GUIDELINE #1400.19(12/09)

ENGINE COMPANY OPERATIONS

Purpose:

The purpose of this guideline is to provide basic information about the District's overall approach to engine company operations.

Planning and Preparation:

A. Planning and preparing for an engine company response begins the moment the member arrives for their assigned shift. The status boards in the apparatus bay should be checked for any information that may affect the response or operations of the unit. Situations such as street closings, hydrants or mains out of service, equipment changes on the apparatus or mutual aid companies out of service should be noted and possible alternate courses of action considered and discussed.

B. Immediately after the start of each shift, members assigned to one of the following positions (Apparatus Operator, Officer, Forcible Entry, and Nozzle) should check over their assigned equipment, to ensure that the unit is ready for response. Each member should place their protective equipment at or near their respective riding position so that it can be donned prior to responding when necessary. Members responding back to incidents should give their equipment a quick check over prior to response, to ensure that it is ready for the call they are responding to.

C. The most important tools engine companies use on the fireground are:
   a. Hydrants – the importance of locating, connecting to, and operating a serviceable hydrant cannot be overemphasized. Each member should be familiar with the operating procedures for the several types of hydrants currently in use.
   b. Apparatus – In addition to transporting personnel and equipment to the scene of an incident the apparatus provides the water supply for fire attack. Each member should be able to perform the following functions:
      i. Transfer the engine apparatus from "road" to "pump".
      ii. Connect the apparatus to a hydrant using all methods available and set-up the apparatus for drafting operations using all methods available.
      iii. Charge and maintain adequate pressure on a hoseline using the pump panel controls.
   c. Hose and fittings – Personnel must be familiar with the current hose inventory and methods of stretching. Fittings may be required to connect and adapt hose to other hose and hose to appliances. A well-trained member should be able to quickly locate and place into operation all hose/fitting combinations.

d. Nozzles – There are several different types and styles of nozzles in use and a knowledgeable member should be familiar with the specific applications and methods of use for each type. For example, the smooth bore nozzle is useful for high volume flows with long reach, superior penetration and reduced nozzle reaction. It is required for standpipe operations due to its effective performance at low pressures. A combination nozzle is effective for ventilation, fires near energized electrical equipment and dispersing vapors at gas leaks.

D. Successful fireground operations do not happen by accident. For an engine company to perform well, the company officer and other assigned members must be involved in ongoing training. Company drills, multi-unit drills and critiques after each incident will ensure that a high level of performance and professionalism is maintained.

Response Considerations:

A. All responses to fires and emergencies should begin with proper receipt of the alarm. All responding members should be informed as to the type of alarm the unit is responding to and the location or address. This information will determine whether or not protective clothing is necessary and will prepare members for the type of action or tactics that might be required.

B. The only type of response that is helpful to the District and the public is one that is completed safely and accident free. Apparatus accidents can cause injuries to members and civilians and damage to the apparatus. Units unable to proceed to the alarm location are unable to render the assistance for which they were initially summoned. For these reasons a safe and reasonable response is necessary.

C. Units returning from previous alarms or available on the air must consider the potential hazards caused by responding from locations outside of quarters. Other units responding to the same incident may not expect to encounter this unit, which will be responding using other than its normal response route. This situation can cause surprise meetings at intersections and result in units arriving out of their normal response sequence.

D. Members responding to an alarm should monitor the radio, MDC or pager (members responding back to the station). This will provide the members with vital information about conditions at the scene and any problems encountered by earlier arriving units including water supply problems, trapped occupants, difficulties in locating the fire, heavy smoke conditions, or the need for special equipment.

Apparatus Positioning:

A. In order to avoid passing the incident location, if no specific address is given, units should slow down upon approaching the scene. Look for any indicators that might identify the location of the incident or for persons

attempting to gain the unit's attention. When a street address is provided, proceed directly to the location. House numbers generally follow a pattern, being familiar with the response area and any variations will assist in a unit's response efficiency.

B. The company officer will decide where to position the apparatus once the incident location has been determined. This decision must be based on several factors, such as overall objectives, water source, type of incident, and if the apparatus will block out or be blocked out by other incoming units.

