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PORTLAND FIRE & RESCUE
Portland, Oregon

March 7, 2013 GENERAL ORDER NO. 16

CARE AND TESTING OF FIRE HOSE

I. GENERAL

A. This order supersedes and rescinds General Order No. 16, dated February 21, 2012.

B. It is the purpose of this order to establish procedures for the general care, testing and maintenance of Portland Fire & Rescue's (PF&R) fire hose.

C. The Chief has designated a B shift battalion chief as the bureau hose officer to administer PF&R's fire hose program. Exceptions to this shift assignment may occur at the discretion of the Emergency Operations Chief.

D. The Hose Officer (PF&R) email profile in Outlook has been removed. All hose related correspondences will be sent to the personal email profile of the Chief Hose Officer.

E. The engine officer on B shift shall be designated as the Station Hose Officer. All station related hose matters should be processed through the Station Hose Officer. It is not the purpose of this order to reduce or restrict the station captain's authority or responsibility for the hose assigned to the station.

F. Reference is made throughout this general order to the Hose Inventory System. This computer application shall serve as the master inventory database for all PF&R fire hose.

II. ORDINARY CARE OF WOVEN JACKETED FIRE HOSE

A. When the woven jacket of a fire hose becomes dirty it shall be thoroughly washed with a brush and clean water to remove dirt. Do not use any type of solvent to remove grease or stains. A strong soap or mild detergent may be used in extreme cases where stains are the result of oil or acid exposure.

B. In the event that mold or mildew should form on the surface of any all-polyester hose, it should be cleaned by brushing with a solution of soap and water and thoroughly rinsed with water. In persistent or severe cases use a solution of one cup bleach in five gallons of water, brushing with the solution and thoroughly rinsing with water. Even though mold or mildew may leave stains, they will not damage all-polyester hose jacket material.

C. Before hose is loaded, graphite the swivels and threads of the couplings as necessary. Inspect the gasket in the female coupling of each length. If the gasket is

hardened, deteriorated, or protrudes appreciably into the waterway, replace it with a fresh, properly fitted gasket. Inspect for the burring of threads on the male coupling. If the threads of the male couplings need filing, use a 7″ double tapered, extra slim, three-corner file. The file shall be carried on all first-line and reserve engines. Spray cans of graphite are available from Logistics. All hose couplings should be checked for damage and a light film of petroleum jelly applied to the gasket before coupling as necessary.

D. Never attempt to roll or fold frozen hose. Transport frozen hose to a warm place. After thawing, provide regular care.

E. Do not allow any vehicle to run over fire hose during fire fighting operations unless absolutely necessary. Do not drive over the hose on or near the couplings. It is not permissible to run over any part of fire hose during picking-up operations. Do not allow vehicles equipped with studded tires or chains to run over fire hose unless the hose has been properly bridged with hose jumpers.

F. Company officers shall record in the Hose Inventory System on the station computer all regular hose changes for both first-line and reserve apparatus.

G. After a fire, companies shall reload their hose and return to in-service status as soon as possible. In exceptional cases of dirty or contaminated hose, the company officer may obtain permission from the incident commander to return to quarters out-of-service.

H. Salvage hose is stored in the Hose Depot and is identified by S2, S3, and S4 respectively. After a fire has been controlled and it is apparent there will be a prolonged period of mop-up and/or stand-by (a day or more), the incident commander shall arrange for hose replacement with salvage hose.

III. HOSE CHANGE SCHEDULE

A. Companies shall reload all assigned hose on their first-line apparatus every three months.

B. Companies shall also reload all hose on reserve apparatus assigned to their station every three months. If reserve apparatus are not quartered at the assigned station's location, company officers shall make efforts to locate and schedule time to conduct these hose changes.

C. Hose changes shall occur in January, April, July and October.

D. All hose shall be reloaded so the folds will occur in different locations on the hose.

E. All hose changes are to be recorded in the Hose Inventory System on the station computer. Once entered these records will be available for review by PF&R's Chief Hose Officer.

IV. MARKING OF FIRE HOSE

A. All hose issued to first-line engine companies shall be marked with the number of the engine company assigned to that station. Do not preface first-line engine company hose with the letter "E". All hose assigned to other PF&R apparatus shall utilize the following letter designations followed by the company number:

1. Brush Units – "BU"
2. Fire Boats – "B"
3. Foam Units – "FU"
4. Reserve Apparatus – "A"
5. Squad 1 – "S"
6. Trucks – "T"
7. Water Tenders – "WT"

B. Wash down hose shall be marked with the engine company number, and to reduce the chance of being loaded on apparatus shall be further marked with three yellow bands not less than ½" wide at a point near the company number. Wash down hose does not need to be recorded in the Hose Inventory System.

C. Hose shall be marked with the regulation 3" stencil supplied by Logistics. Numbers shall be painted with black latex paint. The proper identifying number shall be centered 10" from the coupling on each end of the hose on both flat sides of the hose. Stencils shall be cleaned immediately after use and stored for future use.

D. Hose which has been reassigned and needs new numbers shall be marked as follows:

1. When remarking 1¾" hose with black numbers and no painted background, use a 2½"x 7½" rectangular block stencil centered 10" from the coupling to cover the old numbers. If three numerals are needed, such as required by reserve apparatus, a 2½"x10¾" block stencil shall be used.

2. When remarking 2½" and 3" hose with black numbers and no painted background, use a 4"x5½" rectangular block stencil centered 10" from the coupling to cover the old numbers. If three numerals are needed, such as required by reserve apparatus, a 4"x 7¾" block stencil shall be used.

3. Old numbers shall be blocked out with yellow latex paint.

4. Stencils for rectangular blocks are supplied by Logistics.

5. New numbers shall be centered within the block using black latex paint and a regulation 3" stencil supplied by Logistics.

6. When remarking hose with red background and yellow numbers, repaint the red background and paint new numbers in yellow.

7. Black, yellow and red latex paint is available through company supplies.

8. See Attachment #1 for example of hose markings.

E. All wildland hose shall be marked with a stencil provided by Logistics. The abbreviation "PF&R" will be stenciled on the same side 10" from each coupling. On the opposite side of the hose the company designation will be stenciled lengthwise 10" from each coupling.

VI. TESTING OF FIRE HOSE

A. All assigned hose will be pressure tested annually between April 1 and November 1. Dates of the last test shall be recorded in the Hose Inventory System on the station computer. The Chief Hose Officer will review these records for accountability.

B. Companies shall also be responsible for testing all fire hose on reserve apparatus assigned to their stations. Again, if reserve apparatus are not quartered at the assigned station's location, company officers shall make efforts to locate and schedule time to conduct the annual hose tests.

C. All replacement hose obtained from the Hose Depot will be pressure tested before placing into service.

D. The Station Hose Officer will assign company hose tests in an equitable manner to each shift. Station captains will oversee the administration of this procedure.

E. Station captains will email PF&R's Chief Hose Officer by January 1st with notification of the following:

1. Completion of annual hose testing.

2. Completion of quarterly hose changes.

3. Confirmation of accurate hose inventories and short description of any discrepancies.

F. NFPA 1962 test standards for hose purchased after July 1, 1987, are as follows:

1. Fire hose shall be tested as per the stenciled information on the outside jacket of the hose, e.g., "Service test to 400 psi for five minutes". Nearly all of PF&R's inventoried fire hose will conform to this standard with exception of wildland hose. Only use apparatus with a two stage pump in the pressure mode when testing to 400 psi. Do not relay pump with two single stage pumps to reach 400 psi standard.

2. The annual hose test will be conducted with a 12-port hose test manifold which is configured with a series of blue Chapman test gates attached to the each port of the manifold. A blue Chapman test gate must be connected to the pump panel discharge port whenever testing individual or small amounts of hose. Use the blue Chapman test gate to test all

repaired or replaced hose.

3. For safety reasons, attach all hose to the side of the pump panel opposite the apparatus operator. Only test a maximum of 300 linear feet of hose for each discharge port on the hose test manifold

4. Secure the hose to the apparatus with a utility strap 10 to 15 inches from the coupling which is attached to the discharge port. This will provide an added level of safety if the hose fails during the test.

5. To check for coupling slippage, all non-painted hose (without red background) will be marked at the back of each coupling with a black permanent marker prior to filling the hose with water. If a coupling slips during the test, remove the hose from service and follow the Damaged Hose procedures outlined in Section VII of this general order.

6. Use a spanner to tighten all couplings before adding water to the hose. Fill the hose with water and pressurize to 45 psi plus or minus 5 psi. Check for leaks before increasing test pressure. Inspect the hose during the test by standing 15 feet to the left side of the hose and face away from the pump panel. **Do not straddle the hose during the test.** Do not walk in front of the free or nozzle end of the hose during the test. Helmets and gloves will be worn during the test.

G. NFPA 1962 also requires annual testing of all assigned wildland hose. The same testing procedures outlined in Section VI, Paragraph E will apply. The only exception is wildland hose will be tested at 250 psi for 5 minutes. Test dates will be recorded in the Hose Inventory System on the station computer.

VII. DAMAGED FIRE HOSE

A. When hose is damaged enter all pertinent data into the Hose Inventory System under the Damaged Hose section. Check the box to notify the Chief Hose Officer via personal email of the damaged hose.

B. Prepare the hose for transportation to Logistics. Write the following on a wire tag and firmly attach it to the hose:
   1. Date
   2. Company Number
   3. Size of Hose
   4. Complete inventory number located on the female coupling
   5. An accurate description of where the hose is damaged
   6. The nature of damage

C. To identify the damaged area of the hose, masking tape shall be wrapped completely around the hose within two inches of the damaged area.

D. Refer to Section IX of this general order for procedures to obtain replacement hose.

VIII. MISSING HOSE

A. Stations have full rights to assign hose to and from the Missing Hose Inventory. When a company determines an assigned length of hose is missing, the Station Hose Officer shall complete the Missing Hose section for that individual length of hose. This will automatically transfer the misplaced hose to the Missing Hose inventory in the Hose Inventory System. Check the box to notify the Chief Hose Officer via personal email that the hose is missing. If that particular length of hose is located, a company officer can simply reassign the missing hose back to their station inventory.

IX. OBTAINING REPLACEMENT HOSE

A. The Hose Depot is located at Logistics in the basement of the west storage building. New and used hose are stored on racks and marked with a date the hose was manufactured on the banding that secures the hose in rolls. Earlier manufactured hose shall be distributed and placed into service before later manufactured hose. Efforts should be made to place used hose back into service before issuing new hose. Newly purchased apparatus however should be outfitted with new hose.

B. There are two options for obtaining replacement hose:

1. Submit requests for replacement hose via the Work Supply Request System. Logistics will facilitate this request. Once issued to the company, the Station Hose Officer will email the inventory number(s) indicated on the female connection to the Chief Hose Officer's personal email. Only the Chief Hose Officer has administrative rights to transfer hose from the Hose Depot to individual apparatus in the Hose Inventory System. Companies have no editing privileges of hose assigned to the Hose Depot.

2. The company may also pick up the hose directly from the Hose Depot. This should be done during normal business hours (0800 to 1600) with assistance from a member of Logistics. Again, once issued, the Station Hose Officer will need to email the inventory number(s) to the Chief Hose Officer's personal email. The Chief Hose Officer will then make the transfer from the Hose Depot inventory to the assigned apparatus.

3. Hose editing capabilities for each particular hose will not be enabled unless the station number the hose is assigned to is entered in the "Added By" column in the Hose Inventory System.

X. SERVICE CATEGORIES

A. Each hose must be assigned a service category in the Hose Inventory System. Station Hose Officers will use the following criteria to edit hose assigned to their station and assure these service categories are applied correctly:

1. **First-line**: Hose that is assigned to primary apparatus excluding reserve apparatus.
2. **Reserve:** Hose that is assigned to reserve apparatus. This hose shall be marked with an "A" followed by the apparatus number.
3. **Wildland:** 1" unlined and jacketed forestry hose and 1.5" jacketed forestry

hose assigned to primary apparatus, reserve apparatus and the Hose Depot.

4. **Other:** Hose that is assigned to an apparatus that is in storage at a station. This hose can be placed into first-line status providing it has been tested within the last year. This hose should be designated "spare" in the remarks section.
5. **Salvage:** Hose as defined in Section II, Paragraph H of this General Order
6. **New:** Hose assigned to the Hose Depot which is factory new and yet to be placed into service. This service category is to be utilized only by the Chief Hose Officer.
7. **Used:** Hose assigned to the Hose Depot which has been placed into service and returned to the Hose Depot. This service category is to be utilized only by the Chief Hose Officer.

XI. ATTACHMENTS

A. #1 Marking of Fire Hose

Erin Janssens
Fire Chief
Portland Fire & Rescue

PREPARED BY:	Don Russ
REVISION DATE:	03/07/13
EFFECTIVE DATE:	03/07/13
REVIEWED BY:	Publications Committee
REVISED BY:	Lyn Eisner

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PORTLAND FIRE & RESCUE
Portland, Oregon

January 14, 2016 GENERAL ORDER NO. 18

FIRE LOSS CONTROL PROGRAM

I. GENERAL

A. This order supersedes and rescinds General Order No. 18, dated December 15, 2011.

B. It is the purpose of this order to establish a uniform program to reduce the loss of lives and property due to fire. This program shall be carried out by the fire companies in their respective Fire Management Areas (FMA). The program shall consist of all functions that can reduce loss by fire including, but not limited to, building familiarization surveys, pre-fire surveys, street and route familiarization, public education, station tours and home inspections.

C. Records are to be kept of all activities relating to fire loss reduction. Records of buildings surveyed, target hazards diagrammed, hydrants inspected, station tours and public education activities shall be recorded and reviewed at least annually with each company's respective battalion chief. Records reviewed shall include, but not be limited to, the Journal System/Productivity Tab and the Station Policy Book. All of the above listed activities should be tallied quarterly when station captains forward their Quarterly Productivity Report (Form 200.74).

D. Nothing in this order shall be construed to limit the company officer's initiative in completing high-rise or standard pre-fire surveys on any building they deem necessary.

II. SCOPE

A. The goal of the Fire Loss Control Program is to reduce the severity of life loss and economic impact of fire within each FMA. To accomplish this goal, each fire company must be thoroughly familiar with their FMA so that responsible decisions can be made to minimize fire problems. The Fire Loss Control Program will accomplish this goal through the following activities:

1. Information shall be gathered concerning occupancies identified as Target Hazards, including "Unsafe Buildings" and Hazardous Materials Occupancies and placed in a Pre-Fire Survey Book; this book shall be carried on all first line fire apparatus, and an additional copy shall be

maintained in the station library to assist move-up companies.

2. Identify serious fire hazards and code violations and refer these to the Prevention Division for abatement.

B. Responsibility

1. Station captains shall divide, as equitably as possible, their respective station's FMA into three sections. One section shall be assigned to each shift and rotated annually.

C. Pre-Fire Survey Program

1. A lack of familiarity with a fire structure is often cited among the contributing factors in firefighter Line of Duty Death (LODD) reports by NIOSH and other investigating agencies. A thorough catalog of buildings meeting the criteria listed below adds a greater margin of safety for fire crews and is an essential strategic and tactical tool for command officers.

2. Primary consideration shall be given to those occupancies commonly referred to as "target hazards." Target hazards are those occupancies with any of these characteristics:

a. Potential for large loss of life.

b. Potential for large property loss.

c. Potential for large economic impact to the community (e.g., loss of jobs).

d. Portland Fire & Rescue's (PF&R) resources may be strained when fighting a fire at the location.

e. Hazardous materials at the location.

f. Any structure or complex where pre-incident information would be valuable.

g. High-rise (any building 75 feet or higher, or whose roof cannot be accessed by PF&R aerials).

h. "Unsafe Buildings" designated and posted by PF&R's Prevention Division.

i. Any building or complex that poses a high potential for serious injury or death to fire crews.

j. Residential properties that pose access/water supply/exposure

issues due to a remote location in areas such as Forest Park. (Refer to Attachment 1.)

3. Each January, station captains will assign the year's pre-fire survey responsibilities to each crew in their respective houses. Captains will monitor each shift's progress on a monthly basis for inclusion in the Quarterly Productivity Reports. (Form 200.74) Each station will complete a minimum of twelve surveys per company, per shift, per calendar year.

4. During the months in which hydrant surveys are conducted, stations shall evaluate their FMAs for new or modified occupancies that meet the criteria of a target hazard. It should be remembered that occupancies and internal processes could change without being apparent from the street.

5. When a target hazard is identified, a standard or high-rise pre-fire survey shall be completed.

6. All occupancies containing reportable quantities of hazardous materials, as defined in Superfund Amendment and Reauthorization Act (SARA) - Title III, shall be included in the pre-fire survey book index.

7. The distribution of copies of completed surveys is the responsibility of the company officer.

8. Officers have the option of utilizing the traditional computer line-drawing method, or a Google Earth image, or combination of both when compiling a survey. However, the Google image must clearly show the structure and surrounding premises and accept pre-fire icons clearly as well. Otherwise, a line drawing will be completed.

9. Additional information pertaining to this program will be kept in the Station's Computer Notebook under Tab 6 and under the Help Menu in the Pre-fire System. Under the Help Menu, users can access the Pre-fire Quick Reference Guide and the User Guide.

D. Survey Procedure

1. Companies shall remain in radio contact with Dispatch at all times. Personal appearance shall be emphasized. All members shall wear a clean and neat duty uniform.

2. Company officers should attempt to contact the business owner or property manager in advance, by phone, to select a date and time to conduct the on-site survey. If a survey date has not been arranged in advance, the officer in charge shall check in at the office or with the property manager of the occupancy to be surveyed and ask permission to make a familiarization tour. It is best if someone of authority accompanies the fire company during the survey. Company members should not

interfere with the normal functions of establishments and should avoid controversial discussion concerning code violations or serious hazards. Emphasis should be on how PF&R can help the owner in case of fire, and on which areas would be of most concern and should be protected (e.g., records, computer rooms).

3. If a structure is designated as an "Unsafe Building", and there is no pre-fire survey on file, one will be created by an officer from the first-due station. The FMO inspector or EOPS Battalion Chief assigned to the "Unsafe Building Program" will be contacted to provide assistance with these buildings.

4. Any condition observed which fails to meet the requirements of applicable codes or reasonable requirements for safety should be brought to the attention of the building management. Every effort shall be made to have the hazard abated at that time. If the hazard is not abated, an FMO company referral shall be created using the FIRES2000 program. Companies should avoid reporting frivolous complaints. If, in the opinion of the company officer, conditions exist which may indicate non-compliance with the provisions of SARA Title III, an FMO company referral shall be forwarded.

5. In most cases, a multi-building complex should be consolidated into a single map survey. Occupancies such as the OHSU hospital campus, which are comprised of several unique buildings, may require a separate survey for each facility.

6. Immediately after an existing target hazard has been re-surveyed and changes have been made, or a new survey completed, company officers shall make sufficient copies of the pre-fire survey for each apparatus and move-up pre-fire book in their station. In addition, if new target hazards have been added, they shall make sufficient copies of the Pre-fire Index by Occupancy and by Address for each pre-fire book in their station.

7. The Bureau of Technology Services (BTS) will backup all station pre-fires daily. Computer (CAD) updates are completed three times per year.

8. On re-surveys, a notation shall be made in the space provided to show the re-survey date and initials of the officer conducting the survey.

III. HOME INSPECTIONS

A. PF&R inspects private dwellings upon request from the homeowner or occupant. When a home is inspected, personnel should be looking for ways to reduce the possibility of fire and fire deaths. When inspecting, remember that you represent PF&R and that the people you meet believe you are fully qualified to advise them on fire prevention matters. If unsure of your answer, inform the homeowner that you will research the subject and a member from the Fire

Bureau will get back to them. Be sure to follow-up.

B. When an inspection is made and hazards are found, do not order corrections. Explain the hazard, its potential danger, and the proper method of correction.

C. Remember, we are there by request and can only educate and advise. PF&R is interested in fire prevention and maintaining a friendly, courteous and helpful relationship with the citizens we serve.

D. Portland Fire's Communications Group can provide specific assistance, forms, quick drills and materials to assist companies in completing home inspections.

IV. PUBLIC EDUCATION ACTIVITIES

A. Public education is recognized as a key to reducing the number of fires. Most fires are due to human factors, and are often caused by a lack of knowledge of fire safety practices. Fire companies shall assist the Prevention Division and Communications Group with educational activities. Companies may be assigned to attend neighborhood activities, school functions, industry presentations, institutional presentations, etc. Unless otherwise directed, members shall wear their duty uniform while attending public education activities.

B. Requests by the Communications Group for the presence of a fire company at a public education activity shall be made through the Emergency Operations (EOPS) Deputy Chief's office and coordinated by the appropriate battalion chief.

C. Requests for fire station tours, school visits, or PF&R presence at community events are common. Citizens can submit these requests online through PF&R's website. The requests are received by the Communications Group and then forwarded to the appropriate fire station or public educator via email. At that point, the EOPS members or public educators are to contact the citizen directly. Members shall make efforts to honor requests when possible, while taking operational considerations into account.

D. The Company assigned to a public education event may submit a request to the Communications Group for assistance and any available public education materials appropriate for their event. The company officer needs to be aware of any public safety message being promoted at that time. Requests for public education supplies shall be initiated using PF&R Form 300.47 (PEO Supply Order Form).

E. Company members are encouraged to present their own ideas for methods that will reduce fires in their FMA. Suggestions shall be presented in writing, through the chain of command, to their battalion chief for review.

V. COMPANY RECORD KEEPING

A. Station based activities, such as pre-fire surveys, hydrant surveys, or company fire inspections (CFIP), should be documented (including the number of each), and a list of them retrieved from the computer program specific to that topic for quarterly reporting. Company officers may enter particular activities they feel need to be tracked in the Journal System/Productivity tab.

B. Each station captain shall maintain a complete file of all Pre-Fire Survey Program material in the company's FMA, including original copies of pre-fire surveys, Pre-Fire Book index, and all instruction materials.

C. The station captain is required to complete a Quarterly Productivity Report (PF&R Form 200.74) and submit it through channels to the EOPS Division Chief. This report is to be completed April 1st, July 1st, October 1st, and January 1st.

D. The Quarterly Productivity Report (PF&R Form 200.74) submitted on January 1st will require the station captain to identify, prioritize, and list capital improvement projects and station goals for the upcoming year in the comments area.

E. BTS will backup all station computer data daily. The BTS daily backup eliminates the need for station personnel to backup their own station computer data.

Erin Janssens
Fire Chief
Portland Fire & Rescue

PREPARED BY:	Chris Babcock
REVISION DATE:	1/14/2016
EFFECTIVE DATE:	1/14/2016
REVIEWED BY:	Publications Committee
REVISED BY:	Leanna Smith

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PORTLAND FIRE & RESCUE
Portland, Oregon

May 10, 2013 GENERAL ORDER NO. 24

TRAFFIC REGULATIONS

I. GENERAL

A. This order supersedes and rescinds General Order No. 24 dated April 5, 2011.

B. This policy complies with State Emergency Vehicle operation statutes, provides a greater degree of safety en route to and on scene of emergency incidents, and decreases apparatus maintenance and damage costs to Portland Fire & Rescue (PF&R) equipment.

II. DRIVING POLICY

A. When responding to alarms, all PF&R drivers shall comply with Oregon's "Basic Rule". The Basic Rule says you must always drive at a speed that is reasonable under existing conditions on all roadways at all times. To obey the Basic Rule, you need to be thinking about other traffic, the surface and width of the road, dangers at intersections, weather, visibility and any other conditions that could affect your safety and driving speed. If you drive at a speed that is unsafe for existing conditions in any area, even though you are driving slower than a designated or posted speed, you are violating the Basic Rule law. Notwithstanding, the Basic Rule speed shall not exceed 10 miles per hour over the posted limits.

B. Emergency Signals (Visual and Audible)

1. Emergency lights will be in operation during emergency response. Emergency lights will include headlights day or night. Headlights used during daylight hours will be on low beam only.

2. Emergency lights will always be on when the siren is being sounded.

3. Unneeded warning lights shall be turned off upon arrival at the emergency scene, except as necessary to mark apparatus in a hazardous situation or location.

4. Four-way flashers and /or directional arrow lights will be used at the emergency scene to warn the public and mark location of PF&R apparatus.

5. The officer will see that the audible warning devices are utilized in a reasonable and prudent manner, consistent with safe operations and traffic conditions.

6. When approaching a nursing home, hospital, etc., the officer will be reasonable and prudent in the use of audible warning devices.

C. Crossing Controlled Intersections During Emergency Response

1. PF&R vehicles responding on emergency runs will stop at all red lights, and proceed only when all traffic that is on the green light acknowledges and yields the right-of-way.

2. Responding to an alarm through a signalized intersection with a green light, PF&R vehicles will exercise caution and good judgment in the vicinity of the intersection. When the visibility of the cross street is limited to less than 400 feet in either direction, the emergency vehicle shall slow to a maximum of 20 Miles Per Hour (MPH) or stop if necessary.

3. Extreme caution must be exercised when using the oncoming traffic lane to circumvent a blocked intersection. Be certain you have the attention of and receive the right-of-way from every driver at that intersection before proceeding.

4. PF&R vehicles will stop at all stop signs and only proceed when all other vehicles have yielded right-of-way.

5. Drivers shall not rely on a signal to proceed into or through a controlled intersection from anyone other than a recognized police officer or official.

D. Right-of-Way Privilege

1. Under no circumstances, including emergency response, shall any member of PF&R operating a vehicle attempt to exercise right-of-way privileges with reckless disregard for the safety of

other persons or property.

2. The public is required to yield the right-of-way to responding emergency vehicles. This does not relieve the driver of an emergency vehicle from the duty to drive with due regard for the safety of all persons using the highway.

E. Driving or Turning Against Traffic

1. The driver of an emergency vehicle will drive in a manner so as to allow traffic ahead in the driving lane or lanes the opportunity to pull to the right. In the event it is impossible, Oregon Revised Statutes permit drivers of emergency vehicles responding Code 3 to disregard regulations governing direction of movement or turning in specified directions. This allows emergency vehicle drivers to briefly enter a lane or street allocated to traffic flowing in the opposite direction if the maneuver can be accomplished safely. <u>No law, affording privileges to the driver of an emergency vehicle responding Code 3, is a defense for negligence or reckless driving.</u>

F. School Buses

1. Whether on emergency and non-emergency responses, PF&R vehicles that meet a school bus with red lights flashing must come to a complete stop. The emergency vehicle must remain stopped until the bus's flashing red lights are no longer operating. This law applies to streets or highways with two, three, four or more lanes of traffic. Only highways divided by an unpaved median strip or barrier are an exception to this law. You must only stop if you are on the same road as the bus.

G. Non-Emergency Use of Vehicles

1. When PF&R vehicles are used in non-emergency situations, emergency signals will not be used and drivers will obey all applicable laws. Non-emergency vehicles will comply with all traffic laws at all times.

H. Turn Signals

1. Turn signals will be used, 100 feet continuously, before lane changes or turns during emergency or non-emergency driving.

I. Move-Ups and Public Service Runs

1. When making a move-up or public service response, emergency lights will not be used. Drivers will comply with designated and posted speed limits.

III. OFFICER AND DRIVER RESPONSIBILITY

A. Company officers and drivers are jointly responsible for the safe operation of PF&R vehicles.

B. The City of Portland's Fleet Accident Review Board (FARB) will review accidents involving PF&R vehicles. The board may require the presence of the officer, driver or other personnel at the review hearing. G.O. 24 will be used as a guideline in the review process.

C. Officers shall be responsible for the assignment of drivers to all apparatus in their company. If for any reason these assignments cannot be accomplished, the officer shall notify Battalion Headquarters.

D. Company officers are responsible for providing training opportunities for personnel assigned as drivers. Prior to assigning a member to drive an apparatus, the officer shall certify that the member is qualified. The driver certification (Form 200.79) will be forwarded to the Training, Safety & EMS Division. One copy shall be filed in the Station's Administrative House Policy Notebook.

Erin Janssens
Fire Chief
Portland Fire & Rescue

PREPARED BY:	Paul Komanecky
REVISION DATE:	05/10/13
EFFECTIVE DATE:	05/10/13
REVIEWED BY:	Publications Committee
REVISED BY:	Lyn Eisner

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PORTLAND FIRE & RESCUE
Portland, Oregon

October 27, 2011 GENERAL ORDER NO. 25

FREEZING WEATHER PRECAUTIONS

I. GENERAL

A. This order supersedes and rescinds General Order No. 25, dated April 25, 2009.

B. It is the purpose of this order to outline cold weather procedures for vehicles and property.

II. FIRE APPARATUS

A. Antifreeze is maintained in all apparatus the year around.

B. All pumpers parked in sub-freezing temperatures should be parked with motors idling at about 700-800 rpm, with pumps in gear, flowing water from the booster line into the tank fill opening. Circulating water in this manner through the pump and back to the tank will assist in preventing freezing from occurring in both the pump and booster hose.

C. Prior to the cold weather season, station captains will be responsible for having all apparatus tire chains checked for serviceability and fit for both first line and reserve apparatus in their station. Chains needing repair or replacement shall be reported immediately to the Auto Shop using a Work and Supply Request.

D. Company officers will be responsible for having tire chains installed on all first line and reserve apparatus whenever ice or snow conditions exist in the company's FMA. All questions should be referred through the chain of command to the on-duty Deputy Chief.

E. Jacobs engine brakes should be switched to the OFF or LOW position during this period.

F. Tire chains must be adjusted as tightly as possible using chain tighteners. Cable chains do not require tighteners.

G. When weather conditions require the use of tire chains, the speed of apparatus shall not exceed 25 miles per hour.

H. Shoe or boot chains are issued to companies for use during severe ice conditions. One pair of boot chains is issued per position on each apparatus and should be carried on the apparatus during the winter months. Boot chains are ordered through a Work and Supply Request from Clothing at Logistics.

I. Anytime a fire apparatus requires towing an Emergency Vehicle Technician shall be called to the scene to determine the type of tow required. When a delay might result in critical danger to persons or property, the officer in charge may initiate the tow through their respective Battalion Chief. This will apply irrespective of weather conditions.

J. Engines and brush units equipped with Flowmix Class A Foam Systems are reminded to open the cylinder-mounted petcock and drain any residual water from the foam tanks when the vehicles are expected to remain in sub-freezing temperatures for an extended period of time. Reference the annual Freezing Weather Precautions Memo for specific instructions.

III. CARE OF REAL PROPERTY

A. Clean all gutters and downspouts.

B. Shut off and drain all outside hose bibs.

C. Bring hoses inside.

D. Shut off water to lawn sprinkler systems and make sure they drain, if applicable.

E. Keep sidewalks and driveways free of ice and snow.

F. Call the Portland Bureau of Transportation's Dispatch Center at (503) 823-1700 if streets around a fire station (essential services) need plowing.

John Klum
Fire Chief
Portland Fire & Rescue

PREPARED BY:	Erin Janssens
REVISION DATE:	10/27/11
EFFECTIVE DATE:	10/27/11
REVIEWED BY:	Publications Committee
REVISED BY:	Lyn Eisner

A_____
B_____
C_____

PORTLAND FIRE & RESCUE
Portland, Oregon

July 13, 2006 GENERAL ORDER NO. 30

*MISCELLANEOUS LEAVES

I. GENERAL

A. This order supersedes and rescinds General Order No. 30, dated February 24, 1997.

B. This order outlines the procedures for miscellaneous leaves, as provided in the Human Resources Administrative Rules of the City of Portland, the Portland Firefighters Association (PFFA), City of Portland Professional Employees Association (COPPEA) and District Counsel of Trade Unions (DCTU) Labor Agreements.

C. Questions concerning these procedures should be directed, through channels, to the Emergency Operations Division Chief for clarification.

D. Questions concerning 40-hour members should be directed through channels to their section head or division chief.

II. FUNERAL LEAVE

A. No member employed on a temporary or seasonal basis, or as a consultant, is eligible for paid funeral leave.

B. PFFA Represented Members

1. Up to three days for 40-hour members, or one 24-hour shift for 52.08-hour members, shall be allowed off without deduction of pay by reason of the death of the member's spouse, parent, child, sister, brother, grandparent, grandchild, father-in-law, mother-in-law, sister-in-law, brother-in-law, daughter-in-law, son-in-law, grandparent-in-law, step-parent, step-child, step-sister, step-brother, or step-grandparent.

2. An additional two days for 40-hour members, or one 24-hour shift for 52.08-hour members, may be allowed off for necessary funeral travel time or, under exceptional circumstances, for any other purpose relative to a funeral. This requires the approval of their division chief, or chief's designee, for 40-hour members. The on-duty deputy chief, or if the deputy chief is absent, the member's battalion chief, must approve the extension for 52.08-hour members. This leave is not an automatic entitlement and will only be granted when extenuating circumstances can be shown.

C. COPPEA Represented Members

1. An employee absent from duty by reason of the death of his or her spouse, domestic partner, parents, children, sisters, brothers, grandparents, grandchildren, father-in-law, mother-in-law, sister-in-law, brother-in-law, daughter-in-law, son-in-law, grandparents-in-law, step-children, step-brothers, step-sisters, step-parents, step-grandchildren, step-grandparents and the equivalent relatives of the employee with a domestic partner, shall be allowed no more than three days off duty without deduction of pay on account of such absence.

2. An additional two days shall be allowed an employee for necessary funeral travel time in the event of a death in the member's immediate family. Approval for such travel time shall be made by the division head (or his/her designee).

3. Under exceptional circumstances, leave for death may be granted by the commissioner-in-charge (or his/her designee) upon the death of a person other than the employee's immediate family.

D. DCTU Represented Members

1. An employee absent from duty by reason of the death of his or her spouse, domestic partner, parents, children, sisters, brothers, grandparents, grandchildren, father-in-law, mother-in-law, sister-in-law, brother-in-law, daughter-in-law, son-in-law, grandparents-in-law, step-children, step-brothers, step-sisters, step-parents, step-grandchildren, step-grandparents and the equivalent relatives of the employee with a domestic partner, shall be allowed no more than three days off duty without deduction of pay on account of such absence.

2. An additional two days shall be allowed an employee for necessary funeral travel time in the event of a death in the member's immediate family. Approval for such travel time shall be made by the division head (or his/her designee).

3. Under exceptional circumstances, leave for death may be granted by the division head (or his/her designee) upon the death of a person other than the employee's immediate family.

   a. Four hours off with pay will be granted a member to attend a funeral ceremony for a fellow member within the same department, subject to the needs of the operation.

E. Non-Represented Members

1. Up to three days for 40-hour members, or one 24-hour shift for 52.08-hour members, shall be allowed off without deduction of pay by reason of the death of the member's spouse, parent, child, sister, brother, grandparent, grandchild, father-in-law, mother-in-law, sister-in-law, brother-in-law, or step-child.

2. An additional two days for 40-hour members, or one 24-hour shift for 52.08-hour members, may be allowed off for necessary funeral travel time upon approval of the commissioner-in-charge (or his/her designee).

III. EMERGENCY LEAVE (PFFA REPRESENTED MEMBERS ONLY)

A. Upon proper notification of the on-duty officer or immediate supervisor, members may be granted one Emergency Leave day per year by the Battalion staff captain, on-duty deputy chief or appropriate section head, through the chain of command. This day shall come off the member's following year vacation allotment.

B. Requests for Emergency Leave for a legitimate emergency shall not be arbitrarily denied.

C. An emergency is an unforeseen happening or state of affairs requiring prompt action. Examples of legitimate emergencies: broken water pipes in a member's residence, cancellation of a flight returning to Portland, or other situations beyond the member's control.

D. Emergency Leave is not intended for such reasons as: extending scheduled vacation, attending prearranged activities, taking Christmas day off, etc.

IV. EMERGENCY SICK LEAVE

A. PFFA Represented Members

1. In situations where a member's spouse, parent, child, or other person for whom the member is legal guardian becomes ill or injured, and alternate means of transporting or caring for such person cannot be arranged immediately, the member shall be permitted to use Emergency Sick Leave.

2. Members shall inform Battalion Headquarters, through channels, whether they want the Emergency Sick Leave to be charged against their current vacation or sick leave.

3. A maximum of five days for 40-hour members, or two shifts for 52.08-hour members, of Emergency Sick leave may be used per year as provided in this section. The member shall submit a Physician's Certificate from the patient's physician for any absence of three days or more within a period of five working days for 40-hour members, or more than one shift for 52.08-hour members.

B. Non-Represented Members

1. Members may use sick leave to care for an ill or injured family member who is the member's spouse, parent, child, or other person for whom the member is legal guardian.

2. A maximum of five days for 40-hour members, or two shifts for 52.08-hour members, of sick leave may be used per year. At the discretion of the

division head, the maximum may be extended when special needs are demonstrated.

V. MILITARY LEAVE

A. After six months of City service, and with proper Military Orders, a member required to report for annual military training is entitled to a paid leave of absence not to exceed fifteen days in any one "training year". As defined in ORS 408.290(3) a "training year" is "...the federal fiscal year for any particular unit of the National Guard or a reserve unit." The federal fiscal year runs from October 1 to September 30.

B. Copies of Military Orders shall be turned in to a member's immediate supervisor at the earliest possible date prior to the member's departure for training. Military Orders shall be forwarded to Battalion Headquarters or the proper timekeeper.

C. Members returning from military training earlier than the dates on the Military Orders are expected to report for their next on-duty shift.

VI. EXTENDED MILITARY LEAVE

A. Members ordered to extended active military duty shall promptly notify their immediate supervisor, who shall contact the proper timekeeper. The member shall be guided by the requirements of Sections 4.24.070 and 4.24.100 of the Code of the City of Portland.

VII. JURY DUTY

A. When members receive a notice for jury duty, they shall immediately inform their immediate superior of such notice.

B. Excuse from Jury Duty

1. If members wish to be excused from jury duty, they shall immediately proceed as follows:

a. The member shall forward the notice, through channels, to the Emergency Operations Division Chief.
b. The Emergency Operations Division Chief shall send a letter, on behalf of the member, to the Jury Commission of the Circuit Court requesting the member be excused.
c. It is the member's responsibility to find out if the letter has been accepted, and to notify Battalion Headquarters of the determination.

C. Performance of Jury Duty

1. A permanently appointed member shall be granted leave with pay and without loss of any benefits of employment to serve as a juror in response to a subpoena or similar service issued by a state or federal court.

a. The member shall turn over the fee paid for service as a juror to the City Treasurer, but may retain the travel allowance.

b. When the member is required to serve as a juror on a scheduled day off or vacation day, and such day cannot reasonably be rescheduled, the member may retain the fee paid for service as a juror on the day off or vacation day.

c. If the member is excused from service as a juror with more than two hours remaining in their normal work shift, they shall notify their immediate supervisor and be governed by their supervisor's direction to return to duty or not.

VIII. SEARCH AND RESCUE OPERATIONS

A. If a member is on duty, or is scheduled to report for duty, availability for search and rescue operations shall be determined by the fire chief.

B. A member who takes part, without pay, in a search and rescue operation at the request of any appropriate governmental agency shall receive City wages for not more than five days (40 hours of on-duty time) while engaged in such operation.

C. If an operation continues more than five days, the commissioner-in-charge may allow a member to continue to take part in the operation and receive City wages for as long as the commissioner-in-charge considers proper.

D. A member who desires to be paid by an outside agency for assistance in a search and rescue operation must be granted a leave of absence without pay from City employment.

IX. LEAVE OF ABSENCE TO ACCEPT OUTSIDE EMPLOYMENT NOT ALLOWED

A. No member shall be granted a leave of absence to engage in outside employment, except for search and rescue operations.

X. LEAVE OF ABSENCE

A. After successfully completing probation as a recruit firefighter and upon showing good cause (e.g., family emergency, extended sick leave), members may be granted a leave of absence without pay for a period agreed upon by the member and City Administration. Members must exhaust all accrued leave (current balance plus accrued) before requesting a leave of absence (this requirement does not apply to family medical leave or military leave). If members on unpaid leave receive pay for at least 80 hours during the month, the City will pay their insurance benefits for the following month. If less than 80 hours of pay is received, members must self-pay to continue their insurance coverage by contacting the Human Resources-Benefits Office.

B. Short-Term Leave of Absence (30 Days or Less)

1. Members requesting a short-term leave of absence shall submit a "Request for Leave of Absence Short Term" (PF&R Form 100.21) through channels

to the appropriate division chief. If approved, the Human Resources Section will file the original in the member's personnel file and forward a copy to Battalion Headquarters or the division supervisor. Battalion Headquarters or the division supervisor shall file a copy and forward a copy to the member requesting the leave.

C. When a member has any leave accrual that is equal to or less than 52.08, 42 or 40 hours (based on the appropriate work week), he/she shall submit a "Low Accrual Notice, Possible Need for Leave of Absence" (PF&R Form 100.22) through channels to the appropriate division chief. Form 100.22 shall be resubmitted monthly as long as accrued leave remains at, or is less than, 52.08, 42 or 40 hours.

D. Long-Term Leave of Absence (Over 30 Days)

1. Members requesting a long-term leave of absence shall submit a "Request for Leave of Absence" and "Leave of Absence Application" (PF&R Forms 100.20 and 100.19), through channels to the fire chief. If the requested leave of absence is due to sickness or injury, a statement from the attending physician shall be attached. If approved, the fire chief shall forward the original to the personnel officer for filing in the member's personnel file, and forward a copy to Battalion Headquarters or the proper division supervisor. Battalion Headquarters or the division supervisor shall file a copy and forward a copy to the member requesting the leave.

E. COPPEA, DCTU & Non-Represented (Non-Sworn) Members

1. After a personal leave of absence of longer than six months for any reason, an employee desiring to return to work must give the City ten days written notice of their intent to return. However, if a vacancy does not exist at the time such employee decides to return from a leave, the employee shall be placed on the appropriate laid-off list in accordance with their seniority.

F. PFFA & Non-Represented (Sworn) Members

1. After a long-term leave of absence of 60 days or longer, a member desiring to return to work must notify Battalion Headquarters of intent to return. Battalion Headquarters will notify the appropriate division chief or manager.

2. If a vacancy does not exist at the time such member decides to return from leave, the member shall remain on long-term leave of absence until such vacancy exists. The member may take a voluntary back-off to a lower classification that has a vacancy and return to work. When a vacancy occurs in the member's former classification, the member will be reappointed to that position.

XI. ~~FAMILY LEAVE~~

A. The City shall grant Family Leave to employees in accordance with the Federal Family and Medical Leave Act of 1993 and The Oregon Family Leave Act (ORS

659.470 through 659.494), and as designated in the City's personnel rules and/or administrative procedures. Leaves requested by eligible employees for a purpose covered by the Federal Family Medical Leave Act or the Oregon Family Leave Act shall be so designated.

B. During periods of leave covered by the Federal Family and Medical Leave Act and the Oregon Family Leave Act identified above, eligible employees shall be required to use accrued or accumulated paid leaves, including vacation and, when applicable, sick leave, prior to a period of unpaid leave of absence. The use of sick leave shall be governed by HRAR 6.05 (http://www.portlandonline.com/omf/index.cfm?a=12415&c=27799) of the City's Administrative Rules, and by the applicable collective bargaining agreements. An employee who is granted family leave under the above laws shall be entitled to utilize accrued compensatory time for that leave. Employees not otherwise covered by a collective bargaining agreement may reserve all compensatory time and whatever vacation is necessary to accumulate a total of 80 hours of combined compensatory and vacation time to be available for future use.

C. Any subsequent changes in the law or the Administrative Rules shall be incorporated into this General Order. Specific rules and/or administrative procedures are available from the Bureau of Human Resources.

D. Parental Leave

1. "Request for Parental Leave" and "Leave of Absence Application" (PF&R Forms 100.23 and 100.19) shall be submitted through channels to Battalion Headquarters 30 days in advance of the anticipated birth or adoption date.

   a. If the other parent is employed by the City of Portland, copies of PF&R Form 100.23 shall be given to both employers.

   b. The member shall adhere to the dates stated on the forms unless the member and the Battalion staff captain agree to change the dates. If a change is necessary, the member shall submit an inter-office memo (PF&R Form 200.95) stating the reason for the change and giving the revised dates. Submit the memo through channels to the Battalion staff captain within seven days after birth or taking custody of the child(ren).

E. Leave to Care for a Family Member

1. A "Leave of Absence Application" (PF&R Form 100.19) shall be submitted though channels to Battalion Headquarters 15 days in advance if the leave is anticipated. If the leave is not anticipated 15 days in advance, then an oral request, followed by a written request within three working days, is required. For confidentiality, required medical certification from the health care provider should be submitted directly to the human resource coordinator at the same time the Leave of Absence application is submitted.

F. Leave for Employee's Own Serious Health Condition

1. A "Leave of Absence Application" (PF&R Form 100.19) shall be submitted though channels to Battalion Headquarters 30 days in advance, or as soon as practicable. For confidentiality, required medical certification from the health care provider should be submitted directly to the human resource coordinator at the same time the Leave of Absence application is submitted.

XII. ABSENCE DUE TO PREGNANCY

A. Absence due to pregnancy shall be treated the same as absence due to sickness.

XIII. COMPENSATORY TIME

A. Compensatory time may be granted to members, except chief officers, in lieu of overtime pay by division heads or their designated subordinates. Notification, in writing, must be given to the timekeeper, by the granting authority, prior to recording any compensatory time.

B. Any compensatory time granted will be on the basis of 1-1/2 times the actual hours worked and may be accumulated up to a total accrual of 80 hours at any given time.

C. Any accrued compensatory time remaining at the end of the calendar year shall be paid off in cash upon request or may be carried over into the next fiscal year.

D. Members wishing to use compensatory time shall give as much notice as possible to their supervisor. A minimum of 24 hours notice shall be given unless a legitimate emergency exists.

E. Compensatory time usage will not be approved for time periods of less than 4 hours. If the balance is less than 4 hours, it may be used in one increment only.

Dave Sprando
Fire Chief
Portland Fire & Rescue

PREPARED BY:	Jim Beery
REVISION DATE:	07/13/06
EFFECTIVE DATE:	07/13/06
REVIEWED BY:	Publications Committee
REVISED BY:	Jamie Banks
REVIEW DATE:	

A_____
B_____
C_____

PORTLAND FIRE & RESCUE
Portland, Oregon

July 8, 2010 GENERAL ORDER NO. 51

SWORN PERSONNEL GROOMING

I. GENERAL

A. This order supersedes and rescinds General Order 51, dated May 30, 2008.

B. The purpose of this general order is to establish personal grooming standards for the sworn members of Portland Fire & Rescue (PF&R) that contribute to uniformity of appearance, professionalism, esprit de corps and fire fighter safety. Members shall present an image of competence, efficiency and pride in PF&R. It is critical to the operations of PF&R that members are groomed in such a way as to instill confidence in the public.

C. PF&R personnel shall maintain their appearance in a manner consistent with professionalism in the fire service and in keeping with applicable safety and accident prevention standards in the workplace. PF&R is the community's primary provider of emergency medical care. Therefore, all individuals shall be clean, neat and well groomed in consideration of the extremely close personal contact required between PF&R personnel and patients.

D. PF&R will consider, and may approve, individual adjustments to these standards on a case-by-case basis. Such adjustments may be made for a demonstrated religious or medical need. Requests shall be made through the chain of command to the Fire Chief.

II. PERSONAL GROOMING

A. Shaving

1. Male members shall be clean-shaven at the beginning of each duty day. Exceptions are allowed for approved sideburns, mustaches and facial hair below the lower lip. Beards and goatees are prohibited.

B. Sideburns

1. Sideburns shall be neatly trimmed at all times, shall not extend downward beyond the lower part of the ear lobe and shall end in a clean horizontal line. They shall not be bushy and shall not be flared more than ½ inch (not more than ½ inch wider at the bottom than their natural width at the top).

The width of the sideburn must not extend to the area of the face where a Self-Contained Breathing Apparatus (SCBA) facepiece seals. Please see Attachment #1, Figure 1 for an example.

C. Mustaches

1. Mustaches shall be neatly trimmed at all times. The hair above the mouth shall not extend below the upper border of the lip; mustache hair shall not extend more than ½ inch horizontally, or extend closer than 1/4 inch to the horizontal line of the lower jaw and shall be no more than ½ inch wide at any point. Mustaches shall not extend to the area of the face where the SCBA facepiece seals. Please see Attachment #1, Figure 2 for an example.

D. Hair below the lip

1. Hair centered immediately below the lower lip shall be neatly trimmed and shall be no larger than ½ inch by ½ inch. Hair below the lower lip shall not extend to the area of the face where the SCBA facepiece seals.
Please see Attachment #1, Figure 2 for an example.

E. Tattoos, body art, brands

1. Tattoos, body art, or brands shall not be apparent or visible when wearing PF&R work, duty or dress uniforms. This should be accomplished by selecting uniform items that obscure the tattoo/body art from view. Sworn personnel employed by PF&R at the time of issue of this general order who have existing tattoos, body art or brands of an artistic or benign nature may be exempt from the visibility restriction if the existing body marking cannot be obscured from view by issued uniform items. This does not exempt current personnel from the restrictions against prohibited types of body markings noted below.

2. Tattoos, body art or brands that may be visible to other employees at any time that are prejudicial to good order, discipline and morale, or are of a nature to bring discredit upon PF&R, are prohibited. Examples of prohibited markings are tattoos, body art, or brands that are obscene, sexually explicit, denote a violent or exclusionary group, or advocate or symbolize discrimination against any gender, race, religion, ethnicity or nationality.

F. Hair

1. In the interest of safety and to maintain a professional image, hair must be clean, neatly trimmed and well groomed at all times. To achieve this, hair shall meet the following requirements at all times during the duty day.

a. Uniformed male personnel

i. The hair on the top of the head shall be neatly groomed. The length and bulk of hair shall not be excessive or present a ragged, unkempt or extreme appearance; fullness shall be moderate and present a managed look. Hair shall be well trimmed and tapered or layered. Hair shall not be worn in fad styles such as a Mohawk, ducktail, bowl cut, mullet or spikes, or in any other way that does not meet the requirements noted in section F.1.a.

ii. When standing with head erect, an on-duty member's hair shall not extend below the top of the eyebrows in the front, and shall not fall more than one inch over the top of the ears on the sides or extend below the bottom edge of the collar of the duty uniform shirt in the back. Please see Attachment #1, Figures 1, 3 and 4 for examples.
Hair may be restrained as a matter of preference or to meet all of the length, style, grooming and other requirements noted in section F.1.a. Restraining shall be with a single ponytail, single braid, single bun, or by cornrow style braids. Please see Attachment #1, Figure 5 for example.

iii. When wearing an approved hat or cap, hair in front shall be groomed so it does not fall below the band of the headgear.

iv. Hair may be colored, frosted or tinted in a color naturally occurring in human hair. Etching or other extreme cutting is not permitted.

b. Uniformed female personnel

i. The hair on the top of the head shall be neatly groomed. The length and bulk of hair shall not be excessive or present a ragged, unkempt, or extreme appearance; fullness shall be moderate and present a managed look. Hair shall not be worn in fad styles, such as a Mohawk, ducktail, bowl cut, mullet or spikes, or in any other way that exceeds the length, style, grooming and color requirements noted in section F.1.b.

ii. When standing with head erect, an on-duty member's hair shall not extend below the top of the eyebrows in the front, and shall not extend below the bottom edge of the collar of the duty uniform shirt on the sides. While on duty, hair shall not extend below the horizontal shoulder to shoulder seam of the duty uniform shirt in the back. Although hair may extend to the shoulder to shoulder seam in the back it is required to be restrained if it extends below the bottom edge of the collar of the duty uniform. Please see Attachment #1, Figures 6, 7 and 8 for examples.

iii. Restraining of hair that is required as noted above and , hair that is restrained as a matter of preference must meet all of the length, style, grooming or other requirements noted in section F.1.b. Restraining shall be with a single ponytail, single braid,

single bun, or by cornrow style braids. Please see Attachment #1, Figures 8, 9, 10 and 11 for examples.

iv. When wearing an approved hat or cap, hair in front shall be groomed so that it does not fall below the band of the headgear.

v. Hair may be colored, frosted or tinted in a color naturally occurring in human hair. Etching or other extreme cutting is not permitted.

c. In no case shall the bulk or length of a member's hair interfere with the proper fitting of prescribed PF&R headgear (e.g., Nomex/PBI hood, helmet, SCBA facepiece).

d. During fire fighting operations hair shall be covered with the provided Nomex/PBI hood, and with the turnout coat when applicable.

e. Per the Occupational Safety and Health Administration (OSHA) Program Directive A-98 dated December 10, 1980 and revised October 21, 1993 (section A), "Employees working in proximity to moving machinery or equipment, where hair could present a hazard, shall have such hair contained within a covering such as a hat, cap, net or other similar retainer which need not be of solid construction, but of adequate size and strength to contain the hair."

f. Certain tasks we encounter throughout the duty shift require us to operate equipment in emergency and non-emergency situations, such as performing checks of apparatus and power equipment, grinding, etc. When engaged in these types of activities hair shall be restrained up or back, or kept under a PF&R approved head cover to prevent a safety risk.

G. Hairpieces and wigs

1. The wearing of a wig or hairpiece while in uniform shall be allowed for the purpose of covering natural baldness or a medical condition. If under these conditions a wig is worn, it shall be of natural appearance, not interfere with the proper performance of duty and conform to Section F "Hair" of this general order.

H. Hair Accessories

1. Hair accessories such as clips, rubber bands, pins, combs, or barrettes must be transparent or similar in color to the individual's hair color and shall be concealed as much as possible. Authorized accessories shall only be worn when needed to restrain or manage hair and at no time allowed for decorative purposes. The device used must not interfere with safe and proper use of prescribed PF&R headgear (e.g., Nomex/PBI hood, helmet,

SCBA facepiece).

I. Cosmetics

1. When worn, cosmetics shall be in good taste using conservative, natural-looking cosmetics.

III. JEWELRY

A. Insignia shall not be worn, except those issued by PF&R and intended to be worn as part of the PF&R uniform.

B. The wearing of a necklace or medallion about the neck is permitted and shall be worn under the PF&R shirt.

C. Earrings shall be limited to the style referred to as "ear post." No more than one ear post is allowed per ear and that is allowed in the ear lobe only. The decorative front of the ear post shall not exceed ¼ inch in diameter. The ear post may be silver or gold in color, or may have a clear gemstone as the decorative front. Hoop or ring shapes are not allowed. No other visible body piercing jewelry shall be worn while wearing any PF&R uniform or while on duty. This includes, but is not limited to, nose rings, tongue studs, etc.

D. Rings on fingers are permitted as long as they do not interfere with the quick donning of gloves or turnout coat. However, the wearing of rings is not recommended when responding to emergencies due to the potential for injury (e.g., electrical burns, crushing, entanglement). Rings with projections that compromise the integrity of EMS gloves are not permitted. Similarly, fingernails shall not be styled in a manner that delays the donning of gloves or compromises the integrity of EMS protective gloves. In no case shall fingernail length extend more than ¼ inch beyond the end of the fingertip. Fingernail polish, if worn, must be transparent, or similar in color to the nail or nail bed.

IV. IMPLEMENTATION

A. Personnel are to be in compliance with this general order within 30 days of the date of issue.

V. ATTACHMENTS

A. Sworn Personnel Grooming, Attachment #1

John Klum
Fire Chief
Portland Fire & Rescue

PREPARED BY:	John Klum
REVISION DATE:	07/08/10
EFFECTIVE DATE:	07/08/10
REVIEWED BY:	Publications Committee
REVISED BY:	Lyn Town

PUBLIC INFORMATION OFFICER

I. PURPOSE

A. This guideline supersedes and rescinds Operational Guideline No. 3.3, dated March 23, 2009.

B. To establish uniform guidelines for the release of information by the Portland Fire & Rescue (PF&R) Public Information Officer (PIO) and other uniformed personnel when interacting with the news media.

II. POLICY

A. It is the policy of PF&R to establish and maintain positive, open relationships with the news media. It is also the policy of PF&R to abide by all public record laws of the State of Oregon and the Health Insurance Portability and Accountability Act (HIPAA). Cooperation with the media shall be to the fullest extent possible, without compromising ongoing investigations or any individual's right to privacy.

III. PROCEDURES

A. The PIO position in the National Incident Management System (NIMS) is on the General Staff under the Incident Commander (IC). A PIO acts as liaison between the news media and the IC.

B. At an incident involving multiple jurisdictions, a Joint Information Center (JIC) may be implemented. To disseminate consistent public information requires coordination and communication among all parties that have input in the decisions made by the JIC.

C. The agency with legal responsibility to respond to the incident will maintain a lead PIO role in the JIC. If a Unified Command is initiated, the JIC leadership should mirror those agencies with responsibility for mitigation of the incident.

D. The PF&R PIO or his/her back up will maintain and monitor a media pager at all times.

E. The PIO is automatically paged by Computer-Aided Dispatch (CAD) on all greater alarms. Notification pages (e.g., death/injury of firefighters or civilians, Hazardous Materials (HAZMAT) alerting PF&R Command Staff of critical incidents are also received by the PIO. The PIO will respond when requested to do so by the IC.

F. Prior to the arrival of the PIO, Command may assign an officer to see to the needs of the media and keep them from entering the hazard zone.

G. Immediately after arriving on scene, the PIO shall report to the IC to receive a briefing on the incident. Information may also be gathered from division/group supervisors, branch directors, and chief officers if time allows.

H. Command should coordinate with the responding PIO and designate a media staging area.

I. If police are providing security for the incident, they must be notified to allow media personnel to proceed through road blocks to the media staging area.

J. The media staging area should be upwind and uphill of the incident as visuals are important to TV media. The area should allow access to Command, but not interfere with Command or incident operations.

K. Potential crime scenes may warrant limited media access. The PIO shall coordinate location with the fire investigator when assigned.

L. At the scene of a major crime, media access shall be restricted until the IC decides differently. Admittance to a crime scene on public property may also be limited if a reporter's presence would unreasonably obstruct or interfere with the investigation or jeopardize the safety of any person.

M. All media access to the hazard zone must be authorized by the IC.

N. Ensuring the safety of media personnel allowed inside the hazard zone must be a top priority.

O. Fire cause and loss figures can only be determined by a PF&R investigator or the IC.

P. At a large incident the PIO may request additional assistance. Command may fulfill this request with appointed back-up PIOs; if none are available, an officer may be given this assignment.

Q. At incidents which last for an extended period of time, group updates should be issued to the news media on a regular basis. This will eliminate one-on-one discussions with reporters and ensure uniformity and consistency in the flow and content of press releases.

R. At the conclusion of an incident, the PIO shall prepare a news release which documents the incident and provides information which may be of interest to the news media. Release of information concerning criminal actions should be coordinated with the assigned fire investigator.

S. All information released to the media shall be factual, accurate, and should not contain PF&R nomenclature. It is always proper to include in a news release any part of PF&R's mission statement or objectives which relate to a particular incident. It is also appropriate to release human interest stories, dramatic rescues made, and other items of interest.

T. As per Operational Guideline 2.3 "Patient Confidentiality Policy", in order to protect patient confidentiality and ensure consistent application of Oregon Public Records Law exemptions, only PF&R PIOs or their designees are authorized to respond to media requests for patient information (including injured firefighters). PF&R members should direct all media requests for patient information to the PIO's media pager at 505-940-6003.

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REVISION DATE:	08/12/11
EFFECTIVE DATE:	08/12/11
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APPARATUS SAFETY

I. POLICY

A. This guideline supersedes and rescinds Operational Guideline No. 4.3, dated May 12th, 2011.

B. When responding to emergency calls under Code 3 conditions Portland Fire & Rescue (PF&R) vehicles may exceed the posted speed limit, but shall be regulated at all times by existing road and traffic conditions and are not to endanger persons or property. At no time shall the posted speed limit be exceeded by 10 mph or more. Vehicles shall not exceed 55 MPH, unless at the officer's discretion under highway conditions.

C. Under wet, foggy, or other hazardous weather or road conditions, PF&R vehicle operators should react cautiously and defensively to the conditions encountered. All drivers shall observe the Basic Rule at all times. The Oregon Basic Rule states that you must drive at a speed that is reasonable and prudent at all times by considering other traffic, road and weather conditions, dangers at intersections, and any other conditions that affect safety and speed (Oregon Department of Transportation 811.100).

D. When entering intersections controlled by signal lights or stop signs, PF&R vehicles shall not proceed against a red light or stop sign before coming to a complete stop. They may proceed with due caution when it can be assured that a safe crossing may be made.

E. Avoid backing when possible. Where backing is unavoidable, guides shall be used to direct traffic and/or assist the driver in avoiding obstructions. If guides are unavailable the driver shall walk completely around the apparatus before backing.

