

AIRSPACE

MONITORING SYSTEMS

Finally, Carbon Monoxide and Gas Detectors you can afford to own!

Testing performed by:



January 19th, 2018

**Live Burn HCN Monitor Field Test
For Airspace Monitoring Systems, Inc.**

18-01

Note: All testing was performed by Midway Fire Rescue independent of Airspace Monitoring Systems, Inc. Airspace provided a pre-production monitor as well as guidance on testing procedures and goals. The findings and opinions in this report are those of Midway Fire Rescue exclusively.

Audience Description:

Midway Fire Rescue Personnel (B-Shift and A-Shift)

Personnel are trained to a minimum of Firefighter 1 / Emergency Medical Technician

Prerequisite:

All personnel must have proper PPE and SCBA Fit Testing on file

Lesson Goal:

Upon successful completion of this testing, personnel will be able to understand the monitor's capabilities and offer feedback to the manufacturing facility (Airspace Monitoring Systems Inc.)

Hydrogen Cyanide Definition:

Hydrogen cyanide is a by-product of the combustion of materials used in products used in everyday life (insulation, carpets, clothing, and synthetics). The culprit is nitrogen. Nitrogen gas in atmospheric air can contribute (under the right circumstances) to the formation of minute amounts of cyanide during combustion. High temperatures and low-oxygen concentrations favor the formation of cyanide gas.

HCN is extremely toxic and seriously affects the body. Following are some facts about hydrogen cyanide³:

- HCN is 35 times more toxic than CO.
- HCN is produced when products such as wool, silk, cotton, nylon, plastic, and polymers, foam, melamine, polyacrylonitriles, and synthetic rubber burn.
- HCN can enter the body by absorption, inhalation, or ingestion and targets the heart and brain.
- HCN can incapacitate a victim within a short time.
- HCN has a half-life of one hour in the blood.
- HCN is highly flammable, and most of it will burn away during combustion.

Cognitive Objectives:

Discuss Midway Fire Rescue's Policy operations during a live burn.

Understand the capabilities of an Airspace HCN monitor.

Explain proper use and importance of wearing proper PPE for Live Fire Training.

Explain proper operation of fire apparatus.

Psychomotor Objectives:

Identify the capabilities of a single gas HCN monitor.

Explanation of HCN Monitor Testing:

The testing team will start a fire in the rear of the Midway Fire Rescue Burn Building. The burn will utilize a couch and carpet to create the HCN environment. The team will allow the fire to free burn for approx. 10 minutes or until the contents are burnt down to an acceptable amount.

During the burning process, readings from various distances from the burn building will be taken (20, 15, 10 and 5 feet) at all sides of the burn building. These readings will be recorded on a recording sheet.

Once the burning process is complete and the fire is extinguished, a crew of two will enter the burn building wearing turn out gear and self-contained breathing apparatus to take readings from the doorway and every five feet until the origin of the fire. These findings will be recorded on a recording sheet.

After the burning process, the burn building will be vented for (10 & 15) minutes with a fan and monitoring will be taken again from inside the burn building every five feet until the origin of the fire. These findings will be recorded on a recording sheet.

Note: A Midway Fire Rescue engine will be on site with a qualified engine company operator pumping the apparatus. A single hoseline will be in service during the entire event.

Recommended list of equipment needed:

- Midway Reserve Engine (812)
- Instructors
- AirSpace INC. HCN Monitor
- Orange Marking Paint

Recommended Schedule:

- Practical evolution: 1-3 Hours.
- No units will be call responsive during this experimental HCN monitor testing.
- On site command, can terminate operation at any time for any reason.

Start: 0800 Hours

End: 1200 Hours

WEATHER:

Temperature: Low of 33 Degrees F, High of 56 Degrees F

Humidity: 43%

SAFETY:

Safety is paramount, operating around the burn building will require full turn-out gear and SCBA.

PROPER EQUIPMENT:

Full Turn Out Gear

Self-Contained Breathing Apparatus

Instructor Information:

Command Officer: Lieutenant Peter Copeland

Operations: Firefighter II Justin Lenker

Safety Officer: Firefighter II James McGloin

Co-Instructors: Firefighter II Joshua Herncane

Co-Instructors: Firefighter I Joshua Deleuze



Midway Fire Rescue Air Monitor Recording Sheet

During Free Burn Stage

Outside Monitoring, Parts Per Million (PPM)

