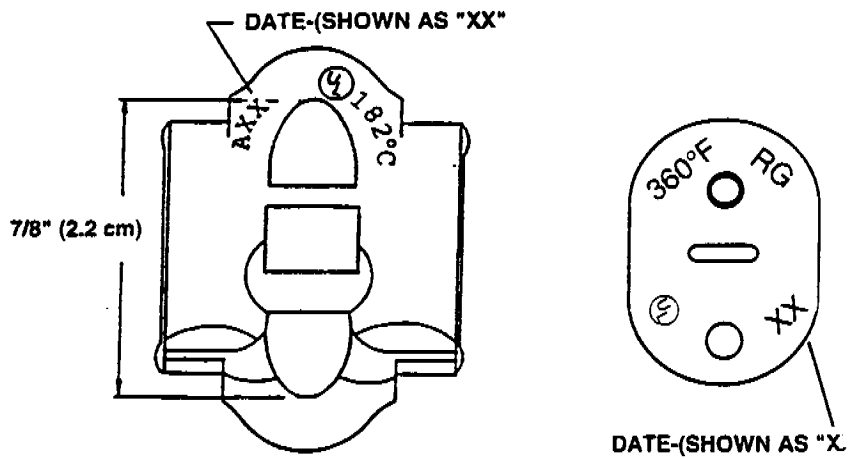
The detector consists of a plated steel bracket 11-3/4" (29.8 cm) long, a Listed fusible link, 2 cable crimps and 2 "S" Hooks to connect the fusible link to the detection system cable.



DETECTOR 97024  
FIGURE 11c



GLASS BULB  
(QUARTZOID) LINK  
FIGURE 12c



360° (18° C) FUSIBLE LINK 96903  
FIGURE 13c

Rating	Part No.	Maximum Ambient Temperature
400° (204°)	57643	375° F (191° C)
500° (260°)	57644	475° F (246° C)

Load rating of both links is 250# (113.4 kg).

300° F (149° C) maximum ambient temperature.  
Min 3 lbs. (1.4 kg) – Max. 45 lbs. (20.4 kg) rated



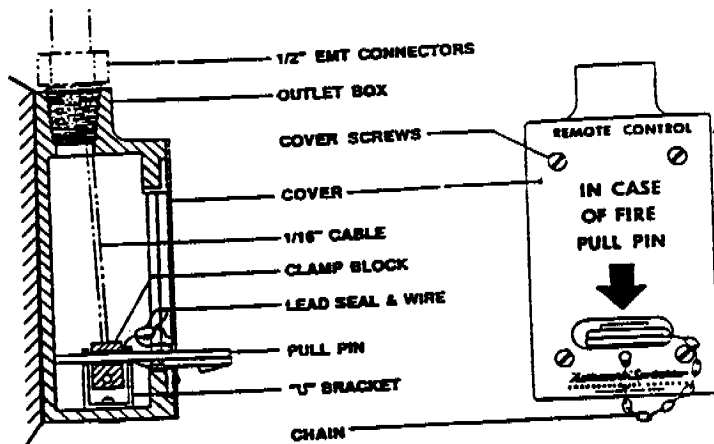
## Surface Mounted Remote Manual Controls

### Remote Manual Controls

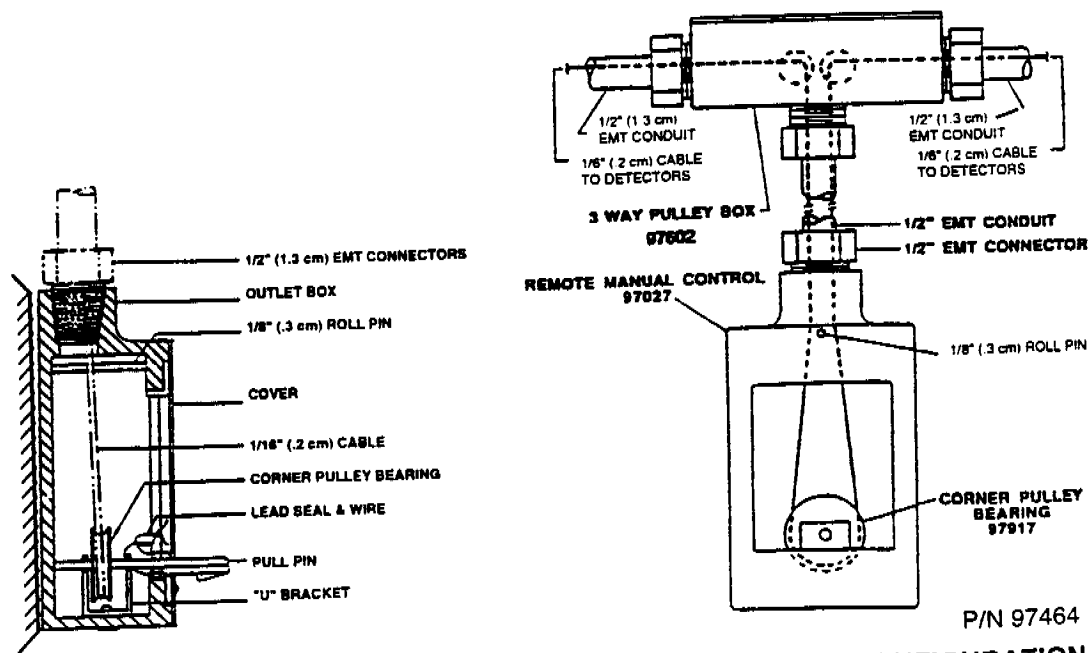
There are two types of Surfaced Mounted Remote Manual Controls available, End-of-Line (Figure 14c) and In-Line (Figure 15c). Each is used as a means to actuate the system manually from a remote location. This is accomplished by removing the pull pin, releasing the tension in the detection cable, allowing the Control Head 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 using an In-Line Kit. Refer to page I-3 of this manual. An In-Line Kit uses a BFPI approved Tee Pulley and Corner Pull Bearing (see Figure 15c) to modify the End-of-Line Remote Manual Control.

