NSPE Position Statement No. 1749—SFPE/NSPE/NICET Joint Position on the Engineer and the Engineering Technician Designing Fire Protection Systems

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1.0 Executive Summary

The Society of Fire Protection Engineers (SFPE) is credited with the original development of this document. The SFPE has agreed to team with the National Society of Professional Engineers (NSPE) and the National Institute for Certification of Engineering Technologies (NICET) to develop a unified position statement regarding the reasonable and prudent roles and responsibilities of Licensed Professional Engineers and Certified Engineering Technicians when designing fire protection systems for installation in the United States.

SFPE, NSPE and NICET recognize that defining fire protection system design and layout in terms of the roles and responsibilities of engineers and engineering technicians is a sensitive undertaking. Each has capabilities and responsibilities that contribute to the relationships in a design project. Moreover, SFPE, NSPE and NICET recognize that fire protection systems – including fire detection, alarm and suppression systems play an important role in protecting the health, safety, and welfare of the public.

Legally, the practice of engineering is a responsibility that cannot be delegated to non-licensed engineers (individuals). The role of the engineering technician is to understand the engineer's design intent and help implement that design. This position statement describes the critical relationships from the perspective of the engineering community. Engineers or engineering technicians overstep their respective roles if they participate in aspects of design for which they are not qualified by education and/or experience. This position statement explains the relative roles of those in the field of fire protection who contribute to public safety, including Licensed Professional Engineers and Certified Engineering Technicians.

The purpose of this Position Statement is to establish basic rules for the relationships between design, code compliance and construction entities to safeguard the public health, safety and general welfare through safety to life and property from fire and related hazards attributed to the constructed environment and to provide safety to fire fighters and emergency responders during emergency operations.

It is intended that this position paper will be supplemented with more detailed information to develop the fire protection design documents.

2.0 Evolution of Licensing and Certification

In the interest of public safety, state and local governments adopt and enforce building codes and fire codes that mandate fire protection systems. There is a need for personnel qualified in the design and layout of these systems.

At that time, the principal, nationally recognized, qualification criteria for engineers in this profession were found in the membership requirements of SFPE. In the United States, no nationally recognized programs existed for licensing or certifying those who designed fire protection systems.

Beginning in the 1980's, several professional organizations contributed significantly to the process of establishing roles and responsibilities of engineers and engineering technicians in fire

safety, including the development of the NICET certification programs for engineering technicians in the field of fire protection engineering technology.

SFPE, NSPE and the National Council of Examiners for Engineering and Surveying (NCEES) have worked together to support fire protection engineering as a recognized professional engineering discipline.

- SFPE has defined and established qualifications for Licensed Professional Engineers in terms of the minimum education, training, and experience necessary to competently practice fire protection engineering.

- NCEES, an independent federation of state engineering licensing officials (boards), works closely with SFPE to maintain a national, professional engineer licensure program for fire protection engineers and recognizes that fire protection systems play an important role in protecting the health, safety and welfare of the public. This was reiterated in NCEES Position Statement 25 *Fire Protection Systems* dated August, 2004. Position Statement 25 is provided in Appendix B of this document.

The National Society of Professional Engineers (NSPE) through its National Institute for Certification in Engineering Technologies (NICET) offers a program for certifying Fire Protection Engineering Technicians in fire alarm and water-based and special hazard fire suppression systems.

Licensure and certification alone are insufficient to assure quality; thus professional organizations have developed codes of ethics and professional responsibility. See Appendix A: Code of Ethics/Professional Responsibility.

3.0 Describing the Project Team Members & Their Tasks

3.1 Project Team Members

Throughout this document, references to the Licensed Professional Engineer and the Certified Engineering Technician are intended to convey the following:

3.1.1 The Licensed Professional Engineer

As defined by the NCEES, the Fire Protection Engineer is a Licensed Professional Engineer (hereinafter referred to as an “Engineer”) who demonstrates sound knowledge and judgment in the application of science and engineering to protect the health, safety and welfare of the public from the impacts of fire. This includes the ability to apply and incorporate a thorough understanding of fundamental systems and practices as they pertain to life safety and to fire protection, detection, alarm, control and extinguishment. This could include:

- Fire Protection Analysis: A basic understanding of hazard analysis, risk analysis and economic analysis techniques. A working knowledge of codes and standards, occupancy and hazard classifications, fire test methods, and the interpretation of fire test data.

