

## A History of Fire Testing and New Opportunities Past, Present, and Future

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### Abstract:

This paper discusses the breakthroughs in science and engineering that have brought fire testing technology to its current state of maturity and provides insight into the possibilities for future fire test development by highlighting some areas where advancements are needed. The quest for understanding the properties of fire has been a part of the human experience since the first primitive human viewed the glow of a flame potentially 2.5 million years ago, during the Paleolithic Period. Since these early observations, humankind slowly developed the knowledge to use and understand fire. However, the initial revolution in fire testing did not begin until recently, in the nineteenth century, when the basic tools were developed that allowed for remote measurement of temperatures and heat flow. Discoveries such as the “thermoelectric effect” and the development of the First Law of Thermodynamics led to the creation of tools for calorimetry providing for the measurement of temperatures and heat flux. The second revolution in measuring and understanding fire occurred in the early twentieth century with worldwide recognition that scientifically based fire standards were needed to protect life and property, and at the same time engineering innovation developed electromechanical equipment that could automatically record data measured from fire experiments. This advancement in data recording allowed for the detailed study of measured fire behavior. The third revolution in fire testing (measurement technology) occurred in the last half of the twentieth century with the development of digital data logging, computing, data analysis, and scientifically based predictive models. Digital computing has opened the theoretical world that provides insight into the subtle features of fire dynamics and provides a means for developing a greater understanding of fire test method performance. Fire measurement technology now has the scientific and computational tools to make significant advancements in the development of fire safety standards. Use of these tools has directed attention to improvements needed in testing for structural fire endurance to enhance fire resistant structural designs. This would include, but not be limited to, advancements in testing of structural components, assemblies, and systems under realistic fire and load conditions. The objective for these new tests would be to enhance structural performance so that uncontrolled building fires result in burnout without partial or total collapse. Additionally, these fire measurement technologies would also lead to improvements in material combustibility, surface flammability, smoke and toxic gas production that will save lives and reduce the high cost of unwanted fires.

### Keywords:

engineering, fire, fire science, fire tests, history, measurement, science