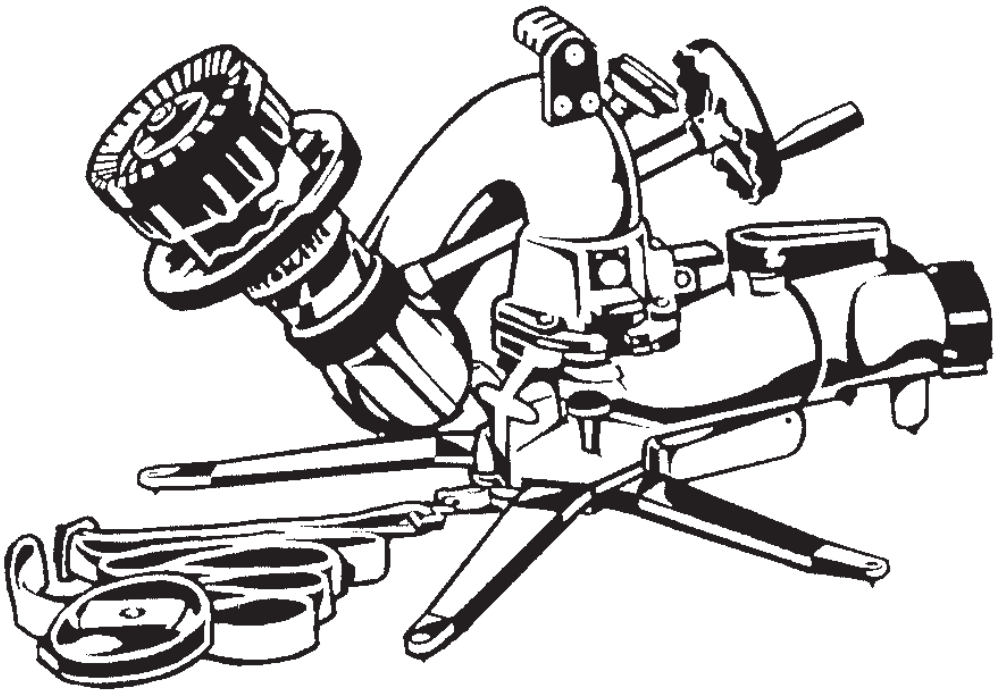
Portable Monitors
for Initial Structural Attack

Workbook and Training Program



COURSE CURRICULUM CREATED BY: Rod Carringer

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Portable Monitors for Structural Attack

"The use of high flow portable monitors in initial structural suppression activities"

A report of a symposium held during 1994

Report of Symposium held in Valparaiso IN, August 1994

Objective: To provide an overview of current use from around the country of portable monitors in initial structural attack tactics.

Scope: To create a written set of records of the discussions held during the symposium and provide this information for articles, technical bulletins, and the creation of a sample Standard Operating Guideline. To provide an overview of the PROs and CONs of using this equipment during initial attack activities, and to discuss maintenance and safety considerations associated with this equipment.

Industry Panelists and Fire Service Experts:

- Jack Cottet, Fire Protection Specialist with Utica National Insurance Co. and Chief of the Cleveland NY, Volunteer Fire Department
- Skip Highwood, Fire Chief of the Chesterton, IN Fire Department
- Larry Linton, Western Divisional Technical Representative for Task Force Tips and KK Products, and Retired Fire Chief of the City of Valparaiso, IN Fire Department
- Doug Miller, Eastern Divisional Technical Representative for Task Force Tips and KK Products, and an Instructor/Safety Officer, Center Fire and Rescue, LaPorte, IN
- Mark Schockman, Fire Chief, Clearcreek Fire Dist., Springboro, OH
- Paul Shapiro, Fire Engineer, City of Las Vegas, NV Fire Department
- John Wozniak, Fire Chief, LTV Steel and Asst. Chief of Operations for Washington Twp. Vol. Fire Department, Valparaiso, IN
- Scott Wynder, Asst. Chief, Chesterton, IN Fire Department
- Rod Carringer, National Sales Manager for Task Force Tips and KK Products, and Past Chief of Center Fire and Rescue, LaPorte, IN

Key Topic Area

Group 1

✓Standard Operating Guidelines for Fixed and Portable Use

✓Manning Considerations

✓ Deployment Tactics

The establishment of departmental operating guidelines is critical for the safe and successful deployment of portable monitors during initial attack strategies. A sample S.O.G. was created as a model for departments to use when these tactics are employed. This sample procedure is meant only to act as a template for any agency to modify. Refer to these samples later in the course. The conclusion was that when good solid procedures were followed, tactical use of these lightweight portable monitors and the higher flow rates they provide are a valuable suppression tool.

