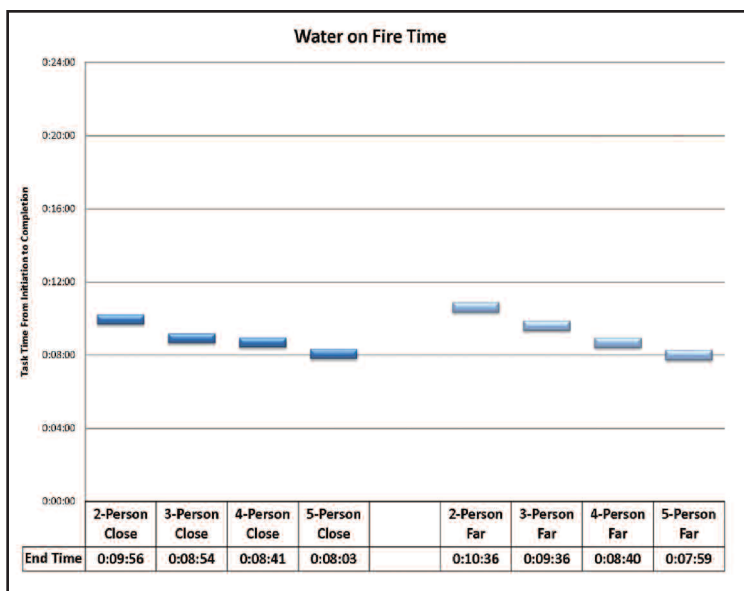


HOW CREW SIZE AFFECTS TIME TO APPLY WATER TO A FIRE

Getting water on a fire quickly is one of the most important fire fighting tasks. Fire risks grow exponentially. Each minute of delay is critical to the safety of occupants and firefighters and is directly related to property damage.

Time to Water Application

Results show that there was a 10% difference in the “water on fire” time between the two- and three- person crews. There was an additional 6% difference in the “water on fire” time between the three- and four- person crews (four-person crews put water on the fire 16% faster than two person crews). There was an additional 6% difference in the “water on fire” time between the four- and five- person crews (five-person crews put water on the fire 22% faster than two-person crews).



The time available to control a fire can be quite small, and these differences in time vividly illustrate the significant risk factor to both emergency responders and to any trapped occupants if response is delayed.

Firefighter Safety

What this means for firefighter safety is that two-person crews arriving later to the scene faced a fire about 2.1 megawatts in size. On the other end of the spectrum, five-person crews arriving earlier to the scene faced a fire about half as big at 1.1 megawatts. For context, a 1 megawatt fire would be a fully-involved upholstered chair burning at its peak. A 2 megawatt fire, however, would be sufficient to produce near-flashover conditions in the 12 by 16 foot room of fire origin used in our experiments. Facing a fire of twice the intensity greatly increases the danger to the firefighters and increases the likelihood that the fire will spread beyond the room of origin.



NIST Report on Residential Structure Fire

The study is the first to quantify fire service lifesaving and fire-fighting operations for a low-hazard residential structure including the effects of changes in crew size, arrival time, and stagger on rescue and suppression effectiveness.¹

The study included more than 60 controlled fire experiments, both in our large fire laboratory and at the custom low-hazard residential burn building constructed at the Montgomery County Training Academy. The results of the study provide quantitative data to fire chiefs and public officials responsible for determining safe staffing levels, appropriate station locations, and necessary funding for community and firefighter safety.

Overall, the results of the study show that that the number of fire service crew members in each company responding to a fire in a 2,000 square-foot, two-story structure had a substantial effect on the crew’s ability to protect lives and property.

Methods

A team of fire service experts designed a research methodology that led to over 60 experiments measuring time-to-task completion with crew sizes of two, three, four, and five firefighters, with different arrival times and different intervals between arrival of each apparatus. A burn building with sophisticated instrumentation was specially constructed for the project. Twenty-two key tasks were measured, beginning with the first engine stopped at the fire hydrant and ending with a fan operating at the front door for mechanical ventilation. Using firefighters acquainted with the tasks as timers and corroborating their data with video records, the researchers accurately timed each task as it was performed by the different crew sizes. Personnel from the Montgomery County (Maryland) and Fairfax County (Virginia) Fire and Rescue Departments performed the various tasks specified by the research methodology.



¹ Funded by a grant from the Department of Homeland Security/Federal Emergency Management Agency Grant Program Directorate for Assistance to Firefighters Grant Program, the project was conducted by a research partnership of the Commission on Fire Accreditation International, the International Association of Fire Chiefs, the International Association of Firefighters, the National Institute of Standards and Technology, and Worcester Polytechnic Institute. The complete report is available for download at http://www.nist.gov/cgi-bin/view_pub.cgi?pub_id=904607&division=866