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Presented to: 

Presented by: **Bison Fire Protection**

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**TODAY'S TOPICS**

- Fundamentals of Design and Maintenance 2016
- What is a kitchen fire suppression system?
- Standards applicable to these systems
- Class K fire extinguishers
- Design and installation parameters
- Components
- Maintenance requirements
- What to look for during an inspection
- When should systems be upgraded?

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**ANSUL**  
Innovative Fire Solutions



**Kidde**  
Fire Systems



**RANGE**  
**GUARD**  
WET CHEMICAL SYSTEM

- Ansul is a premium brand of Tyco Fire Suppression & Building Products. The full line of Ansul special hazard fire protection products
- Kidde Fire Systems is a global leader in fire protection, including fire detection, fire suppression and fire control products. They set the benchmark for fire safety detection, prevention and protection
- 40+ years of proven technology. Range Guard was the first wet chemical which is now the industry standard

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**OVERVIEW OF A KITCHEN SYSTEM**

- A pre-engineered fire suppression system intended to apply an extinguishing agent to a burning fuel such as animal or vegetable grease
- Isolates burning fuel and allows to cool for at least 20 minutes
- Disconnects heat source to appliances
- Uses a "Wet Chemical" agent (since 1994)
- Designed to protect hazards under a canopy and within the exhaust duct only
- Automatic and manual operation

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**UNIQUE CHALLENGES IN THE KITCHEN**

- Fuel (grease) and heat source in close proximity
- Auto ignition temperature of fuel below boiling point
- Casual and untrained personnel
- Inadequate housekeeping
- Inadequate maintenance

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**DO KITCHEN FIRE SUPPRESSION SYSTEMS WORK? (YES AND NO)**

- A study conducted in the early 1980s found that pre-engineered systems were 95% effective
- By the end of the 1980s a similar study found the picture had changed. Dry Chemical systems were only 89% effective, while Wet Chemical systems were 97% successful in extinguishing and preventing flashback.

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**REASONS FOR NON-EXTINGUISHMENT OF FIRE INCIDENTS**

- A number of causes were identified. The most significant reasons are as follows:
  - Higher cooking temperatures and more efficient appliances allowed flashback
  - Improper system installation
  - Tampering
  - Poor maintenance

\* NAFED Extinguishment Record a Look at Pre-engineered Restaurant Fire Suppression Systems, 1990

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**KITCHEN FIRE SUPPRESSION STANDARDS**

- Standards:
  - NFPA 17A, NFPA 96, NFPA 10
  - ULC /ORG-C 1254-6, UL 300
  - Manufacturers Manual




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**NFPA17A – STANDARD FOR WET CHEMICAL EXTINGUISHING SYSTEMS**

NFPA 17A – Standard for Wet Chemical Extinguishing Systems

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**NFPA17A - BASICS**

- Covers design, installation and maintenance in a generic manner with reference to the manufacturers manual
- All grease vapour producing appliances must be protected
- Prescribes who should install and maintain fire suppression systems
- Prescribes listed parts to be used on fire suppression systems

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**NFPA17A – SYSTEM REQUIREMENTS**

- Wet chemical fire extinguishing system shall comply with standard UL 300.
- Each protected cooking appliance, individual hood, and branch exhaust duct directly connected to the hood shall be protected by a system or systems designed for simultaneous operation
- Where two or more hazards may be simultaneously involved in fire by reason of proximity, they shall be protected by individual systems installed to operate simultaneously

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**NFPA17A – SYSTEM REQUIREMENTS**

- Requires gas/electric shut down at discharge
- Does not require ventilation shut down
- Interconnected hazards operate together
- Requirements for multiple systems with common duct. Power off to all appliances under hoods connected to common duct.

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**NFPA17A – SYSTEM REQUIREMENTS**

- Connection to fire alarm if existing & on a separate zone
- Positive location of movable appliances
- AHJ may request discharge test
- Appliance shutdown required


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**NFPA17A- SYSTEM REQUIREMENTS (REFER TO PAGE 3-35)**

- Requires independent manual and automatic operation
- Manual must be before 1st link if on detection line
- Manual release 42"-48" above ground on egress
- Manual release may be part of control head
- Detector at each duct opening including duct to common duct
- Detector may be up to 12" into duct
- Detector over each appliance unless under duct opening


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**NFPA17A - COMPONENTS**

- **Only components listed by the manufacturer may be used.**
- **Nozzles**
  - Must have a strainer
  - Cap to keep clean and prevent grease build-up
  - Clear identification markings
- **Wet Agent**
  - Must be listed for system
  - No mixing of agents