Fire Scene Operations:

A. Firefighting Objectives:
   a. The objectives of firefighting are to protect life and property by performing rescues, and by locating, confining and extinguishing fires.
   b. Strategy and tactics defined:
      i. Strategy – The general plan or course of action decided upon by the incident commander in order to achieve firefighting objectives.
      ii. Tactics – The operations or actions required to carry out the strategy selected by the incident commander.
   c. Most fire operations employ an offensive strategy which emphasizes the rapid stretching of hoselines for an aggressive interior attack on the seat of the fire. Engine company tactics at most building fires are to stretch a hoseline via the primary means of egress (main entrance of the building), secure a water supply and attack the fire.
   d. A defensive strategy may be employed, initially, at large or expanding fire operations where protection of exposures or containment of the fire is critical. Emphasis is placed on developing large water flows. Tactics compatible with these conditions might include positioning the apparatus for use of large caliber stream, such as the deck pipe or stretching a 2 ½" hoseline for exposure protection.
   e. Selection and implementation of any strategic plan and its supporting tactics is dependent upon an accurate and ongoing size-up of the fire situation. Size-up starts with the receipt of the alarm and continues until the fire is under control. The size-up process may be carried out many times and by many different individuals during the course of a fire. The responsibility for size-up initially lies with the fire officer on the scene, however all members must make a personal size-up of the fire situation. As higher ranking officers arrive, the responsibility for size-up is passed up the chain of command.
   f. An accurate and complete size-up must include consideration of the following strategic factors. They are:
      i. Time of day
      ii. Life
      iii. Area

iv. Height
v. Construction
vi. Occupancy
vii. Location and extent of fire
viii. Water supply
ix. Street conditions
x. Auxiliary appliances
xi. Weather
xii. Apparatus and equipment
xiii. Exposures

B. Protection of Life:
   a. The protection of life is the primary consideration at any fireground operation. Engine companies are often confronted with life saving operations upon arrival. Life saving operations are placed ahead of firefighting when sufficient personnel are not available to do both. Judgment is a key factor when confronted with this situation. The best life saving measure may be a prompt attack on the fire which, if allowed to spread, would trap occupants. A life hazard, visible upon arrival, must be addressed. However, immediate rescue attempts by the first arriving engine company without simultaneously stretching and positioning a hoseline should be attempted only in extreme situations.
   b. Factors impacting on the decision to attempt an immediate rescue include:
      i. Occupants endangered by being in the immediate vicinity of the fire.
      ii. Number of persons trapped.
      iii. Occupants threatening to jump.
      iv. Means of egress cutoff by fire.
      v. Ability to reach occupants with portable ladders.
      vi. Anticipated arrival time of the next due companies.
      vii. Staffing level of the engine company.
   c. Actions that the officer of the first arriving engine company can implement to protect endangered occupants include:
      i. Position a hoseline between the fire and the endangered occupants.
      ii. Ventilate to draw fire, heat, and smoke away from the endangered occupants.
      iii. Give verbal instructions and assurances to the occupants.
      iv. Close doors to limit the spread of smoke.
      v. Ensure that incoming units are informed of the location of endangered occupants.

C. Locating the Fire:
   a. Before any fire attack can be initiated, the exact location of the fire must be determined. This is the first stage of the fire suppression effort.

i. Refer to the MDC and/or radio for reported particulars, i.e. floor or apartment number.
ii. Upon arrival, an exterior survey of the building should be conducted for visible flames, smoke, smoke blackened windows, occupants in distress.
iii. Solicit information from occupants that have already evacuated the building.

b. Often the odor given off by burning materials, even if there is no visible smoke, may indicate what is burning and perhaps indicate where the fire might be located.
c. When the exact location of the fire has been determined it must be conveyed to the other units operating on the scene.

D. Confining/Controlling the Fire:
a. Confining and controlling a fire is the second stage of the fire suppression effort and includes those actions taken to prevent the fire from extending beyond the area already involved. This is generally the immediate concern, and fulfills the role of placing a hoseline between the fire and the majority of the building occupants.
b. Confinement of the fire must take into consideration the intensity of the fire as well as the known or anticipated direction of fire spread. Be aware that the fire may be extending via voids, concealed spaces, etc.
c. Great care should be exercised when ventilating so as not to cause unwanted fire extension that might hamper the initial attack hoseline.
d. Exterior fire spread. Company officers must be cognizant of the potential fire extension via the exterior to other areas of the building. This can be one of the fastest means of fire extension. This is the result of fire venting to the outside through a window, door, or other opening, and re-entering the building through the vented eaves or windows above. In areas where structures are in close proximity to one another, the problem may be even greater in that there is now fire extension to an adjacent building as well.