Refer to page I-3 of this manual for installation limitations



Surface Mounted End-of-Line Remote Manual Control, 97463  
FIGURE 14C



SURFACE MOUNTED REMOTE MANUAL CONTROL IN-LINE CONFIGURATION  
IN-LINE KIT, 97464  
FIGURE 15c

## Design/Single Cylinder Actuation

### General

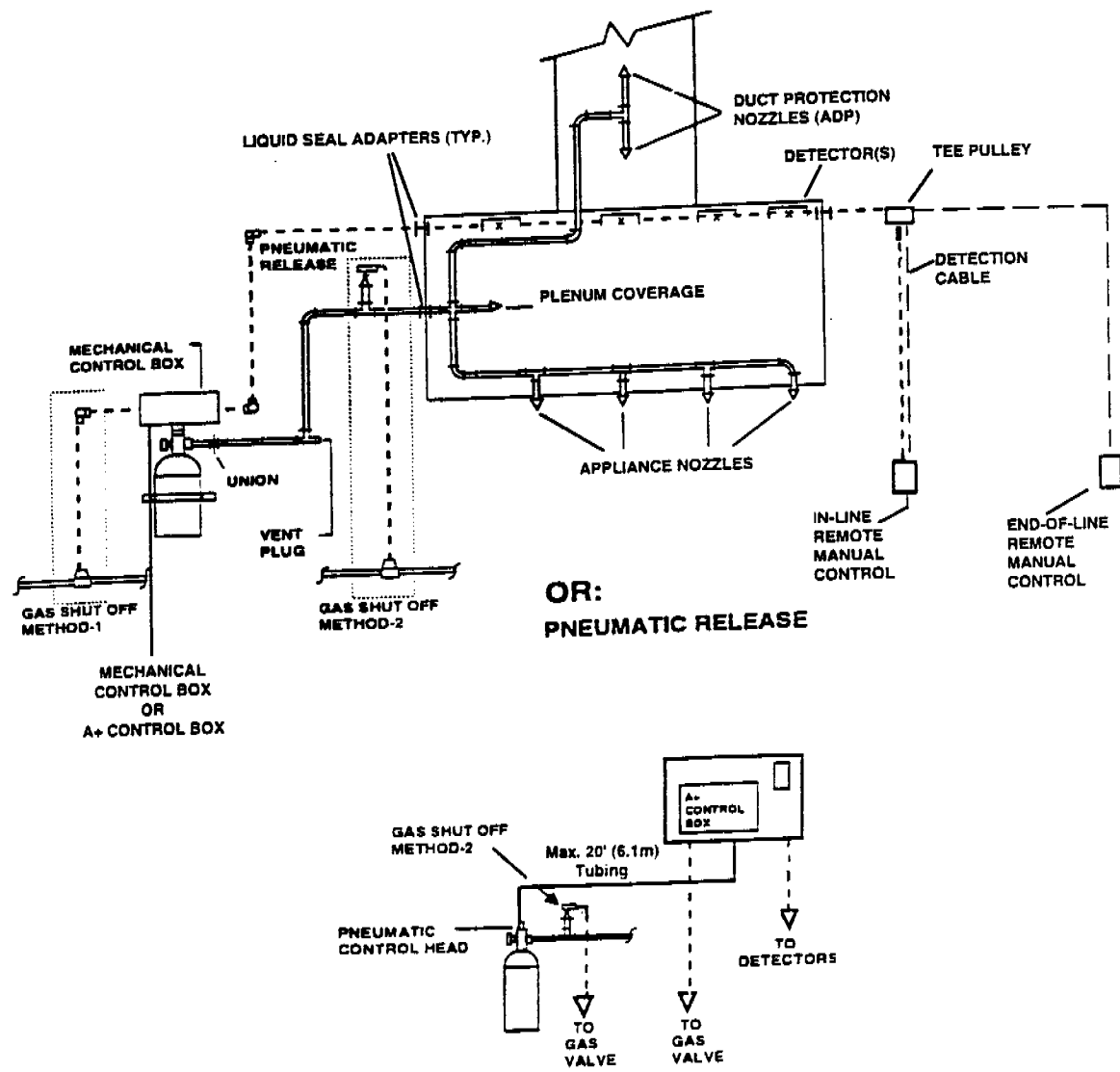
This section covers the design aspects of the 5 quart (4.7L), 2-1/2 gallon (9.5L), 4 gallon (15L) and 6 gallon (22.7L) systems. It contains all the necessary information to design a complete system including nozzle placement, detector placement, cylinder sizing, piping limitations and auxiliary hardware.

All system designs and installations must comply with all requirements of this manual. A well thought out design will save time and money when it comes time to perform the installation.

### SINGLE CYLINDER ACTUATION

Figure 1d illustrates single cylinder actuation using either the Mechanical Control Box or the A+ Control Box. Note that with both the Mechanical Control Box and the A+ Control Box, the

gas valve can be shut off through the control box or by using a pneumatic release. Multiple gas valve actuation must be accomplished with the use of pneumatic releases.



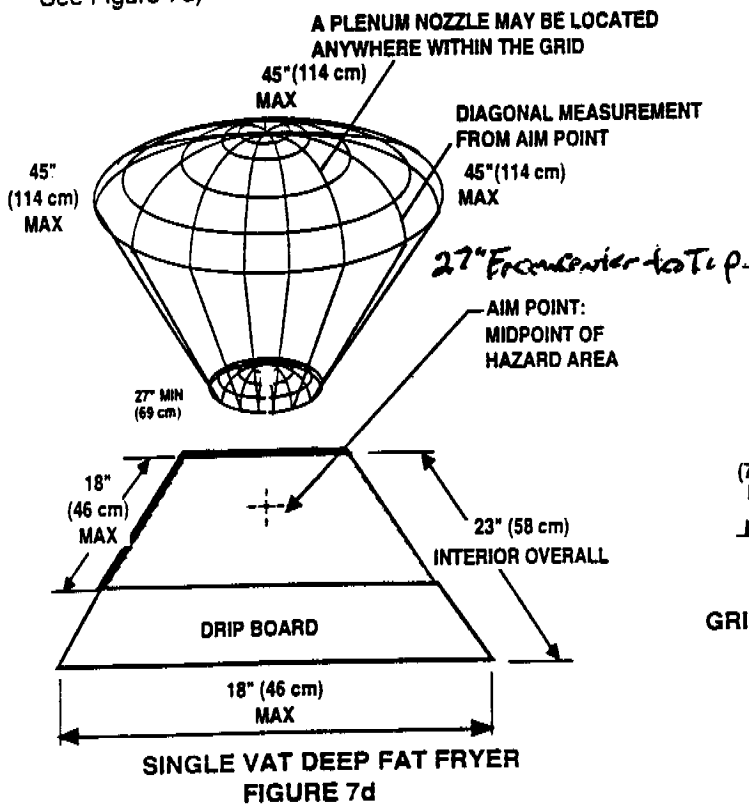
TYPICAL SINGLE CYLINDER SYSTEM  
FIGURE 1d

*Foll*

**D-**

**SINGLE VAT DEEP FAT FRYER WITH DRIP BOARDS**

One Plenum nozzle will protect one Single Vat Deep Fat Fryer with a maximum hazard area of 18" x 18" (46 cm x 46 cm) and an appliance area 18" x 23" (46 cm x 58 cm) for fryers with a drip board. The nozzle is located at an angle of 45 degrees or more from the horizontal. It shall not be more than 45" (114 cm) nor less than 27" (69 cm) from the top of the appliance aimed at the midpoint of the hazard area. (Hazard Area 18" x 18" (46 cm x 46 cm) - See Figure 7d)