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**NFPA17A - COMPONENTS**

- **Cylinders**
  - Must be T.C., older may be DOT
  - Located near hazard but not subject to fire, mechanical or chemical damage
  - Must be accessible for inspection and maintenance
  - Hydrostatic test required every 12 years
- **Pipe and Fittings**
  - Non-combustible
  - Must be per manufacturers manual. No galvanized pipe


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**NFPA17A – DESIGN AND INSTALLATION OF SYSTEMS**

- **Design**
  - “Shall be performed by persons properly trained and qualified to design and/or install the specific system being provided. The installer shall provide certification to the AHJ that the system is in complete agreement with the terms of the listing and the manufacturers instructions.”
- **Training**
  - “One who has undergone the instructions necessary to safely design and install and reliably perform the maintenance and recharge service.”
  - Training and qualification should be performed by system manufacturer


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**NFPA 96 - STANDARD FOR VENTILATION CONTROL & FIRE PROTECTION OF COMMERCIAL COOKING OPERATIONS**

**NFPA 96 – Standard for Ventilation Control & Fire Protection of Commercial Cooking Operations**





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NFPA 96 - STANDARD FOR VENTILATION CONTROL & FIRE PROTECTION OF COMMERCIAL COOKING OPERATIONS

- This standard includes requirements for the installation of fire-extinguishing equipment for the protection of grease removal devices, hood exhaust plenums and exhaust duct systems
- Systems to comply with UL 300 or equivalent (ULC 1254)
- Allows protection of hood/plenum by listed "Water Wash" system provided it is listed to extinguish fire
- All connections to hoods and ducts must have listed liquid tight seal
- Other requirements similar to NFPA 17A

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NFPA 96 – CHAPTER 7 – FIRE EXTINGUISHER EQUIPMENT

- 7-2.1 Fire extinguishing equipment shall include both automatic fire extinguishing systems as primary protection and portable fire extinguishers as secondary protection



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NFPA 96 – CHAPTER 7 – FIRE EXTINGUISHER EQUIPMENT

- 7-2.1.1 A placard identifying the use of the extinguisher as a secondary backup means to the automatic fire suppression system shall be conspicuously placed near each portable fire extinguisher in the cooking area



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NFPA 10 – STANDARD FOR PORTABLE FIRE EXTINGUISHERS



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NFPA 10 – STANDARD FOR PORTABLE FIRE EXTINGUISHERS

- Requires the use of extinguishers listed and labeled as suitable for Class “K” fires
- Requires existing dry chemical extinguishers without a class “K” listing to be replaced
- Agent must be replaced after partial discharge or hydrostatic testing

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CLASS “K” EXTINGUISHERS

- New Fire Test Criteria
  - Cooking appliance (fryer) fire test
  - Combustible cooking media (cooking oils)
- No numerical references associated with rating
- Class “K” rating symbol



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CLASS "K" EXTINGUISHERS

- **PROBLEM:** ABC dry chemical will extinguish media fires but do not saponify – fire can reflash
- **PROBLEM:** BC dry chemical (sodium bicarbonate or potassium bicarbonate) will saponify but does not cool – fire can reflash




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CLASS "K" EXTINGUISHERS

- Wet Chemical Class K rated extinguishers provide a softer discharge – avoids the splashing of cooking oil that dry chemical units can cause when used too close to fryers
- Extinguishing agent is designed for this specific hazard and is completely compatible with system extinguishing agent
- Wet Chemical forms a better saponification layer AND provides cooling to bring oils below auto-ignition levels




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UL300 AND ULC/ORD C.1254.6-1995

- Standard for Fire Testing of Restaurant
- Cooking Area Fire Extinguishing System Units
- These standards are effectively the same
- Set standards for testing of systems which are more stringent and real world than before




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HISTORY OF UL-300

- Previously was Subject 300 as part of UL 1254
- Intent of the 1994 revision was to make testing more realistic
- UL/ULC recognized that the hazards had changed – newer appliance construction, different cooking media
- Information indicated **re-flash** was occurring – older system designs were not keeping fires out




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UL 300 TEST CRITERIA & MAJOR CHANGES

- Results of the changes:
  - Flow rate, nozzle pressure, and agent quantity is established for each nozzle based on full scale fire testing
  - More agent is needed – can be up to 5 times more
  - Testing for appliances is done with actual units not mock-ups
  - Each specific appliance must be tested individually
  - There are **NO DRY CHEMICAL SYSTEMS** that have passed UL 300 testing
  - There are **NO WATER SPRAY** nozzles for appliances




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WHEN SHOULD A SYSTEM BE UPGRADED?

