SPEAKING OF FIRE

FIRE PROTECTION PUBLICATIONS • OKLAHOMA STATE UNIVERSITY

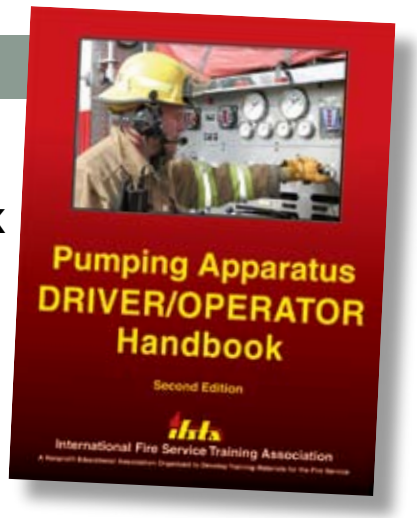
A quarterly newsletter of Fire Protection Publications (Headquarters for IFSTA) Fall 2006 Vol. 6 Number 3

IFSTA Update

Pumping Apparatus Driver/Operator Handbook

2nd Edition

By Carl Goodson and Mike Wieder



Every organized fire department and industrial fire brigade has some type of pumping apparatus in their inventory. They range from tiny industrial pumpers designed to maneuver inside industrial buildings to slightly larger units designed for quick attack and/or wildland fire fighting to huge municipal and industrial pumpers designed to pump large volumes of water or foam when needed. Some also have small trailer-mounted foam units; others have specialized pumping apparatus for aircraft rescue and fire fighting (ARFF) at airports; still others have fire boats for protecting waterfront structures and vessels in port. Most rural fire departments have water tenders (tankers) for transporting large quantities of water from remote water sources. Many municipal and industrial pumpers are equipped with compressed-air foam systems (CAFS) for fighting structural and wildland fires. Some industrial fire brigades have huge pumping apparatus and systems with foam-making capabilities.

Regardless of what type or types of pumping apparatus any given fire department has, the personnel assigned to drive and operate the apparatus must know the capabilities and limitations of each pumping unit and all of its equipment. In addition, driver/operators must know to inspect, test, and maintain the apparatus to which they are assigned. They must know and practice safe driving techniques under a variety of road and weather conditions. Finally, driver/operators must know how to operate the onboard pumps and other systems to supply fire attack crews with an adequate supply of water or other extinguishing agents. The keys to successful pumping operations during fires and other emergencies are having well designed and maintained pumping apparatus and highly trained driver/operators. The **Pumping Apparatus Driver/Operator Handbook** is a teaching tool that fire service and private industry pumping apparatus driver/operators can use to develop and maintain their proficiency.

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From the Director

Fire Safety Solutions for People With Disabilities

Fire Protection Publications has learned a great deal about home fire safety messages and materials for people with disabilities through the *Fire Safety Solutions for People With Disabilities* projects. We'd like to share some of the things we have learned with you as you conduct your fire prevention activities.

<u>Please consider that people with disabilities:</u>

- may have multiple disabilities.
- may use assistive technologies.
- many times should sleep on the ground floor in a room with an accessible exit directly to the outside.
- need residential smoke alarms that meet their needs such as:
  - an alarm that can be tested and silenced with any universal remote control (i.e., a TV remote)
  - an alarm that also has a strobe light and/or a bed shaker
- may need fire safety messages in Braille, large type or in text only for a computer screen reader or recorded on a tape or CD.
- may not welcome fire department personnel into their homes.
- live and work and worship and play throughout your community.
- need fire safety methods and materials customized and accessible.
- are unique - there is no "one size fits all."
- prefer that you use people first language.
- have service providers and advocates in the community that make perfect fire safety project partners.

The *Fire Safety Solutions for People With Disabilities* project has valuable partnerships that have been key to the project successes. Our partners are Oklahoma ABLE Tech, Seeds Educational Services, Inc. and the faculty of the School of Fire Protection and Safety Technology.

We have developed home fire safety materials specifically for people with disabilities. These include a DVD presented in American Sign Lan-

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LODD Update

CREATING THE "NEW" FIRE SERVICE SAFETY CULTURE: ROOT CAUSES OF FIREGROUND DEATHS AT STRUCTURE FIRES

By Bill Manning

The process of reducing non-cardiac-related fireground line-of-duty deaths should begin with the acceptance of certain truths, including:

Most fireground line-of-duty deaths are preventable. It's understood that firefighting is an inherently dangerous occupation, and there are, in fact, times when you can do *everything* right and still meet tragedy. But those cases are relatively few. The vast majority of fireground deaths occur in circumstances we should have or could have controlled or preempted. Tragedy is not our "fate."

All members of the fire department, from the top down, must contemplate firefighter life safety within the context of mission and operational details. Firefighter life safety should be the first mission priority and the primary concern in every aspect of every operation. "Thinking safety" should be elevated in the organizational culture and in the consciousness of every member. No apparatus should roll or line be stretched without short- and long-range working department plans for, and personal commitments to, getting everyone back safe from every call.

Acting in the preservation of known life hazards and acting in the preservation of property are two vastly different emergencies requiring vastly different operational mindsets. We must recognize the distinction and act accordingly. Furthermore, the extent to which we'll go to preserve life should, in an operational sense, mean different things to different fire departments with different operational capabilities. The fire service has to stop dying in unoccupied structures, and if it takes rigid policies and procedures to do it, so be it.

Routine incidents aren't routine incidents until the rigs are turned off and you're back at the firehouse. Fire service history is replete with tragedies in which seemingly routine incidents suddenly went bad, in a hurry. In a recent interview, USFA Deputy Administrator Charlie Dickinson, when asked his experiences as fire chief during the 1992 Bricelyn Street Fire in Pittsburgh in which three firefighters were killed, said, "One moment it can seem so…*benign*…and the next minute, so *unthinkable*, so *terrible*."