E. Extinguishing the Fire:
a. Extinguishment is the third stage in the fire suppression effort.
b. Initial extinguishment includes “knock down” of visible flames and readily apparent burning and smoldering material debris. Final extinguishment means that any fire uncovered by “opening up” and overhauling procedures has been extinguished.
c. Direct Attack – The attack crew advances into the fire area and utilizes a straight or solid stream. The stream is applied directly onto the burning materials until the fire darkens down. This is the attack method most often used for interior firefighting. If necessary, straight or solid streams should be directed at the ceiling to cool the overhead, before directing the stream toward the fire itself in a “Z” pattern. Before advancing, a sweep of the floor with the stream will cool embers and other hot materials that could cause injuries.

d. Indirect Attack – The crew attacks the fire from a doorway, window, or other protected area not entering the fire area. A narrow to wide-angle fog stream is directed into the fire room or area. The super-heated atmosphere will turn the water fog into steam. This method of extinguishment absorbs the heat and displaces the oxygen. This method of extinguishment must not be used in areas where victims may be located or personnel are operating.

Engine Company Riding Assignments/Operations – 1st Due – Attack:

A. Apparatus Operator
   a. Duties:
      i. Drive the apparatus in a safe manner
      ii. Secure a primary water supply on smoke or fire showing.
      iii. Position the apparatus in such a way that the front of the building is left open for the ladder company.
      iv. Operate the pump.
      v. Serve as the Initial Rapid Intervention Team (IRIT), as needed.
      vi. Serve as the Initial Accountability Officer (IAO), as needed.
      vii. Scene illumination, as needed.
   b. Tools/Equipment:
      i. PPE (bunker gear).
      ii. Portable radio on the fireground channel.

B. Company Officer
   a. Duties:
      i. Determine the proper route of travel and location of the primary water supply.
      ii. Ensure proper apparatus placement.
      iii. Give an initial arrival report to include the type of building involved and what is evident.
      iv. Complete a 360° size-up and determine a mode of attack.
      v. Ensure that the proper size/length attack line is stretched.
      vi. Serve as the Initial Rapid Intervention Team (IRIT), as needed.
      vii. Serve as the Initial Incident Commander until relieved, as needed.
   b. Tools/Equipment:
      i. PPE (bunker gear/SCBA).
      ii. Flashlight (apparatus-mounted).
      iii. Portable radio on the fireground channel.
      iv. 5’ Roof Hook or Multi-Hook.

C. Irons
   a. Duties:
      i. Layout the supply line, gate valve and hydrant wrench at the primary water supply.
      ii. Perform forcible entry, as needed.
      iii. Assist with advancing the attack line.

iv. Deploy a back-up/exposure line, as needed.

b. Tools/Equipment:
   i. PPE (bunker gear/SCBA).
   ii. Portable radio on the fireground channel.
   iii. Thermal Imaging Camera.
   iv. Irons and/or Hydra Ram (Multi-Family or Commercial Buildings).

D. Nozzle

a. Duties:
   i. Deploy and advance the proper size/length attack line.
   ii. Confine and/or extinguish the fire.
   iii. Perform a primary search of the immediate fire area after the fire is knocked down.
   iv. Start initial overhaul operations.

b. Tools/Equipment:
   i. PPE (bunker gear/SCBA).
   ii. Portable radio on the fireground channel.
   iii. Flashlight (apparatus-mounted).

Engine Company Riding Assignments/Operations – 2nd Due – Back-Up:

A. Apparatus Operator:

a. Duties:
   i. Drive the apparatus in a safe manner.
   ii. Whenever possible enter the incident scene from another direction.
   iii. When entering the incident scene from another direction secure a secondary water supply.
   iv. Position the apparatus in such a way that additional incoming ladder companies have access to the front/rear of the building.
   v. Scene illumination, as needed.

b. Tools/Equipment:
   i. PPE (bunker gear)
   ii. Portable radio on the fireground channel.