<u>Side A, 20 Feet</u>	<u>Side A, 15 Feet</u>	<u>Side A, 10 Feet</u>	<u>Side A, 5 Feet</u>
1 PPM	0 PPM	2 PPM	2 PPM
0.5 PPM	0 PPM	1 PPM	1 PPM
<u>Side B, 20 Feet</u>	<u>Side B, 15 Feet</u>	<u>Side B, 10 Feet</u>	<u>Side B, 5 Feet</u>
0 PPM	0 PPM	1 PPM	1 PPM
0 PPM	0 PPM	1 PPM	2 PPM
<u>Side C, 20 Feet</u>	<u>Side C, 15 Feet</u>	<u>Side C, 10 Feet</u>	<u>Side C, 5 Feet</u>
0 PPM	0 PPM	1 PPM	1 PPM
0 PPM	0 PPM	1 PPM	2 PPM
<u>Side D, 20 Feet</u>	<u>Side D, 15 Feet</u>	<u>Side D, 10 Feet</u>	<u>Side D, 5 Feet</u>
0 PPM	0 PPM	1 PPM	1 PPM
1 PPM	0 PPM	0.5 PPM	1 PPM

Airspace Monitoring Systems Inc. monitor is the top reading

Competitor's commercially available multi-gas monitor is the bottom reading

After Extinguishment

Inside Monitoring, Parts Per Million (PPM)

<u>Doorway</u>	<u>5 Feet Inside</u>	<u>10 Feet Inside</u>	<u>15 Feet Inside</u>	<u>20 Feet Inside</u>	<u>25 Feet Inside</u>
3 PPM	5PPM*	5 PPM*	5 PPM*	5 PPM*	5 PPM*
2 PPM	3 PPM	6 PPM	18 PPM	20 PPM	35 PPM

Fan Venting

Inside Monitoring, 10 minutes, Parts Per Million (PPM)

<u>Doorway</u>	<u>5 Feet Inside</u>	<u>10 Feet Inside</u>	<u>15 Feet Inside</u>	<u>20 Feet Inside</u>	<u>25 Feet Inside</u>
1 PPM	1.5 PPM	1 PPM	1.5 PPM	1 PPM	3 PPM
0.5 PPM	1 PPM	0.5 PPM	0.8 PPM	1PPM	5 PPM

Fan Venting

Inside Monitoring, 15 minutes, Parts Per Million (PPM)

<u>Doorway</u>	<u>5 Feet Inside</u>	<u>10 Feet Inside</u>	<u>15 Feet Inside</u>	<u>20 Feet Inside</u>	<u>25 Feet Inside</u>
0.5 PPM	1.5 PPM	1 PPM	1 PPM	1 PPM	3 PPM
0.5 PPM	1 PPM	0.5 PPM	0.5 PPM	2 PPM	5 PPM

Airspace Monitoring Systems Inc. monitor is the top reading

*Pre-production Airspace Monitor was limited by software to a maximum reading of 5ppm.
Feedback about this limit has been forwarded to Airspace.

Competitor's commercially available multi-gas monitor is the bottom reading

Summary

After acceptance of the training plan to complete the drill by the Midway Fire Rescue administration was obtained, a date was set to test the pre-production Airspace HCN monitor under live fire conditions. By speaking with Airspace prior to the live fire exercise, we knew the monitor may not “zero” immediately upon startup, which is a process they are working on along with the boot up saying CO/LEL, not HCN. We didn’t see much difference in the humidity as we didn’t have any high humidity during the testing. During start up, the monitor would alarm but after a few minutes of running, it would “zero” out. The company deemed this normal in that software package and will be adjusted prior to release.

The morning of the live fire monitor testing, the crew had clear skies and mid thirty-degree temperatures. A room was furnished in a “Conex” container with synthetic materials that included a large chair, two couches, boxes wrapped as Christmas gifts, a Christmas tree and carpet (walls and floor). This was to create the environment needed to successfully test a HCN monitor in real time.

The fire was set, and it was found that in under 6 minutes conditions deteriorated in the Conex container. The conditions simulated a fully involved fire burning all materials in the room with temperatures that peaked at 1400 degrees Fahrenheit.

The crews made multiple rounds around the Conex container to try and capture readings during the free burn stage of the drill. The highest HCN readings being two parts per million in various areas of the structure. After the fire almost burned itself out, a crew checked multiple areas in the structure for readings and were successful in capturing great readings peaking the Airspace HCN monitor at 5 ppm. The crew also had another commercially available multi-gas monitor to see if comparable levels were achieved which was successful.

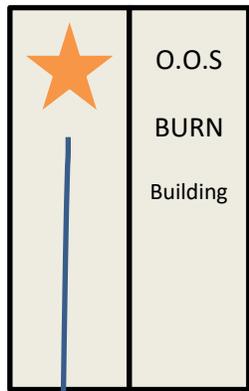
At the end of the extinguishment phase, a crew placed a fan at the door and blew “clean” air into the Conex for ten and fifteen minutes to simulate venting the structure. The crews then re-entered and took readings. This was also successful in lowering the readings and capturing valuable information.