- Fire Protection Management: A basic understanding of the capabilities and limitations of design, facility impairment procedures, and inspection frequencies.

- Fire Science & Human Behavior: An ability to apply principles of fire dynamics as related to fire and smoke behavior, fire growth, combustion, materials properties and heat

transfer. A basic knowledge of human response principles as related to evacuation movement, human response to fire cues and timed egress analysis.

- Fire Protection Systems: An ability to assess and design water-based fire suppression systems, special hazard systems, fire alarm systems, smoke management systems, and explosion protection systems.

- Passive Building Systems: A working knowledge of the principles of building construction as they relate to fire protection, such as construction types, construction materials, interior finish, structural fire resistance, compartmentalization, vertical openings and the protection of openings. The ability to assess adequacy of means of egress taking into account exits, occupancy, occupant loads, emergency lighting, and the marking of the means of egress.

The Engineer's responsibilities for the design include but are not limited to:

A. Evaluate the broad range of hazards and protection schemes required to develop a workable, integrated solution to a fire safety problem.

B. Prepare design documents for fire protection systems. This includes:

- Conceptual and detailed engineering documents
- Hazard and risk analyses
- Performance-based design analyses
- Integrated building systems analyses
- Layout fire protection systems
- Perform necessary calculations for all fire protection systems
- Affix a professional stamp or seal with signature and date to documents prepared under the Engineer's direct supervision and control.

C. Review all work by engineering technicians to ensure conformance with the Engineer's design

D. Review fire protection installation shop drawings and submittals for compliance with the Engineer's design

E. Develop commissioning and acceptance requirements

F. Monitor the installation of fire protection systems.

The Engineer must maintain competency through continued education.

3.1.2 The Certified Engineering Technician

The fire protection engineering technician (hereinafter referred to as a "Technician") is an individual who has achieved NICET Level III or IV certification [1] in the appropriate subfield and who has the knowledge, experience and skills necessary to layout fire protection systems.

Based on engineering design documents, which include the system(s) design drawings, specifications and nationally recognized codes and standards[1], the Technician is qualified to:

A. Perform the system layout in accordance with the Engineer's design.

B. Prepare shop drawings and material submittals in accordance with the Engineer's design for review and approval by the Engineer.

C. Perform supplemental calculations and other functions based on the Engineer's design for review and approval by the Engineer.

D Support the installation of fire protection systems under the direction of the Engineer.

Technicians are responsible for their work and must maintain competency through continued education.

3.1.3 The Authority Having Jurisdiction (AHJ)

The Authority Having Jurisdiction, also commonly referred to in the fire protection community as the AHJ, is the individual or agency that has legal responsibility for reviewing the design for conformance with local codes and regulations. Other organizations that may review the design may include an insurance company and the local fire prevention officer.

The AHJ is qualified to:

- Review Design Documents for conformance with the local codes and regulations.
- Review Layout/Shop Drawings and submittals for conformance with the local codes and regulations.

3.2 Tasks

Throughout this document, references to Design Documents and to Layout and Shop Drawing development are intended to convey the following:

3.2.1 Design Documents

The Engineer is responsible for the preparation of Design Documents which establish the objectives and design criteria of the system. The Design Documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed and show that they conform to the provisions of relevant laws, codes, ordinances, rules and regulations. To establish minimum design quality in the Design Documents, the documents shall include, as a minimum, the following information when applicable:

[1] Such as those published by the National Fire Protection Association, or the ICC - International Code Council