B. Company Officer:

a. Duties:
   i. Determine if an alternate route of travel is available and identify the location of a secondary water supply.
   ii. Ensure proper apparatus placement.
   iii. Ensure that the proper size/length back-up line is stretched.
   iv. Ensure that the proper size/length attack line is stretched for another area of the building.

b. Tools/Equipment:
   i. PPE (bunker gear/SCBA)
   ii. Portable radio on the fireground channel
   iii. Flashlight (apparatus-mounted)

iv. 5’ Roof Hook or Multi-Hook

C. Irons:
   a. Duties:
      i. Layout the supply line, gate valve and hydrant wrench at the secondary water supply.
      ii. Assist with advancing the back-up line.
      iii. Deploy an additional line for exposure protection, as needed.
   b. Tools/Equipment:
      i. PPE (bunker gear/SCBA)
      ii. Portable radio on the fireground channel.
      iii. Thermal Imaging Camera
      iv. Irons and/or Hydra-Ram (Multi-Family and/or Commercial Buildings).

D. Nozzle:
   a. Duties:
      i. Deploy and advance the proper size/length back-up line or;
      ii. Deploy and advance the proper size/length attack line for another area of the building.
      iii. Confine and/or extinguish the fire.
      iv. Perform a secondary search of the immediate fire area after the fire is knocked down.
   b. Tools/Equipment:
      i. PPE (bunker gear/SCBA)
      ii. Portable radio on the fireground channel.
      iii. Flashlight (apparatus-mounted)

Engine Company Riding Assignments/Operations – 3rd Due – RIT:

A. Apparatus Operator:
   a. Duties:
      i. Drive the apparatus in a safe manner.
      ii. Position the apparatus in such a way that it is located out of the way approximately 500’ from the scene unless instructed otherwise.
      iii. Secures and deploys the search rope at the buildings entrance.
      iv. Leads the team out of the building.
      v. 4th to enter, 1st to exit.
   b. Tools/Equipment:
      i. PPE (bunker gear/SCBA)
      ii. Portable radio on the fireground channel.
      iii. Flashlight (apparatus-mounted)
      iv. Search Rope System

B. Company Officer:
   a. Duties:
      i. Ensure proper apparatus placement.
      ii. Performs a complete 360° size-up.

iii. Instructs the crew to set additional ladders, as needed.
iv. Receives orders from the Incident Commander.
v. Keeps the Incident Commander informed of the teams progress, if deployed.
vi. Constantly evaluates the available exit paths and building conditions.
vii. Deploys the search rope after entering the building.
viii. 1st to enter, 4th to exit.

b. Tools/Equipment:
i. PPE (bunker gear/SCBA)
ii. Portable radio on the fireground channel.
iii. Flashlight (apparatus-mounted)
iv. Thermal Imaging Camera w/Spare Battery
v. 5' Roof Hook or Multi-Hook

C. Irons

a. Duties:
i. Carries the extra air supply (RIT Pack).
ii. Locates the downed firefighter.
iii. Disarms the downed firefighters PASS.
iv. Ensures the downed firefighter has an adequate air supply (RIT Pack).
v. Assists with firefighter removal (Feet).
vi. 3rd to enter, 2nd to exit.

b. Tools/Equipment:
i. PPE (bunker gear/SCBA)
ii. Portable radio on the fireground channel.
iii. Flashlight (apparatus-mounted)
iv. Irons/Sledgehammer

D. Nozzle:

a. Duties:
i. Carries basic extrication tools.
ii. Frees entangled firefighter.
iii. Assists with air switchover, as needed.
iv. Assists with firefighter removal (Head)
v. 2nd to enter, 3rd to exit.

b. Tools/Equipment:
i. PPE (bunker gear/SCBA)
ii. Portable radio on the fireground channel.
iii. Flashlight (apparatus-mounted)
iv. Extra Air Supply (RIT Pack)
v. Wire Cutters

Hose:

A. Developing an effective fire stream is one of the most basic fundamentals of any fire fighting operation. Hose is the primary tool for the application

of water. The proper selection, use, care and maintenance of hose will determine if an effective fire stream can be delivered.

B. Hose Specification – The most common sizes of hose carried by engine companies are: 2" with 1 ½" couplings, 2 ½" with 2 ½" couplings, and 5" with 5" storz couplings.

C. Hose Identification – Each length of hose is marked on each end as follows: the year the hose was purchased, the length of the hose, and a number given to that section based on the amount of hose purchased in a given year. Example: 05-100-05 – the hose was purchased in 2005, it is 100' long and it was the fifth section of hose purchased that year.

