



Fire Department

Mark Rohlfing
Chief

Gerard Washington
Assistant Chief
Michael Payne
Assistant Chief
Paul Conway
Assistant Chief

April 25, 2012

To the Honorable
Mayor Tom Barrett
Mayor of Milwaukee
200 East Wells Street, Room 201
Milwaukee, WI 53202

Members of the Common Council
200 East Wells Street, Room 205
Milwaukee, WI 53202

RE: Pickup Truck with Ultra-High Pressure Water Systems for Emergency Response (Resolution #110959)

Dear Mayor Barrett and Members of the Common Council,

This letter reflects my research into the viable benefit and use of pickup trucks equipped with an ultra-high pressure water system for use in the City of Milwaukee by the Milwaukee Fire Department.

ULTRA-HIGH PRESSURE WATER SYSTEM

Resolution #110959 questions if the Milwaukee Fire Department (MFD) may be able to increase the efficiency of fire suppression systems, as well as EMS response and transportation, by using an ultra-high pressure (UHP) firefighting system mounted to a pickup truck.

Pickup trucks and other small service vehicles are not used widely in the American Fire Service. Where they are used, they are used in specific roles such as:

- Specialty apparatus that augment a department's response capability.
- Supplements to their full-size apparatus, for very specific uses such as wildland firefighting.
- Response vehicles to some types of EMS calls.

They do not replace traditional apparatus; they are used as additional resources.

Resolution #110959 states that the ultra-high pressure firefighting systems are used by other fire departments as an alternative to engine and ladder trucks when fighting all fires other than internal structure fires. I have found no information that would agree with the above statement; although I have found some fire departments that are using small vehicles with water systems. These vehicles are not used as replacements for full-size engine or ladder trucks. I have found no departments that are using an ultra-high pressure system mounted on a small vehicle as a replacement for Class 1 engines.

The HMA Fire ultra-high pressure fire suppression system is essentially a high pressure pump and motor attached to a water tank with a hose on a reel with an adjustable nozzle. A combination of the nozzle and the high pressure breaks up the water droplets to about one-tenth their normal size. The effect is that less water will cover a larger total surface area. The nozzle delivers 20 or 30 gallons per minute (depending on the system and nozzle that is purchased). The system is built on a skid and can be mounted on the bed of a standard $\frac{3}{4}$ - or 1-ton pickup truck, an all terrain vehicle, or a standard fire truck (with modifications).

While the system has merit it is not a “new concept” as marketed by HMA Fire. The concept of using high pressure and high intensity fog nozzles under pressure has been around the fire service for many years.

Many departments including Milwaukee used booster lines (a smaller diameter hose line) on their Class 1 engines as a means to allow firefighters to apply small amounts of water with fog nozzles to small exterior fires. These smaller hose lines have been removed from most Class 1 engines used in urban environments because of safety concerns. These small diameter lines are still available on all NFPA Class 3 (wildland / brush firefighting apparatus) and Class 6 (compressed air foam) type engines. Class 3 and Class 6 type engines are designed to fight exterior fires such as wildland fires, grass and brush fires, and small exterior off-road fires and are used almost exclusively in the wildland arena.

The ultra-high pressure fire suppression system that is used by the Middleton (Wisconsin) Fire Department that was demonstrated at MATC, and I reviewed, is manufactured by HMA Fire in Madison Wisconsin. It is marketed as an “attack system for fuel, forest, wildland, grass, and vehicle or structure fires.” The system when mounted to a small vehicle is limited to a 100-gallon water tank.

After reviewing the system I agree that the system is capable of being used in all the above mentioned applications, within the limitations of the system’s water supply and only for small exterior structure fires. The HMA system when attached to a vehicle that is capable of leaving hard surface roads in an environment without adequate water could be a very valuable tool in handling wildland fires, grass fires, and fuel fires.

The Middleton Fire Department currently uses an HMA ultra-high pressure fire suppression system. The system is carried on a command vehicle; a one-ton pickup truck. The

Middleton Fire Department protects a population of approximately 30,000 and covers 54 square miles; it is located on the western edge of Madison. Middleton is a small combination department; they have volunteer firefighters (paid on-call) with four full-time paid command officers.

I spoke with Assistant Chief Gary Gillitzer during my visit to Middleton. Chief Gillitzer was very clear about how the department uses their UHP system from HMA. When they receive a fire call, the full-time paid command officer responds to the fire call (a volunteer firefighter will also respond if one is available) with the command vehicle carrying the HMA ultra-high pressure fire suppression system. If the command officer can use the system to keep a fire in check or to begin putting out a dumpster fire, car fire, or small exterior fire, they will immediately engage it. They use the HMA system to try to reduce the effects of the fire while their volunteer firefighters are responding, first responding to the station, and then to the fire call in their Class 1 engine. They do not use the system for interior attack; however, they will at times use the UHP system at a structure fire but always in conjunction with a hand-line off of a Class 1 engine. They rely on their Class 1 engine, the tools, and firefighters it carries to respond and mitigate their fire calls. They also use the UHP system for fighting brush, grass, and wildland fires.

