BECOME A FIRE PROTECTION ENGINEER

COVER STORY: Fired Up
Shattering the Myths of Fire Protection Engineering
The Discipline of Fire Protection Engineering
Burning Ambition
What do Fire Protection Engineers Earn?
Fire Protection Engineering: A Best-Kept Secret
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A Best-Kept Secret

Welcome to the first issue of Careers in Fire Protection Engineering. The Society of Fire Protection Engineers (SFPE), Fire Protection Engineering magazine, and industry sponsors are very excited to introduce this new publication to the engineering industry. Many corporate leaders and educators have asked for this type of publication to support growth within the profession. This special issue will focus solely on promoting fire protection engineering as a career.

As an important member of the engineering community, we ask that you help us educate your students, peers, and those considering careers in engineering by sharing this informational guide highlighting the many opportunities available in fire protection engineering.

The editorial for this issue features two fire protection engineering graduates talking about their experiences in college and as a fire protection engineers. The remaining editorial will discuss how fire protection engineering is an exciting and rewarding career.

Please enjoy this first issue! We hope that you will share it and reference it often to those interested and curious about this exciting field. You can also access the issue digitally at FPEmag.com/careers. For further instructions on accessing the digital magazine, please refer to page 3. Thank you for your support, and enjoy your issue!

Sincerely,
The Sponsorship Committee

Special thanks to the Society of Fire Protection Engineers and our key contributors below for making this special issue a possibility.

Also contributing…
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Fired Up

Two fire protection engineering graduates discuss their experiences in college and as fire protection engineers.

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You will be routed to the digital version of Careers in Fire Protection Engineering.
The employment prospects for young fire protection engineers are stronger than ever. But in terms of academic preparation, job-seeking, and ultimate career satisfaction, few people outside the profession understand what fire protection engineering really entails.

Fire Protection Engineering spoke with two practitioners to get their take on breaking into the field and what it takes to succeed.

Vidar Landa, E.I.T., studied fire protection engineering in his home country of Norway before attending Massachusetts’ Worcester Polytechnic Institute. He now works at Schirmer Engineering Corporation in Los Angeles.

Stacy Welch, P.E., graduated from the University of Maryland and now works for Marriott International’s corporate headquarters near Washington, DC.

FPE: How did you first hear about fire protection engineering and what were your initial impressions?

Vidar Landa: The first time I heard about fire protection engineering, I was living in Norway. There was only one college in Norway that offered a fire protection engineering program and it happened to be in Haugesand, the city where I’m from. It sounded more interesting than other types of engineering, like electrical or mechanical, and seemed quite different.

Stacy Welch: I applied to the University of Maryland, and once I was accepted into the school of engineering, realized that I didn’t have any idea of what type of engineering I wanted to study. I went to an open house to hear about the different engineering programs offered at Maryland, and one of those was fire protection engineering. Once I heard the presentation by Dr. Jim Milke, one of the professors in the department, I was instantly drawn in. The strong human component really fascinated me.

FPE: What attracted you to engineering in the first place?

Welch: A couple of things. My brother, father, and grandfather were all engineers, so that was in the back of my head. And in high school, I was good at math and science. So the combination of those things led me to the decision that this was something that I wanted to do.

FPE: What factors did you consider when you chose this particular field of engineering?

Welch: I felt that fire protection engineering, of all the different types of engineering, had the strongest impact on people, property, and businesses from the ravaging effects of fire.
They gave me a lot of responsibility, and I got into a number of very different areas of fire protection engineering.

Welch: I actually worked under Professor Jim Milke on some of his research projects while in school. One was cosponsored by Marriott International, which is how I was first introduced to the company where I work. It was really a great hands-on experience. As part of the research, I put in some sprinkler systems, ran tests, and analyzed data. It was insightful to see how projects are developed.

FPE: What would you have done differently while you were in college to have better prepared yourself for your career?

Landa: I wish I took more classes in project management. I think that would have better prepared me to work as a consultant and handle many of the tasks that a fire protection engineer handles on a daily basis.

Welch: I think after you get out of school you gain a much different perspective. While I was still in school, I was focused on passing classes and getting assignments done. I could have spent much more time trying to understand more deeply what we were studying. I think that would have helped me once I got out of school.

FPE: What would you recommend to high school and college students to help them prepare to earn a degree in fire protection engineering?

Welch: Having a job before or during school that is related to the field gives you a great perspective on the purpose of fire protection engineering and really helps you with your classes.

Landa: The most important things are that you work hard and are dedicated. To succeed in school, you have to have a strong interest in the subject.

FPE: Was it difficult to land your first job after leaving school?

Welch: I started working part-time with Marriott International in my senior year, so I had met all the people in the office and knew what the job was like even before I graduated. I thought it would be exciting to work in the hospitality industry, and since the company was located in the area where I went to school, I thought it would be a great fit.

Landa: My first job was with Schirmer Engineering Corporation in Los Angeles. I found it easy to get the job, because I had interned there. Interning is a great way to get your foot in the door and provides the opportunity to prove yourself.

FPE: What is the most memorable aspect of your very early career?

Welch: Less than two months after I had started working full time, I was sent to Hong Kong to survey hotels that Marriott International was thinking about taking over. That was unbelievable! I was part of a team where I was the only fire protection engineer. It was a wonderful new experience for me. The whole trip lasted only two weeks, but it was terrific. Traveling has remained an integral part of my job ever since.

Landa: For me, getting a job in the United States was exciting in and of itself. The opportunity to live in Los Angeles and work for a great company is a privilege. And I find the variety of work always keeps the job exciting.

FPE: So your job is satisfying?

Welch: It is. I feel like there’s a “big reason” why I go to work each morning. I don’t feel like I just sit behind a desk all day. And I know that I have a direct impact on hotel safety. It gives me an incredible sense of purpose.

Landa: Sometimes you’re working really hard and have too much to do, but still the job is rewarding! It has given me so many great opportunities. I always dreamed about coming to the U.S. and living in a place like California. The job has given me the chance to do this, and I’m extremely happy and proud. I also feel it’s important, because we’re making sure buildings are safe. Society appreciates that.

FPE: What parts of your work are the most exciting and challenging?

Landa: I was involved with the Kodak Theater in Los Angeles. It was really cool being part of something that is known worldwide. I also like working on some of the huge high-rise construction projects in the downtown area.

Welch: I was involved with the Kodak Theater in Los Angeles. It was really cool being part of something that is known worldwide. I also like working on some of the huge high-rise construction projects in the downtown area.

FPE: What do you recommend to incoming students interested in fire protection engineering?

Welch: I think after you get out of school you gain a much different perspective. While I was still in school, I was focused on passing classes and getting assignments done. I could have spent much more time trying to understand more deeply what we were studying. I think that would have helped me once I got out of school.

Landa: The most important things are that you work hard and are dedicated. To succeed in school, you have to have a strong interest in the subject.
• What is a fire protection engineer, and what do they do?
• Some of the challenges currently facing the profession of fire protection engineering and how those challenges are being addressed;
• Changes that are occurring in the profession; and
• What can be done to increase the acceptance of the profession.

The Fire Protection Engineer
The fire protection engineer is a professional that uses science and technology, coupled with specialized knowledge, education, and training, to protect people from the effects of fire. A fire protection engineer (FPE) is familiar with the nature and characteristics of fire and the associated products of combustion; understands how fires originate and spread within and outside of buildings/structures, and can be detected, controlled, and/or extinguished; and is able to anticipate the behavior of materials, structures, machines, apparatus, and processes as related to the protection of life and property from fire.

With more than 3,000 deaths per year from fire in the U.S., the need for qualified engineers to address and mitigate these risks is essential. The high demand for FPEs consistently outweighs the supply, resulting in higher-than-average compensation and a multitude of employment opportunities. A wide range of industries offers FPEs outstanding career opportunities and a chance to make the world a better, and safer, place to live.

Fire Protection Engineering: The Historical Perspective
Historically, the fire protection engineering profession has been plagued by the perception that it is a “sub” or specialty engineering discipline, not on a par with the so-called “traditional” engineering fields. Indeed, the evolution of the FPE from a safety professional based in loss prevention to a degree professional engineer with specialized education and certification has been slow. But today’s fire protection engineer, who “applies scientific and engineering principles to protect people and their environment from destructive fire,” is a top-flight professional, working in a variety of industries and with many groups – including other engineers, architects, government and state authorities, insurance underwriters, fire service personnel, and lawyers.

From the first course in fire protection engineering at the Illinois Institute of Technology (1903) to the first accredited safety engineering technology program at Oklahoma State University (1937) and the first Accreditation Board for Engineering and Technology-accredited undergraduate program at the University of Maryland (1976), the field of fire protection engineering has enjoyed steady growth and increasing popularity among engineering students. With the creation of the graduate program at the University of Maryland and masters and doctorate degree programs at Worcester Polytechnic Institute and the University of California, Berkeley, the fire protection engineering profession has made great strides.

The profession is currently recognized as a separate engineering discipline by the National Council of Examiners for Engineering and Surveying (NCEES) and licensing boards in 46 states, while enrollment in both undergraduate and graduate fire programs is increasing. With over 1,000 graduates and more than 8,000 practicing FPEs, these are exciting times.

Challenges
The challenges facing fire protection engineering are many. As stated in SFPE's Strategic Plan and according to key industry professionals, these are some of the critical issues facing the profession:
• The need for additional undergraduate, postgraduate, and continuing education programs to support the demand for more FPEs.
• The transition from prescriptive codes and standards to performance-based codes.
• The increasing requirement for continuing education and professional development to maintain professional engineering credentials.
• The need to enhance the image of fire protection engineers internationally.

The stated mission of SFPE is to advance the science and practice of fire protection engineering internationally. Clearly, the development of the science of fire protection engineering and the actual practice of the discipline will be forever interwoven. No engineering discipline can be accepted without a foundation based in science, and no engineering profession will develop successfully without the ability to apply that science to real-world applications. However, as the profession becomes better accepted by the technical and engineering community by virtue of its application, it will still be left with the task of self-promotion – not the promotion of FPEs to other FPEs, but the promotion of the profession outside the fire protection community. This is where the opportunities for growth occur.

Professional Recognition
Recognition of the fire protection engineer has a lot to do with general acceptance of the engineering tools he or she employs. With volunteers throughout the fire protection community, SFPE has developed a Guide to Performance-Based Fire Protection Analysis and Design.
The guide, published in 2000, outlines a process for using a performance-based approach in the design and assessment of building fire safety with both prescriptive and performance-based code systems. As stated in the guide, its intent is to "provide guidance that can be used by qualified engineers and authorities having jurisdiction as a means to determine and document the achievement of fire safety goals for a particular project." The guide also clearly defines what is considered a "qualified engineer." This resource is a great asset to the FPE in the resolution of design issues and the acceptance of proposed designs by AHJs and building officials. The SFPE Task Group on Performance-Based Design is in the process of preparing the second edition of the SFPE Engineering Guide to Performance-Based Fire Protection Analysis and Design of Buildings.

Education
The number of college and university fire protection engineering programs is still limited. The startup costs and space requirements for a new program are in many cases prohibitive, and the effort required to sell a new program to a college or university is considerable. According to Dr. John Bryan, founding chair of the University of Maryland’s fire protection engineering program, "the establishment of the original program was driven by state-supported legislation and may never have occurred without that support." To compound the problem, due to the substantial up-front investment and effort required for accrediting of undergraduate programs, new programs at the graduate level are seen as the more likely candidates for success. Currently, the University of Maryland is the only school in the U.S. to offer an ABET-accredited undergraduate program in fire protection engineering. Many fire protection engineers start their education by earning a bachelors degree in civil, electrical, chemical, or mechanical engineering, followed by a masters degree in fire protection engineering.

Exciting developments are occurring at all levels of education. Currently, both the University of Maryland and Worcester Polytechnic Institute (WPI) offer masters programs in Fire Protection Engineering and WPI offers a doctorate program to receive a Ph.D. in the field. The University of New Haven has established a Bachelor of Science program in Fire Protection Engineering. The Oklahoma State University (OSU) School of Fire Protection and Safety Technology (FPST) offers a four-year ABET-accredited degree program that concludes with a Bachelor of Science in Engineering Technology.

Distance learning programs have had a positive effect on the growth of the profession and the opportunities for educational development in the field. The distance learning programs at the University of Maryland and Worcester Polytechnic Institute have more than doubled the total number of Masters Degree graduates. WPI’s distance learning program has been ongoing since 1994 and has provided courses to students in over 50 cities in the U.S., Canada, and overseas. In addition, efforts related to the development of campus fire laboratories, such as the privately funded Fire Center Program at the University of Maryland, have
created an exciting and dynamic environment in which to prepare for a career in the field. Other programs that support the promotion of the profession include the Academic Common Market Program, implemented through the Southern Region Education Board. This program offers in-state tuition rates for student from participating southern states.

The Next Generation
Where do new fire protection engineers come from? The profession is primarily fueled by the recruiting of new engineering students out of high schools or by transfers from other engineering, technical, or fire-protection-related disciplines. Some students come from the community and junior colleges, others from the broader technical or engineering community. Historically, an average of 30 percent of the fire protection engineering students enrolled in the University of Maryland’s program come from community colleges, and another 20 percent are transfers from “traditional” engineering disciplines.

All new entrants into the field need to be supported by established educational programs providing BS, MS, and doctoral degrees. With the profession becoming more performance-based, the next generation of leaders will not only need to be skilled communicators but also well-practiced in computers and modeling, and well-versed in such areas as economics and statistics. But producing new engineering graduates is only part of the equation; ultimate success can only be achieved by an industry that offers a steady flow of high-quality employment opportunities, acceptable compensation levels, and an exciting work environment. Fortunately, today’s fire protection engineering profession offers young engineers all three.

The critical issue is how to introduce fire protection engineering to the student who has no acquaintance with the profession. Promotional videos targeting prospective students have been developed by WPI and the University of Maryland.7

Targeting young, would-be FPEs, SFPE has developed the free SFPE Guide to Careers in Fire Protection Engineering.8 This document provides a much-needed overview of the profession, describing what fire protection engineering is, what fire protection engineers do from an industry-to-industry perspective, and the process of becoming a fire protection engineer.

What’s in Store for the Profession?
The emergence and ultimate acceptance of performance-based codes represent incredible opportunities for the fire protection engineering profession. The evolution from prescriptive codes to the engineering of a building using a performance-based approach will not only result in more economical and safer buildings, but will further validate fire protection engineering as a separate and distinct profession.

The skills required of the fire protection engineer are also changing. One major change affecting the profession is the requirement, many times driven by the courts, to understand the science behind fire reconstruction and analysis, or arson investigation. The next-generation FPE will need a broad set of hard skills, with a solid foundation in math and science, plus highly developed soft skills, such as the ability to communicate effectively. Greater emphasis will be placed on presenting technical information in a way that builds confidence and validates technical positions based on sound engineering principles.

