SOCIETY OF FIRE PROTECTION ENGINEERS
POSITION STATEMENT P-01-05

THE ENGINEER AND THE TECHNICIAN DESIGNING FIRE PROTECTION SYSTEMS

October, 2005

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1.0 Executive Summary

In this document, the Society of Fire Protection Engineers (SFPE) describes reasonable and prudent roles and responsibilities of engineers and technicians when designing fire protection systems for installation in the United States.

SFPE recognizes that defining fire protection system design and layout in terms of the roles and responsibilities of engineers and technicians is a sensitive undertaking. Each has capabilities and responsibilities that contribute to the relationships in a design project. Moreover, SFPE 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.

Legally, the practice of engineering is a responsibility that cannot be delegated. The role of the 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 technicians overstep their roles if they participate in aspects of designs for which they are not qualified by education or experience. This position statement explains the relative roles of those in the field of fire protection who contribute to public safety, including engineers and technicians.

2.0 Evolution of Licensing and Certification

During the 1970s and early 1980s in the interest of public safety, state and local governments adopted and enforced record numbers of building and fire codes that mandated fire protection systems. The need for personnel qualified in system design and layout grew accordingly.

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

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

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

- SFPE has defined and established qualifications for professional engineers in terms of the minimum education, training, and experience necessary for a fire protection engineer.

- NCEES, an independent federation of state engineering licensing officials works closely with SFPE to maintain a national professional engineering 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 Section 3.0 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 technicians.

Licensing 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 NCEES Position Statement 25

The Society of Fire Protection Engineers supports 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 professional engineering membership of the SFPE also understands the importance, and endorses the use of, NICET Certified Technicians on the design team for all fire protection projects. NICET technicians generally are not governed by state statues and are not permitted by professional engineering statutes to practice engineering. In its efforts to be vigilant and supportive of its members, SFPE has delineated the appropriate responsibilities of licensed engineers and NICET technicians.

4.0 Describing the Project Team Members & Their Tasks

4.1 Project Team Members

Throughout this document, references to the Engineer and the Technician are intended to convey the following:

4.1.1 The Engineer

The Fire Protection Engineer is a licensed professional 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 is qualified to:

- Evaluate the broad range of hazards and protection schemes required to develop a workable, integrated solution to a fire safety problem.
- Prepare design documents for fire protection systems. This includes:
  - Conceptual and detailed engineering documents
  - Hazard and risk analyses
  - Performance-based design analyses
- Layout fire protection systems based on competency, education and experience.
- Affix a professional seal or stamp to documents prepared under the Engineer's direct supervision and control.
- Review fire protection installation shop drawings for compliance with the Engineer's design.
- Monitor the installation of fire protection systems.

The Engineer is responsible for the design and must maintain competency through continued education.

4.1.2 The Technician

The fire protection 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 could include the system(s) design drawings, specifications and nationally recognized codes and standards[1], the Technician is qualified to:

- Perform the system layout in accordance with the Engineer's design.
- Prepare shop drawings in accordance with the Engineer's design or as otherwise permitted by state regulations (See Section 5.1).
- Perform supplemental calculations based on the Engineer's design.

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

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

4.1.3 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 responsibility for reviewing and accepting the design provided. Examples of the AHJ include the following:

- Municipal Permitting Organization
- Fire Prevention Officer of the Municipality
- Insurance Company
- Governmental Organization
- Code Official
- University Fire Marshal

4.2 Tasks

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

4.2.1 Design Documents

The Engineer develops design documents which establish the objectives and design criteria of the system. For example:

- Identification of the scope of work
- Identification of applicable codes and standards
- 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) confirmation of the available water supply data, e) preliminary 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), and d) identification of interface(s) required with fire safety functions, other fire alarm systems and other building systems.

- 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 or supervises the preparation of design documents.

4.2.2 Shop Drawing Development

The Engineer or the Technician develops working plans/shop drawings based upon the design documents and specified standards. 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 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 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.

4.2.3 Installation

The Engineer supervises the review of fire protection system installation shop drawings for compliance with the design documents. The Engineer and the Technician monitor the installation of fire protection systems.

4.2.4 As-Built Drawings

After the system installation is complete and approved by the AHJ, the Engineer or Technician prepares as-built drawings to incorporate any field changes to accurately reflect the system as installed.