- Identification of the scope of work
- Identification of applicable codes and standards
- Ensure conformance with the applicable building code(s)
    - Have construction trade offs been allowed based on the installation of a suppression system, etc.?
- Identification of occupancy type and hazard classification
- Water-based suppression systems: a) Selection of type of system and components, b) classification of the hazard and commodities to be protected, c) establish the density/flow and design area size, d) determine and confirm the available water supply, e) preliminary system layout and hydraulic calculations to verify adequacy of proposed water supply arrangements, f) analysis to identify concerns regarding systems structural support (as appropriate) and g) analysis to identify any concerns with water quality that would affect the proposed systems (as appropriate).
- Fire alarm system: a) Selection of type of system and components, b) identification of fire alarm panel location, c) creation of system concept riser diagram(s), d) identification of interface(s) required with fire safety functions, other fire alarm systems and other building systems. e) determine average ambient sound level, f) determine minimum candela ratings and placement of strobes, and g) identification of all initiating device and notification appliance locations.
- Special hazard suppression systems: a) selection of type of system and components, b) classification of the hazard area and hazards to be protected, including fire barrier wall requirements and fire dampers, c) determination of the minimum design concentration, normal cylinder storage temperature, cylinder location, and control panel location, d) identification of system interfaces and customer requirements and e) creation of a system input/output matrix.

Based on this design criterion, the Engineer prepares and/or supervises the preparation of Design Documents.

3.2.2 Shop Drawing Development

The Engineer or the Technician develops working plans/Shop Drawings based upon the Design Documents, specified standards and manufacturer listings. For example:

- Water-based suppression systems: a) The detailed layout of risers, cross mains, branch lines, sprinklers, and hangers; b) size of pipe c) furnishing of supplemental hydraulic calculations in accordance with the Design Documents, technical data sheets and details for the specific equipment being furnished for installation.
- Fire alarm system: a) The layout, the circuiting and placement of initiating devices, notification appliances, and other system components, b) preparation of riser diagram(s), c) inclusion of notification appliance circuit voltage drop calculations d) battery calculations for secondary power and e) technical data sheets and details for the specific equipment being furnished for installation.

- Special hazard suppression systems: a) the layout, the circuiting and placement of initiating devices, notification devices, release stations, cylinders, and other system components, b) detailed isometric and plan layout of piping, hangers and nozzles, including calculation nodes, c) hazard volume, agent concentration and flow calculations, d) detailed wiring and control diagrams, indicating all system interfaces and point of interconnection and e) technical data sheets and details for specific equipment being furnished for installation.

- Layout/Shop Drawings shall not be stamped or sealed by an Engineer unless the work is performed under their direct supervision and control.

3.2.3 Installation

The Engineer must review and approve the fire protection system installation Shop Drawings and submittals for compliance with the Design Documents. The Engineer and/or the Technician must monitor the installation, and acceptance testing of all fire protection systems.

3.2.4 Record (As-Built) Drawings

After the system installation is complete and tested as per the Engineer's protocol the Engineer or Technician prepares the record (as-built) drawings to incorporate any field changes to accurately reflect the system as installed.

4.0 Fundamental Objective of Fire Protection Engineering

The application of recent and rapidly evolving fire protection technology to the design of buildings or facilities continues with the advent of performance-based design and a growing use of design-build construction.

The fire protection engineering profession must accommodate a changing environment while maintaining our fundamental objective: *applying scientific and engineering principles to protect people and the environment from destructive fire.*

4.1 Roles for Assuring Public Safety

For fire protection system design, the roles and responsibilities of the Engineer and the Technician are considered reasonable and prudent in the following relationships.

- The Engineer prepares the Design Documents for fire protection systems.

- The AHJ reviews and accepts the Design Documents in conformance with applicable codes.

- The Technician and/or the Engineer prepare Shop Drawings and appropriate supplemental calculations and perform other layout functions in accordance with the Engineer's design.

- The Engineer is responsible for the original design reviews and approves the Shop Drawings and all of the Technician’s work for compliance with the Engineer’s design and specifications. Note – this review does not necessitate sealing or stamping of the Shop Drawings with a P.E. stamp/seal if the work was not done under the Engineer's direct control or authority. This may instead take the form of a review letter or stamp (See Appendix C).