Douglas Rollman is with The Protection Engineering Group, PC.

2 40th Anniversary History Book 1956-1996. Department of Fire Protection Engineering, University of Maryland, College Park, MD.
5 Telephone interview with Dr. John Bryan, past chair, Department of Fire Protection Engineering, University of Maryland, College Park, MD.
6 Telephone interview with David Lucht, P.E. professor and past director, Center for Firesafety Studies, Worcester Polytechnic Institute, Worcester, MA.
7 “Engineering Careers in Fire Protection” (video), Worcester Polytechnic Institute, Worcester, MA.
Will I be part of a team effort?
It might sound obvious that the best way to manage a project is by working together. But many companies foster an environment in which everyone works independently of one another. At RJA, we emphasize teamwork and synergy to the benefit of our clients. You may function as a consultant on one project and a project manager on another. Often, you as the fire protection consultant will be teamed with our experts in security, communications, and construction management to provide integrated solutions for our clients.

Will I be involved in technical innovation?
No two companies approach technical innovation the same way. Some prefer to stick with proven technology while others are out on the “bleeding edge” for pure research’s sake. RJA has a company-wide focus on technical innovation. We pioneered the advancement of performance-based design and are an acknowledged leader in the field of fire/smoke/egress modeling. However, the focus of technical innovation is not on being “first” but on being “best” when it comes to applying technology to solve a client’s fire protection challenge.

Will I be able to continue my education?
Fire protection engineering is a dynamic science, and the pace of innovation is increasing every year. That’s why your engineering degree is only the starting point. RJA provides opportunities to obtain your masters degree in fire protection engineering while you work through distance learning programs with leading universities and institutions. We also promote participation in SFPE and NFPA programs, industry seminars, and Web-based learning events. But the cornerstone of our continuing education program is The RJA Group Academy, a curriculum specifically designed to provide you with the skills necessary to be a more effective engineer, consultant, or manager.

Will I be encouraged to join professional organizations?
In good times, most companies will allow you to join professional organizations such as SFPE and NFPA. RJA sets the bar much higher. Not only are you expected to join these important organizations, RJA encourages you to take meaningful roles in the advancement of their charters. Through our extensive involvement in organizations and associations that develop the codes, standards, and best practices of our industry, we are able to achieve RJA’s ultimate goal: to save lives and protect property and assets against fire.

Will I be working for an ethical company?
Every company has a lofty vision statement, professing their dedication to truth, justice, and the American way. RJA has a vision statement as well: to be recognized as the best in the world at providing fire protection and security consulting solutions for the built environment. But the real key is how a company operates to achieve its vision. RJA is guided by a single statement: do the right thing. It’s not open to debate or subject to exception. Simply do the right thing for the client, the profession, the company, and yourself.

After you’ve asked all the right questions, your next best move might be to join the fire protection consulting team at Rolf Jensen & Associates. With offices in major cities throughout the United States and our China office in Shanghai, there is certainly a place for bright graduates and veteran engineers. For more information on the career opportunities at Rolf Jensen & Associates, contact us at 312-879-7220, e-mail recruiting@rjagroup.com, or visit www.rjainc.com.

Dave Czajka is the VP-Human Resources for The RJA Group, parent company of Rolf Jensen & Associates. He is based at The RJA Group headquarters in Chicago.
Fire protection engineers (FPEs) earn among the best salaries of all the engineering disciplines—and graduates are in demand!

The Society of Fire Protection Engineers (SFPE) periodically surveys its members to gather salary information. The latest figures, derived from the 12th Profile of the Fire Protection Engineer Survey conducted in Spring 2003, show that:

• The average starting salary for an FPE is $47,000.
• The industry-wide mean among FPE professionals is $85,000, reflecting a broad range of years of experience in fire protection engineering.
• Slightly more than 25 percent of respondents earn $100,000 or more.
• Less than 5 percent earn $50,000 or less.

While salaries vary based on education, age, experience, and type of job, the charts shown here represent a typical cross-section of SFPE's membership profile.

Who Responded?
SFPE has been surveying its members since 1976. For the Spring 2003 survey, 1,217 members responded, representing about 32 percent of SFPE membership.

About the respondents:
• 83 percent work in the U.S.
• 68 percent are age 40 or older.
• 77 percent have 10+ years’ experience in fire protection.
• Two-thirds have variable compensation— for those who do, 8 percent is the median percent of their salary that is variable.
• 85 percent hold at least a bachelor’s degree, with Fire Protection and Mechanical Engineering most often cited as specialties.
• Many also hold professional engineering licenses, with Fire Protection cited by 50 percent of respondents.
• Of the 55 percent of respondents who indicate they are licensed, 60 percent were registered in one state only.

Where They Work
FPEs work in a wide range of settings and industries including:
• Consulting engineering firms
• Fire departments
• Fire equipment/systems design and sales
• Government
• Hospitals and healthcare
• Manufacturing
• Research and testing
• Education, and more

Two-thirds of respondents work for large firms (100+ employees), while 15 percent work for firms with 10 employees or fewer.

Salaries for FPEs

<table>
<thead>
<tr>
<th>Years in FPE</th>
<th>0 – 9</th>
<th>10 – 19</th>
<th>20 – 25+</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lower Quartile</strong></td>
<td>$50K – $60K</td>
<td>$60K – $75K</td>
<td>$75K+</td>
</tr>
<tr>
<td><strong>Median Quartile</strong></td>
<td>$55K – $80K</td>
<td>$80K – $90K</td>
<td>$90K – $95K</td>
</tr>
<tr>
<td><strong>Upper Quartile</strong></td>
<td>$65K – $95K</td>
<td>$97K – $102K</td>
<td>$105K – $120K</td>
</tr>
</tbody>
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Salary by Employer Type

<table>
<thead>
<tr>
<th>Employer Type</th>
<th>Median Salary including Bonuses (in Thousands, U.S. Dollars)</th>
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</thead>
<tbody>
<tr>
<td>Industry</td>
<td></td>
</tr>
<tr>
<td>Equip. Mfg./Install</td>
<td></td>
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<tr>
<td>Stock/Mutual Ins.</td>
<td></td>
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<tr>
<td>Consulting</td>
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<tr>
<td>Federal Gov.</td>
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<tr>
<td>Other Ins.</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
<tr>
<td>Education/Res.</td>
<td></td>
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<tr>
<td>Local Gov.</td>
<td></td>
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</tbody>
</table>

Salary by Post-Secondary Engineering Education

<table>
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<tr>
<th>Education Level</th>
<th>Median Salary including Bonuses (in Thousands, U.S. Dollars)</th>
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</thead>
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<tr>
<td>Ph.D.</td>
<td><strong>93K</strong></td>
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<tr>
<td>Masters</td>
<td><strong>78K</strong></td>
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<tr>
<td>Bachelors</td>
<td><strong>68K</strong></td>
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<tr>
<td>Tech. Degree</td>
<td><strong>None</strong></td>
</tr>
<tr>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>
According to the survey, consulting remains the dominant employment sector at 43 percent. Consulting engineers typically analyze the fire safety of a building or design systems that protect people from fire.

The number of respondents who work in the insurance sector continues to decline, with only 15 percent citing this field.

The highest-paying sectors as reported by survey respondents are industry, stock/mutual insurance, and “other.”

How They Spend Their Time
The survey also asked members to cite areas where they spend most of their workplace time. They were asked to make three choices. The top three responses were:

- 56 percent said plan/project construction drawing reviews for code requirements.
- 47 percent said fire protection system design.
- 35 percent said risk management.

Other areas cited were:

- Physical facility fire prevention inspection, 32 percent.
- Facility fire protection program development, 29 percent.
- Performance-based design, 26 percent.
- Codes and standards development, 19 percent.
- Special fire protection applications, 19 percent.
- Construction planning and cost estimating, 13 percent.
- Facility safety and security program development, 8 percent.

Benefits
In addition to salary, the vast majority of respondents said they receive medical insurance benefits and that their employer paid their annual SFPE dues. Nearly 70 percent of respondents also reported “tuition reimbursement” as a benefit, and approximately 50 percent received performance bonuses.

In addition to salary and benefits, FPEs typically enjoy:

- A great deal of personal job satisfaction.
- The “power to make a difference” by helping make buildings safer for everyone.
- Numerous career options and a high degree of job security due to demand for their skills.
- The ability to work on a variety of exciting projects, often in a team-based atmosphere.

The Future Looks Bright
Job security in the field looks solid, as the demand for FPEs has far outpaced the number of qualified candidates.

Through efforts to reach out to high school and college students nationwide, SFPE hopes to quadruple the number of fire protection engineers in the next decade. At the core of this program is this first issue of Careers in Fire Protection Engineering, which can also be accessed digitally at www.FPEmag.com/careers.

“It’s imperative for the safety of our society to train a new generation of fire protection engineers,” says SFPE Executive Director Dave Evans. “These are the people who are going to help ensure the safety of our communities in the years to come.”

Information for this article was obtained from the Society for Fire Protection Engineers. For more information about the 12th Profile of the Fire Protection Engineer Survey, go to www.sfpe.org.
You’ve worked hard to become a professional.

Ready to take that experience to the next level?

Looking to collaborate with a great team of like-minded professionals?

At Schirmer Engineering we’re looking for fire protection engineers and engineers in related fields that share our passion of providing *Engineered Protection for Life*.

Join a firm that provides the atmosphere and challenges that will enhance your skills and opportunities. With Schirmer, you can take advantage of a wide variety of continuing education programs. Apply your theoretical knowledge on the frontline for our clients. Positions are currently being filled in several of our US offices.
Bryan’s research of major fires\textsuperscript{5} indicates that we now know a great deal about how people behave in fires and respond to fire cues. Bryan supports Sime’s and Proulx’s findings as well as those of Ramachandran\textsuperscript{6}, which suggest that stress may cause people to act inappropriately in a fire – often due to lack of information – but rarely to panic and behave irrationally.

It is clear that fire protection engineers can improve the efficiency of evacuation and assist rational decision-making by occupants under fire conditions through measures such as:

- **Architecture in which occupants have a clear “cognitive map” or feel for where they are in building, to aid their movement towards exits;**
- **Provision of escape paths linked to normal building circulation paths; and**
- **Use of good signage that provides clear emergency instructions.**

**Vehicles explode.** Another popular perception is that all combustion in cars and other vehicles immediately leads to explosion rather than fires. It is clear that many people are killed in car fires as a result of accidents. For example, in Australia about 50 percent of all fire deaths occur in vehicle fires\textsuperscript{7}. In these cases, fires can develop quite rapidly, but deaths most often result from the drivers and passengers being trapped due to injuries or vehicle deformation, not as a result of explosions.

What about the design of buildings that house vehicles? Research conducted by BHP Melbourne Laboratories\textsuperscript{8} and in the UK\textsuperscript{9} shows that, while cars burn, they generally do not explode unless fuel vapors are confined and ignited.

**Compliance guarantees safety.** Another persistent myth is that compliance with statutory building codes guarantees absolute safety. The corollary of this myth is, should a building burn and people or property be harmed, it follows that there must have been negligence and design failure.

Clearly, there is absolutely no guarantee of zero risk. If there were, all buildings would be built totally of noncombustible material and have no occupants.

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**The fire department will save me.** Two final public misperceptions are that “fires will not happen to me,” – but should one occur, “the fire department will rescue me.”

A firefighter on a ladder carrying a child from a burning building to safety is indeed a popular image. However, it is often not the reality. While the vast majority of people never experience a fire in their lifetime, and the rate of fire deaths is trending down in most countries, in the U.S. there are still 1.1 deaths per 100,000, with similar rates in Western Europe and Japan\textsuperscript{11}. Complacency is the enemy, and fires, when they do occur, bring personal tragedy and business loss.

Fire departments play an important role in society. Without them, life and property losses would be considerably higher. But fire department officials are the first to acknowledge that all rescue and fire-fighting actions cannot be left to the firefighters.

Research by Fitzgerald\textsuperscript{12} for his fire safety evaluation system suggests that the probability of success of firefighters arriving and setting up before flashover occurs in any building is less than 40 percent. Fitzgerald’s finding is confirmed by the latest research in Australia\textsuperscript{13} with the development of the Fire Brigade Intervention Model (FBIM). This methodology can be used to quantify the response of a fire department in both rescue and initial firefighting, based on the department’s operational characteristics. The use of this technique analysis confirms the advice of the Australian Fire Engineering Guidelines\textsuperscript{14}, which state that, for conservative building design, “the role of the fire brigade in occupant safety should be ignored.”

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**NEW MYSTIQUE**

As noted at SFPE’s international conference in Luxembourg\textsuperscript{15}, performance-based building regulations and design methods are a global trend. Global acceptance raises many fundamental questions for the fire protection engineering profession. The events of 9/11 and the subsequent report by the National Institute of...
Standards and Technology (NIST) have also raised questions about fire engineering. Among them: How can guidance for fire protection engineers be developed to improve the architectural design process? What’s the relationship between fire protection systems and the functionality of buildings? How can fire protection engineers and structural engineers prevent or minimize building collapse? And what is the liability of practitioners in the new era of performance-based design and post-9/11 construction?

Clear answers to such questions require clear thinking. Unfortunately, the new environment resulting from the widespread acceptance of performance-based regulations and design has already generated its own mystique, built in part on long-established myths. Here are the ones most commonly encountered.

**It’s a slow, costly process.** The initial fear of a number of architects and project developers in Australia was the new Performance Building Code of Australia (BCA) introduced in 1997 would add time and cost to the design process for buildings. In particular, many thought that development of alternative solutions, rather than following the prescriptive “deemed-to-satisfy” provisions, would be restricted to a few complex and innovative major projects that could “afford” fire protection engineering.

The experience in Australia and New Zealand, however, has differed from those expectations, with alternative solutions being developed for a wide range of buildings.

The cost and time issues have been addressed through the widespread introduction of fire protection engineering guidance documents, such as the SFPE Handbook and the New Zealand Fire Engineering Design Guide.

In particular, the Fire Engineering Design Brief (FEDB) process, based upon the Qualitative Design Review (QDR) technique first introduced in the UK document DD24021, has clearly improved the process of design for fire protection. Fire protection objectives and acceptance criteria are agreed upon by all parties at a very early stage in a project. The result is usually significant savings through clear, early design decisions – with less costly, but more effective, fire protection measures developed into an integrated design package.

