Thirty-Mile Fire Information

United States
Department
of Agriculture

Forest Service

FIRE SHELTER DEVELOPMENT UPDATE – 4/30/2001

There is concern among firefighters over the progress being made in making improved fire shelter technology available to the field. These firefighters should be applauded for their commitment to their own safety. The purpose of this document is to describe some of steps being taken in their behalf.

Fire Shelter Performance Testing
The key to selecting and approving a new fire shelter has been the development of an appropriate performance test. Art Grand, an expert in fire and toxicity testing from Omega Point Laboratories once cautioned that any product can be tested so it looks good, or it can be tested so it looks bad. With that in mind the Missoula Technology and Development Center (MTDC) recognized that a standard, reliable, repeatable and impartial performance test for the fire shelter is imperative for fire fighter safety. Until now such a test has not been available.

In December of 1998, MTDC gathered a wide variety of experts in thermal protection and toxicity testing to identify the tests necessary to adequately assess fire shelter performance. Participants in the meeting included specialists from Underwriter's Laboratories, SGS-U.S. Testing Company, Gentex Corp., the University of Alberta, Storm King Mountain Technologies (SKM), the USDA Forest Service's Fire Sciences Laboratory and Missoula Technology and Development Center. The upshot of that December meeting was that there was no existing appropriate full-scale test for the fire shelter.

Later, Mark Ackerman, a mechanical engineer and expert in testing of protective clothing from the University of Alberta, was asked to do a complete review of existing test methods and standards. The aim was to identify those that had potential as either material screening tests or that could be used to assess the performance of complete shelters. His conclusion was that there was no existing test method that could adequately measure the performance of a complete fire shelter.

The testing experts told MTDC that an adequate test could be developed if data were provided that describe the fire environment in which the shelter needs to perform. Since this information was not available at the time, MTDC, with assistance from the Forest Service's Fire Sciences Lab, and the University of Alberta gathered this data at the International Crown Fire Experiments in Canada's Northwest Territories in the summer of 1999. This information was provided to the University of Alberta's Combustion and Environment Group, Department of Mechanical Engineering, which accepted a contract in December 1999 to develop appropriate performance tests for the fire shelter. The new tests had to be repeatable so that each shelter would be exposed to the same conditions. To ensure repeatability, the tests had to be performed in a lab. Though much has been learned in field-testing of fire shelters, the widely variable test conditions found in the field make results of such tests questionable. To ensure impartiality, a third party independent test facility must be able to perform the tests.

The work at University of Alberta has led to the development of full-scale radiant and convective thermal tests, as well as several small-scale material performance tests. Jim Roth of Storm King Mountain Technologies accepted MTDC's invitation to tour the lab facilities in Edmonton Alberta, to observe and comment on the test procedures. MTDC contracted with SKM to provide the University of Alberta with shelters made of SKM materials to help ensure that the tests developed would be applicable to a wide variety of fire shelter materials.

The purpose of a performance test is to allow any fire shelter to be reliably tested and compared to any other shelter or against a minimum standard of performance. Radiant and convective (direct flame) thermal testing will measure the shelter's ability to protect against second-degree burn injury and its ability to limit the rise in air temperature in the breathing zone. These thermal tests are done in full-scale because material testing alone cannot account for the effect of design on the performance of the shelter, i.e. an effective material could be made into a shelter that did not offer adequate protection. Strength and durability testing are necessary to ensure that a shelter will not fall apart in windy and turbulent conditions. Flammability testing is required to ensure that shelter components will not offgas and produce flammable mixtures inside the shelter. The volume of the shelter will be measured to ensure that adequate oxygen is available to firefighters in extended entrapments. Toxicity testing is required to ensure that when heated, fire shelter components will not produce compounds that can cause death or long-term harm to occupants. Without these tests we cannot be confident that a shelter will perform as anticipated in an entrapment.

All of these test protocols are to be available for testing fire shelter designs by June 2001.

Fire Shelter Development and Testing

MTDC has been working with personnel from NASA, the Army Research Laboratory, the National Institute of Standards and Technology, U.S. Navy Research at Natick, Mass., Underwriter's Laboratories, the University of Alberta Combustion and Environment Group, and many others, including scores of representatives of private industry to pull together available material and design options for fire shelters. The center's intention is to contract with the University of Alberta to begin small-scale comparative screening in June 2001, and based on these results, to begin full-scale fire shelter testing in September. All promising shelters submitted by that time will be tested. This includes shelters from Storm King Mountain Technologies if they choose to have shelters tested. By testing all promising shelters we give a fair chance to all those who have worked hard on fire shelter development and who have provided shelters or materials for testing.

MTDC is not continuing to test the current shelter except as a baseline comparison against other shelters. Once the full-scale testing and associated toxicity testing have been accomplished, successful design options will be presented to decision-makers for selection of the next generation fire shelter. Presentation of successful designs is planned for Fall-Winter of 2001. After that, creation of drawings and specifications, procurement, contracting, manufacture and distribution of an estimated 100,000 shelters, in short the reality of large-scale production, backs up delivery until (approximately) spring of 2003.

NFPA Certification

Some inaccurate information has been circulating regarding the requirements for National Fire Protection Association (NFPA) certification of a new fire shelter. NWCG does not require that a new fire shelter have NFPA certification before it can be considered. It is true that fire shelters that vary from the current shelter specification cannot be certified until either an amendment is made to the current standard or until the new standard is published in January 2004. However, once documentation is available from the development of the performance tests, and from the testing itself, the Forest Service, through the Missoula Technology and Development Center, can move ahead with a new fire shelter, with confidence that it will offer superior protection and that the selection can be substantiated with unbiased data.

There has been criticism from the field for not approving use of the Storm King Mountain fire shelter. Everyone involved with fire shelters agrees that the stakes are high and the safety of firefighters is critically important. Disagreement arises because opinions differ on how best to protect firefighters. MTDC is committed to impartial, third party testing to ensure that a new shelter will offer excellent protection and will not cause harm to a firefighter. The center has worked hard to make dependable performance tests a reality and will work equally hard toward the approval of an improved fire shelter. It is also important to remember that the current fire shelter has saved many lives and prevented many serious burn injuries. It is time for a new fire shelter, one that offers better protection against direct flame. But we owe it to firefighters to select the shelter that best meets our needs and to make the decision based on impartial scientific data.