D. Hose Pressure:
   a. The maximum pressure in hose lines should be limited to 250 psi. Only emergency needs which allow for no other corrective action permit the use of higher pump pressures. Pressures in excess of 250 psi can only be ordered by the Incident Commander.
   b. Hose line pressure should approach as nearly as possible the ideal pressure required for the stretch. The ideal pressure is a function of:
      i. Friction loss in the hose, fittings and appliances.
      ii. Required nozzle pressure.
      iii. Head loss or gain.
   c. Excessive pressure in a hoseline wastes engine power, may cause a burst length, may result in an ineffective stream, and may endanger personnel if control of the line is lost.
   d. In order to supply the correct pressure in a hoseline, the following information must be known:
      i. Type of nozzle and/or size of nozzle tip.
      ii. Length of hose in the stretch and its size.
      iii. Number of floors or stories above or below grade the nozzle will be operating.
   e. To reduce friction loss, keep hoselines as straight, as short, and as free of kinks as possible. Kinks in hoselines can significantly reduce required flows and must be removed as soon as possible.
   f. Kinks should be removed manually. Attempting to straighten kinks hydraulically by use of unwarranted pressures is not a good practice.

E. Hose Use at Fires:
   a. The 2" pre-connected handline is the primary attack line used at building fires. This hose when used in conjunction with the 1" smooth bore tip and controlling nozzle, provides an adequate fire stream and has better maneuverability and easier handling than the larger 2 ½" handline. At a nozzle pressure of 50 psi, the 2" handline will flow approximately 210 gpm.
   b. Company officers may order the stretching of the 2" handline at fires as the initial line if its use is compatible with fire conditions and the extinguishing capability of the 2" line is weighed against:
      i. The fire's magnitude, location and potential for spread.
      ii. The occupancy of the building and possible life hazard.

iii. The advantages to be gained by an increased speed in stretching and the increased mobility of the line, versus the need for a greater water delivery rate to control the fire.

c. The use of the 2" pre-connected handline would be inappropriate and a company officer should not order it stretched if any of the following conditions exist:
   i. A fire is discovered in a commercial building.
   ii. The line is expected to be used from a purely defensive position.
   iii. An advanced fire on arrival.
   iv. A large volume of water is required to cool a superheated fire area.
   v. A large body of fire in a large uncompartmented area.
   vi. When the officer cannot determine the size or extent of the fire or fire area.
d. Incident Commanders may order the 2" handline stretched as the second or third line when in their judgment it is compatible with fire conditions and their strategy of extinguishment/containment and/or exposure protection.
e. All hoselines stretched from standpipes shall be 2 ½" in size with a controlling nozzle and 1 1/8" smooth bore tip. All handlines stretched from standpipes shall be connected to outlets one floor below the fire floor.
f. The use of 2 ½" handlines at standpipe operations are required due to the large volumes of water it can deliver with low friction loss per length. The 1 1/8" smooth bore tip will produce a fire stream at extremely low pressure and is difficult to clog.
g. 5" hose is used to provide greater water flows with less friction loss. This hose should be used to:
   i. Supply standpipe/sprinkler systems.
   ii. Supply large caliber streams.
   iii. Relay water to other companies.
   iv. In-line supply for the first due engine company.

F. Hose Loading:
a. The typical dead hose load has:
   i. One bed of 2 ½" hose, spare.
   ii. One bed of 1 ¾" or 2" hose, spare.
   iii. One bed of 5" hose.
b. The typical pre-connect hose load has:
   i. One bed of 2 ½" hose, 200' in length.
   ii. Two beds of 2" hose, 200' in length.
   iii. One bed of 2" hose, 100' in length.
c. No more than 300' of 2" hose shall be used as lead lengths in any hose stretch. Greater friction loss in 2" hose precludes the use of more lengths without the danger of exceeding the maximum permissible working pressure.