F. All PF&R personnel shall wear seat belts when operating or riding in a City vehicle or apparatus. Members shall ride in the seats provided on fire apparatus, and shall remain seated and belted while the apparatus is moving.

1. As per ORS 811.215: Any person who is riding in an ambulance for the purpose of administering medical aid to another person in the ambulance is exempt from wearing seat belts if being secured by a seat belt or safety harness would substantially inhibit the administration of medical aid.

2. PF&R members assisting with patient care in a moving ambulance are required to wear a seat belt whether they are sitting on the bench seat or in the rear-facing seat. When members have a choice, they should select

the rear-facing seat at the head of the patient for its superior crash protection.

3. At times, movement inside an ambulance will be necessary to provide patient care. PF&R members are authorized to remove their seat belts to perform medical aid.

4. Members are encouraged to voice their concern to the paramedic driving if they are traveling at speeds that are not appropriate for the patient's condition or the driving conditions.

G. Smoking on fire apparatus is prohibited.

H. During an emergency response, fire vehicles should avoid passing other emergency vehicles. If unavoidable, the passing arrangement should be determined through radio communications.

1. The unique hazards of driving on or adjacent to the emergency scene require the driver to be alert and use extreme caution. Drivers must consider the dangers the moving vehicle poses to fireground personnel and spectators who may not be alert due to a preoccupation with the scene distractions.

II. HEARING PROTECTION

A. Hearing protection shall be worn in all high noise situations. The Occupational Safety and Health Administration (OSHA) has determined that repeated or prolonged exposure to noise levels greater than 90 decibels may be harmful to the hearing. A variety of equipment used by PF&R, such as diesel engines, air horns, sirens, etc., will produce noise levels in excess of this limit.

B. To protect personnel from unnecessary hearing damage, PF&R has issued hearing protection equipment for all personnel positions. Members shall wear the protection devices provided in all situations in which a noise level of 90 decibels or greater is suspected. Firecom® headsets serve this purpose when on the apparatus.

III. STANDARD SIGNALS FOR TILLER OPERATION

A. It is the officer's duty to see that the crew is ready before directing the driver to proceed. All members of the crew shall operate as a team with the driver, being alert for clearance from obstructions and pedestrians.

B. Verbal communications via the headsets shall be used whenever possible. At no time will the driver move a tillered apparatus without a clear signal from the tiller operator indicating that he/she is ready.

C. In the event verbal communication between the tiller operator and the driver is not possible, it is the tiller operator's responsibility to signal the driver when ready to proceed. The following signals may be used:

1. 1 buzz = stop

2. 2 buzzes = go

3. 3 buzzes = back up

IV. BACKING OF APPARATUS

A. Avoid backing whenever possible. When backing is unavoidable, guides shall be used to direct traffic and to assist the driver in avoiding accidents. One guide shall be positioned at the rear of the apparatus, visible at all times in the driver's side mirror. A second guide shall be positioned at the front corner of the apparatus, officer's side. The front spotter shall watch the front and the officer's side of the apparatus. There may be rare exceptions when the guide at the rear will have to use the passenger side mirror. Guides shall monitor all four sides of the apparatus at all times. Apparatus mounted cameras (on apparatus so equipped) shall never substitute for guides.

B. Guides will wear protective equipment appropriate for the situation. In hazardous areas, heavy traffic, or in low light situations a helmet and either the turnout coat with reflective striping or traffic safety vest shall be worn.

V. STANDARD HAND SIGNALS FOR BACKING

A. Straight back: One hand above the head with palm toward your face waving back. The other hand should be at your side. See Attachment #1, figure 1.

B. Turn: Both arms pointing in the same direction with the index fingers extended. See Attachment #1, figure 2. The driver has the option as to which way to turn the apparatus, and the guide then assists the driver in backing.

C. Stop: Both arms above the head with open hands. See Attachment #1, figure 3.

D. Backing at night: Signals will be the same. The guide shall ensure that the spotlights on the rear of the apparatus are turned on before the apparatus is backed. The guide should not use confusing hand signals. A flashlight shall be carried, but at no time shall it be directed toward the mirrors or used as a signaling device. See Attachment #1, figures 4-7.

VI. USING SPOTTERS TO ASSIST AERIAL LADDER PLACEMENT

A. To assist aerial ladder operators with the correct and safe placement of the aerial ladder, the use of one or more ground spotters is recommended. The aerial operator should clearly communicate the objective with the spotter(s) prior to

raising the ladder. Spotters should assist the aerial operator in identifying potential hazards such as overhead wires, tree limbs etc. Proper scene lighting should be used in low light situations. Truck companies should practice and become proficient using these signals. Spotters shall use the standard hand signals as follows:

1. Raise aerial: Arm straight out, and thumb pointing up.

2. Lower aerial: Arm straight out, and thumb pointing down.

3. Extend aerial: Both arms at the side of your body, elbows bent at a 90° angle with thumbs pointing away from each other.

4. Retract aerial: Both arms at the side of your body, elbows bent at a 90° angle with thumbs pointing toward each other.

5. Rotate aerial platform: One arm straight out to the side, either left or right, with index finger extended.

6. Stop: Arm extended away from the body, hand in a fist.

VII. ATTACHMENT

A. Attachment #1 - Standard Hand Signals for Backing

B. Attachment #2 – Standard Hand Signals for Aerial Ladder Spotting

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RESPIRATORY PROTECTION EQUIPMENT

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INTRODUCTION

Every Portland Fire & Rescue (PF&R) member who may be required to wear a respirator shall be fit tested in accordance with accepted OSHA protocols. These testing guidelines can be found in Part 4 of PF&R's Respiratory Protection Program document available at PF&R's Training, Safety & EMS Division.

Each individual is responsible for donning the proper level of respiratory protective equipment as required in this guideline and in Operational Guideline (OG) #4.1 "Use of Respiratory Protective Equipment." Removal of respiratory equipment shall be in accordance with OG #4.1 and OG #4.8 "Air Monitoring."

It is nearly impossible for firefighters to determine all the hazardous gases that might be present at each fire. Protection against respiratory hazards can be achieved only if firefighters use Self-Contained Breathing Apparatus (SCBA) every time they are unsure of the toxicity of the air. Even though adequate oxygen may be present, firefighters must use a SCBA in circumstances in which the supply of oxygen may become inadequate, or when there is a possibility that the atmosphere might become toxic.

Important:
All members must be aware of the following information relating to cylinder service time ratings and air reserve at low air alarm activation.

Actual Cylinder Times: SCBAs that are certified by National Institute of Occupational Safety and Health (NIOSH) have a rated service time based on laboratory tests required by NIOSH. The SCBA is tested using a specified breathing machine with a breathing rate of 40 L/minute. NIOSH uses this 40 L/minute rate because it represents a moderate work rate that the average user can sustain for a period of time. (This rate is based on miners' work performance.) Because firefighters' work performance often results in ventilation rates exceeding the 40 L/minute used by NIOSH, the National Fire Protection Association (NFPA) has chosen to use a more representative rate of 100 L/minute for their certification. What this means in a practical sense is that cylinders identified as 45 minute and 60 minute will on average supply firefighters approximately 22 minutes and 30 minutes of air, respectively.

Low Air Alarm: The above factor affects the minutes of air left in one's cylinder upon activation of the low air alarm. The End of Service Time Indicator (EOSTI), or low air alarm, should activate at approximately 25% of the rated cylinder pressure. With a 45-minute cylinder, it might lead one to falsely anticipate that upon activation of the EOSTI one would have roughly 11 minutes of air remaining. Be aware that because of the different ventilation rates mentioned above, the national average after activation of the EOSTI is 2.5 to 3 minutes of air. This means that firefighters must closely monitor their air pressure level and air consumption rate and not rely on the EOSTI to indicate when to exit to fresh air.

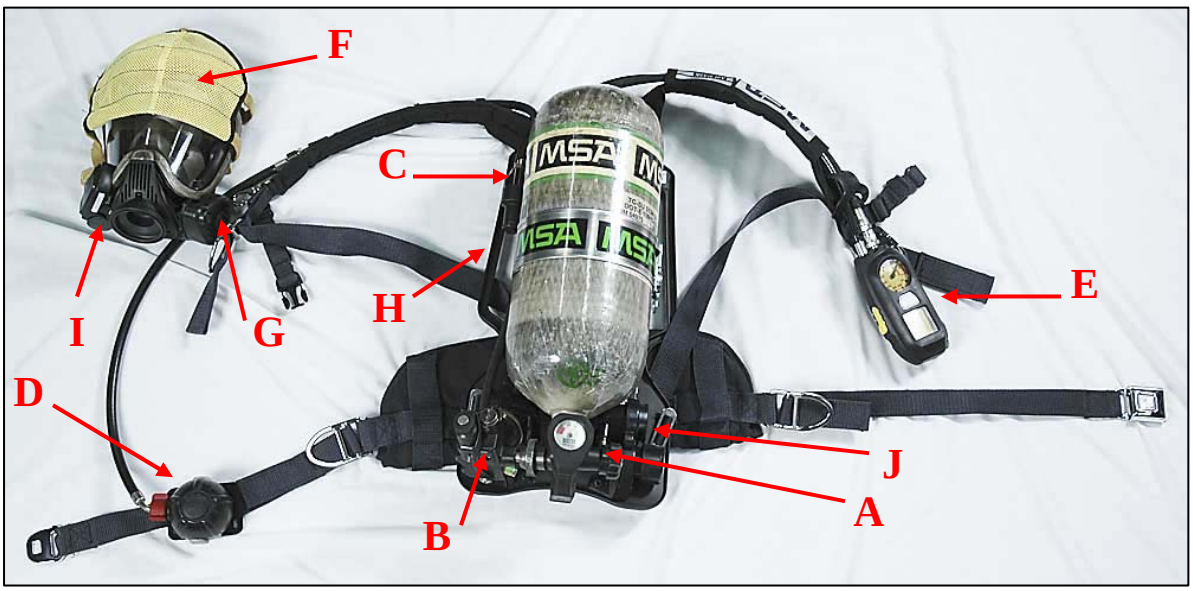
The FireHawk M7 SCBA is Chemical, Biological, Radiological and Nuclear (CBRN) certified. The respirator should not be used beyond 6 hours after initial exposure to chemical warfare agents to avoid possibility of agent permeation.

Important: SCBAs shall be worn 45 minutes after extinguishment, anytime carbon monoxide levels are 35 ppm or greater, or oxygen levels are 19.5% or less, and anytime an atmosphere is unknown, hazardous, is suspected of being hazardous, or has the potential of rapidly becoming hazardous. This includes, but is not limited to, structure fires, overhaul, vehicle fires and dumpster fires. SCBAs shall be worn anytime the gas monitor goes into alarm.

I. PARTS OF THE MSA M7 FIREHAWK PRESSURE DEMAND SCBA

The photo (below) is of the MSA M7 FireHawk Pressure Demand SCBA. It is termed pressure demand because of the constant pressure within the facepiece at all times.

The parts of the MSA M7 FireHawk SCBA are as follows:



(A) Cylinder and Valve Assembly
(B) Audi-Larm, RIT/UAC Assembly
(C) First Stage Regulator
(D) Second Stage Regulator Mask Mounted Regulator (MMR)Assembly
(E) M7 FireHawk Control Module
(F) Ultra Elite Facepiece
(G) Clear Command
(H) Carrier and Harness Assembly
(I) FireHawk M7 Heads-Up-Display (HUD)
(J) FireHawk M7 Power Module / PASS Device

A. Cylinder and Valve Assembly

1. The cylinder is a composite cylinder, which consists of a seamless aluminum liner fully wound with high-strength carbon fibers impregnated with epoxy resin. The cylinder has a 2-inch wide luminescent band to enhance visibility. Department of Transportation (DOT) regulations require that carbon composite cylinders be hydrostatically tested every

five years; cylinders must be retired from service after the 15th year. A set of numbers located on the shoulder of the cylinder indicate when the cylinder was hydro tested. The circled numbers indicate the month and the non-circled numbers indicate the year. The numbers and circle are color coded by year. They are painted in red, green or black for quick reference. This will tell you at a glance when a cylinder needs to be returned to Logistics for testing.

Cylinder sizes and capacities:

Stealth H-45	66 cubic ft	1800 liter	10 lbs-9oz empty
Stealth H-60	88 cubic ft	2400 liter	12 lbs-9oz empty

Note: 45 cubic ft. of air weighs approximately 4.5 lbs.

2. The cylinder assembly consists of the cylinder valve with safety valve (burst disk) and cylinder pressure gauge with hand wheel. The cylinder valve is anodized to provide durability and corrosion resistance. The safety valve (burst disk) is a thin metal disc that will rupture at approximately 7500 psig.

Safety Valve

Cylinder Valve

a. The analog cylinder pressure gauge indicates the pressure contained in the cylinder at all times. It has a glow-in-the-dark dial. The gauge is calibrated in 1000 psig increments. The rubber guard protects the pressure gauge from damage.

b. The hand wheel is at a right angle to the cylinder pressure gauge. The hand wheel is used to open and close the cylinder valve.

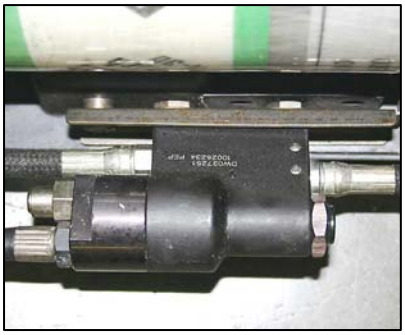
B. Audi-Larm, Rapid Intervention Team / Universal Air Connection (RIT/UAC) Assembly

1. The Audi-Larm is an air-actuated, self-cocking, audible warning bell that automatically operates when the cylinder pressure reaches approximately 25% of the rated service life. The alarm should activate between 1200 psig and 1050 psig and continue to ring until the pressure has dropped to approximately 200 psig or less. At approximately 200 psig there is no longer enough air pressure to activate the bell. ***<u>The Audi-Larm is the only alarm to sound in low cylinder pressure.</u>***

2. The RIT/UAC fitting is located on the Audi-Larm body. It is a male quick-fill inlet used by the RIT for emergency filling of cylinders. It allows for the rapid trans-filling of air from a rescue air supply to a trapped or downed fire fighter. This RIT/UAC is located within four inches of the outside edge of the cylinder valve outlet on all SCBAs that are NFPA 1981, 2007 compliant. For more information on RIT, refer to OG 5.3A. Trans-filling of air shall only be done in a rescue situation.

C. First and Second Stage Regulator Assemblies

1. The first stage regulator reduces the pressure from the cylinder and valve assembly to an intermediate pressure which is in turn further reduced by the second stage regulator. It keeps the pressure to the second stage regulator (MMR) at approximately 80 psig throughout the entire operating pressure range of the cylinder. It also allows direct cylinder pressure to flow unrestricted to the Control Module. There is a pressure relief valve located on top of the first stage regulator that will activate at approximately 125 psig, protecting the low-pressure side of the system from over-pressurization.



2. The second stage regulator (MMR) is a pressure-demand type, which keeps a positive pressure in the facepiece at all times. Inhale sharply to start the airflow. Depressing the gray buttons on the second stage regulator stops the flow of air and releases the regulator from the holster and facepiece. The second stage regulator inserts into the facepiece . When not activated, the second stage regulator may be carried in the holster or attached to the facepiece.

D. FireHawk M7 Control Module

1. The FireHawk M7 Control Module is attached to the gauge line hose and is connected to the FireHawk M7 Power Module by a power cable. The Control Module interfaces with the facepiece and also serves as the

wireless transmitter for the HUD.

2. The Control Module has three control buttons: yellow, white and green.

   a. The yellow RESET/OFF button is located on the side of the unit. Pressing this button 2 times within approximately 1 second resets the PASS device from the full alarm mode, and will also turn the unit off after the system has been drained of all air.

   b. The white ALARM button which flashes green or red activates the full PASS alarm mode when pressed and held for 3 seconds, with or without air pressure.

   c. The green MODE button located on top of the unit will:
      - When pressed once, refresh the display in the HUD when display is in sleep mode.
      - When pressed once, also will activate the backlight on the Control Module display.
      - When pressed twice, will cause the Control Module to toggle between digital display mode, pressure remaining and calculated service time remaining. The time remaining display is based on the calculation of your average breathing rate over the previous three minutes and is updated every thirty seconds. An increase in your breathing rate after checking the display will result in less time remaining than anticipated.
      - When pressed and held for approximately three seconds, will toggle the HUD between continuous display mode and intermittent mode.

   d. The Control Module uses Red and Green Light-Emitting Diodes (LED) to display its status visually on the Control Module itself as well as the "Buddy" lights on the rear of the Power Module:

      1. The LEDs momentarily flash Red then Green when the cylinder valve is opened, indicating that the device is operational and in the sensor mode. The Red LEDs flash when the low air alarm has been activated. In this mode, the digital gauge illuminates. In addition, the Red LED will flash after the manual panic button is pressed when the Control Module is set to the sensor mode.

      2. The Red LEDs flash slowly when the device is in pre-alarm, indicating lack of motion for 18 seconds. If lack of motion occurs for an additional 12 seconds, the PASS will go into full alarm and the Red LEDs will flash more rapidly. In this mode the digital gauge lights will NOT flash unless the low air alarm is activated.

e. The Control Module is turned on automatically when the user opens the SCBA cylinder valve, and manually by pressing the white ALARM button on the front of the unit. After the first three minutes of activation, the device will start to measure and calculate your air consumption rate. After this initial calculation, the service time remaining function is updated every 30 seconds. The Power Module meets the NFPA requirement of providing at least 1 hour of service in full alarm when the low battery indicator has activated.

f. When the battery in the Power Module has discharged to 25% or less of full charge, the unit will beep once every 5 seconds and the unit's battery level indicator will display an "empty battery" icon. Replace the battery when the battery icon indicates empty. In addition, the battery shall be changed at Daylight Savings Time and Pacific Standard Time changes.

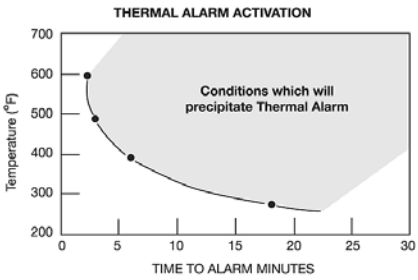
g. The Control Module has a number of features:

1. Integrated thermal sensor

2. Analog and digital information / pressure gauges

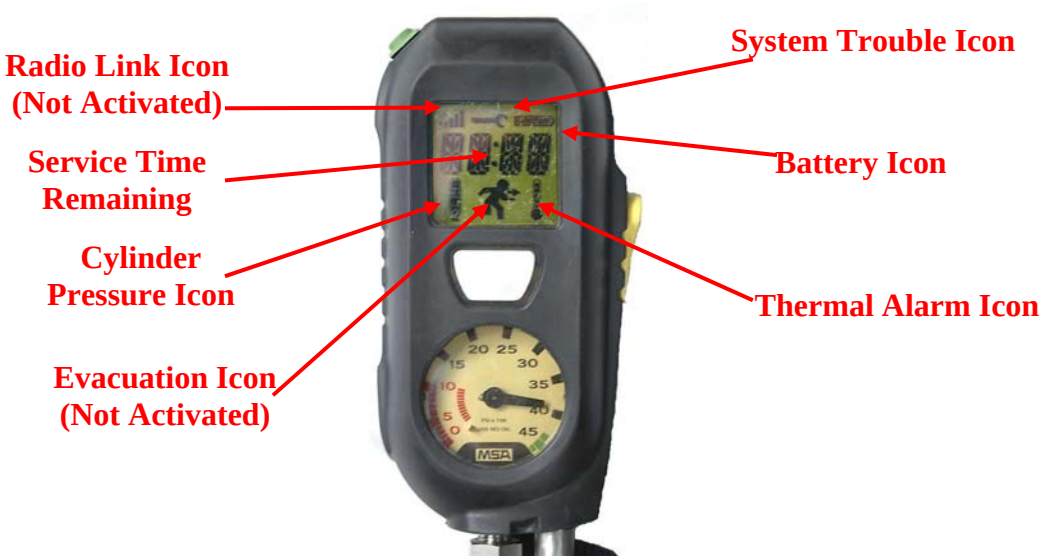
3. Downloadable personal usage information

3. The Control Module will identify when the user is motionless and in possible need of assistance. If the user is motionless for approximately 18 seconds, the PASS will go into pre-alarm. During pre-alarm, the device sounds 3 progressively louder tones and the red LED and buddy lights will slowly flash. Movement of the unit at this time will cancel the pre-alarm and will reset the unit to the sensor mode. If the user remains motionless for an additional 12 seconds (approx.) after the pre-alarm has activated, the PASS will go into full alarm. During full alarm, the PASS repeatedly sounds a 101-decibel alarm of two high-volume tones followed by a buzz, and the red LED and buddy lights will flash rapidly. During full alarm, movement alone will not reset the unit. You must press the yellow RESET/OFF button on the side of the unit twice within approximately 1 second to reset the device from the full alarm mode to the sensor mode. Pressing the yellow RESET/OFF button twice within approximately 1 second will also shut the unit off when the system is not pressurized. **<u>If in an IDLH and pressing the RESET/OFF button does not silence the PASS alarm, immediately exit the IDLH and notify Command.</u>**



4. Audible thermal alarm: If the Control Module is exposed to more than the preset limit of

time/temperature, the unit will beep every 3 seconds and the thermal alarm icon will flash on the display. The alarm will self- cancel after exposure to cooler temperatures.



Important: Whenever the thermal alarm activates, the wearer must exit the Immediately Dangerous to Life or Health (IDLH) atmosphere.

Note: To hear the various alarm sounds produced by the PASS Device, go to the following website:
\\Pfbadmin\Training\Video_photos\SCBA_PASS_sounds2005\pass_sounds_05.html

5. Analog and digital pressure / information gauges - The Control Module gives a digital display showing service time remaining. It also digitally displays service time remaining (in minutes) until low-air alarm based on your current breathing rate after at least three minutes of use. The digital panel uses two icons to show cylinder and battery levels. The SCBA will complete a self-diagnosis when the system is initially charged. If a problem is detected during this self-diagnosis, the "System Trouble" icon will remain on. Also, the word "ERROR" may appear on the digital gauge. In either case, the SCBA should be taken out of service, tagged and sent to Logistics. The analog gauge displays remaining pressure as psig x 100.

6. The downloadable user information feature stores up to 30 hours of usage data. A use session is recorded each time the SCBA is pressurized, which indicates the day, time, cylinder pressure, air consumption rate and the time of alarm activations (thermal, PASS and low pressure warning). Even if the SCBA is pressurized for a routine inspection, the unit will log a user session indicating the time, cylinder pressure and duration of the inspection. Only the most recent 30 hours of user information can be downloaded.

E. Facepiece

1. The Ultra Elite facepiece consists of a single panoramic lens, SpeeD-ON head harness, speaking diaphragm, nose cup assembly with one-way valves, inhalation valve and a spring-loaded exhalation valve. The inhalation valve (spider valve) shall not be removed by anyone except a trained SCBA technician. If the spider valve has accidentally been removed from the facepiece, remove the facepiece from service, tag and send to Logistics for re-assembly.

2. The facepiece head harness consists of head webbing with adjustable straps. They are made of Kevlar, which is a flame and heat resistant material. The head harness should be carried in the fully released position. Inverting the head harness over the lens will help protect it from scratches. The nose cup, with two one-way valves, reduces fogging and carbon dioxide buildup. The facepiece is clipped onto the shoulder strap when not in use.

3. Anytime a fire helmet shows signs of exposure to excessive heat (i.e., melted helmet visor, nametag, reflective stickers, distorted helmet shield) the facepiece shall be immediately taken out of service, tagged stating it was possibly exposed to excessive heat, and sent to Logistics to be evaluated for damage.

F. Clear Command

1. The Clear Command is a communication enhancer for both face-to-face and radio communications. It consists of three primary parts: the internal microphone assembly, mounting bracket and voice amplifier. The internal microphone is located within the SCBA facepiece atop the speaking diaphragm and is hard wired to the bus-bar mounting system. To turn the Clear Command on press the button on the side of the unit. The red LED on top of the voice amplifier illuminates indicating the unit is on. A flashing red LED indicates that the batteries are low and there is approximately one hour of user time remaining.

2. In continuous service, the life span of the batteries is approximately 14 hours. Replace batteries with two AAA alkaline. In addition, the batteries shall be changed at Daylight Savings Time and Pacific Standard Time changes. Remember to date all new batteries before installing them. Although water resistant, the Clear Command must be removed from the facepiece before submersing in water for disinfecting.

G. The FireHawk M7 Heads Up Display (HUD)

1. The FireHawk M7 HUD allows the user to determine cylinder pressure while wearing the facepiece. The HUD wirelessly receives a signal from the Control Module when the HUD comes within 15-18 inches of the

Control Module. The HUD displays cylinder pressure in one quarter increments, using an LED pattern.

a. As each quarter cylinder pressure has been reached, a unique LED pattern will be displayed for approximately 20 seconds (30 seconds when one half cylinder capacity is reached). The display can be refreshed by pressing the green mode button on the Control Module one time. Refer to Attachment #2 for a description of LED patterns.

b. The HUD has a photo sensor that automatically adjusts the brightness of the LEDs based on the intensity of the ambient light measured outside the facepiece.

H. The Vulcan Carrier and Harness

1. The carrier consists of the backplate and cylinder band. The cylinder band is an adjustable stainless steel band used to hold the cylinder to the back plate. It can adjust to accommodate both the 1800 liter (H-45, 66 cubic ft) and 2400 liter (H-60, 88 cubic ft) cylinders. The cylinder band has a latch to hold the cylinder in place.

2. The harness consists of shoulder pads, chest strap and waist belt. There are two Nomex shoulder pads; each having a Kevlar strap reinforcement that provides additional strength should the Nomex fibers become weak. The shoulder straps have reflective markings and anti-rotation style buckles. The adjustable chest strap is made of Kevlar. It is intended to allow the user a greater range of arm movement by reducing the tightness of the shoulder straps. The waist belt is a Kevlar double-pull adjustable seat-belt-type assembly. The harness should be stowed with all adjustable straps fully extended.

I. SCBA Maintenance: Disinfecting / Cleaning

1. Disinfecting the Facepiece, HUD and Clear Command

a. Good sanitary / disinfecting practices are important, especially when more than one person must use a facepiece.

b. Remove the Clear Command and HUD (if dirty, wipe down with a damp sponge).

c. Place a piece of medical tape over the internal microphone to prevent excessive water contacting microphone

d. Prepare a disinfectant solution in a clean bucket, mixing one (1) ounce of disinfectant with one (1) gallon of water.

e. Rinse the facepiece inside and out in a bucket containing warm water, not to exceed 120 degrees F. Shake off the excess water.

f. Immerse the facepiece in the disinfectant solution. Agitate sufficiently to ensure full contact with all surfaces. Thoroughly clean the exhalation valve by pressing in on the stem with a blunt object, flushing solution through the valve.

g. Several facepieces may be disinfected in the same solution.

h. Rinse the facepiece and components in clean, warm water.

i. Operate the exhalation valve by pressing in on the stem with a blunt object.

j. Towel dry. Do not dry the parts by placing them near a heater or in direct sunlight. The rubber will deteriorate.

k. Replace the Clear Command and HUD. To eliminate damage, ensure the HUD is properly seated onto the facepiece allowing the thumbscrew to screw straight in (See Below).

Properly Installed

Improperly Installed

Aligned Screw

Mis-aligned Screw

2. Cleaning the Harness

a. A soiled harness can lead to deterioration and may reduce the serviceable life of the equipment.

b. First wipe off all surface dirt with a sponge dampened with water. Rinse sponge and squeeze dry.

c. Next work up a thick lather with mild soap or commercial detergent. Thoroughly wash the harness with the lathered sponge, being careful to use the lather only.

d. Wipe dry with a clean cloth. Let the harness air-dry.

J. Cleaning the Cylinder

1. Wipe down dirty cylinders with a damp sponge.

K. Cleaning the First and Second Stage Regulators, Audi-Larm Assembly and Hoses.

1. Clean all components with a damp sponge when necessary.

L. Cleaning the Control Module

1. Clean with a damp sponge.

Important: During a cold weather cylinder change, visually check the Audi-Larm for signs of freezing (frost or ice). If freezing is present, take the SCBA out of service and replace it with another unit. If a member from the Air Unit performs a cylinder replacement on a member wearing their SCBA, the air unit member will do this visual inspection. They will then charge the system and verify the cocking of the Audi-Larm. If the unit does not activate properly, remove the SCBA from service, tag, and send to Logistics.

M. Cylinder Change

1. Two types of situations exist in which a firefighter needs to change a cylinder:

a. On scene cylinder change:

1. Close the cylinder valve.

2. Drain air from the system.

3. Loosen the cylinder band.

4. Disconnect the hand-tight cylinder nut from the cylinder valve stem.

5. Remove the discharged cylinder.

6. Place a charged cylinder in the holder and position it with the cylinder gauge facing away from the backpack and the valve stem facing to the left.

7. Before latching the cylinder into place, check to see that the O-ring is properly positioned inside the coupling nut. Replace the O-ring if it is damaged (checked, split or distorted), missing, or the wrong color.

8. Connect the hand-tight coupling nut to the cylinder valve stem first.

9. Then secure the cylinder in place by tightening the latch wing on the cylinder.

10. Flip the latch wing over.

11. Place one hand on the backpack and grasp the cylinder valve with the other. Try to lift the cylinder and valve assembly away from the carrier to make sure the cylinder is secure.

12. Fully open the cylinder valve, making sure the AUDI-LARM and the CONTROL MODULE activate.

IMPORTANT:

- *NEVER carry a cylinder by the handwheel.*
- *Handle a cylinder by cradling the cylinder body or grasping the gauge guard.*
- *Avoid dropping a cylinder or bumping the handwheel.*

b. Maintenance cylinder change

1. This is a change during basic maintenance, usually performed at the station house or in a non-emergency situation. The procedure is the same as that described above except that the SCBA shall be tested as outlined in Attachment #1.

Note: Before attempting to change a cylinder, verify that no pressure is remaining in the system.

N. Donning the SCBA

1. The SCBA may be donned either when seated and seat-belted in the apparatus or using the overcoat method. The over-the-head method is not recommended due to the swing of the Control Module and waist belts.

2. The following sequence is recommended for securing the SCBA to the body:

   a. While slightly bending forward, fasten the chest strap first.
   b. Next, fasten the waist buckle and snug the waist belts up. Pulling on the right waist belts initially will position the MMR belt holster in a more ergonomic location for access.
   c. Finally, snug the shoulder straps up.

When donned correctly, the majority of the weight of the system will be borne on the hips rather than the shoulders.

O. Publications that provide further information on SCBA requirements and use:

1. National Fire Protection Association (NFPA) Standard 1981, 1404 and 1500

2. Occupational Safety and Health Association (OSHA) Standard CFR 1910.134

V. COMFO CLASSIC CARTRIDGE RESPIRATOR PROCEDURES

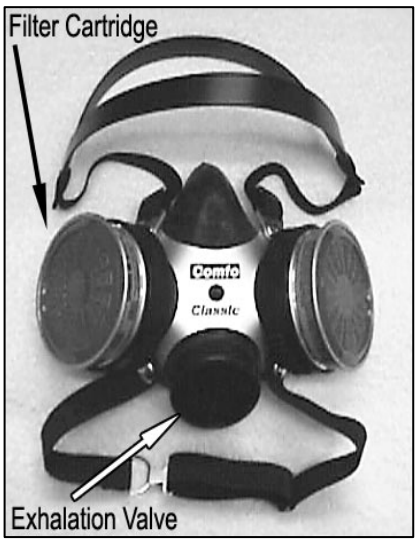
SCBAs shall be used until a non-IDLH condition has been verified in accordance with our Air Monitoring Guidelines (OG #4.8). Air purifying respirators or high filtration masks may be authorized for use by the Incident Commander, Incident Safety Officer or a qualified PF&R authority, provided that contaminant levels are within the PF&R air monitoring guideline.

Important:
The Comfo Classic Cartridge Respirator is an Air Purifying Respirator (APR) and shall be used for particulate protection only. The Comfo Classic will not provide any protection from gases or chemicals and is not intended for this use. SCBAs shall be worn 45 minutes after extinguishment, anytime carbon monoxide levels are 35 ppm or greater, or oxygen levels are 19.5% or less, and anytime an atmosphere is unknown, hazardous, suspected of being hazardous or may rapidly become hazardous. This includes, but is not limited to: structure fires, overhaul, vehicle fires and dumpster fires. SCBAs shall be worn anytime the gas monitor goes into alarm.

Guidelines for Use

1. Remember that the Comfo Classic filtration mask provides particulate protection only. During the overhaul stage of fire fighting operations, various gases in unknown quantities may be present. Your SCBA is the only sure respiratory protection in such conditions.

2. The Comfo Classic or N95 high filtration masks may be worn anytime particulate matter is present in the atmosphere, providing toxic gases are not a concern.



3. The Comfo Classic or N95 high filtration mask shall be worn anytime the Incident Commander or Safety Officer deems it necessary.

4. Leave the area immediately and don SCBAs if your breathing becomes difficult, dizziness or other distress occurs, you taste or smell contaminant, or you experience eye, nose or throat irritation.

5. Additionally, all employees at risk to exposure to airborne pathogens shall be issued a NIOSH approved N95 high filtration mask. In compliance with OSHA and Centers for Disease Control prevention recommendations, this N95 mask shall be used in all cases in accordance with PF&R's "Exposure Control Plan."

B. Maintenance and Safety Procedures

1. Check for seal before using.

   a. Check the inhalation seal by covering the filter with the palm of your hand and inhaling gently. The mask should collapse against your face.

   b. Check the exhalation seal by covering the exhalation valve with the palm of your hand and blowing gently. The mask should billow out from the increased pressure inside the facepiece and no air should leak out.

2. Clean after every use

   a. Remove cartridges

   b. Mix 1 ounce disinfectant with 1 gallon of warm water

   c. Clean

   d. Rinse

   e. Dry

3. Check condition of cartridge filter mask

   a. Check the mask after each use for damage or material deterioration.

b. Look for cracks, breaks or tears in the facepiece or headband.

c. Check inhalation and exhalation valves for dirt hidden around the seat and disc.

4. Cartridge replacement

a. These cartridges are not single use filters. Cartridges shall be replaced when the user finds it hard to draw air through the filters, detects any odor or taste, or experiences nose or throat irritation.

5. Extra cartridges

a. Extra cartridges shall be carried on each apparatus and on Battalion Chiefs' apparatus.

b. For replacement supply or repair, call Logistics.

6. Storage

a. Place the mask in appropriate container (plastic or cloth mask bags, etc.) for protection.

b. Place all filter cartridges in plastic Ziploc bags to protect them from moisture (make sure bags have no holes).

VI. 3M™ 9210 N95 HIGH FILTRATION PARTICULATE MASK PROCEDURES

SCBAs shall be used until a non-IDLH condition has been verified in accordance with our Air Monitoring Guidelines (OG #4.8). Air purifying respirators or high filtration masks may be authorized for use by the Incident Commander, Incident Safety Officer or a qualified PF&R authority, provided that contaminant levels are within the PF&R air monitoring guidelines.

Important:
The N-95 high filtration mask shall be used for particulate protection only.
The N-95 high filtration mask will not provide any protection from gases or chemicals, and is not intended for this use. SCBAs shall be worn 45 minutes after extinguishment, anytime carbon monoxide levels are 35 ppm or greater, or oxygen levels are 19.5% or less, and anytime an atmosphere is unknown, hazardous, suspected of being hazardous or may rapidly become hazardous. This includes, but is not limited to: structure fires, overhaul, vehicle fires and dumpster fires. SCBAs shall be worn anytime the gas monitor goes into alarm.

A. Guidelines for Use

1. Remember that the 3M 9210 N95 high filtration mask provides particulate protection only. During the overhaul stage of fire fighting operations,

various gases in unknown quantities may be present. Your SCBA is the only sure respiratory protection in such conditions.

2. The Comfo Classic cartridge respirator or N95 high filtration mask shall be worn anytime particulate matter is present in the atmosphere. This includes, but is not limited to, carbon particles from burned materials and airborne insulation.

3. The Comfo Classic cartridge respirator or N95 high filtration mask shall be worn anytime the Incident Commander or Safety Officer deems necessary.

4. Leave the area immediately and don SCBAs if your breathing becomes difficult, dizziness or other distress occurs, you taste or smell contaminant, or you experience eye, nose or throat irritation.

B. Procedures for Maintenance and Safety

1. Masks are disposable and single use

2. Keep in sealed packaging until use.

3. Donning information for the N95 high filtration mask is located on the carton, insert and mask packaging.

VII. POWERED AIR PURIFYING RESPIRATORS (PAPRS)

A. The following information outlines operational procedures for the use and maintenance of Powered Air Purifying Respirators as well as safety considerations for their use.

B. Guidelines for the Use at a Potential Chemical, Biological, Radiological and Nuclear (CBRN) Event:

1. PF&R companies are issued one PAPR per position (see Attachment #1). At the discretion of the station captain, these PAPRs may be carried on the apparatus at all times. At a minimum, companies shall place the PAPRs on the apparatus anytime the Terrorist Threat Level is elevated to Orange (high risk or terrorist attack) or Red (severe risk of terrorist attack).

C. Not for use in atmospheres containing less than 19.5 percent oxygen.

D. Not for use in atmospheres containing carbon monoxide levels greater than 35 ppm.

E. Not for use in Lower Explosive Limit (LEL) environments due to the unit containing electrical parts that may cause an ignition in flammable or explosive atmospheres.

F. This respirator provides respiratory protection against inhalation of radiological and nuclear dust particles.

G. Procedures for monitoring radiation exposure must be followed and appropriate Personal Protective Equipment (PPE) must be worn.

H. If during use, an unexpected hazard is encountered (e.g., a secondary CBRN device, pockets of entrapped gases) immediately leave the area for clean air.

I. The respirator should not be used beyond eight hours after initial exposure to chemical warfare agents to avoid the possibility of agent permeation. If there is a liquid exposure, the respirator should not be used beyond two hours.

J. During use of the PAPR, the atmosphere must be monitored for the level of contamination. An exit plan must be provided in the event the contamination level increases IDLH levels.

K. After four hours of use, the user must leave the contaminated area, decontaminate if required, and check the airflow with the airflow indicator when using the single use battery. Thereafter, air flow must be checked, every two hours of use.

L. Deployment at a CBRN Event

1. Prior to deployment of PAPRs, a reconnaissance team will enter the warm zone to determine the presence of CBRN contaminants. This team will be in Level C PPE with SCBA. Monitoring equipment will include:

   a. The TBM 3S radiological monitor to determine the presence of radiological material and alpha, beta and gamma radiation. This monitor will be used to delineate the edge of the warm zone at 10 mR. The TBM 3S will not be used in the warm zone.

   b. A Canberra dosimeter attached to each member to detect gamma exposure.

   c. The M40 gas monitor to monitor for oxygen deficient atmospheres, carbon monoxide levels, and flammable/explosive environments.

   d. Nerve agents and hazardous materials warning cards (attached to the M40 gas monitor).

2. Once oxygen and carbon monoxide levels and LELs have been determined to be within acceptable levels, the Incident Commander (IC)

may downgrade to PAPRs. Air monitoring must continue throughout the hazard zone while PAPRs are being utilized.

M. Guidelines for Use at Non-CBRN Events

1. PAPRs may be used at non-CBRN events. These events may include extended Urban Search and Rescue (USAR) deployments where protection from particulates in the air is needed. An epidemic such as influenza or avian flu may warrant such use. Care must be taken to utilize the proper filter cartridge. The N95 cartridge is appropriate for all incidents outside of a CBRN response. In place of the complete PAPR, use of the system without the power unit is an option. The cartridge can be attached directly to the facepiece and utilized as an Air Purifying Respirator (APR), used anytime it is appropriate to don the Comfo Classic APR.

2. The PAPR high filtration mask provides particulate protection only. During the overhaul stage of fire fighting operations, various gases in unknown quantities may be present. Your SCBA is the only sure respiratory protection in such conditions.

N. Once oxygen and carbon monoxide levels and LELs have been determined to be within acceptable levels, the IC may downgrade to PAPRs. Air monitoring must continue throughout the hazard zone while PAPRs are being utilized.

1. Not for use prior to 45 minute after extinguishment

2. Not for use in atmospheres containing less than 19.5 percent oxygen.

3. Not for use in atmospheres containing carbon monoxide levels greater than 35 ppm.

4. The M40 gas monitor will be used to monitor for oxygen deficient atmospheres, elevated carbon monoxide levels, and flammable/explosive environments.

5. Not for use in LEL environments due to the unit containing electrical parts that may cause an ignition in flammable or explosive atmospheres.

6. If during use an unexpected hazard is encountered (e.g., pockets of entrapped hazardous gas) immediately leave the area for clean air.

7. During use of the PAPR, the atmosphere must be monitored for the level of contamination and a means of escape must be provided in the event that the contamination level increases to IDLH levels.

8. After four hours of use, the user must leave the contaminated area, decontaminate if required, and check the airflow with the airflow

indicator when using the single use battery. Thereafter, air flow must be checked, after every two hours of use.

O. PAPR Inventory

1. Station Captains are to conduct a semi-annual inspection and content audit of the PAPR kit(s) assigned to their station/units using the "PAPR Kit Inventory" (Attachment #3) to verify the completeness of the inventory.

2. Station Captains will return an electronic copy of the "PAPR Kit Inventory" to the Staff Captain at Logistics.

Erin Janssens
Fire Chief
Portland Fire & Rescue

PREPARED BY:	Todd Keathley
REVISION DATE:	06/12/13
EFFECTIVE DATE:	06/12/13
REVIEWED BY:	Publications Committee
REVISED BY:	Eric Johnson

AIR MONITORING

I. PURPOSE

A. This guideline supersedes and rescinds Operational Guideline No. 4.8, dated March 26, 2009.

B. The purpose of this guideline is to designate the conditions under which air monitoring is to be performed. The purpose for air monitoring is to indicate atmospheres (oxygen deficient, explosive, flammable, toxic) which present immediate or potential hazards to personnel. Detection of these atmospheres will determine the proper level of Personal Protective Equipment (PPE) and appropriate actions that will protect firefighters against direct exposure to those hazardous conditions, while allowing remedial measures to be taken. Obstacles to achieving a representative air sample must be noted as follows:

1. Air monitoring data does not indicate exact atmospheric conditions/contaminant concentrations.

2. Air monitoring data gives only a general indication of the most common hazardous conditions/concentrations. Numerous less-common hazardous contaminants/conditions may exist in various combinations and may not be detected by air monitoring.

3. Isolated pockets of air contaminants/gases may go undetected.

   a. The following actions may be appropriate when monitoring:

      i. Wide scanning of areas will produce a more representative sampling.
      ii. More specific air monitoring by the Hazardous Materials (HAZMAT) Team may be required.
      iii. Firefighters must remain alert to physical signs of possible exposure to hazards and not rely solely on air monitoring to be safeguarded.
      iv. Utilize more than one Dräger multi-gas monitor when available and attempt measurements at both high and low levels, depending upon the suspected gas product in question.

4. NOTE: Air monitoring cannot be solely relied upon to determine all Immediately Dangerous to Life or Health (IDLH) atmospheres.

II. RESPONSIBILITIES

A. Personnel

1. Personnel with monitoring equipment

   a. Portland Fire & Rescue (PF&R) will provide training for all personnel required to use monitoring equipment.
   b. Personnel conducting air monitoring shall keep the Incident Commander (IC)/Incident Safety Officer (ISO) informed of changes in atmospheric conditions/contaminant concentrations.
   c. Monitoring shall be conducted in accordance with this guideline, using methods taught in PF&R training.
   d. Personnel conducting air monitoring shall use at least the following minimum level of PPE: Self Contained Breathing Apparatus (SCBA), full firefighting turnouts and gloves. Initial conditions may require a higher level of protection (encapsulating suits, etc.).
   e. After initial monitoring, lower levels of protection may be utilized if monitor levels indicate.

2. Other personnel

   a. Until monitoring occurs, all personnel working in hazardous atmospheres must utilize the appropriate level of respiratory protection as indicated in Operational Guideline (OG) 4.1, "Use of Respiratory Protective Equipment". Personnel working in hazardous atmospheres shall remain in contact with those conducting air monitoring and all personnel in the area shall respond appropriately to changes in air hazard conditions, as indicated by monitoring and/or observation.

B. Incident Commander (IC)

1. The IC shall consider the circumstances of each incident and direct personnel to conduct air monitoring, wear specific respiratory protection, and/or withdraw from a contaminated area in accordance with this guideline and OG 4.1, "Use of Respiratory Protective Equipment". If necessary, the IC shall initiate a consult with the HAZMAT Team and HC458 (automatically paged on all HM7 consults) for advice.

C. Incident Safety Officer (ISO)

1. The ISO shall monitor personnel for the proper use of air monitoring equipment and make recommendations to the IC for any necessary adjustments in accordance with this guideline.

III. REQUIREMENTS

A. General

1. Air monitoring shall be performed when there is or may be a question of exposure to hazardous atmospheres, including atmospheres which are not otherwise known (characterized) to be safe. Examples of conditions that typically create hazardous atmospheres are (or may be): fires, chemical or biological agent releases, confined spaces and overhaul operations. When these conditions exist, air monitoring shall be performed to determine specific air contaminant and air component levels. Monitoring will indicate the proper level of respiratory protection and may also indicate withdrawal from the area when necessary.

B. Conditions requiring air monitoring

1. Air monitoring shall be conducted under any of the following circumstances:

    a. At the scene of structure fires or fires in any enclosed area.
    b. At HAZMAT releases.
    c. Upon recognition of conditions which indicate the presence of physical hazards (choking, strong odors, stinging skin, nose or eyes, etc.).
    d. During confined space operations.
    e. During salvage and overhaul operations.
    f. When directed by: IC, ISO, or other PF&R authority.

2. Continuous air monitoring shall be initiated as soon as practical within all IDLH atmospheres, such as oxygen deficient, explosive, flammable, or toxic atmospheres. For example, IDLH conditions may exist at the site of structural fires and hazardous material releases. Air monitoring shall be conducted continuously until atmospheric conditions have reached safe levels as set forth under this guideline, Section C.

3. Periodic air monitoring shall be conducted when the possibility of an oxygen deficient, explosive, flammable, or toxic atmosphere develops. This possibility exists if:

    a. Work begins on a different portion of the site.
    b. When contaminants are discovered other than those identified.
    c. When a different type of operation is initiated.
    d. In areas of liquid contamination.
    e. While handling leaking drums or containers.
    f. When potential release of hazardous material may occur.

C. Air monitor readings

1. Responses by type of reading

Type	Monitor Reading	Action Required
Carbon Monoxide (CO)	@ 35ppm +	Don SCBA
Oxygen (O_2)	@ <19.5% @ >23.0%	Don SCBA Withdraw
Lower Explosive Limit (LEL)	@ >.5% Vol	Withdraw & evaluate further

2. The Dräger multi-gas monitor currently used by PF&R goes into alarm mode at >.5% Volume. Members should constantly monitor the Dräger readings whenever a potentially explosive atmosphere is present. Remember, isolated pockets of gases may have reached or exceeded the LEL. At no time should members be present in explosive atmospheres greater than 1.0% Volume. .5 % Volume is equal to 10% LEL and 1% Volume is equal to 20%LEL. % Volume reads the actual amount of flammable gas in the atmosphere around the monitor.

Gas Vapor	Heavier / Lighter Than Air
Acetone	H
Acetylene	L
Benzene	H
Ethanol	H
Gasoline	H
Hydrogen	L
Isopropanol	H
Natural Gas (Methane)	L
Propane	H
Toluene	H

3. To facilitate easy operation of monitors in the field, a plasticized copy of monitor user guide will be provided and shall be attached to the Dräger gas monitor. Replacement cards are available through the Hazmat Office.

4. **Note: Always monitor the oxygen level when in an environment with an unknown gas product. A drop in O_2 levels may indicate that another gas is displacing the oxygen in the area.**

D. Fire Suppression Activities

1. If a member is in an atmosphere that contains products of combustion, they will be in a SCBA. This includes the overhaul phase of the incident.

2. Monitors used to identify the presences of toxins and carcinogens on the fire scene are very limited in scope. Further, there is no correlation between levels of carbon monoxide and the presence of other toxic gases.

3. Monitoring of carbon monoxide levels will not be utilized as a benchmark for the removal of the SCBA or the presence of toxins in the atmosphere.

4. Overhaul procedures and the removal of debris from a structure will be kept to a minimum and involve only that which is necessary to ensure extinguishment and prevent rekindle.

5. Companies should utilize electric fans after extinguishment to assist in the removal of toxicants.

Mike Myers
Fire Chief
Portland Fire & Rescue

PREPARED BY:	Bryan Profit
REVISION DATE:	7/14/15
EFFECTIVE DATE:	6/30/16
REVIEWED BY:	Publications Committee
REVISED BY:	Leanna Smith

HEARING PROTECTON AND CONSERVATION

I. PURPOSE

This guideline establishes the Hearing Conservation Program and the issue and use of hearing protection for all Portland Fire & Rescue (PF&R) personnel. This guideline will be in accordance with OSHA 29 CER 1910.95, OR-OSHA, OAR 437 Division 2, Subdivision G, and NFPA 1582.

II. POLICY

PF&R is committed to eliminate or control overexposure to harmful noise levels and to prevent occupational induced hearing loss. This should be accomplished, as feasible, with accepted engineering controls (sound dampeners), administrative controls (postings) and the use of personal protective equipment (earplugs and headsets).

III. AUTHORITY AND RESPONSIBILITY

PF&R's Hearing Conservation Program will be administered by PF&R's Safety Chief and Emergency Medical Service (EMS) Program Manager.

IV. PROCEDURE

A. All personnel with noise exposure equal to or exceeding an eight-hour time weighted average of 85 decibels are required to participate in this program. This includes emergency response, apparatus maintenance, facilities maintenance, and training events.

B. The Training, Safety & EMS Division will provide education, annual audiometric testing, and all applicable recordkeeping, as required by OSHA 29 CFR 1910.98 and industry and NFPA-standard guidelines.

C. Hearing protection shall be worn in areas where posted "Hearing Protection Required" and on all Fire, Training and EMS scenes where personnel are exposed to intermittent or constant noise levels exceeding 85 decibels.

D. Hearing protection approved by PF&R will be provided to and used by all personnel who are exposed to constant or regular peaks in noise levels that exceed 85 decibels. If using standard hearing protection would create additional hazards to the user or interfere with fire scene communications or emergency medical care, personnel may temporarily remove the protection or remove the patient from the noisy environment.

E. Hearing protection should be provided to and used by all personnel operating or riding on fire apparatus. Standard hearing protection on all apparatus should be FireCom™ headsets.

F. The Training, Safety & EMS Division will be responsible for completing "Form 900.45 *Hearing Conservation Program Evaluation Checklist*" annually. Completed checklists will be maintained by the EMS Section.

G. Testing of any hearing protection device and/or work area as it relates to sound, hearing levels, or effectiveness, should be requested and coordinated through the Training, Safety & EMS Division and the City of Portland Risk Management.

John Klum
Fire Chief
Portland Fire & Rescue

PREPARED BY:	Janet Woodside
REVISION DATE:	03/27/2012
EFFECTIVE DATE:	03/27/2012
REVIEWED BY:	Publications Committee
REVISED BY:	Lyn Eisner

TACTICAL PRIORITIES

I. PURPOSE

A. The purpose of this guideline is to establish three separate tactical functions that must be completed in order to stabilize fire situations.

B. This guideline supersedes and rescinds Operational Guideline No. 5.2, dated May 1, 2008.

II. GENERAL

A. Tactical Priorities and Functions

1. Tactical priorities identify the three separate tactical functions that must be completed in order to stabilize significant events involving fire. These priorities also establish the order in which these basic fireground functions must be performed.

2. These functions should be regarded as separate, yet inter-related, activities.

B. Three Basic Tactical Priorities

1. Rescue

a. Activities required to protect occupants, remove those who are threatened, and to treat the injured.

2. Fire Control and Extinguishment

a. Activities required to stop the forward progress of the fire, bring the fire under control and extinguish the fire.

3. Property Conservation

a. Activities required to stop or reduce additional loss to property.

C. Priority Objectives

1. The objectives of each priority are reflected in the following benchmarks of completion:

Objective	Bench Mark
1. Rescue	Primary and secondary search completed
2. Fire Control and Extinguishment	Fire controlled, no extensions
3. Property Conservation	Property loss stopped or minimized

2. All three tactical priorities require different tactical approaches from both a command and operational standpoint. While Command must satisfy the objective of each function in its priority order, many times the activities of each must be overlapped or mixed to achieve the desired benchmark.

3. Notable examples are the frequent need to achieve interior tenability with active and extensive fire control efforts to expedite the primary search, or the need to initiate salvage operations while active fire control efforts are being performed.

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PREPARED BY:	Mark Rasmussen
REVISION DATE:	12/20/10
EFFECTIVE DATE:	12/20/10
REVIEWED BY:	Publications Committee
REVISED BY:	Elonda Bristol

FIREGROUND HYDRAULICS AND PUMP OPERATION

I. PURPOSE

A. This guideline supersedes and rescinds Operational Guideline No. 5.16, dated September 22, 2009.

B. Officers and firefighters are often called upon to furnish answers to problems on water pressure, volume and friction loss during examinations and in their everyday work. A working knowledge of the principals of hydraulics and the ability to apply that knowledge to fireground operations are prerequisites to effective firefighting. The hydraulic formulas and hydraulic calculations are not practical to use on the fireground. The pump card and rules of thumb are used to provide quick, accurate calculations of necessary hydraulic data.

II. INTRODUCTION

A. Hydraulics: "The study of the use and movement of water, especially as pertaining to the extinguishment and control of fires." From Fire Department Terminology, National Fire Protection Association (NFPA).

B. Portland Fire & Rescue (PF&R) fireground calculations found on the pump card are based on hydraulic formulas and flow meter readings giving the approximate gallons per minute that can be moved through any given size of hose and the approximate friction loss. The resulting discharge pressure should be well within the acceptable range for good fire streams.

C. Abbreviations used during fireground calculations are as follows:

1. A: Appliance
2. D: Diameter
3. FL: Friction Loss
4. GPM: Gallons Per Minute
5. H: Head or Height
6. NP: Nozzle Pressure
7. PDP: Pump Discharge Pressure
8. PSI: Pounds Per Square Inch

III. CHARACTERISTICS AND ELEMENTS OF WATER

A. Characteristics

1. Water is a transparent colorless liquid that solidifies at 32°F and boils at 212°F. It weighs 62.5 pounds per cubic foot with each gallon weighing 8.33 LBS and displacing 231 cubic inches. Dividing 1728, the amount of cubic inches in a cubic foot, by 231 will give you 7.5, which is the number of gallons contained in one cubic foot of water. A 2 ½" hose line with a fog tip will deliver 250 gallons per minute (GPM), or over one ton of water per minute.

B. Elements

1. Water Pressure: Water pressure is produced either naturally, by the weight of the water itself, or artificially by pumps exerting force against water in a confined space. A tank that is 1 foot high, 1 foot wide and 1 foot long would hold 1 cubic foot of water. The weight on the bottom of the tank would be 62.5 pounds per square foot. Since pressure is normally expressed in pounds per square inch (PSI), divide the pounds per square foot (62.5) by 144 (the square inches in one square foot), which results in .434 PSI. For fire ground calculations, use the rule of thumb and convert .434 to .5 or ½ pound per foot. So a tank 10' high 1-inch square would have 5 PSI at the bottom of the tank.

2. Head: One of the basic laws of hydraulics is that pressure exerted by the weight of the water is directly proportional to the height of the water, or head. In the fire service, head must always be considered when moving water to a higher or lower level. For example, if the nozzle is 30' higher than the pump supplying the line, then 15 PSI of pressure must be added to overcome the head, or subtracted if the nozzle is lower than the pump. In structural fires, head pressure is figured from the second floor up to and including the fire floor. Using the rule of thumb calculation of 5 PSI per floor, the head pressure needed to operate a line on the 5th floor is 20 PSI; a line on the 6th floor is 25 PSI.

