City of Greencastle Fire Department	Training Division

Instruction page:

September 2012

Fire Suppression: Master Streams	Each shift shall review the Master Stream outline below and do all 3 skill evolutions.
EMS: Vital Signs Skills	All firefighters practice taking vital signs.
Safety/Bluecard: Bluecard Scenario	Everyone on all shifts will need to do a bluecard simulation this month. Everyone needs to do a different simulation than the one you did last month. The simulations will require 4 people to conduct for each simulation. Each person on the shift shall do a different simulation. Simulations can be chosen from GFDTraining Youtube simulation channel.
Specialized: Foam Ops.	Each shift shall review the Foam Ops. Outline and the skill.
Misc.: Wildland Fires	Each shift shall review the Wildland Fire Outline.
Hazmat: Ethanol Response	Go to http://www.ethanolresponse.com/pages/resources and watch both videos: **1. Ethanol: Response Considerations** 2. **Responding to Ethanol Incidents**
Officer: Conflict Management	Review Handling Problems outline.

Fireground Operations

Master Streams

Master Streams

Types of Master Streams:

FIXED **ELEVATED** **PORTABLE**

To be classified as a MASTER STREAM - Minimal flow is 350 Gallons per Minute to 2000 Gallons per Minute

Advantages:

Large amounts of **water**
(Towers - up to 2000 gallons per min or gpm)

Allow us to operate from a **safe** distance
Pre-Piped can be put into operation **quickly**

Defensive/Offensive ops. - hit the fire quickly with master stream while crews prepare to enter the structure.

People Trapped - Use Master Stream to keep the fire away from trapped victims.

Minimal Manning - can be put into operations with 2 firefighters, 1 if pre-piped.

Exposure fires - with fog nozzle you can cover a large area, quickly.

Hazard Vapor Releases - with fog nozzle can break up the toxic cloud from a safe distance.

Disadvantages:

Large amounts of **water**
(water is 8lbs per gallon @ minimum 1000 gpm, with lost water, estimate adding 2 tons per minute)

Force of water often effects structural integrity of building - moving supports/beams ...

Flying Debris - Injuries to operating personnel, personnel not utilized in the Master stream operation need to be in a safe area.

Back pressure - the force of the water coming out of the device create a lot of back pressure and if the portable units is not secured properly it could cause serious injury.

Angle of delivery - this angle should be over 35 degrees to reduce back pressure.

Nozzle Tips become flying object if not tighten to device - they need to be checked before the master stream is operated.

Master Stream Nozzle Tips Considerations:

Solid Stream Tip:

+ Good Penetration
+ Good Reach
(wider the tip - more GPM but less distance **)**
+ Good striking power to move debris
- No Stream conversion

Fog Tip:

+ Good heat absorption/expansion
+ More effective in a confines space use
+ Good in exposure protection & HazMat calls
+ Converts between tight & open stream
+ Good Area coverage
- Reaches are not a good as solid stream

Supplying Water to a Master Stream Device:

When we supply a master stream device: (*Pre-pipe deck gun, Portable master stream, or an Aerial device*) we want to feed these devices with the largest supply line that the device can handle, in most cases this will be a 5" line. (**note**: some portable devices only have 2.5" intakes)

To maximize the master streams output, the Engine feeding these devices should be in close proximity to the device (***within safe reason***) to reduce friction loss from that Engine to the device.
Since we have little control over a hydrant pressure (60-80 psi) and there is very little friction loss on a 5" hose at hydrant pressures, but if we increased the pressure as we do in feeding a device, the friction loss would increase, requiring higher pumping pressures to get the same gpm output.

Realistically getting an engine close to a master stream, is rarely achieved since in most cases they are deployed later in an operation and there are already multiple pieces of equipment clogging up the street or access to the scene. So this means, most of the time, we'll be reverse laying from the master stream device to an engine on a hydrant or being relay fed from another engine on a hydrant.

Master Stream Device = Offense or Defense?

Master Steams are typically considered a Defensive tactic/tool. Before we operated them, we pull everyone out of the structure (***we NEVER want to utilize on a structure with personnel operating inside***) and the Incident Commander usually feels there is no longer a life hazard and risking firefighter inside no longer has any gain. After a period of time the IC will usually go back to Offense to mop up hot spots that the master stream can't get to.

