



WSI-SRS Team

Safely Deploying Tactical Smoke
Grenades During Performance
Testing Activities



Speaker Biography



- Dan Hendricks began his career with WSI-SRS in 1984. His initial service was as a Security Inspector at C Reactor on SRS. He completed Special Response Team training as class honor graduate in 1985 and served in several positions to include SRT team sergeant and SRT lieutenant. In 1989 he became the force on force exercise planner for WSI-SRS. In 1991 he was asked to create and manage the WSI-SRS Special Operations Training Dept., serving as its manager for 16 years. Currently he is the senior technical advisor for the WSI-SRS Director of Plans and Infrastructure. In this position he assists in vulnerability assessments of site facilities, is a member of the emergency response staff and supports the performance testing program of security forces at SRS.



Background and Objective



- Upon reviewing the test data from Sandia Labs, WSI-SRS with approval from DOE-SR worked with the PTWG to consider additional testing replicating tactical deployment conditions for outdoor use.
- It was decided that outdoor use was still desirable if it could be safely deployed. The PTWG tasked WSI-SRS to conduct these tests.
- A test plan for outdoor sampling was created to simply answer the question “*Are IDLH concentrations occurring?*”



Methodology



- With respect to the analytical difficulties with collection of sufficient masses of material to analyze at the lab, multiple tests were called for.
- The test plan sought to maximize the chances that airborne obscurant smoke would pass over staged sample collectors in the downwind area.
- The test criterion for acceptance was simply no results greater than specific IDLH values for the three contaminants (formaldehyde, crotonaldehyde and acrolein).



Methodology (continued)



- On October 14, 2008 at SRS, a single smoke grenade was activated to demonstrate the general vector of wind direction at the test location.
- A carpenter chalk line was used to mark the centerline of the plume to stage samplers along.
- Samplers were staged at 10, 12, 15, 25 and 50 feet from a grenade deployment location.
- SKC sampling pumps were calibrated to a targeted flow rate of one liter per minute (1000 cubic centimeters per minute).
- SKC sampling pumps were connected to 5 feet of tubing using sample media 226-119 impregnated with 2,4-dinitrophenylhydrazine (DNPH).



Methodology (continued)



- Minimum targeted values of at least 16 liters (16 minute sample duration) were collected.
- The model 8210 smoke grenades actually produced smoke for less than one minute. Additional pumps and samples were put out before each of the subsequent grenades, and previous samples were left running so as to increase the odds of significant masses of analytes occurring as more smoke crossed the samplers.
- A total of three tests were conducted, with adjustments made to compensate for slight wind shifts during each test.
- All sample media was refrigerated before and after the test program. A chain of custody was included and samples were shipped refrigerated the same day to Analytics, Inc. in Richmond, Virginia.
- Fifteen samples, one control sample and two field blanks were analyzed with an Aldchye Scan using an EPA approved method.



Results



- Across all samples, acrolein and crotonaldehyde were not detected above their respective limits of detection (0.05 micrograms for acrolein, 0.4 micrograms for crotonaldehyde).
- Most samples did collect sufficient mass of formaldehyde for analysis. In all cases, the formaldehyde concentration captured through this sampling test plan were far below the current IDLH-I value as published by NIOSH of 20 ppm (parts per million).
- The highest concentration calculated from the sampling data occurred during this test at a distance of 12 feet (Station 3, Test #2) at 0.11 ppm.
- The results show that no occasion of analyte concentration exceeded the applicable IDLH value.



Post Activities



The WSI Risk Evaluation, *Engagement Simulation Systems Exercises and Performance Tests*, was updated addressing the hazards and controls associated with the use of smoke grenades outdoors and ensured compliance with the requirements identified in DOE M 470.4-3A, *Contractor PF Manual, Attachment 1, Appendix B (Pages B-25 through B-26)*, which identifies the following requirements:

- (a) Smoke and obscurant generating pyrotechnics may not be used indoors or in confined spaces.
- (b) Planning for smoke use must address the possible effects on facilities, production processes, workers, and other parties (e.g., nearby roads and vehicle drivers, adjacent facilities and workers, air intake systems).



Post Activities (continued)



- (c) Participants must avoid unnecessary exposures to smoke systems by staying upwind of the smoke, where possible; by avoiding entry to the smoke cloud; by limiting the time traversing the cloud; and by choosing routes involving the least densities of smoke consistent with the tactical objective. Full immersion in high-density smoke for extended periods shall be avoided where possible. If immersion cannot be avoided, respiratory protection must be used as defined in the risk analysis for the training, performance test, or FoF activity.

- (d) Thrown smoke generators must be deployed by persons trained in their safe deployment methods and knowledgeable of their potential hazards.



Post Activities (continued)



- (e) When thrown smoke generators and other pyrotechnics are deployed in training or testing activities, adequate firefighting equipment and persons knowledgeable in their use must be readily available. (Spark / flame generation)

- (f) Pre-activity safety briefings must address the safety concerns related to the use of smokes and obscurants, the controls for the deployment of smoke, and the safety controls established to control and limit personnel exposures.



Post Activities (continued)



- The resumption of use of smoke grenades outdoors during FoF exercises was presented and approved by WSI Integrated and Executive Safety Committees and the DOE-SR Office of Safeguards, Security and Emergency Services.
- The guidelines for operating near smoke grenades, (Appendix D, PTWG analytical paper), will be used to revise applicable WSI-SRS procedures and risk assessments.
- The use of smoke in the outdoor portions of tactical events will enable more realistic activities yet avoid exposures to participants below IDLH levels.



IH Point of Contact



- For additional information about the IH aspects of this testing please contact:

Mr. Steven Jahn, SRNS Sr. IH Technician
803.557.3828 or steven.jahn@srs.gov



Questions?



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