- The AHJ accepts the Shop Drawings and the acceptance test results approved by the Engineer - The owner should note that the role of government authorities acting as the AHJ is generally limited to minimum code compliance, and they will not assume the Engineer's responsibilities for Design Documents.

- The Engineer or the Engineer's Technician provide construction period services, which include monitoring the installation, tracking all revisions and witnessing final acceptance tests in accordance with the Engineer's design that establishes the testing procedures, protocols, test acceptance criteria.

- It is recognized that some states have enacted regulations that allow the Technician to layout the system and prepare Shop Drawings without the involvement of a Licensed Professional Engineer for pre-engineered projects, self-installed projects, small projects or minor modifications to existing facilities. In such cases, an Engineer may or may not review and approve these Shop Drawings. The Technician must ensure that the layout and shop drawings are in accordance with all applicable codes, and not assume the role of the Engineer. It must be emphasized that the lack of involvement by an Engineer in this stage of the project could jeopardize the proper protection of the public's health and safety. As previously discussed, it is recommended that an Engineer be responsible for the design of all fire protection system projects to ensure proper protection of the Public's health and safety.

Appendix A: Code of Ethics/Professional Responsibility

Typically, codes of ethics and professional responsibility are developed within professional organizations to serve as guideposts for professional performance and conduct.

A.1 Code of the Engineer

The Engineer subscribes to a code of ethics required from a regulatory viewpoint and designated by a state board of registration.

The NSPE publishes a model code of professional ethics, commonly followed by state boards of registration, which can be read on their website: www.nspe.org [2].

The SFPE *Canon of Ethics for Fire Protection Engineers* can be found on their website: www.sfpe.org

A.1.1 Stamps and Seals

State licensing boards do authorize, and may require, the use of stamps and seals. According to these regulations, the Engineer should sign or seal only those documents for fire protection systems which were actually prepared under their direct supervision and control.

A.1.2 Engineer of Record (Responsible Engineer)

There can only be one Engineer of Record for fire protection system design. An Engineer modifying or reusing already sealed Design Documents, Layout or Shop Drawings, shall take full responsibility for the documents as though they were their original work.

A.1.3 The Role of NFPA Standards in Fire Protection System Design

Standards published by the National Fire Protection Association such as NFPA 13 – *Standard for the Installation of Sprinkler Systems* and NFPA 72 – *National Fire Alarm Code*, are widely adopted by building and fire codes. NFPA standards are recognized as providing minimum requirements for a reasonable degree of protection for life and property through standardized design requirements, which define much of the engineering criteria used to design fire protection systems. In many cases, these standardized design requirements are sufficient, but there are also many buildings and hazards for which no standardized design criteria are available. A qualified fire protection engineer is the only legally enabled entity to evaluate fire protection needs and make the determination as to whether the design is appropriately based on a standardized or special approach. Even where a special design approach is utilized, the Engineer will largely reference and rely upon standardized criteria from NFPA standards in establishing the engineering design. The standardized criteria include many of the detailed requirements carried into the development of working plans and Shop Drawings.

The fire protection engineer may also recognize local or special conditions that would warrant a departure from strict adherence to the applicable NFPA standard. The NFPA standards themselves recognize such possibilities and contain language as follows to allow variances:

NFPA 13 [3]

"1.5 Equivalency. Nothing in this standard shall be intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety over those prescribed by this standard. Technical documentation shall be submitted to the authority having jurisdiction to demonstrate equivalency. The system, method, or device shall be approved for the intended purpose by the authority having jurisdiction.

"1.6.1. Nothing is this standard shall be intended to restrict new technologies or alternate arrangements, provided the level of safety prescribed by this standard is not lowered."

NFPA 72 [4]

"1.2.3 This Code establishes minimum required levels of performance, extent of redundancy, and quality of installation but does not establish the only methods by which these requirements are to be achieved.

"1.5 Equivalency

"1.5.1 Nothing in this Code shall prevent the use of systems, methods, devices, or appliances of equivalent or superior quality, strength, fire resistance, effectiveness, durability and safety over those prescribed by this Code.