Anecdotal evidence suggests that Australia is well on the way to achieving the $200 million yearly savings identified through the Warren Centre and Building Regulation Review Task Force. These potential savings were identified in 1989 as one of the benefits of performance-based regulations and rational design methods. Lovegrove suggests about a 10 percent savings on construction cost since the introduction of performance regulations in Sweden in 1994. In the UK, moreover, building appeals have fallen more than 90 percent. Increased cost and delays both seem to be myths perpetrated by people troubled by change and innovation.

**Liability will escalate.** Brannigan and others have expressed concern that the introduction of performance-based building codes in the U.S. will increase liability for designers and building owners. There is clearly a major difference between performance-based and prescriptive regulations. Greater use of judgment in performance-based design means that challenge is more likely and that opinions may vary as to whether performance objectives have been met.

Lovegrove suggests that education and the “skill imperative” are essential if the performance-based approach is to be successful. He highlights the need for proportionate liability, mandatory insurance for designers and certifiers, 10-year liability capping, and peer review as some of the reforms needed to ensure the liability myth does not become a reality.

**Separate systems are mandatory.** Many practitioners believe that fire protection systems should be separate from all other building systems and construction elements. As a result, exit stairs have often been designed for use only in emergencies. Signs seen on exit stairway doors include “DO NOT ENTER,” “USE ONLY IN EMERGENCIES,” and “THIS DOOR IS FITTED WITH A SECURITY ALARM.”

But research has shown that these escape routes, often provided at great expense, are seldom used. At the National Gallery of Victoria in 1990, not a single person used the four-hour-rated concrete staircase in the evacuation of 1,014 people. Research showing that, in emergencies, people exit the same way they entered buildings strongly suggests exit routes should be part of normal building circulation routes.

Evidence in the U.S. and Australia suggests the potential for poor reliability of complex smoke control systems, particularly where they are stand-alone. If systems can be kept simple and are required to operate every day as part of building’s normal air-conditioning systems, then it is likely they will have a greater probability of success when called on to work effectively in a fire.

Shattering the Myths continued
Civil works are separate. There is a belief shared by many design professionals that fire protection engineering is not related to the building foundation or civil engineering works, a myth that performance-based fire engineering is helping to dispel.

Analysis of design fuel loads and ventilation by fire protection engineers can often lead to reduced Fire Resistance Levels (FRLs) as compared to current prescriptive FRL provisions. Reduced FRLs, particularly in taller buildings, can lead to reduced column size, floor slabs, and fire-rated shafts. The savings in weight can often result in significant reductions in foundation loads and lower construction costs.

Fire spread can be prevented. Design professionals commonly think that sprinklers always prevent external fire spread between the floors of a building. Similarly, many believe that compliance with regulatory separation distance between buildings on adjoining allotments will provide on absolute guarantee against fire spread.

The requirements for vertical spandrels of 900mm in nonsprinklered buildings and 18m separations from boundaries appear in the Building Code of Australia (BCA). Similar requirements appear in other nation’s building codes. However, calculations based on Law and O’Brien27, and evidence from real fires show that there is no absolute certainty of preventing fire spread under all circumstances. The distances involved with spandrels and building separations are sound technical compromises. They ensure reasonable protection at an affordable cost that achieves the required design objectives in most, but not all, fires.

Sprinklers destroy property. Another common misconception in the design profession, as well as the broader community, is that if one sprinkler operates in a fire, they will “all go off” and deliver vast quantities of water that inundate the building, destroying its contents.

This myth is still popular among managers and operators in computer centers, telecommunication facilities, art galleries, museums, libraries, and historic buildings.

Fortunately, there is increasing recognition28 that some 90 percent of fires are extinguished by four sprinklers or fewer, with 65 percent extinguished by a single sprinkler operating. There is also better acceptance by the arts and historic preservation communities of the notion “better wet than burned.” While there is a small chance of limited water damaged, the risk is preferable to significant or total loss of a collection or a building – as with Hampton Court Palace, Windsor Castle, the Los Angeles Public Library, the San Diego Space Museum, and the Venice Opera House. The rebuilding of several of these buildings without sprinklers would suggest the myth about sprinklers is still alive and kicking.

MORE MYTHS

There are a number of concerns that even fire protection engineers give voice to, but that, in reality, are no more than myths. In some cases, these myths are put forward by special interests to promote certain products or systems, with little or no foundation.

Concerning buildings. Two favorites are “all occupied buildings require sprinklers” and “people will not and cannot move through smoke safely.”

The first myth appears to be more commonly advocated in North America and Australia than in the UK or Europe. There is no doubt that sprinklers offer huge life safety and property protection benefits, with very few deaths in sprinkler-protected buildings. However, countries like the UK and Hong Kong allow apartments and offices, for example, to be built to heights of eight stories, or in some cases higher, without sprinklers, and their records on life safety are certainly no worse than that of North America. Acute care hospitals are also built in the UK today without sprinklers, relying on staff and the fire department to suppress fires. Countries such as Germany, which relies even less on sprinklers, similarly have no significantly greater loss of life in occupied buildings.

With regard to egress through smoke, it is inherent in every building code around the world that people may have to move through some smoke, particularly in the enclosure of a fire’s origin. In a high-rise office building, for example, the BCA in Australia17 and Approved Document B29 in the UK do not require a smoke-management system to be installed to ensure that smoke remains above head height on the floor of a fire’s origin. It’s assumed that occupants may have to move through smoke that is not excessively hot or thick for relatively short distances in the vicinity of the fire. However, it is also expected that lobbies, stairs, and separations between floors will be designed so only a minimum of occupants will be exposed, and once in the escape system, people will be protected from further exposure to combustion products.

The movement of people through smoke has been studied in Scandinavia30 and Japan31. Studies have found that people can escape through smoke, but that performance depends on smoke optical density and lighting levels. Use of tactile systems, floor guidance systems, and flashing lights can all increase evacuation efficiency through smoke.

Concerning elevators. A widespread belief holds that elevators are an area of great fire hazard and should be avoided in fire emergencies. However, the feasibility of using elevators in a fire has been examined32, and there is a British standard specifically for the design of elevators for egress33.

One motive for a reexamination of the popular perception of danger associated with elevators is the move to provide equity and better egress provisions for people with disabilities. Countries like Australia are examining the needs of citizens with disabilities, with documents such as the Building Outcomes Reports by the Australian Building Codes Board (ABCB) appearing in response to the Disability Discrimination Act24.
The experiences in the 9/11 disaster have added to the debate on the use of elevators for occupant egress and firefighter access, especially in tall buildings. The use of firefighting shafts, as required in the UK, is now being more widely considered.

Concerning flashover. Some professionals believe that, once a fire starts, it’s inevitable that it will grow to flashover, breaking all glazed openings. In fact, research by Cuzzillo and Pagani, which refers to experimental work by Shields at the University of Ulster, has shown that glazed openings often do not break, particularly if double- or triple-glazed. This often has the effect of limiting fire growth through ventilation control well before flashover.

The effect of glazing in limiting ventilation and fire growth was observed in both the BHP (Australia) and Cardington (UK) experimental test programs on steel structures. It is also one of the bases of the management practice of removing patients and closing ward doors quickly in hospitals and aged care facilities to limit fire size, smoke production, and smoke spread.

A related myth holds that, in large spaces such as factories and warehouses, flashovers involving all combustibles at peak heat release rate occurs throughout the space. However, Clifton has demonstrated that flashover as recognized in small compartments does not occur in very large spaces, and that a zone or zones of peak intensity move through the space over time as the material is consumed.

Concerning structural performance and compartmentation. Building codes give great attention to structural performance and compartmentation, often giving apparent priority to those provisions over means of escape or active measures. This is probably an historic ranking to be found in building codes going as far back as the Great Fire of London, which led to the first regulations on building separation and noncombustible construction.

In terms of life safety, the structural performance for some buildings is irrelevant, since occupants generally will evacuate long before the collapse of even the lightest structural systems. This is obviously not the case for high-rise and certain other buildings. The debate over whether partial or total collapse is a reasonable or acceptable end-point arising from 9/11 and the NIST report is a significant issue that all building developers will have to address. However, the lack of property protection as a regulatory objective in many performance-based building codes highlights the real relationship between life safety and structural performance.

With respect to compartmentation, popular perception holds that solid, noncombustible construction is 100 percent effective. However, any fire protection engineer involved in the auditing of existing buildings has seen significant numbers of non-fire-stopped penetrations, improperly maintained fire dampers, and wedged-open fire doors. Initial indication in a yet-published survey in the UK on passive measures suggested reliabilities significantly less than 100 percent. This is in line with a report from Jenaway that suggests fire-door obstruction as high as 22 percent.

Another myth with popular appeal claims that a one-hour-rated column, beam, or partition will last one hour in an actual fire. This has been highlighted by Fitzgerald in his fire safety evaluation method. Indeed, some structures may have only lasted one hour in laboratory tests, but differences in testing requirements (positive versus negative furnace pressure, for example), construction quality, and other factors all affect performance.

Concerning structural material. A final set of myths relates to the primary structural materials of steel, concrete, and timber.

It is common to think of steel as losing its strength quickly when heated. In fact, single elements retain approximately 50 percent of their ambient temperature strength at 1,000°F (550°C). The BHP and Cardington research shows that, due to load redistribution, unprotected steel structural frames can withstand significantly higher temperatures than 1,000°F (550°C) with only localized deformation. In fact, reinforced concrete loses significant strength above 1,400°F (760°C), as illustrated in SFPE Handbook of Fire Protection Engineering.

Another common perception is that concrete does not lose strength at all in fire and is “invincible.” However, the loss of concrete cover in the Channel Tunnel fire is a good example of failure of concrete through spalling under high fire loads. Exposure of reinforcing due to spalling action can lead to the premature failure of members.

Lastly, the myth persists that timber has no place in structural systems for fire-protected building. On the contrary, while timber does burn, it also chars at a well-known rate and plays a key part as a resilient structural material, particularly in earthquake-prone buildings in New Zealand and Japan. In New Zealand, apartments designed with a performance-based approach have been built as high as eight stories with timber framing. Structural element section sizes are designed to char, but still retain sufficient strength to support the building after a complete burn-out or through fire control by sprinklers.
EDUCATION AND REFORMS NEEDED

In the past, it was the "artful" practice of fire protection engineering that encouraged many myths. Often, these false perceptions stemmed from a misunderstanding of the needs of practitioners, as was highlighted by Law and Beever in their delightful paper "Magic Number and Golden Rules", delivered at the 1994 IAFSS Symposium in Ottawa, Canada. Education remains the key to dispelling these older myths. Fortunately, the number of training opportunities for designers and the broader community have increased every year. But there still needs to be greater interaction between fire researchers and the fire protection engineering community in order to establish strong links for "technology transfer".

The performance-based approach and new building regulations in many countries have fostered their own new myths. Both education and reforms are needed to lay them to rest. If fire protection engineering is to be successful in the new era of building design and construction, a balanced environment must be created, in which risk is minimized at a reasonable cost. ■

Peter Johnson, CP Eng., is with Arup Fire Engineering. The author would like to acknowledge assistance with this article from his colleagues at Arup Fire.

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1 Learn Not to Burn curriculum resource books, preschool program, and public service announcements, National Fire Protection Association, Quincy, MA, 1987.
18 Approved Document C (Amalgamation of C1 to C4), Building Industry Authority, New Zealand, June 2000.
Leading the Way in Fire Protection Innovation

In 1925, Victaulic was created to market a single product – and an innovative, much faster method of joining pipe was born. The Victory Joint was originally developed as part of the “victory” effort in World War I as a quick and easy method to assemble pipe joints for rapid deployment of fuel and water to Allied forces. Shortly after its debut, Victaulic developed the concept of machining a groove into standard Schedule 40 pipe and revolutionized the industry with its faster, easier alternative to traditional welded systems. The significant savings in time and labor that the grooved joining method offered, led to dramatic gains in productivity.

In World War II, the speed advantage of Victaulic made an enormous impact. During the D-Day Invasion, engineer construction crews worked night and day joining fuel lines with couplings to supply jeeps and carriers on land and fighter planes on airstrips. Because Victaulic couplings made welding unnecessary, spur lines could be removed with minimal loss of both pipe and time, and transported ahead to be erected again at forward points. The flexibility of a coupled line resulted in maximum efficiency, and Victaulic became known for delivering speed, ease, and reliability.

In the 1950s, Victaulic expanded its revolutionary grooved piping method by introducing another significant innovation – roll grooving. With this new patented solution, Victaulic brought the efficiencies of the grooved coupling out of the realm of heavy-wall pipe like Schedule 40 and Schedule 80, and into the lighter wall and smaller diameters used in such vital applications as fire protection.

After partnering with the New York City Fire Department in 1951 to demonstrate how grooved piping systems could enhance emergency fire-fighting capabilities, the Victaulic method quickly transformed the fire protection industry.

Victaulic also began efforts to gain approval by Underwriters Laboratories® for using its grooved product in fire protection services. Because grooved piping systems represented a new concept in building piping, new test parameters had to be established. Victaulic engineers worked closely with UL to develop and meet the necessary high standards of performance. In 1952, grooved piping components for use in fire protection systems achieved UL Listing, and Victaulic officially became the first grooved product manufacturer to be used in this industry.

First in Fire Protection

Victaulic has been a pioneer in the fire protection industry, developing innovative products and methods to meet the unique safety, reliability, and performance needs of the industry. Victaulic fire protection products, from FireLock couplings, valves, fittings, and accessories to automatic sprinklers, Fire-Pac units, and pipe preparation tools, can be found in some of the world’s most famous buildings, facilities, and projects such as the Taipei 101 Financial Center (the world’s tallest skyscraper), Sydney Olympic Stadium (home to the 2000 Summer Games), Burj El-Arab & Jumirah Beach Resort in Dubai (the world’s tallest all-suite hotel tower), and many more. Here are just a few highlights from its long list of fire protection innovations:

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1925</td>
<td>Introduced the grooved-end concept to the U.S.</td>
</tr>
<tr>
<td>1952</td>
<td>First grooved-end product to achieve UL Listing</td>
</tr>
<tr>
<td>1957</td>
<td>Introduced roll grooving to piping industry</td>
</tr>
<tr>
<td>1969</td>
<td>Launched the Style 741 Vic-Flange, a breakthrough product which allowed direct connection of flanged components into a grooved piping system</td>
</tr>
<tr>
<td>1972</td>
<td>Pioneered and achieved UL approval of roll grooving for light-wall pipe</td>
</tr>
<tr>
<td>1973</td>
<td>Pioneered special coated ductile iron products for underground fire protection services</td>
</tr>
<tr>
<td>1979</td>
<td>Introduced Hugger plain end system for joining high-density polyethylene pipe; FM-Approved</td>
</tr>
</tbody>
</table>
Victaulic offers a complete line of fire protection products for wet, dry, deluge, and preaction systems. The company’s product line includes devices, valves, sprinklers, alarm modules, and other sprinkler system components.

