

SEATTLE CITY FIRE DEPARTMENT
-Training Division-

Evaluation of the Glo-Jo Helmet Band Safety Device:
Testing Its Conspicuity in Zero Visibility Smoke

VENUE: WASHINGTON STATE FIRE TRAINING ACADEMY

DATE: July 15, 2008

TIME: 16:00 HRS to 21:56 HRS.

WEATHER: CLEAR, 80 DEGREES down to 68 DEGREES BY 21:56, NO WIND

This laboratory experiment was conducted for the sole purpose of discovering at what distance the Glo-Jo helmet band would not be visible to the human eye while in zero visibility smoke conditions. The test was conducted on floor four (4) of a 6 story type I building made of reinforced concrete. This building is used for training fires by the State of Washington and for recruit's classes. The City of Seattle Fire Department does NOT use the state facility as it's main training area. Seattle does use the facility for flammable liquid training and some live class A fire training at the end of their recruit school.

The walls and ceiling of the burn tower range from 10-16" in thickness. Inside of the room, on the ceiling and the two walls that contain the fire pit is vermiculite that shields the concrete from extreme endothermic assault causing early failure of the building due to repeated high temperature insult. The fire pit as seen in our evaluation video is in the corner of the room. Any fire pit that is in the corner of a wall with a relatively low ceiling above it will create the fastest growing fire no matter what the material simply due to the reflected heat back into the pit from both walls and the (low) 10' or less ceiling. The fuel used for the test was wood. Wood pallets comprised 95% of the fuel involved on floor 4 for this test. The other 5% were 2 sheets of OSB board to simulate slight plastic involvement as well as other glues and materials used. These sheets of OSB are NOT thrown onto the fire pit. They are placed up against the wall leading to the door entrance (attack pathway) to the room. The OSB is meant for smoke production that would be even less than that of a contents fire in a single-family dwelling of normal fuel loading.

NFPA 1403 was strictly adhered to in these tests and absolutely NO type of ANY accelerant was used. The pilot ignition source was a propane torch used for three minutes to heat the pile of pallets to the point of self-sustained combustion. It was at this time that the room was closed down simulating an incipient or growth stage fire in the room. All (metal) windows and doors were closed. It would be safe to assume that there was about 10-20 cubic feet/min. of air that was leaking in during the growth stage due to imperfections in the building near the windows and doors.

The fuel loading was as follows:

8000 BTU's/ lb. and 10 lbs/sq. ft, for the test this included 12 pallets and two sheets of OSB board.

The above is considered the normal fuel loading in our industry and it is also what the building construction methods and tests are based off of as well for a "normal fuel" building. It is known that fires in buildings with increased fuel loads will develop faster; as the opposite is true in buildings that have decreased fuel loads, as they develop slower. The objective of THIS test was to see how the Glo-Jo helmet band behaved in "zero" visibility. It should be noted, that the fire development speed was not a concern, the conditions inside the room simply needed to be "zero visibility qualified".

Clarification that parameters were closely adhered to with this test should be noted, as any test that does not validate use of fuel loading requirements is simply inconclusive. The building materials used in our test were based off of the standards that are in place regarding industry fuel loading estimations. Although many disagree with the time temperature curve that was developed long ago, it still holds true in the standards of our industry, and as it pertains to our testing.

Efforts to replicate extreme low visibility conditions were made, as it is known that fires inside compartmentalized buildings become ventilation controlled very quickly. A ventilation controlled fire has a lower heat release rate, but releases greater amounts of gases and smoke that are not burned away due to the low temperatures inside the area of origin. Because of the lack of ventilation, smoke density occurs; which is the compression of smoke particulates in a given area. These conditions present themselves as thick black smoke, "zero visibility" conditions that will fill a room and often entry areas during the approach. Until these fires vent themselves or external intervention takes place, these fires are the worst case scenario as far as visibility conditions are concerned. The environment created for this test involved an extreme, dense, smoke condition; or a visibility condition representing what would be a worst case scenario.

Zero Visibility Qualified: For this test, "Zero Visibility" was defined as the firefighter not being able to see his/her hand 4" Inches in front of his/her face with a face-piece on.

TEST RESULTS WERE AS FOLLOWS:

The firefighter's Glo-Jo helmet band sat at a height of 42" Inches off of the floor. (This is a butt-on-the-heels position). The firefighter in a crawling position had the Glo-Jo helmet band at 34" Inches off of the floor. In these conditions, the results did not vary. The following "Foot" marks are measured horizontally into the zero visibility environment with a band height of 42" Inches off the floor. At the 1' Foot mark, visibility was good and can be seen by the camera and the firefighter just outside the zero visibility environment. At the 2' Foot mark visibility was still good by the firefighter at the door looking in. At the 3' Foot mark visibility drastically dropped off. As the firefighter in the zero vis. room slowly moved along the measurement back to the door, every inch gained created a brighter illumination of the band to the firefighter on the outside looking in. It was measured that at 2' Foot 9" Inches or a total of 33 Inches; within a zero visibility environment (thick black under-ventilated, oxygen controlled environment), visibility of the Glo-Jo helmet band was adequate enough for a firefighter who would be looking for their partner, thus offering a reasonable outcome that someone could successfully be recognized without effort. This would be just beyond a normal reach of the hand from the body of 22 to 26" Inch arm length. Once again, this recognition was accomplished at a measurement of 42" Inches off of the floor. As the Glo-Jo helmet band's position from the floor was heightened, visibility drastically dropped. Beyond 45" Inches the band disappeared from sight to the firefighter looking in. Again the purpose of the test was to create a zero visibility environment, which was successful. The results are true and accurate to the best of the abilities of the facility and the facilitators.

Test Facilitator: Brian Maier, Todd Rademacher, City of Seattle