The Middleton Fire Department responds to two or three “working building fires” per year. Middleton currently is building a rescue apparatus that will have an HMA system fit onto this full-size apparatus; they see the HMS ultra-high pressure system as “another tool” on their new rescue truck.

After review of the ultra-high pressure fire suppression system as demonstrated by HMA Fire, I have concluded that the purchase of the ultra-high pressure fire suppression system by the Milwaukee Fire Department would not be a wise use of taxpayers’ dollars. The HMA ultra-high pressure fire suppression system does not add any “new” ability to our department’s firefighting assets. The Class 1 engines we use every day are able to handle all our fire and rescue responses which make up only 16% of our call volume. We do not respond to wildland fires and our incidents of fuel fires and grass fires are very low. We do not need to duplicate our capacity by adding ultra-high pressure systems.

The Milwaukee Fire Department’s decision not to purchase the ultra-high pressure fire suppression system is based on the following reasons.

1. **SAFETY.** We need an adequate amount of water applied appropriately to the fire to keep our firefighters safe.
Safe, effective, and efficient fire control requires:
 - Sufficient water to control the fire environment as well as direct attack on the fire. Our interior-reduced attack lines supply anywhere from 180 to 200 gallons per minute (UHP 20-30 gallons/minute).

- An appropriate flow-rate for the correct tactical application (cooling hot, but unignited gases may be accomplished by using an indirect fire attack at a lower flow rate than a direct attack* on the fire).
- A direct attack to exceed the critical flow** based on the fire's heat releases.
- A sufficient reserve (flow rate) must be available to control potential increases in the heat release rate that may result from changes in ventilation.
- Water application in a form appropriate to cool its intended target. (This could mean a direct attack or small droplets [fog] to cool hot gases or to cover hot surfaces with a thin film of water [indirect attack].)
- Water to reach its intended target. (Fog stream to place water into the hot gas layer and a straight or solid stream to pass through hot gases and flames and reach the fire or hot surfaces.)
- Control of the fire without excessive use of water.
 - *Direct attack usually indicates using a straight stream pattern to put water on the seat of the fire.
 - **Critical flow is the water flow necessary to control and extinguish the fire.

While the ultra-high pressure fire suppression system provides an alternate means of putting water on a fire, it does not provide the necessary capabilities that we need to safely, effectively and efficiently, control and extinguish every fire.

2. **CURRENT RESOURCES.** The Milwaukee Fire Department has thirty-six (36) Class 1 engines that meet all the appropriate National Fire Protection Association (NFPA) 1901 standards. These engines provide all the capabilities we need to safely, effectively, and efficiently extinguish the fires we respond to in our urban environment.

The ultra-high pressure system feature of breaking down the water droplets into very small particles is a benefit and does allow for very efficient steam conversion. This higher efficiency steam conversion does use less water and HMA markets the system as a low-water-use system. The same steam conversion principal is employed when we use our standard fog setting on our 1-3/4" reduced attack lines. Although the HMA UHP system uses less water to convert heat to steam, the amount of water actually used to extinguish a fire is dependent on the size and extension of the fire, and the firefighter who is operating the nozzle.

3. **NATIONAL FIRE PROTECTION ASSOCIATION STANDARDS.** The HMA ultra-high pressure fire suppression system does not meet the NFPA standards for interior firefighting. As per HMA they are working through the NFPA certification process; hoping to receive certification. The certification process is slow and difficult; the time frame stated by HMA representatives is at least five (5) years. The small engine that drives the water pump also does not meet NFPA standards (NFPA 1901 Chapter 16, Fire Pumps and Associated Equipment - see attached); it

is not considered reliable enough for the system to be used for interior firefighting. We must have a reliable water supply whenever our firefighters attack a fire, either when they enter a burning structure or when we are facing exterior fire conditions.

Further, the ultra-high pressure fire suppression system mounted on pickup trucks does not meet NFPA standards (NFPA 1901 Chapter 6, Initial Attack Fire Apparatus Standards - see attached).

4. **COST.** The cost of the system, \$20,000 for the HMA ultra-high pressure fire suppression system skid, and \$40,000-\$45,000 for the trucks to carry the system, adds a very expensive piece of equipment to our apparatus fleet that has a very limited capability. We would be spending tax dollars to duplicate our current fire extinguishment capacity. The pickup truck with the HMA UHP skid also leaves very little room for additional equipment.
5. **INNOVATIONS.** New ideas and innovations must meet the needs of the department. The ultra-high pressure fire suppression system would seem to be innovative and offer the fire service a “new” approach to a very old fire extinguishment problem. In some applications it may be more efficient; however, it does not add a “new” approach that can effectively be used by the MFD in the urban environment that we serve. The Milwaukee Fire Department is always looking for new and innovative equipment and/or techniques to make our job safer and to provide a better service to the citizens of Milwaukee. This system and delivery method does not offer that innovation.