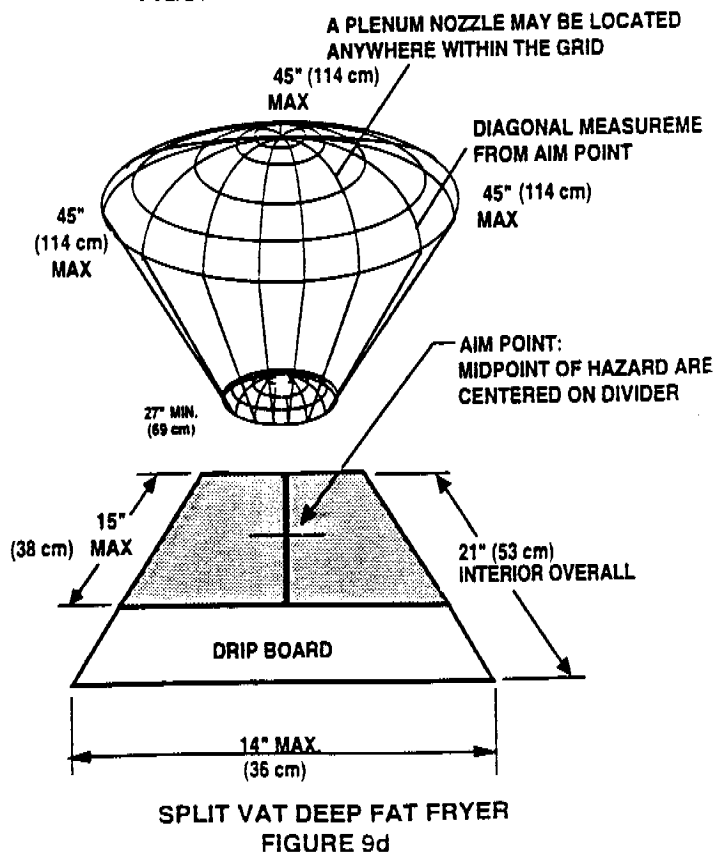
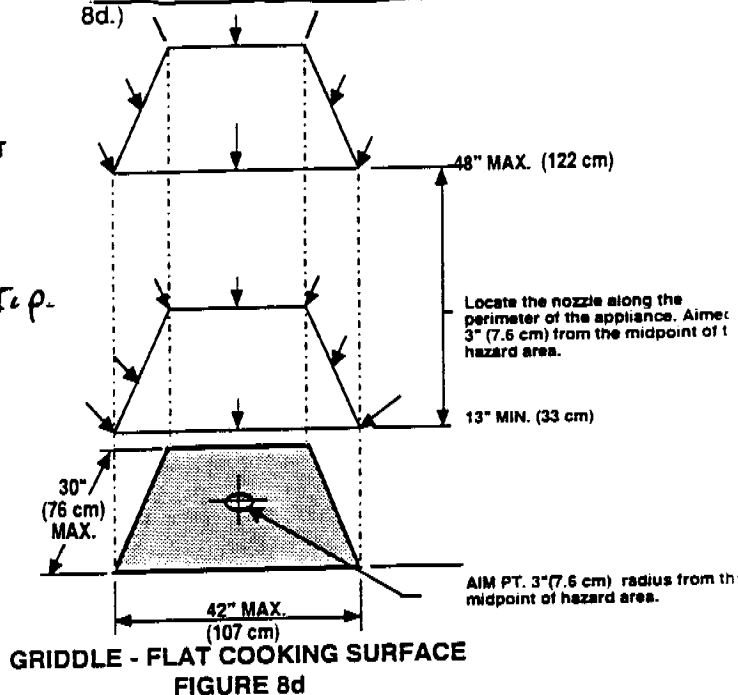


**SPLIT VAT DEEP FAT FRYER**

One Plenum nozzle will protect a Split Vat Deep Fat Fryer with a split vat hazard area maximum of 14" x 15" (36 cm x 38 cm) without drip board and 14" x 21" (36 cm x 53 cm) with a drip board. The nozzle is located at an angle of 45 degrees or more from the horizontal. It shall not be more than 45" (114 cm) nor less than 27" (69 cm) from the top of the appliance aimed at the midpoint of the hazard area. (Hazard Area 14" x 15" (36 cm x 38 cm) - See figure 9d)

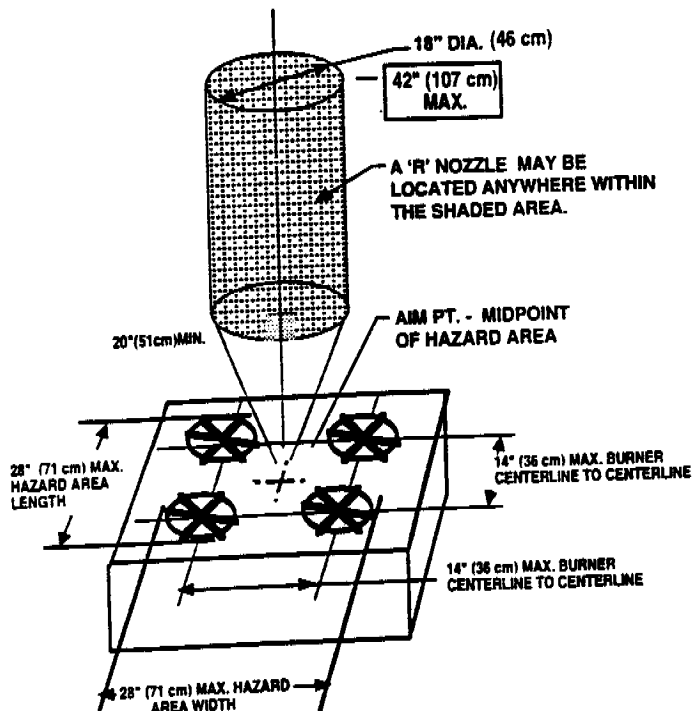
**GRIDDLE - FLAT COOKING SURFACE**

One ADP nozzle will protect one griddle (with or without raised ribs) with a maximum hazard area of 30" x 42" (76 cm x 107 cm). The nozzle is located at any point on the perimeter of the appliance and aimed at a point 3" (7.6 cm) from the midpoint of the hazard area. It shall not be more than 48" (122 cm) nor less than 13" (33 cm) above the edge of the appliance perimeter. Positioning the nozzle directly over the appliance is not acceptable. (See figure 8d.)

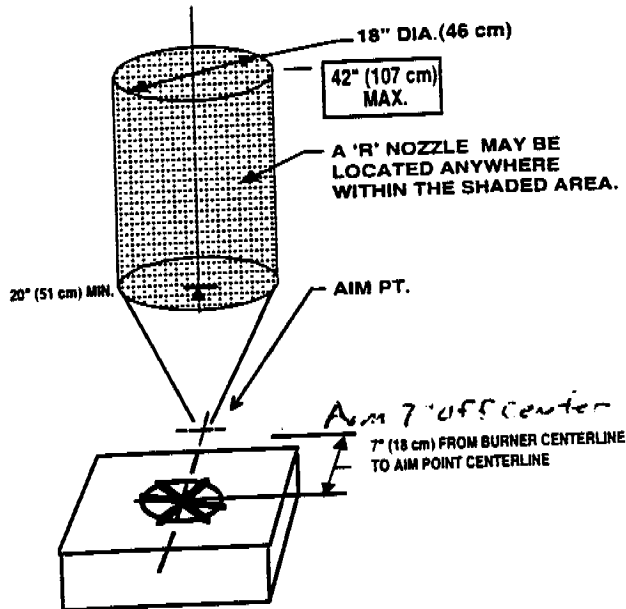
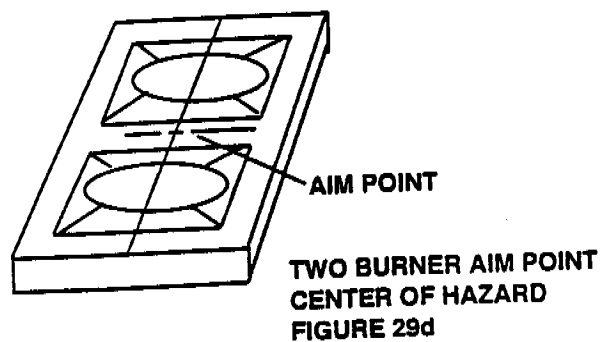


