

Standard on Thermal Imagers for the Fire Service





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NFPA® 1801

Standard on

Thermal Imagers for the Fire Service

2021 Edition

This edition of NFPA 1801, *Standard on Thermal Imagers for the Fire Service*, was prepared by the Technical Committee on Electronic Safety Equipment and released by the Correlating Committee on Fire and Emergency Services Protective Clothing and Equipment. It was issued by the Standards Council on March 15, 2020, with an effective date of April 4, 2020, and supersedes all previous editions.

This edition of NFPA 1801 was approved as an American National Standard on April 4, 2020.

Origin and Development of NFPA 1801

In December 2004, Dr. Francine Amon, Nelson Bryner, and Anthony Hamins of the National Institute of Standards and Technology (NIST) hosted the workshop, "Thermal Imaging Research Needs for First Responders." The workshop provided a forum to discuss thermal imaging camera strategies, technologies, procedures, best practices, research, and development. Participants included representatives from the U.S. Fire Administration, International Association of Fire Chiefs, NIOSH NPPTL, Naval Research Lab, and thermal imaging camera and core manufacturers, as well as first responder users and trainers. The need for standards was clearly identified as a priority. In May 2005, as a direct result of that workshop, a group of manufacturers and fire service end users met to further identify the need for standardization. The Fire Service Thermal Imaging Camera Operational Standard (FSTICOS) Working Group was formed with Larry Konsin of the American Council for Thermal Imaging and MSA selected to be the group's chairman.

The FSTICOS Working Group was well populated with representatives from all the manufacturers of fire service thermal imagers and imager core manufacturers along with fire fighter/end users and trainers. The Working Group focused principally on the needs of the fire service for thermal imagers and set about drafting a needs, functionality, usability, and ruggedness statement to begin defining the levels of performance that were deemed necessary. Through surveys conducted at fire service trade shows nationwide, fire fighters validated the findings of the group. As the FSTICOS Working Group was meeting bimonthly, Dr. Amon and her staff at NIST, with the assistance of the U.S. Army Night Vision Lab, began developing the criteria for image quality for fire service thermal imagers. The two groups met and collaborated on a proposed document for thermal imaging cameras. In September 2006, the FSTICOS Working Group requested that the NFPA Technical Committee on Electronic Safety Equipment (TC on ESE) work with them on the project. The TC on ESE agreed to create a Task Group on Fire Service Thermal Imagers, and many of the participants of the FSTICOS Working Group requested to be appointed as members of the TC's task group. TC on ESE Chairman Bruce Varner appointed committee member Robert Athanas as the task group chairman and the following persons as task group members: Dr. F. Amon, N. Bryner, G. Francisco, C. Gestler, J. Hays, J. Henebury, P. House, R. Klug, L. Konsin, D. Little, S. Lumry, T. McDonald, M. McKenna, S. Nixdorff, T. Tedesco, D. Wiles, and T. Wolf.

During the development process, it became clear that the fire services operational environments were very different from most other emergency services organizations, which led the committee to change the focus of NFPA 1801 to thermal imagers for the fire service. The proposed standard was entered into the fall 2009 standards cycle and underwent several development changes as the committee worked with the very technical design criteria and test methods developed for this standard. As with all PPE product standards in the Project on Fire and Emergency Services Protective Clothing and Equipment, NFPA 1801 included requirements for independent third-party certification of thermal imagers to ensure compliance with the labeling, design, performance, testing, and certification requirements for the certification organizations and the thermal imager manufacturers to claim "certified as compliant" to NFPA 1801.

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The Report on Proposals (ROP) for NFPA 1801 was released for public review and comment on December 29, 2008. Following the public review period, which closed on March 6, 2009, the Report on Comments (ROC) was processed in the spring of 2009. The Technical Correlating Committee (TCC) on Fire and Emergency Services Protective Clothing and Equipment processed the proposed NFPA 1801 at their meeting in late May 2009 and approved the document to go forward.

The 2010 edition of NFPA 1801 was recognized as one of the most technical documents assembled and released under the NFPA Fire and Emergency Services Protective Clothing and Equipment Project to date. The image quality tests that were developed specifically for the standard were complicated due to their highly technical nature, and the degree to which they were reproducible from testing laboratory to testing laboratory was in question.

The committee sought the assistance and resources of the Fire Protection Research Foundation to coordinate a series of round-robin tests to determine the lab-to-lab repeatability of the image quality tests. The project was conducted by Dr. Francine Amon, Ph.D., who began this project while employed by the National Institute of Standards and Technology (NIST). The remainder of the testing was conducted by Chad Morey of Intertek Testing Services of Cortland, New York. Additional sponsorship of the project came from Draeger Safety, Honeywell First Responder Products, ISG Infrasys, MSA, and Scott Safety.