Throughout the ‘50s and early ‘60s, Victaulic built a reputation for developing innovative solutions across a wide range of industries. This experience outside the fire protection business led to new ideas and applications that Victaulic could tailor to the specific needs of fire protection applications.

In the 1970s, Victaulic expanded its product offerings in fire protection from couplings and fittings to include valves, which represented a higher level of engineering and precision manufacturing. In addition, Victaulic developed the Style 741 Vic-Flange, a significant breakthrough in the industry that allowed direct connection of flanged components into a grooved piping system.

The ‘70s also saw first production of the special coated ductile iron products used in AWWA applications and underground fire protection services. The precision requirements of this type of manufacturing required more highly advanced production technology – a quality that would soon become another hallmark of Victaulic systems.

Throughout the ‘70s, ‘80s, and ‘90s, Victaulic continued to lead the industry with innovations in all aspects of fire protection products, from sprinkler outlets that used mechanical-style components to the Hugger system for joining high-density polyethylene (HDPE) pipe.

Victaulic also led the way in efforts to gain UL Listing and FM approval of light-wall steel pipe for fire protection services, providing an attractive alternative to threading, which required full-wall thickness standard Schedule 40 pipe. The acceptance of roll-grooved, light-wall pipe swept through the industry, due to the way it reduced system costs.

As we entered a new century, Victaulic remained dedicated to the innovative spirit with which it was founded. In 2003, Victaulic again changed the way fire protection systems were installed, this time with the Series 745 FireLock™ Fire-Pac, a completely preassembled fire protection valve that provides maximum service in a minimal enclosed space, available in 1½” through 6” pipe sizes.

Today, 80 years later, Victaulic continues to forge new paths, advancing the fire protection industry as it continues to develop ground-breaking new products and methods to aid fire protection professionals.

To learn more about Victaulic, visit www.victaulic.com.

Victaulic offers a complete line of fire protection products for wet, dry, deluge, and preaction systems. The company’s product line includes devices, valves, sprinklers, alarm modules, and other sprinkler system components.
Fire Protection Engineering

The NCEES documents reflect the discipline of fire protection engineering through state board licensing requirements. But licensing requirements do not necessarily capture all aspects of a discipline. As the professional society for FPEs, SFPE also considers fire protection engineering in license-independent terms. Several SFPE sources describe fire protection engineering and the FPE’s role in engineering design. These descriptions reveal the broad range of activities of the FPE.

The article “Shattering the Myths of Fire Protection Engineering” in this issue of Careers in Fire Protection Engineering magazine defines fire protection engineering as the application of science and engineering principles to protect people and their environment from fire. The definition goes on to say that fire protection engineering includes:

- Analysis of fire hazards;
- Mitigation of fire damage by proper design, construction, arrangement, and use of buildings, materials, structures, industrial processes, and transportation systems;}

FIGURE 1: NCEES Fire Protection Engineering Standard of Minimal Knowledge, Skills, and Abilities

A minimally competent fire protection engineer must demonstrate 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 fire prevention, detection, control, and extinguishment. As a minimum, a competent fire protection engineer must demonstrate the following:

- **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 and 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 of 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 types, occupant loads, emergency lighting, and the marking of the means of egress.

FIGURE 2: NCEES P.E. Examination Specifications for Fire Protection Engineering

**Knowledge Area I – Fire Protection Analysis**
- A. Types of Analysis
- B. Information Sources of Analysis

**Knowledge Area II – Fire Protection Management**

**Knowledge Area III – Fire Science and Human Behavior**
- A. Fire Dynamics
- B. Human Behavior

**Knowledge Area IV – Fire Protection Systems**
- A. Water-Based Fire-Suppression Systems
- B. Special Hazard Systems
- C. Fire Detection and Alarm Systems
- D. Smoke-Management Systems
- E. Explosion-Protection and Prevention Systems

**Knowledge Area V – Passive Building Systems**
- A. Building Construction
- B. Means of Egress
The Discipline of Fire Protection Engineering continued

- Design, installation, and maintenance of fire detection, suppression, and communication systems; and
- Post-fire investigation and analysis.

The SFPE membership application reflects the above points in its definitions:

- **Fire Protection Engineering** is the application of science and engineering principles to protect people and their environment from destructive fire and includes (1) analysis of fire hazards; (2) mitigation of fire damage by proper design, construction, arrangement, and use of buildings, materials, structures, industrial processes, and transportation systems; (3) design, installation, and maintenance of fire detection and suppression and communication systems; and (4) post-fire investigation and analysis.

- A Fire Protection Engineer (FPE) by education, training, and experience (1) is familiar with the nature and characteristics of fire and the associated products of combustion; (2) understands how fires originate, spread within and outside of buildings/structures, and can be detected, controlled, and extinguished; and (3) can anticipate the behavior of materials, structures, machines, apparatus, and processes as related to the protection of life and property from fire.

The SFPE Constitution and Bylaws lists these requirements for Professional Member grade in SFPE:

- A Member of SFPE shall be a graduate of an engineering curriculum of accepted standing and shall have completed not less than four years of engineering practice, three of which shall have been in responsible charge of fire protection engineering work. If not such a graduate, see Table 1.

- **Responsible charge** signifies responsibilities of the individual to make decisions for successful completion of work without relying on advice from a superior as to methods, materials, and standards to be applied. It further signifies that these duties are carried out at the discretion of the individual and that they do not necessarily require authority from supervisors except as a matter of form.

### TABLE 1: Requirements for the Grade of Professional Member in SFPE

<table>
<thead>
<tr>
<th>Education</th>
<th>Yrs of Eng. Prac.</th>
<th>Yrs. of Resp. Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graduate of an engineering curriculum of accepted standing. (1)</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Bachelor of Science degree in physical science (math, physics, chemistry) from a university of accepted standing. (2)</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Graduate of an engineering technology curriculum of accepted standing. (3)</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Master of Science degree in engineering or science from a curriculum of accepted standing. (4)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Doctoral degree in engineering or science from a curriculum of accepted standing. (5)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Education in engineering or the physical sciences which demonstrates a knowledge of the principles of engineering. (6)</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Baccalaureate degree in a field other than engineering or physical science. (7)</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>No degree. (7)</td>
<td>14</td>
<td>4</td>
</tr>
</tbody>
</table>

**Notes**

(1) “Accepted standing” is defined as an engineering curriculum which is ABET-accredited (USA), CEAB-accredited (Canada), FEANI-listed (Europe), the FPE’s engineering curriculum at Illinois Institute of Technology (USA), the FPE curriculum at the University of Lund (Sweden), or equivalent.

(2) “Accepted standing” is defined as college/university (USA) which is an accredited institution of post-secondary education.

(3) “Accepted standing” is defined as an engineering technology curriculum which is ABET (USA) or similarly accredited.

(4) “Accepted standing” is defined as those of the University of British Columbia (Canada), University of Maryland (USA), University of New Brunswick (Canada), and Worcester Polytechnic Institute (USA).

(5) “Accepted standing” is defined as those of the University of California, Berkeley (USA), University of Maryland (USA), and Worcester Polytechnic Institute (USA), or equivalent.

(6) Credit is given based upon college transcripts and grades received in engineering principles, math, and science courses which demonstrate a knowledge of the principles of engineering.

(7) Those without academic qualifications are asked to provide a detailed description of their practice of engineering and of being in responsible charge of fire protection engineering work. Being under qualified supervision for an extended period is essential.

### What Do Fire Protection Engineers Do?

The SFPE Career Guide states that fire protection engineers:

- Use physics, math, and chemistry to protect people and buildings from fire.

- Analyze how buildings are used, how fires start and grow, and how fire and smoke affect people, buildings, and property.

- Use the latest technology to design systems that control fires, alert people to danger, and provide means for escape.

- Work with other engineers, architects, state and local building officials, and local fire departments to build and maintain fire-safe communities.

FPEs can work in any of the categories listed in the Examination Specifications.
The smarts to keep your profitability flowing.

As your fire protection solutions partner, we understand reliability and performance are goal No. 1. But Victaulic fire protection solutions don’t end there.

Built into every Victaulic system is 80 years of innovation and ingenuity. Ingenuity that delivers greater design flexibility and faster system installation to help you complete your projects ahead of schedule.

As a result, you work smarter and more productively while delivering the reliability your customers demand. Working smarter means greater profitability for you.

For information about how Victaulic fire protection systems can exceed your expectations, call 1-800-PICK-VIC today.
Most FPEs do not work in all of them: A typical FPE works in several fields falling under one or more of these categories. For example, a fire-suppression system designer might evaluate the hazard to be protected, select detection methods, and specify fire-suppression system performance. Or a consultant might conduct hazard analyses and compare the overall risk for an entire facility from various combinations of fire protection design options.

Some FPEs are closely involved with project reviews – from design concept to plan reviews to checking installed systems. This close involvement assures that the specified level of fire protection for a facility is achieved.

When so qualified, FPEs’ roles may also include laying out fire protection systems and affixing their seals or stamps to fire protection design documents. They may also include any of the related roles described in the next section. The key is that FPEs can be qualified by experience and training in their work areas.

FPEs’ responsibilities vary with their employers. Employers of FPEs include: • Consulting firms • Corporations • Educational institutions and societies • Fire protection associations and societies • Fire-testing laboratories • Government agencies • Insurance companies • Fire protection technicians at four different levels in each of these areas: • Automatic Sprinkler Systems Layout • Fire Alarm Systems • Special Hazards Suppression Systems • Inspection and Testing of Water-Based Fire Protection Systems

Fire protection engineering and fire protection technology are both integral to the discipline of fire protection engineering. Once again, the key is that fire protection professionals work in their areas of qualification.

Fire scientists might study the physics and chemistry of fire, model fire growth on computers, or explore how to control and extinguish fire. They, too, might or might not have engineering degrees or P.E. licenses. Although they are not usually designing the fire protection systems in common use at the time of their research, their work is essential to developing new engineering solutions to the problem of fire control.

Let’s Spread the Word

We may be fire protection engineers, fire protection technicians, or fire scientists. We might or might not have engineering degrees or P.E. licenses. Whatever our careers and backgrounds, we are all part of this fascinating, ever-evolving field of fire protection. Fire protection engineering, fire protection technology, and fire science work together to make up the whole fire protection engineering discipline. As such, we should all spread the word about the benefits of fire protection engineering and help allay misconceptions about our discipline whenever possible.

Jane I. Latallie, P.E. is with Los Alamos National Laboratory.

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Where do fire protection engineers work?
Fire protection engineers are employed principally by private engineering companies, large corporations, and federal, state, and local government agencies.

What does a fire protection engineer do?
A FPE utilizes performance-based approaches to building fire safety analysis and design, including evaluation and integration of fire protection systems for high-rise structures and industrial complexes; analysis of the level of fire protection applicable to commercial and residential buildings, nuclear power plants, and aerospace vehicles; and the research of fire propagation, detection, and suppression, together with physiological and psychological effects on humans and their responses.

Fire protection engineers are members of design teams involved in the development of new building complexes, such as the campus Comcast Center and the redevelopment of the area around the World Trade Center in New York. Also, fire protection engineers participate in research and development activities to introduce new fire protection products, such as advanced fire detectors and suppression systems, into the market. An area of recent growth includes the involvement of fire protection engineers in fire investigations, including incidents of national interest, such as the attack on the World Trade Center and the Pentagon.

What education and training do I need?
A thorough understanding of the physics and chemistry of fire is needed to predict building system performance and analyze failures. You will be required to demonstrate the ability to use scientific and engineering principles to evaluate structures for the hazards of fire and apply engineering principles in the assessment of performance of fire protection systems. You will learn how to use deterministic and probabilistic methods for analyzing fire safety risk. You will also have an opportunity to use state-of-the-art computer models to simulate fire development, the response of buildings to fire, and fire protection system performance.

Who should pursue a graduate degree in fire protection engineering?
Obtaining a graduate degree in fire protection engineering can accomplish several possible objectives. For those with an undergraduate degree in fire protection engineering, it provides the opportunity to update and enhance their technical background. Some professionals without an undergraduate fire protection engineering background may seek a graduate degree in order to pursue an alternative career path or may have already been involved in fire protection projects and seek to improve their fire protection background. Prospective students must have a bachelor’s degree in engineering or related field in the physical sciences or mathematics.
Is there a benefit to taking only a few graduate courses in fire protection engineering?

Yes! Some professionals may be seeking to improve their technical skills in a particular area of fire protection engineering, such as fire modeling, smoke management, or fire protection system performance. In these cases, professionals may elect to take a single class or a limited number of classes in the desired subject areas. Alternatively, individuals may wish to enroll in a limited number of courses to assist with their preparation to take the Principles & Practice of Engineering examination in order to become a registered professional engineer. Courses in fire dynamics, fire protection systems, and structural fire protection provide a good foundation for their preparation.

Why Maryland?

Drawing upon 50 years of expertise and seeing a national and international need, the University of Maryland’s premier academic and research institution for fire protection engineering began offering its graduate level education to the world via an online education system in August 2003. This practice-oriented, part-time program is focused on educating the working engineer or technical professional to allow them to continue their current work while gaining the expertise they need to advance their career. Since August of 2003, we have enrolled over 60 students with our first two graduates finishing this past August. The faculty teaching in the program are world-renowned with recognition and awards from the Society of Fire Protection Engineers, International Association of Fire Safety Science, American National Standards Institute, and Standards Engineering Society, and have eighteen books published in the field.

How do I take courses online?

The University of Maryland’s Department of Fire Protection Engineering is one of the few places in the world offering degrees in fire protection engineering and has a web-based fire protection option under its existing Professional Master of Engineering Program. Students download Web-casts of each lecture and receive all notes, outlines, and presentations, and participate in online chat sessions with faculty and fellow students in the class, and e-mail questions, homework, projects, and exams with the faculty. FPE student Kathy Kinney says, “I’ve been in the online program from the beginning, and it’s been getting better every term. We are getting better at using WebCT with e-mail and discussion postings; now there are weekly chat sessions. It’s a chance to have a real-time interchange with the professors and other students in the class. We’ve learned to use the tools.”

Who is a Fire Protection Engineer?

Student Profile
Kathy Kinney, M.Eng.
Fire Protection Engineering candidate
Kathy is a full-time Facility Engineer for Nonreactor Nuclear Facilities at Oak Ridge National Laboratory in Tennessee. She has a bachelor’s and master’s degree in Civil Engineering with a concentration in structures. However, to be more valuable in her job, she needed training and experience in fire protection, especially after 9/11. "I was looking to combine my abilities into a unique skill-set to stay on top of the physical conditions in a facility...the University of Maryland's online program had a recognized national reputation in Fire Protection by individuals outside of the Fire Protection field. Considering that I don't have to go to class 2-3 times a week, I think it's an ideal way to get your advanced degree...plus, you have the credentials and reputation of a nationally ranked university behind you to insure you are getting a quality product, and you and your employer know it's not an online degree mill."