We must address the root causes of our line-of-duty deaths if we expect to change. Our typical thought process for examining our fireground deaths needs to change. Too often, we take an oversimplified cause-and-effect approach to these incidents, carrying the analysis only so far as to identify the most obvious mitigating factors

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Speaking of Fire newsletter is published four times a year by Fire Protection Publications (Headquarters for IFSTA) to update customers on the latest information about FPP and IFSTA products and other significant issues affecting the fire industry. The views acknowledged in the guest editorial don't necessarily reflect those of Fire Protection Publications or International Fire Service Training Association.

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From the Director

guage for people who are deaf and a social etiquette guide for fire department personnel working with people with disabilities. Watch the IFSTA/FPP web site for links to access these materials in the future.

Best wishes to you and your fire department as you reach those greatest at risk for fire death and injuries – people with disabilities!

Sincerely,

Nancy Trench

Assistant Director for Research at FPP

This issue's Director's Letter was written by Nancy Trench. Nancy has been involved in fire prevention projects for 30 years. She is the Assistant Director for Research at FPP. The projects discussed in this message are funded in part by USFA, FEMA and Homeland Security through the Assistance to Firefighters, Fire Prevention and Safety Grants, and Fire Safety Solutions for People With Disabilities.

Award Update

OSU Fire Protection Publications Receives President's Award from the Home Safety Council

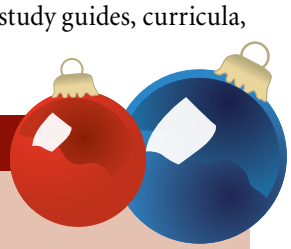
Oklahoma State University's Fire Protection Publications (FPP) was named a co-recipient of the Home Safety Council's President's Award at the annual Salute of Home Safety Awards Dinner held in Washington, DC on June 8, 2006. The President's Award recognizes one or more organizations that have partnered with the Home Safety Council on initiatives that bring home safety messages and education to especially vulnerable and underserved populations, thereby extending the scope and reach of the Home Safety Council's life-saving mission. FPP was recognized along with ProLiteracy Worldwide and the Federal Emergency Management Agency (FEMA) for partnering with the Home Safety Council on the highly successful Home Safety Literacy Project.

It is estimated that more than 93 million people in the United States read English at or below the 6th grade level. Funded by FEMA, the Home Safety Council, ProLiteracy Worldwide, and FPP have developed extensive packages on improving home safety as it relates to fires and other disasters for implementation in adult literacy programs throughout the United States. The learners increase their ability to read by using materials that also teach them how to make their homes safer and to prepare for disasters, such as hurricanes and tornados. Local fire departments are encouraged to work with the literacy programs and learners by providing home safety inspections and working smoke alarms, where needed.

The award was presented by Home Safety Council President Meri-K Appy. Ron Hazelton, the Home Improvement Editor for ABC's Good Morning America, served as Master of Ceremonies for the event. FEMA Director R. David Paulison, Undersecretary for Emergency Preparedness and Response, DHS and Robert Wedgeworth, President, ProLiteracy Worldwide served as the keynote speakers for the evening.

FPP is an auxiliary enterprise of the College of Engineering, Architecture, and Technology at OSU and serves as the headquarters for the International Fire Service Training Association. Since their inception in 1934, IFSTA has worked with FPP to produce and distribute high quality fire service training materials. Its operations are funded primarily by the sales of the training materials they produce and distribute, as well as by grants from various sources. Located on the OSU campus, FPP employs approximately 70 full- and part-time employees. IFSTA and FPP produce a full line of fire, emergency medical, and hazardous materials training manuals, study guides, curricula, video products, and associated training materials.

2006 Holiday Ordering Schedule



Fire Protection Publications will be observing the OSU Holiday Break from December 23, 2006, until January 2, 2007. Customer Service at FPP will be open on Friday, December 29, from 8:00 am to 4:30 pm (CT) to take phone orders. Web orders placed during the break will also be processed and invoiced on that day as well. Orders will be shipped out on January 3, 2007. Please visit IFSTA.org to place your order online.

Thank you and have a safe and happy holiday season.

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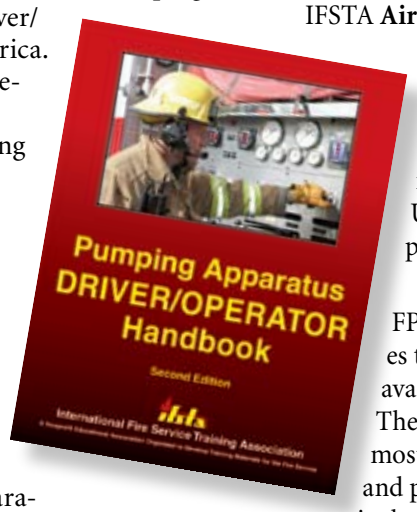
The Evolution of the *Pumping Apparatus Driver/Operator Handbook*

IFSTA and Fire Protection Publications have been producing training manuals on fire apparatus operations and their related subjects almost since the organizations began operations in 1934. For much of the early history of their publishing efforts, the various topics surrounding apparatus operations were covered in separate manuals. These manuals were typically structured around the manner in which the subjects were commonly taught in those days.

This would begin to change when the first edition of NFPA 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications* was published in 1976. This was the first effort at developing uniformity in fire apparatus driver/operator training in North America. As the impact of this standard began to be felt in the fire service, the demand for improved training materials became apparent. The first step that IFSTA/FPP took to this effect was to divide the old IFSTA **Introduction to Fire Apparatus Practices** manual into two separate manuals: **Fire Department Pumping Apparatus and Fire Department Aerial Apparatus**, in 1989 and 1991. However, firefighters who were studying to drive apparatus equipped with fire pumps still needed the IFSTA **Fire Streams Practices** and **Water Supplies for Fire Protection** manuals in order to meet the entire NFPA 1002 standard.