A number of changes that needed to be made were identified in the document. A Tentative Interim Amendment (TIA) and Errata were issued to address these changes. Ultimately, the committee decided that the best course of action was to immediately enter the revision cycle for Annual 2012 and review the document for any additional changes.

In April 2011, several thermal imager manufacturers began work to revise the testing issues. In June 2011, at the direction of TC on ELS Chairman Bruce Varner, a task group was formed chaired by committee member Robert Athanas of FDNY and SAFE-IR, Inc. In an effort to identify and resolve these issues in an expeditious manner, the task group was comprised of thermal imager manufacturer technical personnel (engineers from the thermal imager camera and core manufacturers) and testing lab technicians. Task group members included Daniel Akins and John Morris (ISG INFRASYS), Landon Borders and Kyle Hawes (Bullard), Craig Gestler (MSA), Jason Patterson (Scott Safety), Jon Turner and Bill Wilson (e2v Technologies), and Dr. Bernd Spellenberg and Travis Tedesco (Draeger Safety). The thermal imager core manufactures were represented by Humphrey Ha (L-3 Communications), and Bob Nishi and Julie Hoy Moreira (FLIR Systems). Certification and testing organizations were represented by Steve Sanders and Jim Rose (SEI) and Jason Allen and Chad Morey (Intertek). Fire service representation included Bob Athanas of FDNY/SAFE-IR and Steve Townsend of the Carrollton, Texas Fire Department.

The first task group meeting was held on June 29, 2011, in Newark, New Jersey, where testing issues were further clarified and a course of action was developed and agreed upon by all the participants. This meeting was followed by several lengthy conference calls and many hours of research and testing over the summer months to meet a September 2011 NFPA 1801 ROC deadline.

The last task group meeting was held in Austin, Texas, on September 19, 2011, prior to a full meeting of the TC on ELS to finalize the proposed work. The final comments included revised language and test procedures, which improved the content of the first edition of the standard as initially written. The committee was balloted according to the NFPA Regulations Governing Committee projects. The ballot subsequently passed, enabling the committee's changes to be included in the 2013 edition of NFPA 1801. It should be noted that participation and cooperation of all task group members and the support afforded them by their employers during this project was unprecedented and should serve as a model for future projects.

The 2018 edition of NFPA 1801 also applied to the design, performance, testing, and certification of thermal imagers originally certified to the previous edition of this standard, that incorporate replacement parts, components, and/or software, to be certified to the 2018 edition of the standard. New UL standard references were added, as were specifications for labeling upgraded thermal imagers. The TI BASIC operational format was permitted to include audio, video, and data transmission.

The 2018 edition of NFPA 1801 also added a design requirement for an audio/video recording indicator, as well as several editorial and referenced document updates.

A summary of the 2018 edition technical requirements follows:

- Battery locking mechanism testing was added so that where the use of a tool-secured feature is relied upon to meet ANSI/ISA-12.12.01 and this feature is not automatically engaged, the camera will inform the user by a message that prevents normal use of the camera.
- All imagers are required to pass a 2-hour run time conducted with video and image capture functions active.
- The thermal imager must display a useful image within 30 seconds of power being applied (battery installed).
- The thermal imager must display an icon in the form of a red dot inside a green circle when recording audio/video.
- Camera resolution of 76,800 pixels (320 × 240) is a minimum requirement.
- A sensor/image refresh rate of at least 25 Hz is required.
- Only specified symbols can be displayed at power-up.
- A display resolution of 76,800 was added to match the sensor requirement.
- A display resolution of 76,800 was added to match the sensor requirement.

The 2021 edition features editorial changes as well as:

- In Chapter 4, updated test matrices include both stand-alone and integrated thermal imagers.
- In Chapter 6, the spot temperature measurement feature has moved from the TI BASIC operational format to the TI BASIC PLUS operational format. Despite all thermal imager manufacturer user manual warnings not to use temperature measurement to make tactical decisions, it became apparent in three recent NIOSH Firefighter Fatality Investigation Reports that there is a lack of understanding on behalf of the fire service of the feature's capabilities. Although the use of the temperature measurement feature was not considered the sole factor in these fatalities, its use and potential misuse certainly could be considered a factor in a cascading series of events that may have been attributed to these fire fighter injuries and fatalities. The move is further substantiated in all previous editions of NFPA 1801 in Subsection 6.5.2, which requires additional training for TI BASIC PLUS operational format functions, enhancements, and innovations beyond TI BASIC.
- In Chapter 8, an updated spatial resolution source target has been added, as well as an updated region of interest selection figure to simplify testing and testing procedures without compromising image quality.