Although, Master Streams especially pre-piped devices, can be rapidly deployed offensively. An example of this would be pulling up on a fully involves structure "with know hazards, such as propane, acetylene...", hitting the main body of fire quickly w/ the deck gun before deploying the crew inside would be an excellent offensive tactic. Garages, outside rubbish w/ exposure issues... a quick hit with a deck gun could make a big difference and can be deployed by 1 firefighter as others pull and set the line for the interior attack.

Another offensive tactic would be to use the pre-piped master stream to keep fire away from a trapped occupant as the minimal manned crew attempts the rescue. This could also be using the Master Stream to keep a Hazardous Material away from a downed victim(s).

Note: When we use a master stream on a structure, we want to check the structure's stability **before** we deploy personnel inside that structure, since the structural integrity may have been compromised during the master stream operation.

Hands-On Skills

All shifts must do these 3 Master Stream Operations Evolutions.

Hands on Evolution #1 (Supplying a Tower Ladder)
* Set up Tower 7 for Master Stream Operation
* Reverse Lay with E-2 from Tower 7 to Hydrant
* Familiarize members with the Nozzle Tips available and how to change from one to another.
* Familiarize members with Nozzle controls
* Flow water from elevated stream at a desired target.

Hands on Evolution #2 (Pre Pipes Deck Gun Use)
* Do a forward lay into hydrant at training grounds and Connect E-2 to a hydrant
* Familiarize members with Smooth Bore Nozzle Stacked Tips
* Familiarize members with converting from the Fog Nozzle, to a Smooth Bore Stacked Tips.
* Familiarize members with Deck Guns operational controls
* Flow water from E-2 fixed master stream at a desired target.

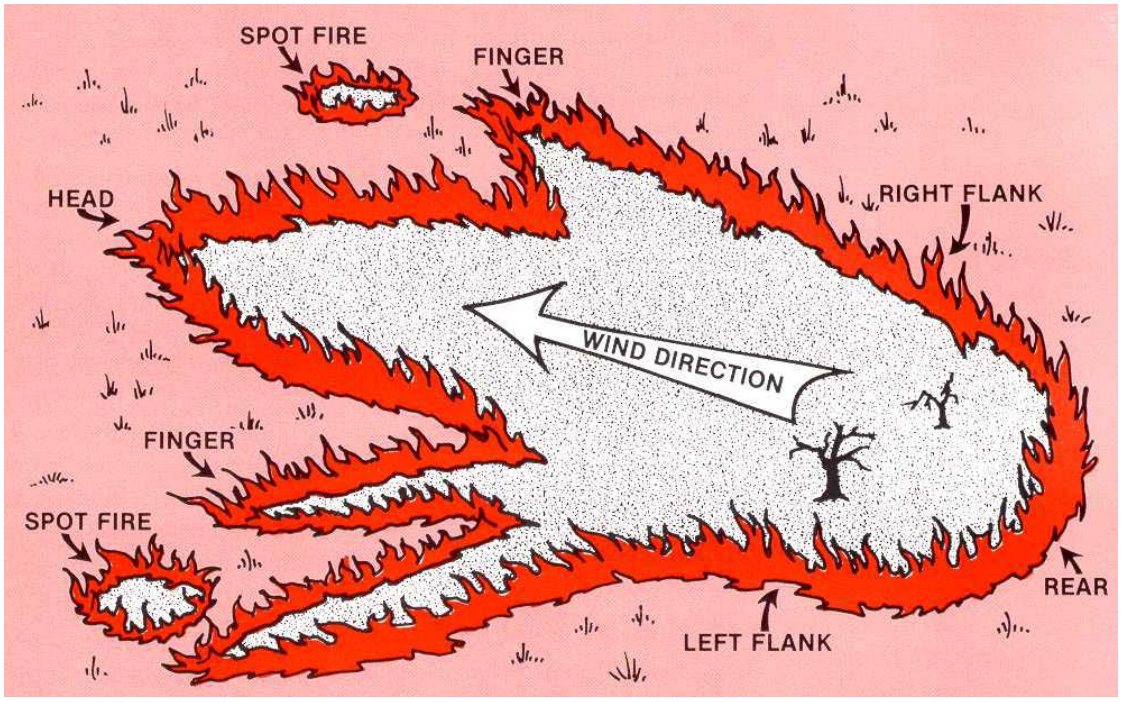
Hands on Evolution #3
(Converting E-2 Pre-pipe Deck Gun to a Portable Master Stream)
* Deploy E-2 Portable Master Stream tripod
* Familiarize members removing Pre-piped Nozzle head and Installing onto the portable tripod
* Familiarize members on adequately securing the Portable Device.
* Familiarize members with Nozzle Controls

WILDLAND FIRES

The safest area to fight this type of fire is from “IN THE BLACK”, which is the already burned area. Try to avoid fighting the fire from head on if at all possible, this is the most dangerous attack position. Flanking the fire is usually much safer for firefighters.