When the revision cycle came around to these manuals again in the late 1990's, the decision was made to combine the three pumping-oriented manuals into one handbook. This would make it easier to study for the student and would negate the need to buy three different manuals to meet one course. The first edition of the **Pumping Apparatus Driver/Operator Handbook** was released in 1999 and has become the standard upon which most fire apparatus driver/operator training is based today. The manual, and its accompanying curriculum package, form the basis of the majority of formal pumping driver/operator training programs in North America and beyond.

The 2nd Edition of the *Pumping Apparatus Driver/Operator Handbook*

Since the first edition of the **Pumping Apparatus Driver/Operator Handbook** was released in 1999, there has been explosive growth and development in fire apparatus and system design. Items such as compressed air foam systems and electronic pump panels are much more common now than they were in the late 1990's. There has also been an increased emphasis on fire apparatus driving safety and safe operations when operating at roadway incident scenes. An updated manual was needed to address these issues.

The 2nd edition of **Pumping Apparatus Driver/Operator Handbook** is designed to provide updated information on the operation of fire department pumping apparatus and their built-in systems. It is aimed at municipal and industrial pumping apparatus driver/operators and those aspiring to that position. It contains information on the requirements for becoming a pumping apparatus driver/operator, types of apparatus equipped with fire pumps, apparatus inspection and maintenance, operating and positioning emergency vehicles, the properties of water, fire hose nozzles and flow rates, theoretical pressure calculations in both the customary (U.S.) and metric systems, fireground hydraulic calculations, fire pump theory, operating fire pumps, static water supply sources, relay pumping operations, water shuttle operations, foam equipment and systems, and apparatus testing.

This manual is designed to support training programs that meet the requirements for NFPA 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications* in the sections that pertain to apparatus equipped with fire pumps, wildland apparatus, and tankers/tenders. Much of the information is also applicable to ARFF vehicles as well, though personnel responsible for driving them should also consult the IFSTA **Aircraft Rescue and Fire Fighting** manual. The manual also reflects the recommendations of many other agencies recognized by the vast majority of fire protection professionals to be critical to the driver/operator, including Underwriters Laboratories, FM Global, U.S. Department of Transportation, Transport Canada, and other credible resources.

In addition to the manual itself, IFSTA/FPP also has available a wide variety of resources to support it use. Student study guides are available in both print and CD-ROM formats. These manuals present questions in the format most likely to be encountered in certification and promotional testing. A complete curriculum, including teaching outlines, PowerPoint® presentations, and other resources, is available to allow classes to be easily developed from these materials. All curriculum materials are contained on a computer disk and the files are easily customizable by the user to meet local needs. A clip art disk that contains all of the images from the manual is also available.

The 2nd edition of IFSTA's **Pumping Apparatus Driver/Operator Handbook** provides the most up-to-date information on fire apparatus operations available in today's market. The safe and efficient operation of fire apparatus is one of the most critical elements to deliver the services for which we are responsible. It is important that driver/operators be trained with the best information available to meet their responsibilities.

***Carl Goodson** is a Senior Technical Editor at Fire Protection Publications and was the author of the 2nd edition of the Pumping Apparatus Driver/Operator Handbook.*

***Mike Wieder** is the Assistant Director and Managing Editor at Fire Protection Publications and was the author of the 1st edition of the Pumping Apparatus Driver/Operator Handbook.*

Benefits at a glance.

- Learning objectives have been developed for this manual. They are found at the beginning of each chapter and may be used by the readers to guide their study of the subjects addressed in those chapters.
- The manual reflects the recommendations of many agencies recognized by the vast majority of fire protection professionals to be the minimum standard. These agencies include the National Fire Protection Association (NFPA); Underwriters Laboratories; Factory Mutual, U.S. Department of Transportation, Transport Canada, and other credible resources.
- Fire service professionals will find that the information in this manual will help to bring about a better understanding of fire department pumping apparatus operation. Those personnel involved with fire apparatus management, safety, and maintenance should also be better able to understand the concerns of the public and private fire services for proper maintenance of this equipment.

To order a copy of the manual or PADO support products, please **call 800-654-4055**

Manual and support products available for Pumping Apparatus Driver/Operator Handbook:

Pumping Apparatus Driver/Operator Handbook 36719 .....$45.00

Pumping Apparatus Driver/Operator Study Guide (print) 36720 .....$20.00

Pumping Apparatus Driver/Operator Study Guide (on CD-ROM) 37175 .....$25.00

Pumping Apparatus Driver/Operator Clip Art 38116.....$25.00

Pumping Apparatus Driver/Operator Curriculum on CD-ROM 36722.....$50.00

Hydraulics for Jakes

by Jeff Welle

Gaining proficiency in pump operations by applying principles of mathematics can be a difficult task for many. IFSTA acknowledges this problem and encourages a more simplistic approach during fireground operations. "Hydraulics for Jakes"(H4J) is a simple method to calculate fireground hydraulics and is available in U.S. standard and metric system versions. This material has been tailored to structural firefighters working toward basic pump proficiency. There are no complicated formulas and the only required math is addition of rounded numbers. "H4J" will present a hand method that is simple, accurate, and flexible. I'll compare and contrast "H4J" to the U.S./Metric IFSTA mathematical equation routinely to allow the reader to validate the material.

A firefighter could spend a career looking for consistency in the variables of pump hydraulics. Theoretically, every hose brand has its own unique friction loss, and theoretically, every pump has its own unique friction loss characteristics associated with its piping. An individual can spend a lot of time and effort on this thought or subscribe to this fact: Fireground hydraulic calculations won't have to be exact to be effective and efficient. Based on this fact, a hydraulic calculation method using rounded friction loss numbers is possible.