3. Friction Loss: Besides overcoming water pressure generated by head, there is another factor offering resistance to the flow of water through a hose called friction loss. The size of the line and the velocity of the flow (GPM) determine the amount of friction loss. For fireground operations the simplest and most reliable way to determine friction loss is to determine the amount of discharge at the nozzle (GPM) and utilize a pump card to determine the friction loss per 100 feet of a particular hose lay. Discharge of any nozzle can only be predetermined when a standard nozzle pressure is maintained. Nozzles used by PF&R are divided into two types, which should be operated at the following pressures:

a. Smooth Bore Nozzles

i. Hand Held – 50 PSI
ii. Master Stream Tips – 80 PSI

b. Fog Nozzles

i. Hand Held – 75 PSI
ii. Master Stream Fog – 100 PSI

FRONT

PORTLAND FIRE & RESCUE PUMP CARD

JUNE 2012

1 3/4"	HAND LINE	GPM	PSI	FL - 100'
1 3/4	FOG	150	75	25
15/16	SMOOTH BORE PLUG	185	50	35
2 1/2"	**HAND LINE**	**GPM**	**PSI**	**FL - 100'**
2 1/2	FOG	250	75	10
1 1/8	SMOOTH BORE	260	50	10
1 1/4	SMOOTH BORE	330	50	15

AVAILABLE HYDRANT FLOW **STATIC** ☐ **RESIDUAL** ☐

0 - 10% DROP — 3 MORE LIKE VOLUMES
11 - 15% DROP — 2 MORE LIKE VOLUMES
16 - 25% DROP — 1 MORE LIKE VOLUME

ONLY WHEN FLOWING OVER 350 GPM
APPLIANCE = 10 PSI
STANDPIPE = 25 PSI
EXTEND THROUGH THE BAIL = 20 PSI

RELAY PUMPING
FRICTION LOSS + HYDRANT RESIDUAL

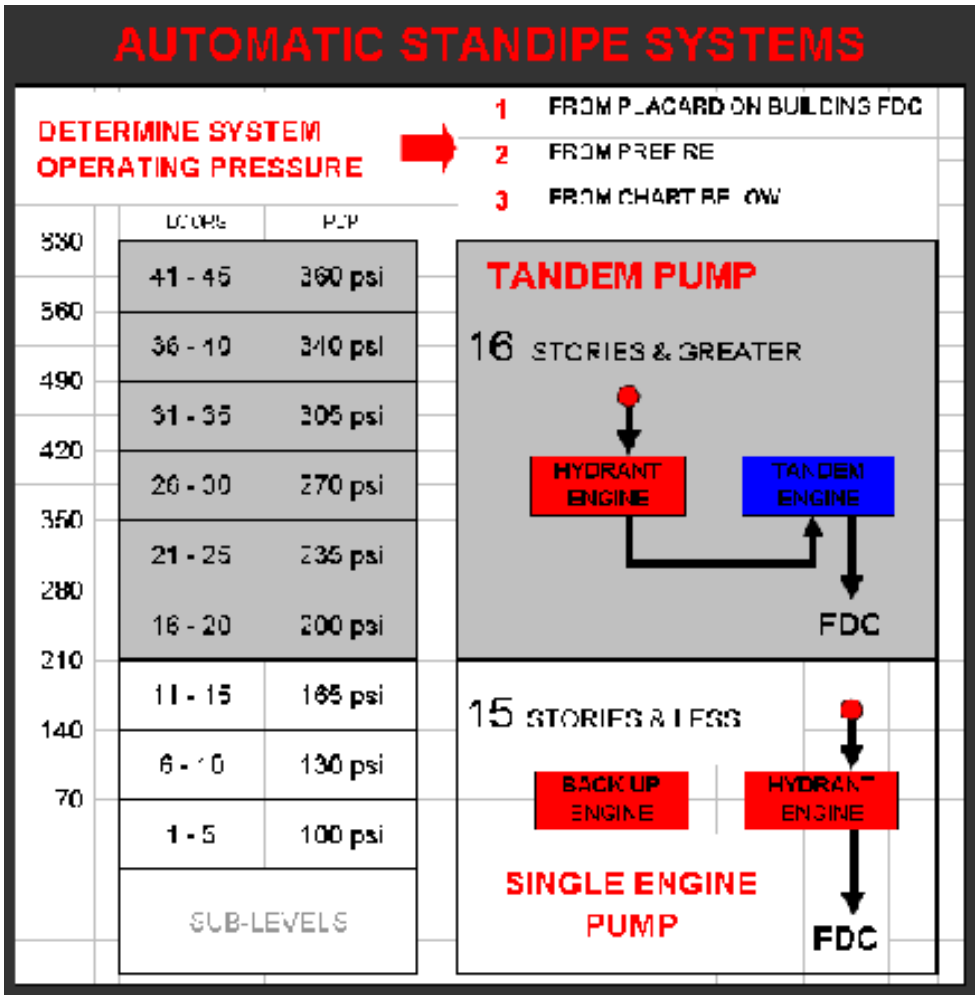
SILVEX BATCH MIX **500 GAL TANK**
.1% = 1/2 GAL .3% = 1-1/2 GAL
INLINE FOAM EDUCTOR = 100 PSI

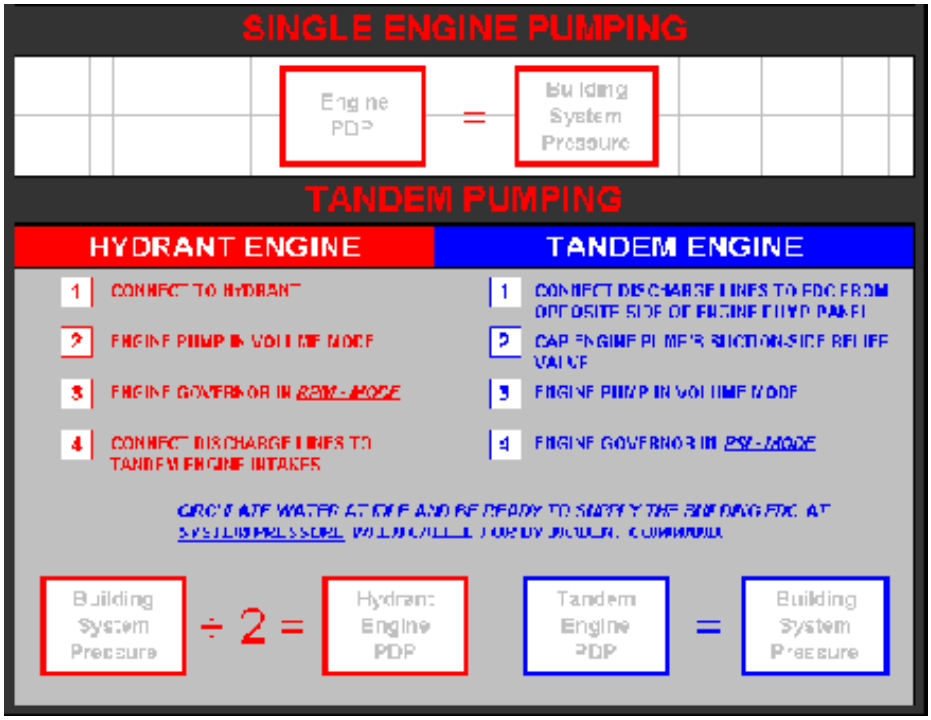
ACTIVATED SPRINKLER SYSTEMS
COMMERCIAL BLDG NO FIRE PUMP = 150 PSI
AUTOMATIC SP WITH PUMP = HIGHRISE CARD
MOORAGE STANDPIPE = 125 PSI

GPM			
NP			
FL			
FL			
FL			
H (5 LB / Floor)			
A			
A			
SP			
PDP			

MASTER STREAM				FRICTION LOSS PER 100 FEET			
FOG NOZZLES 100 PSI		GPM	PSI	2.5"	3"	2 - 3"	3 - 3"
PUMP IN VOLUME MODE		300	80	15	5		
	1 1/4	400	80	25	5	5	0
	1 3/8	500	80	35	10	5	5
	1 1/2	600	80	50	15	5	5
		700			20	5	5
	1 3/4	800	80		30	5	5
		900			35	10	5
		1000			45	10	10
	2	1100	80		55	10	10
		1200				15	15
		1300				15	15
	2 1/4	1400	80			20	15
		1500				25	20

BACK





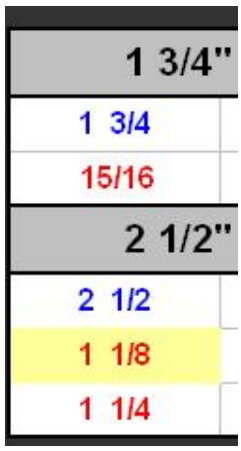
IV. PF&R PUMP CARD

A. The pump card serves as the basis for fireground computations regarding nozzle sizes, discharge, and friction loss. The blank spaces in the pump card indicate that the friction loss is either too high for efficient hose stream or too low to be of any concern.

B. The pump card is divided into three basic areas. The handheld nozzle friction loss calculations are located at the top of the pump card. Special information and the friction loss work sheet area are positioned in the center of the pump card. Master stream friction loss calculations are found at the bottom of the pump card.

C. The hand line friction loss table is divided into the following sections:

1. Section 1 – Tip Size: Use this column to choose the fog or smooth bore tip you will use.



1 3/4"
1 3/4
15/16
2 1/2"
2 1/2
1 1/8
1 1/4

2. Section 2 – Hand Lines: Our Akron 1-3/4″ combination nozzles are capable of being used as smooth bore nozzles by simply removing the fog tip and utilizing the smooth bore plug built into the shut off.

HAND LINE
FOG
SMOOTH BORE PLUG
HAND LINE
FOG
SMOOTH BORE
SMOOTH BORE

3. Section 3 – GPM: This column will give you the correct GPM for the type of tip you are using.

GPM
150
185
GPM
250
260
330

4. Section 4 – PSI: This column will give you the proper nozzle pressure for the type of tip you are using.

PSI
75
50
PSI
75
50
50

5. Section 5 – Friction Loss: Use this column to determine the correct friction loss for the GPM flowing through each 100′ of the hose size used.

FL - 100'
25
35
FL - 100'
10
10
15

6. Section 6 – Special Information: Use this chart to determine:

Available hydrant flow: To estimate the available hydrant flow you must first determine what your static pressure was (pressure of the water at rest) by reading your intake gauge after the hydrant has been opened but prior to discharging any water into your attack lines. After attack lines have been placed into operation observe what the intake gauge reads. This is the residual pressure, (pressure of the water in motion). Determine the percentage of drop between the static and residual pressures. Use the chart to determine how much water is available in the hydrant being used.

Static Pressure – Residual Pressure/Static Pressure = % Drop

Example: 100 PSI static drops to 90 PSI residual = 10% drop, 3 more like volumes are available.

AVAILABLE HYDRANT FLOW	
0-10% Drop	**3 MORE LIKE VOLUMES**
11-15% Drop	**2 MORE LIKE VOLUMES**
16-25% Drop	**1 MORE LIKE VOLUME**

D. The special information section is divided into following sections:

1. Pressure loss for the in-line foam eductor is 100 PSI for the eductor alone. All other friction loss in the hose layout, nozzle pressure, head, etc., will need to be figured and added together for the final discharge pressure.

2. Appliance pressure loss is 10 PSI when flowing over 350 GPM through the appliance. Examples of appliances are the wyes, siamese, ladderpipe rams horn, ground turret, etc.

3. For hand lines that have been extended through the nozzle bail, add 20 PSI pressure when flowing over 350 GPM.

4. Figure 25 PSI pressure loss for a dry manual standpipe connection when the combined outlet flows are over 350 GPM. Head and friction loss in the hose layouts before and after the standpipe must also be determined.

5. When relay pumping, determine the GPM being discharged by the attack engine to figure friction loss for the hose layout. Next identify your hydrant residual pressure and add that pressure to your friction loss pressure to set your pump discharge pressure.

6. When pumping into an activated sprinkler system, and the system is supplied by city water pressure only, pump at 150 PSI. If the sprinkler system is part of a high rise or has its own pump, refer to the High Rise Protocols.

7. To determine the friction loss in 5″ hose, use the 3-3″ hose calculation table.

8. When batch mixing SILV-EX in an on-board or portable tank, use the SILV-EX chart to determine the correct amount of product to obtain a .1% or .3% mixture.

9. The friction loss work sheet area is provided for the pump operator to work the friction loss problem. There is an area at the top to record the static and residual pressures to figure the available hydrant flow. There is also a place to record the GPM flowing when figuring a relay pump operation. The remainder of the work area is designed for recording the differing friction loss amounts to determine the total pump discharge pressure.

E. The master stream friction loss table is divided into five sections:

1. Be certain to pump in volume when using master stream devices or if you are pumping into an activated sprinkler system if you have a two-stage pump.

2. Tip Size: Use this column to choose the correct tip size you will use.

TIP
1 1/4
1 3/8
1 1/2
1 3/4
2
2 1/4

3. GPM: This column will give you the correct GPM for the type of tip in use. This column is also used for pumping operations that require a friction loss calculation for a known gallonage, as in relay pumping.

GPM
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500

4. PSI: This column will give you the proper nozzle pressure for the type of tip being used. Master stream smooth bore tips are all 80 PSI nozzle pressures. If using a fog nozzle designed specifically for a master stream device, pump at 100 PSI nozzle pressure.

PSI
80
80
80
80
80
80
80

5. Friction Loss: Use this column to determine the correct friction loss for the specific tip you are using and GPM you are flowing.

FRICTION LOSS PER 100 FEET			
2.5"	3"	2 - 3"	3 - 3"
15	5		
25	5	5	0
35	10	5	5
50	15	5	5
	20	5	5
	30	5	5
	35	10	5
	45	10	10
	55	10	10
		15	15
		15	15
		20	15
		25	20

F. To use the pump card effectively it is best to follow a systematic process. There are several rules, and rules of thumb that must be observed.

1. If possible, determine the static pressure of the hydrant to which you are connected. Ideally water would not flow after you are connected to the hydrant and you can then get an exact static pressure. Most of the time the pump operator will be using tank water on the fire so there will not be a time when the water is at rest. In these instances watch the intake gauge while the intake port is opened. It will peak when first opened and then drop to the residual pressure. The peak is the best estimate of what the static pressure would have been. Modern pressure governors react so quickly that this rule of thumb may not be accurate. When flowing large volumes of water, take the time to determine the static pressure prior to flowing any water.

2. Always figure the pump problem from the nozzle back to the pump. Deviation from this rule will more times than not cause an incorrect calculation. Be sure to use the formula in the center of the pump card.

3. To figure friction loss in multiple line and extended line configurations the total GPM flowing must be known.

4. In wyed line configurations, figure the line with the most friction loss. Remember to determine the total water flowing through the line that is supplying the wyed lines.

5. The proper sequence for your calculation should be as follows:

   a. Determine the nozzle pressure. Hand lines should be 50 or 75 PSI. Master streams should be 80 or 100 PSI.

b. Determine if there is an appliance near the nozzle or tip. If there is, and the flow is over 350 GPM, add 10 PSI.
c. Determine the friction loss in the hose or hoses. Use FL_1, FL_2, FL_3, etc., to calculate as many different hose layouts as necessary.
d. Add or subtract for any head in the hose layout.
e. Add 10 PSI for any other appliances in the hose layout if the flow is over 350 GPM.
f. Add 25 PSI for a dry manual standpipe when the combined flows are over 350 GPM.
g. Total all figures for the final pump discharge pressure.

An example would be one 2 ½″ line 100 feet long, wyed into two 1 ¾″ lines 100 feet long with fog tips going up a hill 20 feet.

NP: 75 (fog nozzle)
FL1: 25 (for the 100′ 1 ¾″ lines flowing 150 GPM each)
FL2: 15 (for the 100′ 2 ½″ line flowing 300 GPM)
H: 10 (20′ uphill)
A: 0 (Wye)
SP: 0 (no standpipe)

PDP: 125 PSI

V. SPECIFIC PUMPING INFORMATION

A. There are several different types and ratings of pumps at PF&R. Listed below are several rules and rules of thumb for different types of pumps.

1. There are two different types of pumps, single-stage and two-stage. Single-stage pumps have one impeller while two-stage pumps have two impellers. Two-stage pumps can pump in either pressure (series) or volume (parallel). There are positives and negatives to each type of pump.

a. Single-stage pumps: They have the same capacities and ratings as two-stage pumps and are capable of achieving their rated capacities. However, to achieve those capacities they must work the engine much harder and reach much higher RPM's. They also can damage the pump packing when high pressures are reached during relay pumping operations. Single-stage pumps should not be involved in relay pumping operations involving high pressures unless they are the water supply source engine in the relay pump operation.

b. Two-stage pumps: They are more efficient than single-stage pumps, do not require the engine to work as hard, and are capable of achieving higher pressures at lower RPM's. Two-stage pumps require more knowledge and expertise to operate properly. When

to pump in volume or pressure is one example of the knowledge required. Two-stage pumps should normally be kept in volume due to the low-pressure nozzles (75 psi) currently in use. Anytime the pumper exceeds one half its rated capacity, it should be in volume. A two-stage pumper should always be in volume when pumping to a master stream device. Never change from volume to pressure above 75 PSI. The change-over should always be performed with the engine at idle. Failure to do so may cause damage to the pump valves and will immediately double the existing pressure, causing over-pressure to the nozzle crew. Always communicate change-over to the attack crew.

c. PF&R pumps, single and two-stage, are capable of achieving high pressures or large volumes of water. PF&R pumps cannot provide high pressure and large volumes of water at the same time. Each pump has a plate that certifies its capacity and pressure ratings from draft. Each engine's pump is able to supply 1500 GPM at 150 PSI, 1050 GPM at 200 PSI, and 750 GPM at 250 PSI. A pump is rated by drafting water through 20 feet of hard suction, the water source 10 feet below the eye of the impeller. Modern pumps are so efficient that pumping with low PSI nozzles may require the pump to be in volume for normal hand line operations. One exception would be foam operations where high pressure and lower gallonage are required.

B. Engine pump operators should have a good working knowledge of pump construction and hydraulics. They should be able to problem solve when a pump will not function properly.

1. Cavitation is caused when the pump is attempting to pump more water than is available or there is air in the hose. Cavitation can damage the pump and should be avoided whenever possible. Pump operators should always keep at least 20 PSI on their intake gauge to avoid cavitation. A long lay-in may produce a large amount of air in the lay-in line. Pump operators need to be aware of this possibility and open their lay-in lines slowly, or where available, bleeder valves should be utilized to alleviate the possibility of air causing cavitation.

2. Pump will not go into gear. Pump operators need to know how their apparatus goes into pump gear and what steps are necessary should the procedure fail. Go through the road to pump sequence slowly to avoid potential problems. If the problem persists, shut the apparatus down completely, and re-start the apparatus, which should re-boot the computer and allow the pump to go into gear. Be sure to inform Command of possible problems so that another engine can be made available to pump.

3. Priming the pump should not be necessary unless there is cavitation or the need for drafting occurs. Priming should be started at an idle then the

throttle increased to 1000-1200 RPM. A normal priming procedure should only take 10 to 20 seconds. Care should be taken to not operate the priming pump more than 30 to 45 seconds. If after 45 seconds the pump has not primed, there is either an air leak or the pump is defective. Review the steps taken, check all discharge valves to verify that they are fully closed, and attempt to prime the pump again.

4. Pump operators should have a good working knowledge of their apparatus' relief valve or pressure governor. See the apparatus operator's manual for proper procedure and use.

5. Dual pumping is a procedure where two or more engines share a single water source. The source engine establishes a water supply and provides residual water to another engine by connecting intake to intake. This takes water from the intake side of the pump at hydrant pressure rather than at higher pressures from a discharge outlet. The advantages of this procedure are that each engine is capable of pumping at a different pressure and independent of each other. A disadvantage is that the entire fireground operation is relying on a single water source.

6. Relay pumping is an operation where several engines are in a series to overcome distance, head or friction loss problems. For example, an engine is at the water source and pumps to another engine that is several hundred feet away. That engine in turn pumps to the next engine that is several hundred feet away, etc. Pump operators will need to know the GPM being used by the last engine, as well as the length and size of the hose between their engine and the next engine to figure the friction loss pressure. Next identify your hydrant residual pressure and add that pressure to your friction loss pressure to set the pump discharge pressure.

7. Tandem pumping is a shorter relay pumping operation where the goal is to achieve higher pressures. Currently the Pierce engine governors will not go over 300 psi when in pressure mode. To achieve the higher pressures needed to test hose at 400 psi or supply water at a high rise, these governors need to be in RPM mode and the pump manually throttled up.

8. PF&R ladder trucks have multiple styles of waterways supplying their masterstream tips. Trucks 1 and 8 are platform style trucks with preplumbed waterways capable of flowing over 2000 GPM. These trucks will need two engines to supply them, preferably off of hydrants that are on different water mains. Truck 2 also has a preplumbed waterway. Currently, the remainder of the ladder trucks use a 3" hose line attached to the climbing side of the ladder rungs. For the preplumbed apparatus refer to the individual specifications for friction loss in the waterway and for the trucks using the 3" hose line, use the single 3" friction loss table. For master stream use, where the water needs to be placed is the main objective. Distance, wind, elevation and nozzle tip size will all play a part

in your pump pressure calculations. Calculating a PDP is sometimes only a starting point. Are you hitting your objective or overshooting it? Adjust your PDP accordingly.

9. Net pump discharge pressure is the actual work that the pump is accomplishing. Since pump capacities are rated from draft, any incoming pressure from a hydrant or relay pumping operation will reduce the actual amount of pressure the pump must produce. For example, if a pump is receiving 80 PSI from the hydrant and is discharging 125 PSI, the pump is only creating 45 PSI. Pump GPM specifications are rated at draft, thus any additional pressure coming into the pump from a hydrant increases the potential GPM output of the pump above its rated capacity. For example a 1500 GPM pumper on a good hydrant can easily pump in excess of 2000 GPM.

C. Pump operators must rely on current information and training to accomplish their mission, which is to provide effective uninterrupted hose streams. Information on pump operation, theory, hydraulics, and other subjects is available through the Training, Safety & EMS Division or local classes. Pump operators are encouraged to improve their knowledge through the utilization of these resources.

VI. FORMULAS AND COMPUTATIONS

A. At times it may be necessary to determine the volume of a tank or column of water. To find the volume of a container, determine the area at the base and multiply it by the height or depth of the container. This will provide the volume of the tank. Multiply the volume by 7.5 (the number of gallons of water in a cubic foot of water) to determine the number of gallons in a tank. All measurements must be in the same unit, as in feet or inches. For example, a tank that measures 10 feet by 12 feet and is 8 feet high will have an area that is 120 square feet (10 x 12). The volume of the tank is 960 cubic feet (10 x 12 x 8). The number of gallons in the tank is 7,200 (960 x 7.5).

B. To find the area of the base of a cylinder, use the formula .7854 times the diameter of the cylinder squared (Area = .7854 x d^2). To figure the capacity of a round tank that is 6 feet in diameter and 8 feet high you first need to take the diameter of the tank and square it (6^2 = 36 feet). Then use the formula to determine that the base area of the tank is 28.27 square feet (36 x .7854). Next determine the volume of the tank, which is 226.20 cubic feet (28.27 x 8). The number of gallons in the tank is 1696.5 (226.20 x 7.5).

C. A shortcut formula to compute the approximate capacity of a round tank is d^2 x 6 x L. Using the same size tank as the previous problem we see that the shortcut formula calculates that the tank will hold 1728 gallons (36 x 6 x 8). Consider using this formula on the fire ground, as it is faster than and nearly as accurate as the exact formula.

VII. EXAMPLES

Hand Line Examples - - Problem #1
Engine 1 is supplying one 1 ¾″ hand line 200′ long with a fog tip.

NP:	75
FL1:	50
H:	0
A:	0
SP:	0

Pump discharge pressure: 125 PSI

Problem #2
Engine 2 is supplying one 1 ¾″ hand line 200′ long with a smooth bore tip.

NP:	50
FL1:	70
H:	0
A:	0
SP:	0

Pump discharge pressure: 120 PSI

Problem #3
Engine 3 is supplying one 1 ¾″ hand line 200′ long with a smooth bore tip, and one 2 ½″ hand line 250′ long with a fog tip.

NP:	50 (1 ¾″)	75 (2 ½″)
FL1:	70 (1 ¾″)	25 (2 ½″)
H:	0	0
A:	0	0
SP:	0	0

Pump discharge pressure: 120 PSI
Note: The 2 ½″ line is longer but the 1 ¾″ requires more friction loss. The operator must figure both hose layouts, determine the one with the most friction loss and pump to that one. The operator must then gate down the other line or lines as needed for the proper pump pressure if possible.

Problem #4
Engine 4 is pumping to an apartment fire using a standpipe. The standpipe is supplied using three 3″ lines 100 feet long. There are two 2 ½″ hand lines 100 feet long with fog nozzles on the 4th floor. On the 5th floor, there is one 2 ½″ hand line 100 feet long that has been wyed off using two 1 ¾″ hand lines 100 feet long using smooth bore tips.

NP: 50
FL1: 35 (1 ¾″ lines)
FL2: 25 (2 ½″ line supplying the 1 ¾″ lines)
H: 20 (Using the 5th floor)
A: 10 (Wye)
SP: 25
FL3: 5 (three 3″ supplying the standpipe)

Pump discharge pressure: 170 PSI
Note: This problem can be confusing and is ***a good example of why it is necessary to begin at the nozzle and work backwards.*** The 1 ¾″ lines were used because the friction loss is greater for them than the 2 ½″ lines on the 4th floor. The 2 ½″ line that is supplying the 1 ¾″ lines has 370 GPM flowing through it. Using the wyed lines table on the pump card, there is 20 PSI friction loss per 100 feet of 2 ½″ hose. The 5th floor was used for the head calculation because that is where the lines with the most friction loss are. There is a total of 870 GPM flowing through the three-3″ lines (two-2 ½″ lines flowing 250 GPM each and 370 GPM through the wyed line on the 5th floor). Rounding up to 900 GPM on the pump card will show 5 PSI FL per 100 feet of triple 3″ lines. If there had only been double 3″ lines instead of triple lines the friction loss would have increased from 5 PSI per 100 feet to 10 PSI per 100 feet. ***The important fact to remember is that each hose layout must be figured independently and the hose layout with the greatest friction loss is the one the pump operator must pump to.***

Problem #5
Engine 5 is supplying one 1 ¾″ line 200 feet long that has been extended with another 100 feet of 1 ¾″ that has a fog tip.
NP: 75
FL: 75
H: 0
A: ***0***
SP: 0

Pump discharge pressure: 150 PSI

Problem #6
Engine 6 is supplying one 2 ½″ line 150′ long with a fog nozzle and operating a foam eductor.
NP: 75
FL: 15
H: 0
A: 100
SP: 0

Pump discharge pressure: 190 PSI

Note: ***Always add 100 PSI for a foam eductor.***

Problem #7
Engine 7 is pumping to two ground turrets using 1 ½" tips, each supplied with two 3" lines 200 feet long. Engine 7 is being supplied through a relay pump operation from Engine 8 and Engine 9. Engine 9 is at a hydrant with a residual pressure of 60 psi and has 600 feet of three 3" lines going to Engine 8. Engine 8 has 400 feet of triple 3" lines going to Engine 7 up a 20-foot hill. Figure the pump pressure for all 3 engines.

Engine 7
NP: 80
FL1: 10
H: 0
A: 10
SP: 0

Engine 7 pump discharge pressure: 100 PSI

Engine 8
NP: 60 (pressure given the next engine for residual hydrant pressure)
FL1: 60 (Engine 7 is flowing 1200 GPM)
H: 10
A: 0
SP: 0

Engine 8 pump discharge pressure: 130 PSI

Engine 9
NP: 60 (pressure given the next engine for residual hydrant pressure)
FL1: 90 (Engine 8 is flowing 1200 GPM)
H: 0
A: 0
SP: 0

Engine 9 pump discharge pressure: 150 PSI

Problem #8
Engine 10 is on a hydrant that has a static pressure of 90 PSI. After supplying a 2 ½" hand line with a fog tip, the residual pressure drops to 78 PSI. How many like lines can the hydrant supply using the available hydrant flow chart?

90 less 78 divided by 90 equals 13% drop. Using the table we can get two more like lines or a total of 750 GPM from the hydrant.

Problem #9
Engine 11 is pumping to Truck 2R. Truck 2R has the ladder with ladderpipe extended to 80 feet. They are using a 2″ tip and 100 feet of 3″ hose. The siamese is supplied by two 3″ hose lines 100 feet long. Engine 12 supplies Engine 11 through three 3″ lines 500 feet long. What are the pump discharge pressures for Engine 11 and Engine 12? The hydrant that Engine 12 is using has a residual pressure of 60 PSI.

Engine 11
NP: 80
FL1: 55 (3″ line up ladder)
H: 40
A: 10 (Rams Horn)
A: 10 (Siamese)
FL2: 10

Engine 11 pump discharge pressure: 205 PSI

Engine 12
Hydrant Residual: 60
FL1: 50

Engine 12 pump discharge pressure: 110 PSI

VIII. PUMP CARD REPLACEMENT

A. Replacement pump cards shall be requested through PF&R's driving instructor in the Training, Safety & EMS Division.

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REVISION DATE:	08/03/12
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REVIEWED BY:	Publications Committee
REVISED BY:	Lyn Eisner

SEARCH OPERATIONS

I. PURPOSE

A. This guideline was created on March 31, 2014.

II. GENERAL INFORMATION

The purpose of this document is to provide direction for firefighters conducting fireground search operations.

III. GLOSSARY OF TERMS

A. Flow Path:
The movement of heat and smoke from high to lower air pressures within a building's fire area, both in and outside a fire involved structure.

Facts about flow paths:

1. It is common for a ventilation opening in a fire building (windows, doors, roof openings) to act simultaneously as an inlet for fresh air and as an exhaust vent for the products of combustion.

2. When this occurs, the flow path at the bottom of the opening allows air to enter the fire area, while the flow path at the top of the opening allows heat, smoke and fire to ventilate out of the fire area.

3. Based on varying building configurations and ventilation profiles, there may be several flow paths during a structure fire.

4. New flow paths are created and existing paths impacted, with every opening made in a structure during fire operations.

Members must be aware that all fire tactics occurring in a flow path have the potential to place them at a greater than normal risk. If the incident involves a ventilation limited fire (oxygen deprived, usually indicated by heavy black smoke), there is a greater chance of experiencing untenable increases in heat as the fire receives oxygen from the flow path opening. Any open window represents a low-pressure vent point which will become a flow path if not isolated from the fire area. By practicing **door control,** firefighters can isolate the fire area and close off potential flow paths. Firefighters must also refrain from venting windows indiscriminately or in a manner that is not coordinated with

fire attack or a ventilation plan. This practice can slow search efforts and places firefighters at greater risk as it creates unanticipated or unintended flow paths.

B. Heat Release Rate (HRR):
The rate at which energy (heat) is released by the burning of a fuel and oxygen mixture.

Facts about Heat Release Rate (HRR):

1. The rate at which energy (heat) is released by the burning of a fuel and oxygen mixture.

2. Providing oxygen to a ventilation limited fire will increase the HRR.

3. Oxygen is introduced each time a door or window is opened.

4. An increase in HRR will result in increased heat and smoke production within the fire area and in all flow paths.

C. Ventilation Limited Fire:
A fire in which the HRR or growth rate of the fire is slowed due to a limited supply of fresh air and oxygen.

Facts about ventilation limited fires:

1. Modern, hydrocarbon based products burn at a rate of two to three times that of legacy fuels, producing four to ten times more smoke. When the smoke level in a fire area lowers and reaches a flame from burning materials, it suppresses further flame production. However, the hydrocarbon based fuels will continue to burn and give off heat. The fire will remain suppressed until a ventilation point is created that supplies oxygen and fresh air.

D. Ventilate Enter (Isolate) Search
The acronym V.E.I.S. (commonly communicated as V.E.S.), describes the fireground tactics associated with a firefighter entering a fire involved structure through a ventilation opening with the intent of conducting a search.

Ventilate: Opening or removing the window, creating a potential flow path for fire, smoke and products of combustion.

Enter: Making access through an open window, which now becomes a potential flow path.

Isolate: Isolating the room by closing the door, eliminating the potential flow path.

Search: Conducting a search of the room after isolating the room from the flow path.

E. Primary Search:
Describes an immediate search to identify and rescue all occupants located in survivable spaces within a structure. Primary search is a rapid, systematic and thorough search, and should be conducted with due regard for personnel safety. Typically the primary search will be completed by the interior team of the first-due truck company. This practice allows early arriving engine companies to focus on getting a hose line in position and operational. In the event the first truck company is delayed or unavailable, a primary search can be completed by early-arriving engine companies. Depending on the circumstances of the incident a primary search may be conducted ahead of the hoseline or prior to the application of water.

F. Secondary Search:
Secondary search describes a thorough and complete search for life in all areas in and around the structure. This search covers the entire interior of the building including all shafts, elevators, and other areas not covered during the primary search. The purpose of the secondary search is to ensure that no possible victims have been overlooked. When conducting a secondary search, time is not as important as thoroughness. A best practice for conducting secondary searches is to have a company other than the one that conducted the primary search complete the secondary search.

G. Targeted Search:
Describes the actions taken by firefighters when there is credible information available regarding the location of a fire victim. Victim location information may come in the form of dispatch reports, occupant or bystander reports, visualization of a fire victim at a window, or reports of a firefighter mayday. The available information leads firefighters to *target* a specific area or room of the structure. Other information that may lead firefighters to target a certain area of a structure may include: occupancy type, building layout, location of bedroom windows, audible cues from victims calling out, or the sound of a PASS device.

H. Oriented Search:
The use of search tools and/or techniques that keep a search team oriented within the structure they are searching. Maintaining orientation allows for prompt exit from a fire area or structure, and will aid in directing other companies to one's location when victims are located or in the event of an emergency. It is imperative that orientation be maintained by search teams operating within a structure fire.

I. Door Control:
Door control refers to the practice of closing doors while conducting searches or prior to initiating firefighting operations. Door control is important for two primary reasons:

1. To isolate the fire area, limiting fire spread to uninvolved areas of the structure.

2. To eliminate flow paths that are not part of the ventilation plan.

IV. SEARCH OVERVIEW

A. The primary mission of Portland Fire & Rescue (PF&R) is to protect and save civilian lives. This is accomplished on the fireground by initiating aggressive fire attacks, applying appropriate ventilation tactics, and by conducting safe, systematic and aggressive search operations. The appropriate application and coordination of these tactics affords the greatest opportunity for victim survival and successful fireground operations.

B. Search operations begin with the receipt of the alarm. Vital information such as dispatch reports, occupant or bystander information and type of occupancy relative to time of day must be considered. A careful size-up, establishment of a search plan, and coordination amongst the crew members involved in the search are essential elements of a successful operation.

V. SEARCH FUNDAMENTALS

A. Size-up:

A thorough size-up is fundamental to successful search operations. At a minimum the size-up should consider the occupancy type, age of the structure, building construction, number of floors, access and egress, fire development / smoke conditions and rescue profile. In residential occupancies, a minimum of two sides of the structure should be viewed prior to initiating search operations. If time and circumstances permit, viewing three sides or a complete 360-degree walk around the structure is preferred.

Members must include the building's interior configuration as part of their size-up. This may help members determine the number of rooms/apartments and their floor plans. In multiple occupancy structures, prior to reaching the fire floor, consider conducting a survey of the floor below to determine the interior hallway layout, floor plan of the fire floor and points of access and egress.

B. Rescue Profile:

The rescue profile for a structure fire is first determined by considering all critical size-up information, followed by applying a member's judgment and experience. PF&R recognizes three rescue profiles:

1. **No Rescue:** In this profile, the fire and smoke conditions indicate that the interior environment is incompatible with human life or the structural integrity of the building is comprised beyond the point of mounting reasonably safe interior search operations.

2. **Possible Rescue:** In this profile, there is little reason to believe a rescue situation exists. However, as a matter of practice PF&R conducts primary and secondary searches on all fires where interior firefighting operations are initiated. This may include:

   a. Residential fires that occur during the evening or early morning hours when occupants would typically be sleeping.

   b. Structure fires where a credible person tells firefighters that everyone is out.

   c. Strip mall, school, commercial occupancy, or other building in which a fire occurs outside of normal business hours.

   d. Abandoned houses or boarded up structures.

   In this profile the OSHA "Two in – Two out" rule may or may not apply.

   When operating under this profile a search is conducted, but the aggressiveness of the search is somewhat restrained.

   Note: ***Searching ahead of the hose line and VEIS tactics may be utilized when operating in possible rescue mode. Smoke and fire conditions as well as the overall circumstances surrounding the incident will ultimately determine the appropriate search tactic to be employed.***

3. **Confirmed Rescue:** In this profile, firefighters are operating with information that suggests an occupant or firefighter is in need of rescue. Information that would prompt a confirmed rescue profile may include:

   a. Dispatch reports of trapped occupants

   b. Credible occupants or on-scene bystanders indicating someone is unaccounted for or inside the fire building.

   c. A firefighter mayday is called.

      i. In this profile the OSHA "Two in – Two out" rules do not apply.

      ii. Aggressive search practices such as VEIS and searching ahead of the hose line may be employed.

      iii. All efforts on the fire ground are in support of the search effort.

C. Search Plan:

Establishment of a search plan is also fundamental to successful search operations. A search plan that is developed based on a considered size-up and the overall circumstances surrounding the incident will facilitate the primary objective of searching for victims and locating the fire. The basic elements of a search plan include; method of orientation, individual member roles and responsibilities, equipment assignments, and the area of the structure to be searched. If the search plan involves splitting the crew this information must be communicated to command.

D. Communication:

Effective communication between search team members is critical to successful search operations. In most instances, communication amongst team members will occur face to face. Communication with command will be by the officer or "B" team leader. Effective communication amongst search team members while engaged in search operations improves operational effectiveness and victim survivability. This may include: calling out doors and windows (means of egress or area of refuge), avoiding scene hazards, calling out for victims or conducting "all quiets" to listen for victims or firefighter pass devices.

Communication with the Incident Commander should include:

1. Changes in smoke or heat conditions.

2. Changes in location (moving from first to second floor etc.).

3. Completion of the search, or location of a victim.

4. If the search plan includes splitting a single company between two floors this information must also be communicated to command ("Command from Truck 25. Truck 25B is searching second floor, Truck 25 will be searching the first floor").

E. Air Management:

Firefighters conducting search operations must continuously monitor their air status and consumption rate. Members must maintain a sufficient air reserve to complete the search operation or exit the IDLH prior to the activation of their low air alarm. Firefighters that overextend will become a liability to the incident and draw resources away from civilian rescue efforts (See O.G. 4.10). Practicing good air management during search operations also assists command in assigning relief search teams in a timely manner.

F. Crew Accountability:

Search teams must stay intact, **NO FREELANCING**. Whether operating as a team of two or four, a search team needs to stay within voice, visual or touch contact at all times. A victim's chance of survival will be greatly diminished if a firefighter becomes lost or separated and resources are diverted to assist them.

G. Orientation:

Maintaining orientation is key to firefighter safety and successful search operations. All searches conducted by PF&R personnel shall utilize a search method that maintains orientation within the structure.
Individual members can begin to orient themselves to a structure by:

1. Performing a size-up of the structure prior to entering.

2. Understanding which floor the search team is entering on and ascending or descending to.

3. Recognizing which side of the structure has been assigned as the "alpha" side and where they are working in relation to it.

Conducting an oriented search requires at least one search team member to primarily focus on staying oriented within the structure and maintaining a constant awareness of the search team's location. This allows the other members to focus on the search operation and locating victims. Depending on occupancy type and search plan, the oriented firefighter will maintain contact with a wall, search rope, and/or hose line. As the search team moves through the structure, the oriented member will be in constant voice, visual, or touch contact with the other team members. All search team members need to work to maintain situational awareness. However, it is the oriented firefighter's primary responsibility.

The oriented firefighter must focus on the following:

1. Monitoring changing heat, smoke, and fire conditions.
2. Monitoring radio traffic and making necessary communications (B-team leader / Officer).
3. Ensuring a safe means of egress.
4. Ensuring search continuity.

VI. SEARCH TOOLS

A. The type of search, scene conditions, structure size/type, RIT scenario, etc., will dictate the types of tools necessary to meet the objectives of the search and not hinder efforts. In most cases, time is of the essence. To reach victims quickly search teams should travel light.

The following are examples of effective search tools:

1. **Search Rope**: A 150' "rings & knots" rope or the integrated search rope within the RIT bag. The search rope is primarily recommended for large

area search scenarios s. A ring and series of knots are located every 20′ on this rope, thus indicating how far into the structure the search team is located.

2. **Thermal Imaging Camera:** Referred to as a "TIC", this can be used in poor visibility to help direct search teams. Firefighters should not rely solely on the TIC for orientation, as they can fail or white out during search operations.

3. **4′ Pike Pole**: This can be used as a sweeping tool to increase a searcher's reach.

4. **Firefighter's Axe:** This can also be used as a sweeping tool, but can be used as a breeching, prying, and/or chopping tool as well.

5. **Personal Rope Bag / 20′ Rescue Webbing:** This can be extended from the oriented firefighter, the main search rope, a hose line, or used for victim removal.

6. **Entry Set**: This tool "un-married" can be split to use as two sweeping tools or for forcible entry.

These are only a few examples. Every situation is different and may require a tool not mentioned above.

VII. TYPES OF SEARCHES

A. Left / Right Hand Searches:

The basic left / right hand search orientation is the most common method of orientation utilized in single family residential structure fires. The initial size-up and overall circumstances surrounding the incident will determine whether a search team chooses to search right or left upon making entry. Regardless of which hand is chosen, it is critical that firefighters avoid inadvertently switching hands at any point during the search. An accidental or inadvertent switch of hands will disorient the search team and undermine the safety and effectiveness of the search operation.

When conducting a left /right handed search, in either a two-person or four-person search team, one member should be assigned as the oriented firefighter. This firefighter's primary responsibility is to stay oriented to the wall. If the need arises for the team to exit, it is the oriented firefighter that will lead the search team out of the structure.

B. Searching off Hose Lines / Searching with a Search Rope:

Another way for search teams to maintain orientation is to utilize search ropes or hose lines as anchor points. When a search rope is utilized, the rope is attached

to an appropriate attachment point at or near the point of entry and the rope is extended into the building via the oriented firefighter. The rope is used as a lifeline to keep the search team oriented and to lead them out when necessary. For the majority of residential occupancies, use of a search rope is not recommended. However, firefighters occasionally encounter large single family residences that necessitate the use of commercial structure search tactics.

If a search rope is utilized, the oriented firefighter will be assigned the rope bag and will function as the "trailing" search team member. This will prevent other search team members from becoming entangled in the rope. (See diagram under "Large area Searches").

A combination of search ropes and hose lines can be used when searching large areas. In these instances, the search rope is tied off to the end of a hose line and extended further into a structure.

C. Large Area Searches:

When considering a large area search scenario, command must first consider the rescue profile and overall risk vs. benefit to firefighting personnel. For example; a large warehouse involved in fire after normal business hours would likely have a diminished rescue profile and pose a higher risk to firefighting personnel. Conversely, an elementary school involved in fire during school hours would present a similar level of risk but a significantly increased rescue profile.

When faced with an open floor plan, the standard four-person search method is recommended. This method requires all search team members to be assigned a functional position.

The 4 positions are as follows:

1. Lead firefighter
2. Officer
3. Wing firefighter
4. Oriented firefighter

The position functions are as follows:

Lead firefighter:

1. Leads direction of search: Right hand or left hand
2. Works off wall

Officer:

1. Orients off of lead firefighter
2. Radio communications
3. Uses TIC
4. Monitors interior conditions
5. Maintains crew accountability

Wing firefighter:

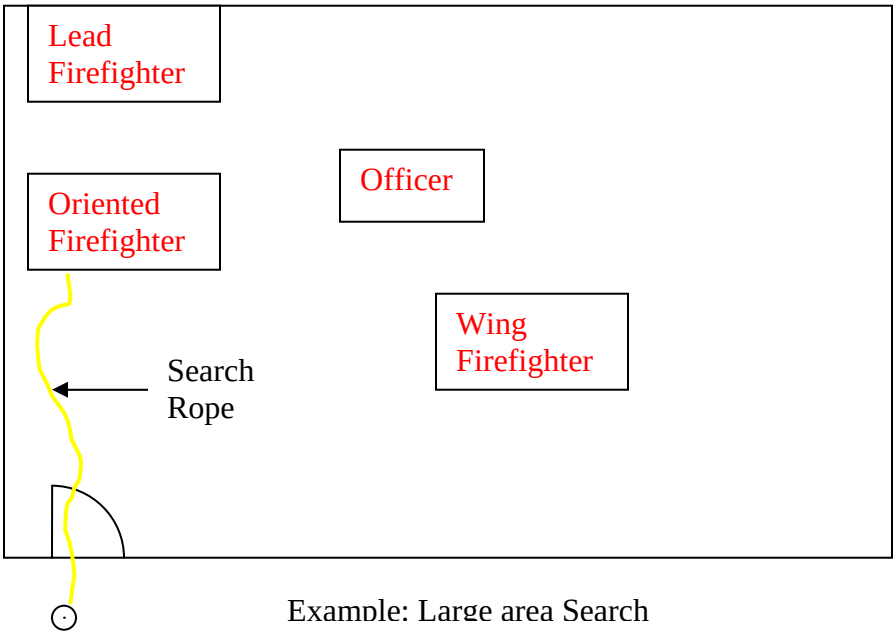
1. Orients off of the officer
2. Fans out towards middle of room
3. Maintains voice, visual or touch contact with Officer

Oriented firefighter:

1. Anchors and tends search rope
2. Remains constantly oriented
3. Follows search team (see diagram below)
4. Responsible for leading crew out

The oriented firefighter will use a properly anchored search rope or hose line and follow the team into the structure, ensuring the other members don't become entangled in the rope (See diagram below).

This technique allows the search team to "fan out" thus covering more square footage of the occupancy. A four-person search team with a search rope is recommended in a Mayday/RIT scenario due to the amount of equipment and personnel necessary for extrication. Teamwork, coordination, and discipline are critical for this technique to be successful.



Example: Large area Search

VIII. SEARCH OPERATIONS

Search operations will typically be the primary responsibility of the first due truck company. Engine companies may also be assigned to search operations. However, it's critical that the first due engine company focuses on the proper positioning of their hose line(s) to contain and extinguish the fire. This tactic is proven to save civilian lives and protect search crews working on and above the fire floor.

A. Search Priorities:

The first job of the search crew is to locate and isolate (if possible) the fire area and then initiate the search. Fire location should be communicated to the fire attack team and the incident commander. The first priority is to search the fire floor, followed by the floor above.

Most fire victims found during the primary search are located:

1. Within the area of fire origin.

2. In a path leading from the area of fire origin towards an exit.

3. In the apartment or occupancy directly above the fire.

Search teams need to further identify high priority search areas within a structure. Some examples of these types of areas are:

1. Areas indicated by occupants as the "last known location of victims".

2. Upper floors in residential structures (typical location of bedrooms).

3. Areas near points of egress.

4. Corridors likely utilized by victims attempting to escape.

5. Stairwells where victims may have tried to escape.

Fire victims can be further targeted by age:

1. Adult fire victims are commonly found in their beds or in normal paths of access / egress.

2. Teenage fire victims are commonly found in their beds, in normal paths of access / egress, or in bathrooms.

3. Child fire victims are commonly found in their cribs, under their beds, or in closets.

B. Single Family Dwellings / Garden Style Apartment Searches:

In these occupancies, the two-firefighter left or right hand search is the preferred method. It is recommended that either the officer or "B" team leader take the oriented position. When searching the fire floor ahead of the hose line, the search team, if possible, should work first to isolate the fire and notify fire attack of the location, then initiate a search for victims. If the hose line is already in position, the search team should follow it to the fire area and start their search from there.

Fire conditions and the circumstances of the incident may require firefighters to conduct search operations above the fire, exposing them to elevated risk. In these circumstances, it is important that the oriented firefighter keep track of changing fire conditions near the top of the stairs. As the search progresses, the oriented firefighter may have to move back and forth between the top of the stairs and the doorway of the room being searched to monitor fire conditions. The oriented firefighter must still maintain voice or visual contact while assessing fire conditions.

C. Center Hallway Apartment Building Searches:

When searching the fire floor of a center hallway apartment building, the focus should be directed to locating the fire room and controlling the door. This action helps prevent the spread of fire into the public hallway and buys time for the engine to properly stretch the hose line.

If the fire apartment is searched ahead of the hose line, every effort should be made to maintain door control. To keep searchers less exposed, should a window suddenly fail, the following procedure is recommended:

1. If fire and heat conditions are significant, prior to forcing the door consideration should be given to forcing a nearby apartment door to create an area of refuge.

2. Once the door has been forced and all search team members have entered the apartment to be searched, post an oriented firefighter just inside the doorway and close the door.

3. Locate and isolate the fire if possible.

4. Conduct a left or right hand search.

5. When the search is complete or fire attack is ready in the hallway, recall the search team to the oriented position and open the door.

Once the fire has been located and the door is controlled, firefighters can begin search operations working away from the fire apartment.

IX. GENERAL SEARCHING TIPS

1. When forcing an apartment entrance door, if the night latch chain is in place, it is likely victims will be present.

2. Always be alert for sounds of a trapped victim (e.g. coughing, moaning, or crying).

3. Rely on left /right hand search fundamentals, search ropes, and hose lines to keep oriented.

4. Make a mental note of the floor plan and landmarks during the search (windows, doors, large furniture, doorways, etc.).

5. Try to avoid moving furniture, as it may hide a victim or block a doorway to an adjoining room.

6. Check the areas between the bed and the wall, and between two beds pushed together.

7. Look under beds and behind furniture for trapped victims.

8. To find out whether there is a victim under a bed, probe with an arm, tool, or insert a leg under it and sweep gently back and forth.

9. Sweep beds and couches from front to back. If a person is found on a bed, give an extra sweep, as there may be more than one person.

10. Check all rooms, closets and bathrooms thoroughly.

11. When searching a bathroom firefighters must be sure to check the bathtub for victims.

12. A locked bathroom door is usually an indication that someone is inside.

13. Ensure all interior walls of a closet are touched when searching the closet floor to reach the back of the closet. Many times children will hide from the fire deep inside closets or in a toy chest.

14. When a victim has been located, conduct a quick search of the area around and under the victim, Parents often attempt to shelter children with their bodies and adult victims will often attempt to escape together.

15. Narrow tapered furniture legs (with wheels) often indicate a crib.

16. Thoroughly search all piles of clothes, draperies, or bed linens. The removal and dropping of window draperies may have covered a victim.

17. Ambulatory victims, those that can assist themselves in their own removal, may hesitate or want to return for valuables, pets, etc. Members must be firm and direct these victims to a place of safety before returning to complete the search. Command should be notified of any ambulatory victims that are evacuated from the IDLH area.

X. ATTACHMENT

A. Attachment #1 – Vent-Enter-Isolate-Search (VEIS)

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Tools and Equipment

This section is intended to give assistance in recognizing or identifying tools and equipment used in the fire service and to denote the proper nomenclature of such tools and equipment. In addition to being well versed in the **T**ool, **U**se, **M**aintenance and **S**afety, firefighters shall know the location of all tools and equipment carried on the apparatus or in the station to which they are assigned.

The care and maintenance of tools is important. Metal tools should be kept free of rust and may be lightly oiled or painted, depending on the finish of the metal and use of the tool. Cutting edges of tools should be kept sharpened and lightly oiled. Those implements with working parts should be clean and well lubricated to allow free movement. Wooden handled tools must be sanded smooth to eliminate slivers, and finished with an approved coating. Wooden handled tools may be finished with boiled linseed oil or given two coats of a water-resistant varnish.

This section is separated into the following categories with a brief description of the tool and its use. Following these sections is a list of tool talks in alphabetical order.

- ♦ Sundry Supplies
- ♦ Hand Tools
- ♦ Hose Connections
- ♦ Portable Extinguishers
- ♦ Power Tools
- ♦ Miscellaneous Tools & Equipment
- ♦ Tool Talks

Sundry Supplies

There are numerous items carried on most fire apparatus, which are by their nature and use, considered as expendable. These supplies are largely common commercial commodities. They are obtainable from Portland Fire & Rescue's Logistics Section through a system of requisitioning or are purchased on the open market. The expendable nature of such supplies requires each station to stock an adequate amount for day to day use.

The supplies involved are so common to everyday use that recognition is assumed. Consequently, illustrations and tool talks of some of these items will not be presented.

BROOMS Brooms are utilized in salvage and overhaul work. Those that are best for this work are the warehouse type corn brooms. Although they are expendable, rinsing with water after each use will prolong their usefulness. Cleaning and drying is necessary before replacing them on the apparatus.

CHAMOIS Chamois skins are used in salvage work for wiping moisture from finished woods of furniture, counter tops and similar surfaces. They are also used to wipe down apparatus after they have been washed. Proper cleaning involves washing with soap and lukewarm water. Wring it out and stretch it to be dried at normal room temperature.

CHEMICAL LIGHT STICK Chemical lights may be used to draw attention to such things as ladder tips, standpipes, hydrants, doorways, marking equipment, a hazardous condition, etc. They are a tool to use in places where a Fusee would not be practical.

DUCT TAPE Duct tape has many uses. It has very good adhesive qualities that can aid in temporary repairs, salvage practices, etc.

FILES Files are used as an aid to maintain equipment in good repair. A double tapered, 7 inch, 3 corner file is used for filing fire hose coupling threads, and a mill bastard file is used for tool and equipment maintenance. Both files are carried on the apparatus.

FLARE/FUSEE These attention-getting devices, not attached to the apparatus, may be classified as accident prevention items. They should be utilized when there is a need for additional warning signals, such as during a highway emergency or marking a landing zone. The most common Fusee lasts about 30 minutes.

LATH During salvage operations, lath may be utilized in the temporary repair of openings in order to protect them from the elements. Visqueen can be held in place over an opening by utilizing lath nailed over the edges of the Visqueen.

MOPS The principal use of mops is the picking up of water from floors during salvage operations. Timely and appropriate use of the mop can be a strong factor in good public relations. After their use, mops should be cleaned with soap and water, bleached, and dried before replacing on the apparatus.

NAILS Nails are useful in the various salvage tasks such as fastening lath and Visqueen around an opening. They come in various sizes and are carried in the salvage belt.

SEALANTS When the need arises to stop a leak where a wood plug would not do the job, sealants are used. Two such sealants are "Dux Seal and "Plug N Dike". Both sealants are multi-purpose sealing and caulking compounds with adhesion and shape retention. These products will seal water, air, liquid fuels, fumes and some chemicals. Depending on the circumstances one product may work better than the other.

VISQUEEN Visqueen (polyethylene sheeting) has many uses in salvage work. It is used to cover openings, divert or contain water, protect items from damage caused by fire or firefighters in the performance of their duties. It has taken the place of salvage covers in cases where an inexpensive covering can be left at the scene.

WEDGES Wooden door wedges are carried by all firefighters in their turnout gear. They are used to block doors open during firefighting operations.

WOOD PLUGS Wood plugs are normally used for plugging ruptured pipes. Plugs are constructed from softwood, and come in various lengths and diameters.

Hand Tools

The following listing of hand tools involves those implements and devices of a more permanent nature. Care will be taken to maintain these items in proper working order.

AXES The pickhead axe was developed and is manufactured exclusively for fire fighting. It is used for forcible entry, ventilation, and overhaul work. The head of the pickhead axe has a blade, a peen, and a flat surface. Two sizes are preferred; the 4½ lb. head, which is usually carried in an axe belt, and the 6 lb. head, which is usually mounted on the apparatus. Fiberglass axe handles come in various lengths. The 4½ lb. head can have a handle length of 26" to 30". The 6 lb. head usually has a 36" handle. Flathead axes are also carried on apparatus. The flat side is used like a sledgehammer to strike other tools, such as the Halligan tool or the flat surface of another axe.

BAR, CROW This tool resembles a straight bar at one end and has a hook-like end on the other. It comes in various lengths and is used in similar applications as the wrecking bar.

BAR, HUX The Hux bar is utilized in situations requiring a prying or leverage action. However, its design makes it a more versatile tool than the crow bar.

BAR, WRECKING This straight bar has a point on one end and a flattened end on the other. The principle application of this bar is in situations requiring a prying or leverage action. Forcible entry and rescue work are the most common practical applications.

BELT, SALVAGE The salvage belt, as the name implies, is used for salvage work, most generally to secure cover protection over roof or window openings. It is provided with a shingling hatchet, hammer-stapler, a knife, and two pouches containing nails.

CUTTER, BOLT The bolt cutter is a scissors-like tool with hardened steel jaws; the leverage being provided by the handles. Bolt cutters are useful in forcible entry work. Padlocks, metal fencing, heavy wire screen, and small bars of metal gratings are typical items that bolt cutters may be used on.

CUTTER, WIRE The wire cutter is designed for the cutting of non-energized electrical lines. The hooks on the end of the cutter provide a means of grasping the wire to control it. The handles must be properly insulated and kept clean.

DOOR OPENER, PORTLAND This tool is an adz-type tool, having a blade set at a right angle to the handle and opposite this blade, a flat end that may be struck to drive the blade. The handle end is also in the form of a blade. The principle use of this tool is in forcible entry. It is used by driving the blade into the object and then pull or push with the tool in a prying action.

HALLIGAN TOOL (with axe) This tool, like the Portland Door Opener, is a multi-purpose forcible entry tool. The halligan tool is carried with a flathead axe and together is referred to as the “Entry Set”.

HOOK, CARGO Cargo hooks, or hay hooks, are useful in handling baled goods and wooden crates which must be removed from a fire or for salvage purposes. These hooks are also of great use in tearing open burned mattresses and overstuffed furniture for overhaul. The lifting of sewer inspection covers or metal covers over various types of valves located in streets are another use.

HOOK, RUBBISH The rubbish hook has a 'D' handle, fiberglass pole and a heavy metal fork on the end. It comes in various lengths and is used for overhaul work. It can also be used for "sounding" roof integrity.

PICKAROON This tool has a lightweight curved pick head about 7" in overall length with an axe type handle. It has been adopted because of its value in overhauling lumber pile fires and in removing some types of roofing.

PIKE POLE This tool has a wooden or fiberglass pole, some with a “D” handle, and a metal head having a strong spike and hook combination. The length of pike poles may vary from 3' to 16'. Pike poles have many uses but generally are utilized in ventilation and overhaul work.

SHOVELS These hand tools come in various sizes and configurations. More common configurations are the round point, square point and scoop. Handles may be long or short and made from wood or fiberglass. Short handled shovels may be equipped with a “D” handle.

SPANNERS This wrench has a jaw or socket to fit a nut, the head of a bolt, a pipe, a cap or hose coupling. It may also have a pin in its jaw to fit a hole or slot in an object. It is mainly used by firefighters on fire hydrants, fire hose couplings and fire department connections to fire protection systems. This tool is manufactured in a variety of shapes and sizes. Spanners currently used are the pocket, booster, hydrant, adjustable and foam bucket.

SQUEEGEE A blade of rubber on a metal backing to which a handle is attached. It is used to push water on floors as a part of a salvage operation.

TUBS This two handled, galvanized tub is used primarily for removing debris during overhaul operation. It can also be used to contain water from broken pipes or after fire suppression operations.

WATER SCOOP The water scoop is a modified scoop shovel having about half of its top area covered by a metal hood. Such modification makes the scoop shovel more efficient for picking up or moving water during salvage operations.

NOTES

Hose & Hose Connections

Hose Connections include those devices that are used in conjunction with hose layouts and in the production of hose streams. The devices presented are Connections, Master Stream Devices, and Nozzles.

CONNECTIONS

It is necessary to have the means to connect hose lines, connect nozzles, or control the flow of water in hose lines regardless of how the couplings come together. This is accomplished by one of the following connections.

ADAPTERS At times, adapters may be necessary to couple our fire hose to various non-standard outlets or hydrants. The adapters normally carried are for 1½" connections and hydrant steamer ports.

DOUBLE CONNECTIONS These are used whenever it becomes necessary to connect two female or two male couplings together. All of our engines carry double male and double female connections in both 1½" and 2½" sizes.

EDUCTOR, FOAM Foam eductors are used in conjunction with a foam nozzle or fog nozzle. The foam eductor extracts foam concentrate from 5 gallon buckets to the nozzle, at a desired percentage. The foam eductor has 1½" or 2½" connections and must be thoroughly cleaned after each use.

FIVE INCH HOSE CONNECTIONS Five inch hose and specific connections are generally carried by outlying engine companies.

GATE, CHAPMAN The Chapman gate takes several turns of the handle to operate. This is an advantage when precise control of water flow is important. The primary use of these gates is during the annual hose test.

GATE, MORSE The Morse (ball-type valve) gate is the most prevalent gate used by PF&R. It needs only a quarter turn to open and close.

GATED WYE This device is used to divide a single line into two or more lines. The most common wye is used to reduce a large line, usually a 2½", into two smaller 1¾" lines. The outlets on wyes are normally equipped with ball valve gates.

REDUCERS These connections are used to connect two different sizes of hose or fittings. The most common is the bell reducer that has 2½" female threads and 1½" male threads. Another common reducer is used to connect a hydrant steamer port to 2½" hose. Reducers can also be reversed to increase the size from 1½" to 2½".

SIAMESE Siamese are used to supply one large line by two or more smaller lines. These connections are usually equipped with clapper valves to prevent loss of water from a disconnected line. One use of siamese connections is in supplying lines to ladder pipes.

MASTER STREAM DEVICES

Master stream devices are nozzles capable of delivering water in quantities greater than what could be controlled by firefighters without mechanical aid. The two basic categories of master stream devices are portable and permanently mounted. The method used to supply these devices usually depends upon how they are mounted. Portable devices can be supplied by hose lines or preplumbed from the pump, while those that are permanently mounted are connected to built-in piping systems.

LADDER PIPE Ladder pipes are intended to be clamped to the top rungs of an aerial ladder for use any time that an elevated stream is desired. Either a 3" line laid up the center of the aerial ladder or pre-plumbed system supplies them.

MONITOR Monitors are sometimes referred to as Deck Pipes. They are permanently mounted turrets, usually with gear operation for horizontal and vertical motion. Monitors are mounted on the fireboats.

TURRET, PORTABLE These devices are intended for producing large streams from any point on the fireground. Portable turrets may also be operated from their deckmounted position on the apparatus in order to be quickly placed in service or to gain some height advantage. When operated from the ground they usually require at least two 3" supply lines.

NOZZLES

There is considerable history behind the development of modern fire service nozzles. Research and experimentation continually brings improvement to the production of hose streams. Nozzles currently in service vary in size and design.

APPLICATOR The term applicator refers to a device that is attachable to 1¾" nozzles or a booster hose for the purpose of applying hose streams beyond the accessibility of the firefighter. Applicators are constructed of metal tubing and vary in size and length. The ends are tooled to accommodate being connected to a nozzle, and a tip (spud) which is pierced with a number of holes to provide a spray stream.

DISTRIBUTOR, ACKWOOD The Ackwood distributor is constructed of 1½" brass tubing approximately 3 feet in length and is equipped with an 1½" female connection. When properly supplied from a 2½" line, it will deliver approximately 460 GPM at 100 PSI nozzle pressure. This distributor requires a two inch hole for insertion and will cover an area of approximately thirty feet.

DISTRIBUTOR, BRESNAN The Bresnan distributor is a circulating nozzle equipped with a 2½" female connection. It can be lowered through an eight inch hole, and with 80 PSI nozzle pressure will produce approximately 250 GPM. It will also cover an area of approximately thirty feet in diameter.

FOAM NOZZLE A nozzle specifically designed to generate foam. This nozzle is used in conjunction with a foam eductor to produce the desired percentage of foam. Although fog nozzles can be used to generate foam, foam nozzles, when used properly, will produce a much better product.

FOG NOZZLE Fog nozzles are available in a variety of sizes, shapes and types. Fog nozzles can be adjusted from a wide fog pattern to a straight stream. In addition, fog tips are available for operation on ladder pipes, portable turrets and monitors.

PIERCING NOZZLE This nozzle is designed to be driven through walls by striking the blunt end. The tip is in the shape of a wedge and can be driven through ordinary constructed walls, cinder block walls, and roofing. It has a 1½" female connection. The water discharges from holes drilled in the tube just behind the wedge-like tip.

SMOOTH BORE NOZZLE Smooth bore nozzles produce streams that are powerful and have a long reach. These nozzles are normally carried in 1½" and 2½" sizes. Smooth bores are available for use on ladder pipes, turrets, monitors and hand lines. Smooth bore nozzles can be stacked to allow for varying the size of the tip or to extend a hose line from the nozzle.