Grass, brush, wildland type fires can be very dangerous, watch the news. Most of us feel comfortable fighting structure and vehicle fires, but have very little experience fighting a large grass fire. The fire is capable of out running you and if you don’t know what your doing, well the outcome will not be very good.

Do you know what tools you have to fight this type of fire? Which ones would you use for various types of grass, brush, trees, etc.?



All shifts need to review Brush 6 and discuss tools and operations of Brush 6.

Foam Operations

Objectives:
I. Review Types Of Fuels
II. Review Foam & Foam Equipment
III. Review The Four Basic Extinguishment Principles
IV. Review Foam Application
V. Review Assembling a Foam Fire Stream
VI. Review Tactical Considerations for Foam Operations
VII. All shifts perform the task of using In-Eductor, And discuss E-2 On-Board Foam System to make foam

Materials Needed:
E-2
Hose
Foam Eductors
Foam Nozzles
Foam Solution

Introduction: Foam and foam-making equipment are among those items of firefighting equipment that are carried on most engines but seldom used. When the need arises where foam must be used, it must be applied quickly and efficiently. Regular practice with the foam and foam-making equipment is important to maintaining knowledge and skills. The emergency scene is not the time to become reintroduced to the foam and foam equipment.

I. Types of Fuels

1. Hydrocarbon
    1. Petroleum based
    2. Lighter than water
    3. Vapors suppressed by foam as it floats on fuel surface
2. Polar solvent
    1. Has attraction for water (like that of positive and negative magnetic poles)
    2. Alcohol resistant formulations of foam necessary for extinguishment

II. Definitions

>Expansion ratio – amount by which foam solution expands when mixed with air. Low expansion foams have an expansion ratio of about 10:1. Medium expansion foams have an expansion ratio of between 20:1 and 200:1. High expansion foams have an expansion ratio of between 200:1 and 1,000:1.

>Finished foam – foam solution mixed with air or aerated

>Foam concentrate – foam in the container before it is mixed with anything

>Foam eductor – device used to mix water and foam concentrate; also serves as the proportioning device

>Foam nozzle – special nozzle with openings to allow air to be introduced into the foam solution

>Foam solution – foam concentrate mixed with water

- **Characteristics of an Effective Foam**

>Knockdown speed and flow characteristics – the time required for a foam blanket to spread across a fuel surface or around an obstacle and wreckage in order to achieve complete extinguishment

>Heat or burnback resistance – the ability to resist the destructive effects of heat radiated from any remaining fire from the liquid's flammable vapor or any hot metal wreckage or other objects in the area

>Fuel resistant – tolerance and the ability to minimize fuel pick-up so that the foam does not become saturated and burn

>Vapor suppression – the vapor-tight blanket produced must be capable of suppressing the flammable vapors and minimize the risk of reignition

>Alcohol tolerance – due to alcohol's affinity to water and because a foam blanket is more than 90% water, foam blankets that are not protected will be destroyed

- **Types of Foam**

>Protein

- ❖ May be used in 3% or 6% mixture
- ❖ Protein based
- ❖ Low expansion
- ❖ Good re-ignition (burn-back) resistance
- ❖ Excellent water retention
- ❖ High heat resistance and stability
- ❖ May be used with fresh or salt water
- ❖ Performance can be affected by freezing and thawing

- Primary use on Class B fires involving hydrocarbons
- Used to protect flammable and combustible liquids in storage, transport, and processing

>Fluoroprotein

- May be used in 3% or 6% mixture
- Protein and synthetic based; derived from protein foam
- Long-term vapor suppression
- Good water retention
- Excellent, long-lasting heat resistance
- Performance not affected by freezing and thawing
- Maintains low viscosity at low temperatures
- May be used with fresh or salt water
- Non-toxic and biodegradable after dilution
- Pre-mixable for short periods of time
- Primary used for hydrocarbon vapor suppression
- Used for subsurface application to hydrocarbon fuel storage tanks and extinguishing in-depth crude petroleum or other hydrocarbon fuel fires

>Aqueous Film Forming (AFFF)