Comparing IFSTA friction loss equation results to a hose manufacturer's stated friction loss results can be confusing. The manufacturer's friction loss numbers are usually less than what the corresponding IFSTA friction loss would be. This indicates that superior materials and techniques in hose manufacturing are reducing friction loss numbers, and the IFSTA equation results may be higher than the manufacturer's stated losses; more profoundly with smaller diameter hose. This doesn't render the IFSTA friction loss equation results ineffective; you just need to know your department's hose may have a lower stated friction loss than what would be derived from an IFSTA friction loss equation. Conversely, every engine is not going to have hose with a low stated friction loss. "Hydraulics for Jakes" rounded friction loss numbers use IFSTA as a guide; the system utilizes the IFSTA/manufacturer's friction loss results to determine an acceptable friction loss range. This allows "H4J" to have accurately rounded friction loss numbers that are sequenced, easy to remember, and easy to add.

Common fire suppression hose can be broken into three categories containing six different sizes of hose. Attack hose is 1.5" and 1.75" with 1.5" couplings (38/45mm); Medium diameter is 2.5" and 3" with 2.5" couplings (65/77mm); Large diameter is 4" and 5" hose (100/125mm).

The various hose's flows are dictated by friction loss requirements and the maximum operating pressure; therefore, hose flow ranges are quite predictable.

This flow predictability is applied to "H4J" providing five core flows for each size of hose, from minimal requirements to near-maximum capabilities. A specific hose's predictable flow range is a constant and can be easily remembered by any firefighter familiar with hose. Utilizing your hand's five fingers as a visual key, the specific hose's flow range will be recalled. "H4J" is unique as the three categories of hose (attack, medium, large) are each given one set of five corresponding friction loss numbers. Medium and large diameter hose share the same friction loss number sequence. The five assigned friction loss numbers are rounded and sequenced for easy recall and application. The friction loss number indicates an accurately rounded pressure loss in 100' (30m) of hose at the predicted flow and the operator simply adds the number by the distance of the hose. The rounded predicted flows of "H4J" include all the industry standard nozzle flow rates, and both the predicted flows and the corresponding friction loss are sequenced for easy recall. Operating "in between" the predicted flows of "H4J" is obvious and simple. The voluminous quantity of information needed for hydraulic calculations has been reduced to two sets of five numbers, and they are easy to remember.

There are standard nozzle pressures for all fireground nozzles. The nozzles are manufactured to flow a specific quantity of water at their respective Standard Nozzle Pressure (SNP). Nozzle manufacturers also offer low-pressure fog nozzles that have a SNP of 50psi or 75psi (350/525kPa) rather than the standard 100psi (700kPa) SNP. The 50psi (350kPa) saved in SNP can be used to combat friction loss in the line, allowing you to flow more water. These nozzles, as all nozzles, are only as intelligent as the pump operator. All nozzles need to receive adequate water flow in order to operate at their optimum. The importance of knowing an individual nozzle's flow rate cannot be stressed enough. This information is critical, as it tells us how much water must flow down any given line and dictates the friction loss. Utilization of a 250 gpm (750L/min) nozzle doesn't guarantee that flow, the pump operator dictates how much water that nozzle will receive.

All fog nozzles have their flow rate and range clearly identified. A solid stream is marked at the tip in inches. One can utilize the IFSTA equation to determine the nozzle's GPM flow or remember eight rounded common solid stream flows.

Rounding the solid stream nozzle's flow is essential to utilization of "H4J". The rounded flow numbers of "H4J" are tailored to the various hand line hose's specific nozzle requirements. "H4J" predicted flows are also significantly useful as they are completely comprehensive when utilizing dual attack lines of equal length/nozzle flow that are wyed from an MDH distribution point, or when flowing dual or multiple lines to a master stream.

Applicable IFSTA equation: 29.7 x D2 x NP $(\sqrt{\ })$

Tip Size	SNP	GPM flow	Rounded	Change
7/8"	50psi	184.5	175GPM	9.5GPM
1"	50psi	209.9	200GPM	9.9GPM
1- 1/8"	50psi	265.7	250GPM	15.7GPM
1- 1/4"	50psi	328.0	300GPM	28.0GPM
1- 3/8"	80psi	502.0	500GPM	2.0GPM
1- 1/2"	80psi	597.4	600GPM	2.6GPM
1- 3/4"	80psi	813.1	800GPM	13.1GPM
2"	80psi	1062	1000GPM	62.0GPM

Applicable IFSTA equation: .067 x D2 x NP $(\sqrt{\ })$

Tip Size	SNP	GPM flow	Rounded	Change
22mm	350kPa	606	600	6L/min.
25mm	350kPa	783	750	33L/min.
29mm	350kPa	1053	1000	53L/min.
32mm	350kPa	1282	1250	32L/min.
35mm	560kPa	1936	2000	64L/min.
38mm	560kPa	2283	2250	33L/min.
45mm	560kPa	3201	3000	201L/min.
50mm	560kPa	3953	4000	47L/min.

Note the difference between the tip/flows derived utilizing the IFSTA nozzle equation and the rounded flow numbers of "H4J". The rounded tip flows are reasonably accurate and easy to use on the fireground. The "H4J" system integrally revolves around these rounded common flows, and the rounded predictable flows of the system are useful in single, dual, or multiple line configurations. At this point, you should know why reducing a SNP is useful, how to identify a fog nozzle's flow rating and the rounded GPM flows for eight common solid streams tip sizes.

To accomplish 2.5"/65mm hydraulic calculations utilizing "H4J", remember the applicable nozzle flows, the hose's five predictable flow rates, and the five universal friction loss numbers. "H4J" places the 2.5" predictable flow range between 100gpm and 500gpm, and the "in-between" flows have been identified and rounded. However, autonomous application of the system's five predicted flows and their corresponding friction loss numbers will yield you the same information. "H4J" places the 65mm predictable flow range between 750L/min. and 1750L/min. The "H4Js" 2.5"/65mm rounded flow rates include all of the applicable rounded tip flows and common fog nozzle flow rates.