**RANGE**

One 'R' nozzle will protect one four burner range with a maximum hazard area of 28" x 28" (71 cm x 71 cm). The nozzle is to be located directly over the midpoint of the hazard area and anywhere within the area of a circle generated by a 9" (23 cm) radius about the midpoint. The nozzle shall not be more than 42" (107 cm) nor less than 20" (51 cm) from the midpoint of the hazard area, aimed at the midpoint. (See figure 27d) **NOTE: SHAPE OF BURNER NOT IMPORTANT**



**FOUR BURNER RANGE  
FIGURE 27d**



**SINGLE BURNER RANGE  
FIGURE 30d**

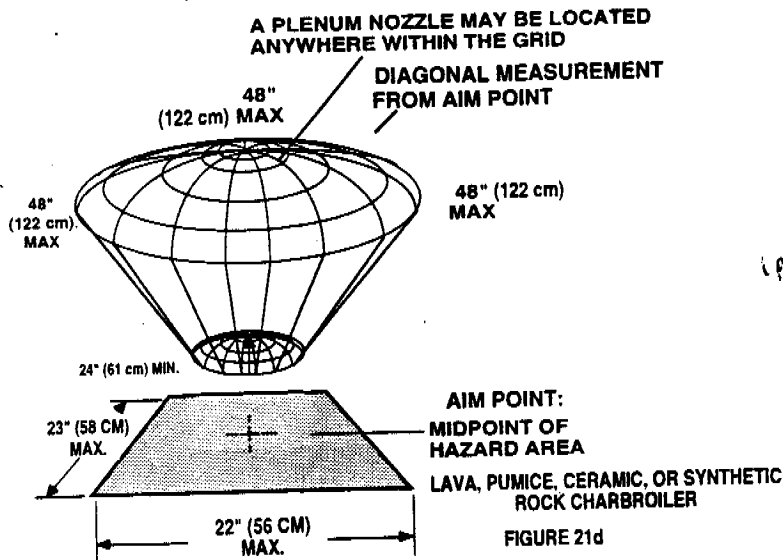
**SINGLE BURNER RANGE**

Special care is to be taken when aiming the 'R' nozzle over a single burner range. The aiming point is to be located 7" (18 cm) from the center of the burner. The nozzle placement shall fall within a cylindrical area generated by a 9" (23 cm) radius about the aiming point. The nozzle must be placed no more than 42" (107 cm) nor less than 20" (51 cm) above the hazard area. (See figure 30d)

**CHARBROILERS**

**Lava, Pumice, Ceramic or Synthetic Rock Charbroiler**

A) One Plenum nozzle will protect a gas fired charbroiler (pumice - ceramic stone) to a maximum dimension of 22" x 23" (56 cm x 58 cm) with a maximum of two layers of lava, pumice or stone. The nozzle is located at an angle of 45° or more from the horizontal and is aimed at the midpoint of the hazard area. It shall be not more than 48" (122 cm) from the midpoint of the hazard area nor less than 24" (61 cm) above the grate surface (See Figure 21d)



**Electric Charbroilers GRW Nozzle**

Grid surface electric charbroilers (a cooking surface with grids or openings in it) are protected the same as gas radiant charbroilers. (See figure 22d).

**CAUTION: ELECTRICAL APPLIANCES BEING PROTECTED MUST BE SHUT OFF AUTOMATICALLY UPON SYSTEM ACTUATION.**

**Natural or Mesquite Charcoal Charbroiler**

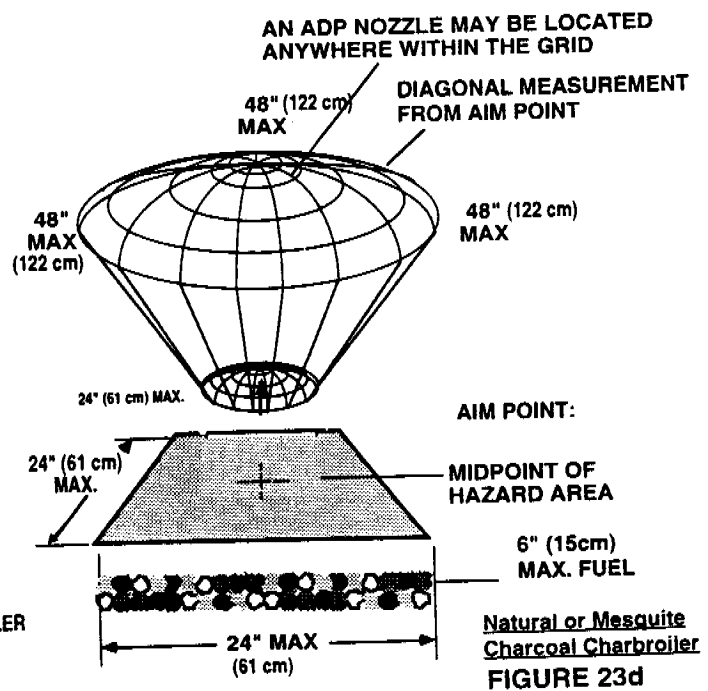
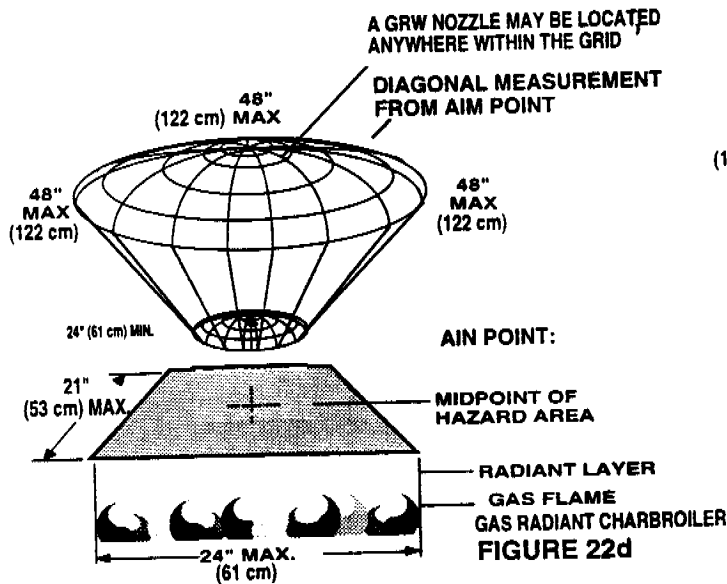
One ADP nozzle will protect a natural charcoal/mesquite-charcoal charbroiler with a maximum dimension on any side of 24" (61 cm). The nozzle is located at an angle of 45° or more from the horizontal and aimed at the midpoint of the hazard area. The nozzle shall be not less than 24" (61 cm) nor more than 48" (122 cm) above the cooking surface (See Figure 23d).