d. When loading hose, fold it neatly, compactly and uniformly. Loading hose correctly allows the hose to play out properly.
e. When folding hose, avoid old bends since repeated bending in the same spot leads to kinking and to cracking of the inner lining.
f. Do not permit the hose to lie over on its edge.
g. Dead loading hose in the hose bed:
    i. Load hose from left to right.
    ii. Start loading with the coupling on the left hand front side of the hose bed.
    iii. Fold the hose at the rear and bring it all the way forward on top of itself.
    iv. At this point, veer the hose slightly to the right so as to come alongside of the first fold.
    v. Repeat the movement back and forth moving from left to right. Upon completing the first layer, fold the hose at the right rear side and cross diagonally to the left front side, and repeat until the hose loading is complete.
    vi. Hose folds should be staggered, the first at the edge and the next row approximately 2" forward. This should be alternated back and forth while keeping the folded ends even on each row.
    vii. Avoid folding hose too close to the coupling.
    viii. To insure the hose lies flat in the bed, avoid twisting the hose when coupling it.
h. Pre-connected loading of hose:
    i. Connect the first 100' of hose to the apparatus pre-connect discharge outlet and flat load this hose on the front side of the hose bed.
    ii. The first 100' of hose should be loaded flat with no tales on either side of the apparatus.
    iii. The second 100' of hose should be loaded upside down, starting with the male end of the hose hanging down to the running board on the officer's side of the apparatus.
    iv. The first fold of this hose should be flat with no tales on either side, the second fold should have an approximate 1' tale on either side of the apparatus for ease of removal.
    v. The third fold should be flat, the fourth fold should be the same as the second and each fold after that should be flat.
    vi. Connect the nozzle to the male end of the hose that is hanging down on the officer's side of the apparatus and fold this end of the hose back on itself.
i. Rolled Length:
    i. Lay the hose out flat and straight for its full length.
    ii. Take the male end and double it back on itself.
    iii. Place the male butt about 3' from the female coupling.

iv. Beginning at the folded end, roll the doubled hose tightly toward the couplings.
v. One member rolls the hose while a second member keeps the hose straight and removes slack.

Stretching and Operating Hoselines:

A. Stretching and operating hoselines is the primary function of an engine company. All members must realize the importance of the initial line stretched at a building fire. More lives are saved at fire operations by the proper positioning and operating of hoselines than by all other life saving techniques available. The majority of building fires are controlled and extinguished by this initial line.

B. Guidelines for Hoseline Placement:
   a. First Hoseline:
      i. The first line is placed between the fire and any persons endangered by it. This is usually accomplished by stretching the hoseline via the primary means of egress. This tactic:
         1. Provides a base for confining and controlling the fire.
         2. Allows occupants to evacuate via the stairs.
         3. Allows members to proceed above the fire for search.
      ii. When placing a hoseline to protect an exterior exposure, it should be positioned so that the stream can be used alternately between operating on the exposure and the fire. When using streams to protect exposed buildings, the water should be applied onto the building's surface for best results.
   b. Second Hoseline:
      i. Unless otherwise ordered, the second line is placed to back up the first line. This tactic is used for the following reasons:
         1. To provide a back-up to the first hoseline in case of a burst length in the first hoseline.
         2. To provide a second line to be used simultaneously with the first hoseline if fire conditions warrant.
         3. If the second line is not needed on the fire floor, it can be advanced to the floor above.
   c. Third Hoseline:
      i. Depending on the occupancy and the fire conditions, a third hoseline may be required. Unless otherwise ordered, this line may be stretched to:
         1. Cover a secondary means of egress.
         2. Prevent vertical fire extension.
         3. An exposure building either attached or detached.
   d. Other Hoseline Placement Guidelines:
      i. Hoselines shall not be operated in opposition to each other.
      ii. Permission must be obtained by the Incident Commander before exterior hoselines are directed into a fire building.

iii. Immediate notification must be given to the Incident Commander when a situation is discovered that requires the positioning of an additional hoseline.
iv. When a hoseline is determined to be operating ineffectively, the Incident Commander must be notified.