An extensive examination was made of the number of personnel required to put not only this piece of equipment into service, but the number of personnel needed to operate handlines safely at different flows and nozzle reactions. Manning is a very critical issue for rural volunteer agencies, as well as urban career departments. Our study was based more on manning for flow-based initial attack and its needs versus manning for search and rescue and truck company operations. The goal is to provide the highest safe application rate with the fewest personnel.

Deployment and operations of portable and truck mounted monitors were discussed with an eye not on surround-and-drown operations, ***but as a preconnected "bomb" line used as an optional initial attack line when higher fire flows are warranted.***

Key Topic Area

Group 2

✓Determination of Flows in Portable and Deck Mounted Operations

✓Water Supply Considerations

✓Foam Concentrate and Solution Supply Considerations

✓Fire Loads and Available Application Rates

An evaluation was conducted of commercially available models of portable/fixed monitors to determine maximum flow rates, friction losses, and operational methods under flow. Most models will flow 1000 gpm to 1250 gpm while mounted to the riser or deck pipe. In the portable mode on a lightweight base, they were rated from 750 gpm up to 1250 gpm. The choice of nozzles (fixed, selectable, automatic, or solid stream) will have a dramatic effect on the final application rates. Units generally are capable of producing much higher flows, but may be limited by the size or flow of the tip. In most cases, the automatic fog nozzle was found to be the most versatile tip with a wide flow range and automatic performance. Especially for rural attack with tank water supply. The solid stream nozzle was chosen, in many cases, for inexpensive simplicity.

The term "bomb" line tells the tale for water application operations. **Many times the high fire loads encountered on arrival quickly preclude the use of standard handlines in initial attack**. In this case, the movement of water and the establishment of a solid, constant water supply becomes crucial. Fires requiring large quantities of water for suppression (a high critical application rate) will dictate the supply operation from the start. If a fire has "burned past you" on the fire curve, additional handlines will provide no relief. The commitment to use these "bomb" lines (500gpm+ flow, or 1500 sq. ft. of fire attacked) also comes with the commitment to supply the necessary water for its operation. The same holds true in foam applications. Quite simply, **if you cannot achieve the necessary critical application rate, the fire will not be suppressed and you will have wasted a great deal of foam concentrate.** Comments on high foam application rates and how to achieve them will follow in this program. With the use of high flow equipment, a program of pre-incident planning should take place. Pre-planning and a standard operating guideline make the use of portable monitors a safe effective tool for suppression when the last 2 1/2" pulled isn't getting it, and you are about to make that decision to go defensive.

Key Topic Area

Group 3

Safety Factors Involved in Monitor Usage

✓Truck Mounted Operations

✓Portable Operations

A great deal of discussion was held concerning the "safe" use of monitors and master stream devices. When mounted on the deck pipe riser, these streams seem easily manageable and relatively sublime. When you look at the potential reaction forces generated by flows at 1000 gpm to 1250 gpm, it is obvious how important a good installation on the truck is. A video was viewed of a Southern California fire department working a deck gun during a wind-driven blaze. In the course of the video, under heavy flow the entire deck gun, pipe and operator became airborne as the unit broke away from the truck plumbing. The firefighter was taken to the hospital with internal injuries from his fall to the ground. The cause was determined to be an excessive amount of corrosion over time to the pipe threads holding the gun. Eventually, under high flow and high reaction force, the piping gave way leading to this tragedy. Even though many installations have been done with care, more often than not, manufacturer's recommendations on the installations are never taken into account.

Portable use of high flow monitors and master streams presents an entirely new set of potential problems. Without proper tie down techniques, the potential for a "flying" monitor exists with most units on the market today. There are some exceptions with units that have safety valve hardware to prevent this mishap from occurring. With the use of Large Diameter Hose to provide an abundance of pressure and flow, the reaction forces previously found only on truck mounted devices are now becoming part of regular operations with portable units.

Safety with master streams is a large concern. It covers the entire spectrum of issues. Increased water within a fire structure may lead to premature collapse. A stream may knock down and injure an unsuspecting firefighter or observer. Pulling of LDH and a portable monitor can cause back injuries, and the potential for a flying monitor exists with most commercial units. A firm Standard Operating Guideline will help to limit exposure to some of these issues, but it still remains the Safety Officer's and operator's responsibility to see that safe fireground practices are adhered to.