Applicable IFSTA equation: C x Q2 x L. C factor = 2 2.5"

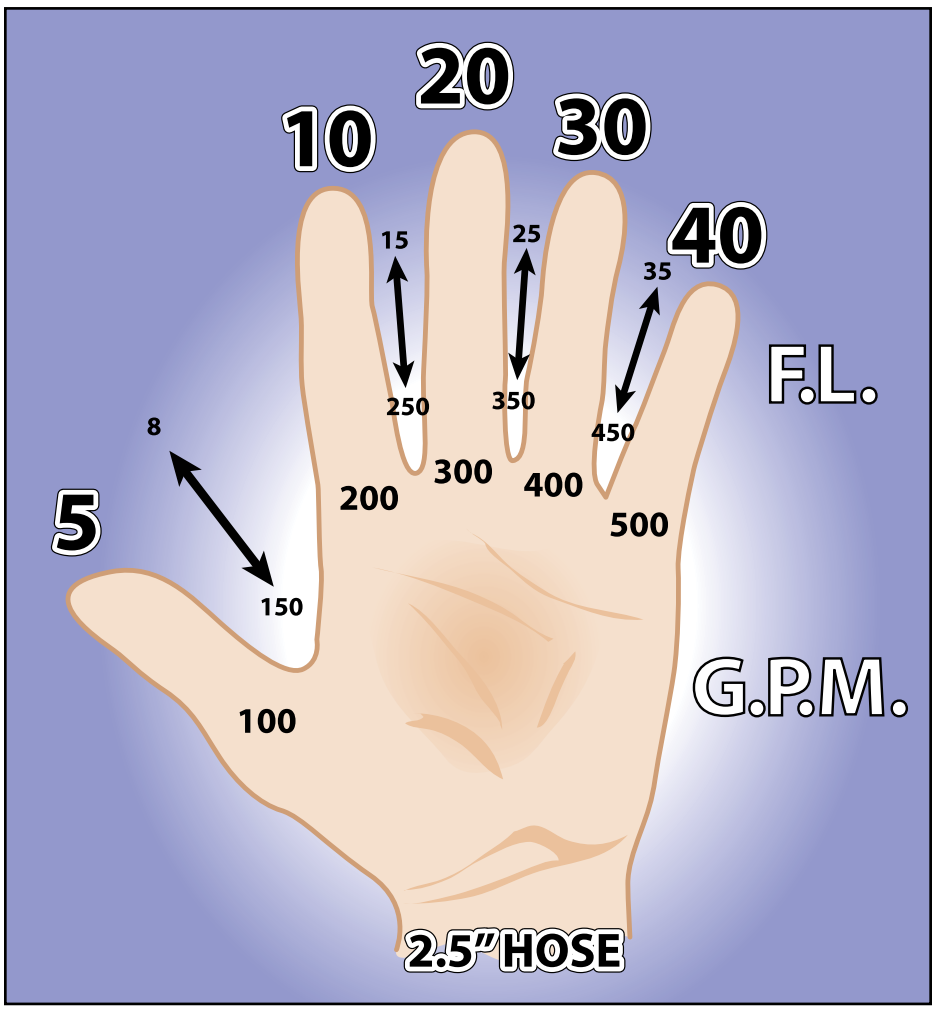
GPM	Actual Friction Loss	Rounded Friction Loss	Change
100	2.0psi	5	3.0psi
150	4.5psi	8	3.5psi
200	8.0psi	10	2.0psi
250	12.5psi	15	2.5psi
300	18.0psi	20	2.0psi
350	24.5psi	25	1.5psi
400	32.0psi	30	2.0psi
450	40.5psi	35	5.5psi
500	50.0psi	40	10.0psi

Applicable IFSTA equation: C x Q2 x L. C factor = 3.17

65mm

L/min	Actual Friction Loss	Rounded Friction Loss	Change
750	53.4kPa	50	3.4
1000	95.1kPa	100	4.9
1250	148.5kPa	150	1.5
1500	213.9kPa	200	13.9
1750	291.2kPa	250	41.2

"H4J" Medium Diameter Hose (MDH) system is accurate, as evidenced by the "change number." Remember the nozzle flow rates, the hose's flow range, and the five "H4J" universal friction loss constants of MDH hose; apply the system, and all the graphed information is easily correlated. When operating with a 50' (15m) section of hose, reduce one friction loss number in half. IFSTA states a master stream device will have a friction loss of 25psi (175kPa) regardless of flow.



1) 300' of 2.5" hose with a 300gpm fog nozzle.
   2 x 3 x 3 x 3 =54(2.5") + 100(snp) = 154psi
   H4J: 20 + 20 + 20 = 100 = 160psi

2) 200' of 2.5" hose with a 1-1/8" tip.
   2 x 2.65 x 2.65 x 2 = 28(2.5") + 50(snp) = 78psi
   H4J: 15 + 15 + 50 = 80psi

3) 300' of 2.5" hose with a 1-1/4" tip.
   2 x 3.28 x 3.28 x 3 = 64.5(2.5) + 50(snp) = 114.5psi
   H4J: 20 + 20 + 20 + 50 = 110psi

4) 200' of 2.5" hose with a 350gpm fog nozzle.
   2 x 3.5 x 3.5 x 2 = 49(2.5") + 100(snp) = 149psi
   H4J: 25 + 25 + 100 = 150psi

5) 200' of dual 2.5" hose supplying a master stream with a 1-3/4" tip.
   2 x 4.06 x 4.06 x 2 = 65.9(2.5") + 25(ms) + 80(snp) = 170.9psi
   H4J: 30 + 30 + 25 + 80 = 165psi

6) 90m of 65mm hose with an automatic fog, snp of 700 kPa, and a flow goal of 1000L/min.
   3.17 x 10 x 10 x .90 = 285.3 + 700 = 985.3kPa
   H4J: 100 + 100 + 100 + 700 = 1000kPa