Faculty Profile
Professor James Milke
Associate Professor and Associate Chair of the Department of Fire Protection Engineering, University of Maryland

Professor James Milke is an Associate Professor and Associate Chair of the Department of Fire Protection Engineering at the University of Maryland. He received his Ph.D. in Aerospace Engineering from the University of Maryland with an emphasis in structures. He received an M.S. degree in Mechanical Engineering and a B.S. degree in Fire Protection Engineering, both from the University of Maryland. In addition, he has a B.S. degree in Physics from Ursinus College. Prof. Milke has served as a Research Fire Prevention Engineer at the Building and Fire Research Laboratory, National Institute of Standards and Technology, as the Fire Protection Engineer for Fairfax County, Virginia; and as a consultant to numerous organizations. Prof. Milke is a fellow of the SFPE and is a member of the National Fire Protection Association, International Association of Fire Safety Science, and American Society of Civil Engineers. He is chairman of the NFPA Technical Committee on Smoke Management Systems and the ASCE/SFPE committee on Structural Design for Fire Conditions. He was a member of the Core Team of the World Trade Center Building Performance Study.

How do I start my new career?

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every day, nine Americans perish in fires. But fear of death or injury by fire doesn't make most citizens' list of anxieties. And planning for better fire safety measures rarely – if ever – occurs to most, except for a group of about 8,000 professionals whose careers focus on protecting people and their property from the ravages of fire.

“When I wake up each morning, I go to work knowing I have a cause I’m working for,” says fire protection engineer Victoria Valentine.

Valentine is manager of product standards for New York-based National Fire Sprinkler Association, the trade association that watches over the ways sprinkler systems are manufactured and installed throughout the country.

With undergraduate courses in civil engineering, Valentine might have chosen to work in building design.

Instead, she quit her civil engineering studies a few years ago and moved into fire protection, after a three-day conflagration in her hometown gave her cause to ponder fire's sheer destructiveness.

“Rather than building another building that’s occupied a few years and then abandoned, I’m doing something to help save people's lives and property,” she says.

Fire protection engineers perform a wide range of public safety-related roles, according to Maryland-based Society of Fire Protection Engineers (SFPE).

The typical fire protection engineer:
• Evaluates buildings to pinpoint the risk of fires and the means to prevent them;
• Designs fire suppression and detection systems, as well as fire alarm, smoke...
control, emergency lighting, communications, and exit systems;
• Conducts fire safety research on consumer products and construction materials;
• Investigates fires to discover how they spread, why protective measures failed, and how those measures could have been designed more effectively; and
• Writes investigative reports and provides expert courtroom testimony in insurance and civil litigation cases.

Though loss of life and property due to fire doesn’t register on most Americans’ radar screens, the ongoing threat of terrorist attack does.

It has turned people’s attention increasingly to improved safety and security.

With increased awareness comes an overall rise in demand for better fire protection in airports, tunnels, arenas, offices, malls, museums, and other public spaces, making fire protection engineering a hot new career.

VARIETY AND FLEXIBILITY
Fire protection engineers work in a variety of work environments.

Most often, they find themselves working alongside architects and real property owners, adding to a building’s blueprints and recommending ways to meet those clients’ never-ending demand to “build the best building for the best price.”

At the same time, fire protection engineers must, in effect, answer to the public. Their recommendations must adhere at all times to the stringent local and national fire safety codes that govern construction. And they must always respect the fact that local government authorities – namely fire marshals – can turn thumbs up or down on any or all their fire safety solutions.

“My biggest challenge is to juggle my clients’ needs to meet their building and cost goals with the codes and with occupants’ safety,” says fire protection engineer James Lord.

Lord is a fire specialist with UK-based Arup, one of the world’s largest consulting engineering firms.

Based in New York, he works on fire protection for airport terminals, schools, cultural and performance centers, and the city’s new subway line.

“At the end of each day, you can be proud that you’ve found the way to balance the public’s safety and your clients’ demands. That’s what I most like about my job.”

WIELDING INFLUENCE
Another fire protection engineer, Laura Doyle, chose the path after abandoning chemical engineering, first to seek a degree in business – which she learned would take too many semesters – then to study fire protection.

Doyle is a team leader in the fire protection engineering section of General Services Administration (GSA) in Washington, DC.

GSA acts as “landlord” to other government agencies, overseeing nearly 200 federally owned buildings near the nation’s capital.

Doyle enjoys the fact that she has considerable autonomy in her job and that she “can have a definite influence on fire protection policies.”

An out-of-the-ordinary facet of Doyle’s work derives from the unusual character of many of the buildings for which she is responsible.

Not only do her recent clients include the Vice President, cabinet-level secretaries, and the heads of the FBI and the Secret Service, but Doyle is responsible for protecting historic properties such as the Eisenhower Executive Office Building from fire.
“I work not only with architects to improve the life safety treatments inside these buildings,” says Doyle, “but with historic preservationists, who want assurances that the building’s fabric won’t be disturbed or compromised.” In addition to historic buildings, Doyle works on futuristic properties as well. She has completed fire protection engineering work for the new burn center operated by the Bureau of Alcohol, Tobacco, and Firearms. The largest burn laboratory in the U.S., the building’s design and construction mandated that Doyle take an extraordinarily creative approach to the fire safety systems, since building codes do not specifically address the one-of-a-kind facility.

EVERY DAY’S AN ADVENTURE

Sometimes, fires turn out to be catastrophes with enormous consequences, such as the Station Nightclub Fire in Rhode Island, in which more than 100 people died and 200 were injured. Disasters like the Station Nightclub Fire push fire protection into the headlines for weeks.

Routine fire protection engineering – thankfully – isn’t all that headline-grabbing. It’s careful, methodical fact-finding and number-crunching that requires well-tempered engineering and technical competency, a strong analytic mind, and a love of understanding “the way things work.”

But it’s also a job where a lot happens every day. “You’re never bored by this job,” says fire protection engineer James Lord. “Employers from Day One throw you right into the fire – no pun intended.”

To succeed in a career in fire protection engineering, you need not only the engineering know-how that the university programs provide, but public-speaking and technical-writing skills – and enough poise and self-assurance to present and defend your ideas before both large and small audiences.

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Engineered Protection For Life
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Applying Science and Engineering Principles

The field of fire protection engineering offers seemingly unlimited opportunities for the application of science and engineering principles, all with a goal of protecting people and their environment from potentially destructive fire hazards.

Tom Martin, director, contracting support services at SimplexGrinnell, has an M.S. in electrical engineering, and first worked in the aviation industry after graduation. He shares the mindset of an engineer – a love of math, science, and technology; an analytical bent; and a powerful drive to solve problems and create efficient designs. As he moved into fire protection early in his career, he was surprised at how appealing the field was with its never-ending focus on life safety and a chance to make a real difference in the structures that surround us every day.

“There is an overwhelming sense of pride among the entire fire protection community, and that alone can bring a level of gratification rarely found elsewhere,” notes Martin. “My personal and professional growth has reached levels beyond my expectations, working for a stable and reputable company like SimplexGrinnell.”

By education, training, and experience, fire protection engineers recognize and understand the nature and characteristics of fire and the associated products of combustion. They help determine how fires originate and spread, and how they can be detected, controlled, and/or extinguished.

Multiple Avenues, Unlimited Opportunities

Tom Wall, a project designer for sprinkler systems at SimplexGrinnell, has worked with the company for well over two decades. He says that one of the significant advantages of working for SimplexGrinnell is the opportunity to “flex your muscles” in a variety of business areas. Wall earned his engineering degree from the highly regarded Rose Hulman Institute of Technology in Terra Haute, IN. He then began his career as a design trainee, moved up to lead designer, and then design manager. He then took his knowledge of products and systems, and moved into sales, and eventually headed back to systems designs.
Career Path

“In an organization as widespread in core competences as SimplexGrinnell, both entry-level and more experienced engineers have a terrific opportunity to move into diverse areas related to the fire protection business,” says Wall. “The extensive and wide-ranging network of system design/development teams and district field offices provides the chance to apply your experience and knowledge in systems design, management, sales, and even research. A fire protection engineer can have a significant impact in this field through a whole assortment of disciplines.”

Jason Miller, an A & E business manager with SimplexGrinnell, graduated from the Fire Protection Engineering Program at the University of Maryland. In his role as an A & E business manager, Miller provides educational training and design support to architects and engineers.

“My position at SimplexGrinnell allows me to make the most of my training and experience as a fire protection engineer to assist architects and engineers in developing the goals for the fire protection systems they are designing, choose the appropriate equipment to meet those goals, and assist in the development of clear and concise construction documents to ensure those goals are met through the construction process,” Miller says. “This kind of involvement helps to ensure systems are not only designed and specified properly, but are also developed as an integral part of the overall fire protection strategy of the building.”

Impacting Sales Operations Management

Samuel Trotter, a recent SimplexGrinnell hire with an electrical engineering degree, is getting the chance to have an impact in sales operations management. As a regional sales operations manager working out of the Dallas office, Trotter is helping drive consistent sales processes and manage sales opportunities. He wanted to bring his electrical engineering background and years of marketing and sales experience to a company that offered stability and a forward-thinking management team. SimplexGrinnell offered the right growth potential, while at the same time allowing him to make important contributions to both the industry and the organization.

“It never ceases to amaze me as to the many sides of this profession,” says Trotter. “The company looked at my engineering degree and years of experience in this field and recognized the contributions I could make in the way of market analysis and the development of successful sales strategies.”

Encouraging Employees

SimplexGrinnell encourages employees to find their niche, or multiple niches, and as a result has created an atmosphere where engineers can thrive. Although known for years as a respected leader in fire protection products and systems, SimplexGrinnell looks at itself as an industry force in system integration, installation, and high-quality service. The company’s experience in special hazards solutions for high-risk environments helps protect high-value operations where conventional fire protection is not sufficient. By designing, installing, and maintaining fire protection systems that combine detection capabilities with extinguishing agents developed specifically for hazardous environments, engineers at the company have helped create safer work environments in power plants, petrochemical facilities, automotive manufacturing plants, airline hangars, computer rooms, and more.

The philosophy at SimplexGrinnell of encouraging growth and transition among its employees is based on the evidence that the fire protection engineering profession is having, and will continue to have, a significant impact on society.

Andy Whitesfield, total service manager at the SimplexGrinnell district office in Cincinnati, speaks about growth and potential from personal experience. “With my degree in fire protection engineering from the University of Maryland, I’ve had an opportunity to become an integral part of a process that applies products to real-world situations and helps make everyday life safer for people. It’s been an extremely gratifying experience. The hands-on work we do and the networking that is generated through industry associations like the SFPE just reaffirm the contributions we make here.”

One of the more appealing aspects of working for a company like SimplexGrinnell is that team members quickly move from the theoretical phase of fire protection into the realm of transferring knowledge and creativity to real-world applications. “We have a rich fire protection heritage at SimplexGrinnell, and it is continuing to be elevated by both the engineers we recruit out of schools across the nation and the more experienced professionals who recognize the value of making SimplexGrinnell their home,” says Daniel Casteel, vice president of sprinkler development and group leader of the company’s newly formed Sprinkler Business Development Team (SBDT). “We are committed to continuing to lead this industry by having the best people in the industry. Through improved design capabilities and expanded sales and services capabilities, we offer many opportunities for employees to enhance their skills and grow within the organization. All of this makes SimplexGrinnell even more attractive as a long-term career path for budding engineers, as well as more seasoned professionals.”

■
Making a career choice can be one of the most important and difficult decisions a person will ever make. It can determine their future success, life satisfaction, and the overall quality of life.

According to Mark Twain, “The secret of success is making your vocation your vacation.” A person who works a full-time, 40-hour work week spends almost a third of their waking hours on the job. As a result, it is important to make a good career choice.

The difficulty of this decision is compounded by the hundreds of options available for someone searching for the perfect career. Nevertheless, the challenge is to find a career that fits your interests and your values. For a person who is looking for a satisfying career that provides a solid income, flexibility, and the opportunity to make a difference, fire protection engineering is an excellent career choice.

The articles in this issue of Careers in Fire Protection Engineering highlight how fire protection engineering is an exciting and rewarding career. More importantly, although fire protection engineers are paid an excellent starting salary and a high industry-wide mean salary, fire protection engineers are hard to find.

Graduating fire protection engineers are in high demand. The number of jobs available to graduates consistently outweighs the number of engineers available to fill them. Because the demand is much greater than the supply, graduating fire protection engineers rarely have difficulty finding employment.

Last January, the Society of Fire Protection Engineers (SFPE) surveyed some of the largest employers of fire protection engineers to find out if they have had difficulties over the last year recruiting qualified fire protection engineers. An overwhelming majority of those surveyed indicated they currently have difficulty recruiting enough qualified fire protection engineers. They also predicted continuing recruitment problems in the next five years.

Each year in the United States, more than 3,000 people die, 18,000 are injured, and $10 billion in property is damaged as a result of fire. In addition to the direct costs from fire, there are indirect costs such as the cost of business interruption. Other costs include damage to the environment, fire insurance costs, and the cost of public fire protection.

Since fire protection engineers use science and technology to make the world safer from fire, it is important for society to keep up with the demand for fire protection engineers.

A career in fire protection engineering also provides an opportunity to work in a variety of work environments and provides the opportunity for world travel. For example, fire protection engineers are employed by a variety of organizations that include engineering consulting firms, large corporations, fire departments, academia, research institutions, fire protection equipment manufacturers, and federal, state, and local governments. They also work in all parts of the world.

Besides all of these excellent reasons to make fire protection a career choice, a person who chooses to enter this profession can truly make the world a better place. Because fire protection engineers go to work knowing they have the opportunity to make a difference, many find satisfaction in their career.

There are many pathways to enter the profession. Some take the traditional route and enter a program that offers a Bachelor of Science program in fire protection engineering. Many students who chose this route entered a bachelor program as transfer students from community college fire science or engineering programs. Others are students who started as bachelor students in other engineering disciplines then transferred to fire protection engineering.

Another common pathway is to enter a Master of Science program in fire protection engineering after completing an engineering program in a different discipline. This pathway is becoming more popular as master programs are now being offered in an online distance-learning format.

People who are interested in making a difference and who find this profession interesting can find more information by contacting SFPE at www.sfpe.org for a free copy of the Guide to Careers in Fire Protection, or by visiting the SFPE Careers Web site at www.careersinfireprotectionengineering.com.