The depth of mesquite charcoal pieces or charcoal is limited to 6" (15 cm) maximum. Mesquite logs or wood are not acceptable.

*NEEDS SEPERATE HAND-DOCT.*

**Gas Radiant Charbroiler**

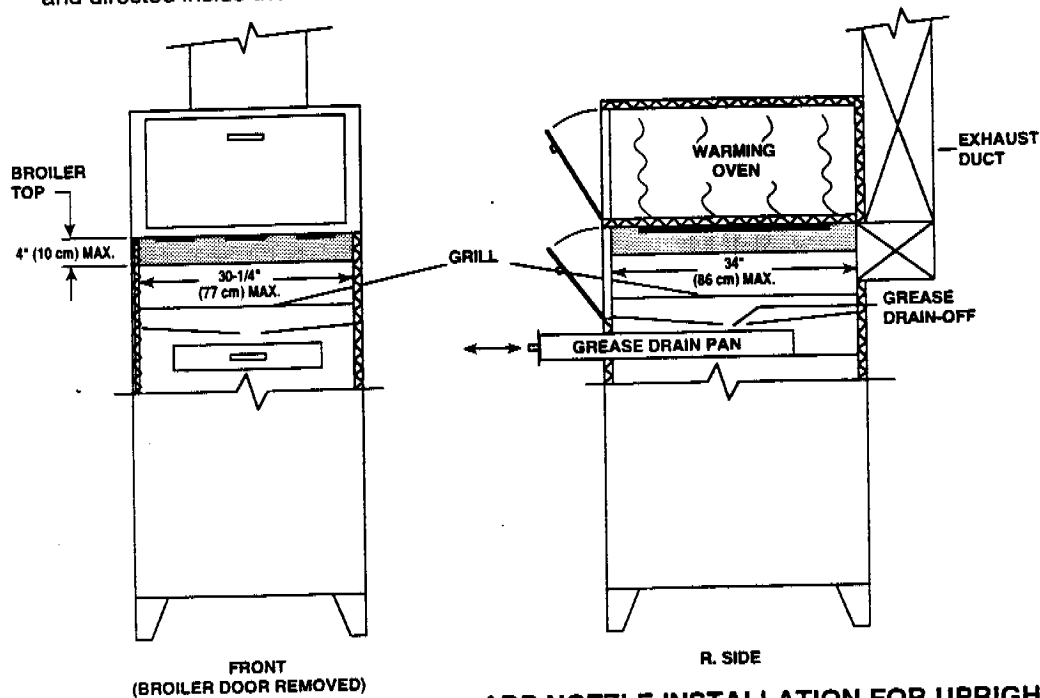
One GRW nozzle will protect a gas fired radiant charbroiler with maximum cooking surface dimensions of 21" x 24" (53 X 61 cm). The nozzle is located at an angle of 45° or more from the horizontal and is aimed at the midpoint of the hazard area. The nozzle shall be not less than 24" (61 cm) nor more than 48" (122 cm) above the cooking surface (See Figure 22d).



## D-10

### Upright Broiler

One ADP nozzle will protect a broiler compartment with maximum internal horizontal dimensions of 30-1/4" x 34" (77 cm x 86 cm). The nozzle is located within the top 4" (10 cm) of space in the broiler compartment (see figure 19d). It is aimed through the grill toward the center of the grease drain-off opening. Nozzles are commonly mounted on upright broilers near the front opening and directed inside the broiler.



**NOTE:** Dimensions shown are inside broiler compartment.

ADP nozzle should be mounted on the perimeter of the broiler top (Shaded area). It should be directed through the grill toward the center of the grease drain-off opening. Nozzle discharge shall not be obstructed by any structural part of the broiler.

**ADP NOZZLE INSTALLATION FOR UPRIGHT BROILERS**

**FIGURE 19d**

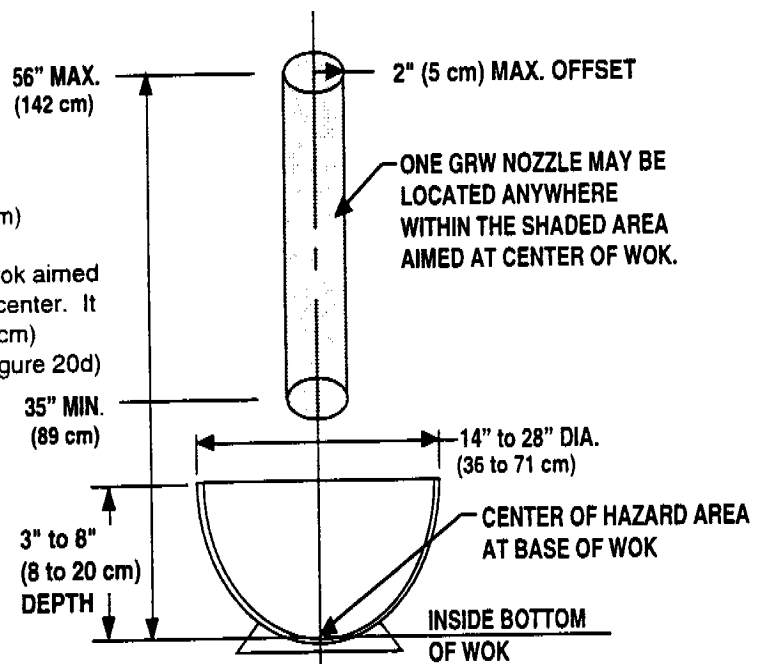
### WOKS

One GRW nozzle will protect one wok:

WOK Min./ Max. Diameter - 14" to 28" (36 to 72 cm)  
 WOK Min./ Max. Depth - 3" to 8" (8 to 20 cm)

The nozzle is to be located directly over the center of the wok aimed at the center and is allowed a 2" (5 cm) deviation from the center. It shall be not more than 56" (142 cm) nor less than 35" (89 cm) from the inside bottom of the wok being protected. (See figure 20d)

**NOTE: ONE NOZZLE IS REQUIRED FOR EACH WOK**



**WOK NOZZLE INSTALLATION**  
**FIGURE 20d**

## Designing for Duct Protection

### ADP Nozzle

Two ADP nozzles shall be used in ducts with a perimeter up to 75 inches (190.5 cm) (or 23.8 (60.5 cm) inches maximum diameter). The ratio of the longest to shortest perimeter sides shall not exceed 3 to 1. One of these nozzles is pointed into the duct and the other is pointed into the plenum.