- This is a short question with a long answer:
  - Dry Chemical systems
  - Wet Chemical systems without UL300/ULC 1254 listing?
  - Can system meet UL300 without label on cylinder?
  - What if some components are not in current manual
  - Is existing pipe OK?




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SAFETY FIRST DRY CHEMICAL SYSTEMS



- Safety First Dry Chemical Suppression Systems **DO NOT** meet current UL1254.6 Standards. Safety First is no longer manufacturing Fire Suppression Systems



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ANSUL R-101 DRY CHEMICAL SYSTEM



- The Ansul R-101 Dry Chemical system **DOES NOT** meet current UL1254.6 Standards.



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DESIGNING THE SYSTEM



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**THE DESIGN PROCESS**

- Decide on extent of protection required
- Review appliances, hood and exhaust duct
- Select type and position of nozzles
- Calculate flow points
- Select cylinder(s) based on required flow points
- Prepare drawing showing nozzles and pipe
- Ensure pipe layout meets all criteria in manufacturers manual for example diameter, length and volume

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**DESIGNING APPLIANCE PROTECTION**

- Nozzle Aim
  - Correct aiming is extremely important!
  - Spray cannot be obstructed
  - Shall comply with parameters outlined in the design section of the manufacturers manual
- Hazard Area
  - Actual cooking area
  - Cooking area plus integral drip board
  - Physical (overall dimension) width and depth not important

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**RANGE GUARD COMPONENTS**

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**RANGE GUARD NOZZLES**

ADP: 1 GROOVE 	F: 2 GROOVES 
GRW: 3 GROOVES 	R: 4 GROOVES 

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**MECHANICAL DETECTION: "A"**

- Fusible Links
  - Listed for all controls
  - "Solder" type link
- Must be changed every SIX MONTHS**



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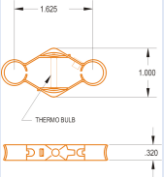
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**MECHANICAL DETECTION: "RG" SERIES**

- Thermo-bulb type link
  - Three temperatures (360, 450, 500)
  - ULC listed with all pre-engineered systems controls
- Must be Changed every SIX MONTHS**





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**REMOTE CONTROLS**

- Two types
  - “Pull-to-trip” type
    - Pull to trip
  - “Release-to-trip” type
    - Release to trip
    - Inline kit for NFPA 17A
- Both approved with Universal Control Head
- A+ Control head can only use “Release to trip”



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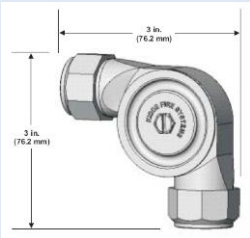
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**RANGE GUARD CORNER PULLEY**

- Used at every change in direction



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**HOOD SEAL ADAPTERS**

- Seals penetrations for pipe and EMT
- Two types
  - Threaded “Quik-seal”
  - Compression fitting type
- All penetrations shall be sealed
  - Liquid tight
  - Grease tight
  - Fire tight



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**INSPECTION AND MAINTENANCE**

- Must comply with the minimum requirements of:
  - NFPA 17A
  - NFPA 96
- As well as:
  - Manufacturers Design, Installation
  - Maintenance Manual


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**NFPA17A – OWNERS INSPECTION MONTHLY**

- To be carried out in accordance with the manufacturers manual
  - System is set with all components in correct position
  - No changes to appliances or hood
  - Manual actuators accessible
  - Cylinder pressure correct
  - Nozzle seals, tamper seals and service tag in place


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**NFPA17A INSPECTION AND MAINTENANCE – SEMI-ANNUAL**

- A trained person who has the manufacturers listed installation and maintenance manual and service bulletins shall service the system every 6 months in accordance with the manufacturers manual and service bulletins
- NFPA recommends training and qualification be performed by the system manufacturer





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NFPA17A INSPECTION AND MAINTENANCE – SEMI-ANNUAL

- Inspection and maintenance to be carried out in accordance with manufacturers listed manual and service bulletins
- Check hazard has not changed
- Examine all detectors, agent containers, releasing devices, piping, hoses, nozzles and cylinder pressure
- Test complete system including operation of detection system and all manual releasing devices
- Test gas and or electrical shut off device
- Replace heat detectors as required