- May be used in 1%, 3% or 6% mixture
- Synthetic based
- Good penetrating capabilities
- Spreads vapor-sealing film over and floats on hydrocarbon fuels
- Can be used through non-aerating nozzles
- Performance may be adversely affected by freezing and storing
- Has good low-temperature viscosity
- Can be used with fresh or salt water
- Can be premixed
- Primary use in controlling and extinguishing Class B fires
- Used in handling land and sea crash rescues involving spills, extinguishing most transportation-related fires, wetting penetrating Class A fuels, and securing un-ignited hydrocarbon spills

>Aqueous Film Forming – Alcohol Resistant (AFFF-ATC or AFFF-ARC)

- May be used in 3% or 6% mixture
- AFFF concentrate to which polymer added
- Can be used on both polar solvents and hydrocarbon fuels (used on polar solvents at 6% solution and on hydrocarbon fuels at 3% solution)
- Forms a membrane on polar solvent fuels that prevents destruction of the foam blanket
- Forms same aqueous film on hydrocarbon fuels as AFFF
- Fast flame knockdown
- Good burn-back resistance on both fuels
- Not easily premixed
- Primary use on fires or spills of both hydrocarbon and polar solvent fuels

>High Expansion

- Synthetic detergent based
- Special purpose, low water content
- High air-to-solution ratios: 200:1 to 1,000:1
- Performance not affected by freezing or thawing
- Poor heat resistance
- Prolonged contact with galvanized or raw steel may attack these surfaces
- Primary use in extinguishing Class A and some Class B fires, flooding confined spaces, volumetrically displacing vapor, heat, and smoke, reducing vaporization from liquefied natural gas spills, extinguishing pesticide fires, suppressing fuming acid vapors, suppressing vapors in coal mines and other subterranean space, suppressing vapors in concealed spaces in basements, as an extinguishing agent in fixed extinguishing systems for industrial use
- Not recommended for outdoor use

>Class A

- Synthetic
- Wetting agent that reduces surface tension of water and allows it to soak into combustible materials
- Rapid extinguishment with less water use than other foams
- Can be used with regular water stream equipment
- Can be premixed with water in booster tank
- Mildly corrosive
- Requires lower percentage of concentration (0.2 to 1.0) than other foams
- Outstanding insulating qualities
- Good penetrating capabilities
- Primary use in extinguishing Class A combustibles only
- Can be used with compressed-air foam systems (does not require aeration)

III. **Extinguishment Principles**

- Smothering - preventing air and flammable vapors from combining
- Separating - intervening between the fuel and the fire
- Cooling - lowering the temperature of fuel and adjacent surfaces
- Suppressing - preventing release of flammable vapors

IV. **Foam Application**

>Methods

- *Roll-On*
- Foam stream is directed on ground near front edge of burning liquid pool Foam then rolls across surface of fuel

- Application continues until it spreads across entire surface of fuel and fire is extinguished
- May be necessary to move stream to different positions along edge of liquid spill to cover entire pool
- Method only used on pool of liquid fuel (either ignited or unignited) on open ground

>Bank-Down

- Employed when elevated object (wall, tank shell, etc.) is near or within area of burning pool of liquid or unignited liquid spill
- Foam stream is directed off object, allowing foam to run down onto surface of fuel
- May be necessary to direct stream to various points around fuel area to achieve total coverage and extinguishment of fuel
- Method used primarily in dike fires and fires involving spills around damaged or overturned transport vehicles

>Rain-Down

- Used when roll-on and bank-down methods are not feasible because of either size of spill area or lack of an object from which to bank foam
- Primary manual application technique used on above ground storage tank fires
- Method directs stream into air above fire or spill and allows foam to float gently down onto surface of fuel
- On small fires, sweep stream back and forth over entire surface of fuel until fuel is completely covered and fire is extinguished
- On large fires, it may be more effective to direct stream at one location to allow foam to take effect there and then work its way out from that point

>Proportioning

- In-line eductors work on venturi principle with water at high pressure (approximately 200 psi) being forced into a reducing oriface where it mixes with foam concentrate
- Once mixed with water, the resulting foam solutions of a 3% foam or a 6% foam are virtually the same with regard to performance characteristics
- By switching from a 6% foam to a 3% foam, you can either double your firefighting capacity by carrying the same number of gallons of concentrate, or cut your foam supply in half without compromising suppression capacity
- As a emergency measure, 15 gallons of foam concentrate poured into a 500-gallon booster tank will produce an adequate 3% foam solution with the pump serving as the eductor