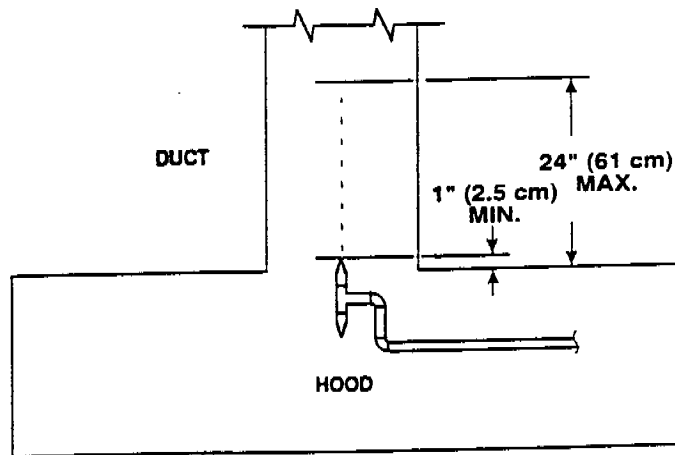
The tip of the upper nozzle, of the pair of nozzles required for each duct, shall be positioned in the center of the duct opening and above the plane of the hood-duct opening between 1" (2.5 cm) and 24" (61 cm). The duct length is unlimited.

When the duct perimeter exceeds 75" (190.5 cm), divide the duct area with imaginary walls so that the smaller ducts created have a perimeter of 75" (190.5 cm) or less, including the length(s) of the imaginary wall(s). Place a pair of ADP nozzles

in the center of each of the imaginary ducts with one nozzle pointed into the duct and the other nozzle pointed in the opposite direction.

Ducts 25 feet (7.6 m) or less in length and with a perimeter of 48" (122 cm) or less (or 15-1/4" (39 cm) diameter) may be protected with one ADP nozzle pointed up into the duct. The tip of the nozzle shall be positioned in the center of the duct opening and above the plane of the hood-duct opening between 1" to 24" (2.5 to 61 cm).

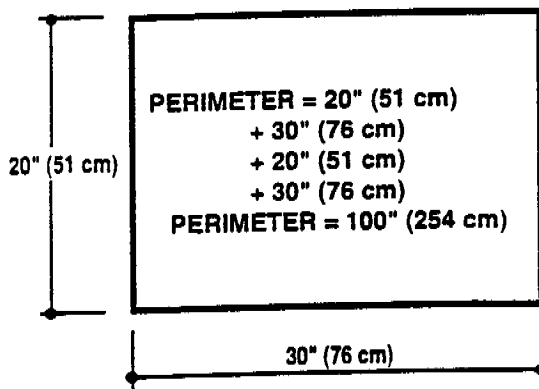
After placing your ADP nozzle(s) in the duct(s), determine the total flow numbers necessary to protect the duct(s).  
NOTE: WHEN A DAMPER IS PRESENT AT THE HOOD DUCT OPENING THE DUCT NOZZLES ARE TO BE LOCATED ABOVE THE DAMPER AND SHOULD NOT INTERFERE WITH THE OPERATION OF THE DAMPER.



Note: All Range Guard systems are Listed by UL for use with the exhaust fan either on or off when the system is discharged.

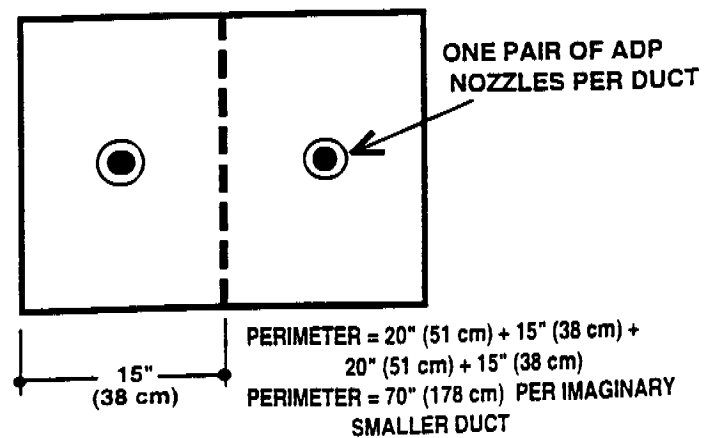
DUCT NOZZLE PLACEMENT  
FIGURE 33d

1.) PERIMETER TOO LARGE FOR ONE PAIR OF ADP NOZZLES.



EXAMPLE OF A DUCT THAT EXCEEDS 76" (190 cm) PERIMETER  
FIGURE 34d

2.) SUBDIVIDED DUCT INTO TWO IMAGINARY SMALLER DUCTS. THE SMALLER DUCTS PERIMETER ARE LESS THAN 75" (190 cm) AND REQUIRE THE USE OF A PAIR OF ADP NOZZLES IN EACH.



## D-14

### Designing for Plenum Protection

A single ADP nozzle will protect a single filter bank plenum with the following maximum dimensions:

Plenum Length	6 Feet (1.8 m)
Plenum Width	4 Feet (1.2 m)
Filter Area	6 (1.8 m) Feet Long - 20 Inches (51 cm) Wide

A single ADP nozzle will protect a "V" filter bank plenum with the following dimensions:

Plenum Length	3 Feet (.9 m)
Plenum Width	4 Feet (1.2 m)
Filter Area	3 Feet (.9 m) Long - 40 Inches (102 cm) Wide

A single plenum nozzle will protect a single filter or "V" filter bank plenum with the following maximum dimensions:

Plenum Length	10 Feet (3.0 m)
Plenum Width	4 Feet (1.2 m)
Filter Area	10 Feet (3.0 m) Long - 40 Inches (102 cm) Wide