Key Topic Area

Group 4

- ✓Maintenance of Equipment
- ✓Overview of Features and Benefits of Currently Available Models
- ✓Operational Controls
- ✓Nozzle and Accessory Choices

After evaluation of all operations manuals of the currently available models, it became apparent that, as with any piece of equipment, ***a regular maintenance and lubrication schedule should be followed to keep the equipment functioning as originally designed.*** Keeping units clean and wiped down is important to prevent oils and dirt from accumulating on any exposed mechanical components. For units with an automatic safety valve, the valve should be tested from time to time as outlined in the manufacturer's operating guidelines.

Data was collected on all currently available models for study and evaluation. Much has changed from 20 years ago when these devices were large and very heavy. Todays units are made from aluminum alloys instead of brass or bronze, and have incorporated stronger lightweight materials to make deployment easier and a more rapid operation. Operational manuals on all units provide varying levels of information on maintenance, and operations on the fire ground. The manuals, even those that provide only limited information, must be used as reference in the creation of Standard Operating Guidelines for your agency.

Proper training will take into consideration all operational controls such as: height and rotational movement, leg deployment on portable units, the limits of low elevation and its relation to reaction force, and the use of the unit's pressure gauge as a safety indicator. All controls should be checked regularly for proper operation as outlined in operations manuals. If a problem exists, it must be corrected immediately. Monitor manufacturers provide customer service in varying degrees to help with questions and concerns. If a unit is not operating properly, the chances of a successful deployment will become limited. Each type and style of portable monitor provides many features and benefits. These will be looked at in-depth under operational controls. The use of smooth bore tips, fog nozzles, straighteners, self-educting foam nozzles, and deployment hardware will also be looked at in a future segment.

Symposium Report

➡the FIVE major ***PROs***

vs.

the FIVE major ***CONs***

of Using Portable Monitors for Initial Attack Operations

•**Higher flow rates can translate to increased reach and better penetration than handlines.** Higher initial fire flows and increased reach can allow better firefighter protection by keeping operations in a more tenable atmosphere while providing higher knockdown potential in life safety situations.

•**These devices provide better allocation of personnel resources.** In limited manning situations, higher fire flows can safely be provided with fewer personnel. For flow-based operations, more gpm per person can be delivered than with any combination of handline flows.

•**A single engine company is allowed more tactical versatility in flows with the portable nature of these monitors.** A single line put in place and a portable monitor can flow from 150 gpm up to 1250 gpm providing a wide range of flows to meet changing fire ground conditions.

•**Portable monitors can provide unparalleled safety in hazmat and vapor mitigation procedures, exposure protection, and high flow foam applications with a self-educting master stream nozzle.** The new lightweight features of this equipment offer fast deployment and the ability to better utilize pump capacity and available water supply flow in initial attacks. Faster knockdown translates to an overall reduction in stress levels of attack personnel.

•**The scale up feature of single line supply followed with a second supply line (either 2 1/2" or 3") can be used for initial attack or moved to surround-and-drown defensive operations as required by command.** A single "bomb" line can have as much effectiveness as up to 5 handlines with hose and necessary support. This can amount to a large dollar savings in time and resources.

Symposium Report

the FIVE Major PROs

vs

➡the FIVE major CONs

of Using Portable Monitors for Initial Attack Operations

•Improper or inadequate training on this type of attack can result in extensive water usage and potential collapse in the fire structure. Lack of training will also affect the procedures used in proper deployment, placement, advancement and operation of attack lines.

•The choice of supply line to the portable monitor will, in some way, affect its use. Though 3" line is flexible and mobile, its flow rates are limited. The use of 5" supply will provide high flow, but restrict advancement of the line after flow has been initiated.

•The perception is that these lines are strictly for defensive situations. The idea is that this sort of flow is either unnecessary or unwise. Typically, for most calls this is true, but for the small percentage of fires that cause our largest dollar losses, low flow handlines normally are proven ineffective as the move inevitably is made towards defensive operations.

•Though these newer portable monitors are smaller, lighter, and easier to deploy and use both on the ground and from the deck pipe on the truck, they are expensive - between $2,000 and $3,000. A commitment has to be made by a department to use this tool to justify its investment.

•Safety is a large drawback to the untrained operator. Higher flows translate to higher nozzle reactions and a much heavier stream which sometimes can create unsafe operations on the fire ground. Due to poor training, tie down straps are infrequently used and the portable monitor is often placed in service well below the elevation safety "stop" pin.

•Operational considerations should also take into account the potential for undermining of the ground around portible monitors as continuous water is pumped onto a fire. This undermining will potentially cause a loss of footing for the monitor base.

Symposium Summary

The single Biggest Factor in
Effective use of this Equipment is..
Training
A sample program is provided next...
The second Biggest Factor for Success is....
A Standard Operating Guideline
A couple of sample
Guidelines are included...