>Shortfalls

- Foam concentrates require large quantities of water to produce foam solution
- The nozzles and eductors must be matched in terms of flow rates
- Partially closed nozzle controls can result in a higher nozzle pressure
- Too long a hose layout on the discharge side of the eductor can result in poor quality foam
- Kinks in hose can result in back pressure and affect ability to produce foam solution or reduce the foam quality
- Nozzle too far above eductor can affect foam discharge
- Different types of foam concentrates should not be mixed because the mixture may be too viscious
- A regular combination nozzle can be used to discharge foam solution; however, since it has no way for air to be introduced, the expansion rate will be low. Aeration can be greatly enhanced by the addition of a clip-on foam tube to the nozzle
- You need to have an adequate supply of foam concentrate and water in place to meet the application rate requirements along with the equipment to apply the foam at the required rate before starting the foam operation. If you begin your operation without all the required supplies and equipment in place and the fire is not extinguished, you may have to start over at the beginning.

V. Assembling a Foam Fire Stream (in-line proportioner)

- Select proper foam concentrate for involved fuel,
- Check eductor and nozzle for hydraulic compatibility
- Check concentration listing
- Must match eductor percentage rating
- If adjustable, set to proper concentration setting
- Attach eductor to hose capable of flowing rated capacity of eductor and nozzle
- Avoid hose kinks
- Prevent water turbulence that will adversely affect eductor operation
- Avoid connections to discharge elbows
- Make sure valves are completely open
- Connect attack hoseline and nozzle to eductor
- Place open foam concentrate containers at the eductor so operation may be carried out uninterrupted
- Place eductor suction hose into concentrate - bottom of concentrate must be no more than six feet (2m) below the eductor
- Increased water supply pressure as required
- At conclusion of operation, rinse and clean all foam appliances, tanks, and pumps with lukewarm water whenever possible.

> **Assembling a Foam Fire Stream (E-2 On-Board System)**

Start Up Procedures

- Pressurize water supply to a minimum 150 psi
- Turn Selector to tank A or B
- Note: We No Longer Carry Class B Foam, so tank A and B are the same
- Set mode to prime
- After flow is indicated in window, set mode to foam
- Adjust to appropriate percentage
- Deploy back cross lay only for foam!
- **NEVER MIX CLASS A & CLASS B FOAM TOGETHER**!!!!

Shut Down Procedures

- With water supply pressurized, set mode to flush for one minute
- Turn selector to off

VI. Tactical Considerations for Foam Operations

- Tactical considerations (combustible and flammable liquids incidents),
- Utilize accountability and buddy system within ICS
- Utilize full protective equipment including SCBA (monitored by safety officer)
- Preferable to utilize pair of matched air aspirating nozzles - 1 1/3", 2" or 2 1/2" attack lines
- Attack from uphill and upwind whenever possible
- Remember that foam lines do not provide any thermal protection from heat for handline crews
- Minimize personnel in flammable liquids/rescue area - never enter unfoamed spill area
- Vapor seal, once established, must be maintained. AFFF drain down time foam quarter life is the time it takes to lose 25% of its water - three minutes in a lab - two minutes in a fire
- Sun and wind break down foam, therefore the more foam that is applied, the longer it will blanket the area
- Continually blanket area when emergency service responders and victims are in the spill or fire area
- Establish well-protected rescue path with back-up foam lines (2 1/2" minimum) and turrets whenever possible (foam should at least cover toe of boots)

>Operations,

- Whenever spill area or hazard is involved, apply foam in massive quantity
- Assemble enough product to do the job - half extinguished fire can reignite
- Apply foam gently in a rainfall, snowflake, or lob method
- Never aim or plunge the stream into the fuel spill
- Deflection method of bouncing foam off objects picks up additional air
- Application of foam can be with a wall of foam which is pushed gently across burning liquid surface (bounce method, rolling foam blanket)
- Nozzle person
- Watches and delivers foam - never lets go of line or turns back to fire
- Listens to pitch of pumper when using foam eductor - can listen to detect foam continuity
- Utilize predetermined hand signals
- Caution - *EMERGENCY SERVICE RESPONDERS BEWARE*,