"1.5.2 Technical documentation shall be submitted to the authority having jurisdiction to demonstrate equivalency.

"1.5.3 The systems, methods, devices or appliances that are found equivalent shall be approved."

Although the role of the Authority Having Jurisdiction is recognized in the above references, the Engineer is ultimately responsible for the adequacy of the design.

The Engineer has the responsibility to review of the working plans/Shop Drawings and to require correction of features or details that are inconsistent with the Design Documents and/or which contain unauthorized departures from the requirements of applicable NFPA standards.

A.2 Professional Code of Certified Engineering Technicians

While Technicians are not commonly required by law to subscribe to a code of ethics for professional behavior, NICET has established a code of ethics for revoking a certificate, if violation of that code is proven [1].

The *NICET Code of Ethics* [1] closely parallels the NSPE *Code of Ethics for Engineers*. The *NICET Code of Ethics* can be found on the NICET website: www.nicet.org.

A.2.1 Stamps and Seals

NICET does not authorize seals or stamps for Technicians. Documents prepared in accordance with approved design standards may bear the signature, date, NICET certification title and number of the Technician taking responsibility for the work. The use of any seal or stamp conveying the NICET name or mark on engineering documents or drawings prepared or checked by a NICET certificant is not authorized.

A.2.2 Working with Codes and Standards

The system layout and detail within working plans or Shop Drawings must be consistent with the Engineer's design regardless of whether the design is fully addressed within the applicable NFPA standards. Technicians preparing working plans or Shop Drawings have an obligation to adhere to the standards referenced in the engineer's design.

Appendix B: NCEES Position Statement 25

SFPE, NSPE, and NICET support the National Council of Examiners for Engineering and Surveying (NCEES) Position Statement (PS) 25 *Fire Protection* issued in August 2004, and has issued this position paper as a more detailed examination of the issue. The NCEES Position Statement is as follows:

PS 25 Fire Protection

NCEES recognizes that fire protection systems—including fire detection, alarm ,and suppression systems—play an important role in protecting the health, safety, and welfare of the public. NCEES also recognizes the design and calculation of fire protection systems to be the practice of engineering.

NCEES recommends that Member Boards actively pursue enforcement of state statutes and rules with local permitting authorities having jurisdiction (AHJ) regarding the engineering supervision over the specification, design, and calculation of fire protection systems.

To implement the above, the following is recommended:

• Contract drawings should include a set of fire protection drawings that are sealed by a licensed professional engineer.

• Supervision by a licensed professional engineer is required in the review of fire protection installation Shop Drawings for compliance with the engineer's design and specifications.

• *Oversight by a licensed professional engineer is required in the installation of an original permitted design.*

The Task Force that developed the NCEES statement found that there is confusion among code enforcement officials and building owners on the appropriate role of the Engineer in the design of fire protection systems. In the opinion of the Task Force, the confusion is being intensified by the development of position papers and guidelines for the design of fire protection systems that are contrary to state professional engineering statutes. As a result, the enforcement of professional engineering laws is being compromised.

Appendix C: Sample Review Stamp

(To view Appendix C, please reference *The Engineer and the Engineering Technician Designing Fire Protections Systems* Position Statement at: www.nspe.org/GovernmentRelations/TakeAction/PositionStatements/index.html)

References

1. *Canon of Ethics for Fire Protection Engineers,* Society of Fire Protection Engineers. Obtained at http://www.sfpe.org/Profession/Canon.aspx

2. *Code of Ethics for Engineers*. Publication #1102, National Society of Professional Engineers. Revised January, 2003.

3. *NICET Code of Ethics*. National Institute for Certification in Engineering Technologies. Obtained at: http://www.nicet.org/about/code.cfm. December, 2004.

4. *Standard for the Installation of Sprinkler Systems*. NFPA 13. (2002). National Fire Protection Association.

5. *National Fire Alarm Code*. NFPA 72. (2007). National Fire Protection