Power Tools

There are many occasions when firefighters benefit by utilizing power driven equipment. The power furnished for this equipment is from electric motors, compressed air, or internal combustion engines. For these units to be capable of providing their intended function, it is necessary to provide proper care, maintenance and to be knowledgeable in their use.

It is recommended that during the weekly check, internal combustion engines be run for a short period of time, and then checked for fuel, oil level and any malfunction.

AIR CHISEL This tool is most often used for vehicle extrication when sheet metal needs to be removed for access to patients inside a vehicle. The Air Chisel's regulator is attached to a common S.C.B.A. bottle and the pressure set according to the type of bit used.

CHAIN SAW The chain saw is primarily used for ventilation and wildland fire operations. It consists of a 20" cutting bar, carbide tipped cutting chain, and is powered by a two (2) stroke engine that runs on mixed fuel.

ELECTRIC FAN The standard electric fan is used for ventilation operations either in a negative or positive pressure mode. The fan is equipped with hooks for hanging the unit above ground, an extension cord and a 1/3 horsepower motor that can be operated from any 110-volt power source. The SuperVac P-164SE used by PF&R moves approximately 3200 to 5200 cfm depending upon placement. Some larger fans will typically move up to 9500 cubic feet of air a minute.

FLOATING PUMP The floating pump is used to supply water from ponds, rivers, swimming pools, etc., when normal hydrant supplies are inaccessible or not available. It is powered by an eight (8) horsepower, two (2) cycle engine and will supply one 1¾” line with sufficient pressure for exposure protection only.

GAS FAN The gas fan is used for positive pressure ventilation operations. It is powered by a 5.5 horsepower, four stroke engine that runs on unleaded gas. This fan can be expected to move up to 14,885 cubic feet of air each minute (CFM).

GENERATOR The electrical generators used in the fire service are capable of supplying emergency electrical energy. These units are often used in firefighting activities to provide electrical energy where none is available. Some are driven by aircooled, governor throttled engines, generally of the four (4) cycle variety, either gas or diesel. Newer generators run using an apparatus PTO. Power output of most of our generators is 110-volt, A-C with a power range of 1,500 to 7,500 watts.

HOLMATRO TOOL The Hurst Tool, also known as the "Jaws of Life", is primarily used in extrication operations. The name refers to one general application although there are several devices involved including the "spreader", the "cutter", and the "ram". The Holmatro Tool can be powered either by a gasoline engine or in some cases by 110-volt electrical energy supply.

ROTARY SAW The rotary saw is a circular cutting device. It is used for forcible entry and ventilation operations when it is necessary to cut through metal or other hard materials. It consists of an extension frame, spindle and pulley, vee-belt, centrifugal clutch and drive pulley that are powered by an air-cooled, hand-throttled engine of approximately six (6) horsepower. An assortment of twelve (12) inch cutting blades is available for cutting through wood, masonry, and metal.

SAWZALL The Sawzall is a reciprocating saw used for extrication, ventilation, and other cutting operations. It operates off of a 110-volt power supply and comes with a variety of blades for cutting through different materials.

WATER VACUUM A device used to remove water during salvage operations. It consists of a backpack type harness, 110-volt electric motor, and a holding tank with a capacity of approximately five to six gallons.

NOTES

Portable Extinguishers

All Portland Fire & Rescue apparatus carry portable fire extinguishers. The appropriate choice of portable fire extinguisher used for a fire attack depends upon the type and quantity of material that needs to be extinguished. It is important that all firefighters be knowledgeable in the different types, classes, correct usage, maintenance, and safety of these extinguishers.

Fires are classified into five (5) classes. They are described below:

Class A – Ordinary Combustibles – Green Triangle Class A fires are fires that involve ordinary combustible materials such as cloth, wood, paper, rubber, and many plastics.

Class B – Flammable Liquids – Red Square Class B fires are fires that involve flammable and combustible liquids such as gasoline, alcohol, diesel oil, oil-based paints, lacquers, etc., and flammable gases.

Class C – Electrical Equipment – Blue Circle
Class C fires are fires that involve energized electrical equipment.

Class D – Combustible Metals – Yellow Star
Class D fires are fires that involve combustible metals such as magnesium, titanium and sodium.

Class K
Class K fires are fires that involve vegetable oils, animal oils, or fats in cooking appliances. This is for commercial kitchens, including those found in restaurants, cafeterias, and caterers.

PASS is an acronym that is used for the proper operation of an extinguisher. The four steps are; **P**ull the pin, **A**im the nozzle, **S**queeze the handle, **S**weep the base of the fire.

Miscellaneous Tools & Equipment

Listed below are a few of the many tools and equipment that Portland Fire & Rescue apparatus carry that are not listed in the previous categories.

BACKBOARD: A specially built wooden or molded plastic board with cut out handholds and straps attached. Used for assistance in first aid procedures and rescue operations.

BLANKET, FIBERGLASS: A fire containment blanket that is used to remove burning mattresses, bedding, upholstered furniture, etc., from a building without spreading smoldering debris. It is 9' X 12' in size and has handles and strapping sewn into it. Care of this blanket can be summed up in one word, GENTLE! It should be swept gently to remove particles.

CHAFING PADS: A pad that is utilized to prevent damage to vibrating fire hose at points where it touches the ground near the pump. Chafing pads can be made from a section of tire equipped with strap and buckle to hold it to the hose.

EXTENSION CORDS: Extension cords are used to bring electrical power from a remote source to the power tool. The most common extension cord is found on a reel, mounted on truck apparatus with 100' to 150' of cord.

FLOOR RUNNER: A floor runner is a scrap piece of tarp that is used to cover and protect flooring during overhaul and salvage operations.

HOSE CLAMP: Hose clamps are used in conjunction with many hose evolutions. The hose clamp resembles a large pipe vise. The jaws or compression pieces are straight bars and will accommodate 3" fire hose. The clamp is hinged and has a spring snap lock on the opposite side making it easy to open and close quickly.

KEY, GAS AND WATER: This combination key will fulfill the functions of a gas shutoff key and a water shutoff key. The key is constructed from heavy metal and has a "T"

handle. It breaks down into two pieces, each piece having an end to either accommodate a gas or water shutoff valve, domestic or commercial fittings.

LADDER BLOCK: Whenever ladders are placed on uneven ground, these wedge shaped blocks may be placed under a ladder stirrup for stabilization.

LIFE JACKET: The life jacket is a flotation device worn when working around water. It is generally worn on the inside of the turnout coat.

LIGHT, PORTABLE: Most fire apparatus carry an assortment of electrical adapters, extension cords and lights that are used in firefighting activities. This lighting equipment is dependent on electrical power from the fire building, from a portable generator or from the battery powered outlets mounted on the apparatus.

PIGTAIL: A pigtail is a term used to describe a device that plugs into the end of an extension cord to provide two or more receptacles. This device is often found at the end of an extension cord on the cord reel mounted on trucks.

SALVAGE COVER: Salvage covers carried on PF&R apparatus are 12' x 18' in size with grommets spaced every 16” around the edges. They are primarily used for salvage and overhaul work. Care should be taken to clean and refold the salvage cover after each use. Firefighters are encouraged to use Visqueen whenever possible due to the expense of replacing salvage covers.

SPRINKLER KIT: The sprinkler kit is composed of an assortment of sprinkler heads, stops and wrenches which are utilized in salvage operations.

UTILITY STRAP: The utility strap is carried as part of the turnout uniform. The utility strap, sometimes referred to as a hose strap, has many uses, one of which is in controlling handlines.

NOTES

Tool Talk Information

Tool Talk Organization
The following is an outline of commonly used tools, nozzles, and appliances. They are organized in the TUMS format. Listed below describes the TUMS format and outlines aspects that apply to nearly all of the various tools. Apply appropriately to the tool being considered. This list of tool talks is not a complete list of tools carried on apparatus. Each firefighter is responsible for knowing how to use and maintain every tool carried on the apparatus they are assigned.

Tool:

- A brief summarization of the tool and its components

Use:

- A summarization of the uses, advantages, disadvantages, utilization procedures, specifications, and suggestions for the tool

Maintenance:

- Check for damage
- Keep clean, in good condition, and free of debris
- Keep free of rust with -00- steel wool; apply a protective coating of oil or paint
- Polish if necessary
- Paint as needed
- Keep wood surfaces splinter free, sanded, and coated with boiled linseed oil
- Keep well marked with company or apparatus number
- For any repairs or replacement parts, initiate a form 500.36 to logistics

Safety:

- Wear full PPE, which may include SCBA, eye and ear protection, and BSI
- Work with a partner
- Use clear and concise communication
- Tool is in good working order
- Be aware of your immediate surroundings for hazards and people
- Use good lifting techniques
- Use caution when carrying the tool as to not hurt yourself or others

Helpful Hints:

1. Describe the tool
2. Some tools have common uses (i.e., ventilation, overhaul)
3. Explain daily, weekly and monthly checks and maintenance where applicable
4. Safety considerations will be the same in most cases (i.e., PPE, gloves) 5. Keep the tool talks short and to the point, but be thorough
6. Know the tool.
7. Be able to answer questions about the tool

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TAC TOOL TALKS

ENTRY SET

Tool:
Multipurpose, forcible entry tool set consisting of the Halligan carried in marriage with the flathead axe.

- Flathead Axe- Consists of the blade, the flat surface, and the fiberglass handle. Comes in 6 and 8 pound sizes.
- The Halligan has a forked prying end a peen and an “Adz” which means that the working end is at a 90’ angle to the handle.

Use:

- Halligan- Generally used for forcible entry and as a prying tool (windows, doors, etc.) Can be used to break windows or locking mechanisms. Generally used in conjunction with a flathead axe.
- Flathead Axe- The flat side is used like a sledgehammer to strike the halligan or other tool. It can also be used for ventilation.

Maintenance:

- Wash with mild detergent and water.
- Metal should be kept free of rust.
- Use a file to sharpen the blade and take off any burrs or nicks.
- Head of axe should be checked for tightness.
- Check handle for damage.
- Don’t paint metal because it can hide damage.
- Ensure the Halligan is properly marked with visual depth indicator marks:
  - At the crotch of the forks.
  - 1 ¾” from the tip of the adz.
- Ensure shoulder of the forked end is squared for striking.

Safety:

- Always make sure the tool is in good condition. Don’t use a tool if the head is loose.
- Wear full PPE when using the tool (especially eye protection).
- Carry in a safe manner.
- Ensure the peen and Adz of Halligan are facing down when setting on ground.
- Sparks from striking could become an ignition source.
- Be aware of your surroundings when swinging or striking another tool, and be careful not to strike your partner’s hands.

Carbon Dioxide Extinguishers

Tools:
- Cylinder
- Hose w/ nozzle and fog horn
- Handle w/ squeeze trigger
- Safety pin / safety seal
- Maintenance tag
- CO2 stored as a compressed gas under its OWN pressure

Use:
- Extinguishes B & C fires
- Extinguishes by displacing oxygen and smothering the fire
- Has a reach approx. 3 – 8 ft
- **Size and rating varies, check label on extinguisher! Some older extinguishers aren't marked with ratings.**
- Use acronym PASS to discharge starting at a near corner and progress forward:
  1. Pull pin
  2. Aim nozzle
  3. Squeeze trigger
  4. Sweep

Maintenance:
- Check condition of hose and nozzle.
- Check safety pin/seal to ensure they are intact.
- Ensure 'PFB' marking is clearly visible and in place.
- Check maintenance tag to ensure it has not expired (1 year from service date).
- Tag, submit Work & Supply request, and send to Logistics for recharging or maintenance.

Safety:
- Wear full PPE (Especially gloves to prevent frostbite)
- Use the buddy system.
- Be cautious of re-ignition.
- Approach uphill/upwind if possible.
- Use appropriate extinguisher for the job.

Dry Chemical Extinguisher

Tool:

- Two types: regular BC and multipurpose ABC
- Pressurized with nitrogen or CO2
- Components:
  - Cylinder
  - Pressure gauge
  - Safety pin/safety seal
  - Hose w/ nozzle
  - Handle w/ squeeze trigger
  - Maintenance tag

Use:

- Can extinguish ABC fires
- Extinguish by interrupting chemical chain reaction.
- **Size and rating varies, check label on extinguisher!**
- Reach of 5 – 20 feet
- Use acronym PASS to discharge starting at a near edge and progressing forward:
  1. Pull pin
  2. Aim nozzle
  3. Squeeze trigger
  4. Sweep

Maintenance:

- Check cylinder for external damage/corrosion
- Check gauge: should be in “green”. High or low pressure indicates service is needed.
- Check condition of nozzle/hose
- Check safety pin/safety seal are intact
- Check condition of squeeze trigger
- Check maintenance tag to ensure it has not expired (1 year from service date)
- Invert /shake extinguisher once a month to prevent caking
- Ensure ‘PFB’ marking is clearly visible and in place
- Tag, submit Work & Supply request, and send to Logistics for recharging or maintenance.

Safety:

- Wear Full PPE
- Use the buddy system.
- Be cautious of re-ignition.
- Approach uphill/upwind if possible.
- Use appropriate extinguisher for the job.

Water Extinguisher

Tool:

- Components:
  - Cylinder
  - Pressure gauge
  - Safety pin/safety seal
  - Hose w/ nozzle
  - Handle w/ squeeze trigger
- Rating of 2A with 2 ½ gallons pressurized to 100psi

Use:

- Extinguishes Class A fires only!
- Extinguishes by cooling
- Discharge in straight stream or semi fog
- Reach of 20-30ft
- Check rating on extinguisher to verify rating.
- Use acronym PASS to discharge
  1. Pull pin
  2. Aim nozzle
  3. Squeeze trigger
  4. Sweep

Maintenance:

- Check cylinder for external damage/corrosion
- Check condition of hose and nozzle
- Check safety pin/safety seal to ensure they are intact
- Check condition of squeeze trigger
- 1st empty, then fill w/ 2 ½ gallons of water (do not overfill), add 2 tbsp Silvex, replace top and hand tighten, pressurize to 100psi.
- Marked with engine/truck # (frontline) or apparatus# (reserve)

Safety:

- Wear Full PPE
- Use the buddy system.
- Be cautious of reignition.
- Approach uphill/upwind if possible.
- Use appropriate extinguisher for the job.

Fire Axe

Tool:

- Developed exclusively for fire fighting.
- 4 ½ lbs and 6 lbs.
- Metal blade and peen (base of peen-flat surface for striking.)
- Blade effectiveness depends on proper usage not sharpness.
- Handle:
  - Wood: thick at shoulder and thin at grip. Sanded and coat of boiled linseed oil.
  - Fiberglass: requires less care and maintenance. Seldom splinters or cracks. Do not sand handle. Won't absorb moisture or dry rot or warp.

Use:

- Multi use tool primarily used for forcible entry, ventilation, and overhaul, .

Maintenance:

- Keep clean of rust & light coat of oil.
- A keen edge is not necessary, if too sharp/thin pieces can break out when using. Prefer filing vs grinding to prevent ruining the temper.
- Check for cracks in handle, and ensure the head is on tight.
- After use
  - Clean with soapy water, rinse, and dry.
  - Sand if wood handle is burned.
  - Remove burred or sharp edges (flat bastard file).

Safety:

- Keep the head close to the body to prevent injury.
- Never carry over shoulder.
- Short swings.
- Cut at an angle – never in line with body.
- Always check for obstructions when swinging.
- Wear proper PPE.

2½” Smooth Bore Stacked Tip Nozzles

Tool:

- 2 ½”-2 ½” National Hose Thread (NH) bale with 1 ¼” and 1 1/8” smooth bore tips attached.
- 1 1/8” tip flow of 260 GPM at 50 PSI nozzle pressure.
- 1 ¼” tip flow of 330 GPM at 50 PSI nozzle pressure.

Use:

- Placed on all PF&R pre-connected 2 ½” hose lines.

Maintenance:

Daily

- Check that correct nozzles are placed on the correct hose lines.
- There are two 1 1/8” tips at PF&R. The shorter of the two should be on this nozzle.
- Ensure bale and nozzles are marked appropriately.
- Check for yellow tape indicating 1 1/8” nozzle.

Weekly

- Wash with mild soap and water and rinse with clean water.
- Check for smooth operation of bale and swivel.

Monthly

- Check gaskets for hardening or cracking.

After each use

- Perform all checks listed above.

If any parts are missing, nozzle components perform improperly or nozzle leaks during operation send nozzle to logistics for repair.

Safety:

For maximum flow and highest quality fire stream flow nozzle with bale fully opened.

Before Entering IDLH

- Select appropriate nozzle for desired application.
- Always flow nozzles with bale fully opened in a safe area outside the IDLH to ensure proper pressure.
- Remove kinks in hose line.

Akron Assault 4814 Fog Nozzle

Tool:
- 1 ½" National Hose Thread (NH) constant gallonage fog Nozzle.
- Flow of 150 GPM at 75 PSI nozzle pressure.

Use:
- Attached to Akron 1 ½"-1 ½" bale with 15/16" smooth bore plug tip.
- Placed on all PF&R pre-connected 1 ¾" hose lines.
- Spinning tip to the left widens fog pattern. Full left position opens nozzle to "flush" feature.
- Spinning tip to the right narrows fog. Full right position is a straight stream.

Maintenance:

Daily
- Check that correct nozzles are placed on the correct hose lines.
- There are 2 old nozzles that can be easily mistaken for this one. One is the 4817 that has a shut off feature when the nozzle is spun to the full right position. The other is a 125 GPM version. Both of these nozzles should be removed from front line and reserve apparatus.
- Check that no turbine teeth are missing and that they spin freely.
- Ensure nozzle is marked appropriately.

Weekly
- Wash with mild soap and water and rinse with clean water.
- Check for smooth operation of bale, swivel and nozzle.

Monthly
- Remove nozzle and check for debris.
- Check gasket for hardening or cracking.

After each use
- Perform all checks listed above.

If any parts are missing, nozzle components perform improperly or nozzle leaks during operation send nozzle to logistics for repair.

Safety:

For maximum flow and highest quality fire stream flow nozzle with bale fully opened.

Before Entering IDLH
- Select appropriate nozzle for desired application.
- Always flow nozzles with bale fully opened in a safe area outside the IDLH to ensure proper pressure.
- Remove kinks in hose line.
- Turn nozzle to "flush" to remove debris and set desired stream pattern.

Akron Assault 4824 Fog Nozzle

Tool:

- 2 ½”-2 ½” National Hose Thread (NH) bale with 1 ½” NH Thread reducer/ 1 ¼” smooth bore nozzle attached.
- 1 ½” NH Thread constant gallonage fog nozzle.
- Flow of 250 GPM at 75 PSI nozzle pressure.

Use:

- Placed on PF&R stretch bed.
- Spinning tip to the left widens fog pattern. Full left position opens nozzle to “flush” feature.
- Spinning tip to the right narrows fog. Full right position is a straight stream.

Maintenance:

Daily

- Check that correct nozzles are placed on the correct hose lines.
- Check that no turbine teeth are missing and that they spin freely.
- Ensure nozzle is marked appropriately.

Weekly

- Wash with mild soap and water and rinse with clean water.
- Check for smooth operation of bale, swivel and nozzle.

Monthly

- Remove nozzle and check for debris.
- Check gasket for hardening or cracking.

After each use

- Perform all checks listed above.

If any parts are missing, nozzle components perform improperly or nozzle leaks during operation send nozzle to logistics for repair.

Safety:

For maximum flow and highest quality fire stream flow nozzle with bale fully opened.

Before Entering IDLH

- Select appropriate nozzle for desired application.
- Always flow nozzles with bale fully opened in a safe area outside the IDLH to ensure proper pressure.
- Remove kinks in hose line.
- Turn nozzle to “flush” to remove debris and set desired stream pattern.

Akron 1 ½” Bale With 15/16” Plug Nozzle

Tool:

- 1 ½”-1 ½” National Hose Thread (NH) bale with integrated 15/16” smooth bore nozzle.
- Flow of 185 GPM at 50 PSI nozzle pressure.

Use:

- Placed on all PF&R pre-connected 1 ¾” hose lines with Akron 4814 fog nozzle attached.

Maintenance:

Daily

- Check that correct nozzles are placed on the correct hose lines.
- Older PF&R 1 ½” bale look very similar, but should be removed. The ones that should be removed can be identified visually by the absence of the smooth shank in front of the bale on the male side, as well as the absence of the 15/16” orifice when the fog nozzle is removed.
- Ensure nozzle is marked appropriately.

Weekly

- Wash with mild soap and water and rinse with clean water.
- Check for smooth operation of bale and swivel.

Monthly

- Check gasket for hardening or cracking.

After each use

- Perform all checks listed above.

If any parts are missing, nozzle components perform improperly or nozzle leaks during operation send nozzle to logistics for repair.

Safety:

For maximum flow and highest quality fire stream flow nozzle with bale fully opened.

Before Entering IDLH

- Select appropriate nozzle for desired application.
- Always flow nozzles with bale fully opened in a safe area outside the IDLH to ensure proper pressure.
- Remove kinks in hose line.

Bulk Load Nozzle - 7/8” Smooth Bore

Tool:

- 1 ½”-1 ½” National Hose Thread (NH) bale with 7” long 7/8” smooth bore.
- Flow of 160 GPM at 50 PSI nozzle pressure.

Use:

- Placed on all PF&R bulk load hose lines.

Maintenance:

Daily

- Check that correct nozzles are placed on the correct hose lines.
- Ensure bale and nozzles are marked appropriately.
- Check for red tape indicating 7/8” nozzle.

Weekly

- Wash with mild soap and water and rinse with clean water.
- Check for smooth operation of bale and swivel.

Monthly

- Check gaskets for hardening or cracking.

After each use

- Perform all checks listed above.

If any parts are missing, nozzle components perform improperly or nozzle leaks during operation send nozzle to logistics for repair.

Safety:

For maximum flow and highest quality fire stream flow nozzle with bale fully opened.

Before Entering IDLH

- Select appropriate nozzle for desired application.
- Always flow nozzles with bale fully opened in a safe area outside the IDLH to ensure proper pressure.
- Remove kinks in hose line.

High-Rise Bundle Nozzle

Tool:

- Flow of 260 GPM at 50 PSI nozzle pressure.
- 2 ½”-1 ½” National Hose Thread (NH) bale used with 5” long 1 1/8” smooth bore nozzle.

Use:

- Placed on one high-rise bundle on all PF&R engines.
- Reducer integrated in bale reduces weight and length of nozzle making it well balanced on a hose line.

Maintenance:

Daily

- Check that correct nozzles are placed on the correct hose lines.
- Ensure bale and nozzle are marked appropriately.
- Check for yellow tape indicating 1 1/8” nozzle.

Weekly

- Wash with mild soap and water and rinse with clean water.
- Check for smooth operation of bale and swivel.
- There are two 1 1/8” tips at PF&R, the longer of the two should be on this nozzle.

Monthly

- Check gasket for hardening or cracking.

After each use

- Perform all checks listed above.
  If any parts are missing, nozzle components perform improperly or nozzle leaks during operation send nozzle to logistics for repair.

Safety:

For maximum flow and highest quality fire stream flow nozzle with bale fully opened.

Before Entering IDLH

- Select appropriate nozzle for desired application.
- Always flow nozzles with bale fully opened in a safe area outside the IDLH to ensure proper pressure.
- Remove kinks in hose line.

Pike Pole

Tool:

- A pike pole is a fiberglass pole, with or without a D-handle, and with a metal head having a strong spike and hook combination.
- Pike poles range in size from 3 – 16 feet in length.

Use:

- The pike pole is usually used in pulling down ceilings. When being used for this, the firefighter should always wear a full set of protective gear.
- The firefighter must take the position so that the lath runs at right angles to the direction he/she faces.
- To start a hole in the ceiling, stand to the side of the pole and work forward, jamming the point up with the hook parallel to the lath, turning the pole 90', and then pulling the lath down – be sure to position yourself between the work area and an exit.
- It can be used for a variety of other uses whenever a long pole with a spike or a hook is needed, such as to make a water chute.
- A pike pole should not be used as a forcible entry tool.

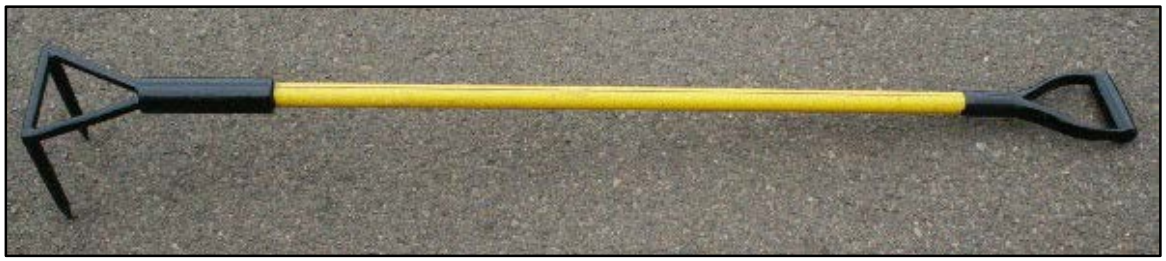
Maintenance:

- The pike pole should be clean and well-marked.
- The pike should be kept rust free with clear or black paint.
- The wood D-handles should be kept smooth and varnished.
- Keep fiberglass handle clean.

Safety:

- Use proper PPE depending on use.
- Wear eye protection when working overhead.
- Do not use as a pry tool.

Rubbish Hook



Tool:

- Fiberglass poles that vary in length with a heavy, metal fork on the end and a “D” shaped handle.

Use:

- Used in overhaul work for raking through piles of rubbish and burning debris
- Can also be used for sounding roof integrity in ventilation operations

Maintenance:

- Metal should be kept free of rust and debris.
- Do not paint metal parts unless already painted. Keep metal portions lightly oiled to preventing rusting as needed
- Keep fiberglass handle clean.
- Check for cracks or damage to the head and make sure the metal parts are secured.

Safety:

- Wear appropriate PPE.
- Carry in a safe manner.
- Keep hooked portion faced down.
- Always work with a buddy.

MSA FIREHAWK M7 SCBA

Tool:

Cylinder and Cylinder Assembly:

- Seamless aluminum cylinder fully wound with carbon fibers impregnated with epoxy resin
- Pressurized to **4500psi**:
  - H-45 cylinder holds 66 cubic feet of air and provides approximately 22 minutes of working time before EOSTI
  - H60 holds 88 cubic feet of air and provides approximately 30 minutes of working time before EOSTI
- 2” luminescent band to enhance visibility
- Analog gauge measures air in psi x100 and has a rubber cover for protection
- Safety Valve (burst disc) ruptures at approximately **7500 psi**

Audi-Larm:

- Audi-Larm or End of Service Time Indicator (EOSTI):
  - Air-actuated, self-cocking audible alarm
  - Activates between **1200 and 1050 psi** (25% rated cylinder pressure)
  - Continues to ring until at least **200psi**.
- ***This is the only audible alarm that will sound when in low air.***
- RIT/UAC: male Quick-Fill inlet used by RIT for rapid fill in emergency situations only.

First Stage Regulator:

- Reduces cylinder high pressure to low pressure which supplies the second stage regulator.
  - Has a pressure relief valve that actuates @ **125psi** on the low-pressure side.
- High pressure side allows unrestricted flow to Control Module
- Keeps the pressure to the MMR @ about 80 psig

Second Stage Regulator:

- Pressure demand type regulator maintains pressure slightly above atmospheric in the facepiece
- Inhale sharply to start air flow
- Red bypass valve for draining pressure or to provide continuous air if there is a malfunction(Not in OG)
- Release tabs shut off the air, press both tabs to remove from facepiece

Control Module:

- Monitors air, motion and exposure to heat
- Powers on automatically when system is pressurized
- 3 buttons:
  - White: ‘ALARM’ button for activation of the full pass alarm when held for 3 seconds.

        - Also activates the buddy lights both on the ALARM button and on the rear of the carrier near the power module with or without pressure
    - Green 'MODE' button:
        - x1 = backlight;
        - x2 = approx. minutes of air remaining based on current breathing rate after at least 3 min of use, updated every 30 sec.
        - Hold 3 sec for continuous HUD display.
    - Yellow: 'RESET/OFF' button
- Analog Gauge
    - Analog gauge calibrated in psi x100
- Digital Screen:
    - Air pressure in psi
    - Air cylinder icon that displays cylinder pressure
    - Battery icon marked in ¼ increments that will flash when batteries are low
        - When icon shows empty you have 25% battery life left.
    - Thermometer icon will flash when the thermal alarm is activated, sounding a tone every 3 seconds if exposed to preset time and temperature limits.
        - Will continue to sound until cooler temperatures are sensed.
        - Exit IDLH immediately!
    - Downloadable User Data:
        - Stores most recent 30 hours of user information; a session is recorded every time system is pressurized.
- PASS Alarm:
    - Pre-alarm activates when no motion is detected for **18 sec**., with 3 progressively louder tones every 4 sec. until full alarm is activated at **30 sec**.
    - Red buddy lights will flash slowly in pre-alarm, then quickly in full alarm
    - Pre-alarm may be reset by shaking the Control Module or by depressing the yellow 'RESET' button. Full alarm must be deactivated by pressing yellow RESET button twice in 1 second.

NOTE: If in an IDLH and any alarm sounding cannot be silenced by depressing the RESET button, withdraw from the IDLH immediately and notify command.

Carrier, Harness, and Power Module Assembly:

- Carrier and Harness:
    - Adjustable stainless-steel band with latch to hold the cylinder in place
    - Nomex shoulder pads and Kevlar straps
    - Clip located on shoulder strap for facepiece
- Power Module:
    - PASS Alarm Dual Sound Emitters - Full-alarm = **101 db** 2 high pitch tones and a buzz
    - Alarm will remain active until unit is reset or batteries die – even if air cylinder is empty.
    - Powered by 4 "C" cell batteries

Ultra Elite Face Piece:

- Single panoramic lens

- SpeeD-on harness with adjustable Kevlar straps – stow with harness inverted over lens to reduce scratching, and should also ensure:
  - Face piece is placed inside the **face piece bag** at the end of each shift.
  - Face pieces shall be protected from external damage and placed *on locker shelves* or packed *loosely in gear bags* when not in use.
- Nose cup w/ 2 one-way valves that reduce fogging and CO2 build-up
- Inhalation valve with spider valve (If out of position, don't adjust - send to Logistics)
- Nose cup has spring loaded exhalation valve and speaking diaphragm
- Anytime a fire helmet shows signs of exposure to excessive heat, take the facepiece out of service and send to Logistics

Clear Command:

- Voice amplification system for radio and face-to-face communication
- 3 parts – microphone, mounting bracket, and voice amplifier
- 3 AAA batteries with approximately **14** hours of battery life
- Solid red LED indicated system is on and batteries are good, flashing red indicated batteries are low and 1 hour of life remains

Heads Up Display:

- Provides visual display of approx. cylinder pressure, pre-alarm activation and low battery levels in both the Power Module and the HUD
- LED's
  - 3 solid green, indicates bottle is between ¾ and full capacity
  - 2 solid green, indicates bottle is between ½ and ¾ capacity
  - 2 flashing yellow, indicates bottle is between ½ and ¼ capacity
  - 1 red continuously flashing, indicates bottle is ¼ or less capacity (one light is located inside the HUD, and one light is located on the exterior of the HUD)
  - 1 orange flashing: indicates PASS pre-alarm activation
  - 1 yellow flashing:
    - single flash indicates low HUD battery
    - double flash indicates low Power Module battery
  - Red and Orange solid LED warns firefighter to evacuate (programmable feature not currently in use by PF&R)
- Seeks and locks into Control Module signal (Hold within 18" when turning on system)
- 1 Duracell Ultra CR2 battery

Use:

- The SCBA is to be used in IDLH environments when the Oxygen level is below **19.5%** or the CO levels are above **35ppm** (Including but not limited to: structure, vehicle and dumpster fires, overhaul) and when air monitoring guidelines indicate usage.
- There are 2 methods of donning the SCBA: Over Coat and In the jump seat.

Maintenance:

- Identification:
  - Properly mark in 2 places with company number, or 'A' and apparatus number for reserve.
  - Each SCBA face piece component is/should be identified with Firefighter's

employee number
    - Face piece = marking will be stamped on metal tab for adjustable head harness
    - HUD and Clear Command = marking will be engraved onto the plastic cases
- Cleaning:
  - Use a damp sponge and soapy lather to remove dirt and debris.
  - Facepiece:
    - Remove Clear Command modules
    - Place tape over microphone prior to submerging
    - 1oz disinfectant (NOW) to 1gal water
    - Rinse, disinfect, rinse again and dry
    - Drain spring-loaded exhalation valve
  - NOTE: Per manufacture, DO NOT need to remove HUD when cleaning mask in disinfectant solution. However, if mask is heavily soiled and soaking is required, the HUD shall be removed and washed separately.
- Members assigned to each position on apparatus are responsible for visual inspection and function test of SCBA assigned to that position at the start of each tour of duty and after each use
  - Any damage or malfunction found requires the SCBA be removed from service, tagged and sent to Logistics
- Battery Replacement:
  - Replace batteries twice a year corresponding to daylight savings time changes or as needed
  - Mark batteries with the date to track usage.

Visual Inspection:

- Inspect harness, straps, buckles and frame for excessive wear or heat damage
- Check cylinder pressure: at least **4050 psi** (90% capacity)
- Check the hydrostatic test date (Circled number indicates month, other number indicates year of the last hydrostatic test: Hydro tested every **5** years, retired after **15th** year)
- Inspect hand-tight fitting, O-ring, cylinder threads and malleable shaft
  - Must be sent in to Logistics for repair – DO NOT replace O-ring at station level.
- Inspect cylinder for heat damage, abrasions, cuts or gouges that expose the black carbon fibers
- Check Audi-Larm, RIT/UAC valve and relief valve for damage. Check the tattletale tape for integrity (actuates at 5200psi).
- Check high/low pressure hoses for cuts or severe abrasions
- Check MMR for cracks or abnormalities, bypass valve and seal ring condition
  - Check to ensure MMR is free of water which can freeze during use.
- Sanitize facepiece: wipe down with sanitizing wipe
- Check facepiece for rubber deterioration, dirt, cracks, tears or holes.
- Inspect lens for cracks, crazing or severe scratches
- Check head straps for breaks, loss of elasticity, missing buckles or straps; extend straps and invert to protect lens
- Verify nose cup in place, one-way valves properly oriented
- Inspect inhalation valve and spider valve (do not attempt to remove or replace)

- Turn on Clear Command and verify red LED

Functional Test:

- Pressurize system: verify Audi-Larm ring, Control and Power Module self-check (Red-to-Green, then green LED's slowly flashing)
- Verify HUD lights (within **18"** of Control Module for pairing).
- Ensure no difference greater than 10% between gauges (never to exceed **400psi**)
- If >10% difference, change cylinder and repeat test. If still >10% difference, remove cylinder, tag SCBA and send to Logistics. If no difference, tag original cylinder and send to Logistics
- Close cylinder valve to perform 30 second leak test
- Allow PASS to remain motionless and verify Power Module, Control Module & HUD through Pre-Alarm to Full-Alarm
- Reset alarm and check manual alarm activation (hold White Alarm Button for **3** seconds)
- Check Control Module battery level icon
- Open cylinder valve, check Control Module analog gauge for **>100psi** jump. Close valve.
- If >100psi jump, close valve, drain system, check bypass, hand-tight and retry.
- If still >100psi jump, remove cylinder, tag SCBA and send to Logistics.
- Check facepiece seal (**10** seconds)
- Attach MMR and inhale sharply. Immediately depress release tabs/buttons
- Open bypass slowly to drain system.
- Observe Audi-Larm, PM low air alarm and HUD light drop in ¼ increments
- Press 'RESET/OFF' x2 to turn Control Module to sleep mode
- Verify HUD battery level lights

Safety:

- Full PPE
- Be aware of surroundings when donning and doffing
- Check PPE, hand-tight, 2nd stage regulator seal and min air pressure of **4050psi** prior to entering IDLH
- Use buddy system in the IDLH
- Use proper air management
- Never carry cylinder by hand wheel.

Water/Gas Shut-off Key

Tool:

- A two piece tool that is connected by a pin between sections.
- The upper section has a T-handle at the operating end and residential sized water and gas valve fittings on the working end.
- The second section, has a working end with two fittings. The square fitting is for water valves. The rectangular fitting is for gas valves.

Use:

- Water and gas services can typically be verified to be off when the padlock holes align and meter gauges do not show flow.
- Residential gas services are typically ¼ turn to shut-off at the meter. Residential water services are typically ½ turn to shut-off at the valve box near the street.
- Hydrant and/or commercial water valves are typically found in a valve box on the street side nearby the hydrant and close clockwise with several turns.
- Commercial/industrial gas valves require a ¼ turn to close. These may be found on the meter itself or in an underground valve box.
- Only close street valves to hydrant. Leave other street valves to the water bureau.

Maintenance:

- The gas and water shut-off keys should be kept clean, well-marked, and rust free.

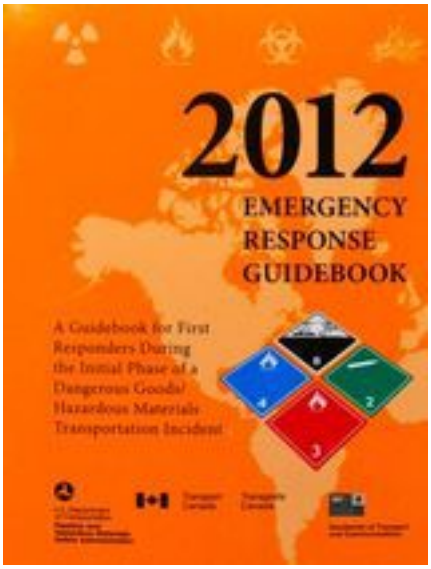
Safety:

- Use caution when closing any valve—a frozen valve may break rather than close.
- Be certain the *correct* valve is being closed!
- Do not reopen gas valves once closed.

ENGINE 2 TOOL TALKS

DOT Emergency Response Guidebook

Tool:



- Developed by the Department of Transportation for use by firefighters, law enforcement, and other emergency services personnel who may be the first to arrive at the scene of an incident involving hazardous materials.
- Contains 6 different sections:
    1. Placard/container section (WHITE) Used to identify placards (without the 4-digit ID) or container shapes, and then reference the guide number to the orange pages provided in the nearest circle. *This section is used as a last resort if all other forms of identification are unavailable.*
    2. ID Number Index (YELLOW) List of hazardous materials in numerical order of ID number. List displays the 4-digit ID number of the material followed by its guide number and material name.
    3. Material Name Index (BLUE) List of hazardous materials in alphabetical order of material name. List displays the name of the material followed by its guide number and 4-digit ID.
    4. Initial Action Guides (ORANGE)
        - Most important section – each individual 2-page guide provides safety recommendations (on left page) and emergency response information such as fire situations, spill or leak incidents and first aid (on right page).
        - Guide title identifies the general hazards of the HAZMAT covered.
        - Each guide is divided into three sections:
            - Potential Hazards – Displays fire/explosion and health effects upon exposure; the highest potential is listed first. This should be the first section the firefighter consults.
            - Public Safety – Provides information regarding immediate isolation of the incident site, recommended PPE and respiratory protection.
            - Emergency Response – Outlines special precautions for incidents which involve fire, spill, or chemical exposure and also includes first aid for those exposed.
    5. Tables (GREEN)
        - Table 1 is the Initial Isolation and Protective Action Distances.
        - Table 2 is the Water-Reactive Materials Which Produce Toxic Gasses. These materials will produce large amounts of Toxic-by-Inhalation (TIH) Gases when spilled in water.

- Table 3 lists the 6 most common Toxic-by-Inhalation (TIH) gasses and their Isolation and Protective Action distances for large spills based upon container type.

6. User's Guide, Glossary and Phone Numbers (WHITE)
   - Contains miscellaneous information and glossary terms as well as important phone numbers, such as CHEMTREC 1-800-424-9300.

Use:

- Used as a guide to aid emergency responders in quickly identifying the hazards of materials involved in an emergency and protecting themselves and the public during the initial phase of the incident.

- To use this guidebook during a hazardous materials incident:

  STEP 1

  Identify the material by finding either the 4-digit ID number or name of the material on a placard, orange panel, shipping document or package.

  STEP 2

  Look up the material's 4-digit ID number (YELLOW Section) or material name (BLUE Section) in the guidebook.

  NOTE: If an entry is highlighted in green in either the YELLOW or BLUE pages AND THERE IS NO FIRE, go directly to Table 1 (GREEN). If there is a fire then also consult the assigned guide (ORANGE) and apply the evacuation information shown under Public Safety.

  NOTE: If the guide number is supplemented with the letter "P", the material may undergo violent polymerization if subjected to heat or contamination.

  STEP 3

  Using the 3-digit number, turn to the guides in the orange section and read carefully. Follow the directions and precautions given.

  Note: If a reference to a guide cannot be found and the incident is believed to involve a hazardous material, turn to GUIDE 111 (unidentified substance) and use it until additional information can be obtained.

  STEP 4

  Seek additional information as soon as possible by contacting the appropriate agency (such as Chemtrec), the emergency number on the shipping document, or by consulting specific information on the shipping document.

Safety:

- Approach hazardous material incidents from uphill/upwind.
- Secure the scene without entering the immediate hazard area. Assure the safety of people and the environment.
- Identify the hazards using the ERG, but remember that this guide only provides the most important and worst-case scenario information. As more material-specific information becomes available, the response should be adjusted.
- Assess the situation keeping the following in mind:

  - Is there a fire, spill or leak?
  - What are the weather conditions?
  - What is the terrain like?
  - Who/what is at risk?
  - What actions should be taken?
  - What can be done immediately?
- Obtain help from qualified personnel and notify the HAZMAT team (Station 7).
- Enter the area only when wearing appropriate PPE.
- Continually reassess the situation for any changes.
- Do not walk into or touch the spilled material. Avoid inhalation of fumes, smoke and vapors – do not assume gases are harmless because of a lack of smell.
- Use caution when handling empty containers – may still present hazards until they are cleaned of all residues.

Dräger X-Am 2000

Tool:

- Attachable clip.
- Gas inlet with sensors that work by diffusion.
- Blue +/Menu button.
- Green OK/On Button.
- Water, dust, heat and cold resistant
- Visual, audible, and vibrating alarms
- Low battery alarm is visual and audible
- Rechargeable battery lasts for 12 hours
- Charger in apparatus requires 4 hours to recharge if fully depleted
- Display provides LEL, O2 and CO (H2S on trucks and squads)

Use:

- Used for measuring LEL, O2, CO, and H2S.
- Press and hold the green OK/On button for 3 seconds to turn on
- Takes up to 5 minutes to warm up LEL, O2, CO and H2S sensors
- A solid "!" indicates the LEL sensor is warming up and turns off when warmed up.
- 4 alarm indicators:
  - >90db audible alarm
  - 3 bright red flashing LED's
  - Vibrating alarm
  - Alarm levels (A1(1 beep) and A2(2 beeps)) indicated in display screen:
    - LEL A1=.5% (Evaluate further), A2=1.0% (Withdraw)
      - LEL Measured as % volume
    - O2 A1=19.5% (don SCBA), A2=23% (Withdraw)
    - CO A1=35PPM (don SCBA), A2=50PPM
    - H2S A1=10PPM (don SCBA), A2=15PPM
- Press both buttons to turn the unit off.

Maintenance:

- Clean with a damp sponge using soap and water only, no solvents.
- Secure in the charger and ensure properly charging. A flashing red light on the charger indicated the unit is charging, and solid red indicates a fully charged battery.

Safety:

- Turn unit on in fresh air (before arrival if possible).
- May take up to 10 seconds for the monitor to provide reading of atmosphere
- Wear appropriate level of PPE when monitoring.
- Firefighters must remain alert to physical signs of possible exposure to hazards and not rely solely on air monitoring to be safeguarded.

Addendum: (Know these points but do not include in tool talk)

- Wide scanning of areas will produce a more representative sampling
- To ZERO OUT false readings when the unit is in clean air and there are no fault codes on the display, press the blue + button three times and then press the OK button twice. This is also called a fresh air setup or “bump” test. This process takes about 5 seconds.
- To view peak readings hold the OK button for 2 seconds. To clear peak readings turn the unit off and then back on. This should be done any time you want to clear the peak reading in the memory prior to monitoring a new area.
- Utilize more that one Dräger monitor when available and attempt measurements at both high and low levels, depending upon the suspected gas product in question.

WATEROUS FLOTO PUMP

TOOL:

- Plastic Float Assembly
- Skid plate and intake screen
- 1 ½" discharge
- 1 cylinder, 2 cycle motor
- Self-priming centrifugal pump
- On/Off switch
- Starter cord
- Choke lever
- Float controlled throttle
- Spark plug/air filter
- Fuel tank with vented cap (Takes 50:1 mixed gas).

USE:

- Used in Marine and Wild Land applications when hydrants are distant and inaccessible.
- Requires a water source of at least 6" depth to operate
- Operates between 60-90 minutes on a full tank
- Can sufficiently supply one 1 ¾" Handline for exposure protection ONLY.
  - Minimum 10 GPM @ 105 PSI
  - Maximum 140 GPM @ 30 PSI
- To operate:
  - Connect hose to discharge port
  - Tie off to a stationary object
  - Open vent in fuel tank cap
  - Move ignition switch to run
  - Choke engine
  - Pull starter handle
  - When the engine starts, turn choke off.
  - When engine is running smoothly, slowly place pump in water.

MAINTENANCE:

- Keep fuel levels full
- Make sure air filter is clean
- Check the condition of the started cord
- Check spark plug for condition
- Ensure intake screen is clear of debris

SAFETY:

- Wear a life vest under turnouts when operating near water.
- Assign a firefighter to remain at the pump during its operation.
- Tie off pump securely to a stationary object.
- Do not operate out of water for prolong periods of time.

1½” FOAM EDUCTOR

Tool:

- 1 ½ ”female inlet
- 1 ½” male outlet
- Detachable metering head with check ball
- Adjustable foam percentage dial 0, 1, 3, 6 %
- Pick up tube

Use:

- 125 GPM
- 75 psi nozzle pressure.
- Designed to operate with 200 psi inlet pressure.
- Calculate eductor as 100 psi friction loss.
- Maximum 150’ hose between nozzle and eductor
- Nozzle bale must be operated in the fully open position
- Nozzle must not be operated greater than 10 feet above eductor
- The eductor may fail to educt foam concentrate if there are kinks in the hose line
- The eductor may not pick up concentrate if the nozzle flow is less than the eductor flow rate
- Venturi Principle: Restricted passage increases water velocity, thus reducing its pressure as it passes into the larger area. Foam concentrate is then introduced into the pickup tube.

Maintenance:

- Visual inspection of tube for damage, threads, gasket.
- Check the function of the metering dial.
- Before shutting down water supply line, remove pickup tube from concentrate and insert in container of clean water to flush entire system downstream.
- The eductor should be removed from apparatus as soon as possible after use.
- Ensure the check ball moves after flushing.
- Remove metering device from eductor and immerse entire assembly in detergent solution. Clean thoroughly and flush with clear water.

Safety:

- Class B foam can conduct electricity. Do not use on or near Class C fires.
- Do not allow foam blanket to deteriorate or the fuel can reignite.

2½" FOAM EDUCTOR

Tool:

- 2 ½ "female inlet
- 2 ½" male outlet
- Detachable metering head with check ball
- Adjustable foam percentages dial 1, 3, 6 % (some fixed at 3 or 6%)
- Pick up tube

Use:

- 250 GPM
- 75 psi nozzle pressure.
- Designed to operate with 200 psi inlet pressure.
- Calculate eductor as 100 psi friction loss.
- Maximum 200' hose between nozzle and eductor.
- Nozzle bale must be operated in the fully open position.
- Nozzle should not be operated greater than 10 feet above eductor.
- The eductor may fail to pick up foam concentrate if there are kinks in the hose line.
- The eductor may not pick up concentrate if the nozzle flow is less than the eductor flow.
- Venturi Principle: Restricted passage increases water velocity, thus reducing its pressure as it passes into the larger area. Foam concentrate is then introduced into the pickup tube.

Maintenance:

- Visual inspection of tube for damage, threads, gasket.
- Check the function of the metering dial.
- Before shutting down water supply line, remove pickup tube from concentrate and insert in container of clean water to flush entire system downstream.
- The eductor should be removed from apparatus as soon as possible after use.
- Ensure the check ball moves after flushing.
- Remove metering device from eductor and immerse entire assembly in detergent solution. Clean thoroughly and flush with clear water.

Safety:

- Class B foam can conduct electricity. Do not use on or near Class C fires.
- Do not allow foam blanket to deteriorate or the fuel can reignite.

Hazmat Decontamination Bucket

Tool:

- Bucket – 2 gallon
- 6 Chux
- 4 Tyvek suits
- 4 pair Trionic gloves
- 2 garbage bags
- 1 wash mitt
- 1 jar liquid soap
- 1 jar bleach (optional)
- Directions for use and inventory

Use:

- For emergency decontamination (decon) of PF&R personnel and/or civilians.
- Use at PF&R member's discretion or as directed by Hazmat team or poison control.
- Contents are used as follows:
  - Chux: To clean up small area of biohazard or to dry personnel after going through decon.
  - Tyvek suits: To provide clothing following decon from a HazMat exposure or worn by PF&R personnel as Level C protection.
  - Trionic gloves: For PF&R personnel use as protection while deconning others.
  - Garbage bags: Use for contaminated clothing and/or personal possessions.
  - Wash mitt: Used to wash contaminated people or items.
  - Liquid Soap: Use for general HazMat decon.
    - Mix ½ jar to 2 gallons of water.
  - Bleach: Use for specific decontamination or disinfection, primarily biological. Only use bleach if instructed by Hazmat Team.
    - Mix 1 jar with 2 gallons of water.

Maintenance:

- Check bucket and contents regularly and after each use.
- Replacement of contents is done through the Hazmat Coordinator.
- Replace items when mold or mildew develops, rips or tears are found, or jars are leaking.

Safety:

- Approach all HazMat scenes uphill and upwind.
- Consult DOT guidebook for more information on contaminant.
- Do not enter the hazard zone. Do not become part of the problem.
- Attempt to gather contaminated personnel into a safe area.
- Materials in bucket are one time use and should be disposed of properly.

Task Force Tip Pro-Pack

Tool:

- 2.5 Gallon foam tank
- Twist Grip Flow Control
- Proportioning knob
- Percentage selector wheel with filter screen
- Outlet hose with twist-lock connection
- Straight stream nozzle provides greatest reach with the least foam production.
- Low Expansion nozzle provides moderate reach with moderate foam production.
- Medium Expansion nozzle provides least reach but greatest foam production.

Use:

- Used for Overhaul and Small Fires where foam is required in low quantities and low GPM.
- Can operate using Class A foam at 0.1 % to 1.0% for ordinary combustibles.
- We use the Class B settings with Class A foam for higher foam concentrations at 1, 3 or 6%.
  - To switch between Class A and Class B foam settings unscrew nut on top of proportioning knob. Switch to Class B setting and tighten the knob.
- Rated flow of 12 GPM @ 100 PSI
- To Flow foam
  - Connect water supply from booster line by disconnecting booster nozzle.
  - Attach desired nozzle to the quick connect with a ¼ turn to the right
  - Turn proportioning knob to desired %
  - Charge booster line and twist operating handle to start water flow/foam.
- For clear water turn the proportioning knob to off.

Maintenance:

- Keep clean and rinse off foam residue, as it is corrosive.
- Check level periodically and keep full with foam concentrate.
- Do not mix types of foam concentrates.
- Adequately flush Pro-Pack after every use by
  - Turning proportioning knob to off.
  - Flush and disconnect hose and nozzle.
  - Remove control block from unit, put on cap, turn control on half way
  - Cycle proportioning knob, flush until clean water trickle from the pickup tube.

Safety:

- Use the correct foam and percentage for the job
- Make sure connections are made securely
- Wear proper PPE

Radiation Detector TBM-3SR-D

Tool:

- Digital display shows either mR/h, or Dose
- Select (SEL) and reset (RST) buttons
- LED lights
- Volume control knob
- 3 position switch: ON/OFF/BAT
- Powered by 6 AA batteries (Approx. 100 hours use)
- Swivel type handle
- Detector protected by a plastic slide cover

Use:

Use to detect Alpha, Beta, and Gamma radiation on explosions, rad occupancy or CBRNE calls.

- Check battery: switch to BAT position. Green “BAT OK” LED should illuminate.
- Turn on, open slide cover and ensure detector is in Rate Mode (“R” shows on digital display).
- To alternate between Rate and Dose modes press SEL button.
- To reset dose- press RST button in either mode.
- Adjust volume.
- Screen surface or patient: 1” away, 1”/sec, 2 min/pt.
- Normal background radiation is = 0.02 mR/h
- Contamination is ≥ 0.04 mR/h
- Warm zone is established > 10 mR/h, back out and notify command or Haz Mat.
- Determine presence of Gamma by closing slide cover. Gamma will pass through slide cover and/or detector.
    - If reading drops considerably or totally, it is probably Alpha or low level Beta.

Maintenance:

- Check Batteries and replace as necessary.
- To protect detector keep plastic cover over detector window when storing.

Safety:

- Turn on and lower plastic cover prior to immediately upon responding to any explosion, unusual fire or suspicious event.
- Use proper PPE to avoid exposure.
- Remember the principles of protection from radiation:
    - TIME
    - DISTANCE
    - SHIELDING

Motorola APX 6000XE

Tool:

- Waterproof radio body with detachable antenna.
- ON/OFF volume control knob.
- 16 channel selector knob.
- 2 position keypad lock switch.
- 3 position ABC Zone switch for zone selection.
- Emergency button sends radio back to OPS 1:
  - Mic flashlight flashes S.O.S. in Morse code
  - Does not work on simplex/mayday channels
  - Does not alert dispatch
- Intelligent lighting indicators:
  - Orange- Emergency Button activated
  - Green- Radio alerted by dispatch
  - Red- Failed power up, low battery, out of range, or failsoft mode.
- Buttons on the side of radio body:
  - Top side button turns on/off LCD light
  - PTT- Push to talk
  - Mid Side Button- Nuisance delete for scanning
  - Lower Side Button- Squelch level adjustment for Simplex/Mayday
- 2 LCD screens (on top and front of radio body) display visual information.
- Front display always shows the radio's ID # when on home screen.
- Keypad Buttons:
  - 3 Menu Select Buttons
  - Home Button- will revert back to home screen
  - 4-Way Navigation Button
  - Data Feature Button (not programmed)
- Voice and alert tones that will not go below an audible volume regardless of volume adjustment.
- Rechargeable battery rated to 10 hours on full charge
- Remote mic with PTT button, volume adjustment buttons, emergency button and flashlight.

Use:

- For communicating between fire bureau members, BOEC, and other emergency agencies.
- Monitoring bureau radio traffic.
- To use:
  - Turn radio ON and adjust volume.
  - Go to and verify proper talkgroup or channel.
  - To Transmit: Press and hold PTT button - wait 1 second - speak your message - wait 1 second - and release PTT button.
  - Talk directly into the mic (not off to the side) and speak in a clear and concise tone.
  - When wearing a facepiece, hold microphone to the center of the mask near

speaking diaphragm (avoid placing near clear command).

- To change talkgroups/channels, use the 16 position selector knob and the zone selector (either the ABC switch for A, B, or C zones or the keypad for D through P zones.)
- Radio templates, used for navigating talkgroups/channels, can be found in the apparatus city map book and the MDT guidebook.
- NOTE: The radio works on one of two systems – Simplex, Trunked.
  - SIMPLEX channels are transmitted radio to radio directly. Transmitting distance will be limited to the power of the radio and any obstructions between.
  - TRUNKED signals are transmitted to a repeater which then retransmits back to all receiving radios (increasing distance). PF&R Dispatch works on this system.
- Use Clark County (zone L) or Wash. County (zone M) if our system goes down.
- Use of a radio strap will provide additional thermal and ejection protection.
- Radio does not respond to commands issued while radio is off; when turned back on the radio will remain on the last talkgroup and zone selected prior to being powered off.
- Zones AA, BB and CC are the digital zones that will replace zones A, B and C.

No Response / Troubleshooting (3 Basic reasons why the radio may not work)

- Out of Range – LCD will flash “Out-of-Range”:
  - Move to another location.
  - Try simplex channel.
- Transmission blocked – Basements, ship hulls, high rise buildings:
  - Move to another location.
  - Try simplex channel.
- Problem with radio:
  - Check antenna and battery.
  - Check talkgroup/channel selection.
  - Try a different talkgroup or simplex channel.

Tones

- Solid Honk – Talkgroup busy.
- Solid Honk (but no reservation tone) – Out of range.
- Wobble sound – Emergency Traffic Alert: followed by emergency information.
- 1 Chirp – Failsoft every 10 seconds will also display “Failsoft” on LCD screen (indicates Trunked System is down).
- 2 Chirps – Low Battery
- 3 Chirps – Reservation Tone (System is busy)
- 4 Chirps – Incoming page when on talkgroup (occurs during dispatch or page)
  - To stop beeping: Change talkgroup, turn unit Off/On, change zone switch, or press the Home key.

Maintenance:

- Every morning member should check: battery, scan is off, and ensure V-mute is off.
- Keep battery charged. “LOW BATT” will flash on displays when shutdown is imminent.
- Each radio comes with a spare battery and a station charger that reconditions.

  - Smart chargers on apparatus alert when reconditioning is needed (see chart on charger).
  - When indicated to recondition, initiate reconditioning on the station charger then exchange battery with an extra.
  - Station Charger LEDs indicate: Orange- Reconditioning, Red- Charging, and Green- Charged
- When replacing battery it's **critical** that the gasket is properly seated. (Protects flash drive)
- Keep clean and debris free with disinfectant and rinse with water.
  - Can use soft bristled brush to remove debris.
  - Give special consideration to ensure weep holes are down to allow drainage.
- Notify Officer if radio will not operate. Replacements are obtained from District Headquarters (Stations 5,7,9 &24).
- Defective radios need to be sent to the Fire Liaison.

Safety:

- Do not use radio within 500' of bomb incidents or blasting areas.
- Be able to access all the talkgroups/channels in ABC zones by feel, particularly the "MAYDAY" channels.
- Radio is intrinsically safe.
- Cord is rated to 500° F, connections are rated to 320°, but radio body is only rated to 140°.

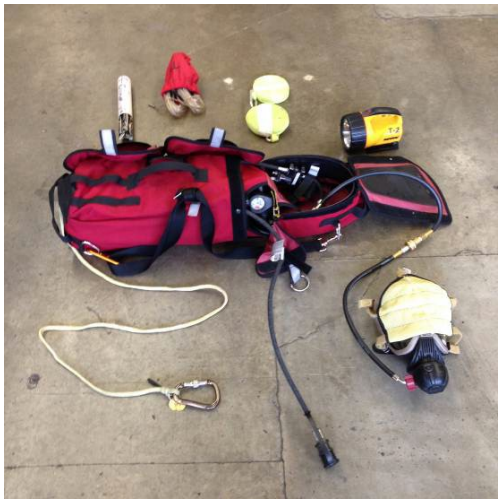
Examples of Radio Terminology:

- "Mayday" - Term used to indicate missing, trapped or injured **fire personnel** in need of immediate assistance or rescue. Mayday messages have absolute priority over all other radio communications. Mayday should be repeated three times if possible. If you call Mayday state: WHO you are, WHERE you are, and WHAT the problem is. Mayday may be transmitted on tactical OPS talkgroup, Mayday channels, OPS 1, or Dispatch.
- "Emergency Traffic" - For transmitting critical info. important to firefighter safety
- "Hold the Air" – Term used by Command to halt all non-critical information on a specific Talkgroup.
- "Code Zero" - Police needed ASAP.