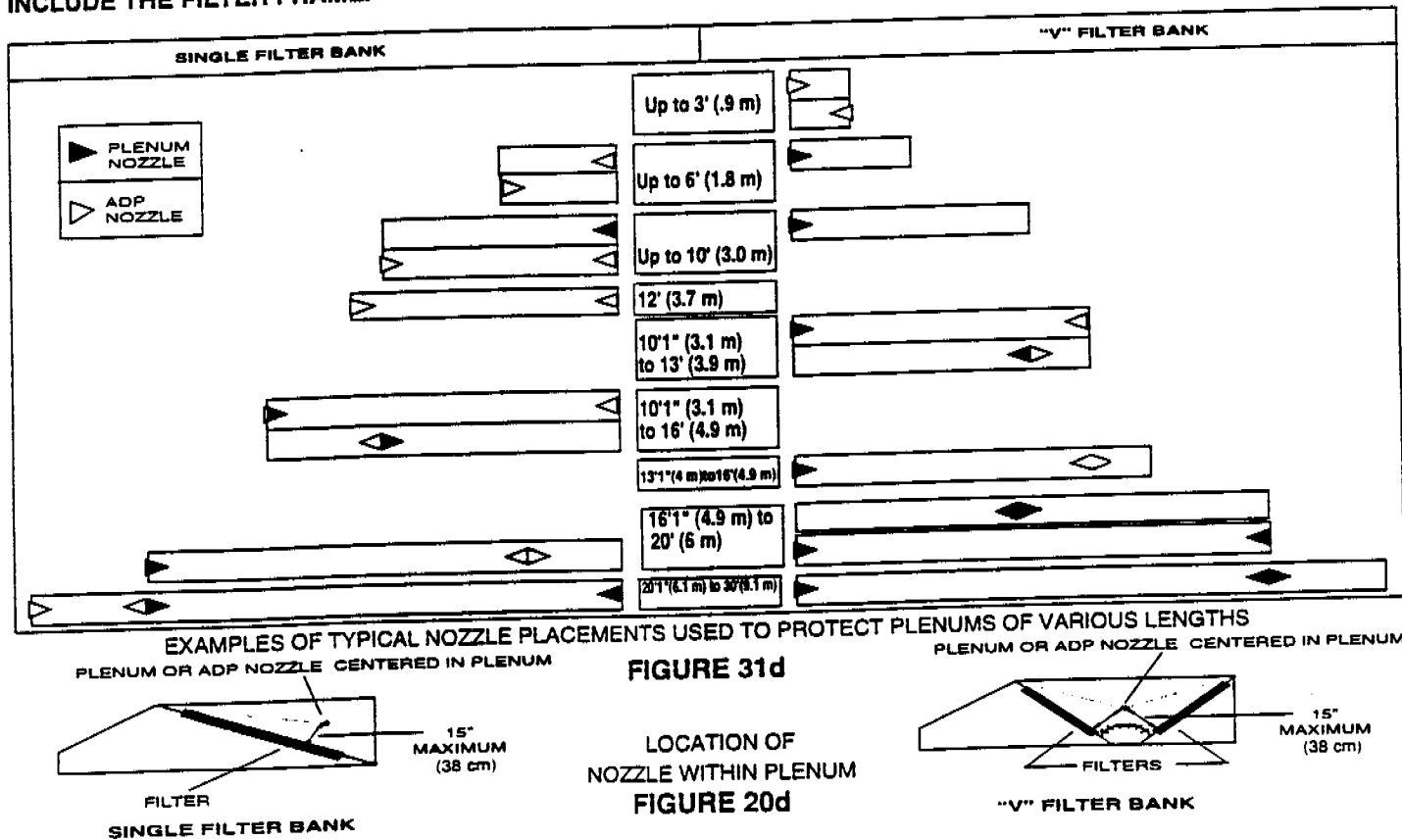
**NOTE: 40" (102 cm) WIDE FILTER AREA IS MADE UP OF TWO FILTERS WHICH BOTH HAVE AN EXPOSED FILTER SURFACE OF 20" (51 cm). THIS DOES NOT INCLUDE THE FILTER FRAME.**

When no filters are present, the nozzle protecting the plenum is used to discharge Karbaloy® on the underside of the hood. In this case, the hood may not exceed a length of 6 ft. (1.8 m) for the ADP nozzle and 10 ft. (3.0 m) for the plenum nozzle. The hood shall not exceed a width of 6 ft. (1.8 m) for either nozzle.

A single filter bank plenum with a length of 6 ft. (1.8 m) or less may be protected by one ADP nozzle. A "V" filter bank plenum with a length of 3 ft. (.9 m) or less may also be protected by one ADP nozzle. A plenum with either a single filter bank or "V" filter bank and a length of 10 ft. (3.0 m) or less may be protected by one plenum nozzle. Either nozzle shall be located at one end of the plenum. Longer plenums may be similarly protected with a single ADP nozzle being used for each 3 or 6 ft. (.9 or 1.8 m) of plenum length (depending on the type of filter bank) and each 10 ft. (3.0 m) of plenum length for plenum nozzles.

ADP and plenum nozzles may be used in any combinations (see Figure 19d). Multiples may be installed in pairs at the midpoint of the plenum with their discharges directed at the ends of the plenum or installed at each end of the plenum with the discharges directed at the midpoint.

ADP and plenum nozzles must be centrally located in the plenum (see figure 32d) with their discharge directed along the length of the plenum. In no case, however, shall the horizontal center line of the nozzles be located more than 15 (38 cm) inches from the inside filter surface.





## D-20

### Nozzle Summary

Hazard	Perimeter Max.	Diameter Max.	Length	Nozzle / Flow No.
Duct	75" (190.5 cm)	23.8" (60.5 cm)	Unlimited	2 - ADP / 2
Duct	48" (122 cm)	15.25" (39 cm)	25' Max. (7.6 m)	ADP / 1

Hazard	Length Max.	Width Max.	Filters	Nozzle / Flow No.
Plenum	10' (3.0 m)	4' (1.2 m)	"V" Bank/Single	Plenum / 2
Plenum	10' (3.0 m)	6' (1.8 m)	No Filters	Plenum / 2
Plenum	6' (1.8 m)	4' (1.2 m)	Single Bank	ADP / 1
Plenum	6' (1.8 m)	6' (1.8 m)	No Filters	ADP / 1
Plenum	3' (.9 m)	4' (1.2 m)	"V" Bank	ADP / 1

Hazard	Hazard Size Inches/cm	Nozzle Height Inches/cm	Notes Inches/cm	Nozzle/ Flow No.
Range - 4 Burner	28" X 28" (71 cm x 71 cm)	20" to 42" (52 to 107 cm)	within 9 (23 cm) rad. of mid pt.	R / 1
Flat Cooking Surface - Griddle	42" X 30" (107 cm x 76 cm)	13" to 48" (33 to 122 cm)	3 (7.6) Offset	ADP / 1
Single Vat Deep Fat Fryer (Drip Boards 1" to 6" (2.5 to 18 cm))	18" X 18" (46 cm x 46 cm)	27" to 45" (69 cm to 114 cm)	45° to 90°	Plenum/2
Single Vat Deep Fat Fryer (i.e. Donut Fryer) (Drip Boards 1" or Less (2.5 cm))	24" x 24" (61 cm x 61 cm)	27.5" (70cm) to 46" (117 cm)	within perimeter	Plenum/2
Split Vat Deep Fat Fryer	14" x 15" (36 cm x 38 cm)	27" (69 cm) to 45" (117 cm)	45° to 90°	Plenum/2
Split Vat Deep Fat Fryer (Low Proximity)	14" x 15" (36 cm x 38 cm)	16" (41 cm) to 27" (69 cm)	within perimeter	ADP/1
Chinese Woks	14"(36 cm)Dia/3"(8 cm)Dp to 28"(71 cm)Dia/8" (20 cm) Dp	35" (89 cm) to 56" (142 cm)	within 2" (5 cm) of mid pt.	GRW/1
Upright Broilers (Salamanders)	30.25" X 34" (77 cm x 86 cm)		top 4" (10 cm) of broiler comp.	ADP/1
Closed Top Chain Broilers	28" X 29" (71 cm x 74 cm)	See D-12	See D-12	ADP / 1
Open Top Chain Broilers	28" X 29" (71 cm x 74 cm)	See D-12	See D-12, 2 Nozzles	ADP/1
Pumice Rock (Lava, Ceramic) Charbroiler	22" X 23" (56 cm x 58 cm)	24" (61 cm) to 48" (122 cm)	45° to 90°; 2 Layers of rock	Plenum/2
Natural/Mesquite Charcoal Charbroiler	24" X 24" (61 cm x 61 cm)	24" (61 cm) to 48" (122 cm)	45° to 90°; 6" (16 cm) Charcoal depth	ADP/1
Electric Charbroiler (Open Grid)	24" X 21" (61 cm x 53 cm)	24" (61 cm) to 48" (122 cm)	45° to 90°;	GRW / 1
Gas Radiant Charbroiler	24" X 21" (61 cm x 53 cm)	24" (61 cm) to 48" (122 cm)	45° to 90°;	GRW / 1
Mesquite Charbroiler (Chips, Wood, Logs)	30" X 24" (76 cm x 61 cm)	24" (61 cm) to 48" (122 cm)	45° to 90°; 10" (25 cm) Fuel depth	DM / 3
Natural/Mesquite Charcoal Charbroiler	30" X 24" (76 cm x 61 cm)	24" (61 cm) to 48" (122 cm)	45° to 90°; 10" (25 cm) Fuel depth	DM / 3