Discussion of Summary of Symposium and expected results in the future.

8.1 Sample Sheet

A sample competency overview is provided as an example on the following pages. (8.1 and 8.2)

Sample Competency Sheet for Deployment of a Portable Monitor and Operation of a Master Stream

NAME: _____

DATE: _____

EVALUATOR: _____

OVERALL COMPETENCY RATING: _____

Reference: NFPA 1001, Fire Hose, Appliances and Streams
Prerequisite: NONE

Student's Instructions: To meet the overall standards, you must perform this task in ____min. and you may have _____attempts. When you are ready to perform this task, ask your instructor to observe the task and complete this form. To show mastery of this task, you must perform all steps to receive an overall rating of at least Moderately Skilled.

Introduction: The master stream and portable monitors are the high flow appliances of the fire department. Master streams will deliver large volumes of water and have greater reach and penetration than hand held streams. Flows may range from 300 to 1250 gpm with portable ground monitors. Master stream devices not only provide higher needed fire flows, but will also generate considerable reaction forces. It is important to note that although lightweight and very portable, these pieces of equipment will require training and safety considerations.

Equipment and Personnel: One pump engineer, one engine, two firefighters with complete protective clothing, communications equipment, necessary wrenches. adapters, and hose. This equipment and its use should follow the commonly accepted training of the local fire agency.

TASK STEPS	KEY POINTS
1. Remove needed tools from apparatus	Spanners, adapters, tie downs
2. Place equipment at flow location	Pick appropriate topography
3. Remove monitor top from truck riser safety	Use necessary assistance and follow established guidelines
4. Remove portable base from apparatus	If preconnected, use necessary assistance
5. Place portable monitor in position	Select foundation carefully for good footing
6. Secure unit with provided tie down equipment	Select tie down point with care
7. Test rotational and elevation operations of gun	Lock all rotational and elevation controls
8. Adjust nozzle to proper elevation and pattern	Check operation of nozzle from fog to flush
9. Extend hose lines if not preconnected	From apparatus..3", 4", 5" or twin 3"
10. Connect hose lines to portable monitor	Using necessary wrenches or adapters
11. If using stacked tips, check tip size	Note usage of straighteners and tip size
12. Signal engineer to initiate flow	Start low and work up to operating pressure
13. If valve is used at monitor, open slowly	Charge line with necessary flow
14. Steady monitor and adjust tie down as needed	Stay behind monitor
15. Under flow, operate all elevation, rotational, and fog/straight stream controls	Adjust to changing flows as necessary
16. Operate master stream device	Hitting target, changing patterns, safety
17. Return all items in service after shut down of equipment and procedures	Follow procedures tear down, and stowing

EVALUATOR'S COMMENTS:

This Sample Task Sheet is taken in part from IFSTA Fire Streams Manual, and should be used as nothing more than a guide for an individual department to create a set of task based training programs to help staff be more proficient. Only intended as a minimum, this sheet may be modified tofit the needs of any agency.

"Portable Monitors for Initial Attack"

It's not just for defense anymore....

The concept of using heavy streams for initial fire attack !!!

by
Rod Carringer
Center Fire and Rescue
LaPorte, IN

9.1 Slide
Within four minutes upon arrival an engine company (3+1 officer) places a 5" attack line and a portable monitor flowing between 1000 and 1250 gpm in service. Typical deployment uses two firefighters and one support person for this task.

If Used Properly and Safely...

***High Flow Initial Attacks* with Portable Master Stream Devices**

can be a Valuable Tool in the Fire Suppression Arsenal

10.1 Slide
Portable monitor mounted on the riser of its engine. Crossfire monitor matched with an 18" Extend-a-gun device to provide for tactical use over obstacles on top of the apparatus.

10.2 Slide
Using a crew of 3+1 and a 4" preconnected "bomb" line, two firefighters and one support place a Crossfire monitor flowing 750 + gpm into service in under 4 minutes upon arrival.

Tactical Choices ???

First Lines Down

1 3/4"or 2" Preconnect ...

2 1/2" Preconnect ...

or

A Preconnected "Bomb" Line with a single 3" supply attached and ready for another 3" as resources permit ...

11.1 Slide
With a crew of 3+1, two firefighters pull a preconnected 150 foot, 1 3/4" attack line, advance and flow within three minutes of arrival. (Typically a 150 foot 2" attack line can provide over 300 GPM.)

11.2 Slide
With a crew of 3+1, two firefighters and one support firefighter pull a preconnected 150 foot, 3" handline, advance and flow within three and one half minutes of arrival.