Common Talkgroups and Channels:

- PFB Dispatch = B1
- PFB Talk = B2
- OPS 1 – OPS 12 = A1 – A12
- Simplex Channels = A13-15 & B15
- Mayday Channels = A/B/C-16
- Police Talkgroups = Zone E
- ODOT = I1

RIT Bag



Tool:

- 60 minute SCBA cylinder pressurized at 4500 PSI.
- Air-activated, self-cocking, audible warning bell.
- 1st stage regulator wyes into:
  - High Pressure to the UAC
  - Low Pressure (80 PSI) to the quick coupling and MMR
- SCBA face piece with MMR and low pressure hose with male quick coupling.
- 150' of search rope (rings every 20')
- Flashlight
- 2 - 11' Rescue Straps
- 2 - O2 tubing sets with male quick couplings
- 4 - chemical light sticks

Use:

- For rescuing trapped or injured Firefighters or civilians by extending the amount of breathable air in an IDLH environment
- When assigned to RIT you need to check hand-tight connection and turn on the cylinder outside.
- When you are using a RIT bag from a mutual aid company, the person that will be using the bag needs to familiarize themselves with the contents of the bag and their location.
- When you locate the distressed firefighter you should communicate your:
  - Situation found
  - Location
  - Plan and needs to extricate
- The primary means of supplying a downed firefighter with air is with the UAC.
- Second, you can attach the MMR to the victims mask.
- Third, you can replace the victims mask with the spare mask inside the bag.
- If the victim is inaccessible, such as in a building collapse, the O2 tubing can be used for providing air to victims where the space is limited. The tubing can be put into the SCBA face piece or directly into the victim's mouth.
- Use the AWARE acronym **A**ir/**W**ater/**A R**adio/**E**xtrication.

Maintenance:

Daily Check:

- Check the bottle pressure (4050-4500 PSI).

Weekly Check:

- Charge the system and check for leaks and ensure bypass function.
- Inspect all couplings for proper function and cleanliness.

- Ensure all items are present and properly stowed in the RIT bag:
  1. Cylinder's pressure gauge visible and 1st stage regulator laid on top of cylinder.
  2. Low pressure hose, MMR and SCBA facepiece pre-connected and coiled in the end compartment with quick coupling.
  3. High pressure hose folded lengthwise in outside sleeve with UAC strapped at the side opening.
  4. Search rope flaked into its bag to deploy through the larger opening and out the rear of the RIT bag.
  5. Rescue Straps, O2 Tubing, and chemical lights stored in the side compartments.

Safety:

- Wear Full PPE
- Always use the AWARE acronym
- Do NOT become a victim yourself

TIC MSA 5200

Tool:

- Camera body that is flame retardant, dust and water **resistant**.
- Display Screen.
- Rechargeable Battery with 2 hours of operating capacity.
- Apparatus mounted charger.
- Green On/Off/Standby button.
- LED indicator lights.
- External video connection port.

Use:

- Search and Rescue, initial size up, locating the fire and checking extension, identifying potential flash over, HAZMAT situations, overhaul, determining entry and ventilation points.
- To turn the unit **ON**: Press and hold the green button for 1 sec. Wait 5 seconds for infrared sensor to self-test.
- To turn the unit **OFF**: Press and hold the green button for 4 seconds.
- To put unit in **STANDBY**: When on, press green button until the display shuts off and the status LED begins to flash green ("Power save mode")
  - To take the unit out of **STANDBY**: Press green button until display reactivates and status LED turns to solid green.
- 2 modes of operation:
  - High Sensitivity / Low temperatures (up to 320° F)
  - Low Sensitivity / High temperatures (320° - 1040° F)

On screen indicators

- Low Sensitivity Mode Indicator:
  - There is an "L" located in the lower left when temperatures exceed 320° F.
- Heat Seeker Indicator
  - Adds shades of color to the temperature of objects in both high and low sensitive modes. Colors range from Black to White, then Yellow, Orange and finally Red as temperatures increase. In low sensitivity mode the colors represent a higher temperature range.
- Quick-Temperature Indicator: the green square in the center of the screen
  - Place square on the object of interest.
  - The digital temperature read out displays only the temperature of the surface; **does not measure gas temperature.**
  - The vertical bar on the right hand side of the screen gives the temperature ranging from 0°-300° in High Sensitivity and 0°-1000° in Low Sensitivity.
- Shutter Indicator:
  - Periodically the TIC will refresh the focal plane in order to operate properly
  - The TIC image on screen will temporarily freeze (1 sec.) and a green square will appear in upper left corner of screen.

- This occurs more often in higher heat condition.

LED Indicators

- Over-Temperature Warning:
  - Flashing Red LED indicates the TIC has exceeded recommended operational thermal limits.
- System Status Indicator:
  - Green LED - TIC is on and fully operational.
  - Flashing Green LED - TIC is on and in power-saving standby mode.
- Battery Status Indicator: a row of three LED lights. Only one will be illuminated at a time.
  - Green indicates full or nearly full battery capacity.
  - Yellow indicates marginal battery capacity.
  - Red indicates battery warning (about 15 minutes of battery life remaining).
  - Flashing Red indicates the battery shutdown is imminent (one minute warning).
- System Fault Indicator
  - The TIC's computer runs a self-diagnostic program and all 5 LED lights will flash if a system fault is detected.

TIC Limitations

- TIC can't provide images through glass, water, or shiny objects; it displays reflected image.
- Do not point the camera at the sun.
- Will not provide underwater images. If fogging occurs wipe off the screen **and** the sensor.
- Electromagnetic energy such as radio transmissions may cause interference with the TIC.

Maintenance:

After Use:

- Clean external surfaces with mild detergent and warm water and dry with soft cloth (avoid scratching display).
- Inspect for heat, chemical, and structural damage or missing parts.
- Inspect batteries and contacts for damage or leakage.
- Place TIC in charging cradle and ensure pins and cradle are free from debris.

Daily Check:

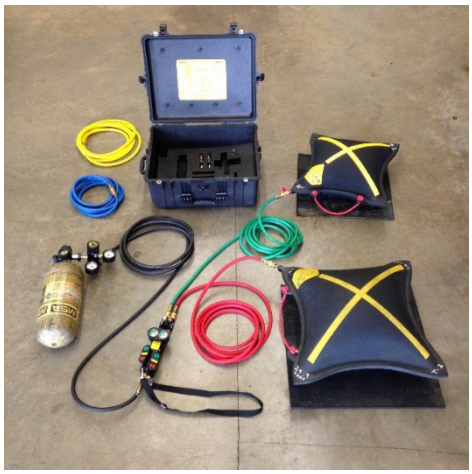
- Turn on TIC and check battery condition.
- Check apparatus mounted charger to ensure spare battery is charged and TIC is properly placed.
  - Verify the LED light is on as indicated:
    - Green…….. Charge complete
    - Fast Blinking Green….. Charging
    - Slow Blinking Green…..Charge pending
    - Red…….. Fault (ensure terminals free of debris and if still not charging then contact the shop)
- Inspect condition, cleanliness, and for missing parts.

- Ensure TIC LED's are operating properly in both "ON" and "Standby" modes.

Safety:

- Prior to entering environment, ensure that the camera is functioning properly by turning it on.
- Ensure that batteries are fully charged prior to use.
- Do not rely on the camera as sole means of navigation.
- Do not walk while looking through the TIC; it increases the danger of falling.
- The TIC is not intrinsically safe.
- Avoid overexposure to heat.

TRUCK 2 TOOL TALKS
High Pressure Air Bag System



Tool:
- SCBA cylinder
- Pressure regulator
- 5 multicolored air supply hoses
- Safety control valve ("deadman")
- Air bags
- Rubber pads
- Carrying case with instructions, extra fittings and spare O-rings

Use:
- Used to lift objects that are beyond the capability of any other equipment carried by PF&R.
- When setting up the system, start from the air supply and make connections toward the object to be lifted.
  - Connect the Pressure Regulator to the Air Cylinder using the hand tight fitting.
  - Use the Black hose to connect the Pressure Regulator to the Safety Control Valve.
  - Place In-Line Relief Valves to the Outlet Couplings of the Safety Control Valve. (These allow for the use of additional airbags but these valves can be used anywhere in the system.)
  - Use colored hose to connect the In-Line Relief Valve to the Air Bag.
  - Ensure that all valves are in the closed position before charging the system.
  - Slowly open the SCBA Cylinder to allow air to the Pressure Regulator.
  - Use the Regulator Knob to set the Pressure Regulator to 118psi (pressure relief valve will operate at 150psi.). Open the Valve on the Pressure Regulator to allow air to the Safety Control Valve.
  - Open the In-Line Relief Valve to the line that leads to the Air Bag to be pressurized and depress the GREEN button to inflate the Air Bag.
  - When operating always inflate slowly and only lift the amount necessary.
- Use the rubber pads to protect the air bags from damage.
- DO NOT ALLOW THE REGULATOR AIR PRESSURE TO EXCEED 118 PSI.
- Depress the RED button to deflate the Air Bags – during deflation be careful of load shifts.
- When breaking down the system for storage ensure each component is bled prior to disconnecting. Check by ensuring that all gauges are at "0" on the "deadman" control and pressure regulator.

Maintenance:

Check Monthly and after each use:
- Keep all components clean and free of dirt and debris (NO solvents!).
- Clean the Air Bags with soap and warm water, using a brush if necessary.
- Make sure all components are dry before putting back in service.

- Check all parts and hoses for damage or excessive wear – including O-rings.

- Inflate the Air Bag (do not exceed 30psi without load) and inspect for air leaks or damage.

Safety:

- Never exceed the maximum inflation pressure of 118 psi.
- Always use cribbing as you lift.
- Stability decreases as inflation increases.
- Stand away from the object being lifted or lowered.
- Use extreme caution when stacking air bags, and never stack more than 2.
- Only lift necessary amount to do the job.
- Do not use on an angle greater than 30 degrees.

CHAINSAW (Stihl/Univent)

Tool:

- 6 Hp, 2 cycle engine with decompression valve (Univent 272XP - 4.9 HP)
- 20 inch bar with carbide tipped chain
- Chain brake
- Starter cord
- Off/Run/Choke master Control Switch
- Fuel reservoir 50:1 (40:1 at training) mixed gas
- Bar oil reservoir with Automatic oiler
- Air filter

Use:

- Forcible entry, ventilation, rescue and overhaul
- After use and cleaning, saw should always be left in **ready position**:
  - Decompression pin engaged
  - Chain brake off
  - Ignition/Choke/Throttle Lock on
- Start saw for warm up prior to carrying aloft for cutting operations

Start

- Start on surface while maintaining 2 points of contact (Hand and foot/knee)
- Pull cord until ignition or engine sputters
- Turn off choke and resume pulling starter cord if needed
- Do not pull the cord to the end of rope or allow the rope to snap back into the housing
- Once saw is running, let it warm up prior to revving
- Warm start may not require choking

Flooded

- Turn choke off and turn off ignition
- Pull cord 4-5 times to clear fuel in cylinder
- Follow normal starting procedures without choking the saw

Maintenance:

After Use

- Disassemble covers, guards, chain, and air filter
- Blow off debris with air compressor then clean components using solvent
- Ensure fins on cylinder head are clean to prevent overheating (extra care for tarred roofs)
- Clean air filter with compressed air and replace when heavily soiled
- Reassemble and check chain for condition, tension, and direction of travel
- Replace chain when:
  - 3 or more teeth are missing in a row
  - 6 or more teeth are missing at random
  - Carbide tips have visible wear

- Tension the chain tightly while still allowing movement of chain by a gloved hand
- Check chain tension periodically during operations
- Start to ensure correct assembly
- Refuel and fill bar oil reservoir
- Place controls in ready position

Daily

- Check fluids
- Check chain condition, tension, direction of travel
- Ensure controls are in ready position

Weekly

- Start saw, allow saw to idle for 30-60 seconds. Rev saw in 15 seconds intervals for 1 minute until saw is warm. Allow saw to idle for 30 seconds before shutting down.
- Ensure chain is oiling properly by noticing oil on ground below bar
- Chain clutch should keep chain stopped or slowly creeping around bar
- Ensure chain brake operates properly
- Check starter cord for fray/damage

Safety

- Use full PPE
- Work between hole and point of egress
- Try to be on the windward side of cut especially when clearing hole
- Never cut in line with the body or above shoulder height
- Work with one foot on the roof ladder when necessary
- Engage chain brake before handing saw to someone else
- Beware of kickback

Super Vac P-164SE Smoke Ejector

Tool:

- Explosion proof 1/3 hp, 115 vAC, 750 Watt electric motor @ 1725 rpm
- Square, steel housing for 4 bladed 16 inch, cast aluminum prop
- Explosion proof switch and 2 foot cord with adapter
- 50’ extension cord attached to adapter
- Two hooks w/chains
- Moves 5200 cfm

Use:

- Used for positive or negative ventilation to improve interior conditions for fire fighters and occupants.
- Can be used below ground level when removing an undesirable atmosphere.
- A visqueen smoke tube allows the smoke ejector to move smoke through a clean area without contaminating them.
- Two hooks attached to the top of the fan facilitate placement from window frames, doorframes, doors and or ladders.
- Can be used in a parallel or series arrangement.
- Can be used in an explosive or flammable atmosphere.
- Does not generate CO like gas fans do.

Maintenance:

- After use:
  - Hose down with water at the incident.
  - Remove guards and wipe down blades, housing, and guards with mild soap and water.
  - Check cord and plugs for splits, frays, and loose wires, and wipe down.
  - Motor and switch are non-serviceable.

Safety:

- The cord and adapter are not explosion proof so make cord connection out of flammable or hazard zone.
- Keep objects from being sucked into fan or obscuring intake guard.
- Make sure interior crews are ready before beginning positive pressure ventilation.
- Never operate with loose or damaged fan guards.
- Monitor exposures near exhaust openings.
- Keep people clear of smoke from exhaust opening.

Super Vac 720VR2

Tool:
- 20” Variable Speed 110v Electric Fan
- Motor: 1.5hp motor, 2400 RPM
- 14,000 CFM
- Adjustable angle

Use:
- Positive pressure ventilation
- Variable speed controls
- The variable speed control causes T-2’s generator to surge – to achieve the fans full power and prevent power surge place a separate electrical load on the generator. (i.e turning a generator powered light on).
- Fan will run at full capacity using a 15-amp house circuit **If** the fan is started low and then increased to full RPM
- Can be run on a GFI circuit unlike the other variable speed fans in the bureau.
- Manufacture recommends, 6' max distance from opening and if using multiple fans - use the "V attack" method or fans in the parallel position.

Maintenance:
- Wipe off debris at scene
- If needed, remove guards and wipe down with mild soap and water
- Check cords and plugs for damage and proper ground

Safety:
- Communicate with interior crews before starting ventilation
- Never operate with loose or damaged fan guards.
- Be aware of loose or hanging equipment/clothing around moving fan blades.
- Keep people out of area of exhaust opening
- NOT intrinsically safe

Unifire DS-3P4-L Gas Fan

Tool:

- Honda 5.5 HP, 4 cycle engine with adjustable throttle up to 3600 rpm
- Engine uses 30 weight oil
- Automatic decompression
- 1-gallon gas tank – unleaded fuel – 60 to 90 minutes run time
- Electronic ignition – ON/OFF switch – Fuel shutoff valve
- 18”, 4 blade, 100% waterproof prop with adjustable tilt from -10 to +20 degrees
- Low oil pressure sensor – automatically shuts down engine
- Moves 14885 cubic feet of air per minute (cfm)

Use:

- For mechanical ventilation of heat, smoke, and fire gasses to improve interior conditions for fire fighters and occupants
- START: Ignition ON, fuel valve open, full choke (if engine is cold), throttle 1/2 - pull starter until sputter or ignition – turn choke off and pull again if necessary
- Place fan approx. 3-6 feet from opening so that opening is completely covered by cone of air
- STOP: turn fuel valve to OFF and allow fan to run itself out of fuel

Maintenance:

- Keep in ready position – Choke ON, fuel OFF, ignition ON, and throttle at 1/2
- DAILY: Check oil and gas
- WEEKLY: Check fluid levels and start to ensure proper operation
- AFTER USE:
  - Clean fan - Use compressed air and wipe down blade with soap and water
  - Clean paper air filter with air compressor and foam filter with detergent and warm water – rinse, dry and soak in clean engine oil – squeeze out excess
  - Refuel, check oil level and start fan to ensure proper operation
  - Place controls in ready position

Safety:

- Communicate with interior crews before starting ventilation
- Never operate with loose or damaged fan guards.
- Be aware of loose or hanging equipment/clothing around moving fan blades.
- Keep people out of area of exhaust opening
- NOT intrinsically safe
- Fan produces carbon monoxide – monitor CO levels.

Holmatro Hydraulic Rescue Tool

Tool:

Power head

- Four stroke, 3.5 H.P. Honda motor
- ONLY use Holmatro mineral-based hydraulic fluid
- Can operate 2 rescue tools simultaneously without loss of performance
- Two LED lights for lighting the unit illuminate when the unit is started
- Three LED lights located to the right of the female connections:
  - The top red LED is for low oil pressure and also indicates that the unit is not sitting level. The unit may shut down if it is placed on a 20 degree slope or greater
  - The middle red LED indicates an overheat situation
  - The bottom green LED indicates the unit is due for service
- Access panel to access oil dipstick and air filter
- Storing the power unit on the rig
  - The ON / OFF switch in the OFF position. This closes the fuel supply valve
  - The choke in the ON position
  - The fuel tank vent kept in the closed position to prevent fuel from leaking

Spreaders

- Can be used to spread or squeeze (pull)

Cutters

- The greatest cutting force is at the back of the tips, not at the tip
- Do not cut hardened steel whenever possible. However, if it is necessary, use the back part of the tips

Three Rams

- Large, medium and small
- With the proper attachments, these are capable of pushing or pulling. The pulling force is approx. 1/3 of the pushing force

Hose

- Each length of hose is 32 feet
- Two hoses, one blue and one orange
- The hose is a hose within a hose, with a high pressure supply hose inside a low pressure return hose
- Each end has swivel connectors, allowing the hose to rotate and preventing the hose from kinking
- Kevlar reinforced for strength and flexibility

Chain - T2 chain inventory includes

- ½" Black grade 100 chain used for various stabilization and extrication situations. i.e. pulling steering columns, securing heavy loads and pulling vehicles.
- (2) approximately 6' sections with wrecking hook at one end.

- (1) 20 foot section with ½" chain hook at each end.
- (1) 3' take up chain with chain hook at each end to connect 2 chain sections in order to reset spreaders after a pull.
- (2) ½" chain hook tips for spreaders.
- (1) hook cluster with wrecking hook, chain hook and oval link.

Operation and Use

- Can be used for extrication, rescue and forcible entry
- To start:
  - Turn the ON / OFF selector switch to the ON position
  - Open the fuel tank vent
  - Make sure choke is on
  - Pull the starter cord
  - After 20 or 30 seconds of warm up, the choke can be turned off
- Hoses and tools can be connected to the power unit at any time, with the unit running or off and in no particular order
- Tools can also be hot swapped and can be left in position and under load
- Hoses may be connected to each other for extending reach
- Know how to use the pressure relief device

Maintenance:

Daily and after use

- Check fluid levels (do not fill above max fill lines)
- Clean tools with soap and water after use
- Storage positions (released position)
  - Cutter tips crossed
  - Spreader tips approx. ¼" apart
  - Ram piston with approx. ¼" showing
  - Check cylinders and gaskets for damage

Weekly check

- Normal daily check
- Start power unit and operate all tools
- Check hoses, tools and power unit for damage and leaks

General

- Lubricate female couplings with WD 40
- Do not store the hydraulic hoses with ends connected together
- Do not walk on the hydraulic hoses and protect from mechanical damage

Safety

- Wear full PPE (safety glasses in addition to your helmet shield)
- Use extrication gloves for greater dexterity
- Keep yourself and hoses clear of moving / falling parts
- Do not position yourself between tool and object being removed / cut

Hydra-Ram

Tool:

- Hydra Ram with carrying sling
  - Jaws with a ¼ inch bite and total opening ability of 4 inches
  - Handle ring lock.
  - Pressure relief lever.
  - Fluid is Propylene Glycol (anti-freeze)
  - Frangible disc located under the yellow sticker (pressure relief)
- Rubber mallet
- Flat bar

Use:

- Used for forcible entry tool primarily used for metal/commercial inward swinging doors. May also be used to lift objects.
- Operation:
  - Ensure that the pressure relief lever is not in the open position.
  - Place tool in gap – create ¼" gap with flat bar and mallet if necessary
  - Unhook the handle locking ring.
  - Operate pump handle to extend jaws.
  - When lifting crib as you go.
  - Open relief valve to retract Jaws.
- The hydra ram can be used in any position and can also be used under water.
- Only strike with the rubber mallet.

Maintenance:

- The Hydra Ram should be exercised daily by pumping the handle to create pressure (a vise may be used) so that all three stages of the hydraulics are activated. This will lube up the seals and decrease seal failure.
- Clean after each use with mild soap and water.
- Extend the jaws to expose the piston. Wipe shaft clean with rag and re-lube with 3 in 1 oil. (Do not use WD 40)

Safety:

- Don't over extend the jaws as it will build pressure until the tool activates the pressure relief disc.
- Wear appropriate PPE.
- Keep clear of all moving parts when lifting or pulling
- Always use cribbing if lifting object with tool
- Never add an extension to the pump handle

Rescue 42 Telecrib Strut Set

Tool:

- 4 - Kevlar Composite Telescoping Struts (2 long, 2 short)
  - 4000- 18000 lb limit based on extension and number of pins
  - Steel Base Plate with steel pin
  - 2 - Yellow Kevlar Composite pins
  - Red Steel Combi Head (Chain slot & Piercing point)
- 4 – 2” x 27’ Red Ratchet Straps (3335 lb Working Load Limit)
- 2 – 3”x 30’ Yellow Ratchet Straps (5400 lb Working Load Limit)
- Hook Clusters
  - 8” wrecker’s hook
  - 3/8” chain grab hook
  - “T” hook for inserting into tie down slots in car chassis
- Cinch Rings
- Screw Jack Head
- 20’ Grade 70 Chain
- Working Load Limit(s) for all components are printed on the struts including a load chart for the struts based on extension length

Use:

- Struts are used in combination with ratchet straps and other accessories to stabilize vehicles on their side, top, over embankments or stacked on other vehicles or objects
- Place and set struts so the strut ends up with a 45 to 70 degree angle when tensioned
- Priority should be given to stabilizing the side of the vehicle that is most likely to roll first
- Struts should be placed near the heaviest part of the vehicle
- When extrication is needed place struts so they will be outside of the work area
- Can be used in place of wood cribbing
- Never place pins on the ground after removing them from the struts

Maintenance:

- Wash struts, straps and accessories with soap and water only (No Solvents)
- Dry all components before storing to prevent rust and mildew
- Inspect struts for nicks, cracks and cuts that penetrate the fiber
- Straps should be inspected for rips and excessive fraying
- Avoid excessive exposure to sunlight with straps
- Strut sections can be lubricated with a light spray of WD-40
- Strut bases can be repainted if needed

- Rust should be removed from all bare metal with 00 steel wool

Safety:

- Always Use Proper PPE and Eye Protection
- Never side load struts
- Do not exceed Working Load Limits
- Struts should not be used for lifting
- Do not overextend struts past the orange indicator stripes
- Fully insert and lock pins before use
- Use a long tool to release straps if in a dangerous location

Working Load Limit (WLL)= An industry standard term that refers to the maximum working load designed by the manufacturer.

Rescue 42 DVD YouTube Link:
http://www.youtube.com/watch?v=t9qp8ht_llk&list=PL3108A79CC6C65E4B

Rex Tool

Tool:

- A steel lock pulling tool, with sharp tapered blades on one end and a chisel type blade on the other end.
- The tool also comes with two lock operating tools that are housed in the foam handle:
  - A square key tool for rim locks.
  - Flat bar key tool with flat end and cam end (bent end).

Use:

- **Try before you pry**.
- For use on commercial lock assemblies to pull lock cylinder and expose latch mechanism.
- Drive the forked end over the lock and pry off the lock cylinder to expose the locking mechanism inside the lock.
- Use the lock operating tools to activate the lock to open the door.

Maintenance:

- Insure that there are no chips or breaks in the metal.
- Keep clean with water and soap.
- Paint as necessary.
- Mark appropriately.

Safety:

- Wear appropriate PPE including eye protection.
- Insure a clear swing path when striking.
- Use caution in explosive or flammable atmospheres, striking can cause sparks.

ROTARY SAW (K950/970)

Tool:

- 93cc, 2 cycle engine with decompression valve
- Belt driven 12" (K970-14") diameter carbide tipped or "Tiger Tooth" blade
- Adjustable blade guard and drive arm with belt tension adjuster
- Starter cord
- Throttle assembly
- Choke
- On/Off switch
- Fuel reservoir 50:1 (40:1 at training) mixed gas
- Air filters (primary oiled foam filter, secondary paper filter)

Use:

- Used for forcible entry, ventilation, extrication, and overhaul.
- After use and cleaning, saw should always be left in **ready position**:
  - Decompression valve engaged
  - Ignition/choke on
  - Throttle lock engaged
- Start saw for warm up prior to carrying aloft for cutting operation

Start

- Start on surface while maintaining 2 points of contact (Hand and foot/knee)
- Pull cord until ignition or engine sputters
- Turn off choke and resume pulling starter cord if needed
- Do not pull the cord to the end of rope or allow the rope to snap back into the housing
- Once saw is running, let it warm up prior to revving
- Warm start may not require choking

Flooded

- Turn choke off and turn off ignition
- Pull cord 4-5 times to clear fuel in cylinder
- Follow normal starting procedures without choking the saw

Maintenance:

After Use

- Disassemble covers, guards, chain, and air filter
- Blow off debris with air compressor then clean components using solvent
- Ensure fins on cylinder head are clean to prevent overheating (extra care for tarred roofs)
- Clean air filters:
  - Primary filter- wash with soapy water, rinse, dry and lightly apply engine oil
  - Secondary filter: clean with compressed air and replace when heavily soiled

- Reassemble and check blade for condition, tension, and direction of travel
- Replace carbide blade when:
  - 3 or more teeth are missing
  - Carbide tips have visible wear
- Replace “Tiger Tooth” blade when:
  - blade is cracked, warped, or out of round
  - flat spots, core fatigue, or discoloration
- Start to ensure correct assembly
- Refuel
- Place controls in ready position

Daily

- Check fluids
- Check belt/blade condition, tension, direction of travel
- Ensure controls are in ready position

Weekly

- Start saw, allow saw to idle for 30-60 seconds. Rev saw in 15 seconds intervals for 1 minute until saw is warm. Allow saw to idle for 30 seconds before shutting down.
- Check starter cord for fray/damage

Safety:

- Use full PPE
- Work between hole and point of egress
- Try to be on the windward side of cut especially when clearing hole
- Never cut in line with the body or above shoulder height
- Work with one foot on the roof ladder when necessary
- Two inherent hazards of a rotary saw are the gyroscopic effect of a blade on the saw and the blade continues to spin at high rpm after throttle has been released.
- Be aware when cutting metals, the blade gives off sparks
- Bury blade in material to stop blade before repositioning

Addendum: (know these points but do not include in tool talk)

- To begin cut, bring the saw to full throttle then bury blade into the material using the bottom portion of the handle as a pivot. Drag the saw across work surface.
- Cut with work surface at 90° to blade. Do not twist saw when cutting. Make cuts in straight lines to avoid binding.
- If blade binds in material, release throttle and remove saw from material.
- When cutting concrete, asphalt, or masonry water may be used to cool the blade, control dust and speed cutting operations.
- Cut only as deep as necessary.

TIC Flir K50

Tool:

- 4” LCD display
- Apparatus mounted charger
- On/Off Button
- Mode Button
- Zoom Button
- Save trigger
- Rechargeable battery, 4 hours operating time
- USB port for picture downloading

Use:

- On/Off Button:
  - Push to turn the camera On
  - Push and hold between 3 to 10 seconds to place camera in Standby
  - Push and hold for more than 10 seconds to camera Off
- Mode Button accesses 5 imaging modes:
  - NFPA (default setting), Black & White, Fire, Search & Rescue, and Heat Detection.
- Access main menu by holding down mode button and then pressing the zoom button.
  - Allows access to the image archive and settings
- 2 ranges of sensitivity:
  - Low temperatures -4 - 302° F **(High Sensitivity)**
  - High temperatures 32° - 1202° F **(Low Sensitivity)**
- Search & Rescue and Heat detection modes are locked in high sensitivity.

Indicators

- *Over Heating Indicator* is a triangular symbol at the top center of screen which warns that shut down is imminent due to internal overheating.
- *Spotmeter* a small square in the center of the screen which reads surface temperature.
- *Temperature Scale* is a vertical bar on the right hand side of the screen giving the temperature of spotmeter.
- *Battery condition indicator* is an icon in the lower center of the screen which shows battery life
- *Spotmeter temperature* digital readout is in lower right hand corner.
- *Green icon color* indicates automatic switch between high and low sensitivity ranges.
- *Blue icon color* indicates sensitivity range is locked.

TIC Limitations

- Cannot provide images through glass, water, or shiny objects; it displays reflected image.
- Do not point the camera at the sun.

- Will not provide underwater images. If fogging occurs wipe off the screen **and** the sensor.
- Electromagnetic energy such as radio transmissions may cause interference.

Maintenance:

- Clean housing with a soft cloth damp with a mild detergent solution. (No Solvents)
- Clean infrared lens with cotton wool damp with lens cleaner.
- Store camera and additional battery in apparatus mounted charger.
  - Charging time takes 4 hours when fully depleted, 2 hours to 85%
  - Charging is complete when blue light glows continuously.
- Daily Check and After Use:
  - Turn on camera and check battery condition.
  - Inspect for condition, cleanliness, and for missing parts.
  - Inspect battery and contacts for damage or leakage.
  - Check apparatus mounted charger to ensure proper placement of FLIR and extra battery.

Safety:

- Prior to entering environment, ensure that the camera is functioning properly by turning it on.
- Ensure that batteries are fully charged prior to use.
- Does not measure gas temperatures but rather the temperature of surfaces.
- Do not rely on the camera as sole means of navigation.
- Do not walk while looking through the TIC; it increases the danger of falling.
- The TIC is not intrinsically safe.
- Avoid overexposure to heat.

TIC MSA 5800

Tool:

- Camera body that is flame retardant, dust and water **resistant**.
- Display Screen.
- Rechargeable Battery with 2 hours of operating capacity.
- Apparatus mounted charger.
- Green On/Off/Zoom button.
- Palette Change Button
- LED indicator lights.
- External video connection port.

Use:

- Search and Rescue, initial size up, locating the fire and checking extension, identifying potential flash over, HAZMAT situations, overhaul, determining entry and ventilation points.
- To turn the unit **ON**: Press and hold the green button for 1 sec. Wait 5 seconds for infrared sensor to self-test.
- To turn the unit **OFF**: Press and hold the green button for 4 seconds.
- **Does not have a standby mode. The 5800 model has the zoom feature instead.**
  - **Zoom 2x:** when TIC is on, press the green status button once. Green status light will start to blink and "2X" will appear on the display screen.
- 2 modes of sensitivity:
  - Low temperatures up to 320° F **(High Sensitivity)**
  - High temperatures 320° - 1040° F **(Low Sensitivity)**

On screen indicators

- Low Sensitivity Mode Indicator:
  - There is an “L” located in the lower left when temperatures exceed 320° F.
- Heat Seeker Indicator
  - Adds shades of color to the temperature of objects in both high and low sensitive modes.
  - Colors range from Black to White, then Yellow, Orange and finally Red as temperatures increase.
  - In low sensitivity mode the colors represent a higher temperature range.
- Quick-Temperature Indicator: the green square in the center of the screen
  - Place square on the object of interest.
  - The digital temperature read out displays only the temperature of the surface; **does not measure gas temperature.**
  - The vertical bar on the right hand side of the screen gives the temperature ranging from 0°-300° in High Sensitivity and 0°-1000° in Low Sensitivity.
- Shutter Indicator:
  - Periodically the TIC will refresh the focal plane in order to operate properly
  - The TIC image on screen will temporarily freeze (1 sec.) and a green square will appear in upper left corner of screen.

- This occurs more often in higher heat condition.

LED Indicators

- Over-Temperature Warning:
  - Flashing Red LED indicates the TIC has exceeded recommended operational thermal limits.
- System Status Indicator:
  - Green LED - TIC is on and fully operational.
  - Flashing Green LED - TIC is on and in power-saving standby mode.
- Battery Status Indicator: a row of three LED lights. Only one is illuminated at a time.
  - Green indicates full or nearly full battery capacity.
  - Yellow indicates marginal battery capacity.
  - Red indicates battery warning (about 15 minutes of battery life remaining).
  - Flashing Red indicates the battery shutdown is imminent (one minute warning).
- System Fault Indicator
  - The TIC's computer runs a self-diagnostic program and all 5 LED lights will flash if a system fault is detected. Remove from service.
- Selecting palettes: Select by depressing the palettes button on the bottom right of the camera's main housing. Camera will automatically default to "white hot" mode when turned on. Each time the button is pressed the palette will change. Press and hold palette button for 2 seconds to return to default setting.

TIC Limitations

- TIC can't provide images through glass, water, or shiny objects; it displays reflected image.
- Do not point the camera at the sun.
- Will not provide underwater images. If fogging occurs wipe off the screen **and** the sensor.
- Electromagnetic energy such as radio transmissions may cause interference with the TIC.

Maintenance:

After Use:

- Clean external surfaces with mild detergent and warm water and dry with soft cloth (avoid scratching display).
- Inspect for heat, chemical, and structural damage or missing parts.
- Inspect batteries and contacts for damage or leakage.
- Place TIC in charging cradle and ensure pins and cradle are free from debris.

Daily Check:

- Turn on TIC and check battery condition.
- Inspect condition, cleanliness, and for missing parts.
- Ensure TIC LED's are operating properly
- Check apparatus mounted charger to ensure spare battery is charged and TIC is properly placed.
  - Verify the LED light is on as indicated:
    - Green…….. Charge complete
    - Fast Blinking Green….. Charging
    - Slow Blinking Green…. Charge pending

- Red……..Fault (make sure free of debris or contact shop)

Safety:

- Prior to entering environment, ensure that the camera is functioning properly by turning it on.
- Ensure that batteries are fully charged prior to use.
- Do not rely on the camera as sole means of navigation.
- Do not walk while looking through the TIC; it increases the danger of falling.
- The TIC is not intrinsically safe.
- Avoid overexposure to heat.

GLOSSARY

ACCORDION FOLD	Hose folded back and forth in the hose bed, having the appearance of pleats in an accordion.
BIGHT OF HOSE	The amount of a hose it takes to run from the rear of the bed to the front of the bed forming a fold and running back to the rear of the bed again is one bight of hose.
CHARGED LINE	A hose line filled with water under pressure.
COUPLING	As a noun, it is the connecting device attached to the end of a length of hose having either male or female threads. When used as a verb, it is the act of connecting hose.
DOUBLE HEADER	Means “taking a hydrant” using 2 lay in lines, a “Steamer Port” along with a spare gate w/spanner to double the volume of water to the engine.
DRAFTING	A means of supplying a pump with water from a body of water, by creating a partial vacuum within the pump and permitting atmospheric pressure to force water into the pump.
DRAG LOAD	The drag load consists of 2 bights of hose along with the hose leading out of the stretch bed to provide additional ready hose to be dragged by a firefighter during the performance of an evolution.
DUTCHMAN	A shortened bight of hose usually made in the rear of a lay-bed to accommodate either the strategic placement of a coupling or to hide the paint marks on the bights at the front of the bed that are visible to the public.
EVOLUTION	An organized pre-assigned sequence of tasks carried out or executed simultaneously by a crew of 2-4 firefighters to accomplish a firefighting objective usually within a pre-determined amount of time.
EXPANSION RING	The metal ring that holds fire hose securely to the inside of a coupling.

FLAKE	As a noun; a Flake is equal to a “bight” of hose (see “Bight of Hose”) carried on ones right shoulder during the performance of a stretch to be “flaked” off the shoulder with the right hand. As a verb; it is the skilled and orderly removal of the flakes of the “Shoulder load” that are carried on the right shoulder.
HAND LINES	Firefighting hose with nozzles able to be advanced and operated manually by one or more firefighters. Portland Fire handlines consist of 1” Booster lines, as well as, 1 ¾” to 2 ½” attack lines
HARD SUCTION	A hard rubber hose with a plastic or wire helix, usually 10’ long, used for drafting operations. Hose can be 3” or 6” in diameter.
HYDRANT SPANNER	A specially designed double ended wrench. One end for removing the caps of a hydrant and turning the valve stem found on top of the hydrant that opens the subterranean water gate to the hydrant. The other end is a hook for tightening and loosening the couplings by their lugs.
LUGS	The knobs found on both the male and female coupling that aid in making and breaking their connections to each other as well as gates, standpipes, turrets, Etc.
OVERHAUL	A late stage of firefighting in which remaining hot spots are extinguished and fire debris is removed from the structure.
PORT	Any fixed intake or outlet where hose lines may be attached.
SHOULDER LOAD	Usually 2 or more bights of hose loaded on the shoulder to be stretched and flaked during a hose evolution.
SINGLE HEADER	“Taking a hydrant” using a single lay-in line and spare gate with spanner.
SOFT SUCTION	An erroneous but commonly accepted term for a short length of 3” diameter hose used to connect a pump to a hydrant (no “suction” is involved because the hose is useful only when the engine receives water at pressures above atmospheric). Soft suction hose is used for incoming water only, not for lengthening a stretch line.
STEAMER PORT	The larger 5” port on the front of the hydrant that we use to attach our spare gate when we have taken a hydrant double header. We call the Morse Gate with its attached adapters to make it fit the 5” port a “Steamer Port” as well.

STRETCH — To stretch hose is to pull hose from an engine to a fire objective.

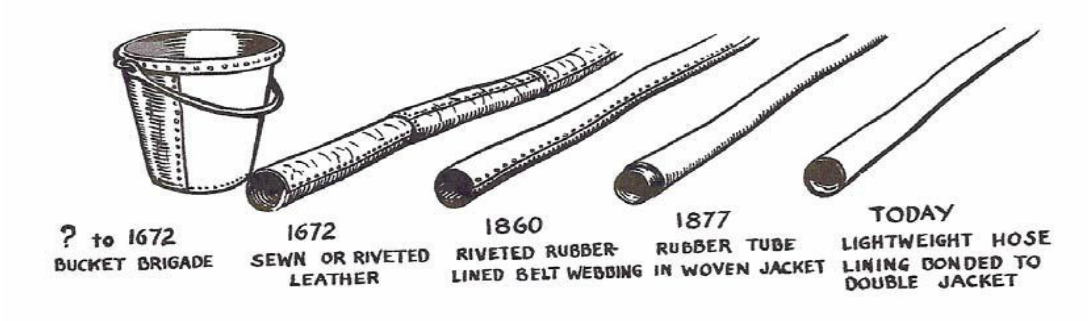
As a command; “Stretch” is yelled to the next firefighter in line that will flake hose as an advanced notice just before they are to begin flaking their hose so that they can be prepared for the hose becoming taut and needing to lay down and “stretch” out their first flake (or bight of hose) off their shoulder load.

“U” SHOULDER LOAD — The finish load in the stretch bed, which is carried to the fire to be used for firefighting.

TAKE A HYDRANT — To secure a water supply for an engine laying-in to a fire by removing enough hose, gates and hydrant wrench (Spanner) in order properly connect all said equipment to the ports of a hydrant, open the hydrant and send water through the hose to the waiting engine.

VULCANIZE — A process of treating crude or synthetic rubber chemically to give it useful properties such as strength and elasticity.

WATER HAMMER — The force created when the flow of water is abruptly halted.



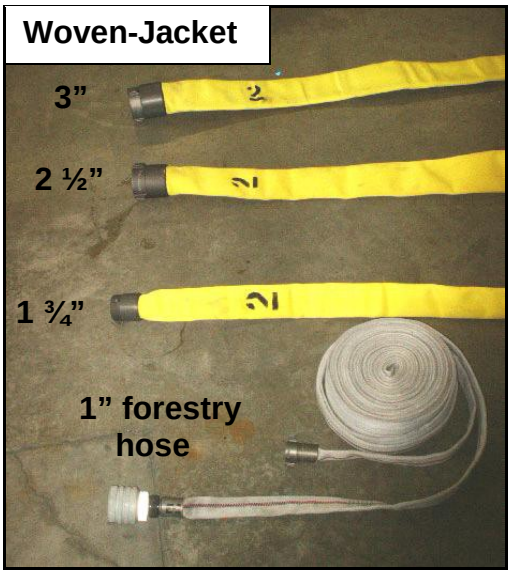
PART I
TYPES OF FIRE HOSE

FOUR STANDARD TYPES OF FIRE HOSE IN USE TODAY:

Woven-Jacket
Rubber-Covered
Wrapped (Hard Suction)
Braided (Booster)

Woven-Jacket

There are two types of woven-jacket fire hose: lined and unlined. The standard fire department hose consists of one, two or three woven jackets with an inner lining. They are supplied in fifty foot lengths, with diameters of 1¾", 2½", and 3".



Unlined hose consists of a single thickness of woven linen and depends upon the tightness of the weave to hold water. It is widely used with inside standpipes and in forest firefighting because of its lightweight and flexibility. Forest fire-fighting hose with a one-inch diameter is usually found in 100' lengths

Rubber-Covered

Rubber-covered is a general term used to describe this type of hose. The construction differs from woven jacket hose. The outer protective covering can be rubber or a synthetic type of material. It can either be extruded or vulcanized during the construction process. The diameter sizes used are 1¾", 2½", 3", and 5".

Generally, 5" hose comes in 100' lengths and has a unisex coupling called a Stortz connection. Unlike a 3" hose coupling, a Stortz coupling has no male or female ends and only requires a ¼ turn to make and break connections. There are no threads but a silicone lubricant is required on the rubber

seals between the couplings. A full 100 foot length of 5” hose weighs about 900 pounds, which makes it difficult to move once it has water in it. Because of the large diameter of the hose, it is not recommended that it be driven over. However, if it is necessary to drive over it, at least 8” of clearance is needed. Apparatus should approach the hose at a 30 to 45 degree angle to get over it. If not, the tire will most likely push the hose in front of it damaging the hose.

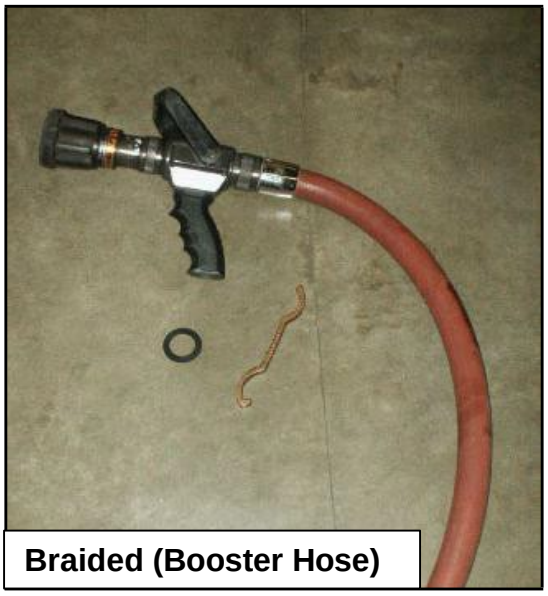
Wrapped (Hard Suction)

Wrapped hose is constructed by wrapping layers of material around an extruded rubber tube. Rubber covered suction hose has a rubber lining, plies of fabric reinforcement, a helix of wire set in rubber, additional plies of fabric reinforcement, and a rubber cover. Plastic covered suction hose has a plastic helix to provide support. Either type of construction results in a hard, stiff hose that will resist the vacuum developed in the hose during drafting operations. The standard length for hard suction hose is 10’ and is available in 3” or 6” diameter

Wrapped (Hard Suction)

Braided (Booster Hose)

This type of hose is a rigid, non-collapsible hose made of several layers of rubber and braided material. This 1” hose is loaded on booster reels, typically located mid-ship above the pump panel on engines.



Braided (Booster Hose)

Specifications and Testing

N.F.P.A. publishes the minimum requirements of hose design and construction and the design verification testing done by the manufacturer of new fire hose. Portland Fire & Rescue purchases fire hose that meets or exceeds these specifications. General Order #16 “Care and Testing of Fire Hose”, which mirrors the NFPA standards, establishes procedures to properly perform hose maintenance, testing, repair, marking and inventory.

PART II
CARE OF FIRE HOSE

Fire hose provides one of the most valuable means of extinguishing fire. As with all fire extinguishing equipment, to be reliable it should always be in good working order and cared for properly. It should not be used, except in extreme emergencies, for other than firefighting purposes.

The importance of reliable hose and the ability to put hose streams into action without delay is often not fully appreciated until fire occurs and a pressing need for action arises. When neglect of hose is discovered because it fails when called upon for service, it may be too late. Time will be lost when attacking a fire if a hose fails and must be replaced. A hose line that fails may also be responsible for serious injury to firefighters and other persons.

The Chief Hose Officer has determined that fire hose be subjected to an annual service test. Specifications for the annual service test are found in General Order #16 “Care and Testing of Fire Hose.”

Cleaning Hose

Dirty hose should be washed and thoroughly rinsed with clear water. Use a stiff brush or broom to remove small particles lodged in the weave of the jacket. Do not use any type of solvent to remove grease or stains. A strong soap or a mild detergent may be used in extreme cases where stains are the result of oil or acid exposure. Couplings should be cleaned and a visual inspection should be made of its overall condition and any necessary repairs attended to. Hose should be thoroughly dried before placing in storage. All polyester, nylon, or rubber-covered hose may be reloaded while still wet but only after proper cleaning.

Marking Hose

All hose issued to first line companies shall be marked with the number of the Engine Company in that station. Hose issued to reserve apparatus shall be marked with an “A” followed by the apparatus number in yellow. Marking of fire hose will follow the instructions contained within General Order #16 “Care and Testing of Fire Hose.”

Damage to Fire Hose

The sources of damage to fire hose are as follows:

- Mechanical Injury
- Heat Injury
- Mold and Mildew
- Freezing
- Chemicals

Mechanical Injury

Cuts, snags, abrasions and damaged couplings result from dragging hose over rough ground or pavement or around sharp corners. Care must be taken that vibration from the apparatus pump and motor does not cause chafing of the jacket on pavement, curbs, or other surfaces the hose may contact. Figure 1 illustrates the protection of hose using chafing pads.

Figure 1

Heavy vehicles being driven over hose lines may cause severe mechanical injury. Do not allow any vehicle to run over fire hose during firefighting operations unless absolutely necessary. It is not permissible to run over any part of fire hose during "picking-up" operations. Do not allow vehicles equipped with studded tires or chains to run over fire hose unless the hose has been properly protected (See Figure 2).

Never under any circumstances should the hose be run over near a coupling since this might distort the expansion ring and pull the hose loose from the coupling.

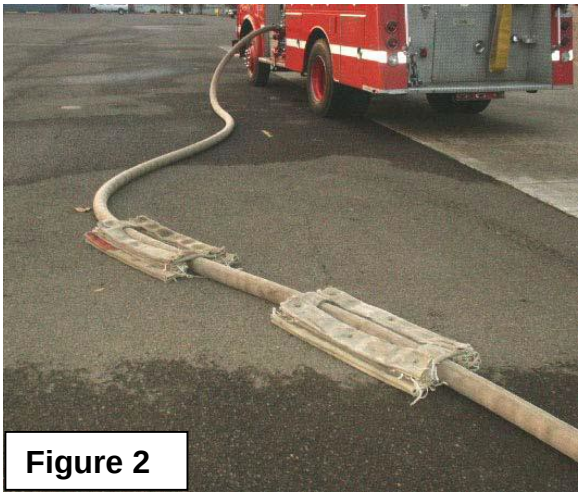


Figure 2

A "water hammer" can injure not only hose lines in use but also plumbing on the apparatus. To avoid a "water hammer," shut off the water flow slowly.

Hose can also be mechanically damaged by the sharp bends that occur when it is loaded into the hose bed. Frequent hose changes helps to avoid the strain that causes permanent kinks. First line and reserve companies shall reload hose every three (3) months. All hose shall be reloaded so the folds will occur in different locations on the hose.

Heat Injury

The higher the temperature to which hose is exposed, the more rapidly the lining hardens. At very high temperatures, such as are encountered adjacent to steam pipes, vulcanization takes place so rapidly that the hose is readily put out of commission by the lining hardening and cracking the first time the hose is bent.

The fiber in hose loses its strength when scorched. Take precautions to see that the hose is not buried by, dragged over, or allowed to rest on hot cinders.

Mold and Mildew Injury

All cotton-polyester hose should be thoroughly dry before loading or storing. Improper cleaning and drying of hose causes mildew, mold and other forms of fungus growth appearing on the hose. Mold and mildew are likely to occur in the lower layers of the hose load where there is a lack of air circulation.

In the event that mold or mildew should form on the surface of any all-polyester hose it should be cleaned by brushing with a solution of soap and water, and thoroughly rinsing with water. In persistent or severe cases use a solution of 1 cup bleach in 5 gallons of water, brushing and thoroughly rinsing with water. Even though mold or mildew may leave stains, it will not damage all-polyester hose jacket material.

Injury by Freezing

A common cause of hose injury during the winter months is improper handling when it is frozen. When in this condition it should be picked up with great care, as the frozen fibers are weakened and apt to break. When necessary, chop it clear by using an axe to free the ice beneath it. Any ice attached to the hose should be permitted to remain and the hose loaded with as few bends as possible. Never attempt to roll or fold frozen hose. Transport frozen hose to a warm place. After thawing, give it regular care.

Chemical Injury

Many liquids and gases contain chemical ingredients that can harm fire hose. Strong acids and alkaloids will attack hose jackets and the more volatile petroleum products such as gasoline penetrate the jacket and act to dissolve the rubber lining. Where there is likelihood that hose has been in contact with chemicals it should be thoroughly washed and scrubbed as soon as possible.

Hose lines laid parallel to the curb should be kept far enough away that water in the gutter will flow between the hose and the curb. The dirt, grease, chemicals and gasoline which are picked up and carried in the gutter by water flowing from the fire ground are apt to damage the hose if it is laid in the gutter.

When marking hose, use only materials specified in General Order #16 “Care and Testing of Fire Hose.”

INSPECTION OF HOSE

A visual inspection of all hose should be conducted to discover chafing, checking, cuts in the hose outer covering and displacement or damage to the couplings. This inspection is made after each use, when reloading, and at the annual service test.

Booster Hose

Booster hose should not be kinked, and care should be taken when rolling this hose onto the reel so that no undue twist is put into the hose. When hose is rolled back onto the reel it should be wiped clean and inspected for damage. Hose should not be jammed between the side of the reel and the frame. (See Figure 3)

Hard Suction Hose

Hard suction hose construction results in a hard, stiff hose that will resist the vacuum developed in the hose during drafting operations.

Because of the weight and stiffness of the hose, it will require at least two firefighters to lift and make connections. A rubber mallet can be used to strike the ears on the coupling to tighten the connection. Sharp bends should be avoided and the weight of the hose should not hang from the connection. If it is suspended when connected, some suitable support should be provided at the middle. Engines drafting, or connected to a hydrant by hard suction hose should not be moved unless the hose is disconnected.

Unlined Linen Hose

Unlined linen hose can be encountered inside buildings connected to standpipes. They are usually located in a hose cabinet with a non-closing nozzle attached. These hose lines are meant to be operated by untrained users.

This type of hose is being phased out as of 1976, because it is subject to rapid deterioration under moist or wet conditions. It will not withstand frequent service and is not suitable for use where fabric will be subjected to chafing on rough or sharp surfaces. For fire-fighting purposes, it is recommended that firefighters disconnect this type of hose from the standpipe and connect their own hose for use.

Figure 3

Hose Weight and Capacity

1¾” Hose:

- 50’ weighs approx. 13lbs.
- Will hold 6.23 gallons of water.
- Weight of hose and water is approx. 65lbs.

2½” Hose:

- 50’ weighs approx. 45lbs.
- Will hold 12.75 gallons of water.
- Weight of hose and water is approx. 151lbs.

3” Hose:

- 50’ weighs approx. 50lbs.
- Will hold 18.36 gallons of water.
- Weight of hose and water is approx. 203lbs.

5” Hose:

- 100’ weights approx. 107lbs.
- Will hold 102 gallons of water.
- Weight of hose and water is approx. 956lbs.

PART III
COUPLINGS AND GASKETS

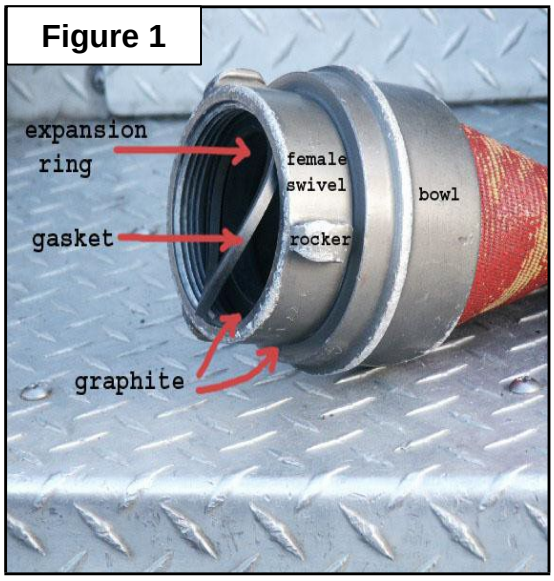
A coupling is a simple connecting device attached to the end of hose. When properly maintained it will provide years of service. The coupling consists of a bowl that houses an expansion ring that holds the fire hose securely inside it. The female end will have a swivel with a rubber gasket. Rockers are found on both male and female couplings and are used for gripping the coupling with either your hand or a spanner (see Figure 1).

Care should be taken when handling hose to prevent dropping couplings. Impact can cause damage to the swivel and male threads or even make the couplings out of round. Hose should be rolled with the male threads in the center of the roll to protect from injury.

Couplings should be cleaned, washed out and thoroughly checked for defects before the hose is placed back in service. Sticky swivels can ordinarily be freed by washing in a warm solution of soap and water. Submerge the swivel and turn it until a free movement is obtained and the swivel spins easily. Rinse in clear water and lubricate the swivel joint both externally and internally with an approved lubricant. Do not use grease or oil!

When couplings are examined, check gaskets for fit and condition. Rubber gaskets deteriorate from age and mechanical injury. Gaskets should be replaced if they show hardness, checking or cutting. A gasket should not protrude into the waterway of the coupling and should have an outside diameter large enough to fit the gasket recess. Before making any hose connection, the firefighter should check to see that there is a gasket in place.

Figure 1



PART IV
HANDLING FIRE HOSE

Firefighting requires a high degree of teamwork, proficiency, and timing. When hose is used in fire-fighting operations, each individual involved is called upon to perform basic hose practices. The skills exhibited in performing these basic hose practices determine the relative success of the hose operation. Should an individual fail in one minor practice, such as coupling a hose, the team will falter or fail.

All basic hose practices are important to the success of hose evolutions. They must be mastered by the individual firefighter before that firefighter can participate in company operations.

TEN BASIC HOSE PRACTICES

- Make and Break Connections
- Loading Hose Beds
- Pulling Hose From The Bed
- Shoulder Loading
- Carrying Fire Hose
- Carrying Nozzles
- Controlling Nozzles on Hand Lines
- Picking Up Hose
- Taking a Hydrant
- Clamping a Hose Line

MAKE AND BREAK CONNECTIONS

One Firefighter

There are three recognized methods that may be used by a firefighter in making a connection while working alone.

Straddling the Hose

Place hose between the knees just back of the female coupling and grasp the male coupling in the other hand. Insert the male coupling into the female coupling swivel and turn the swivel to the right until the connection is tight (See Figure 1).

Figure 1

Over the Knee

Position feet apart, with your knees bent. Have the hose thrown well behind your body with female end of hose lying across upper part of your leg. Cup the male coupling in a hand and grasp the female coupling in the other hand. With your thumb behind the lug, bring the couplings together and turn the swivel to the right until the connection is tight (See Figure 2).

Figure 2

Stepping on the Hose

Spread feet well apart. Place foot close to male coupling to tilt coupling off ground. Turn female coupling swivel onto male coupling until connection is tight (See Figure 3).

Figure 3

Greater latitude is allowed in breaking connections since there is no need to align threads to mesh and it is not considered essential to work from the male side of the connection in order to turn the swivel to the right when uncoupling. Any of the methods used in making connections may also be employed to break a connection by turning the female swivel to the left until the couplings are freed.

Attaching Nozzles

When attaching a nozzle by stepping on the hose, hold the nozzle, coupling, and hose in the same manner as when making a connection in the hose line. When straddling the hose, hold the nozzle so that the tip is away from the body (Figure 4)

Double Connection

The double connection is screwed into or onto the hose or appliance depending on the circumstances of the situation. There is less chance of dropping the double connection when using the method illustrated in Figure 5.

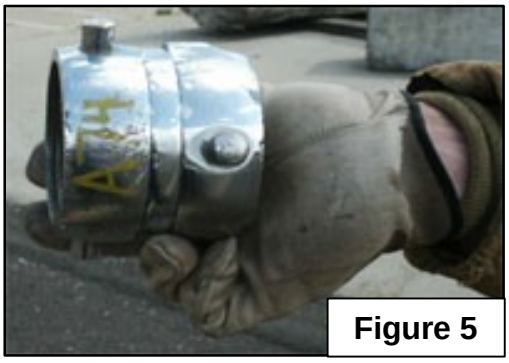


Figure 5

Figure 4

Two Firefighters

Two firefighters working together will make the connection as illustrated in Figure 6. The operation is made easier when the firefighter holding the male coupling holds it steady and looks away, allowing the firefighter with the female coupling to align the couplings while turning the swivel.

Figure 6

LOADING HOSE BEDS

Figure 7

The areas on engines where 2 ½" and 3" hose is carried are called the "hose beds." On Portland Fire & Rescue engines they are divided into two hydrant beds, a stretch bed and a bulk load. Figures 7 & 8 shows the common arrangement of hose beds together with the terms used for each hose bed.

Loading hose beds is not an emergency operation, but is vital to the efficiency of company operations at the time of an emergency. Hose should be loaded snugly enough to prevent it from shifting or sliding when the engine is driven over rough terrain, but not tight enough to bind when laying-in or pulling hose out for a stretch. All couplings should be hand tight and the flat side of each length of hose kept in alignment to the flat side of the length to which it is coupled. Bends at the rear of the bed should be made carefully and kept even to facilitate pulling hose and estimating the amount of hose remaining in the bed. Hose carefully and evenly loaded presents a neat appearance, shows pride in apparatus and equipment and is indicative of company morale.

Figure 8

Loading the Hydrant Bed

An "Accordion Load," is used to load the hydrant bed. It is started in a rear left corner of the hydrant bed with a double female attached to the end of the hose bearing the male coupling (Figure 9). Holding the hose close to the side of the bed, it is brought from the rear to the front of the bed where it is bent and led back to the rear. After the first full fold is in place it is flipped over so that the coupling is on the inside. This is done to protect the coupling and to pull it away from the side of the compartment so it is easier to remove the double connection if needed. It is then bent again and led back to the front of the bed. This folding is continued until a layer of hose has been formed in the bed. With the first layer of hose completed, the hose is gradually raised as it is brought from front to rear along the side of the bed. At the rear of the bed the hose is on top of the first layer and in position to start the second layer (See Figure 9).

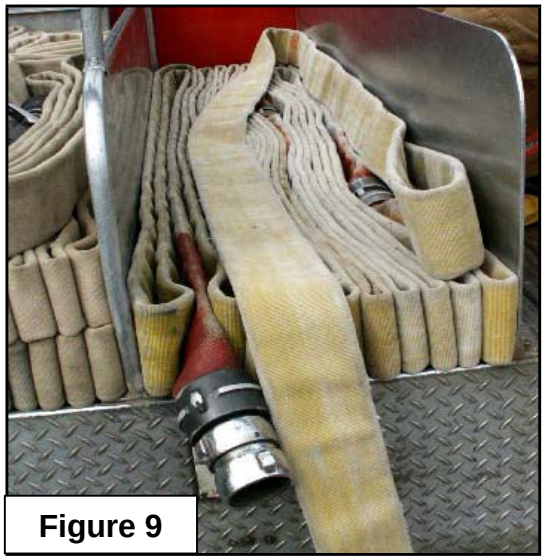


Figure 9

The same back and forth folding process as the first layer forms the second and succeeding layers. As each fold, or bight, of hose is placed into the load, the remaining space in the bed becomes increasingly narrower until the width is less than the length of a coupling. If a coupling is placed in the load at this point so that it must turn around when paying out, it will jam. To prevent this from happening, a short fold or reverse bend is made as shown in Figure 10. This procedure, known as a "Dutchman," brings the coupling into place so it does not have to turn around when leaving the bed. It may also be used to keep a coupling out of the bend in the hose at either end of the bed.

Figure 10

WRONG – Coupling must turn to pay out.

RIGHT – Dutchman formed. Coupling will now pay out without having to turn around.

Loading the Stretch Bed

A Modified Accordion Load is used to load hose in the stretch bed (Figure 11). This load is started by placing the end of the hose bearing the female coupling in the left rear corner of the stretch bed. The first layer of hose is then folded into the bed as described for the accordion load in the hydrant bed.