WANTED: FIRE PROTECTION ENGINEERS

Chris Jelenewicz, P.E.
Engineering Program Manager, Society of Fire Protection Engineers

from the engineering program manager
Special Thanks to the Sponsors who made this guide possible:

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A Best-Kept Secret

Welcome to the first issue of Careers in Fire Protection Engineering. The Society of Fire Protection Engineers (SFPE), Fire Protection Engineering magazine, and industry sponsors are very excited to introduce this new publication to the engineering industry. Many corporate leaders and educators have asked for this type of publication to support growth within the profession. This special issue will focus solely on promoting fire protection engineering as a career.

As an important member of the engineering community, we ask that you help us educate your students, peers, and those considering careers in engineering by sharing this informational guide highlighting the many opportunities available in fire protection engineering.

The editorial for this issue features two fire protection engineering graduates talking about their experiences in college and as a fire protection engineers. The remaining editorial will discuss how fire protection engineering is an exciting and rewarding career.

Please enjoy this first issue! We hope that you will share it and reference it often to those interested and curious about this exciting field. You can also access the issue digitally at FPEmag.com/careers. For further instructions on accessing the digital magazine, please refer to page 3. Thank you for your support, and enjoy your issue!

Sincerely,
The Sponsorship Committee
COVER STORY

Fired Up

Two fire protection engineering graduates discuss their experiences in college and as fire protection engineers.

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The employment prospects for young fire protection engineers are stronger than ever. But in terms of academic preparation, job-seeking, and ultimate career satisfaction, few people outside the profession understand what fire protection engineering really entails.

Fire Protection Engineering spoke with two practitioners to get their take on breaking into the field and what it takes to succeed.

Vidar Landa, E.I.T., studied fire protection engineering in his home country of Norway before attending Massachusetts’ Worcester Polytechnic Institute. He now works at Schirmer Engineering Corporation in Los Angeles.

Stacy Welch, P.E., graduated from the University of Maryland and now works for Marriott International’s corporate headquarters near Washington, DC.

**FPE: How did you first hear about fire protection engineering and what were your initial impressions?**

**Vidar Landa:** The first time I heard about fire protection engineering, I was living in Norway. There was only one college in Norway that offered a fire protection engineering program and it happened to be in Haugesand, the city where I’m from. It sounded more interesting than other types of engineering, like electrical or mechanical, and seemed quite different.

**Stacy Welch:** I applied to the University of Maryland, and once I was accepted into the school of engineering, realized that I didn’t have any idea of what type of engineering I wanted to study. I went to an open house to hear about the different engineering programs offered at Maryland, and one of those was fire protection engineering. Once I heard the presentation by Dr. Jim Milke, one of the professors in the department, I was instantly drawn in. The strong human component really fascinated me.

**FPE: What attracted you to engineering in the first place?**

**Welch:** A couple of things. My brother, father, and grandfather were all engineers, so that was in the back of my head. And in high school, I was good at math and science. So the combination of those things led me to the decision that this was something that I wanted to do.

**FPE: What factors did you consider when you chose this particular field of engineering?**

**Welch:** I felt that fire protection engineering, of all the different types of engineering, had the strongest impact...
They gave me a lot of responsibility, and I got into a number of very different areas of fire protection engineering.

**Welch:** I actually worked under Professor Jim Milke on some of his research projects while in school. One was cosponsored by Marriott International, which is how I was first introduced to the company where I work. It was really a great hands-on experience. As part of the research, I put in some sprinkler systems, ran tests, and analyzed data. It was insightful to see how projects are developed.

**FPE:** What would you have done differently while you were in college to have better prepared yourself for your career?

**Landa:** I wish I took more classes in project management. I think that would have better prepared me to work as a consultant and handle many of the tasks that a fire protection engineer handles on a daily basis.

**Welch:** I think after you get out of school you gain a much different perspective. While I was still in school, I was focused on passing classes and getting assignments done. I could have spent much more time trying to understand more deeply what we were studying. I think that would have helped me once I got out of school.

**FPE:** What would you recommend to high school and college students to help them prepare to earn a degree in fire protection engineering?

**Welch:** Having a job before or during school that is related to the field gives you a great perspective on the purpose of fire protection engineering and really helps you with your classes.

**Landa:** The most important things are that you work hard and are dedicated. To succeed in school, you have to have a strong interest in the subject.

**FPE:** Was it difficult to land your first job after leaving school?

**Welch:** I started working part-time with Marriott International in my senior year, so I had met all the people in the office and knew what the job was like even before I graduated. I thought it would be exciting to work in the hospitality industry, and since the company was located in the area where I went to school, I thought it would be a great fit.

**Landa:** My first job was with Schirmer Engineering Corporation in Los Angeles. I found it easy to get the job, because I had interned there. Interning is a great way to get your foot in the door and provides the opportunity to prove yourself.

**FPE:** What is the most memorable aspect of your very early career?

**Welch:** Less than two months after I had started working full time, I was sent to Hong Kong to survey hotels that Marriott International was thinking about taking over. That was unbelievable! I was part of a team where I was the only fire protection engineer. It was a wonderful new experience for me. The whole trip lasted only two weeks, but it was terrific. Traveling has remained an integral part of my job ever since.

**Landa:** For me, getting a job in the United States was exciting in and of itself. The opportunity to live in Los Angeles and work for a great company is a privilege. And I find the variety of work always keeps the job exciting.

**FPE:** So your job is satisfying?

**Welch:** It is. I feel like there’s a “big reason” why I go to work each morning. I don’t feel like I just sit behind a desk all day. And I know that I have a direct impact on hotel safety. It gives me an incredible sense of purpose.

**Landa:** Sometimes you’re working really hard and have too much to do, but still the job is rewarding! It has given me so many great opportunities. I always dreamed about coming to the U.S. and living in a place like California. The job has given me the chance to do this, and I’m extremely happy and proud. I also feel it’s important, because we’re making sure buildings are safe. Society appreciates that.

**FPE:** What parts of your work are the most exciting and challenging?

**Landa:** I was involved with the Kodak Theater in Los Angeles. It was really cool being part of something that is known worldwide. I also like working on some of the huge high-rise construction projects that encourage students with dual interests in the fire service and fire protection engineering to combine the two.

Called the “live-in” program, it allows students to live in local firehouses while commuting to campus for classes. The initiative provides students with hands-on experience as volunteers in the fire service while they’re studying the behavior of fire in the classroom.

“The practical experiences of fire protection engineering student firefighters help them to appreciate the conditions produced by fires in buildings and how these conditions can change dramatically in a short time period,” says Dr. Jim Milke, undergraduate director.

continued on page 11
• What is a fire protection engineer, and what do they do?
• Some of the challenges currently facing the profession of fire protection engineering and how those challenges are being addressed;
• Changes that are occurring in the profession; and
• What can be done to increase the acceptance of the profession.

The Fire Protection Engineer
The fire protection engineer is a professional that uses science and technology, coupled with specialized knowledge, education, and training, to protect people from the effects of fire. A fire protection engineer (FPE) is familiar with the nature and characteristics of fire and the associated products of combustion; understands how fires originate and spread within and outside of buildings/structures, and can be detected, controlled, and/or extinguished; and is able to anticipate the behavior of materials, structures, machines, apparatus, and processes as related to the protection of life and property from fire.

With more than 3,000 deaths per year from fire in the U.S., the need for qualified engineers to address and mitigate these risks is essential. The high demand for FPEs consistently outweighs the supply, resulting in higher-than-average compensation and a multitude of employment opportunities. A wide range of industries offers FPEs outstanding career opportunities and a chance to make the world a better, and safer, place to live.

Fire Protection Engineering: The Historical Perspective
Historically, the fire protection engineering profession has been plagued by the perception that it is a “sub” or specialty engineering discipline, not on a par with the so-called “traditional” engineering fields. Indeed, the evolution of the FPE from a safety professional based in loss prevention to a degree professional engineer with specialized education and certification has been slow. But today’s fire protection engineer, who “applies scientific and engineering principles to protect people and their environment from destructive fire,” is a top-flight professional, working in a variety of industries and with many groups – including other engineers, architects, government and state authorities, insurance underwriters, fire service personnel, and lawyers.

From the first course in fire protection engineering at the Illinois Institute of Technology (1903) to the first accredited safety engineering technology program at Oklahoma State University (1937) and the first Accreditation Board for Engineering and Technology-accredited undergraduate program at the University of Maryland (1976), the field of fire protection engineering has enjoyed steady growth and increasing popularity among engineering students. With the creation of the graduate program at the University of Maryland and masters and doctorate degree programs at Worcester Polytechnic Institute and the University of California, Berkeley, the fire protection engineering profession has made great strides.

The profession is currently recognized as a separate engineering discipline by the National Council of Examiners for Engineering and Surveying (NCEES) and licensing boards in 46 states, while enrollment in both undergraduate and graduate fire programs is increasing. With over 1,000 graduates and more than 8,000 practicing FPEs, these are exciting times.

Challenges
The challenges facing fire protection engineering are many. As stated in SFPE’s Strategic Plan and according to key industry professionals, these are some of the critical issues facing the profession:
• The need for additional undergraduate, postgraduate, and continuing education programs to support the demand for more FPEs.
• The transition from prescriptive codes and standards to performance-based codes.
• The increasing requirement for continuing education and professional development to maintain professional engineering credentials.
• The need to enhance the image of fire protection engineers internationally.

The stated mission of SFPE is to advance the science and practice of fire protection engineering internationally. Clearly, the development of the science of fire protection engineering and the actual practice of the discipline will be forever interwoven. No engineering discipline can be accepted without a foundation based in science, and no engineering profession will develop successfully without the ability to apply that science to real-world applications. However, as the profession becomes better accepted by the technical and engineering community by virtue of its application, it will still be left with the task of self-promotion – not the promotion of FPEs to other FPEs, but the promotion of the profession outside the fire protection community. This is where the opportunities for growth occur.

Professional Recognition
Recognition of the fire protection engineer has a lot to do with general acceptance of the engineering tools he or she employs. With volunteers throughout the fire protection community, SFPE has developed a Guide to Performance-Based Fire Protection Analysis and Design.
The guide, published in 2000, outlines a process for using a performance-based approach in the design and assessment of building fire safety with both prescriptive and performance-based code systems. As stated in the guide, its intent is to "provide guidance that can be used by both qualified engineers and authorities having jurisdiction as a means to determine and document the achievement of fire safety goals for a particular project." The guide also clearly defines what is considered a "qualified engineer." This resource is a great asset to the FPE in the resolution of design issues and the acceptance of proposed designs by AHJs and building officials. The SFPE Task Group on Performance-Based Design is in the process of preparing the second edition of the SFPE Engineering Guide to Performance-Based Fire Protection Analysis and Design of Buildings.

Education

The number of college and university fire protection engineering programs is still limited. The startup costs and space requirements for a new program are in many cases prohibitive, and the effort required to sell a new program to a college or university is considerable. According to Dr. John Bryan, founding chair of the University of Maryland’s fire protection engineering program, “the establishment of the original program was driven by state-supported legislation and may never have occurred without that support.” To compound the problem, due to the substantial up-front investment and effort required for accrediting of undergraduate programs, new programs at the graduate level are seen as the more likely candidates for success. Currently, the University of Maryland is the only school in the U.S. to offer an ABET-accredited undergraduate program in fire protection engineering. Many fire protection engineers start their education by earning a bachelor’s degree in civil, electrical, chemical, or mechanical engineering, followed by a master’s degree in fire protection engineering.

Exciting developments are occurring at all levels of education. Currently, both the University of Maryland and Worcester Polytechnic Institute (WPI) offer masters programs in Fire Protection Engineering and WPI offers a doctorate program to receive a Ph.D. in the field. The University of New Haven has established a Bachelor of Science program in Fire Protection Engineering. The Oklahoma State University (OSU) School of Fire Protection and Safety Technology (FPST) offers a four-year ABET-accredited degree program that concludes with a Bachelor of Science in Engineering Technology.

Distance learning programs have had a positive effect on the growth of the profession and the opportunities for educational development in the field. The distance learning programs at the University of Maryland and Worcester Polytechnic Institute have more than doubled the total number of Masters Degree graduates. WPI’s distance learning program has been ongoing since 1994 and has provided courses to students in over 50 cities in the U.S., Canada, and overseas. In addition, efforts related to the development of campus fire laboratories, such as the privately funded Fire Center Program at the University of Maryland, have

WHAT IS PERFORMANCE-BASED DESIGN?

Most fire protection requirements in buildings are designed based on “prescriptive” requirements. Prescriptive requirements identify, in very specific terms, how fire protection is to be provided in buildings. The level of safety provided by prescriptive requirements is not precisely known, although history has shown that prescriptive requirements provide a reasonable level of safety. Because of their rigidity, prescriptive requirements can stifle innovation.

“Performance-based design,” on the other hand, identifies the level of safety that is to be provided without identifying exactly how it is to be accomplished. Performance-based design requires more engineering effort although it results in more design flexibility.

An example of a prescriptive requirement is “smoke exhaust fans shall be provided such that they provide six air changes per hour.” This requirement is intended to ensure that a fire in an atrium does not endanger people within the atrium. To apply this requirement, the volumetric flow rate of smoke removal fans would be determined by multiplying the enclosed volume of the space by 6/hour. However, this requirement does not allow consideration of the amount of smoke that could be produced by the fire or the impact of the smoke on people.

A performance-based requirement that addresses the same concern would read “the smoke layer shall not descend below six feet above the highest occupied level.” This requirement is intended to ensure that the smoke layer (which will rise, because it is hotter than air) will be above head level for most adults. It also requires an engineering analysis that considers the rate of smoke production and the geometry of the atrium.
created an exciting and dynamic environment in which to prepare for a career in the field. Other programs that support the promotion of the profession include the Academic Common Market Program, implemented through the Southern Region Education Board. This program offers in-state tuition rates for student from participating southern states.

The Next Generation
Where do new fire protection engineers come from? The profession is primarily fueled by the recruiting of new engineering students out of high schools or by transfers from other engineering, technical, or fire-protection-related disciplines. Some students come from the community and junior colleges, others from the broader technical or engineering community. Historically, an average of 30 percent of the fire protection engineering students enrolled in the University of Maryland’s program come from community colleges, and another 20 percent are transfers from “traditional” engineering disciplines.

All new entrants into the field need to be supported by established educational programs providing BS, MS, and doctoral degrees. With the profession becoming more performance-based, the next generation of leaders will not only need to be skilled communicators but also well-practiced in computers and modeling, and well-versed in such areas as economics and statistics. But producing new engineering graduates is only part of the equation; ultimate success can only be achieved by an industry that offers a steady flow of high-quality employment opportunities, acceptable compensation levels, and an exciting work environment. Fortunately, today’s fire protection engineering profession offers young engineers all three.