11.3.1 Slide
11.3.2 Slide
11.3.3 Slide
With a crew of 3+1, two firefighters and one support firefighter pull a preconnected 200 foot, 3" "bomb" line with a portable monitor base attached. While the two firefighters stretch line, the support firefighter removes the monitor top from the engine and places it on the base. Advancement, attachment, tie down and flow within 4 minutes of arrival.

Lots of Fire....but Limited Manning ???

1 3/4" or 2" Attack Line with 2 firefighters .... equals about ..75 - 125 gpm per person.

2 1/2" Attack Line with 3 firefighters ....equals about ...100 gpm per person

A "Bomb" Line with twin 3" supply lines and 3 firefighters ...equals about ... 200 gpm per person !!!

12.1 Slide
150 foot, 1 3/4" preconnect with two firefighters flowing 200 gpm with a 190 psi engine pressure. TFT 100 psi automatic nozzle. ***NOTE: A 150 foot, 2" preconnect at 190 pump pressure will provide 320 GPM.***

12.2 Slide
200 foot, 3" preconnect handline with two firefighters and one support firefighter flowing 300 gpm with a 112 psi engine pressure. A TFT 100 psi automatic nozzle.

12.3 Slide
Two-200 foot, 3" attack lines. One preconnected to the portable base and the second added from a prelay by two firefighters and one support firefighter flowing 600 gpm with a 125 psi engine pressure. Crossfire monitor and a 100 psi TFT automatic master stream nozzle.

NOTE:
Occasionally, when using a single supply line feeding one side of the dual inlet monitor, a flow angle may be created that will encourage sliding of the base unit. Consider a single inlet monitor if this situation occurs during routine operations.

Hose Choices ???

Determining your initial attack needs can provide the information required to make an accurate choice of supply hoselines.....

Twin 3"s allow for single or dual line flexibility and flows from 100 gpm to 600 gpm

A single 4" is for flows up to 800 + gpm

A single 5" is for flows up to 1000 + gpm

13.1 Slide
With a crew of 3+1, two firefighters and one support firefighter deploy a single 200 foot, preconnected 3" line to the portable monitor. While flow is being initiated, 400 gpm with a 122 psi engine pressure, a second 3" prelay is pulled to the portable monitor base.

13.2 Slide
As the portable monitor is put into operation, the second prelayed 3" line is connected at the monitor and the support firefighter connects to the engine.

13.3 Slide
With both 3" lines flowing 600 gpm, the engine pressure is 125 psi. Two firefighters man the device. Deployment and flow is achieved with the 100 psi automatic nozzle under 4 minutes and 30 seconds.

13.4 Slide
With two firefighters and one support firefighter, a 250 foot, 4" preconnected "bomb" line with a set of quad stacked tips operating at 80 psi produces 1000 gpm at 130 psi engine pressure. (Note PRV)

13.5 Slide
With two firefigters and one support firefighter, a 250 foot, 5" attack line and a portable monitor with a 100 psi TFT automatic nozzle will produce a 1250 gpm flow at 130 psi engine pressure. (Note PRV)

Departments utilizing LDH to supply the portable bomb line should become familiar with NFPA Standard 1961 that implies the use of LDH attack hose, which has higher service test and maximum working pressures, 300 psi and 275 psi respectively. This compares to LDH supply hose pressures of 200 psi service test and 185 psi maximun working pressures.

Limited Resources ??

Needed Fire Flow (Critical Application Rate) of 1000 gpm ???

you can use ....

✓ 5 1 3/4" Attack Lines

or

✓ 3 3" Attack Lines

or

➡1 - 4" "Bomb" Line

LDH Supply			
Burst PSI	Acceptance (proof) Test	Annual Service	Working
600	400	200	185
LDH Attack			
900	600	300	275

Application Rates Rules of Thumb
ISO Formula used specifically to meet the needs of the fire insurance rating organizations....

The "Iowa" formula was used to determine flow in the confined spaces of a compartment fire...(LXWXH/100) or 0.10 gpm/sq.ft. for 60 seconds....

The current National Fire Academy formula for figuring needed fire flow in the field is the most current and practical approach to structural attack.

Needed Fire Flow (GPM) = (L X W)/3 X (% of involvement) For Fire Preplanning an additional compensation is made for exposure, building construction, and occupancy classification and number of stories.

* Also consider that these field formulas take into account that the structure is over 50% involved, primary search is taking place, and that the structural integrity of the building has not deteriorated.

14.1 Application Rate Sheet
Using currently accepted formulas, this chart provides a brief view of what your line will "handle" by square foot of typical initial attack fire loads.