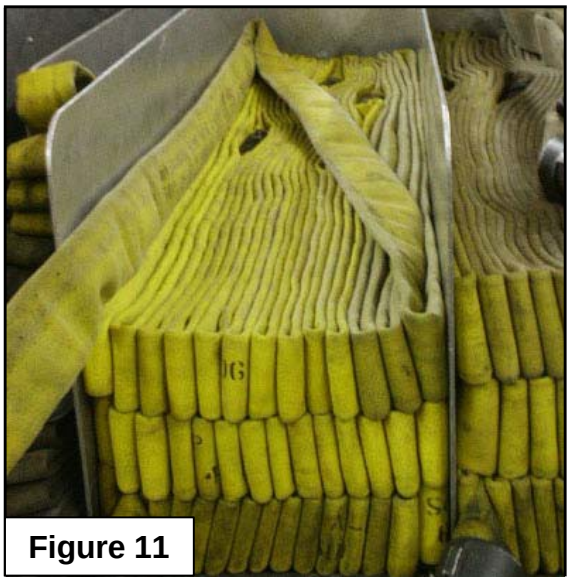


Figure 11

When making the last bight in a layer, fold the bight towards the inside of the bed and bring the line a short distance toward the front of the bed. Then lift the hose up and lead it diagonally across the top of the first layer to the left front of the bed where it is bent back and a new layer is begun from the left side of the bed. When making the transition from right to left, the top edge of the hose on the right side should be on the top edge on the left side of the bed. Succeeding layers are made in the same manner.

Loading the Bulk Load

The Bulk Load consists of 300 feet of 1 ¾" connected to 200 feet of 2 ½" hose with a bell reducer. Start loading hose with a 2 ½" female coupling extended beyond the hose bed on the left side.(Figure 13a) Lay the hose straight forward to the left front of compartment. Fold hose at the front and bring it about halfway back on top of itself. At this halfway point, veer the hose slightly to the right so as to come alongside the first fold. Repeat the movement back and forth from left to right with 2 bights per row until all the 2 ½" is loaded.(Figure13b) Attach the Bell reducer to the male end, then attach the 1 ¾" hose and continue loading left to right with 3 bights per row. Allow the bights to extend approximately 12" beyond the end of the hose bed for ease of deployment.(Figure 12) Upon completing the first layer of 1 ¾", fold hose at right front side and cross diagonally to the left rear side. Repeat until all but the last 50' is loaded. Leftover hose can be flaked at front of bed. Finish with a 50' "U" shoulder load.

Figure 12

Figure 13a

Figure 13b

Figure 13c

Figure 13d

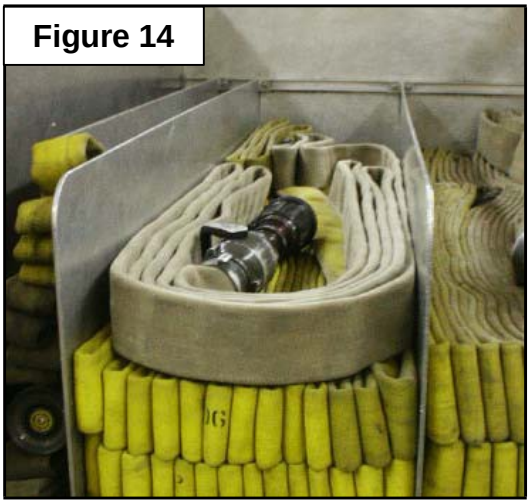
Load Finishes

The last length of hose is usually made up in a special manner designed to expedite placing the load in service. This special treatment is known as the load finish.

In the stretch bed the load finish is called the "U" shoulder load (Figure 14). A nozzle is attached to the last length of hose and the shoulder load is started with the nozzle and made up before the length is connected to the rest of the hose in the bed.

The nozzle is laid on the hose in the stretch bed. Starting with the first loop to the right, two loops approximately three to four feet long are made on each side of the nozzle. The balance of the hose is looped toward the front of the bed, then brought back and connected to the male coupling of the preceding length at the right rear corner of the bed.

Figure 14



Loading the Preconnect Slots

The standard vertical accordion 1¾" hose load is started by first making a drag load of the first one or two lengths. Attach the female end of the first length to the supplied male connection in the slot. The hose is then folded into the slot. Leave a small drag loop on the second layer of hose to facilitate pulling the hose from the bed. Continue with as many folds as the hose and bed length allows. When the male coupling is reached it is laid up out of the way until the shoulder load has been finished.

The shoulder load (one or two lengths) is started with an attached nozzle that is folded into the slot in a vertical accordion load. The nozzle is placed on top of the last fold of the drag load of hose. The nozzle tip should just protrude beyond the folded ends beneath it. Connecting the male coupling (which was laid up out of the way) to the female coupling on the end of the line bearing the nozzle completes the load. Due to variations in hose and bed lengths it may be necessary to make a short fold of hose on top of the load to take up slack (Figure 15a).

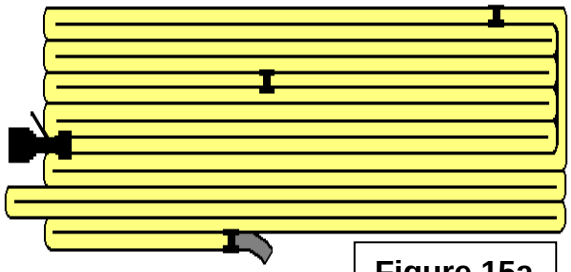


Figure 15a

The modified accordion load version is very similar but eliminates the need to pull on the drag load loop. When the nozzle is pulled from the bed, it pulls on the entire hose load. The drag load will drop to the ground right out of the slot (Figure 15b).

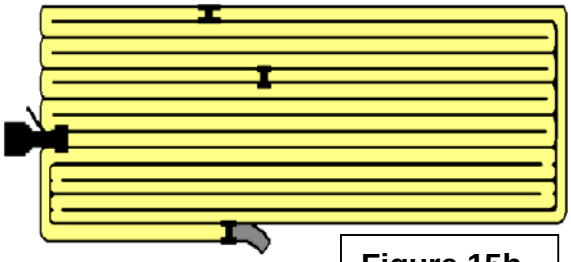


Figure 15b

PULLING HOSE FROM THE BED

When hose is pulled from the bed for a drag load, the pull load normally consists of the line coming out of the bed and two bights of hose.

Stand with the hose leading out of the bed on your right side. As you pull a load, lift it slightly to lessen friction and pull it straight back until the load drops free from the bed (Figure 16). Retain a grip on the hose. Back up and continue to pull until the line leading from the bed is taut. It will help to properly arrange the drag load on the ground if you bend over and hold your hands close to the ground while backing up after the load has dropped from the bed.

Figure 16

If the hose is being pulled from the bed, make a quarter turn, look to make sure the area behind you is clear, then back toward the left side of the engine until the load is at right angles to the hose remaining in the bed. The load is then released, laying the hose on the ground. The area directly behind the engine should remain clear to reduce the chance of tripping or hose becoming entangled.

SHOULDER LOADING

Taking A Shoulder Load of Hose

Taking a shoulder load of hose starts as though pulling hose from the bed (Figure 17). The hose is grasped with the line leading from the bed and two bights of hose and pulled until the load is about three-quarters out of the bed. You then lay the ends down, move to the right side of the hose, and take hold of the middle of the load with both hands. Squeezing the layers of hose together, the load is then rolled onto the right shoulder so the line coming out of the bed will be on top of the shoulder load (Figure 22). With the load balanced on the right shoulder, move away from the engine, watching over the left shoulder and stop when the line coming out of the bed is taut.

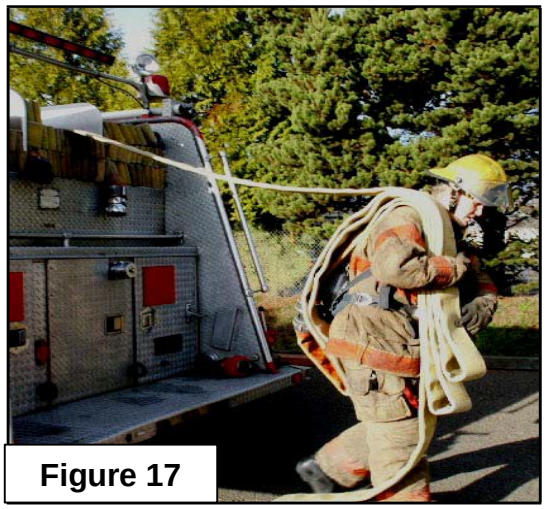


Figure 17

Taking A "U" Shoulder Load

To shoulder a "U" shoulder load, pull the load toward yourself until you can get your right arm under the center of the loops (Figure 18). Slipping the load onto your right shoulder, turn to the left and move directly away from the engine, watching back over the left shoulder until the hose coming out is taut.

Figure 18

Pre-connect Line

When shoulder loading a pre-connect, the load consists of that part of the hose folded on top of and including the line with the nozzle attached.

A firefighter shoulder loading a pre-connect grasps the load, raises it up and pulls it out of the slot far enough to shoulder it. Laying the ends down, move to the right side of the load, squeeze the bights together, and place the load on your right shoulder.

CARRYING FIRE HOSE

Hose is usually carried in one of the following ways:

- While connected in a line
- While rolled
- As a shoulder load
- With utility straps
- For taking up a ladder

While Connected in a Line

When hose is connected in a line, it is carried by a firefighter at each coupling, with each firefighter carrying the hose on the same shoulder. The coupling is placed just behind the shoulder to avoid injury if the hose should become entangled and hang up while being carried, as shown in Figure 19.

Figure 19

The carrying of a charged supply line is not recommended. When possible, it is better to clamp or shut down and drain the line before moving.

While Rolled

Hose is sometimes carried rolled, especially when picking up lines after a large fire. Usually it is carried under the arm against the side of the body with the fingers thrust through the center of the roll. Safety and the protection of the couplings are the main considerations. It is not recommended to carry 5” hose alone! However, it can be carried by two firefighters placing a pike pole through the center of the roll and each lifting an end of the pike pole.

As A Shoulder Load

A shoulder load of hose is carried as shown in Figure 20. This load is normally taken from the stretch bed; it should be carried so the female coupling or line coming out of the bed is on top of the load.

The procedure of paying out hose from this load while walking along is known as “flaking.”

The top fold or bight of hose is grasped between the thumb and first two fingers. It is then taken off the shoulder and brought down at arm’s length near the knee, where it is released. Immediately the next bight of hose in the shoulder load is grasped and brought down to knee level in the same manner. It is released when the preceding bight has been stretched out. This action continues until the shoulder load has been flaked (Figure 21).

When flaking on stairways, the bight is brought down to knee level and released one layer at a time as the hose pays out (Figure 22).

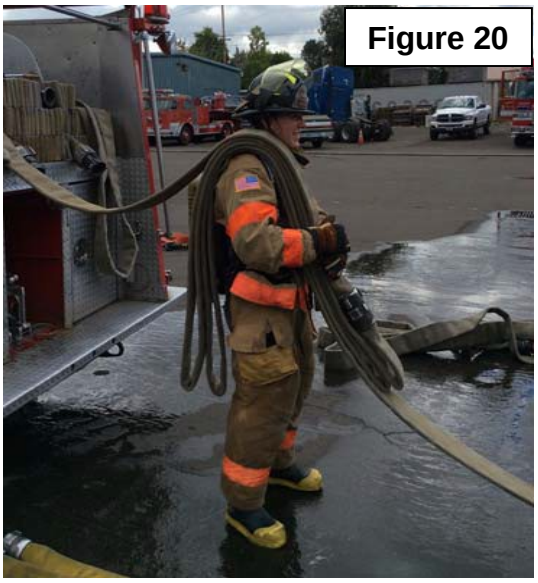


Figure 20

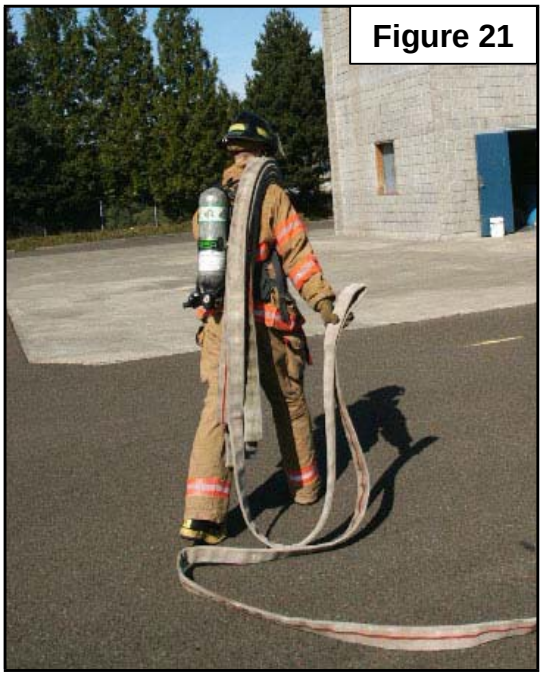


Figure 21

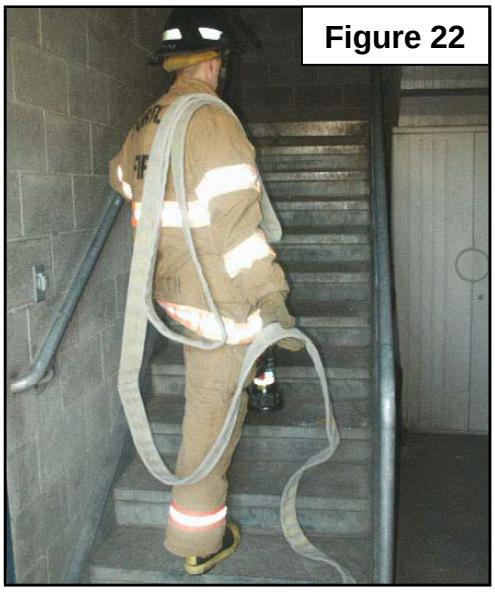


Figure 22

With Utility Straps

To use a utility strap for carrying fire hose, place the strap around the hose and through the loop of the strap. This is called a “girth hitch.” Place the strap on your shoulder and start the carry. It is important not to place the utility strap across your body and over your neck. If the hose were to hang up while ascending a ladder it could cause the firefighter to fall, rather than the hose pulling off the shoulder.

An alternative method is to place the strap around the hose and snap it to itself.

For Taking Up A Ladder

Hose connected in a line is carried up ladders by using utility straps over the same shoulder on which the hose will lead off the ladder (Figure 23). The hose is carried by a firefighter at each coupling and one in the middle of each length. The firefighter in the middle of the first length does not fasten the utility strap at the center of the length but rather about 15 feet behind the nozzle to help distribute the weight more evenly.

Figure 23

As a safety precaution, a firefighter carrying hose on the ladder must always step around the hose when dismounting to a roof or fire escape balcony. Do not step between the hose and the ladder.

A length of hose is carried up a ladder by one firefighter as illustrated in Figure 24. The length is doubled back with the couplings almost together and laid over the shoulder so the couplings hang down about ten feet.

An emergency carry of hose can be conducted without utility straps. The firefighters are spaced two to a length of hose; they follow each other at close intervals on the ladder (Figure 25).

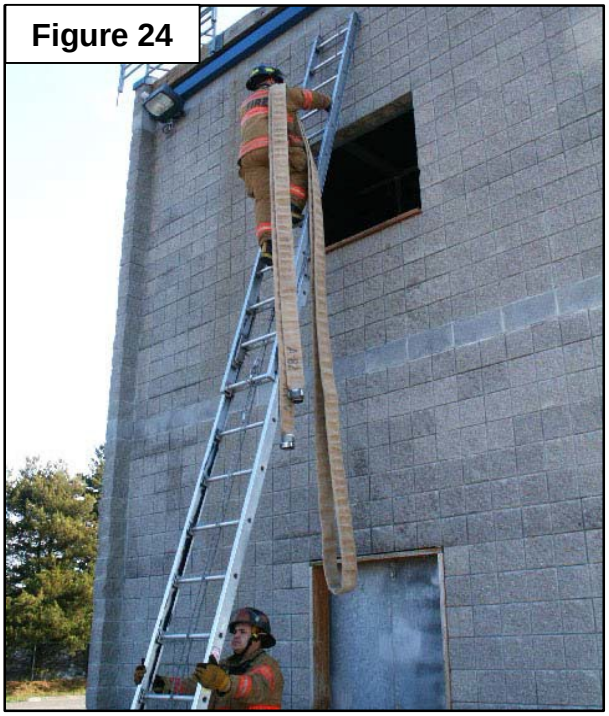


Figure 24

Figure 25

CARRYING NOZZLES

The chief considerations in establishing methods of carrying nozzles are the safety of the bearer and protection of the nozzle.

To place a nozzle on your back, slip your arm and shoulder under it rather than throw it over the shoulder. When picking up a nozzle, grasp it firmly with both hands, having your feet well set and your body prepared to assume the load. Always make certain that the shut-off is closed before carrying a nozzle connected to a line of hose.

With A "U" Shoulder Load

The normal method for the ground carry of a nozzle is in the "U" shoulder load (Figure 26), the standard finish load for the stretch bed. With this load, the nozzle is in front on the chest where it may be grasped by the left hand to keep it from swinging or sliding down and can be controlled in the event of accidental charging of the line.

Figure 26

Ground Carry w/out "U" Shoulder Load

When the "U" shoulder load is not available, and a line has already been taken from the stretch bed, the nozzle is carried over the right shoulder as shown in Figure 27. To place the nozzle on your back, form a bight in the hose at the nozzle coupling and slide it over the arm and onto your shoulder. Do not throw it over your shoulder! Turn to the right so the hose will lead across your chest and under your left arm.

Ground Carry With Shoulder Load

If a shoulder load of hose is to be carried that is not in a "U" shoulder load, it is carried on the right shoulder with the nozzle placed over the left shoulder as in Figure 28. Observe the same precautions when placing the nozzle on your back.

Figure 27

Figure 28

On A Ladder

A nozzle on a hose line should be carried up a ladder as shown in Figure 29. The nozzle is carried on the shoulder on the same side as where the hose will lead off from the ladder. The same precautions should be observed in placing the nozzle over the shoulder as in a ground carry.

Figure 29

Entering a Window from a Ladder

When entering a window from the ladder, the firefighter carrying the nozzle, before stepping off the ladder, places the nozzle through the window in the following manner. If the nozzle is on the right shoulder, reach down and back with your right hand and grasp the nozzle behind the tip. Then swing it forward between the hose and your right side and through the window while the hose is still on your shoulder (Figures 30 & 31). If the nozzle is on your left shoulder, you would use your left hand. With the nozzle through the window, shrug the hose off your shoulder and release the nozzle, allowing it to hang inside the window with the hose lying on the windowsill. Then step through the window, pick up the nozzle, and proceed, as the situation requires.

Figure 30

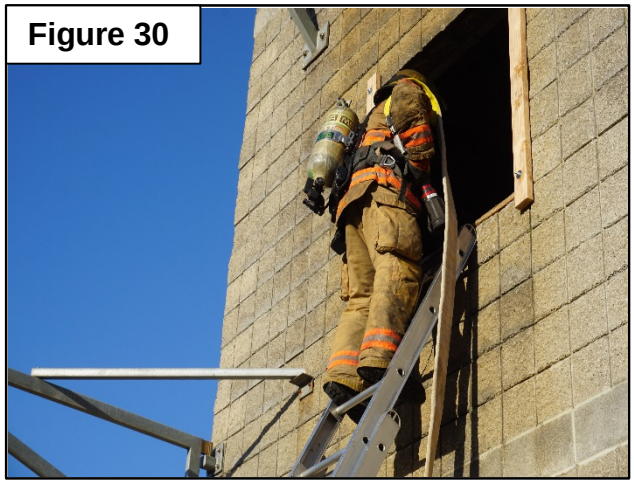
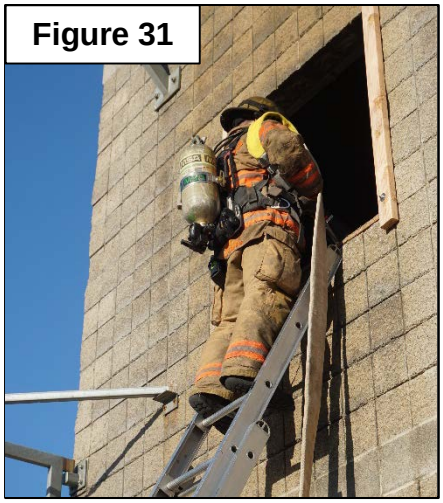


Figure 31



CONTROLLING NOZZLES ON HAND LINES

Nozzle Reaction Force

All nozzles exert reaction forces while flowing water. This force is opposite of the direction that water is flowing, and is directly proportional to the GPM and nozzle pressure. Effective hose handling depends on proper pressures; too little and the hose will kink, too much and it will be difficult to handle. A firefighter operating a nozzle must be prepared to control these forces when opening a nozzle and directing the stream. 2 ½" hoselines have significantly more nozzle reaction force than 1 ¾" hoselines. One method to control the nozzle reaction of an over-pressurized hose is the "Leg Clamp" (See Section 5 – Part V) - pin the hose to the ground and aim the nozzle straight overhead while opening the bale, which will send the nozzle reaction force straight down (Figure 32).

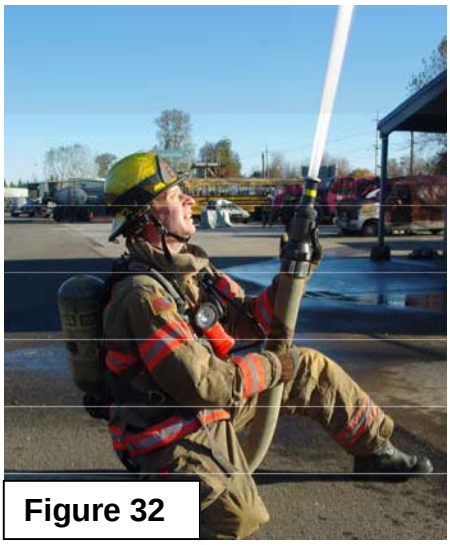


Figure 32

Hand Position on the Nozzle

Hold the hose with both hands, and keep the nozzle bale within easy reach, about an arms-length from the body. The nozzle should be held far enough away from the body so that the stream can be directed to all areas of a room, including behind the nozzle team. If the nozzle is held too close to the body, it is very difficult to direct the stream into all areas of a room. If the nozzle is held too far from the body, the hose may kink behind the nozzle. Rotating the nozzle bale towards the body makes it easier to operate and easier to shut the bale if the hoseline slips backward (Figure 33).

Figure 33

Nozzle Movement While Flowing Water

Move the nozzle to direct the stream into all areas of the room that need to be cooled. Rotating a straight/solid stream in a circular motion is an effective way to cool the ceiling, walls and floor of a fire area (Figure 34). All water streams push some amount of air ahead of the stream. A wide fog stream moves the most air, and straight/solid streams move the least air. Rotating the stream also increases the amount of air that is moved ahead of the nozzle team.

Figure 34

Keenan's Hose Loop

For defensive operations where mobility is not needed a practice known as a Keenan's hose loop can be used by one firefighter to control and direct a 2½" hose line under normal pressures (Figure 35).

Figure 35

The Keenan's hose loop is formed in a length of hose by bringing the nozzle end of the hose back in a circle and passing it far enough under the line near the center of the length so it is workable by a firefighter sitting at the crossover point. As a safety practice, the loop shall be secured at the crossover point. A utility strap may be used to tie the lines together at this point (Figure 36). Start by attaching the utility strap to the hose with a girth hitch. Wrap the intersecting hose with one full turn. Then wrap the hose strap around the back of the girth hitched hoseline and clasp the strap back to itself.

Figure 36

On A Ladder

Attach your utility strap to the hose line using a girth hitch about six inches behind the nozzle before ascending the ladder. Then place the nozzle and strap over the shoulder. When you reach the position on the ladder from which the nozzle is to be operated, pass the nozzle and strap through the ladder about waist high in the same manner as passing a nozzle into a window as shown in Figure 37. The nozzle is secured on the rung below where you have passed it through. Make several wraps with the utility strap and snap the utility strap back onto itself. When fastened in this manner and properly adjusted, the utility strap takes all the back thrust of the nozzle while it is being operated, leaving the firefighter free to direct the hose stream.

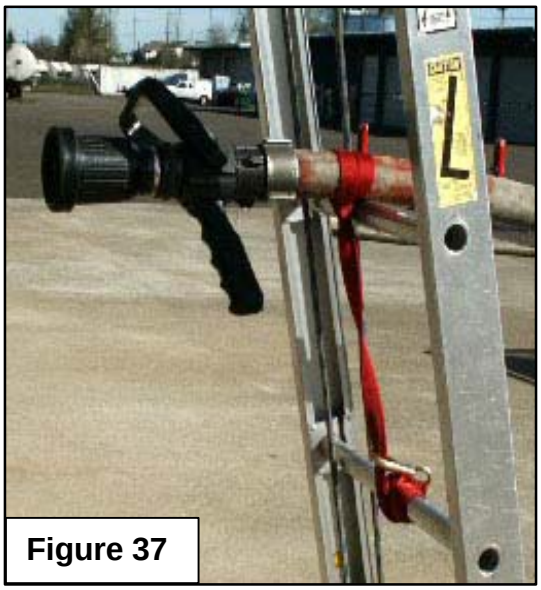


Figure 37

PICKING UP HOSE

When hose is being picked up, it should not be dragged unnecessarily. Dragging causes wear to the jacket and increases the likelihood of damage to hose and couplings through snagging, pinching, hanging up and dropping. Recommended methods of picking up are rolling hose and loading hose on the shoulder or arm.

Rolling Hose

When rolling hose, the roll is started at the male coupling so it will be on the inside of the roll where the male threads will be partially protected. The roll should not be started too tight. When completed, the roll is laid down flat and the edges evened out by standing on the roll.

Loading on the Shoulder

To pick up a length of hose on the shoulder, you place the nozzle or coupling over your shoulder onto your back. Taking the hose leading down in front of you with both hands, form a loop extending from the ground up to your shoulder and back to the ground (Figure 38).

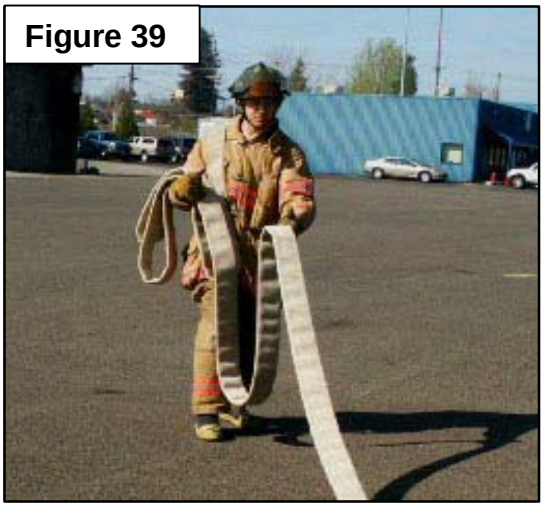
The loop thus formed is laid back across the shoulder and equalized. Each succeeding loop is made in the same manner and placed on the shoulder until the length of hose has been picked up.

Figure 38

Loading on the Arm

The firefighter “picking up” places the line over the right shoulder and faces the direction of travel. Walk along the line “picking up” the hose with the left hand each time the left foot is advanced. Place each bight of hose on the right forearm until you have an arm load (Figure 39).

Figure 39



TAKING A HYDRANT

The major water source for fire-fighting operations is the fire hydrant. To get water from the hydrant, the responsibility of one member of the engine crew is to connect the lay-in line(s) to the fire hydrant. That job is referred to as “taking the hydrant.”

In most of our fire-fighting efforts, the time required to get water on the fire is controlled by the firefighter taking the hydrant. For this reason the procedures for taking the hydrant are closely detailed, and little is left to discretion or personal preference.

Laying-In One Line (Single Header)

When the order to “take the hydrant” is given, the firefighter in the hydrant position takes the spare gate and spanner in the hand nearest the hydrant and the attached gate and hose in the other hand. The firefighter turns in the direction of the hydrant and pulls the line to the ground. Moving to the front of the hydrant, the firefighter pauses to pull on the hose for slack and swings the hose in a loop around the hydrant, then the firefighter moves to the back of the hydrant.

Both of the gates are laid on the ground. Taking a stand close to the back of the hydrant, place a foot on the hose line to hold the hose line in place, give a clear hand signal and call “Lay-in” to the driver (Figure 40).

Figure 40

Under no circumstances should you make a complete circuit around the hydrant. Always stay free of the hose wrapped around the hydrant so that if the hose hangs up in the bed and pulls tight around the hydrant, you will not be injured.

Remove the 2½” outlet caps with a spanner. Spin the outlet caps off rapidly, maintaining your hold on the wrench close to the hydrant cap. Make certain the steamer port cap is tight. When the caps are removed, place the spanner on the hydrant stem. Pick up the gate on the hose line and remove the loop of hose from around the hydrant. Step in front of the outlet in the direction of the lay-in and connect the gate. Attach the spare gate to the other hydrant port.

Gates are attached by tightening the gate swivel hand tight, while holding the gate in a position where the gate handle is backed off a quarter turn from being on top of the gate. When the swivel is hand tight, the swivel and valve together are turned a quarter turn to the right to further tighten the swivel and bring the handle on top of the gate (Figure 41).

During these operations the spanner should not be dropped to the ground. When the caps have been removed, the spanner should be placed in position on the hydrant stem.

If an outlet cap does not yield when the spanner is first applied, the position of the spanner should be changed so it points downward and it should be given a sharp kick with the heel of the foot. This will generally loosen the cap. If the hydrant stem will not turn, give the spanner a heavy lurch in the direction of opening. If the hydrant stem still does not turn, the turn should be reversed and the operation repeated. If the valve stem turns, it may indicate that the hydrant is already open.

Figure 41

Open the hydrant completely, letting water into the line. Check the gate on the lay-in line to be sure it is wide open. Remove any kinks in the line near the hydrant and proceed toward the nozzle, checking and straightening the lay-in line on the way.

Taking Hydrant for a Double Header

Occasionally two lines are laid from a hydrant and this operation is known as “laying-in a double header” (Figure 42).

When the order is given “take the hydrant double header,” the hydrant is three ported if possible, using the larger steamer port as the third one.

The firefighter at the nozzle position takes the hydrant bed line closest to the hydrant and moves to the back of the hydrant, pauses and pulls on the hose to get slack. The firefighter continues around the hydrant, then places the coupling with gate attached on the ground about ten feet from the hydrant near the engine. The nozzle person also places the steamer connection with gate attached near this line and gets back on the engine.

The firefighter taking the hydrant proceeds in the normal manner with the exception of connecting the steamer port before turning on the hydrant. The firefighter then proceeds toward the nozzle, straightening both lay-in lines

Laying In From an Engine

When the lay-in is being made from another engine, the hydrant gates attached to the hose should be removed and left with the laying in engine. Snub the hose at a convenient place on the engine being laid from. Make sure there is sufficient slack hose to reach one of the pump outlets. The hose may also be snubbed on the bumper or under a wheel, but should never be snubbed on any port of the pump. The firefighter at the hydrant position should assist the driver with connecting and getting water into the line after releasing the snubbed hose. Then proceed toward the nozzle as in taking a hydrant.

Figure 42

Anchoring Hose for Reverse-Lay

When making a reverse-lay (from fire to hydrant), snub the hose to a convenient post, under a tire, tree, bumper, etc. This ensures that it will pull free from the hose bed as the engine drives to the hydrant.

Occasionally there is no convenient object on which the hose may be fastened and a firefighter must “anchor” the line. To do this, the firefighter holds the hose line in both hands, feet well braced, and leans back against the pull of the hose (Figure 43). The firefighter stands behind the hose pulled from the bed so that it lies between the firefighter and the engine. It is important to maintain a position where entanglement with the line is not possible and the firefighter must be prepared to turn the line free in the event it hangs up in the bed.

Figure 43

CLAMPING A HOSE LINE

At times, the flow of water must be controlled by the use of a hose clamp. In the event of a hose line failure it becomes necessary to stop the flow of water. Another instance would be while placing a hose line in operation and the water must be held in the lay-in line until the driver is ready for water at the pump.

Applying the Hose Clamp

Before attaching the hose clamp, the catch holding down the upper jaw of the clamp must be released and the clamp opened. The hose line should be positioned in the middle of the lower jaw and the pressure bar backed off into the upper jaw far enough to permit the clamp to be closed over the base. The clamp is then closed, the catch refastened, and the handle cranked clockwise until the pressure bar is tight enough against the hose and lower jaw to stop the water flow (Figure 44). To release the hose clamp, crank the handle rapidly counterclockwise until the pressure bar is raised off the hose. **Never kick the release open!**

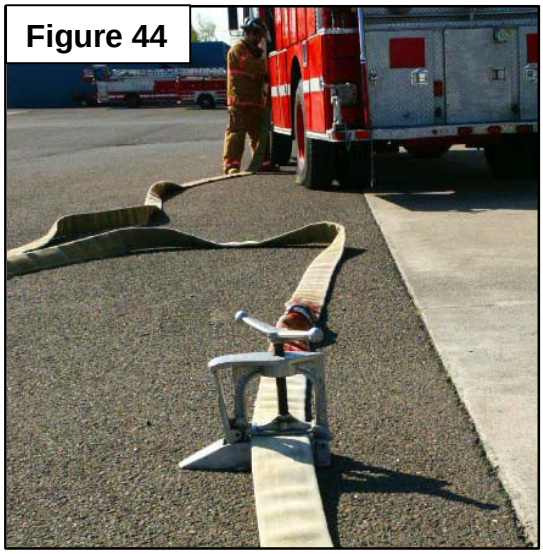


Figure 44

The most common use of the hose clamp is at the end of the lay-in line. When used for this purpose the clamp is placed (normally by the driver) on the lay-in line about twenty-five feet to the rear of the engine and on the hydrant side of a hose coupling, typically. When placing the clamps for a “double header,” the release on each clamp is placed opposite one another and to the outside of the hose. This prevents a charged lay-in line from accidentally striking and releasing the other lines clamp.

Emergency Clamp

In an emergency, the flow of water in a line may be almost stopped by kinking the hose as shown in Figure 45. This operation requires at least two firefighters and it is recommended that the bights be about six feet in length.
If the hose is to be kinked near the end of the line, the first fold should not be less than fifteen feet from the nozzle, and the nozzle should be partially opened after the first fold is made to relieve the pressure in the hose. With pump pressure in the hose line and the nozzle closed it is very difficult to keep the line kinked.

Figure 45

Emergency Hose Replacement

If a hose line should burst or a coupling fails during emergency operations, it should be replaced with two lengths of the same size hose. The hose should be clamped with a hose clamp or an emergency hose clamp can be performed if the driver cannot be told which line to shut down.

Part V
ADVANCING CHARGED HOSELINES

NOZZLE FIREFIGHTER SKILLS

Charged hose should be moved as a team whenever possible. However, firefighters are frequently expected to move and operate hose lines with limited assistance, especially during initial fire attack.

Moving Hose: Outside of a Fire Area

The nozzle firefighter can easily move the lead length of hose by pulling the nozzle's pistol grip (if attached) and a bight of hose from 20-50 feet behind the nozzle (*Figure 1*). This method does not allow for rapid operation of the nozzle, and should not be used inside the fire area.

Figure 1

Moving Hose: Inside a Fire Area

While inside of a fire area, the Nozzle Firefighter should be ready to operate the nozzle at all times. When advancing a hoseline through a fire area, the Nozzle Firefighter will often be the first one to enter a hazardous area in zero visibility. In these cases, the Nozzle Firefighter should crawl with one leg out front to feel for holes in the floor, stairways, loading docks, etc. A firefighter shouldn't expect to pull more than 10-25 feet of hose and operate the nozzle at the same time. Most of the work to advance the hoseline should come from the Backup Firefighters.

There are three basic methods for operating 1 3/4” or 2 1/2” hoselines:

- Arm Grip
- Hip Grip
- Leg Clamp

Every firefighter has positions they prefer to use due to differences in strength, height, and working conditions. No matter which method is used, the nozzle must be held in a way that allows the stream to be quickly directed into all areas of the fire room, including overhead and behind the nozzle team.

Figure 2

With each method, there should be no kinks in the first 3 feet of hose behind the

nozzle. The Arm Grip – Figure 2

Pinch the hose tightly in your armpit and wrap your arm around the hose. Operate the nozzle bale with the other hand, then move that hand back to the hose, a couple inches behind the

hose coupling, to direct the stream. The Arm Grip is effective while standing or kneeling; while working alone or with a backup firefighter, or with a hose strap. When standing, lean forward into the nozzle reaction force.

The Hip Grip – Figure 3

Push the hose into the crease of your hip with one hand, and operate the nozzle with the other hand**.** The Hip Grip is effective while standing or kneeling; while working alone or with a backup firefighter; or with a hose strap. When standing, lean forward into the nozzle reaction force, when kneeling, sit upright as shown in *Figure 3*.

Figure 3

The Leg Clamp – Figures 4 & 5

To perform the leg clamp, position the nozzle at arm's length. Kneel over the hose with your shin/ankle on top of the hose. Sit on your foot to "pin" the hose to the ground. The forward leg should stay close to the body to avoid injuries from falling debris. The left hand controls the bale and is quickly repositioned to the hose behind the nozzle once opened. The right hand is used to keep the hose from kinking, as shown in *Figure 5*. Backup firefighters should keep several feet of hose on the ground straight behind the Nozzle firefighter. The friction of the hose against the ground assists in keeping the hose in place.

Figure 4

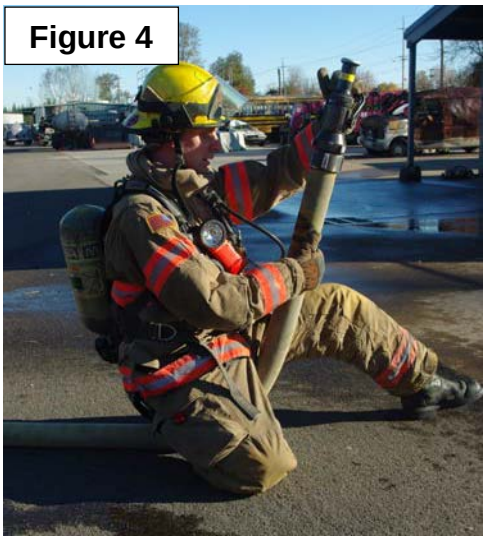


Figure 5

Figure 6a

Utility Straps

Utility straps can be used to assist taking up the nozzle reaction force of a 2 ½" hoseline, which may be necessary if the line is over-pressurized, or has a fog or large smooth bore nozzle.

Girth Hitch a utility strap around the hose a short distance behind the nozzle. Place your utility strap over the shoulder closest to the nozzle so the strap will lead from this shoulder down across the front of your body. The Firefighter in *Figure 6a* has attached the strap far enough behind the nozzle to ensure they can flow water into all areas of the room. Attaching the strap too close to the nozzle makes it difficult to direct the stream in all directions. While using a utility strap use the "Arm Grip" or "Hip Grip" method to operate the hoseline.

Two Firefighters

Utility straps are effective when working from a fixed position, when firefighters can stand, such as during defensive operations. If you are working with another firefighter, take positions on opposite sides of the hose line and attach a utility strap a short distance behind the nozzle firefighter's strap.(*Figure 6b*) If more firefighters are needed, they attach their utility straps and take similar positions far enough back on the hose so as not to impede directing the nozzle.

Figure 6b

BACKUP FIREFIGHTER SKILLS

The Backup Firefighter monitors changing fire room conditions, moves hose forward or backward, assists the Nozzle Firefighter with the nozzle reaction force, and communicates with other firefighters on the hoseline. The Backup Firefighter should ensure that the hoseline is kept straight and is not allowed to bend or kink behind the nozzle firefighter.

Longer hoselines require several Backup Firefighters. The first Backup Firefighter advances the first 10 to 20 feet of hose, and each additional Backup Firefighter positions at friction points or long spans as the line advances.

Monitoring Changing Fire Room Conditions

Any position the Backup Firefighter takes should allow for a view above and behind the nozzle team. The Nozzle Firefighter may be focused on the area ahead and the fire stream, and may not see changing conditions behind and overhead.

Assisting with Nozzle Reaction

Kneeling and Advancing

For rapid hoseline advancement, the Backup Firefighter kneels 5-10 feet behind the Nozzle Firefighter as shown in *Figures 7 & 8* When the Nozzle Firefighter calls **"***Forward***"** to advance the hose, plant your left hand on the ground on the opposite side of the hose and drive forward with your right leg while pulling with your right arm, always using an underhand grip. Reset your position and pull again until the Nozzle Firefighter calls "Stop".

Figure 7

Figure 8

Kneeling while Stationary - Figure 9

If the Nozzle Firefighter is kneeling while operating the hoseline, the Backup Firefighter can use the Leg Clamp to pin the hose to the ground a couple feet behind them. This position does not allow for rapid hoseline advancement, but is very effective for assisting with nozzle reaction.

Figure 9

Standing – Figures 10 and 11

For 1 ¾" hose, the Backup Firefighter can stand behind the Nozzle Firefighter and hold the hose in an Arm Grip, taking up 30 to 40 pounds of nozzle reaction force.

For 2 ½" hose, both Firefighters should take positions on the same side of the hose. The Nozzle Firefighter takes a wide stance and leans backwards into the back- up firefighter.

The Backup Firefighter takes an athletic stance behind the Nozzle Firefighter at an approximately 45 degree angle while leaning into the Nozzle Firefighter. The Backup Firefighter holds the hose in a secure position as shown in *Figure 11.* The Nozzle Firefighter can now lean into the Backup Firefighter for easier operation. While this technique is primarily used for 2 ½" hoselines, it is also effective for 1 ¾" lines.

Figure 10

Figure 11

ADVANCING AS A TWO-FIREFIGHTER NOZZLE TEAM

Many times, a fire is self-vented on arrival and any prevailing wind is in the nozzle team`s favor. If only one or two rooms are involved, these conditions may permit use of so-called "hit and move" tactics: hit the fire, shut down, advance a little bit, and hit the fire again. Other situations require that the nozzle be kept open throughout the advance. This might be necessary when several rooms are involved in fire; if ventilation is inadequate; when the fire involves a large, open area with high ceilings; when battling a wind-driven fire; and when heat conditions are severe, such as during a fire in a high-rise residential or office building with concrete floors. Advancing a charged line with the nozzle open can be very difficult, particularly 2 1/2-inch hose. Additional personnel will be required to ensure that the handline keeps moving.

A. Fredericks, Fire Engineering, 1997

The "Hit and Move"

The "Hit and Move" is a method of fire attack, not a position, which means that several techniques can be used. The nozzle team advances with the nozzle closed, then stops moving before flowing water. This is the most common method of interior fire attack in Portland, and is the preferred method at most fires.

Figure 12

The Nozzle Firefighter

The Nozzle Firefighter should use the Hip Grip, Arm Grip or Leg Clamp *(Figures 12 & 13)*.

The Nozzle Firefighter should use the commands "Forward" and "Stop" and "Bump Up" or "Bump Back".

Figure 13

The Backup Firefighter

The Backup Firefighter can either stay several feet behind the Nozzle Firefighter *(Figure 12)* or brace the nozzle firefighter by leaning into their back with the forward shoulder *(Figure 13).*

While operating in a stationary position for any extended period of time, the Backup Firefighter can pin the hose to the ground with the right knee, similar to the Leg Clamp while still providing support for the Nozzle Firefighter *(Figure 14)*.

Figure 14

The "Push"

The "Push" Technique is a more aggressive method of fire attack. It is used to advance either 1¾" or 2½" handlines while flowing water.

To perform the "Push", the nozzle team positions as shown in *Figures 15a-b*. The Backup Firefighter's position is exactly the same as when Kneeling and Advancing (*Figures 7 & 8*), and they support the Nozzle Firefighter's weight, similar to the standing technique in *Figure 11*.

Figure 15a

When the Nozzle Firefighter calls "Push!" the Backup Firefighter drives forward at a steady, continuous pace, resetting their body positon after each drive with the back leg. All other communications with the Backup Firefighters are the same as the Hit and Move.

This movement is repeated in short increments as the team advances.

Figure 15b

The Nozzle Firefighter's rear leg swings forward when pushed, and the lead leg steps forward after each drive. Each push should result in 1-2 feet of forward progress, and the team should always reset to a stable position after each movement. The Backup Firefighter should be carrying some of the Nozzle Firefighter's weight in order to maintain contact during each push.

When Pushing through a fire area, remember that the Backup Firefighter's job is to move the nozzle team, and the Nozzle Firefighter's job is to direct the hose stream. With every step forward the nozzle firefighter should sound the floor with their foot, feeling for holes, stairways and any other fall hazards.

Figure 16

Rotating the nozzle in a circular pattern will cool all areas of the fire area and clear the floor of burning debris ahead of the nozzle team.

This technique requires more coordination and effort than the Hit and Move, but will become a valuable tool for disciplined nozzle teams.

ADVANCING AS AN ENGINE COMPANY OR MULTIPLE CREWS

Communication

Good communication on the hoseline is essential for rapidly deploying fire attack hoselines. There are many barriers to communication on the fireground such as loud tools, smoke, SCBA masks, radio traffic, and other hoselines in operation. Because of these barriers it is important to have a standardized set of commands that are universally understood and easily relayed. The Backup Firefighter can easily communicate to the Nozzle Firefighter where the stream should be directed by tapping on their shoulder and pointing. Communicating with the other members on the hoseline is more difficult and should be clear, systematic and standardized.

Discipline

Assisting the fire attack nozzle team as a member of another engine crew can be a difficult assignment, and it requires a lot of discipline to stay at a friction point or stairway landing while the hose advances. Two or three firefighters can advance hose through a small house or apartment quickly, but longer hose deployments may require several engine crews to advance at the same rate. When assigned as a Backup Firefighter anywhere on a hoseline, maintain your position until given another assignment.

Standard Phrases

1. **"Bump Up"** - Move forward to the next friction point (or) move forward to back up the Nozzle Firefighter.
2. **"Bump Back"** - Move back to the next friction point. Called when backing out of a fire area, or separating the nozzle team due to confined spaces.
3. **"Forward"** - Advance the hoseline forward
4. **"Back"** - Move backward
5. **"Push"** - Used by the Nozzle firefighter to tell the backup Firefighter they are going to start the Push operation
6. **"Stop"** - Stop
7. **"More Hose"** – The nozzle team needs more hose. When used by Backup Firefighters advancing the hoseline, this term means the hoseline is not advancing quickly enough.

Positioning at Friction Points

Friction points exist in structures anywhere the hose bends around an object. Some examples are corners, doorways, stair landings, and large furniture. When advancing hose into a structure, the Backup Firefighters should position themselves at friction points on the outside of the hose so as not to get caught between the hose and the friction point. When positioning in a corner the Backup Firefighter should place their SCBA bottle into the corner and squat or kneel. The firefighter then pulls hose from behind and pushes it forward.

Stairwell Landings

When advancing charged hose up or down stairways, it is important to push enough hose forward so that the hose does not pull tight against the inside railing, which will slow down the operation and congest the stairway. Once enough hoseline has been advanced to the fire area, the slack can be pulled tight against the inside railing.

The "Rowing Technique"

To perform the Rowing technique, sit in a stairway landing or doorway with legs spread in a wide stance, grab the hose with both hands and pull using your legs, back and arms *(Figure 17).* One disadvantage to the rowing technique is that the firefighter will block access to the stairway or doorway.

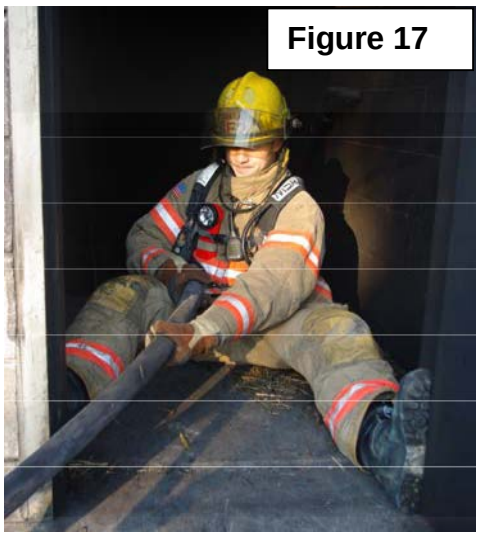


Figure 17

Extra Bights

In straight runs, such as hallways, the hose should be pushed forward into an "S" pattern so there is surplus hose available for the nozzle team *(Figure 18)*. The Backup Firefighters may not be able to communicate with each other when advancing the hoseline. Pushing extra bights forward into an "S" allows the Backup Firefighters to feel when the hose begins to move again after a pause. When the surplus hose starts to move, continue pushing hose forward. When the hose ahead stops moving, keep pushing hose forward to replace the extra bights on the floor ahead of you.

Figure 18

"Off Loading" Hose

If there is enough time to bring forward extra hose, push it down the opposite side of a "T" shaped hallway intersection or into a room opposite the fire room *(Figure 19).* If there is no room opposite the fire area, a small bight of hose can be laid up the wall instead. This technique allows the Nozzle team to advance with enough surplus hoseline behind them to allow a quick transition into the fire area.

Figure 19

Rolling a Loop of Hose – Figure 20

Charged 2 ½" or 3" hose can also be advanced by making a loop in the hose and rolling it forward. This technique works on flat ground and in stairways.

Do not make a loop that is too large, as the hose is difficult to roll and will kink while rolling.

Figure 20

Pulling a Bight

To easily pull a bight into a building, the Backup Firefighter places a bight across their chest or hip, then walks or crawls forward *(Figure 21).* Alternately, the Backup Firefighter can drag a bight forward *(Figure 22).* The Nozzle Firefighter should be able to pull the first 20 feet of a 1 3/4" hoseline, and the first 10 feet of a 2 1/2" hoseline, so this method may allow the nozzle team to advance up to 50 feet of hose into a building.

Figure 21

Figure 22

External Sources:

Fredericks, Andrew. "Stretching and Advancing Handlines- Part 2, *Fire Engineering Magazine*, Volume 150, Issue 4, April 1997.
Fields, Aaron. "Da Manual of Hose." www.thenozzleforward.com. 15 December 2014.
http://nozzleforwarddotcom1.files.wordpress.com/2013/04/damanualofhose3.pdf

GLOSSARY

BACKLASH	The motion of the booster reel turning faster than the hose is played out, causing an entanglement.
BLEEDER PLUG	A threaded metal stopper placed in the housing of a standpipe for the purpose of draining.
CAP	A threaded metal cover placed on the male connections of standpipes, hydrants, pumps, etc.
PLUG	A threaded metal stopper placed in the female connections of standpipes, appliances, etc.
REMOTE PUMPING	An operation where an engine company lays-in to the fire from a hydrant and pumps into its stretch lines.
STANDPIPE	A vertical water pipe riser used to supply fire hose outlets on buildings. Frequently found in inside stairwells and outside alongside fire escapes.

PART I
GENERAL RULES AND PRECAUTIONS

Hose evolutions are team operations. It is essential that every firefighter be thoroughly trained in their proper performance. The evolutions presented are the basic outline to be followed when drilling. There may be, and usually are, variations of these evolutions performed at an emergency scene. At the emergency scene, protective clothing is required. Full protective clothing includes: helmet, PBI hood, turnout coat and pants, boots, gloves, and SCBA. When participating in company drills or evaluations, the officer in charge will determine when to wear the SCBA.

The laying-in and stretching of fire hose to the site of a fire or other emergency is a basic operation of firefighting. There are many factors that impact the performance of these operations.

Factors impacting performance operations:

- Fire location (below grade, ground level, upper floor, etc.)
- Number of firefighters
- Nature of area (topography)

Hose evolutions are composed of two parts: the *lay-in* and the *stretch* (Figure 1). In the following discussion of these basic operations and the subsequent picking-up, certain points have been itemized for emphasis. Companies performing hose evolutions should bear these points in mind. Experience has shown them to be of value in achieving safety, smoothness, and effectiveness in the evolutions. Speed of the evolution, without compromising safety, will follow with practice.

Figure 1 – The "Lay-in" and the "Stretch"

LAYING-IN

The “lay-in” is the operation of placing a hose line between the water source and the fire location by letting hose pay out of the hose bed while the engine is moving. It usually presents little problem as long as the length of the lay- in does not exceed the amount of hose carried on the engine.

- When making a lay-in from a hydrant, the engine should come to a complete stop at the hydrant to let the hydrant person dismount safely.

- An engine laying-in should keep the lay-in line to the hydrant side of the street but out of the gutter. If it is necessary to cross the street, it should be done at the fire location.

- Standard procedure is after positioning the apparatus the driver clamps the lay-in line. The hydrant person charges the hose up to the clamp when laying-in. If water is needed at the fire it is available that much sooner and the hydrant person is free to rejoin the engine crew.

- When a hose line leading from the bed is disconnected behind the engine, the end of the hose coming from the bed should be placed back into the bed.

- All hose lines must be kept free of kinks and sharp bends to permit the unobstructed flow of water through the hose (Figure 2).

- When an engine is making a reverse lay, or being driven to a hydrant to pump, all equipment needed at the fire should be removed from the engine before it is driven away.

Figure 2 – Keep hose line free of kinks

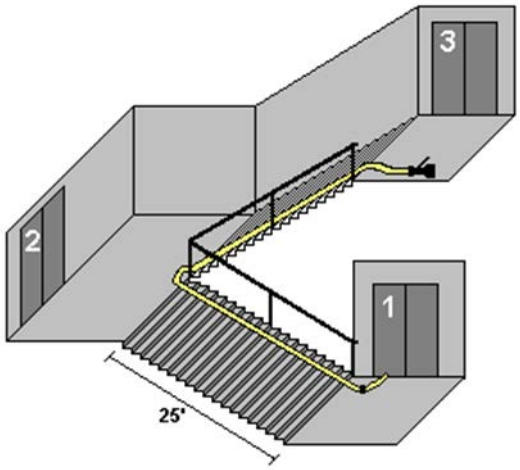
STRETCHING

The term “stretch” is either a manual operation of placing a hose line from the engine pump to the fire or a verbal signal used by firefighters when they are advancing hose. Judgment must be exercised when the stretch is made because difficulties can arise in an evolution. This is due to a number of things primarily because the stretch operation is performed by hand and fireground conditions and terrain vary widely.

The amount of stretch line necessary after the engine spots at or near the fire location is enough hose to reach the fire plus sufficient hose to maneuver about or “work” the fire, usually fifty feet. When dealing with fires in warehouses and other large structures, the difficulty in estimating the amount of stretch line increases. During drills, estimates should be made of different stretches and these estimates checked by making the stretch. Also, as a means of becoming proficient in making stretches, it is good practice to estimate distances, especially distances over 100 feet.

Check the estimates by actually pacing the distance estimated. When stretching up a stairway, allow one length of hose for each two floors or twenty-five feet per floor (Figure 3).

Figure 3 – Allow 25’ per floor on stairways



Measuring the amount of hose removed from the hose bed is greatly simplified by the use of the accordion method of loading hose, as the folds in a hose bed are of uniform length. Once the length of the hose bed is known, the length of a bight may be determined and it is comparatively simple to measure the amount of hose in the bed or as it is removed.

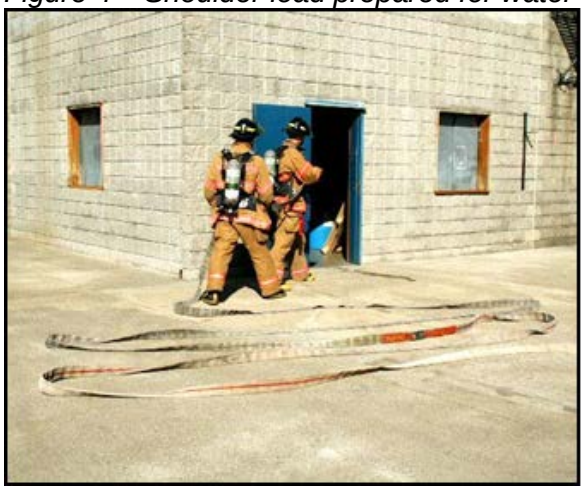
When a company is preparing to make a stretch, the position of the apparatus will affect the ease with which hose is stretched towards the objective. If the driver points the engine away from the direction of the stretch, the hose will lead out of the bed in a direct path toward the objective. However, if the drag load is properly cleared from the engine, the stretch can be made in any direction without difficulty.

The stretching of the shoulder load begins when the last firefighter in line has a shoulder load. After the last drag load is pulled out, the driver will call out “Stretch.” When the shoulder load of the last firefighter loaded has been stretched, “Stretch” is called out to the firefighter ahead. In this manner, stretching of shoulder loads progresses up the line toward the nozzle. Flaking hose normally stretches the shoulder load being carried. If the area is open and free of obstructions the load may be laid on the ground and the hose stretched.

Listed next are rules to follow when stretching:

- When hose is taken from the hose bed for stretches, it should come from the stretch bed unless otherwise ordered by the company officer.
- Hose stretched up a stairway should be on the stairs, tight to the inside rail. Hose must not be allowed to hang over railings in the stairwell (Figure 3).
- It is permissible to stretch hose from a shoulder load by laying the load down and pulling the hose out when the area being traversed is open and free of obstructions.
- The nozzle should be advanced to the point of use at the fire before the stretch line is charged.
- When a company is positioning hose lines at a window or door with the intention of entering to fight fire, the stretch should provide enough hose to reach the objective at the point of entry.
- Unused or removed pieces of small equipment, such as replaced nozzle tips, should be placed in a pocket to prevent them from being lost.
- Upon reaching the objective, the nozzle person lays down the shoulder load, arranges the bights in loose folds and prepares for water (Figure 4).

Figure 4 – Shoulder load prepared for water



PICKING-UP

When hose is being picked up in a building, a coupling should be disconnected outside the building to allow the hose to drain. If a continuous line of hose (consisting of several lengths) is to be picked up, each firefighter loads about three loops of hose on the shoulder. Leave sufficient hose between each firefighter to allow freedom of movement but without allowing hose to drag.

When hose being picked up is to be put back in the bed, the lengths in the line are disconnected and loaded on the shoulder. This drains the hose and makes it easier to transport to the engine or a loading point. Loading points should be established for long lay-ins by bringing hose to a central location between the hydrant and the apparatus.

When rolling hose, the lengths are disconnected at each coupling and pulled out straight so they will drain. Hose is generally rolled if it has become too dirty to clean at the scene, or has been damaged. If it has been damaged, it should be marked, rolled and taken back to quarters for processing.

Sometimes it becomes necessary for a company to pick up and load enough hose to respond to an alarm as quickly as possible. For example, two greater alarms in sequence, a need to move to a new location because of fire spread, inadequate water supply, or other need. When such action is required, it is suggested that the companies drain the hose and load it flat in the bed in long folds. The fold should reach the cab in front and hang out of the bed at the rear. The line leading out of the bed must be on top of the load but under the handrail. This loading may be done at selected loading points, or the engine may be loaded as it is backed along the line of hose (Figure 5).

Figure 5 – Emergency hose load

HAND SIGNALS

Difficulty in hearing oral communications on the fireground is commonly experienced by all firefighters. To overcome this problem, Portland Fire & Rescue uses visual signals for basic maneuvers. It is essential that these signals be made deliberately, with a sweeping motion, at right angles to the line of sight of the recipient. The recipient should confirm each signal by returning the signal to show that it was understood. Signals made in a careless manner are likely to be misunderstood and may be worse than no signal at all. Figures 6a and 6b illustrate the two basic fireground hand signals.

CHARGE LINE OR RAISE PRESSURE

As seen in figure 6a, a hand or light is extended overhead and rotated in a circular motion.

CEASE OPERATIONS

As seen in figure 6b, a hand or light is swung in a wide arc horizontally at shoulder level.

Figure 6a – Charge line or raise pressure

Figure 6b – Cease operations

"FIREFIGHTER IN DISTRESS" (Emergency Signal)

The flashlight carried by firefighters at emergencies should be used to communicate the "Firefighter in Distress" signal. The firefighter transmitting the signal should aim a flashlight at other firefighters and turn the flashlight "on" and "off" in a blinking (strobe effect) manner. The flashlight may be turned "on" and "off" by the switch on the light, or left "on" and a hand placed over the lens, then removed, repeating this action until answered by the same signal.

WORKING POSITIONS

Individually assigned numbers refers to the working positions on apparatus. This is for convenience in training scenarios and to more clearly assign task responsibilities (Figure 7).