The critical issue is how to introduce fire protection engineering to the student who has no acquaintance with the profession. Promotional videos targeting prospective students have been developed by WPI and the University of Maryland.7

Targeting young, would-be FPEs, SFPE has developed the free SFPE Guide to Careers in Fire Protection Engineering.8 This document provides a much-needed overview of the profession, describing what fire protection engineering is, what fire protection engineers do from an industry-to-industry perspective, and the process of becoming a fire protection engineer.

What’s in Store for the Profession?
The emergence and ultimate acceptance of performance-based codes represent incredible opportunities for the fire protection engineering profession. The evolution from prescriptive codes to the engineering of a building using a performance-based approach will not only result in more economical and safer buildings, but will further validate fire protection engineering as a separate and distinct profession.

The skills required of the fire protection engineer are also changing. One major change affecting the profession is the requirement, many times driven by the courts, to understand the science behind fire reconstruction and analysis, or arson investigation. The next-generation FPE will need a broad set of hard skills, with a solid foundation in math and science, plus highly developed soft skills, such as the ability to communicate effectively. Greater emphasis will be placed on presenting technical information in a way that builds confidence and validates technical positions based on sound engineering principles.

Douglas Rollman is with The Protection Engineering Group, PC.

5 Telephone interview with Dr. John Bryan, past chair, Department of Fire Protection Engineering, University of Maryland, College Park, MD.
6 Telephone interview with David Lucht, P.E. professor and past director, Center for Firesafety Studies, Worcester Polytechnic Institute, Worcester, MA.
7 “Engineering Careers in Fire Protection” (video), Worcester Polytechnic Institute, Worcester, MA.
Will I be part of a team effort?
It might sound obvious that the best way to manage a project is by working together. But many companies foster an environment in which everyone works independently of one another. At RJA, we emphasize teamwork and synergy to the benefit of our clients. You may function as a consultant on one project and a project manager on another. Often, you as the fire protection consultant will be teamed with our experts in security, communications, and construction management to provide integrated solutions for our clients.

Will I be involved in technical innovation?
No two companies approach technical innovation the same way. Some prefer to stick with proven technology while others are out on the “bleeding edge” for pure research’s sake. RJA has a company-wide focus on technical innovation. We pioneered the advancement of performance-based design and are an acknowledged leader in the field of fire/smoke/egress modeling. However, the focus of technical innovation is not on being “first” but on being “best” when it comes to applying technology to solve a client’s fire protection challenge.

Will I be able to continue my education?
Fire protection engineering is a dynamic science, and the pace of innovation is increasing every year. That’s why your engineering degree is only the starting point. RJA provides opportunities to obtain your masters degree in fire protection engineering while you work through distance learning programs with leading universities and institutions. We also promote participation in SFPE and NFPA programs, industry seminars, and Web-based learning events. But the cornerstone of our continuing education program is The RJA Group Academy, a curriculum specifically designed to provide you with the skills necessary to be a more effective engineer, consultant, or manager.

Will I be encouraged to join professional organizations?
In good times, most companies will allow you to join professional organizations such as SFPE and NFPA. RJA sets the bar much higher. Not only are you expected to join these important organizations, RJA encourages you to take meaningful roles in the advancement of their charters. Through our extensive involvement in organizations and associations that develop the codes, standards, and best practices of our industry, we are able to achieve RJA’s ultimate goal: to save lives and protect property and assets against fire.

Will I be working for an ethical company?
Every company has a lofty vision statement, professing their dedication to truth, justice, and the American way. RJA has a vision statement as well: to be recognized as the best in the world at providing fire protection and security consulting solutions for the built environment. But the real key is how a company operates to achieve its vision. RJA is guided by a single statement: do the right thing. It’s not open to debate or subject to exception. Simply do the right thing for the client, the profession, the company, and yourself.

After you’ve asked all the right questions, your next best move might be to join the fire protection consulting team at Rolf Jensen & Associates. With offices in major cities throughout the United States and our China office in Shanghai, there is certainly a place for bright graduates and veteran engineers. For more information on the career opportunities at Rolf Jensen & Associates, contact us at 312-879-7220, e-mail recruiting@rjagroup.com, or visit www.rjainc.com.

Dave Czajka is the VP-Human Resources for The RJA Group, parent company of Rolf Jensen & Associates. He is based at The RJA Group headquarters in Chicago.
Fire protection engineers (FPEs) earn among the best salaries of all the engineering disciplines – and graduates are in demand!

The Society of Fire Protection Engineers (SFPE) periodically surveys its members to gather salary information. The latest figures, derived from the 12th Profile of the Fire Protection Engineer Survey conducted in Spring 2003, show that:

• The average starting salary for an FPE is $47,000.
• The industry-wide mean among FPE professionals is $85,000, reflecting a broad range of years of experience in fire protection engineering.
• Slightly more than 25 percent of respondents earn $100,000 or more.
• Less than 5 percent earn $50,000 or less.

While salaries vary based on education, age, experience, and type of job, the charts shown here represent a typical cross-section of SFPE’s membership profile.

Who Responded?
SFPE has been surveying its members since 1976. For the Spring 2003 survey, 1,217 members responded, representing about 32 percent of SFPE membership.

About the respondents:
• 83 percent work in the U.S.
• 68 percent are age 40 or older.
• 77 percent have 10+ years’ experience in fire protection.
• Two-thirds have variable compensation – for those who do, 8 percent is the median percent of their salary that is variable.
• 85 percent hold at least a bachelor’s degree, with Fire Protection and Mechanical Engineering most often cited as specialties.
• Many also hold professional engineering licenses, with Fire Protection cited by 50 percent of respondents.
• Of the 55 percent of respondents who indicate they are licensed, 60 percent were registered in one state only.

Where They Work
FPEs work in a wide range of settings and industries including:
• Consulting engineering firms
• Fire departments
• Fire equipment/systems design and sales
• Government
• Hospitals and healthcare
• Manufacturing
• Research and testing
• Education, and more

Two-thirds of respondents work for large firms (100+ employees), while 15 percent work for firms with 10 employees or fewer.
According to the survey, consulting remains the dominant employment sector at 43 percent. Consulting engineers typically analyze the fire safety of a building or design systems that protect people from fire.

The number of respondents who work in the insurance sector continues to decline, with only 15 percent citing this field.

The highest-paying sectors as reported by survey respondents are industry, stock/mutual insurance, and “other.”

How They Spend Their Time
The survey also asked members to cite areas where they spend most of their workplace time. They were asked to make three choices. The top three responses were:

- 56 percent said plan/project construction drawing reviews for code requirements.
- 47 percent said fire protection system design.
- 35 percent said risk management.

Other areas cited were:
- Physical facility fire prevention inspection, 32 percent.
- Facility fire protection program development, 29 percent.
- Performance-based design, 26 percent.
- Codes and standards development, 19 percent.
- Special fire protection applications, 19 percent.
- Construction planning and cost estimating, 13 percent.
- Facility safety and security program development, 8 percent.

Benefits
In addition to salary, the vast majority of respondents said they receive medical insurance benefits and that their employer paid their annual SFPE dues. Nearly 70 percent of respondents also reported “tuition reimbursement” as a benefit, and approximately 50 percent received performance bonuses.

In addition to salary and benefits, FPEs typically enjoy:
- A great deal of personal job satisfaction.
- The “power to make a difference” by helping make buildings safer for everyone.
- Numerous career options and a high degree of job security due to demand for their skills.
- The ability to work on a variety of exciting projects, often in a team-based atmosphere.

The Future Looks Bright
Job security in the field looks solid, as the demand for FPEs has far outpaced the number of qualified candidates.

Through efforts to reach out to high school and college students nationwide, SFPE hopes to quadruple the number of fire protection engineers in the next decade. At the core of this program is this first issue of Careers in Fire Protection Engineering, which can also be accessed digitally at www.FPEmag.com/careers.

“IT’s imperative for the safety of our society to train a new generation of fire protection engineers,” says SFPE Executive Director Dave Evans. “These are the people who are going to help ensure the safety of our communities in the years to come.”

Information for this article was obtained from the Society for Fire Protection Engineers. For more information about the 12th Profile of the Fire Protection Engineer Survey, go to www.sfpe.org.
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Bryan’s research of major fires\textsuperscript{5} indicates that we now know a great deal about how people behave in fires and respond to fire cues. Bryan supports Sime’s and Proulx’s findings as well as those of Ramachandran\textsuperscript{6}, which suggest that stress may cause people to act inappropriately in a fire – often due to lack of information – but rarely to panic and behave irrationally.

It is clear that fire protection engineers can improve the efficiency of evacuation and assist rational decision-making by occupants under fire conditions through measures such as:

- Architecture in which occupants have a clear “cognitive map” or feel for where they are in building, to aid their movement towards exits;
- Provision of escape paths linked to normal building circulation paths; and
- Use of good signage that provides clear emergency instructions.

**Vehicles explode.** Another popular perception is that all combustion in cars and other vehicles immediately leads to explosion rather than fires. It is clear that many people are killed in car fires as a result of accidents. For example, in Australia about 50 percent of all fire deaths occur in vehicle fires\textsuperscript{7}. In these cases, fires can develop quite rapidly, but deaths most often result from the drivers and passengers being trapped due to injuries or vehicle deformation, not as a result of explosions.

What about the design of buildings that house vehicles? Research conducted by BHP Melbourne Laboratories\textsuperscript{8} and in the UK\textsuperscript{9} shows that, while cars burn, they generally do not explode unless fuel vapors are confined and ignited.

**Compliance guarantees safety.** Another persistent myth is that compliance with statutory building codes guarantees absolute safety. The corollary of this myth is, a building burn and people or property be harmed, it follows that there must have been negligence and design failure.

Clearly, there is absolutely no guarantee of zero risk. If there were, all buildings would be built totally of noncombustible material and have no occupants.

International building codes and regulations generally recognize that a community needs to provide only a reasonable level of life safety, consistent with societal expectations and at a reasonable cost. Until now, the measure of that level of risk (or level of safety) has not been possible for an individual building. Fortunately, the research of Beck, Yung, and others is starting to produce tools of risk measurement\textsuperscript{10}. Through their use, it may be possible in the future to design on the basis of acceptable risk levels and evaluate the comparative levels of risk to life safety in different building types and occupancy classifications.

**Compliance protects property.** The issue of property protection is, of course, separate from life safety, as the advent of performance-based building codes has highlighted. Many people believe that compliance with a building code provides protection of a building’s fabric and contents. But a number of countries, including the UK, New Zealand, and Australia, have not included property protection (apart from adjoining properties) as a building code objective. Rather, it is left to building owners and their insurers to consider.

Under these performance-based regulations, the fire protection engineer has a duty to point out to owners that property protection and business interruption lie outside the regulatory framework – and must be explicitly considered over and above building code considerations.

**The fire department will save me.**

Two final public misperceptions are that “fires will not happen to me,” – but should one occur, “the fire department will rescue me.”

A firefighter on a ladder carrying a child from a burning building to safety is indeed a popular image. However, it is often not the reality. While the vast majority of people never experience a fire in their lifetime, and the rate of fire deaths is trending down in most countries, in the U.S. there are still 1.1 deaths per 100,000, with similar rates in Western Europe and Japan\textsuperscript{11}. Complacency is the enemy, and fires, when they do occur, bring personal tragedy and business loss.

Fire departments play an important role in society. Without them, life and property losses would be considerably higher. But fire department officials are the first to acknowledge that all rescue and fire-fighting actions cannot be left to the firefighters.

Research by Fitzgerald\textsuperscript{12} for his fire safety evaluation system suggests that the probability of success of firefighters arriving and setting up before flashover occurs in any building is less than 40 percent. Fitzgerald’s finding is confirmed by the latest research in Australia\textsuperscript{13} with the development of the Fire Brigade Intervention Model (FBIM). This methodology can be used to quantify the response of a fire department in both rescue and initial firefighting, based on the department’s operational characteristics. The use of this technique analysis confirms the advice of the Australian Fire Engineering Guidelines\textsuperscript{14}, which state that, for conservative building design, “the role of the fire brigade in occupant safety should be ignored.”

**NEW MYSTIQUE**

As noted at SFPE’s international conference in Luxemburg\textsuperscript{15}, performance-based building regulations and design methods are a global trend. Global acceptance raises many fundamental questions for the fire protection engineering profession. The events of 9/11 and the subsequent report by the National Institute of

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Standards and Technology (NIST) have also raised questions about fire engineering. Among them: How can guidance for fire protection engineers be developed to improve the architectural design process? What’s the relationship between fire protection systems and the functionality of buildings? How can fire protection engineers and structural engineers prevent or minimize building collapse? And what is the liability of practitioners in the new era of performance-based design and post-9/11 construction?

Clear answers to such questions require clear thinking. Unfortunately, the new environment resulting from the widespread acceptance of performance-based regulations and design has already generated its own mystique, built in part on long-established myths. Here are the ones most commonly encountered.

It’s a slow, costly process. The initial fear of a number of architects and project developers in Australia was the new Performance Building Code of Australia (BCA) introduced in 1997 would add time and cost to the design process for buildings. In particular, many thought that development of alternative solutions, rather than following the prescriptive “deemed-to-satisfy” provisions, would be restricted to a few complex and innovative major projects that could “afford” fire protection engineering.

The experience in Australia and New Zealand, however, has differed from those expectations, with alternative solutions being developed for a wide range of buildings. The cost and time issues have been addressed through the widespread introduction of fire protection engineering guidance documents, such as the *SFPE Handbook* and the *New Zealand Fire Engineering Design Guide*.

In particular, the Fire Engineering Design Brief (FEDB) process, based upon the Qualitative Design Review (QDR) technique first introduced in the UK document DD240, has clearly improved the process of design for fire protection. Fire protection objectives and acceptance criteria are agreed upon by all parties at a very early stage in a project. The result is usually significant savings through clear, early design decisions – with less costly, but more effective, fire protection measures developed into an integrated design package.

Anecdotal evidence suggests that Australia is well on the way to achieving the $200 million yearly savings identified through the Warren Centre and Building Regulation Review Task Force. These potential savings were identified in 1989 as one of the benefits of performance-based regulations and rational design methods. Lovegrove suggests about a 10 percent savings on construction cost since the introduction of performance regulations in Sweden in 1994. In the UK, moreover, building appeals have fallen more than 90 percent. Increased cost and delays both seem to be myths perpetrated by people troubled by change and innovation.

Research showing that, in emergencies, people exit the same way they entered buildings strongly suggests exit routes should be part of normal building circulation routes. There is clearly a major difference between performance-based and prescriptive regulations. Greater use of judgment in performance-based design means that challenge is more likely and that opinions may vary as to whether performance objectives have been met.