Nozzle Identification	Part No.	Flow No.
ADP (Appliance-Duct-Plenum)	96981	1
ADP-S (Appliance-Duct-Plenum) - Swivel	96979	1
R (Range)	96508	1
GRW (Gas Radiant-Wok)	96506	1
P (Plenum)	96982	2
DM (Mesquite)	96980	3

NOZZLE SUMMARY TABLE 2d

## Cylinder Sizing

After finding how many nozzles of each type are required for a system, the sum of all the nozzle flow numbers is used to determine the number and size of the cylinders required, in accordance with the cylinder flow number limits given below.

■ **Table 3d**

Maximum Flow Numbers of Cylinders	
Cylinder	Flow Number
5 Quart (4.7 L)	4 Single Cylinder Only (Cannot Manifold)
2-1/2 Gallon (9.5 L)	8 Single Cylinder Systems Only (Cannot Manifold)
4 Gallon (15 L) (Long or Short) 1 Cylinder 2 Cylinders 3 Cylinders 4 Cylinders	12 } 24 } Can Manifold * 36 } 48 } Up to 4 Cylinders
6 Gallon (22.7 L) 1 Cylinder 2 Cylinders	18 } 36 } Can Manifold * Up to 2 Cylinders

\*Only like cylinders can be manifolded (ie, four 4 gallon, two 6 gallon.)

The system can be actuated through various control boxes, in accordance with Table 4d. To actuate a single cylinder system, use either the Mechanical Control Box or the A+ Control Box with pneumatic control head. To actuate two or three cylinders, use either one or two Tandem Control Box and a Mechanical Control Box or the A+ Control Box with 1-3 pneumatic control head(s). To actuate more than 3 cylinders, the A+ Control Box with pneumatic control head(s) must be used.

■ **Table 4d**

System Size	Mechanical Control Box	Tandem Control Box	A+ Control Box
1 Cylinder	√		√
2 Cylinders	√*	√*	√
3 Cylinders	√**	√**	√
4 Cylinders			√
5 Cylinders			√

\* Requires both a mechanical control box and tandem control box

\*\* Requires a mechanical control box and two tandem control boxes

**D-22****Designing for Pipe Size and Type Within the Bounds of Piping Limitations****Piping and Fittings**

Range Guard systems do not require balanced piping to achieve proper distribution of Karbaloy® to all nozzles. Balanced piping is not necessary because a liquid has no difficulty in turning corners or changing directions. Range Guard nozzles come equipped with permanent predetermined orifices. This means that the liquid will be delivered in the exact quantities necessary to the duct, plenum and appliance hazards as required.

All pipe shall be schedule 40 (standard weight) black steel. Pipe may be chrome plated. Galvanized pipe shall not be used. All pipe and fittings must be made tight without pipe dope or thread sealant.

Pipe fittings shall be standard weight steel, cast iron, malleable iron or ductile iron. Galvanized fittings shall not be used. Branch line connection and individual nozzle connections may be made by using either the outlet or the run of a tee.

**Stainless Steel Tubing and Fittings**

Stainless steel tubing may be used on all Range Guard systems. Fittings may be stainless steel compression or stainless steel flare types. Bending of tubing using mandrels is permissible.

**Pipe Sizing**

Pipe sizes are determined by the total number of flow numbers running through a particular piece of pipe. This is the flow demand for that portion of the system.

**NOTE:** It is not permissible to drop pipe diameters below the required value. For example, using 1/2" (1.3 cm) pipe to flow 18 flow numbers is not permissible. However, increasing pipe diameter is acceptable (i.e., using 1" (2.5 cm) pipe to flow 18 flow numbers) providing the system complies with internal pipe volume limitations.

**■ Table 5d**

Flow Number Range	Minimum Pipe Size	.035 wall Stainless Steel Tubing Size
1 - 2	1/4" (.6 cm)	3/8" (1.0 cm)
1 - 8	3/8" (1.0 cm)	N/A
1 - 12	1/2" (1.3 cm)	5/8" (1.6 cm)
13 - 24	3/4" (1.9 cm)	7/8" (2.2 cm)
25 - 48	1" (2.5 cm)	1" (2.5 cm)

**GENERAL RULES**

- A maximum of 100 equivalent feet (30.5 m) (but not more than 40 (12.2 m) linear feet) of 1/4" (.6 cm) pipe may be used for each branch line.
- The highest point of the system shall not exceed 12 feet (3.7 m) above the cylinder outlet.
- The vertical rise of a branch line above the supply line shall not exceed a maximum of 4 feet (1.2 m).
- Maximum discharge pipe volume limitations shall not be exceeded.
- Maximum equivalent length limitations shall not be exceeded.
- Maximum flow points for a given pipe shall not be exceeded.
- There are to be no low points or "traps" present in discharge piping.

CITY OF SACRAMENTO  
**CERTIFICATE OF OCCUPANCY**

For Information Contact (916) 264-5716

Building Address 2546 Arch Street

Permit No.

98-02227 (hood)  
97-16223 (elect)  
97-14170

Building Use Restaurant remodel D.M. Wilson/Keebe-Deary

Occupancy A3 B2

Building Owner Huy Lewis

Construction Type

Owner Address 822 Arden Blvd Sacramento, CA 95828

Sprinkled ( ) Yes ( ) No

Portion of Building Occupied 100%

Area Sq. Ft.

Date Issued 10 30 / 98

By

*Bradford J. Boehm, P.E.*  
City/Building Official

Wilhelm/Green/Gilpin/Pack

This Certificate, issued pursuant to the requirements of Section 109 of the Uniform Building Code, certifies that at time of issuance the described portion of the building has been inspected for compliance with the Uniform Building Code as adopted per Title 9 of the Sacramento City Code for the group and division of occupancy and use for which the proposed occupancy is classified. Issuance of this certificate shall not be construed as an approval of a violation of any Codes, or Federal, State and City Law or Ordinance. Certificates presumed to give authority to such violation shall not be valid. This certificate shall be posted in a conspicuous place on the premises and shall not be removed except by the City Building Official. No changes shall be made in the character of occupancy or use without approval of the City Building Official.

**POST IN A CONSPICUOUS PLACE**