SMALL RESPONSE VEHICLES / PICKUP TRUCKS

The Milwaukee Fire Department has made the decision not to pursue the purchase of the ultra-high pressure fire suppression system mounted on pickup trucks, but is actively continuing to study the use of pickup trucks for emergency medical services (EMS) responses. Before making the decision to use smaller vehicles to respond to EMS calls we need to make sure that we are satisfied that safety and response times will not be compromised and that spending capital dollars for smaller vehicles makes fiscal sense. The following concerns are being further studied.

1. **SAFETY.** The safety of the men and women of the Milwaukee Fire Department is my greatest concern. To routinely respond in a pickup truck with only EMS capacity could put both our firefighters and the citizens of Milwaukee at risk. We are currently reviewing the risks of responding to EMS calls in a pickup; the increased risk comes from being in the pickup truck returning from an EMS call and being dispatched to a fire/rescue call. Our challenge/task is to see if we can find locations in the city that would work for the small truck response that does not significantly increase the risk to our firefighters and citizens.

Fire departments respond with Class 1 engines and ladder trucks because they have been designed with fire and rescue emergencies in mind. They are equipped with the necessary equipment required to handle all the emergencies routinely responded to in order to effect positive outcomes. Each time we leave our station we must be as prepared as possible to handle the emergency we may be dispatched on. Even though only 1% of our calls are structure fires, those fire calls represent our most serious and critical calls. They are low-probability high-danger calls. We are looking at the statistics to make sure that if we choose to use smaller vehicles that we do the best job we can to mitigate the risk of having our firefighters in service in the wrong apparatus. I want to minimize the chance of a Milwaukee fire company being without the proper apparatus or equipment when called to a fire emergency. It is imperative that solid response data drive our decision. If we decide to use small trucks for EMS responses we need to make sure we assign them in the appropriate stations.

The need for quick response times and immediate action at fire scenes is more important today than it has ever been. Today we are faced with fires that grow and spread very quickly. Because of large increases of synthetic materials in modern homes and businesses, including foams, plastics, vinyl, and volatile coatings, we are now experiencing fires with higher rates of heat-release than ever before. These fires are also spreading faster than ever before.

The benchmark for the American Fire Service when attacking interior fires is to attack the fire before flashover occurs. If we can aggressively extinguish or control the fire before flashover we have a good chance of saving lives and minimizing property damage. When home furnishings and floor coverings consisted of mainly natural materials, upon arrival at a fire scene we had enough time (29 minutes 30 seconds*) before flashover to make an effective fire attack and do our rescue work. Today, we are lucky to get to the scene moments before flashover. In a modern home flashover can occur as early as 3 minutes and 30 seconds* into the fire. Historically under the best conditions we make our interior attack at the 8- to 9-minute mark in the fire. This fast-fire spread combined with modern construction techniques make a home unsafe to enter at times within 5 to 10 minutes of fire growth. These conditions put the public and our firefighters at great risk very early into the fire and necessitate good response times and immediate action once we arrive at the scene. In these critical situations we do not have the luxury to be in a pickup truck without the needed equipment, tools, and means to quickly respond and aggressively attack a structure fire. Although 1% of our calls are working fires, approximately 16% of our calls are fire and rescue calls in which the equipment and tools we carry on our Class 1 engines and trucks are needed. We should not use alternative vehicles when we respond to our fire and rescue calls.

*Underwriters Laboratory experiment, the Comparison of Modern and Legacy Home Furnishings under fire conditions.

2. **EFFICIENCY and EFFECTIVENESS.** For the Milwaukee Fire Department to be efficient and effective when responding to fire and EMS calls we need to make sure:
 - We respond to our calls for service within the National Standards, as defined in NFPA 1710.
 - The response apparatus we respond with has the tools and equipment necessary to mitigate the emergency.
3. **EFFECTIVE EMS.** For the pickups to be effective response units for EMS responses they need additional fire and rescue equipment tools and a full complement of BLS supplies and equipment.
4. **ENSURE EFFECTIVENESS OF CHANGE.** Change and innovation are encouraged and highly desirable, but that change and innovation must work for the department. The Milwaukee Fire Department is actively gathering the data to see if the placement of pickup trucks appropriately located for EMS responses would increase our efficiency while not significantly increasing our risk. We also must make sure that there is enough financial savings to move forward with a small-vehicle placement plan. This change must be a wise monetary investment for the City.

Sincerely,



MARK ROHLFING
Chief

MR/cf

Mayor\High Pressure Water System (Resolution #110959)
Attachment

cc: Mike Tobin/F&P
Patrick Curley/Mayor
Jodie Tabak/Mayor