Overall, a lot of planning and preparation went into making this live burn a success. The success of this training was due to a group of people willing to put time into making this successful and seeing how the equipment that Midway Fire Rescue utilizes works. These monitors are life changing devices that help emergency responders function on a daily basis.

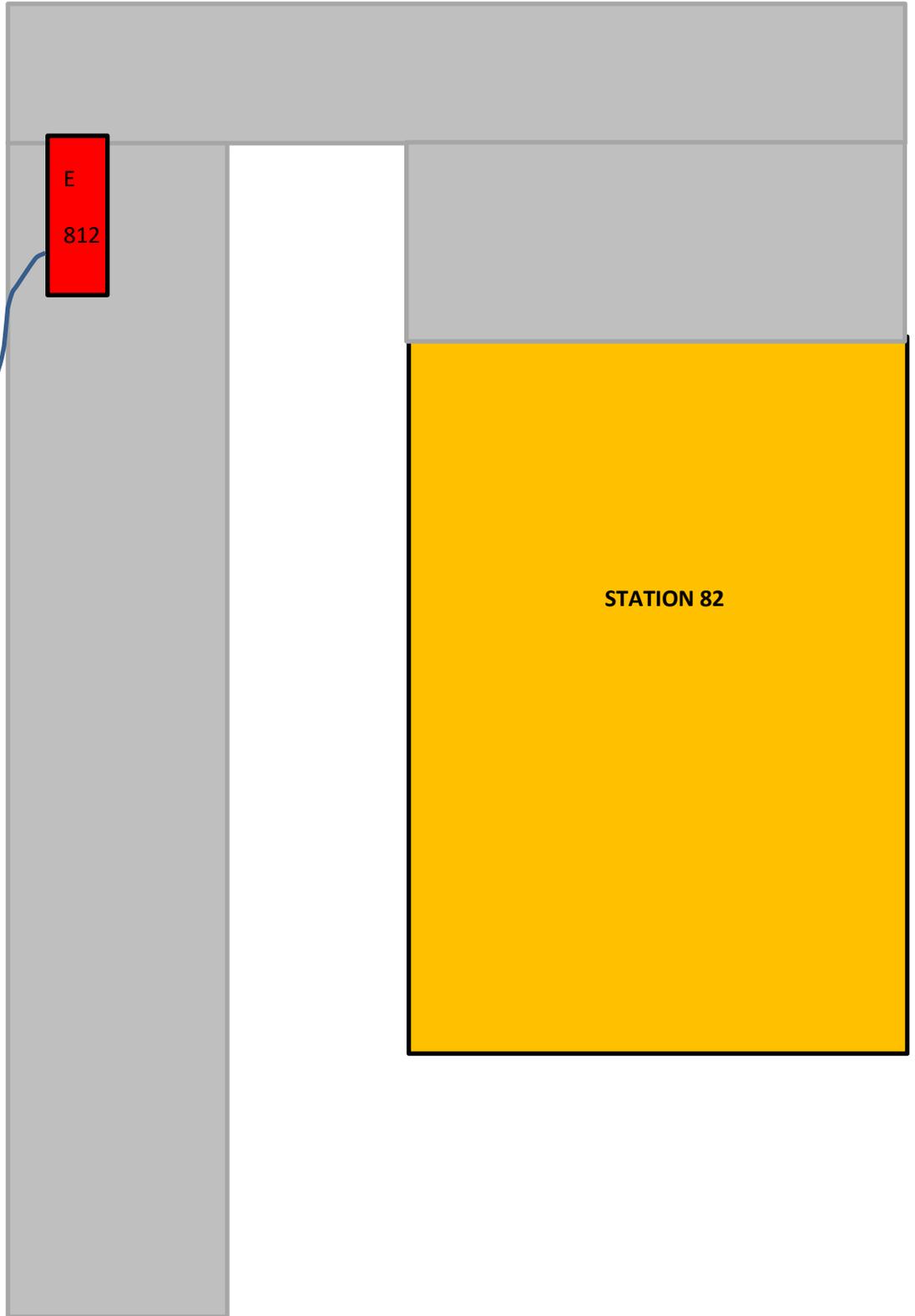
The battery life was also impressive staying on for forty-eight hours straight until dying under no working conditions and lasting over 20 hours with fresh batteries before the burn started until well after the burn was complete.

After the final numbers came out for how successful the air monitor performed, all personnel were impressed on how the monitor preformed and how successful it was compared to the much more expensive multi-gas monitor. We feel this monitor will be a home run when released because of the cost and ease of use.

Diagram



Star: Burn Area
Blue Line: Hoseline



Pictures of HCN Burn