7) 60m of 65mm hose with a 32mm tip.
   3.17 x 12.82 x 12.82 x .60 = 312.5 + 350 = 662.5kPa
   H4J: 150 + 150 + 350 = 650kPa

8) 75m of 65mm hose with a 29mm tip.
   3.17 x 10.53 x 10.53 x .75 = 263.6 + 350 = 613.6kPa
   H4J: 100 + 100 + 50 + 350 = 600kPa

9) 60 m of dual 65mm hose to a ground master stream with a 45mm tip.
   3.17 x 16 x 16 x .60 = 486.9 + 175 + 560 = 1221.9kPa.
   H4J: 200 + 200 + 175 + 560 = 1135kPa

10) 60m of 65mm, an automatic fog, snp 700, flow goal of 1250L/min.
    3.17 x 12.5 x 12.5 x .60 = 297.1 + 700 = 997.1kPa
    H4J: 150 + 150 + 700 = 1000kPa

Versatility Charts

2.5"

Flow Rate	Single Line	Wyed to Attack	Dual Lines
100GPM			
150GPM			
200GPM	1" Tip		
250GPM	1-1/8" Tip/ 250 Fog	Two 125 Fogs	1-3/8" Master
300GPM	1-¼" Tip/ 300 Fog	Two 150 Fogs	1-½" Master
350GPM	1-¼" Tip/ 350 Fog	Two 7/8"Tips/ 175 Fogs	
400GPM		Two 1" tips / 200 Fogs	1-¾" Master
450GPM			
500GPM	1-3/8" Tip Master	Two 1-1/8"s/250Fogs	2" Master

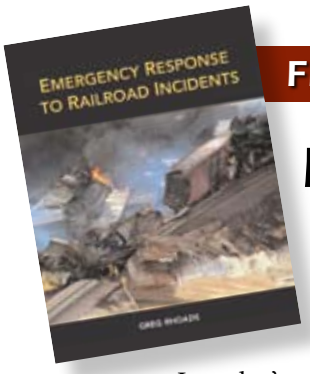
65mm

Flow Rate	Single Line	Wyed to Attack	Dual Lines
750L/PM	25mm Tip	Two 400 L Fogs	
1000L/PM	29mm / 1000L Fog	Two 500 L Fogs	35mm Master
1250L/PM	32mm / 1250L Fog	Two 22mm/600 L Fogs	38mm Master
1500L/PM	25mm/750L Fog	Two 25mm/750L Fogs	45mm Master
1750L/PM			

"Hydraulics for Jakes" incorporates all the rounded tip and common fog nozzle flows and they can be found as either a single or dual line application. Information to flow multiple lines supporting a master stream device are obvious, and autonomous application of the system with equally divided flow rates will easily accomplish a multiple line strategy. Although the "H4J" system is not fully explained in detail in this article, the versatility graph for the 2.5"(65mm) demonstrates how the system is fully comprehensive, providing all the information needed to accomplish accurate fireground calculations with essentially any combination of hose you and your apparatus can produce. "H4J" also discusses maximum distance relays, drafting, reducing resistance, and manifold operations.

"Hydraulics For Jakes" was created for firefighters; it's easy to remember, easy to use, lightning fast, and accurate. Sound fire fighting strategy can only be formulated through a strong knowledge of pump tactics. "H4J" will help line F/F's make the appropriate line and nozzle selections based on a desired water flow. "H4J" will provide the pump operator with accurate hydraulic calculations improving proficiency, and "H4J" will assist officers in making the appropriate choices for strategies based on reasonable expectations of hose capabilities.

Jeff Welle *is a career Firefighter, Paramedic, R.N. and educator. Mr. Welle was a D.P.S. Fire Division Battalion Commander in the city of Rio Rancho N.M., and now resides in Naples, Florida. Information on the "Hydraulics For Jakes" system can be found at* ***Hydraulics4Jakes.com***



Emergency Response To Railroad Industry Incidents — Back To Basics Today's Response Environment

By Greg Rhoads

In today's post-September 11th response environment the United States first responder community is faced with a host of new roles and new hazards. Terrorism, mass casualty incidents and clandestine drug labs all have raised public awareness of the highly technical hazards faced by first responders in cities across America. In the midst of these new challenges, ever-increasing training demands are placed upon both career and volunteer first responders. New technology, new hazards, and new tactics fill the training calendars of most departments.

Even with these new training demands, fire service officers and instructors must remain aware of and train for those long-standing hazards present in their communities. Beyond the benefits of new equipment, emerging technology and advanced tactics is the core importance of information and knowledge. Information about those exposures present in your community and knowledge about how potential hazards can impact your personnel, the public, and the environment.

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Railroad Industry Changes

One of these exposures is railroad operation within your community. For many departments, railroad operations are long-standing exposures with the potential for a variety of incidents. In many communities, the railroad has been a part of the local landscape for so long that the public and first responders can overlook it because it has always been there. But past operations and traffic may be changing in many communities, and first responders need to be aware of changes and review the actual hazards they may face.

The US rail industry is currently experiencing a period of strong growth. Annual rail traffic is on the rise nationwide. Many railroads are making capital expenditures to increase the number of trains operating on existing lines through higher train density using advanced communication and signal systems or through construction of additional passing sidings or double tracking. Many larger Class 1 (the largest railroad operations based upon traffic) railroads have sold or leased trackage to regional or short line rail operations. Regional or short line railroad operations may serve industries in a limited area, provide industrial switching services, or serve as a bridge carrier between the larger Class 1 railroads.

The nation's railroads are using a variety of new operating models to increase both the capacity and the velocity of mainline operations. Examples of these new models include:

- run through service with one company operating trains from origin to destination over non-owned trackage and under the dispatch control of another railroad or
- shared trackage rights agreements with both freight railroads and commuter mass transit systems operating train service over the same tracks.