5.0 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.*

5.1 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 Technician or Engineer prepares shop drawings and appropriate supplemental calculations.

- The Engineer responsible for the design reviews the shop drawings for compliance with the Engineer's design and specifications. Note – this review does not necessitate approval and sealing of the shop drawings with a P.E. stamp. This may instead take the form of a review letter or stamp (See Appendix B).

- The AHJ accepts the shop drawings and the acceptance test results. 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 and the Technician provide construction period services, which include monitoring the installation and witnessing final acceptance tests.

- 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 an engineer for pre-engineered projects, self-installed projects, small projects or minor modifications to existing facilities. In such cases, the Engineer may review and approve the shop drawings.

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.

NSPE publishes a model code of professional ethics, commonly followed by state boards of registration [2]. The following are several excerpts from that *Code of Ethics for Engineers* applicable to this document:

> *Engineers, in the fulfillment of their duties, shall perform services only in their areas of competence.*
>
> *Engineers shall hold paramount the safety, health, and welfare of the public.*
>
> *Engineers shall undertake assignments only when qualified by education or experience in the specific technical fields involved.*
>
> *Engineers shall not affix their signatures to any plans or documents dealing with subject matter in which they lack competence, nor to any plan or document not prepared under their direction and control.*
>
> *Engineers may accept assignments and assume responsibility for coordination of an entire project and sign and seal the engineering documents for an entire project, provided that each technical segment is signed and sealed only by the qualified engineers who prepared the segment.*

The *Code of Ethics for Engineers* and state registration laws permit the Engineer:

- To practice in any area for which the Engineer is qualified by education or experience.
- To establish the scope of work within which the engineer practices on a day-to-day basis.

Safeguards lie within the state registration laws. State registration boards investigate complaints when the Engineer is believed to be practicing outside the scope of competency.

A.1.1 Stamps and Seals

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

A.1.2 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. In many cases, these standardized design requirements are sufficient for a project, but there are also buildings and hazards for which no standardized design criteria are available. A qualified fire protection engineer is in the best position 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. The standardized criteria include many of the detailed requirements carried into the development of working 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 in 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 supervise the review of the working/shop drawings and to require correction of features or details that are inconsistent with the design or which contain unauthorized departures from the requirements of applicable NFPA standards.

A.2 Professional Code of Certified Technicians

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

The *NICET Code of Ethics* [1] closely parallels, in a highly condensed form, the NSPE *Code of Ethics for Engineers*. Excerpts from the *NICET Code of Ethics* follow:

Certificants shall undertake only those assignments for which they are competent by way of their education, training and experience.

Certificants shall perform their duties in an efficient and competent manner with complete fidelity and honesty.

Certificants shall not misrepresent or permit misrepresentation of their own or their associate's academic or professional qualifications nor exaggerate their degree of responsibility for any work.

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 and NICET certification number of the Technician taking responsibility for the work.

A.2.2 Working with Codes and Standards

The system layout and detail within working or shop drawings must be consistent with the design regardless of whether the design is fully addressed within the applicable NFPA standards. Technicians preparing working or shop drawings have an obligation to adhere to the requirements of the referenced standards except as needed to comply with an otherwise approved engineer's design.

Appendix B: Sample Review Stamp

SUBMITTAL REVIEW

A ☐ NO EXCEPTIONS TAKEN
No further review of Submittal is required

B ☐ MAKE CORRECTIONS AS NOTED
Incorporate corrections in work: resubmittal is not required. If Contractor cannot comply with corrections as noted, revise to respond to exceptions and resubmit. Record Drawings shall reflect corrections.

C ☐ REVISE AND RESUBMIT
Revise as noted, and resubmit for further review.

D ☐ NOT REVIEWED: STATE REASON _____

This submittal has been reviewed only for the limited purpose of checking for general conformance with the design concept as expressed in the Contract Documents, subject to the requirements of the Contract Documents. Nothing in this review is intended to authorize any aspect of work that is not in accordance with state and local code requirements.

XYZ FIRE PROTECTION ENGINEERING INC.

By _____ Date _____

Project No. _____ References _____

References

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

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

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

4. *National Fire Alarm Code*. NFPA 72. (2002). National Fire Protection Association.