- Misuse of water at flammable liquids fire suppression operations is the most common mistake - causes break-up of foam blanket
- Failure to apply enough foam on a fire for a sustained period is the next prevalent mistake
- Remember foam will not generally extinguish a moving, spraying, pressurized, flammable liquids
- If air-aspirating foam nozzles are not available, utilize fog nozzles on straight stream patterns no more than 30 degrees
- With most foams utilized at an incident, the residue must be hauled off with dirt, chemicals, and debris to a hazardous waste site
- Conducts electricity
- ***NOTE: DO NOT WALK IN PRODUCT***

VII. All shifts perform the task of using In-Eductor, and discuss E-2 On-Board Foam System

References:

Clarence "Smiley" White, Field Instructor Maryland Fire Institute "Foam Operations For Firefighters" and "Engine Company Ops: Handling Hoselines and Foam Application"

Handling Problems

Introduction to Problems:

In general, a problem is the difference between the actual state and the desired state. A problem is the discrepancy between the actual state and the desired state.

A fire officer must be prepared to deal with several different types of problems. Decision – making skills are required whenever the fire officer is faced with a problem or any type of situation that requires an action or a response.

Complaints, Conflicts, and Mistakes:

Definitions:

A complaint is an expression of grief, regret, pain, censure, or resentment; accusation; or fault finding.

A conflict is a state of opposition between two parties. A complaint is often a manifestation of a conflict.

A mistake is an error or fault resulting from defective judgment, deficient knowledge, or carelessness. A mistake can also be a misconception or misunderstanding. *Mistakes happen; the issue is how to deal with a mistake.*

Sometimes, a fire officer has to make a decision or enforce a policy that is not popular with the crews.

Disagreements and differences of opinion occur and it is not possible to make everyone happy all of the time. A fire officer must be prepared to deal with all of these situations in a professional manner, acting as the official representative of the fire department.

Types of problems:

1. In-house issues include situations, decisions, or activities that occur at the fire officer's work location and within the direct scope of supervisory responsibilities.
2. Internal departmental issues involve fire department operational policies, decisions, activities that go beyond the fire station level.
3. External issues include any fire department activities that involve private citizens or another organization.
4. High- profile incidents can involve any type of issue that is likely to become a major one for the organization because of its nature.

General Decision-Making Procedures:

A Five step process can be applied to many different types of problems:

1. Define the problem
2. Generate alternative solutions
3. Select a solution
4. Implement the solution
5. Evaluate the result

Define the Problem:

The first step in solving any problem should be to closely examine and carefully define the problem. A well- defined problem is on that is half solved.

How Quickly Do You Get Bad News?

Few things damage a fire officer's career more effectively than not finding out about something that is not going well until it is too late to fix it. Effective fire officers create a work environment that encourages subordinates to report bad news immediately.

Fear Versus Trust:

The goal of every fire officer should be to foster a trusting relationship with the employees. Employees who do not trust their boss or each other are unlikely to make good decisions when faced with a problem. Employees who do not feel that their input is valuable will stop passing vital information to their fire officer. Effective problem solving requires good information.

Generate Alternative Solutions:

The best people to solve a problem are usually those who are directly involved in the problem.

Select a Solution:

Once you have defined the problem, generated solutions, and ranked them based on criteria. One factor in deciding on the best solution is the core valve system of your department.

Implement the Solution:

On the decision has been made the solution still has to be implemented. The implementation phase is often the most challenging aspect of problem solving, particularly if it requires the coordinated involvement of many different people.

Evaluate the Results:

Determining whether the solution actually solved the problem requires some type of measurement that compares the original condition with the condition after implementation.

Managing Conflict:

A fire officer might be faced with any one of four different types of internal situations that can originate within the fire station.

- A coworker (or coworkers)
- The work environment including the station, apparatus, or equipment
- A department policy or procedure
- The officer's own behavior, or actions

Conflict Resolution:

Listen & Take Detailed Notes:

The first phase of conflict management is to obtain as much information as possible about the problem.

Active Listening:

When dealing with an individual who expressing a concern or a problem, the fire officer should focus on active listening

Paraphase & Feedback:

The first objective should be to understand the issue and why the individual is complaining. After listening, the fire officer should be able to paraphrase the complaint and recite it back to the complaintant.

Do Not Explain or Excuse:

In situations where the complaint is directly related to the action taken or policies enforced by the fire officer, it is immediately respond to the complaint. However often it is best to take your time and allow time to help the situation then implement your answer to the complaint.

Review GFD SOG Section 43(Chain of Command)

Review GFD SOG Section 64 (Complaints)