

In a previous program at Battelle, the use of Nitinol was identified as a promising method for quick-response sensing and actuation of residential fire sprinklers, due to the ability of this alloy series to rapidly convert heat energy to mechanical energy.

The current program began with the conceptualization of numerous Nitinol sensor/actuators for use with sprinklers. These concepts were evaluated based on criteria drawn from industry standards for residential sprinklers, and the best design was chosen for continued development.

Concurrent with this work, the proper formulation and processing of the Nitinol was being determined to achieve a response temperature of 135 degrees F. Using an existing sprinkler frame, prototype Nitinol sprinklers were fabricated at Battelle.

Tests were conducted to assure adherence to the NFPA 13-D standards. In addition to these, sensitivity and roomfire tests were conducted at Underwriters Laboratories, further demonstrating the rapid response time of the Nitinol sprinklers. A time-constant (t), (eg. den grekiska bokstaven för oaspirerat t , alltså "tau") of 23 seconds was achieved in the prototype, with an actuation temperature of 135° F.

It was also shown that by using thinner wire, the response times can be reduced even further, well below current industry standards. In addition, a concept for a Nitinol actuated on-off sprinkler was developed, partially based on the prototype on only design.

This program demonstrated that Nitinol can rapidly and reliably actuate sprinklers in a realistic room-fire scenario. The heads are simple in design, readily manufacturable at a competitive cost, and meet or surpass existing industry standards.

It is recommended that they be pursued on a commercial basis for the use in residential or industrial applications, and that further development be carried out on the Nitinol-actuated on-off sprinkler.