C. Fire Attack Techniques:

a. Knowledge of the buildings layout is the most valuable asset to an attack crew advancing under heavy fire and/or smoke conditions. If the smoke is not banked down to the floor, a quick glance at floor level before opening the nozzle can give an indication of the floor layout. From this position, obstructions such as furniture, debris or other obstacles which could impede the advance of the attack crew may be evident. The glow of the fire may indicate the direction and distance the crew has to advance. Once the line is opened, any visibility will be lost until adequate ventilation is accomplished.
b. The nozzle should be cracked open as the crew waits for water. The sound of exhausting air will indicate water is on the way, and any air in the line will be expelled. The line must be bled before the fire attack begins.
c. NEVER enter the fire area with an uncharged hoseline. However, the hoseline should be stretched as close to the fire area as possible before being charged. An uncharged hoseline is stretched more rapidly and it is less fatiguing than attempting to move a charged hoseline into position.
d. All members should operate on the same side of the line. When the door to the fire area is opened members should be low and to one side of the opening, to let the pent up heat and gases vent prior to advancing.
e. Once the line is advancing, keep moving toward the seat of the fire. In order to reduce the chance of burn injuries and ensure rapid knockdown, the attack crew should move aggressively but deliberately.
f. Let the reach and penetrating power of the stream do the work, especially in large area buildings or when several rooms are involved in fire.
g. The stream should be operated “out front and overhead”. The water should be deflected off the ceiling and upper walls. The nozzle member should hold the nozzle at arms length to allow for maneuverability and change of nozzle direction.
h. As the fire darkens down, the angle of the stream may be lowered to directly cool burning solid fuel material.
i. Do not crowd the nozzle.
j. As the advance is made, listen for crackling of fire, look for a glow of fire in the smoke, feel for heat.
k. Listen to the sound of the stream as you sweep the nozzle across a room or area. The sound of the water striking a wall or partition will

change if an opening such as a door or window is encountered. This opening might lead to a room or a hallway leading to another group of rooms where fire might still be burning.

l. Once the fire appears to be knocked down consider shutting down the nozzle to let the smoke and steam lift. Be prepared to reopen the nozzle at any moment.
m. The floor should be swept with the stream as you advance to cool any burning material and prevent knee and leg burns.

Sprinkler/Standpipe Operations:

A. Commercial sprinkler/standpipe systems should be supplied through the "Fire Department Connection" using a single 5" supply line and pumped at 150 psi. Most connections in the District have a single 5" storz connection, however there are still a few 2 ½" Siamese connections left and these connections should still be supplied with a single 5" line.
B. Residential sprinkler systems should be supplied through the single 2 ½" "Fire Department Connection" using a single 2 ½" supply line and pumped at 90 psi.

Foam Operations:

A. Types of Foam
    a. Aqueous Film Forming Foam (AFFF)
        i. May be used in 1%, 3%, or 6% mixture.
        ii. Synthetic based.
        iii. Good penetrating capabilities.
        iv. Spreads vapor-sealing film over and floats on hydrocarbon fuels.
        v. Can be used through non-aerating nozzles.
        vi. Performance may be adversely affected by freezing and storing.
        vii. Has good low-temperature viscosity.
        viii. Can be freeze protected with anti-freeze.
        ix. Can be used with fresh or salt water.
    b. Class A
        i. Synthetic.
        ii. Wetting agent that reduces surface tension of water and allows it to soak into combustible materials.
        iii. Rapid extinguishment with less water use then other foams.
        iv. Can be used with regular water stream equipment.
        v. Can be premixed with water in booster tanks.
        vi. Mildly corrosive.
        vii. Requires lower percentage of concentration (0.2 to 1.0%) than other foams.
        viii. Outstanding insulating qualities.

ix. Good penetrating capabilities.
x. Primary use in extinguishing Class A combustibles only.

B. Application Rates
   a. Hydrocarbon fuel spill fires (non-diked) – protein and fluoroprotein foams: 0.16 gpm/sq. ft. of surface area for 15 minutes; AFFF foams: 0.10 gpm/sq. ft. of surface area for 15 minutes.
   b. Polar solvent fuel spill fires – range is between 0.10 and 0.20 gpm/sq. ft. or surface area, depending on manufacturer's UL listing.
   c. Hydrocarbon fuel fires in fixed roof storage tanks – 0.16 gpm/sq. ft. of surface area. Combustible liquids require a 50-minute application time; flammable liquids and crude petroleum require a 65-minute application time.
   d. The application rate for Class A foam is the same as the minimum critical flow for water.
   e. Example of an application rate for hydrocarbons:
      i. An area of 2,000 square feet of regular gasoline burning and 3%/6% AFFF foam is available.
      ii. Application rate per square foot times the number of square feet of surface area (0.10 gpm per sq. ft. x 2,000 sq. ft.) equal amount of foam solution (200 gpm) required..
      iii. Proportion percentage times application rate (3% x 200 gpm) equals amount of concentrate (6 gallons of 3%) required per minute.
      iv. Concentrate requirements per minute times application period (6 gallons x 15 minutes) equals amount of concentrate (90 gallons of 3% AFFF) required to control, extinguish, and initially secure the 2,000 sq. ft. hydrocarbon fire.