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NFPA17A INSPECTION AND MAINTENANCE – SEMI-ANNUAL

- Any defects that could cause failure of the system must be rectified in accordance with the manufacturers recommendations
- A maintenance report is to be filed with the owner
- A service tag showing date of maintenance shall be attached to the cylinder. Only the current tag is to be attached
- Year of manufacture and date of installation of detectors must be noted on service tag



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WHAT TO LOOK FOR ON INSPECTIONS

- UL-300 Systems are labeled as such by the manufacturer
- Updating older systems – check for manufacturer bulletins and design manual instructions
- Every grease producing appliance has a dedicated nozzle(s) and detector
- Read the inspection report form from both the fire suppression and hood cleaning contractors for deficiencies
- Check for fuel shut-off. Gas valve must shut-off all gas appliances under the hood. NFPA 17A requires shut-off of any “electric sources” under the hood that can come in contact with the extinguishing agent



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**WHAT TO LOOK FOR ON INSPECTIONS**

- Solid fuel cooking (charcoal, wood, wood chips) must be under separate hood
- If a building alarm system is present, the fire suppression system shall be tied-in to the alarm
- Manual pull station is provided on a path of exit 42"-48" above the floor
- Per NFPA 96 the "system" includes both the fire suppression hardware and the portable "K" extinguisher
- When in doubt about proper coverage ask for documentation

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**WHAT TO LOOK FOR ON INSPECTIONS**

- Inspection of fusible links
  - Top link in service for 6 months may fuse at 600 or 700 degrees



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**WHAT TO LOOK FOR ON INSPECTIONS**

- Duct Nozzle found during an inspection, had not been checked on a routine 6 month schedule



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**WHAT TO LOOK FOR ON INSPECTIONS**

- System cylinder past hydrostatic test date
- Manufacturer out of business
- UL listing not valid
- No remote pull

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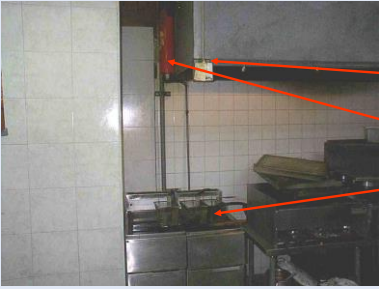
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**WHAT TO LOOK FOR ON INSPECTIONS**



- Remote release is on face of hood
- Fire system is over the hazard
- Fryers are not under the hood

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**WHAT TO LOOK FOR ON INSPECTIONS**



- Pipe is bent
- No nozzle caps
- Nozzles not pointing into broiler

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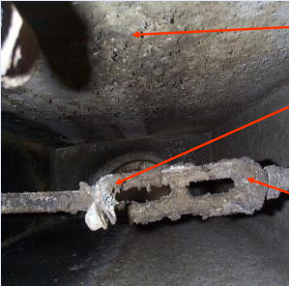
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WHAT TO LOOK FOR ON INSPECTIONS



- Duct needs cleaning
- Fusible link cable is broken jamming the cable
- This was the only link in the system
- Conduit is full of grease
- System was inoperable

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WHAT TO LOOK FOR ON INSPECTIONS



- Cylinder is mounted to the hood with screws
- No quick seal
- Remote pull is higher than 48"

**THIS WAS IN A HOSPITAL!**

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WHAT TO LOOK FOR ON INSPECTIONS



- Duct is the wrong gauge
- Duct is riveted and caulked
- Hood had no filters
- Fryers have paper towels under them to soak up grease

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WHAT TO LOOK FOR ON INSPECTIONS



Range Guard nozzle seal was missing. The grease completely plugged the hole in less than two weeks after the semi-annual maintenance

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WHAT TO LOOK FOR ON INSPECTIONS

- Inspection -- Do it yourself install
  - Lab Fume hood installed over 3 vat fryer bought at auction
  - Hood mounted on plywood
  - Inline fan
  - All Nozzles point to floor not hazard area
  - No Fuel shut off



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WHAT TO LOOK FOR ON INSPECTIONS

- Improper Clearances
  - Do-it-yourself duct
  - Not welded
  - Wrong gauge steel
  - Not liquid tight



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WHAT TO LOOK FOR ON INSPECTIONS

- Improper termination
  - Clearance to combustible issue



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WHAT TO LOOK FOR ON INSPECTIONS

NO COMMENT!



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**BISON**  
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THANK YOU

- Winnipeg
- Thompson
- Brandon
- Regina
- Saskatoon
- Kenora
- And continuously growing!



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