These industry trends can have significant impacts to your community through increased rail traffic, new facilities or new local contacts and communication points. While rail offers a very safe method of transportation, the increased demand for rail service increases the potential for your department to face an incident that involves response to, and interfaces with, the railroad serving or traversing your community.

All of this highlights the need for first responders to review how railroad operations are conducted in your community and reassess, or develop, your standard operating guidelines or transportation emergency response plan (TERP). Like other plans in place for your department, time spent in the development of a TERP will form the basis for a safe and effective response to a rail incident.

Common Types of Rail Incidents

For many fire service personnel, mention a railroad incident and most think of a large- scale derailment with a hazardous materials release. While this type of incident is possible (and may need to be planned for), there are many other incidents that can involve railroad operations or exposures. These can include:

Grade Crossing Incidents

Motor vehicle accidents without train involvement

Crossing accident with train involvement

Crossing blocked with motor vehicle

Crossing blocked with train

Fire Incident

Fire involving railroad fixed facility (bridges, trestles, signal equipment or rail yard support structures.)

Fire involving railroad rolling stock (mainline, yard or at industry)

Structure fire with railroad mainline or other operations exposure

Forest or brush fire with railroad mainline or other operations exposure

Structure fire with railroad equipment exposure on private siding

Derailment

Derailment with no hazardous materials or fuel release

Derailment with a hazardous materials or fuel release

Derailment with a non-hazmat release and/or environmental impact

Derailment involving passenger services (commuter vs. long distance or intercity)

EMS Incident

Railroad employee at fixed facility

Railroad employee on line of road

Railroad or citizen injury at any of the above incidents

Each of these incidents presents first responders with potential hazards that need to be recognized early by officers or incident commanders. The ability to assess the type of railroad incident being faced, the hazards faced, and development of suitable response objectives and tactics are critical to conducting safe and effective operations.

Key To Safe and Effective RR Response

The key to conducting any operation involving railroad operations or equipment is the same as most community exposures- pre-emergency planning. A basic component of your response plan is to identify which railroads are operating within your response area. This starts with an inventory of all rail tracks and facilities within your jurisdiction. From this inventory, make contact with local railroad facilities. This contact

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can be as easy as looking in your local telephone directories, visiting the websites for larger Class 1 railroads, or by contacting local rail served industries to determine their serving railroad and an initial point of contact.

All Class 1 railroads and many short line operations have resources available to work with local responders. These resources can include training materials, information about the frequency and types of train operations conducted in your area, and traffic density information. While all of this information is important to develop your TERP, the most critical piece of information is a 24-hour emergency number for contacting the railroad.

This number needs to be clearly communicated to your dispatch or communication center, first response units, and in all apparatus. This number is the key to fast contact with the railroad to control train traffic for those incidents that the railroad is not aware of and when first responders may be on or around "live" tracks. From the list of common incidents listed above, many do not involve a train crew and thus the railroad may not be aware of an emergency operation that is impacting their operations.

From the information gained from contacts with those railroads serving or operating in your jurisdiction, emergency planners can identify credible incident scenarios. An example would be pre-emergency response planning for operations that involve hazardous materials versus a line that serves a coalmine with no chemical traffic. Both types of operations have some common characteristics but also present unique response considerations due to the types of products being transported.

Development of credible response scenarios leads to development of training plans and topics that accurately reflect the expected hazards from rail operations. Training for response to railroad incidents needs to be tailored to the level of involvement of the responding personnel (i.e., BLS units don't need training on conducting transfers of compressed gases). However all emergency personnel who may be first responders to a railroad emergency need a base line railroad safety and hazard recognition training program.

Summary

The railroad industry continues to evolve and embrace new technology. New technology and operations means first responders need to keep abreast of industry operating practices and have a clear understanding of the potential hazards they may face when responding to a railroad incident. Information and resources are available to fire service training officers and instructors. Seek out these resources and prepare your team for a safe and effective response to an old industry with new hazards.

***Greg A. Rhoads** has been actively involved with the fire service since 1977, starting as a volunteer firefighter with the Avis Fire Company in Avis, PA. He also served with the Prince Georges County Fire Department as a live-in firefighter/EMT at the Berwyn Heights station where he was a member of the county Hazardous Materials Team.*

As a Hazardous Materials Manager and later as the Director of Chemical Safety for CSX Transportation, Greg was responsible for emergency response to railroad hazardous materials incidents, regulatory compliance and training for first responders. Greg was also past Chairman of the ACC Responsible Care Partners Group, a member of the Responsible Care team and the TRANSCAER national team. Since 2001 Greg has been the President and CEO of Greg Rhoads & Associates, a full service Health, Safety and Environmental consulting firm specializing in fire protection and chemical safety systems for the chemical and transportation industries. Greg holds a BS degree from the University of Maryland in Fire Protection and Industrial Safety and an MBA degree from Nova Southeastern University in Business Management.

FPP is looking for a firefighter to be part of the cast for a DVD to be produced by FPP. This DVD will be part of a training packet to assist firefighters in fire stations all over the US in conducting developmentally appropriate fire station tours and firefighter visits to early childhood classrooms.

Young children 3 to 5 years old have a keen interest in firefighters and fire department equipment and apparatus. They frequently come to fire stations for tours and early childhood educators frequently invite firefighters to visit their classrooms. While firefighters have the best of intentions, sometimes their efforts are not as successful as they would wish. These training materials will prepare firefighters in conducting fire station tours and firefighter classroom visits that will keep children interested and be appropriate for children 3 to 5 years old.

If you or someone you know has an aptitude for conducting fire station tours for young children and/or has a special ability in visiting early childhood classrooms, let us know!!

FPP will pay transportation, lodging and meal expenses to the designated location to shoot the film. The firefighter(s) selected will be required to sign a photo release, work from a script prepared by the project team, and arrange with their local fire department to be away from work for up to three days.