C. Water and Concentrate Requirements
   a. A 5-gallon container of 3% foam concentrate requires 161.7 gallons of water and will produce 166.7 gallons of foam solution.
   b. A 5-gallon container of 6% foam concentrate requires 75.2 gallons of water and will produce 80.2 gallons of foam solution.
   c. For a 750 gallon booster tank 20 gallons of foam concentrate can be emptied into the booster tank providing a 3% mixture of foam solution. A 1,000 gallon booster tank will require an additional 5 gallons of foam concentrate.
   d. In the example above, the 90 gallons of 3% foam concentrate will require 2,917.6 gallons of water and will produce 3,000.6 gallons of foam solution.

D. FoamPro System 1600
   a. Engines 701 and 702 are each equipped with the FoamPro System 1600, an electric motor driven flow-based proportioning system that measures water flow and then injects the proportional amount of foam concentrate to maintain the preset percentage. The system will accurately deliver from 0.1% to 1.0% foam concentrate to the foam injector fitting. The flowmeter measures the water flow and sends a

signal to the motor driver control. Another sensing device monitors the foam pump output. Constant comparison of these two information signals by the computer ensures maintenance of the desired proportion of foam concentrate at all times based on the water flow rate, independent of any variations in fire pump intake or discharge pressures. As water flow increases or decreases, the foam concentrate rate of injection is increased or decreased automatically to correspond to the water flow. Foam concentrate is injected directly into the water stream on the discharge side of the water pump.

b. Normal System Operation
    i. Once the system has been set up and calibrated, operation is very simple and is controlled by the ON/OFF switch and the INJECTION RATE knob on the control module.
    ii. When the switch is toggled into the ON position, the LOW CONC. Light momentarily flashes on. This indicates that the system is ready to operate. The FoamPro system monitors the water flow and controls the foam injection at the specified concentration selected.
    iii. The foam injection rate can be adjusted at any time during operation to suit the conditions and/or concentrate being used.
c. Simulated Flow Operation
    i. The simulated flow function of the system allows the operator to control the foam pump manually. To begin simulated flow turn the switch to the "ON" position located on the left side of the motor driver (inside the pump house on the officers side of the apparatus). The light on the control module will blink once per second.
    ii. Adjust the percentage on the control module.
    iii. To exit the simulated flow turn the switch to the "OFF" position located on the left side of the motor driver (inside the pump house on the officers side of the apparatus). The light on the control module will stop blinking.

E. Elkhart Brass Foam Eductor
a. Engine 703 is equipped with a 1 ½" and 2 ½" Elkhart Brass foam eductor. An eductor is a device that uses the venture principle to introduce a proportionate amount of liquid concentrate into a water stream. This venture principle is used in all Elkhart eductors to induce foam or other liquid agents into a fire control stream.
b. Elkhart eductors are calibrated to flow rated capacity at 200 psi inlet pressure and most non-aspirating fog/straight stream nozzles achieve rated flow at 100 psi.
c. Operating Instructions
    i. Connect the eductor to a discharge outlet on the apparatus then connect no more then 200' of attack hose to the discharge side of the eductor.

ii. The eductor must be used with a nozzle having the same rated flow or larger.
iii. Adjust the metering device to the correct setting for the required percentage of concentrate, generally 3%.
iv. Open the discharge and set proper flowing pressure. Eductor inlet pressure of 200 psi is required for accurate proportioning of concentrate into the water stream and efficient nozzle performance. Ensure that the nozzle is open fully.
v. Insert the pick-up tube into the foam supply bucket. There will be a delay of 12 to 15 seconds before the foam solution will be discharged at the nozzle in a typical system.
vi. The hose lay between the eductor and the nozzle must not exceed the recommended length for the combination of flow rate and hose size being used. Increasing the inlet pressure will not correct the problem. Increasing inlet pressure will increase water flow and thus nozzle pressure will also increase, creating excessive back-pressure at the eductor venture.