Figure 7 – Working positions

- #1 – Officer
- #2 – Driver
- #3 – Nozzle position
- #4 – Hydrant position

The company officer has overall responsibility for the safety and success of the company's operation at an emergency, and must give immediate attention to sizing up the fire. The officer must decide whether to assist the company with the stretch or take command of the incident. In cases where the company is short-handed or where unforeseen difficulties arise, the officer is expected to recognize and deal with these emergencies.

For ease of practice the officer has been assigned task-oriented functions in the following evolutions.

PART II
BOOSTER HOSE

Placing a booster line in use is a simple operation. It is carried connected on a reel. Small fires outside of buildings such as auto fires, trash fires, grass and brush fires may be initially attacked with booster hose lines. **DO NOT USE BOOSTER HOSE FOR INITIAL ATTACK ON RESIDENTIAL OR COMMERCIAL WORKING FIRES!** The following rules will provide effective advancement of booster lines.

- The hose should be unreeled by a steady pull, rather than a sudden strong tug, to prevent a “backlash” of hose on the reel.

- For a straight run, take the nozzle and advance to the fire, pulling the hose. When possible, a second firefighter pays-out the booster hose from the reel to the #3 position (Figure 8).

Figure 8 – Straight run

Figure 9 – Advancing booster hose

- Advancing a booster line from the engine to the fire, the nozzle person should follow an open route. This will permit moving the nozzle to a new point of attack without excessive delay. Take enough hose so that there is enough working line to control the fire or wash-down the product (Figure 9).

- When replacing the booster hose use a rag to clean the hose as it is reeled up, inspecting for deep cuts or abrasions, and taking care to wind the hose on the reel in an orderly fashion, and remember to refill the booster tank (Figure 10).

Figure 10 – Replacing booster hose

PART III
PRE-CONNECTED 1¾" HOSE LINES

A 1¾" hose will deliver nearly as much water as a 2½" hose and many times more than a 1" booster hose. It is used on many fires that have grown beyond the control of booster lines. The speed with which 1¾" lines can be put into operation, their mobility and flow of 75- 200 gpm under normal operating pressures makes them highly desirable hand lines for residential and small mercantile fires.

Pre-connected 1¾" Hose Lines

Engine companies carry 1¾" and 2½" lines pre-connected to the pump to save time getting lines in operation. Figure 11 demonstrates one of the common evolutions used on the fire ground.

Figure 11 – Pre-connected line

Pre-connect Evolution (no lay-in)

#1
- Assist company as needed.

#2
- Set brakes, engage pump, set wheel blocks.
- Supply pump from tank.
- Operate pump.

#3
- Take preconnect (2½" or 1¾") and proceed to objective.
- Do not enter structure until #1 or #4 arrives.

#4
- Assist #3.

Pre-connect Evolution (with lay-in)

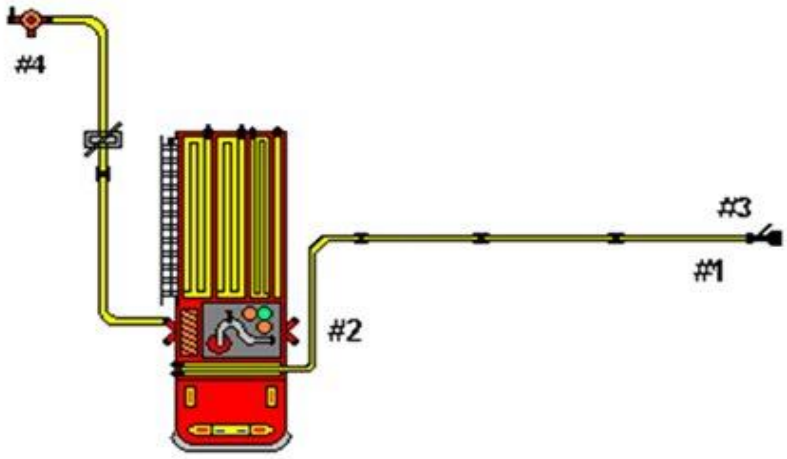
#1
- Back-up #3 at nozzle.

#2
- Lay-in, set brakes, engage pump.
- Set wheel blocks.
- Clamp lay-in line.
- Break lay-in line.
- Connect lay-in line to pump intake.
- Release clamp.
- Operate pump.

#3
- Takes preconnect (2½" or 1¾") and proceed to objective.
- Do not enter structure until #1 or #4 arrives.

#4
- Take hydrant.
- Remove kinks encountered.
- Assist #2 as directed.
- Come up and assist company.

Figure 12 – Preconnect evolution



PART IV
BASIC 2½" HOSE EVOLUTIONS

SHORT STRETCH

The Short Stretch is used in stretching hose over unobstructed terrain. The distance covered by this stretch will depend on the number of firefighters used to perform it. Depending on firefighters available, each firefighter in turn will pull a drag load, shoulder a coupling and stretch the drag load until the desired amount of hose has been stretched.

The firefighter must not gain on the firefighter ahead because an undesirable loop will then form in the line between them. A crew of four firefighters is able to stretch 150 feet of hose line (Figure 13). If the firefighters available are not sufficient to stretch hose as far as necessary by using this method, another method, such as the Long Stretch, must be employed.

Figure 13 – Short stretch

2½" Short Stretch (With Lay-in)

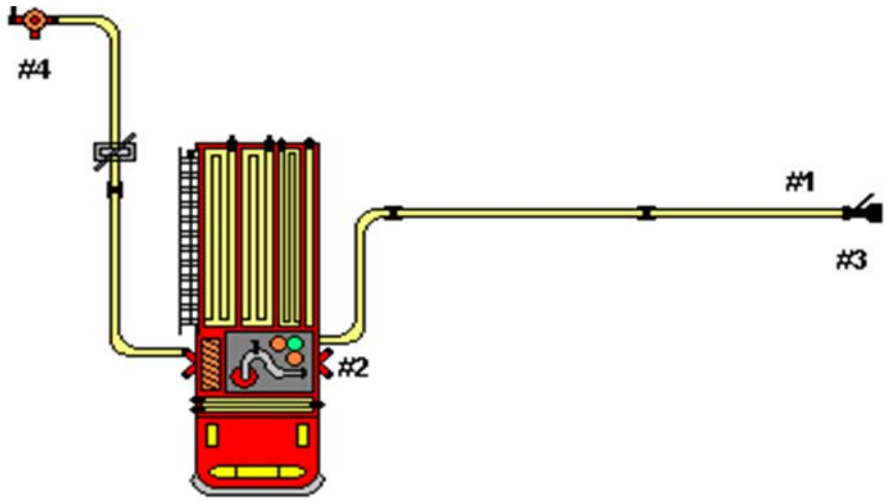
#1
- Assist #3 with breaking lay-in line.
- Pull and stretch a drag load for #3.
- Back-up #3 at the nozzle as needed.

#2
- Lay-in, set brakes, engage pump.
- Set wheel blocks.
- Clamp lay-in line.
- Connect lay-in to pump intake release clamp.
- Pull drag load for #1 and call stretch.
- Break stretch line and connect to pump discharge outlet.
- Operate pump.

#3
- Break lay-in line.
- Take U Shoulder load and proceed to objective.
- Do not enter structure until #1 or #4 arrives.

#4
- Take the hydrant.
- Remove all kinks encountered.
- Assist #2 as needed.
- Advance appropriately to the nozzle and assist.

Figure 14 – Short stretch evolution



THE LONG STRETCH

The Long Stretch evolution, like the Short Stretch, is primarily for stretching hose over unobstructed terrain but is used to stretch hose greater distances. A crew of four firefighters will be able to stretch 250 feet of hose by having #1 take a shoulder load after pulling a drag load for #3. #2 would then pull two drag loads for #1 and call “Stretch”.

Additional firefighters may be added to the evolution to stretch even greater distances. Stepping in behind #1, each additional firefighter would pull an additional drag load and then take a shoulder load, adding another 100 feet to the stretch. #2 would then pull a drag load for the last firefighter in line and call “Stretch” (Figure 15).

Figure 15 – Long stretch evolution

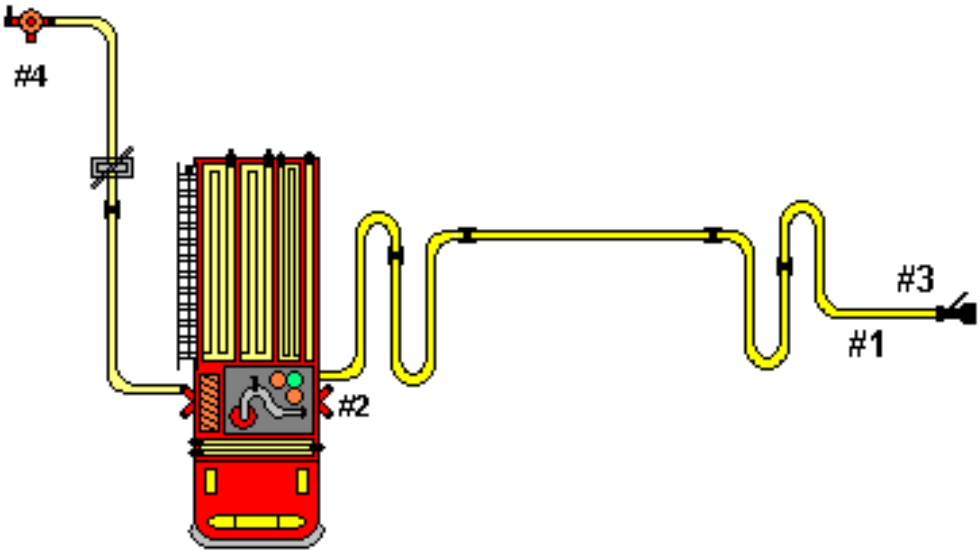
2½" Long Stretch (with lay-in)

#1
- Assist #3 with breaking lay-in line.
- Pull a drag load for #3.
- Take a shoulder load and advance.
- Stretch drag load.
- Flake shoulder load and call "Stretch."
- Back-up #3 at the nozzle as needed.

#2
- Lay-in, set brakes, engage pump.
- Set wheel blocks.
- Clamp lay-in line.
- Connect lay-in to pump intake and release clamp.
- Pull two drag loads for #1 and call "Stretch."
- Break stretch line and connect to pump discharge.
- Operate pump.

#3
- Break lay-in line.
- Take U shoulder load and proceed to objective.
- Do not enter structure until #1 or #4 arrives.

#4
- Take the hydrant.
- Remove all kinks encountered.
- Assist #2 as needed.
- Advance appropriately to the nozzle and assist.



(Figure 16 – Long Stretch Evolution)

SHOULDER CARRY STRETCH

The Shoulder Carry Stretch is used to stretch hose where it is difficult or not practical to drag hose. One of the greatest difficulties in advancing hose after entering a structure are the obstructions encountered inside. Using the Shoulder Carry Stretch, firefighters can quickly and easily advance hose around obstructions and up or down stairways. It is also useful over rough terrain and in heavy brush (Figure 17).

The stretch is similar in operation to the Long Stretch. Each firefighter making the stretch carries a shoulder load of hose. It differs in that no hose is dragged between firefighters. This must be considered by the Officer to determine the distance the firefighters available will be able to stretch. A crew of four fighters can stretch at least 150 feet of hose. Extra firefighters may be included in the stretch as additional positions with the same duties as #1.

Figure 17 – Shoulder carry evolution

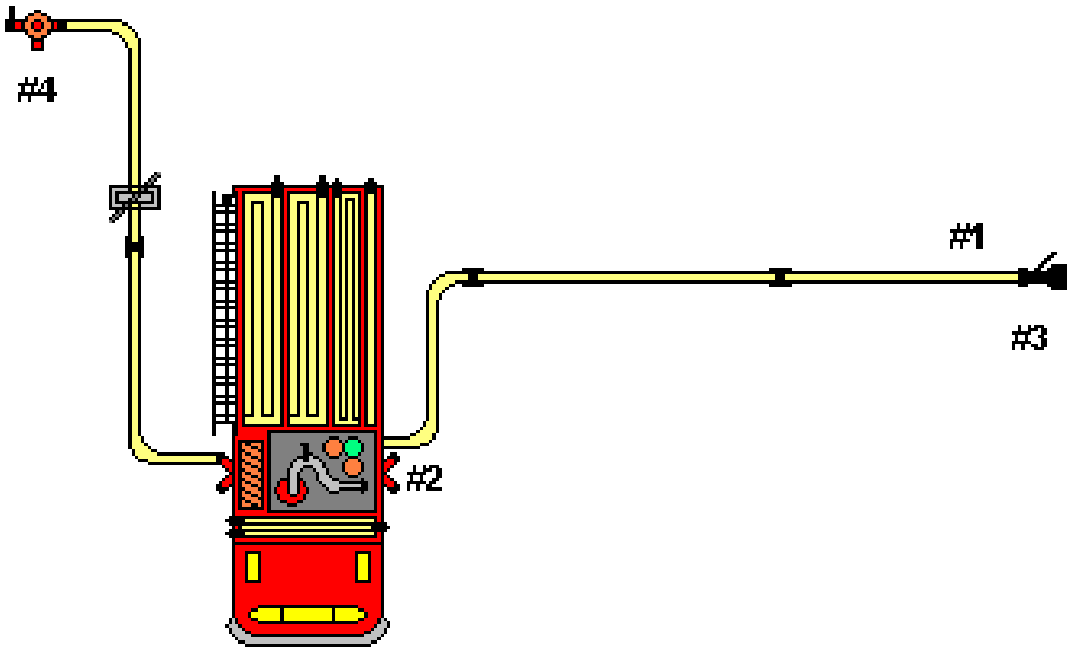
Shoulder Carry Stretch (With Lay-in)

#1
- Assist #3 with breaking lay-in line.
- Take the second shoulder load and proceed to objective.
- Flake hose from shoulder after receiving signal “Stretch” from #2.
- Back-up #3 at nozzle.

#2
- Lay-in, set brakes, engage pump.
- Set wheel blocks.
- Clamp lay-in line.
- Connect lay-in line to pump intake and release clamp.
- Pull drag load for #1 and call stretch.
- Break stretch line and connect to pump discharge.
- Operate pump.

#3
- Break lay-in line.
- Take U shoulder load and proceed to objective.
- Do not enter structure until #1 or #4 arrives.

#4
- Take the hydrant.
- Remove all kinks encountered.
- Assist #2 as directed.
- Come up and assist company.



(Figure 18 – Shoulder Carry Stretch Evolution)

Interior Shoulder Carry Stretch Evolution – 200' 2½" (Single Engine Company Operation)
(All positions shall maintain accountability)

#1
- Assist #3 with pulling and breaking lay- in lines.
- Take the second shoulder load and proceed to objective.
- Flake hose from shoulder after receiving signal "Stretch" from #2.
- Move to the half landing above the fire floor and secure the hose while it is being charged.
- Back-up #3 at nozzle.

#2
- Lay-in, set brakes, engage pump.
- Set wheel blocks.
- Clamp lay-in lines.
- Connect 1st lay-in line to pump intake.
- Pull drag loads for #1 and call stretch.
- Break stretch line and connect to pump discharge
- Connect 2nd lay-in line to pump intake and release clamp.
- Operate pump.

#3
- Assist with hydrant double header
- Pull and break lay-in lines.
- Select appropriate nozzle type.
- Take U shoulder load and proceed to objective.
- Proceed to designated floor.
- Flake hose from shoulder, up to the half landing above the fire floor, after receiving signal "Stretch" from #1.
- Control the door and call for water.
- Bleed the line.
- Proceed to objective and operate nozzle.

#4
- Take the hydrant double header.
- Release 1st lay-in line clamp.
- Pick up third coupling
- Pull up the slack at each landing, tight to interior stair rails.
- Call stretch.
- Position at the first corner to shag hose.
- Assist company, as needed.

PART V
SPECIAL EVOLUTIONS

These evolutions have been designated "special" because they are limited in application, having been developed to fit or take advantage of a particular situation.

OPERATING FROM A STANDPIPE

The ladder on the outside of a fire escape is termed the "firefighter's ladder" and is intended for use by the Fire Bureau. Do not block the fire escape stairway. It is an escape route for occupants of the building. The ladder used to reach the fire escape ladder must be secured with a clove hitch and safety knot. This should be done by the first firefighter up the ladder.

Connecting to a Standpipe

To make connections to a standpipe intake siamese, begin with the intake on the left if the ports are horizontal, and at the bottom inlet if the ports are vertical. Connections to the intakes should be made spanner tight (Figure 19).

Figure 19 – Connecting to a standpipe

If the standpipe intake siamese swivel will not turn, place the thumb of the right hand on the inside of the male hose coupling and twist eight half turns to the right in the line of hose. Then attach the male coupling to the intake of the siamese by turning the hose line.

If the plugs in the siamese intakes cannot be removed or if there is debris in them, the standpipe may still be supplied by attaching the supply line to the outlet on the first balcony.

Care must be exercised whenever working on fire escape balconies to lessen the chance of objects falling (caps, spanners, etc.). Any loose objects should be placed in a pocket or inside the building.

Draining a Standpipe

Use the following procedures to place a standpipe back in service after use.

- Drain the water from a standpipe by removing the drain plug in the intake siamese, or if not practical to drain in this fashion because of a congested area, attach a proper length of hose line to an outlet on the first balcony and by draping or using a ladder, direct it into the gutter.

- Then go to the roof of the building and remove the caps and open the gate valves on the roof outlet. Stand-by on the roof long enough to allow the standpipe to drain.

- Close the gate valves on the roof outlet hand tight and back off sufficiently to relieve strain on the threads. Replace caps hand tight.

Proceed down the fire escape, stopping at each landing to inspect gate valves in the following manner. First remove caps and open gate valves, noting the action and condition of the valves. Close gate valves hand tight and back off to relieve strain on threads. Replace caps hand tight.

- Upon reaching the street, remove plugs or open drain valve and open clapper valves in the intakes to completely drain the siamese. **Do not place fingers into intakes. Use a pocket spanner or some other tool to open the clapper valves.** After the standpipe is completely drained, replace the bleeder plug and the plugs in the intake siamese.

EXTERIOR STANDPIPE EVOLUTION

The evolution as outlined will put at least two firefighters on the fire escape with fifty feet of 2½" hose connected to the standpipe balcony outlet. If the line is to be worked from the balcony, it is tied off to the railing about 15 feet behind the nozzle and the excess hose allowed to hang over the railing outside the balcony.

If the hose line is to be taken through the window into the building, enough hose is taken to allow for a minimum of 50 feet of working line onto the fire floor. The firefighter in the #3 position removes the cap on the standpipe outlet. The firefighter in the #1 position, carrying the female coupling, assists #3 to advance the hose line into the building after connecting to the outlet. The firefighter in the #1 position will charge the attack team's hose line at the standpipe outlet (Figure 20). When possible, make the initial attack on the fire from the floor below the fire floor.

Figure 20 – 2 1/2" Standpipe evolution

Standpipe Evolution - 2½" (Single Engine Company Operation)

(All positions shall maintain accountability)

#1

- Assist #3 in stretching 3" line from pump to standpipe.
- Raise ladder to fire escape ladder.
- Attach utility strap 15' from female coupling of 2 ½" line.
- Assist #3 taking hose up fire escape.
- At designated balcony step around hose to back of fire escape ladder.
- Step off fire escape ladder onto balcony.
- Attach female coupling to standpipe outlet.
- Secure hose line to railing 15' behind nozzle with utility strap.
- Open standpipe when #3 calls for water.
- Assist #3.

#2

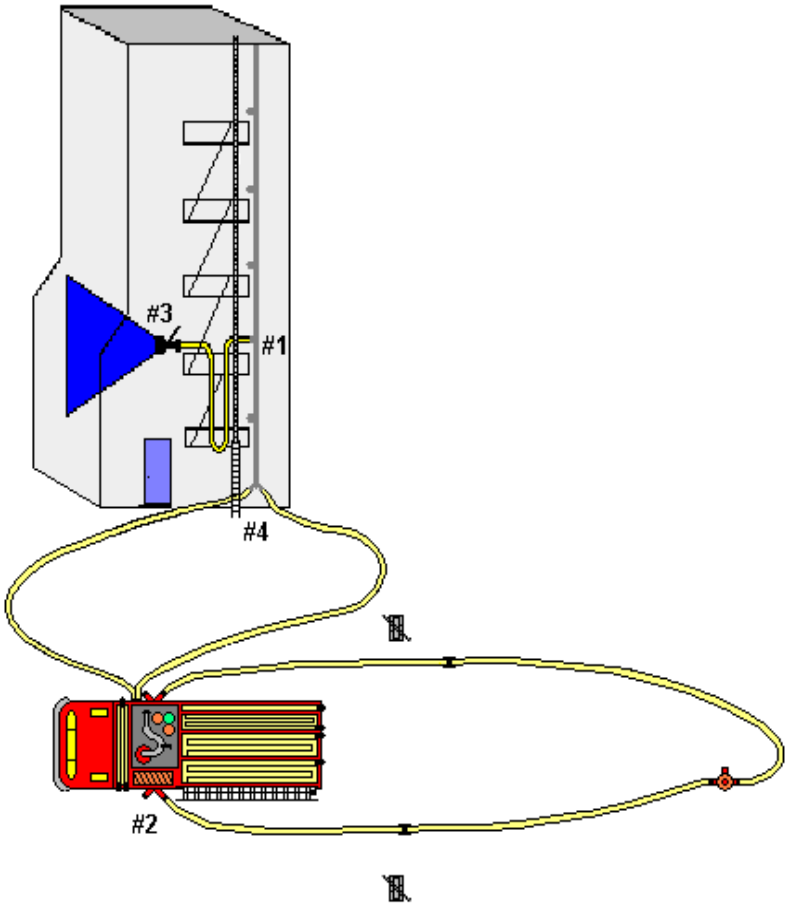
- Lay-in double-header, set brakes, engage pump.
- Set wheel blocks.
- Clamp lay-in lines.
- Break first lay-in line and connect to pump intake.
- Release clamp.
- Connect first 3" line from standpipe to pump discharge outlet and charge line.
- Set and operate pump.
- Supply standpipe.
- Break second lay-in line and connect to pump intake.
- Release second clamp.
- Stretch second 3" line from pump discharge outlet to standpipe.
- Make connections on both ends spanner tight and charge line.

#3

- Remove enough 3” hose from bed to reach standpipe and break.
- Stretch 3” line from pump to standpipe and connect spanner tight.
- Remove 50 feet of 2½” hose with nozzle and take to the base of the ladder.
- Shoulder nozzle and proceed up the fire escape ladder.
- Secure ladder to the fire escape.
- At designated balcony step around hose to back of fire escape ladder.
- Step off fire escape ladder onto the balcony.
- Pull up needed amount of hose.
- Remove cap from standpipe outlet.
- Proceed to objective, operate nozzle.

#4

- Take hydrant double-header.
- Assist #2 as directed.
- Come up and assist company.



(Figure 21 – 2½” Standpipe Evolution)

INTERIOR STANDPIPE EVOLUTION

Some buildings are equipped with an interior standpipe. The intake will be on the exterior of the building, and the discharge outlets will be interior (commonly in the stairwell). The attack line should be connected to the standpipe outlet on the floor below the fire. The following evolution will put at least two firefighters on the fifth floor interior with 150 feet of hose attached to the standpipe outlet on the fourth floor.

Interior Standpipe Evolution - 2½" (Single Engine Company Operation)

(All positions shall maintain accountability)

#1

- Assist #3 in removing 3" line from bed and breaking connection.
- Connect first 3" line from standpipe to pump discharge outlet on the opposite side of the pump panel.
- Remove the standpipe bundles and standpipe kit.
- Take 2nd section of the standpipe bundle.
- Proceed up interior stairway to fourth floor.
- Assist #3 and #4 connecting the hose sections.
- Pull enough hose to reach objective.
- Back up #3 at nozzle.

#2

- Spot engine at hydrant, set brakes, and engage pump.
- Set wheel blocks.
- Remove enough 3" hose from bed to reach standpipe and break connection.
- Charge the line supplying the standpipe, and set the pump pressure.
- Stretch second 3" line from pump to standpipe and connect.
- Make connections on both ends spanner tight and charge the line.
- Attach 50' section of 3" line to hydrant.
- Operate the pump.

#3

- Remove enough 3" hose from bed to reach standpipe and break connection.
- Stretch 3" line from pump to standpipe and connect spanner tight.
- Take 1st nozzle section of the standpipe bundle.
- Proceed up interior stairway to fourth floor.
- Connect 1st and 2nd sections of hose.
- Shoulder nozzle section and proceed to objective.
- Control the door and call for water.
- Bleed the line and flow water to allow #4 to verify gauge pressure.
- Proceed to objective and operate nozzle.

#4

- Take hydrant double-header.
- Take third section of the standpipe bundle and standpipe kit.
- Proceed up interior stairway to the fourth floor.
- Open standpipe to verify there is water while clearing out any debris.
- Attach elbow and gauge to the standpipe.
- Attach 2nd and 3rd sections of hose.
- Attach 3rd section of hose to the gauge and flake excess hose into the fourth floor.
- Open standpipe and verify the pressure when #3 calls for water.
- Assist company as needed.

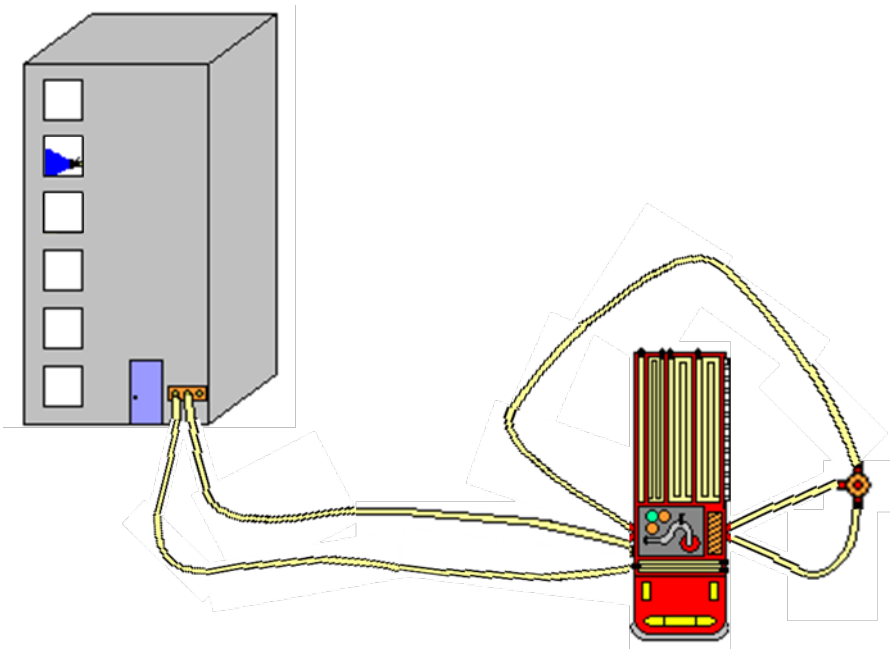


Figure 22 – Interior Standpipe

Figure 23 – Standpipe Bundle and Kit

Figure 24 – Inline Pressure Gauge and Elbow

Figure 25 – Flaked Excess Hose

REVERSE-LAY

In a Reverse-lay, a lay-in line is laid from the fire to the hydrant rather than the hydrant to the fire. Any of the special evolutions may be adopted for use with the Reverse-lay. It is usually employed when an engine arrives at a fire where the source of water is beyond the scene of the fire, or to remove the engine from the hazard zone.

Based on the situation, or the evolution to be performed, the engine stops at the scene of the fire and the officer calls for a Reverse-lay.. While the hose is being pulled from the appropriate hose bed(s), the driver and one firefighter remove equipment from the engine. Equipment needed may include axes, pike pole, hotel bundle, exhaust fan, first-aid kit, ladder, hose clamp, double male, etc.

When the officer ascertains that everything needed at the fire scene has been removed from the engine, the hose is anchored and the driver is directed to proceed with the lay-in (Figure 26). The driver will spot on a hydrant, connect the laid in hose line to an outlet, connect soft suctions to the hydrant and supply the pump, and then charge the line.

Reverse lays are designed to protect personnel and apparatus from falling debris and glass. It ensures that collapse zones are maintained and it avoids blocking access to the building. Also, safety considerations dictate that the pumper supplying the standpipe and/or sprinkler connection is a minimum of 200 feet away from the building.

Figure 26 – Reverse Lay

Standpipe Evolution - 2½" - Reverse Lay (Single Engine Operation)

(All positions shall maintain accountability)

#1

- Remove required equipment including double males.
- Remove lay-in lines for anchoring.
- Anchor 3" lay-in line.
- Clamp lay-in lines.
- Release clamps after standpipe connections are made.
- Attach utility strap 15' from female coupling of 2 ½" line.
- Assist #3 in taking hose up fire escape ladder.
- At designated balcony, step around hose to back of ladder.
- Step off fire escape ladder onto balcony.
- Attach female coupling to standpipe outlet.
- Secure hose line to railing 15' behind nozzle with utility strap.
- Open standpipe when #3 calls for water.
- Assist #3.

#2

- Spot apparatus and set brake.
- Assist #1 in removing required equipment.
- Reverse-Lay to hydrant double- header, set brakes, engage pump.
- Set wheel blocks.
- Break 1st supply line and connect to pump discharge with double female.
- Break 2nd supply line and connect to pump discharge with double female.
- Supply standpipe.
- Set and operate pump.

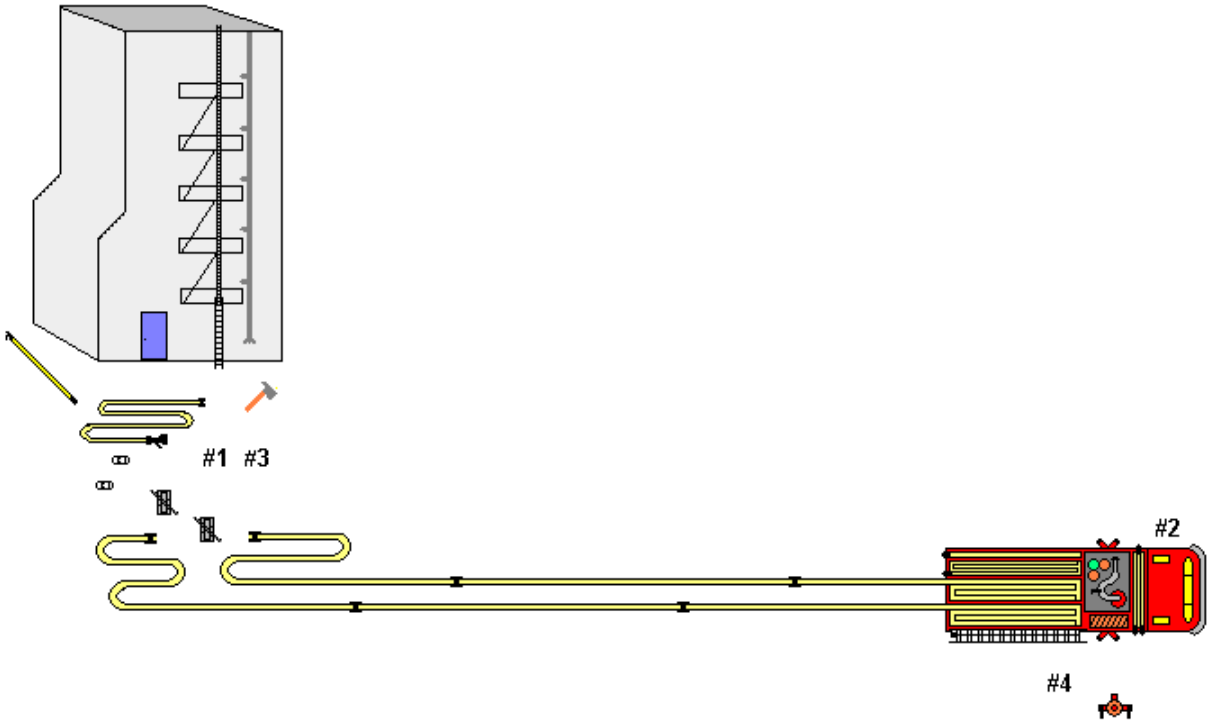
#3

- Remove 50' 2 ½" of hose with nozzle and take to the base of the ladder.
- Remove lay-in lines for anchoring.
- Anchor 3" lay-in line.
- Connect lay-in lines to standpipe (spanner tight).
- Shoulder nozzle of 2 ½" hose and proceed up to fire escape ladder.
- Secure ladder to the fire escape.
- At designated balcony, step around hose to back of ladder.
- Step off fire escape ladder onto balcony.
- Pull up needed amount of hose.
- Remove cap from standpipe outlet.
- Proceed to objective and operate nozzle.

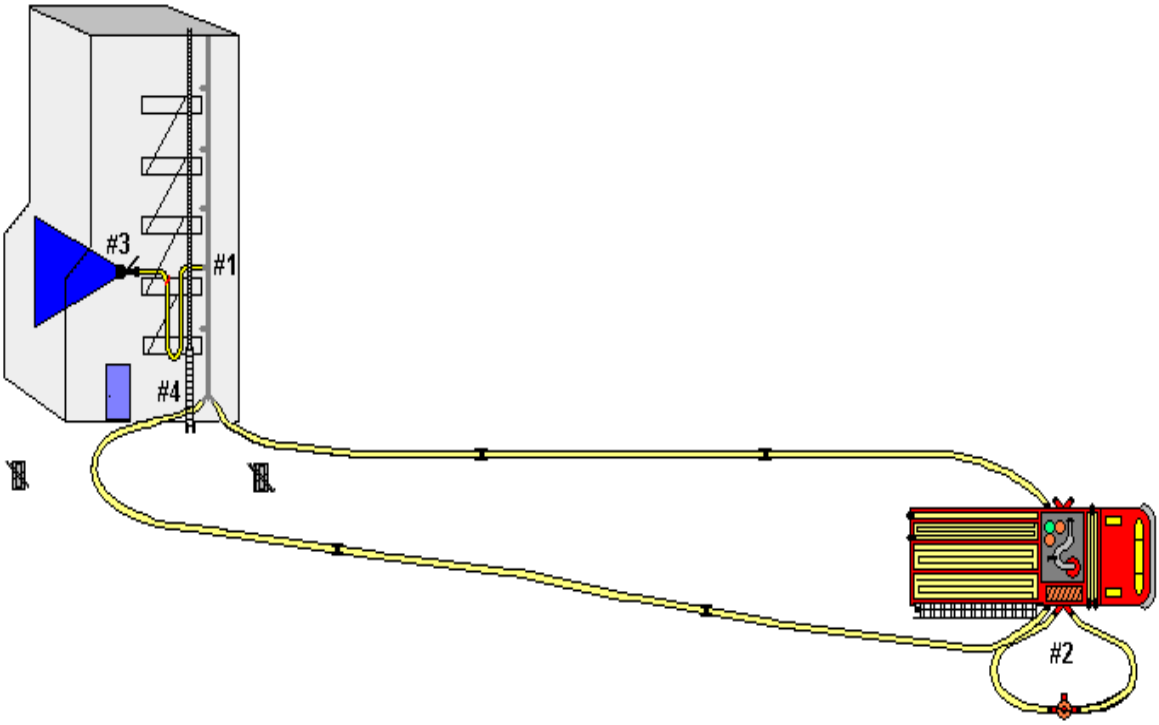
#4

- Raise ladder to fire escape ladder.
- Proceed with #2 to hydrant.
- Take hydrant double-header.
- Assist company as needed.

(Figure 27 – Reverse Lay Standpipe Evolution - 2½" - Single Engine Operation)



(Figure 28 – Reverse Lay Standpipe 2½", in progress)



(Figure 29 – Reverse Lay Standpipe 2½")

Standpipe Evolution - 1¾" (Single Engine Company Operation)

At some fires the use of 1¾" hose lines off the standpipe outlet would be better suited for the needs of the situation. Where 100 feet of 1¾" hose is sufficient, the following evolution utilizes the hotel bundle as pictured in Figure 30.

#1

- Assist #3 in stretching a 3" line from pump to standpipe.
- Raise ladder to fire escape ladder.
- Attach utility strap on end of 1¾" line near wye.
- Assist #3 in taking hose up fire escape ladder.
- At designated balcony step around hose to back of fire escape ladder, dismount, and attach wye.
- Assist #3 advancing hose line to the objective.

#2

- Lay-in a double-header, set brakes, engage pump.
- Set wheel blocks, clamp lay-in lines.
- Break 1st and 2nd lay-in lines and connect to pump intake, release clamps.
- Connect standpipe supply lines spanner tight, and connect to pump discharge.
- Supply standpipe.
- Set and operate pump.

#3

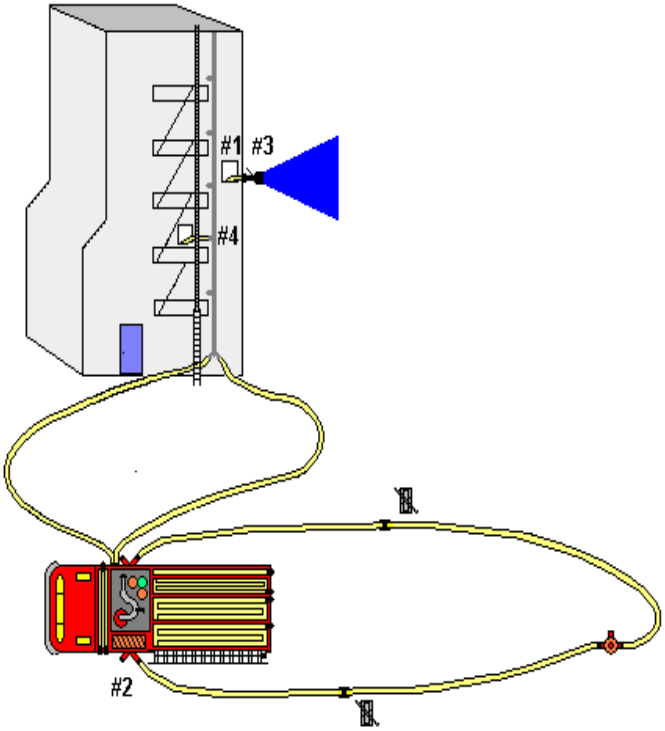
- Stretch 3" line from pump to standpipe and connect spanner tight.
- Take 1¾" hotel bundle and lay on ground near fire escape.
- Attach utility strap around middle of hotel bundle shoulder load.
- Place utility strap on shoulder and proceed up to fire escape ladder.
- Secure ladder to the fire escape.
- Climb fire escape ladder to designated balcony.
- - At balcony, before dismounting from ladder, grasp the utility strap and swing the hose over railing and drop onto balcony floor.
- Remove cap from standpipe outlet.
- Proceed to objective with assistance from #1.

#4

- Take hydrant double-header.
- Assist #2 as directed.
- Charge attack teams' hose line at the standpipe outlet, when instructed.
- Assist company, as needed.

Figure 30 – FF taking 1 ¾" up fire escape

(Figure 31 – 1¾" Standpipe Evolution)



(Figure 32 – 1¾" Standpipe Evolution)

Reverse Lay Standpipe Evolution – 1¾" (Single Engine Operation)

(All positions shall maintain accountability)

#1

- Remove required equipment.
- Anchor 3" lay-in line.
- Clamp lay-in lines.
- Release clamps after the standpipe connections are made.
- Attach utility strap on end of 1¾" line near wye.
- Assist #3 in taking hose up fire escape ladder.
- Step around hose and off fire escape ladder onto balcony and attach wye.
- Charge line when water is called for by #3.
- Assist #3 advancing hose line to the objective.

#2

- Spot apparatus and set brake.
- Lay-in double-header, set brakes, engage pump.
- Set wheel blocks.
- Break 1st supply line and connect to pump discharge with double female.
- Break 2nd supply line and connect to pump discharge with double female.
- Supply standpipe.
- Set and operate pump.

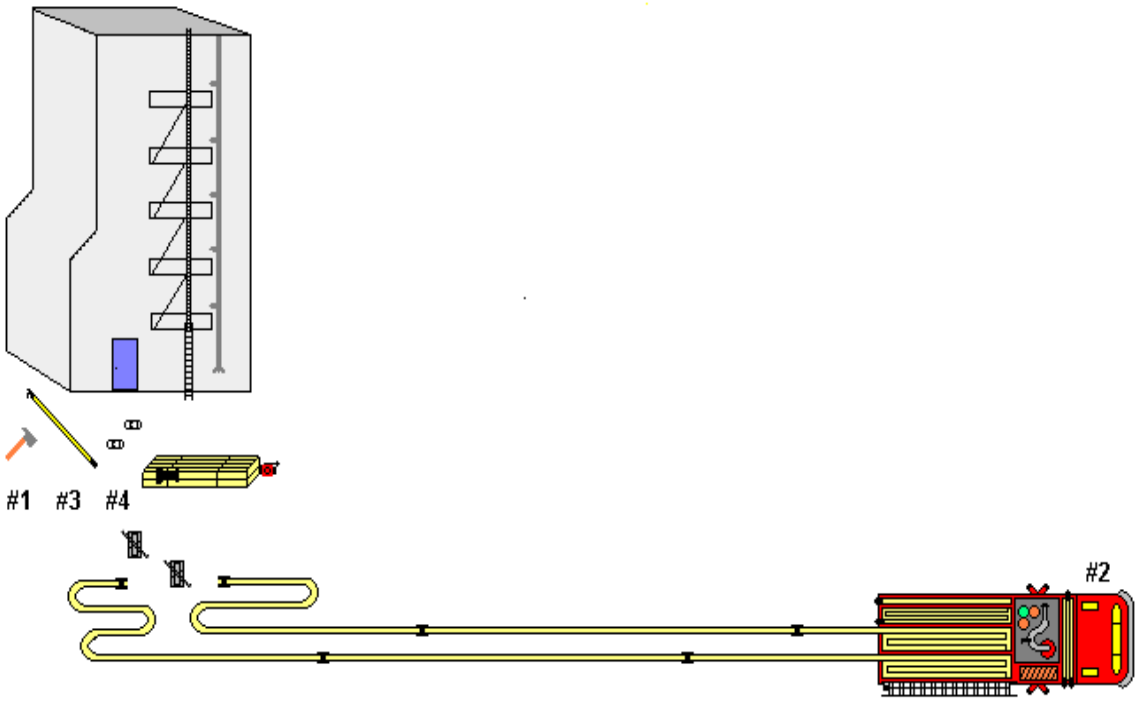
#3

- Remove hotel bundle and take to the base of the ladder.
- Assist #1 in removing lay-in line for anchoring.
- Anchor 3" lay-in line.
- Connect lay-in lines to the standpipe (spanner tight).
- Attach utility strap around middle of hotel bundle shoulder load.
- Shoulder bundle and proceed up to fire escape ladder.
- Secure ladder to the fire escape.
- Climb to designated balcony.
- Grasp the utility strap, swing bundle over railing, and drop onto balcony.
- Step off the fire escape ladder onto balcony.
- Remove cap from standpipe outlet.
- Proceed to objective with assistance of #1.

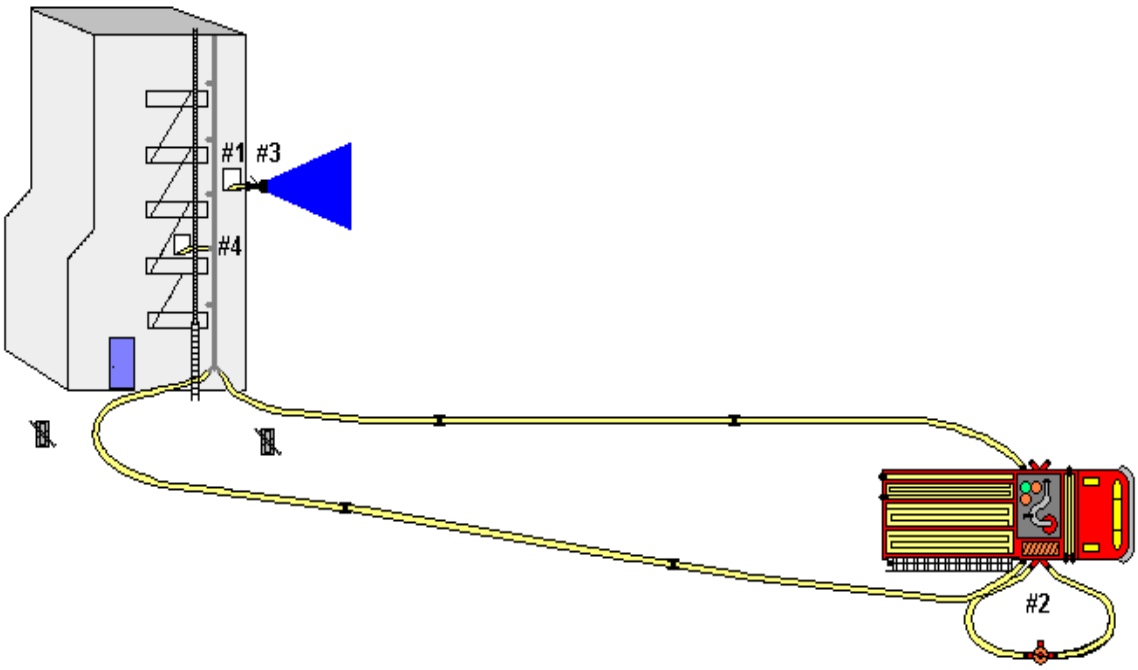
#4

- Raise ladder to fire escape ladder.
- Take hydrant double-header.
- Assist #2 as needed.

Figure 33 – Reverse Lay Standpipe Evolution
1 ¾" Single Engine Operation



(Figure 34 – Reverse Lay 1¾" Standpipe in progress)



(Figure 35 – Reverse Lay 1¾" Standpipe)

TURRET OPERATION

Master stream devices are "pre- plumbed" into the water pump system of pumpers. To operate the pre-plumbed turret usually requires only one person in addition to the driver (Figure 36). Because of the difference in apparatus, it is not feasible to outline a "specific duties" style of evolution for the operation of the turret from the apparatus.

Figure 36 – Pre-plumbed turret

The "remote ground-turret" operation is an evolution used to place the turret or master stream device remote from the engine. This often occurs during the defensive fire attack mode of a large fire.

There are generally two methods of setting the turret up for operations on the ground. The first involves removing the barrel of the turret from the engine and attaching it to the "platform device" for use on the ground. A length of chain is connected to the platform with a combination hammer and hook device on the end. This hammer is used to secure the feet of the platform into the ground. The chain can then be secured to a convenient stationary object and hooked back on itself. The 3" hose lines are then attached to the turret siamese and run straight back from the device to the apparatus. Ten feet behind the turret the two lines need to be tied together using a utility strap (Figure 37).

Figure 37- Turret secured to an object

The other method of deployment resembles two "Keenan's Hose Loops." This is normally used when it is impractical to hammer the pointed footings into the surface upon which the turret platform rests (i.e.: concrete or loose soil). When this option is utilized it is necessary to place the loops forward of the turret. The loops are made using 25 feet of hose and shall have no kinks in them. The crossover point is made at approximately one foot behind the intake siamese. The part of the hose connected to the turret base should be on the bottom of the crossover.

A utility strap is used to secure the hoses tightly together before charging them with water (Figure 38). In either case, the primary objective is to prevent the device from sliding along the ground and injuring someone.

Often the turret is used in an "unmanned" fashion and it needs to stay put without assistance from personnel. Another thing to remember is to avoid pointing the barrel at an angle below 30 degrees from horizontal. An angle less than this may cause the turret to slide.

It is important to remember that a master stream device requires a large volume of water. To obtain the necessary GPM for effectiveness, a minimum of two lines must be provided from the hydrant to the pump and then to the device.

Figure 38 – Turret operation using the "Keenan's Hose Loop" configuration.

(Inset is of the tie-off.)

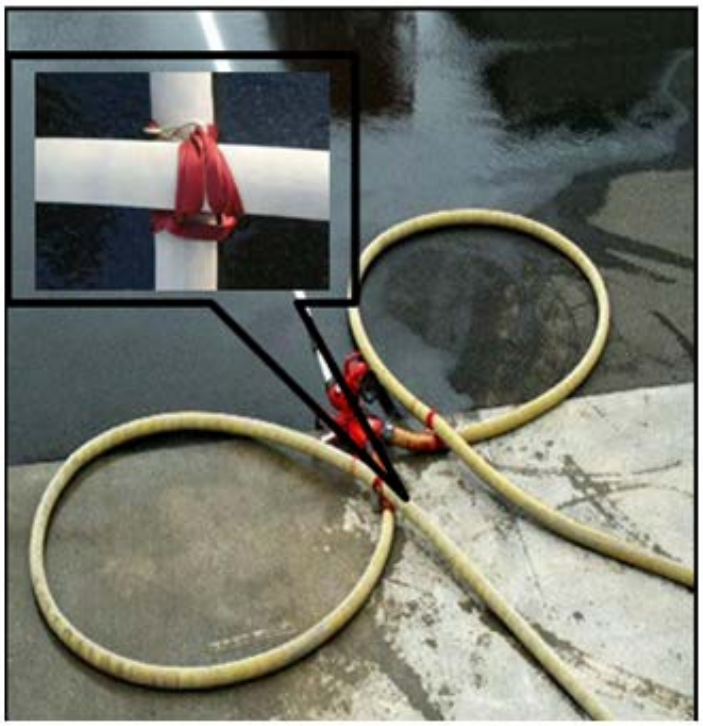


Figure 39 – Remote Ground Turret Evolution

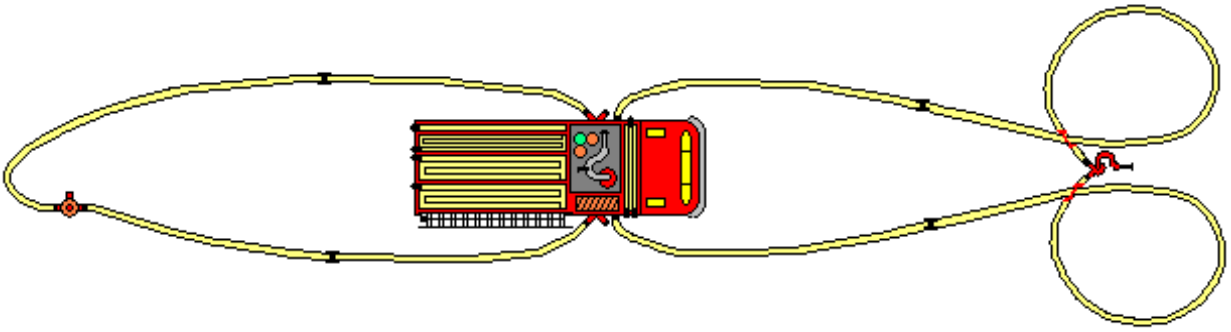
Remote (Ground) Turret Evolution

#1
- Receive turret and turret base from #3, take turret and place in the desired location.
- Return to engine and pull enough 2½" or 3" hose to reach the turret (plus an additional length if the Keenan's Hose Loop method is to be used).
- Connect the hose to the siamese intake (if Keenan's Hose Loop method, tie crossover using utility strap).
- Assist #3 with operation of turret.

#2
- Lay-in, set brakes, engage pump.
- Set wheel blocks, clamp lay-in lines.
- Break lay-in lines, connect to pump intakes.
- Assist #3 and #1 in stretching lines to the turret.
- Break stretch lines and connect to pump discharge outlets.
- Release clamps and operate pump.

#3
- Remove turret from mount, hand turret and turret base down to #1.
- Pull enough 2½" or 3" hose to reach the turret (plus an additional length if the Keenan's Hose Loop method is to be used).
- Assist #1 with connections to siamese and make the necessary tie-off.
- Notify #2 to charge the stretch lines and operate turret.

#4
- Take hydrant double-header, three port.
- Come up and assist company (assure that supply lines are attached to pump intakes and clamps released



(Figure 40- Remote [Ground] Turret Evolution)

TAKING OVER A HYDRANT

At times, Command will call for an engine to "take over a hydrant" to supplement water flow on the fire ground. A line should be laid-in by the relay engine from the attack engine location to the hydrant. Another option is to back stretch the line by hand from the attack engine to the hydrant. This third line will allow maximum volume from the hydrant, and two lines will always be flowing to the attack engine from the relay engine as the hydrant is taken over.

In each operation the driver will spot the engine on the target hydrant, set the brakes, place the pump in gear, and block the wheels. The specific tasks are detailed below. These operations assume a double header has been laid- in to the fire.

Taking Over the Hydrant - Three Port Hydrant

#2

- Connect a soft suction to the steamer port.
- Supply pump.
- Apply a clamp to one of the lay-in lines on the attack engine side of the nearest coupling (increased water pressure from the attack engine returning to the relay engine may cause clamp to slip), and notify attack engine.
- Close the gate and disconnect that line from the hydrant.
- Connect that line to the discharge port on the pump, break clamp and charge line.
- Connect a soft suction to the open port and supply the pump.
- Repeat above steps for the second lay-in line.
- Connect a third line from hydrant to the pump.
- Contact a engine for water pressure adjustments.

#4

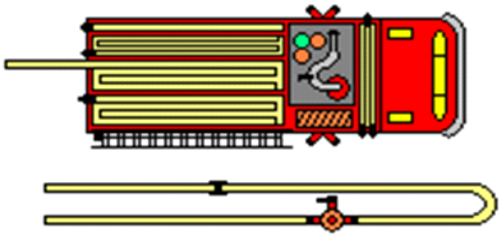
- Connect third lay-in line to pump outlet and charge.
- Place clamps in position for use on lay-in lines.
- Assist driver as needed.

Note:

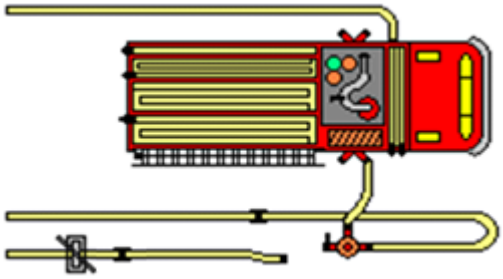
- Positions #2 and #4 have interchangeable tasks.
- Position pumping engine slightly downstream of the hydrant.
- Set pump pressure to residual hydrant pressure plus friction loss of hose lines between attack engine and relay engine for the flow rate of the attack engine.
- Driver will engage and operate pump.
- When assigned as a four person evolution, #1 and #3 positions will assist as needed.
- A double female may be necessary to connect the third lay-in line to the discharge port.
- **Remember**: Water In / Water Out

The drawings below illustrate the general steps involved in taking over the hydrant. This method will have two lines flowing to the attack engine at all times and will greatly decrease the possibility of a mechanical failure to the attack engine's pump.

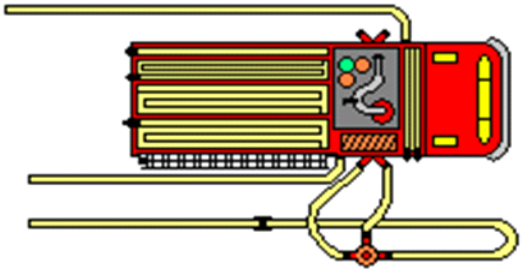
Step 1 – Pumping engine laid-in from attack engine and positioned on hydrant



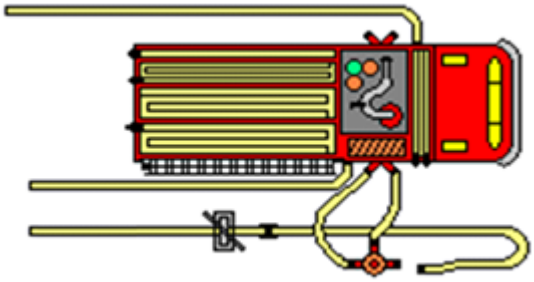
Step 2 – One line into the pump with one line out of the pump plus lay-in line



Step 3 – Two lines into the pump with two lines out of pump plus lay-in line



Step 4 – Two lines in, two lines out, lay-in line clamped and disconnected



Step 5 – Taking over the hydrant complete with three lines into pump and three lines out of pump to attack engine

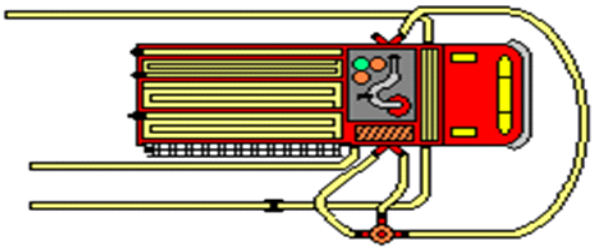


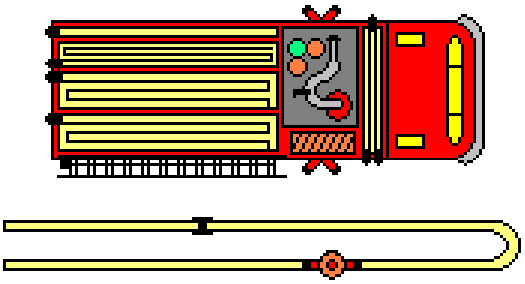
Figure 41 – Taking over the hydrant, 3-port hydrant

Taking Over the Hydrant - Two Port Hydrant

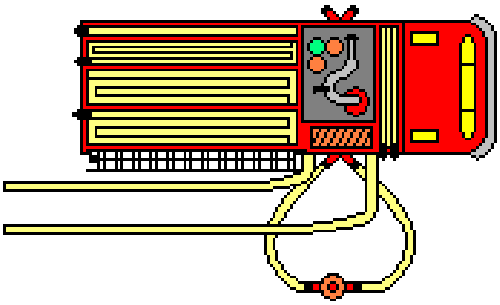
#2
- Apply a clamp to one of the lay-in lines and notify downstream engine.
- Close that gate.
- Disconnect line from hydrant and connect to pump discharge.
- Put soft suction on open port and charge.
- Release clamp and charge lay-in line.
- Repeat the first five steps for the second lay-in line.
- Contact downstream engine for pressure adjustments.

#4
- Connect soft suction to hydrant and supply pump.
- Assist driver as directed.

Note:
- The water flow supplied to the attack engine must not be interrupted.
- If a two-port hydrant has been laid-in from, and pressure and water volume needs to be supplemented, it would be best to find an additional hydrant.
- When #1 and #3 are available assist as needed.
- Care must be taken not to cut off the water supply entirely to the attack engine.
- **Remember**: Water In / Water Out.



(Step 1 – Pumping engine positioned on the hydrant)



(Step 2 – Taking over a two port hydrant completed)

(Figure 42 – Taking Over the Hydrant, 2 Port Hydrant)

TRANSITIONAL ATTACK

A transitional attack tactic is used on those fires that are too large for a quick knock down from handlines. It requires that a pre-plumbed turret be placed into operation and attack the fire from the outside of the structure as soon as the apparatus is positioned. The turret can be placed into operation using water from the booster tank. A water supply needs to be obtained quickly because of the large amount of water used by the turret. After the main body of fire has been knocked down, handlines can be advanced to attack the remainder of the fire.

Note: Master stream devices are not to be directed into a structure if personnel are working inside.

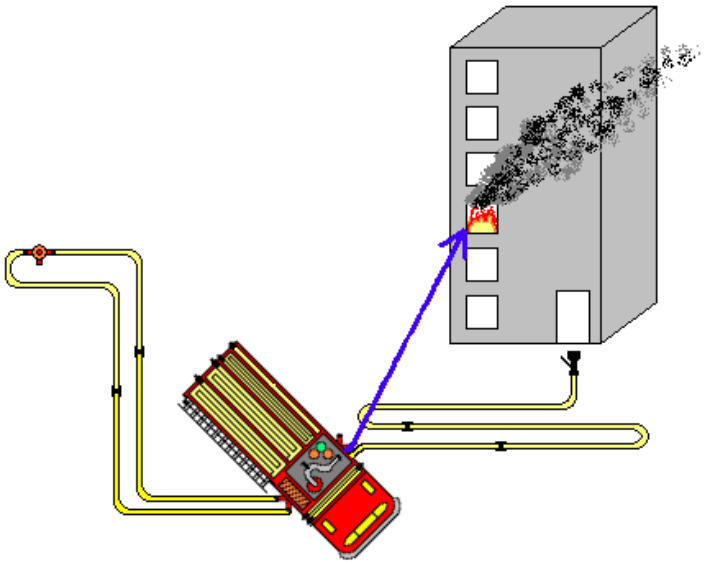
Transitional Attack Evolution using a Pre-Plumbed Turret
(All positions shall maintain accountability)

#1
- Assist #3 breaking first lay-in line.
- Set-up pre-plumbed turret and operate into the third floor.
- Back up #3 at nozzle.