Please send your name, contact information, photo or video clip along with a statement (about 200 words) about why the FPP Early Childhood Education Project should choose you to be our fire station tour and classroom visit celebrity to:

FPP/Star Search
Attention Cindy Finkle
930 North Willis
Stillwater , OK 74078

or e-mail:

royals@osufpp.org

(put "Star Search" in the subject line.)

or call:

(405) 744-8301

or download application form:

www.ifsta.org

Chief Dennis Compton from the International Fire Service Training Association (right), and Sean Carroll from the Congressional Fire Services Institute (left), presented Senator John McCain (AZ) with the CFSI Legislator of the Year Award in Senator McCain's Washington, DC office on June 22, 2006. Senator McCain serves as Honorary Co-Chair of the Congressional Fire Services Caucus and has been instrumental for many years in the passage of critical Spectrum legislation, as well as many other important issues that have benefited our nation's fire service and the people they protect.

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Photo Courtesy Scott LaPrade

and trigger points to the tragedies. Certainly, for example, incident command breakdown or poor fireground air management or bad tactics have been mitigating factors in firefighter deaths, but they are not the ultimate root causes for them. We won't see the kind of positive progress in death and injury reductions until these root causes are accepted, contemplated, and addressed in every aspect of fire department operations.

One of the great fire service thinkers and doers, Tom Brennan, said success and safety at a structure fire attack are intertwined—*and even the same thing*—and are achieved by enough well-trained, well-equipped, and experienced "thinking firefighters" correctly performing immediately necessary tactics support the correct strategy in coordinated fashion under the supervision of seasoned officers. Failure to actualize this basic truth jeopardizes the success and safety of the operation, along with our chances of surviving the fire building that we didn't, in Brennan's words, "make behave." And so our preventable fireground line-of-duty deaths and injuries continue.

In assessing or investigating a fire that "got away" (or worse), we might identify that, for example, "they didn't stretch a backup line for the second floor search." Such assessments beg for further discussion about firefighting operations within the context of Brennan's Law. But the remedy usually isn't accomplished by a chief's bulletin because most often the operational failures or inadequacies were set up long before the fire ever occurred. And these fomenting operational failures reveal hard realities about your organization as a whole in its ability to help protect its members through formal structures; about your ability to lead; about your preparedness and capabilities as a fire department and as firefighters; about your decision-making abilities in crisis mode; and about the seriousness with which you take your personal responsibility to your fellow firefighters, your families, and yourselves.

These five elemental areas—policies/procedures, leadership, preparedness, decision making, and personal responsibility—in some way underlie every fire department operation and action. And preventable line-of-duty deaths (and injuries) can be traced back to, either alone or in combination, the lack of them.

Policies and procedures reflect "must have," nonnegotiable items for firefighter safety. The span the gamut from fireground SOPs to seatbelt regulations to policies on fire attack strategies for vacant structures. They must be adhered to and enforced.

Leadership takes many forms, from making the case (and fighting the good fight) in city hall for adequate personnel to personal conduct in the fire station to a firm gloved hand on a probie's shoulder to help get him through his first tough fire. Good leadership means you're a living example that firefighter safety takes second place to nothing else in this business.

Preparedness refers to every individual and organizational ingredient, mental and physical, that results in enough well-trained, well-equipped, and experienced "thinking firefighters" correctly performing immediately necessary tactics that support the correct strategy in coordinated fashion under the supervision of seasoned officers—that is, everything that contributes to the adherence to Brennan's Law.

There are many theories and methods of decision making, but the bottom line is whether or not we're training firefighters and officers who can read fire buildings so well as to not be "surprised" by the "sudden" change building/fire behavior, and for whom conducting a rapid, organized decision process under stressful conditions is second nature.

Personal responsibility is, of course, just that. You have to have it. You have to take it. Leadership must nurture and demand it. You are personally responsible for not becoming a victim and personally responsible to see to it that your brothers and sisters don't become victims. It's the foundation for safe fireground operations and the organizational systems that support them. Firefighter safety is everyone's *personal* responsibility, from the chief of department to the probationary firefighter.

Today's rapid dissemination of information and avenues for discussion bring into clearer focus the fire service's continual tactical and systemic failures at fireground operations. These failures, and the operational results from them (in failing to make the building behave), must be part of an analysis that leads to operational correction and improvement. But it doesn't end there.

Manual firefighting is a human endeavor. Preventable line-of-duty deaths result from human behaviors and human decisions that failed in an unforgiving, dangerous environment. The fix—becoming better at making the building behave or knowing when not to try anymore—requires correction at the source, at the level of the five root causes. Behaviors then are modified and controlled to where they become engrained in the operational fabric. As scientific behavioral studies have shown, this yields a natural, positive progression in attitudes and beliefs about safety. And combined, safer behaviors and healthier attitudes toward safety create a "new" organizational safety culture that will appreciably reduce firefighter line-of-duty deaths and injuries nationwide—and, possibly, in your fire department.

***Bill Manning, Vice President, Business Development, Anderson Manning Media Group**. Bill Manning is an award-winning editor, writer, speaker, and producer. He has 24 years of experience in the publishing business. For 15 years he served as editor in chief of Fire Engineering magazine. Upon the acquisition of the Fire Department Instructors Conference (FDIC), he assumed the role of conference director, building that conference into the world's largest fire training event. Bill currently serves as communications director for the National Fallen Firefighters Foundation's Everyone Goes Home program.*

FPP On The Road*

Oklahoma Terrorism Conference
Tulsa, OK
October 4-6, 2006

Illinois Fire Chiefs Association Annual Conference
Peoria, IL
October 16-19, 2006

Minnesota Fire Chiefs Annual Conference
Duluth, MN
October 18-21, 2006

Fire Rescue East
Jacksonville, FL
January 26-27, 2007

Firehouse World
San Diego, CA
February 27 – March 1, 2007

***Please note that show dates may be subject to change.**