#2
- Lay-in, set brakes, engage pump.
- Set wheel blocks.
- Clamp lay-in lines.
- Connect lay-in lines to pump intake.
- Release clamps.
- Operate pump.

#3
- Break lay-in lines.
- Take 2½" preconnect and proceed to entrance of structure.
- Do not enter structure until #1 or #4 arrives and the turret is shut down.
- Proceed to 3rd floor objective.

#4
- Take the hydrant double header.
- Remove kinks encountered.
- Assist #2 as needed.
- Proceed to nozzle and assist #3.



(Figure 43 – Transitional Attack Evolution)

FOAM FOR FIREFIGHTING

Portland Fire & Rescue is currently using two types of foam concentrate: .

- ANSUL's Ansulite (TM), Aqueous Film Forming Foam / Alcohol Resistant Concentrate 3/6% (AFFF-ARC).
- ANSUL's SILV-EX (TM).

The primary function of the Class "B" foam is to form a vapor sealing foam blanket over a flammable liquid. Class "A" foam, on the other hand is used to provide a sustainable wetting agent for combustible materials such as vegetation. It is because there is a distinct difference between these two classes of fire that the use of two types of foam is required.

Figure 44 – Foam

Note: All types of concentrate are provided in similar five gallon buckets, so the user must exercise caution **not** to use the wrong foam for the wrong class of fire or to mix the two concentrates together (Figure 44).

Foam Evolution 1¾"

(All positions shall maintain accountability)

#1

- Break lay-in line.
- Assist #2 as needed.
- Take 150 feet 1¾" pre-connect for foam application and proceed to objective.
- Place foam line into operation.

#2

- Lay-in, set brakes, engage pump.
- Set wheel blocks & clamp lay-in line.
- Assist #1 breaking lay-in line.
- Connect lay-in line to pump intake.
- Release clamp.
- Operate pump.
- Assemble foam bucket, foam bucket spanner, and eductor.
- Adjust pump pressure for foam line and *gate down protection line.*
- Attend foam bucket.

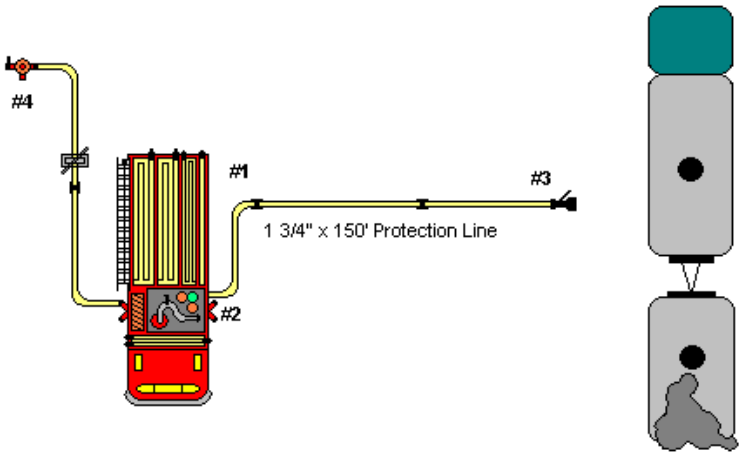
#3

- Take 150' preconnect 1 ¾" protection line and proceed to objective.
- Operate protection line (do not wash away foam blanket).

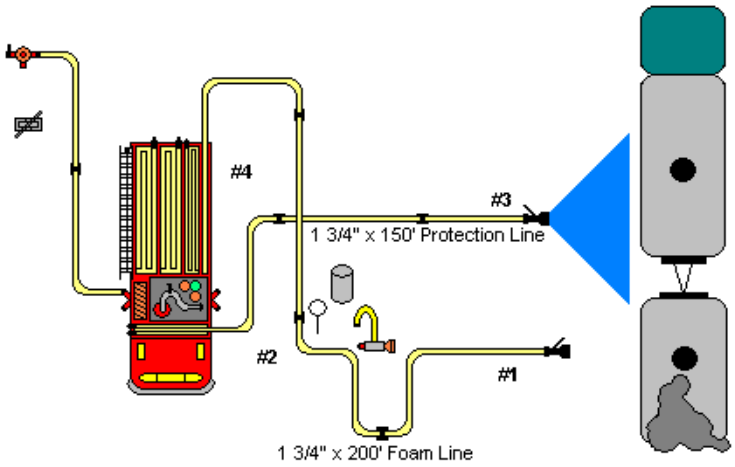
#4

- Take the hydrant.
- Remove all kinks encountered.
- Assist #2 with foam equipment and connections.
- Assist #1 and #3 with hose line placement and operation.

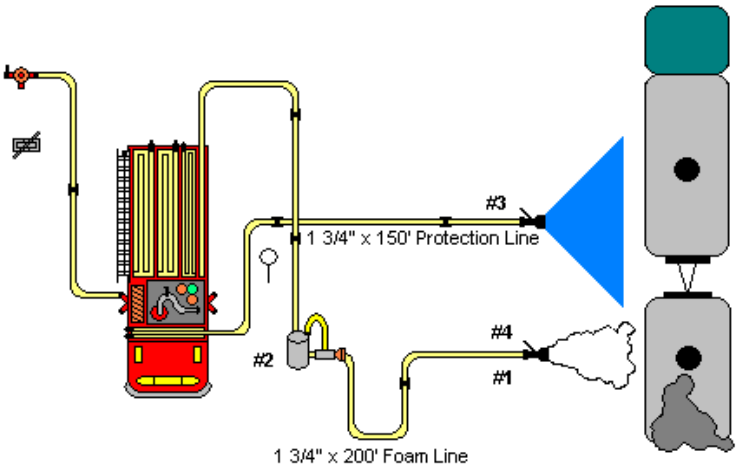
NOTE: The protection line has to be gated down due to the high pressure required for the foam line. It is also important that the protection line does not wash away the foam blanket and/or spread the fuel that is burning. It may be necessary to cover catch basins and dike an area to contain the fuel runoff. If a "Hotel Bundle" is used for a foam line the low-pressure nozzle has to be replaced with a high- pressure nozzle.



(Figure 45 – 1¾" Pre-connect Evolution for the Protection Line)



(Figure 46 – Protection Line Operating, Foam Line in Place)



(Figure 47 – Protection Line Operating, Foam Line Operating)

PART VI
SUPPLEMENTARY HOSE OPERATIONS

STRETCHING HOSE UP A LADDER

Extreme care must be taken to ensure that no water will be turned into the line until called for by the firefighter at the nozzle. If needed, a firefighter with a clamp should stand by the base of the ladder to control the water supply. Communication between the pump operator and the one or two firefighters involved must be clear and exact.

To Operate A Nozzle From a Ladder

Operating a nozzle from a ladder can be a trying task. There may be considerable smoke and flame emerging from the building or a window. One firefighter can control a nozzle from a ladder when the nozzle has been properly secured. Another firefighter should assist using an approved safety hold (*Figure 48*).

Figure 48- Operating nozzle from ladder

#1
Clamp line at base of ladder.
Assist #3 in carrying hose up ladder with little slack between them.
As soon as nozzle has been passed through ladder, remove utility strap from shoulder and lay hose in middle of ladder.
Drop strap between ladder rungs.
Move up and support #3 with safety hold.

#3
Lay hose at base of ladder.
Attach hose utility strap near nozzle.
Take nozzle to point where it is to be operated.
Tie off nozzle to ladder.
Place nozzle in operation.

#4
Release clamp when water is called for.
Straighten hose line and adjust to center of ladder after charging.

To Advance over a Ladder

This operation is used to advance a hose line through a window and into a structure, or to take a hose line onto a roof.

If a window is to be used, the officer will designate it, and an appropriate ladder will be placed. At the window, remove the utility strap from your shoulder and place the hose on the sill. Sound the floor, if necessary, then enter through the window and pull up several bights of hose, then advance (*Figure 49*).

If the hose line is to go to the roof, the ladder is to have at least three rungs above the eave or parapet. Keeping the utility strap on your shoulder, step over and around the hose as you step onto the roof. Advance the hose line and continue to your objective. When the nozzle is in place secure the hose line to the ladder using the beam on the side away from the nozzle (*Figure 50*).

The hose should lay in the middle of the ladder in a straight line. Slack from the hose stretching under pressure should be adjusted from the base of the ladder.

Figure 49 – Advancing a hose line through window

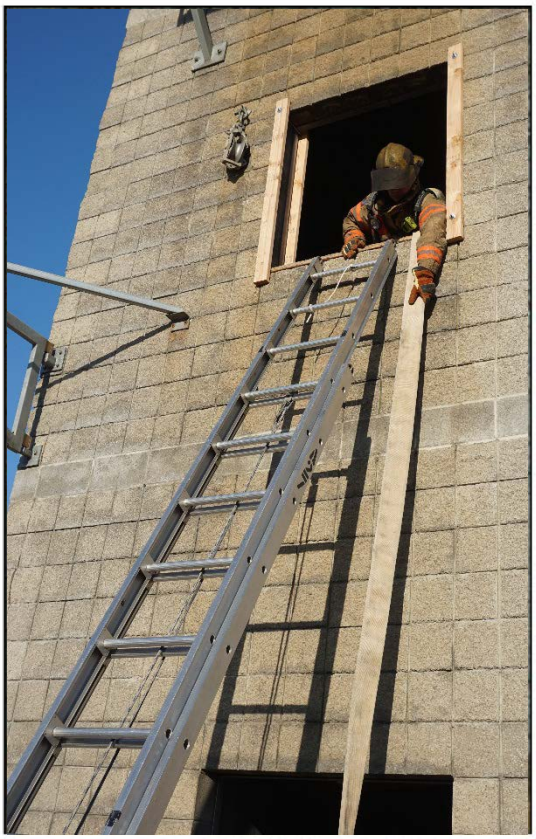


Figure 50 – Securing a hose line to a ladder up to the roof

DRIVEWAY-LAY

A Driveway-lay is an operation common to more rural areas but also has applications where access is limited. Examples include large apartment complexes and flag lots, which are lots set back behind other lots. A Driveway- lay may consist of either one or two 3” lay-in lines.

The second arriving company has two variations to work with. They can lay in from a hydrant to the driveway lay or reverse lay from the driveway lay back to the hydrant. (*Figure 51*). The officer originating the driveway-lay must specify what he or she wants so the next engine company knows their duties.

For the second arriving company, if the officer says to lay-in from a hydrant, the hydrant is taken as a normal single or double header. The driver then connects the lay-in line to the driveway- lay. The second in company may remote pump at the base of the driveway-lay if it is an extremely long lay or circumstances require it.

If the order is to reverse-lay from the driveway-lay, a firefighter anchors the hose appropriately and then connects the lay-in line to the driveway-lay, using the double male left by the company originating the driveway-lay. Any additional equipment needed at the fire scene is also removed.

The driver then proceeds with a normal lay-in and connects to the hydrant as in a Park and Stretch, which is described later in this chapter.

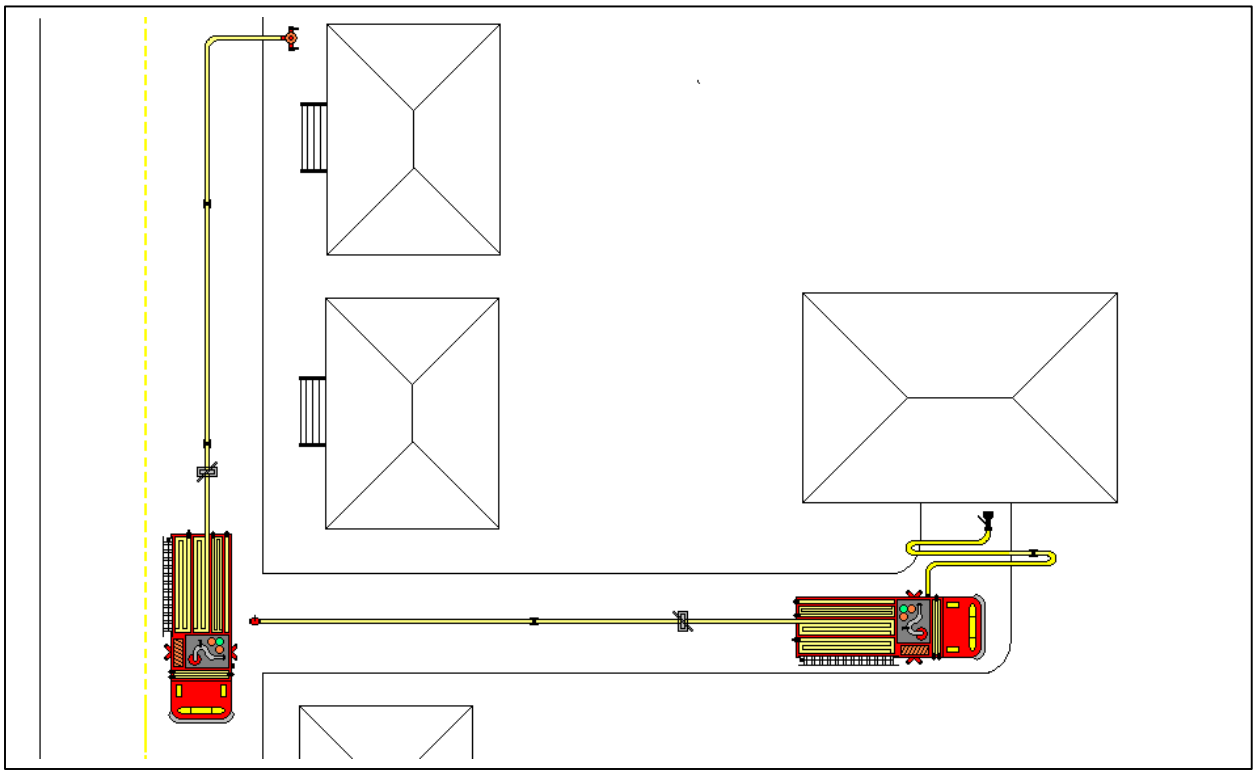
First Arriving Company

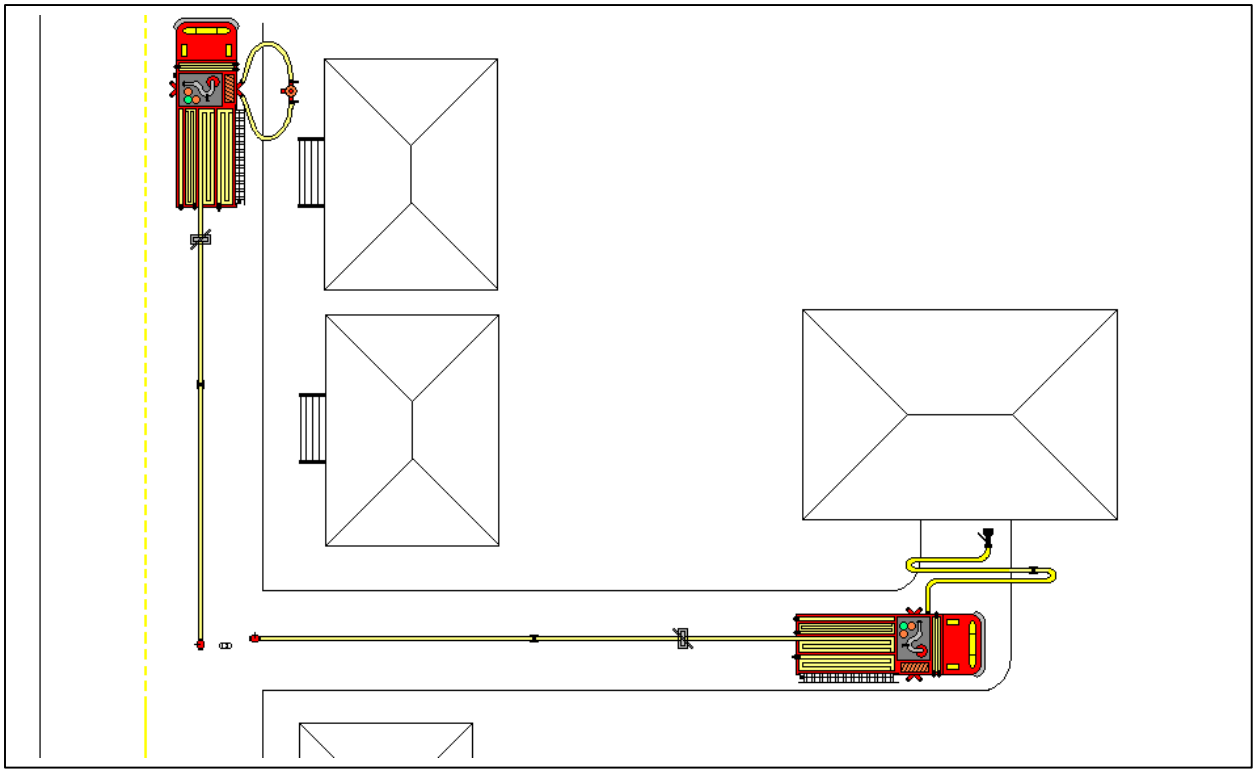
#1
- Establish the evolution by radio.
- Direct next engine to lay-in to, or reverse-lay from, the driveway lay-in line.

#2
- Lay-in, set brakes, engage pump.
- Set wheel blocks.
- Clamp lay-in line.
- Break lay-in line and connect to pump.
- Release clamp.
- Operate pump.
- Perform other duties as needed.

#3
- Assist company as needed.

#4
- Snub lay-in line around stationary object or anchor line safely.
- Close gate on end of hydrant line (If 5" hose is used, attach a 3-way gated wye).
- Leave a double male with hydrant gate.
- Mark the driveway-lay with appropriate marker if at night.
- Come up and assist company.





(Figure 51 – Driveway-Lay: forward lay (top) and reverse lay (bottom))

HOTEL BUNDLE

The hotel bundle is a 100 foot bundle of 1¾" hose that is carried on every engine and truck in Portland Fire & Rescue. Figure 50 shows the bundle and the configuration of the buckles used to secure the hose.

The hotel bundle is assembled starting with the nozzle. Lay the hose out straight until you reach the black stripe (approximately 4.5' from the nozzle). Wrap the hose clockwise around the nozzle, back up to the black stripe, and continue until all the hose has been used. Attach the wye and buckles to complete the bundle.

(Figure 52- Hotel Bundle)

EXTENDING A HOSE LINE

Extending a Stretch

The situation sometimes occurs in which a stretched line fails to reach its objective. In that event, the stretch line is extended in the following manner.

The firefighters extending the line return to the engine and take the required amount of hose from the hose bed. The additional hose is carried to the end of the stretch line or where the firefighters are going to connect the additional hose. This operation may be repeated until the hose necessary to reach the objective has been stretched.

Anytime a hoseline is extended through a bale, wye, or other gated appliance, the appliance must be tied off in the open position. This is done to ensure the bale or gate stays open and isn't kicked shut with firefighters operating the hose line.

Extending a Line at a Fire

When it becomes necessary to extend a hose line, which is being operated, the extension of the line should be completed in as short a time as possible in order to keep the interruption of firefighting to a minimum. The hose line should be kept in operation until the required amount of hose has been brought up and prepared for the extension.

At this time, the operating line is shut down by the driver, the line broken, and the extending line connected. The driver charges the line and operations with the extended line resume. Communications is important between the driver and nozzle person. It can be done by either radio or hand signals.

If the line to be extended is extended at the nozzle, simply shut off the nozzle bale, remove the tip and attach the hose line (Figure 53). If extending a 2 ½" with a hotel bundle, connect the wye to the nozzle bale. A second line can be attached if necessary.

Anytime a hoseline is extended through a bale, wye, or other gated appliance, the appliance must be tied off in the open position. This is done to ensure the bale or gate stays open and isn't kicked shut with firefighters operating the hose line (Figure 54).

(Figure 53– Extending a line with a nozzle)

(Figure 54 – Securing the bale and gate)

Extending a Stretch Line with a Hotel Bundle

Note: All positions shall maintain accountability. For drilling purposes, a short stretch will be performed and then extended using a hotel bundle.

#1

- Breakdown nozzle after line is in place.
- Make connections for #4.
- Assist #4 with advancing charged hose line.

#2

- Assist #4 with retrieving the hotel bundle
- Adjust pump pressure for extended line

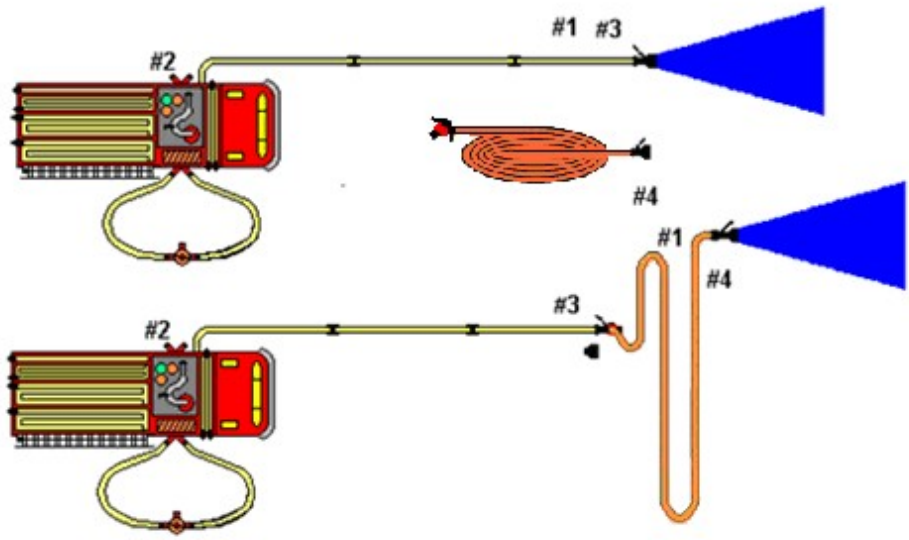
#3

- Assist #1 with connections.
- Charge 1 ¾" hose line at wye.
- Tie bale & wye in the open position.

#4

- Return to apparatus and retrieve the hotel bundle.
- Proceed to end of stretch line and set the bundle on the ground.
- Hand the wye to #3 and call for water.
- Stretch hose to objective after line is charged.

(Figure 55 – Extending a line with a hotel bundle)



(Figure 56 – Extending a line with a hotel bundle)

PARK AND STRETCH

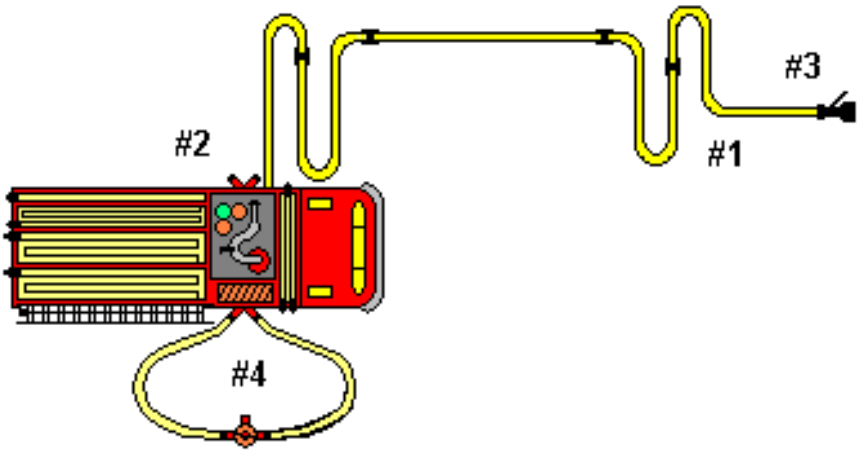
The Park and Stretch evolution essentially eliminates the lay-in line. The pumper is spotted at a hydrant and one of the various stretches is performed from that point. Soft suction hose lines are generally connected to the hydrant supplying the pump.

Park and Stretch

#2
- Spot engine at hydrant, set brakes, engage pump.
- If evolution is from stretch bed, pull drag load for #1 and call stretch.
- Break stretch line and connect to pump outlet.
- Operate pump.
- Charge line when called for.

#4
- Connect soft suction(s) from pump intake to hydrant.
- Attach spare gate if needed.
- Open hydrant.
- Come up and assist company.

(Figure 57 – Park and Stretch)



(Figure 58 – Park and Stretch)

PART VII

BULK LOAD EVOLUTION

The Bulk Hose Load consists of 300' of 1 ¾" hose connected to 200 feet of 2- 1/2 " hose via a bell reducer. It offers flexibility and speed when only a 1 ¾" is required for long stretches such as flag lots, room and contents fires in center hallway apartments and moorages. The bulk load can also be used for short stretches where only a few lengths of hose are needed. When possible, spot the engine so that the rear of the bed does not become a pinch point. Nozzle FF grabs the U shoulder load and steps down. The nozzle FF has the option to then slide right arm through top layer of bites, pulling an additional 40-50'. Backup FF puts right arm through top layer of bites and steps down. Try to stay close to nozzle FF until reaching the desired drop point. As the nozzle team proceeds to objective the driver may assist by pulling a layer of hose to the first pinch point. Only when the nozzle team signals they are ready for water should the driver break the next coupling in the bed and attach to the outlet. Do not break the coupling already on the ground, as this is the working line.

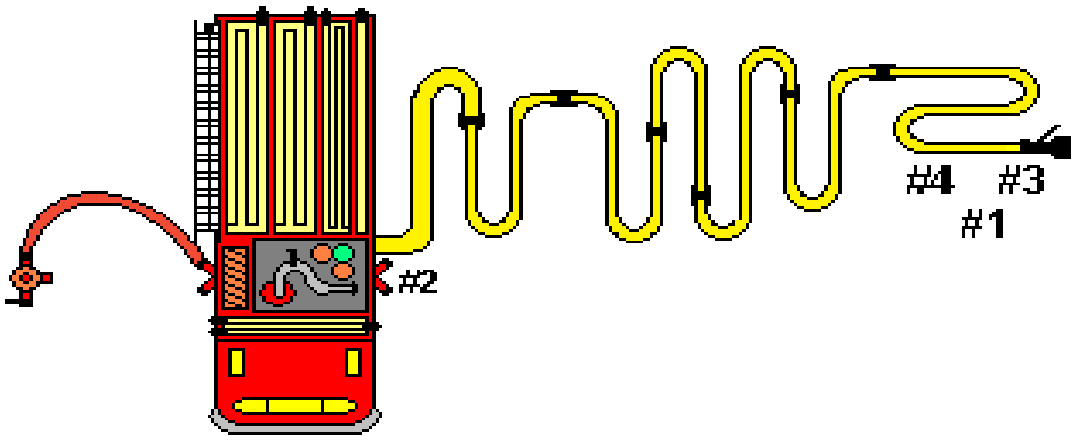
Bulk Load 350' (with Park & Stretch)

#1
- Don SCBA
- Pull a drag load for #4.
- Take an arm load and advance.
- Stretch drag load.
- Flake arm load and call "Stretch."
- Back-up #3 at the nozzle as needed.

#2
- Spot engine at hydrant, set brakes, engage pump.
- Set wheel blocks.
- Pull one drag load for #1 and call "Stretch."
- Break hose line and connect to pump discharge.
- Charge hose line from tank water.
- Adjust hoseline pressure
- Connect soft suction(s) from pump intake to hydrant.
- Attach spare gate if needed.
- Open hydrant.
- Operate pump.

#3
- Take U shoulder load.
- Take an arm load and advance.
- Advance to objective
- Flow nozzle to allow #2 to set pressure
- Do not enter structure until #1 or #4 arrives.

#4
- Pull a drag load for #3
- Take an arm load and advance.
- Stretch drag load.
- Flake arm load and call "Stretch"
- Remove all kinks encountered.
- Assist #2 as needed.
- Advance appropriately to the nozzle and assist.

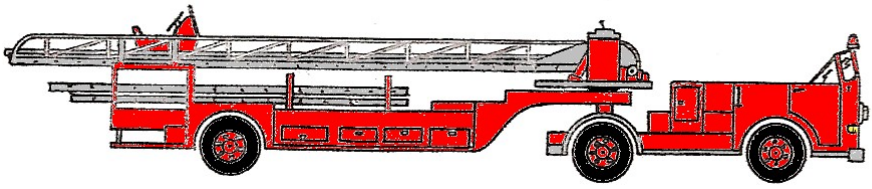


(Figure 59 – Bulk Load Evolution)

GLOSSARY

BEAM	The sidepieces of a ladder which support the rungs and which may be either solid or trussed.
DOGS	Devices that hold and lock the fly section in position when it is extended, sometimes referred to as pawls or locks.
FLY	A section of an extension or aerial ladder, which may be elevated by extending it out of the main or bed section. There may be several fly sections in one ladder.
GUIDES	Metal strips on an extension ladder which guides the fly section while it is being elevated.
HALYARD	The rope or cable used to elevate the fly sections of an extension ladder.
HEAT SENSOR LABEL	A label affixed to the ladder beam near the top and heel to provide a warning that the ladder has been subjected to excessive heat.
HEEL	The end of a ladder that rests on the ground.
HOOKS	Spring-loaded swivel hooks mounted on the top ends of roof ladders for hooking over the peak of a gable roof.
MAIN SECTION	The bottom section of an extension or aerial ladder, also referred to as the bed section.
POLES	Support poles attached with swivels to the main section of long extension ladders and used to help guide and steady the ladders during raising and lowering operations.

PULLEY	A small grooved wheel used to guide the halyard when raising or lowering a fly.
RUBBER PADS	Found on collapsible attic ladders that have a swivel-type foot. It is designed to lay flat to help prevent slippage on smooth surfaces.
RUNGS	Round crosspieces between the beams.
SPIKE	A pointed metal pin set into the end of a pole.
STIRRUP	A formed metal strap, covering the heel of a beam, which helps prevent the base of the ladder from slipping when raised.
STOPS	Limiting devices that prevent the fly section from being over-extended when raised or retracted.
TOP	The end of the ladder opposite the heel.



PART I
TYPES OF LADDERS

The use of ladders is so essential to the operation of the fire service that they are carried to some extent on nearly all fire apparatus. To handle all the different situations that may be encountered, there are many different types of ladders employed by the fire service. Listed below are the types most commonly used:

- Extension Ladder
- Roof Ladder
- Attic Ladder
- Aerial Ladder

Extension Ladder

An extension ladder consists of two or more sections nested together to provide a longer ladder, which still permits ease of handling and convenience in mounting on fire apparatus. The 45 foot extension ladder is equipped with poles to assist in raising and steadying them (Figure 1).

Figure 1 – Extension Ladder

Roof Ladder

Roof ladders are straight ladders, equipped with spring-loaded collapsible hooks at one end and range in length from 12 to 20 feet. The hooks are commonly placed on the ridgeline of a roof and are used to distribute weight and avoid slipping. They may also be used for descending into holes or whenever it is necessary to suspend a ladder from the top instead of supporting it from the bottom (Figure 2).

Figure 2 – Roof Ladder

Attic Ladder

Attic ladders are small and vary in type and design, from small roof ladders to collapsible ladders, which fold to a width of four inches. They are usually used in confined areas to gain access to attics or other hard to reach places (Figure 3).

Figure 3 – Attic Ladder

Aerial Ladder

Aerial ladders are power operated extension ladders with the base permanently mounted to a platform on the apparatus. They are multiple section ladders ranging in length from 65 feet to 100 feet. Speed, stability, and range make them useful for most types of ladder work, especially for rescue and elevated fire streams (Figure 4).

Figure 4 – Aerial Ladder

PART II
CONSTRUCTION, PARTS, AND CARE

The illustration below shows some of the common parts and terms used in reference to ladders.

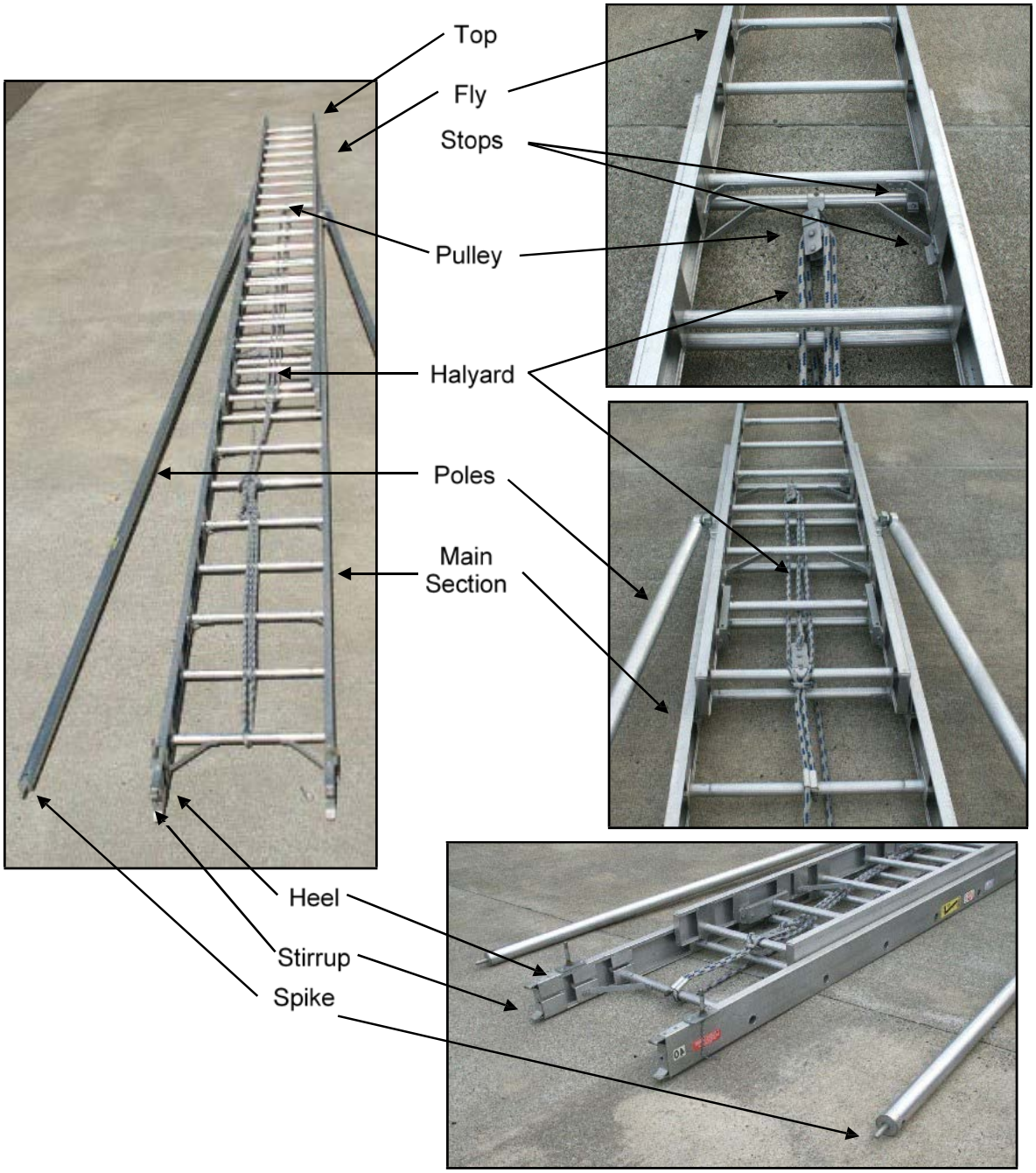


Figure 5 – Parts of a Ladder

CONSTRUCTION

A fire service ladder is quite different from the ordinary household ladder. Demands of emergency service have developed material and construction standards, which produce equipment that is strong and reliable. Portland Fire & Rescue has a rigid program of inspection and maintenance. The National Fire Protection Association and the National Board of Fire Underwriters publish the standards of material, construction and maintenance for fire service ladders. Ground ladders used by Portland Fire & Rescue are constructed of metal (aluminum alloy).

Parts of the ladder

Firefighters use many terms and expressions to describe the parts of a ladder. Parts of the ladder are depicted in Figure 5, and definitions for the terms can be found in the glossary. The terms have been selected because of their wide usage and commonly accepted meaning. They will be used as standard nomenclature throughout this manual.

Ladder Care

All fire service ladders should be given an annual strength test supervised by proper authority. Also, fire service ladders must receive constant care and attention to keep them in dependable condition.

As part of this program of constant care and attention, ladders should be examined *after each use* for damage they may have received. Any repairs that are needed should be made immediately. A thorough weekly inspection should be made to determine their overall condition. During this inspection, ladders should be removed from the apparatus and placed on ladder horses for better observation. Some of the things to look for, and the proper remedial actions, are listed below:

Burring - File burrs on metal ladders smooth with a mill bastard file and polish with steel wool.

Corrosion - Wash with soap and water, then clean with steel wool.

Foreign Material - Cut, scrape, or file away foreign material (melted tar, sulfur, or light metals) or remove with proper solvent.

Loose Rungs – This defect is beyond company repair. Notify the proper authority.
Worn Halyard - This defect is beyond company repair. Notify the proper authority.

Ladder Dogs - Keep dogs clean. Check spring action periodically. If sticking occurs, coat with paraffin wax by rubbing it over and onto all of the contacting parts, as this reduces wear.

Care should be exercised in placing all ladders on the apparatus. Each ladder has a proper location and should be carefully replaced after use. Do not attempt to force ladders into brackets or slides. Ladders can be damaged during removal from the apparatus, as well as during replacement. Care should also be exercised when adjusting a ladder. It is not good practice to relocate a ladder more than a short distance by sliding

it along a cornice or to roll it beam over beam.

Paint shall not be applied to aluminum parts of the ladder except for identifying the length and/or company number.

Cleaning Aluminum Ladders:

A. Mild soap and water works well. Be sure to flush inside the rails and rungs to clear them of road salts, dirt, etc.

B. If the ladder is greasy or oily, use a solvent cleaner to remove the oil.

C. If brightening is required, use a double -00- steel wool or a plastic scrub pad on aluminum surfaces and rinse thoroughly to remove residue.

D. Use paraffin wax as a lubrication. This wax coats and works into the pores of the aluminum ladder and does not easily wash away with frequent water baths. To apply, extend the ladder, and simply rub the wax over and onto all of the contacting parts. Do not forget to coat the lock parts (dogs) with wax as this reduces the wear on the rungs and these parts move over the rungs every time the ladder is used.

E. A coating of paste wax to the unpainted aluminum surfaces will help to preserve the finish.

Visual Inspection of Ground Ladders:

After each use, ladders should be inspected as follows:

A. Make certain that all rungs are snug and tight. Test by attempting to twist by hand. If any rung shows evidence of being loose, arrange to have the ladder repaired.

B. Check all bolts and rivets for tightness. Rivets on metal ladders should show no indication of looseness

C. Visually check any welds for apparent defects.

D. Inspect rails for cracks, splintering, breaks, gouges; check for any evidence of failure.

E. If a discoloration or a slight deformation in the ladder is noted, it is not necessarily an indication that the ladder is unsafe.

F. Check the heat sensor label for discoloration. If discoloration is noted the ladder must be taken out- of-service for testing.

Note: Use of harsh soaps and chemicals can sometimes turn heat sensor labels dark, which is why a mild soap is recommended for cleaning.

G. Any deficiencies noted in “A” through “F” above should be corrected. After major repairs have been made, the ladder shall be tested before placing it back in service.

NOTE:

Any picture in the following sections which shows a firefighter not in full turnouts is included only for the purpose of clarity. When training, drilling, or at an actual emergency, appropriate PPE shall always be worn.

PART III
CLIMBING LADDERS

Whenever a firefighter climbs or works from a ladder, the safety of the firefighters depends on the angle of inclination, observance of ladder load capacities, correct climbing methods, and utilization of the proper safety holds.

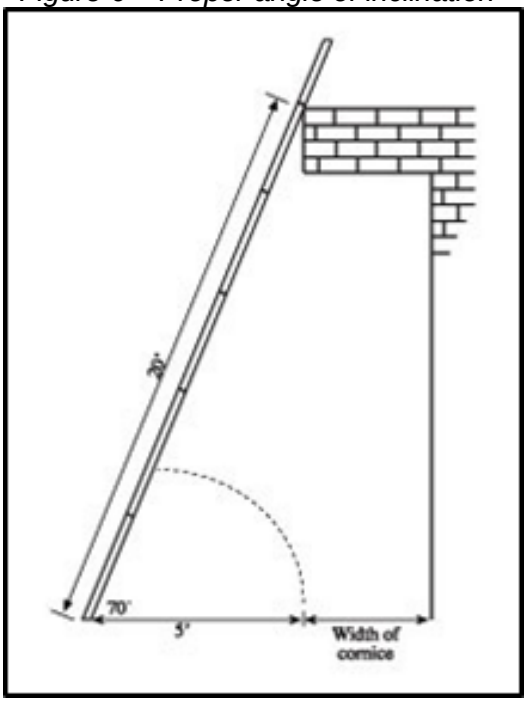
ANGLE OF INCLINATION

The angle of inclination providing both strength and easy climbing is about 70 degrees from the horizontal. Increasing this angle results in decreased stability of the ladders. A flatter angle lessens the ability of the ladder to withstand loading. It is therefore important for a firefighter to be able to set a ladder at the proper climbing angle.

Proper Angle of Inclination

The heel of the ladder should be out from the building a distance equal to one-fourth the distance from the heel to the point where the ladder touches the building (Figure 6). If the top of the ladder rests on a cornice, shelf, or other projection from the building, the width of the projection must be added to the heel distance.

Figure 6 – Proper angle of inclination



When setting the ladder to a window for potential rescue or egress, the angle should be lower than 70 degrees if this can be done safely in a soft heeling surface such as grass or dirt. When setting the heel on hard surfaces such as concrete or asphalt, other techniques must be used to ensure the heel of the ladder will not kick-out. These techniques include heeling the ladder against an object or utilizing the hooks of a roof ladder in the window if the ventilation profile allows. If these techniques are not available, the ladder will need to be set at a steeper angle or will need to be heeled by another member.

Checking Angle of Inclination

Stand erect with the toes of your boots against the ladder stirrups (Figure 7). Then extend your arms straight out from your shoulders toward the ladder rung nearest shoulder height. If your hands fall on the rung in a comfortable grasping position, the ladder will be near the proper angle of inclination.

Figure 7 – Checking angle of inclination

LADDER LOADING

The safe capacity or normal load limit of a ladder with the weight properly distributed and the ladder at the recommended angle of inclination will vary with the length of the ladder. National Standards for Ladder Capacities are set forth in Standard #1932 from NFPA. Portland Fire & Rescue believes that this standard should not be exceeded and that is should be curtailed to meet local practices. The following, more conservative table will be used with Portland Fire & Rescue ladders.

Ground Ladders

0 to 19 feet	1 firefighter
20 to 29 feet	2 firefighters
30 to 39 feet	3 firefighters
40 to 49 feet	4 firefighters
50 feet and above	5 firefighters

Ladders Resting on a Roof

The capacity of a ladder resting on a roof will vary with the length of the ladder and the pitch of the roof. In addition, room must be allowed for firefighters on the ladder to work safely and effectively. As a rule of thumb, the maximum load for any ladder on a roof is: *one firefighter for every five feet of roof ladder*. The load bearing capability of the roof is, of course, the final determining factor and may further limit the load that may be placed on a roof ladder in a given emergency situation.

CLIMBING METHODS

Proper climbing methods should always be employed in ascending and descending ladders. They have been developed as the safest, most efficient manner of climbing, and they will keep ladder bounce and sway to a minimum. When climbing or working off of a ladder, three points of contact must be maintained at all times.

Portland Fire & Rescue Ladders

PF&R ladders are climbed with the hands on the rungs. While climbing the ladder, grasp the rungs with palms down and step on the rungs with the balls of your feet. Use each rung as the ladder is climbed, never skipping a rung. With your body erect and your arms straight, move your hands up the ladder between your waist and your head. Keep the weight of the body on your legs, straightening them as each step is made. Keep your feet near the center of the ladder and use your hands to help maintain balance (Figure 8).

When climbing a ladder and carrying a piece of equipment, such as a roof ladder or power saw, it is important for a firefighter's hand to maintain contact with the ladder at all times. To do this, the firefighter must slide their free hand up the beam of the ladder. This will enable the firefighter to carry equipment in the other hand and still have a secure contact point with the ladder.

Figure 8 – Climbing PF&R ladders

Fire Escape (Firefighter's) Ladder

The firefighter's ladder is climbed by sliding the hands up the beams rather than placing them on each rung. This is done so that if a rung were to give way, it would be underfoot and the firefighter climbing would be able to avoid a fall by holding onto the beams with both hands.

Arms should travel between waist and shoulder level with thumbs wrapped to the inside of the beams. By keeping a slight bend in the arms, the legs do the majority of the work. At all times, three points of contact with the fire escape shall always be maintained (Figure 9).

Figure 9 – Climbing fire escape ladders

SAFETY HOLDS

It is necessary at times to perform work from a ladder that requires the use of both hands. Two holds that allow free use of hands are described below. They are referred to as the leg-lock and the body hold. Their application is often referred to as "tying-in." Because there are several types of ladders and physical differences between individuals, it will occasionally be necessary to vary from the directions given in order to assume a comfortable and safe working position.

Leg-locks

The leg-lock is used by a firefighter working alone. Two different variations can be used depending if work is to be done facing the ladder or to the side (Figure 10), or facing away (Figure 11). If working to one side of the ladder, the leg opposite to the side that work is to be done should be used to tie-in. The foot on the tie-in leg should be placed on the outside of the beam for additional leverage. This safety hold is not recommended if work is to be done for an extended period of time without the ladder being secured.

Figure 10 – Leg-lock facing ladder

Figure 11 – Leg-lock facing away

Body Hold

The body hold provides more freedom to the firefighter being secured and is particularly useful in holding a firefighter who is operating a nozzle from a ladder.

Stand a rung or two below the firefighter to be held. Place your arms around their sides and grasp the beams or a convenient rung (Figure 12).

Figure 12 – Body Hold

PART IV
HANDLING LADDERS

The proper handling of ladders is of prime importance and cannot be overemphasized. Proper handling prevents damage to ladders and property, and results in speed and effectiveness in placement. In addition, the chance of injury to firefighters, bystanders, and victims being rescued is greatly reduced.

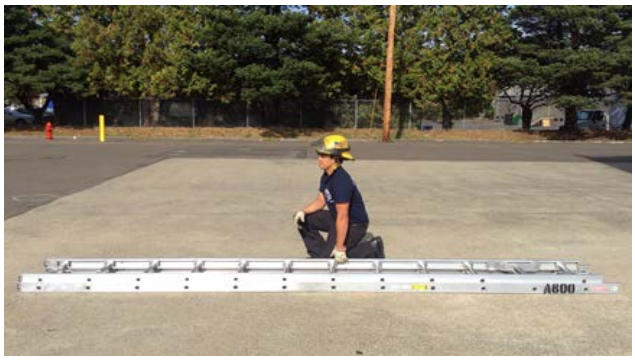
The ability to handle ladders properly can be acquired by learning and practicing the fundamental individual skills that are presented in this manual. They are presented by detailing the actions of an individual firefighter.

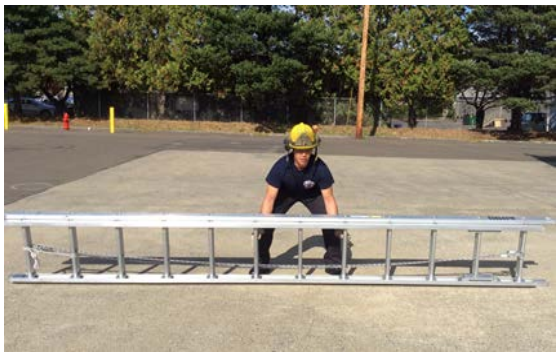
In several of the ladder carries, the actions of the individual remain the same, but the positions taken along the ladder will vary according to the number of firefighters available and the length of the ladder. These positions will be detailed in Section 8, "Ladder Evolutions."

PICKING UP A LADDER

A firefighter should develop the habit early of using the powerful muscles of the legs when picking up ladders, rather than risking a strained back. Whenever it is necessary to pick up a ladder from the ground, lifting should be done by bending the knees and keeping the back straight. This same procedure should be followed in reverse whenever laying a ladder on the ground. When a single firefighter is picking up the ladder, it should be rolled on the beam and picked up from the center (Figure 13).

Figure 13 – One firefighter picking up a ladder





The ladder will be carried with the heel pointing downward. Care should be taken to not strike anything or anybody with the ends of the ladder.

Flat Pickup for Carry

Take a position alongside the ladder facing the direction opposite to that in which the ladder is to be carried. Squatting, take hold of the second to the last rung or the last rung with the hand nearest the ladder with the palm of your hand facing the rear as in Figure 14.

The ladder is lifted with one hand until it is high enough to permit placing the other hand under the beam, at which time an about-face is executed toward the ladder. This places the ladder on the shoulder as shown in Figure 15.

Figure 14- Picking up for carry, ladder flat

Figure 15 – Ladder ready for carry

Flat Pickup for Raise

When the ladder is to be raised, follow the same procedure as for flat pickup for carry. After executing the about-face, (Figure 16), push the ladder high above the head until the arms are straight as shown in Figure 17. By advancing the hands down the rungs (one firefighter), or the beam (two firefighters), the ladder is raised to the vertical.

Figure 16- Executing the about-face

Figure 17 – Ladder raised on the flat

Beam Pickup for Carry

Take a position alongside the ladder, facing the direction opposite of carry. Squat and take hold of the top beam, or a rung, with one hand as shown in Figure 18. The ladder is lifted and an arm is passed between the rungs bringing the top beam to rest on the shoulder as shown in Figure 19. The rung in front of the body should be pulled tight against the shoulder

Figure 18- Beam position for carry

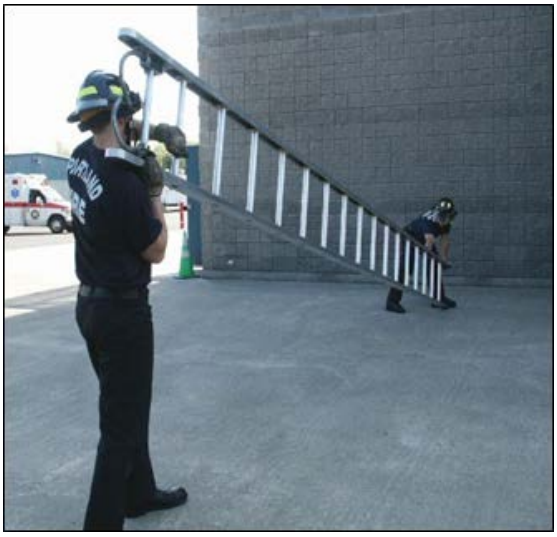
Figure 19 – Carrying a ladder on the beam

Beam Pickup for Raise

Take a position alongside the ladder facing the direction opposite to that in which the ladder is to be raised. Take hold of the second to the last rung or the last rung, as shown in Figure 20, with the palm of your hand toward the heel of the ladder. As the ladder is lifted above your head, swing under the beam in an about face which leaves you facing the heel (Figure 21). By advancing your hands on the beam, the ladder is raised vertically.

Figure 20 – Beam pickup for raise

Figure 21 – Swinging under the ladder, beam pickup for raise



When there are two firefighters for the beam positions, the firefighter at the forward beam position advances with hands down the beam, keeping them near the shoulder with the head to one side of the beam as shown in Figure 22.

Figure 22- Ladder being raised on the beam, two firefighters

HEELING A LADDER

The heeling of a ladder means anchoring the heel so it will serve as a pivot for the ladder during the raise. This is accomplished by placing the heel against the side of a building or by positioning one or more firefighters at the heel or bottom of the ladder.

Depending on the position of the ladder at the start of a raise, there are two different ways of heeling a ladder. Either the ladder is on the flat or on the beam.

Ladder Flat

Place both feet on the bottom rung of the ladder close to the beams. Grasping a rung above the feet with both hands, you lay back, using your body weight to assist in the raise as shown in Figures 23 and 24. As the ladder is raised, your hands are moved up one rung at a time.

When two firefighters are used to heel a ladder, each firefighter places one foot on the bottom rung and the other on the stirrup. Also, the hand next to the beam may be placed on the beam.

Figure 23- One firefighter heeling ladder flat

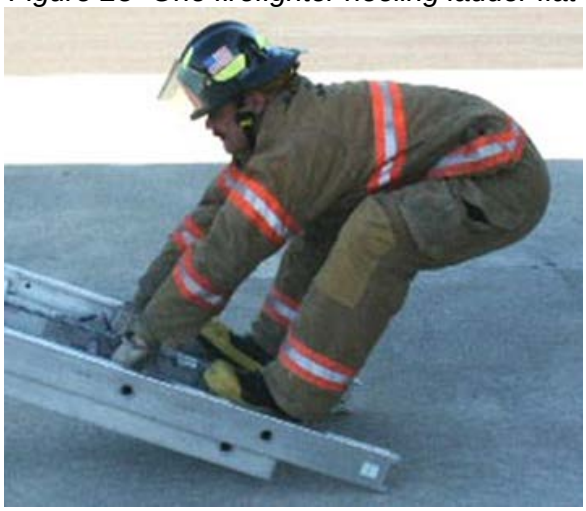


Figure 24- Two firefighters heeling ladder flat

Just before the ladder reaches the vertical, step back with one foot, leaving the other foot on the bottom rung. At the same time, place your hands on the beams about shoulder high as shown in Figure 25. All firefighters involved in the raise should be looking up at the top of the ladder. This will help the firefighter(s) at the heel position check the momentum and steady the ladder.

Figure 25- Stepping back as the ladder reaches vertical

Ladder on the Beam

A position is taken alongside the base of the ladder facing the top. The foot next to the ladder is then placed on top of the ladder and spanning the heel, pushing the stirrup firmly to the ground. The other foot is placed one step forward. One hand is placed on the upper beam stirrup with the other grasping the upper beam directly above the forward foot (Figure 26).

Figure 26 – One firefighter heeling, ladder on the beam

As the ladder is raised by the firefighter at the beam position, the firefighter at the heel position pushes down with the hand on the upper stirrup and pulls up with the other hand. The forward foot is moved back as the ladder comes up to maintain good body balance.

As the ladder reaches vertical, place your hands on the beams about shoulder height. Rest one foot on the bottom rung to steady the ladder. Eyes should be looking up at the top to assist with steadying the ladder (Figure 27).

If two firefighters are to heel the ladder, the second firefighter takes a similar position on the opposite side of the ladder with a foot placed on the beam forward of the bottom rung (Figure 28).

Figure 27- One firefighter steadying the ladder

Figure 28- Two Firefighters heeling, ladder on the beam

LOWERING A LADDER TO A BUILDING

Lowering a ladder to a building after it has been raised is not difficult. Care must be exercised to avoid damage to the ladder or the building. Lowering should not be done individually unless you have raised the ladder yourself.

The operation as described here, begins with the ladder in a vertical position. At this time, either the flat side of the ladder or the one beam of the ladder will be toward the building.

Flat Side Toward Building

Take the position shown in Figure 27 and ease the ladder carefully to the building. If two firefighters are doing the raise, the second firefighter takes a position between the ladder and the building. By grasping both beams shoulder high, and facing the ladder, the second firefighter assists by pulling the ladder to the building (see Figure 29).

The firefighter in the heel position maintains a hand position about shoulder height on the beams. While keeping the heeling foot on the bottom rung, the heel position then assists in lowering the ladder to the building. If two firefighters are between the ladder and the building, they each grasp a beam with hands well apart and pull the ladder to the building. If two firefighters are used to heel the ladder, each grasps one beam while maintaining their heeling foot on the bottom rung as shown in Figure 30.

Figure 29- Lowering the ladder to the building, flat side

Figure 30 – Two firefighters between the ladder and the building

Ladder Edge Toward Building

This operation requires a minimum of two firefighters. One firefighter assumes a position between the ladder and the building. Grasping the beam with hands just above and below shoulder level, you pull the ladder carefully toward yourself and to the building.
The other firefighter faces the climbing side of the ladder and places the foot nearest the building on the bottom rung, next to the beam nearest the building.

Placing hands on the beams about shoulder height, the ladder is steadied as it is eased into the building on the beam (Figure 31). Both firefighters should be watching the top of the ladder. As soon as the top of the ladder rests against the building, the firefighter heeling the ladder turns the ladder down flat, which is also referred to as “closing the door.”

Figure 31 – Lowering ladder, ladder edge toward the building

ADJUSTING A LADDER

After a ladder has been raised and placed against the building it may be necessary to move the heel of the ladder closer to, or farther away from the building, to get the proper angle for climbing. This may also be necessary when preparing to lower a long ladder.

Side Position

Take a position alongside one of the beams and grasp the second or third rung from the bottom with one hand and the beam about shoulder height with the other. Then lift the ladder slightly and move the heel to the proper distance from the building (Figure 32). Two firefighters would take opposing positions, one alongside each beam.

Figure 32- Adjusting ladder, side position

SHIFTING A LADDER

It is often necessary to move or shift a ladder that has been raised and positioned without lowering the ladder to the ground. When this situation is encountered, the ladder is shifted in one of three ways: by rolling the ladder, vertical carry in front of the body, or vertical carry on the shoulder.

Figure 33 – Rolling a ladder

Rolling a Ladder

When a ladder resting against a building is to be rolled or turned, place your foot on the bottom rung next to the beam that is in the direction of the roll or turn. Place your hands on the beam about shoulder high as shown in Figure 33. The ladder is then turned until the edge of the ladder is toward the building. You can keep pressure on the ladder with your upper body to help maintain control of the ladder. Removing your foot from the rung and allowing the ladder to pass in front of you completes the rolling process. As the ladder is about to reach a flat position against the building, your foot should be placed back on the bottom rung. This procedure can be repeated multiple times to reach a designated objective; however, it should not be used to relocate a ladder more than a short distance.

Vertical Carry, in Front of the Body

Depending on your height and the distance the rungs are apart, you will grasp either the second or the third rung from the bottom of the ladder with one hand and the beam overhead with the other hand as shown in Figure 34. The ladder is canted slightly back overhead, and is easier to balance and carry when held away from the body. The top of the ladder should be checked frequently to avoid collision with obstacles overhead.

Figure 34 – Vertical carry in front of the body

Figure 35- Vertical carry on the shoulder

Vertical Carry, on the Shoulder

An arm is placed through the ladder between the third and fourth rungs from the bottom and the second rung from the bottom is grasped with the hand, bringing the fourth rung to rest on the shoulder. The other hand is raised high on the front beam to aid in balancing the ladder. This position is shown in Figure 35. With this method, the weight of the ladder is carried on the shoulder rather than by the arm.

LADDER POLES

The poles on poled ladders are used to assist with the following:

- Raising the ladder
- To steady the ladder while the fly is being extended
- To control the movement at the top of the extended ladder
- To help support the ladder load and check side sway when the ladder is in position

The following information is basic to the use of poles. Further information relative to specific operations will be given when these operations are described.

Holding a Ladder Pole

The firefighter in the pole position faces the pole and grasps the lower end in one hand and with the other hand grasps the pole higher up at a comfortable distance (Figure 36). A firefighter in the pole position should maintain an upright position and watch the top of the ladder.

Figure 36- Holding a ladder pole

When a firefighter is on uneven ground, the pole may be moved such that the firefighter holding the pole will need to let the pole slide through their hands to stay erect. The sliding of the pole should be done by alternating through the upper and lower hands. As you move out of these positions you can regain your original hold on the pole with one hand on the lower end.

Positioning With The Poles

Coordination of firefighter's efforts in positioning the poles is extremely important since the poles give them leverage on the ladder, which cannot be overcome by the firefighters at the beam position. For this reason, the two firefighters at the pole positions should face each other. This will allow them to coordinate their efforts to the observed progress of their partner and quickly communicate back and forth should it become necessary.

Figure 37- Poles at 90 degrees

When the ladder is standing in a vertical position, as when the fly is to be extended, one firefighter handling the pole should always move to a position at ninety degrees from the other (Figure 37). This will ensure stability at the top of the ladder. Also, continue to watch the top of the ladder and direct each other as necessary to keep the ladder vertical.

Walking With a Pole

When walking with a pole to assume a position at ninety degrees from the other pole, the firefighter walks forward. If the position is to the rear, move around the pole, change hands and walk forward to the new position. Arriving there you again move around the pole and change hands, so that you once again face the other pole.

Placing the Poles

When the ladder has been lowered to the building the pole ends are placed on the ground next to the building in a manner that keeps them out of the way and helps to support the load on the ladder (Figure 38). They must be checked frequently to see that they have not been moved by traffic on the ladder. Movement of the poles may cause the ladder to move or walk from its original position.

Figure 38 – Poles in position