Lovegrove suggests that education and the “skill imperative” are essential if the performance-based approach is to be successful. He highlights the need for proportionate liability, mandatory insurance for designers and certifiers, 10-year liability caps, and peer review as some of the reforms needed to ensure the liability myth does not become a reality.

Separate systems are mandatory. Many practitioners believe that fire protection systems should be separate from all other building systems and construction elements. As a result, exit stairs have often been designed for use only in emergencies. Signs seen on exit stairway doors include “DO NOT ENTER,” “USE ONLY IN EMERGENCIES,” and “THIS DOOR IS FITTED WITH A SECURITY ALARM.”

But research has shown that these escape routes, often provided at great expense, are seldom used. At the National Gallery of Victoria in 1990, not a single person used the four-hour-rated concrete staircase in the evacuation of 1,014 people. Research showing that, in emergencies, people exit the same way they entered buildings strongly suggests exit routes should be part of normal building circulation routes.

Evidence in the U.S. and Australia suggests the potential for poor reliability of complex smoke control systems, particularly where they are stand-alone. If systems can be kept simple and are required to operate every day as part of building’s normal air-conditioning systems, then it is likely they will have a greater probability of success when called on to work effectively in a fire.
Civil works are separate. There is a belief shared by many design professionals that fire protection engineering is not related to the building foundation or civil engineering works, a myth that performance-based fire engineering is helping to dispel.

Analysis of design fuel loads and ventilation by fire protection engineers can often lead to reduced Fire Resistance Levels (FRLs) as compared to current prescriptive FRL provisions. Reduced FRLs, particularly in taller buildings, can lead to reduced column size, floor slabs, and fire-rated shafts. The savings in weight can often result in significant reductions in foundation loads and lower construction costs.

Fire spread can be prevented. Design professionals commonly think that spandrels always prevent external fire spread between the floors of a building. Similarly, many believe that compliance with regulatory separation distance between buildings on adjoining allotments will provide on absolute guarantee against fire spread.

The requirements for vertical spandrels of 900mm in nonsprinklered buildings and 18m separations from boundaries appear in the Building Code of Australia (BCA). Similar requirements appear in other nation’s building codes. However, calculations based on Law and O’Brien, and evidence from real fires show that there is no absolute certainty of preventing fire spread under all circumstances. The distances involved with spandrels and building separations are sound technical compromises. They ensure reasonable protection at an affordable cost that achieves the required design objectives in most, but not all, fires.

Sprinklers destroy property. Another common misconception in the design profession, as well as the broader community, is that if one sprinkler operates in a fire, they will “all go off” and deliver vast quantities of water that inundate the building, destroying its contents.

This myth is still popular among managers and operators in computer centers, telecommunication facilities, art galleries, museums, libraries, and historic buildings.

Fortunately, there is increasing recognition that some 90 percent of fires are extinguished by four sprinklers or fewer, with 65 percent extinguished by a single sprinkler operating. There is also better acceptance by the arts and historic preservation communities of the notion “better wet than burned.” While there is a small chance of limited water damaged, the risk is preferable to significant or total loss of a collection or a building – as with Hampton Court Palace, Windsor Castle, the Los Angeles Library, the San Diego Space Museum, and the Venice Opera House. The rebuilding of several of these buildings without sprinklers would suggest the myth about sprinklers is still alive and kicking.

MORE MYTHS

There are a number of concerns that even fire protection engineers give voice to, but that, in reality, are no more than myths. In some cases, these myths are put forward by special interests to promote certain products or systems, with little or no foundation.

Concerning buildings. Two favorites are “all occupied buildings require sprinklers” and “people will not and cannot move through smoke safely.

The first myth appears to be more commonly advocated in North America and Australia than in the UK or Europe. There is no doubt that sprinklers offer huge life safety and property protection benefits, with very few deaths in sprinkler-protected buildings. However, countries like the UK and Hong Kong allow apartments and offices, for example, to be built to heights of eight stories, or in some cases higher, without sprinklers, and their records on life safety are certainly no worse than that of North America. Acute care hospitals are also built in the UK today without sprinklers, relying on staff and the fire department to suppress fires.

Countries such as Germany, which relies on sprinklers, similarly have no significantly greater loss of life in occupied buildings.

With regard to egress through smoke, it is inherent in every building code around the world that people may have to move through some smoke, particularly in the enclosure of a fire’s origin. In a high-rise office building, for example, the BCA in Australia and Approved Document B in the UK do not require a smoke-management system to be installed to ensure that smoke remains above head height on the floor of a fire’s origin. It’s assumed that occupants may have to move through smoke that is not excessively hot or thick for relatively short distances in the vicinity of the fire. However, it is also expected that lobbies, stairs, and separations between floors will be designed so only a minimum of occupants will be exposed, and once in the escape system, people will be protected from further exposure to combustion products.

The movement of people through smoke has been studied in Scandinavia and Japan. Studies have found that people can escape through smoke, but that performance depends on smoke density and lighting levels. Use of tactile systems, floor guidance systems, and flashing lights can aid escape. People can escape through smoke, but that performance depends on smoke optical density and lighting levels. Use of tactile systems, floor guidance systems, and flashing lights can aid escape.

Concerning elevators. A widespread belief holds that elevators are an area of great fire hazard and should be avoided in fire emergencies. However, the feasibility of using elevators in a fire has been examined, and there is a British standard specifically for the design of elevators for egress.

One reason for a reexamination of the popular perception of danger associated with elevators is the move to provide equity and better egress provisions for people with disabilities. Countries like Australia are examining the needs of citizens with disabilities, with documents such as the Building Outcomes Reports by the Australian Building Codes Board (ABCB) appearing in response to the Disability Discrimination Act.
The experiences in the 9/11 disaster have added to the debate on the use of elevators for occupant egress and firefighter access, especially in tall buildings. The use of firefighting shafts, as required in the UK, is now being more widely considered.

Concerning flashover. Some professionals believe that, once a fire starts, it’s inevitable that it will grow to flashover, breaking all glazed openings. In fact, research by Cuzzillo and Pagni, which refers to experimental work by Shields at the University of Ulster, has shown that glazed openings often do not break, particularly if double- or triple-glazed. This often has the effect of limiting fire growth through ventilation control well before flashover.

The effect of glazing in limiting ventilation and fire growth was observed in both the BHP (Australia) and Cardington (UK) experimental test programs on steel structures. It is also one of the bases of the management practice of removing patients and closing ward doors quickly in hospitals and aged care facilities to limit fire size, smoke production, and smoke spread.

A related myth holds that, in large spaces such as factories and warehouses, flashovers involving all combustibles at peak heat release rate occurs throughout the space. However, Clifton has demonstrated that flashover as recognized in small compartments does not occur in very large spaces, and that a zone or zones of peak intensity move through the space over time as the material is consumed.

Concerning structural performance and compartmentation. Building codes give great attention to structural performance and compartmentation, often giving apparent priority to those provisions over means of escape or active measures. This is probably an historic ranking to be found in building codes going as far back as the Great Fire of London, which led to the first regulations on building separation and noncombustible construction.

In terms of life safety, the structural performance for some buildings is irrelevant, since occupants generally will evacuate long before the collapse of even the lightest structural systems. This is obviously not the case for high-rise and certain other buildings. The debate over whether partial or total collapse is a reasonable or acceptable end-point arising from 9/11 and the NIST report is a significant issue that all building developers will have to address. However, the lack of property protection as a regulatory objective in many performance-based building codes highlights the real relationship between life safety and structural performance.

With respect to compartmentation, popular perception holds that solid, noncombustible construction is 100 percent effective. However, any fire protection engineer involved in the auditing of existing buildings has seen significant numbers of non-fire-stopped penetrations, improperly maintained fire dampers, and wedged-open fire doors. Initial indication in a yet-published survey in the UK on passive measures suggested reliabilities significantly less than 100 percent. This is in line with a report from Jenaway that suggests fire-door obstruction as high as 22 percent.

Another myth with popular appeal claims that a one-hour-rated column, beam, or partition will last one hour in an actual fire. This has been highlighted by Fitzgerald in his fire safety evaluation method. Indeed, some structures may have only lasted one hour in laboratory tests, but differences in testing requirements (positive versus negative furnace pressure, for example), construction quality, and other factors all affect performance.

Concerning structural material. A final set of myths relates to the primary structural materials of steel, concrete, and timber.

It is common to think of steel as losing its strength quickly when heated. In fact, single elements retain approximately 50 percent of their ambient temperature strength at 1,000°F (550°C). The BHP and Cardington research shows that, due to load redistribution, unprotected steel structural frames can withstand significantly higher temperatures than 1,000°F (550°C) with only localized deformation. In fact, reinforced concrete loses significant strength above 1,400°F (760°C), as illustrated in SFPE Handbook of Fire Protection Engineering.

Another common perception is that concrete does not lose strength at all in fire and is “invincible”. However, the loss of concrete cover in the Channel Tunnel fire is a good example of failure of concrete through spalling under high fire loads. Exposure of reinforcing due to spalling action can lead to the premature failure of members.

Lastly, the myth persists that timber has no place in structural systems for fire-protected building. On the contrary, while timber does burn, it also chars at a well-known rate and plays a key part as a resilient structural material, particularly in earthquake-prone buildings in New Zealand and Japan. In New Zealand, apartments designed with a performance-based approach have been built as high as eight stories with timber framing. Structural element section sizes are designed to char, but still retain sufficient strength to support the building after a complete burn-out or through fire control by sprinklers.
EDUCATION AND REFORMS NEEDED

In the past, it was the “artful” practice of fire protection engineering that encouraged many myths. Often, these false perceptions stemmed from a misunderstanding of the needs of practitioners, as was highlighted by Law and Beever40 in their delightful paper “Magic Number and Golden Rules”, delivered at the 1994 IAFSS Symposium in Ottawa, Canada. Education remains the key to dispelling these older myths. Fortunately, the number of training opportunities for designers and the broader community have increased every year. But there still needs to be greater interaction between fire researchers and the fire protection engineering community in order to establish strong links for “technology transfer.”

The performance-based approach and new building regulations in many countries have fostered their own new myths. Both education and reforms are needed to lay them to rest. If fire protection engineering is to be successful in the new era of building design and construction, a balanced environment must be created, in which risk is minimized at a reasonable cost. ■

Peter Johnson, CP Eng., is with Arup Fire Engineering. The author would like to acknowledge assistance with this article from his colleagues at Arup Fire.

1 Learn Not to Burn curriculum resource books, preschool program, and public service announcements, National Fire Protection Association, Quincy, MA, 1987.
18 Approved Document C (Amalgamation of C1 to C4), Building Industry Authority, New Zealand, June 2000.
Leading the Way in Fire Protection Innovation

In 1925, Victaulic was created to market a single product – and an innovative, much faster method of joining pipe was born. The Victory Joint was originally developed as part of the “victory” effort in World War I as a quick and easy method to assemble pipe joints for rapid deployment of fuel and water to Allied forces. Shortly after its debut, Victaulic developed the concept of machining a groove into standard Schedule 40 pipe and revolutionized the industry with its faster, easier alternative to traditional welded systems. The significant savings in time and labor that the grooved joining method offered, led to dramatic gains in productivity.

In World War II, the speed advantage of Victaulic made an enormous impact. During the D-Day Invasion, engineer construction crews worked night and day joining fuel lines with couplings to supply jeeps and carriers on land and fighter planes on airstrips. Because Victaulic couplings made welding unnecessary, spur lines could be removed with minimal loss of both pipe and time, and transported ahead to be erected again at forward points. The flexibility of a coupled line resulted in maximum efficiency, and Victaulic became known for delivering speed, ease, and reliability.

In the 1950s, Victaulic expanded its revolutionary grooved piping method by introducing another significant innovation – roll grooving. With this new patented solution, Victaulic brought the efficiencies of the grooved coupling out of the realm of heavy-wall pipe like Schedule 40 and Schedule 80, and into the lighter wall and smaller diameters used in such vital applications as fire protection.

After partnering with the New York City Fire Department in 1951 to demonstrate how grooved piping systems could enhance emergency fire-fighting capabilities, the Victaulic method quickly transformed the fire protection industry.

Victaulic also began efforts to gain approval by Underwriters Laboratories® for using its grooved product in fire protection services. Because grooved piping systems represented a new concept in building piping, new test parameters had to be established. Victaulic engineers worked closely with UL to develop and meet the necessary high standards of performance. In 1952, grooved piping components for use in fire protection systems achieved UL Listing, and Victaulic officially became the first grooved product manufacturer to be used in this industry.

In WWII, U.S. troops in Normandy used Victaulic couplings to set up pipelines quickly and efficiently.

Victaulic has been a pioneer in the fire protection industry, developing innovative products and methods to meet the unique safety, reliability, and performance needs of the industry. Victaulic fire protection products, from FireLock couplings, valves, fittings, and accessories to automatic sprinklers, Fire-Pac units, and pipe preparation tools, can be found in some of the world’s most famous buildings, facilities, and projects such as the Taipei 101 Financial Center (the world’s tallest skyscraper), Sydney Olympic Stadium (home to the 2000 Summer Games), Burj El-Arab & Jumirah Beach Resort in Dubai (the world’s tallest all-suite hotel tower), and many more. Here are just a few highlights from its long list of fire protection innovations:

1925 Introduced the grooved-end concept to the U.S.
1952 First grooved-end product to achieve UL Listing
1957 Introduced roll grooving to piping industry
1969 Launched the Style 741 Vic-Flange, a breakthrough product which allowed direct connection of flanged components into a grooved piping system
1972 Pioneered and achieved UL approval of roll grooving for light-wall pipe
1973 Pioneered special coated ductile iron products for underground fire protection services
1979 Introduced Hugger plain end system for joining high-density polyethylene pipe; FM-Approved
Throughout the ‘50s and early ‘60s, Victaulic built a reputation for developing innovative solutions across a wide range of industries. This experience outside the fire protection business led to new ideas and applications that Victaulic could tailor to the specific needs of fire protection applications.

In the 1970s, Victaulic expanded its product offerings in fire protection from couplings and fittings to include valves, which represented a higher level of engineering and precision manufacturing. In addition, Victaulic developed the Style 741 Vic-Flange, a significant breakthrough in the industry that allowed direct connection of flanged components into a grooved piping system.

The ‘70s also saw first production of the special coated ductile iron products used in AWWA applications and underground fire protection services. The precision requirements of this type of manufacturing required more highly advanced production technology – a quality that would soon become another hallmark of Victaulic systems.

Throughout the ‘70s, ‘80s, and ‘90s, Victaulic continued to lead the industry with innovations in all aspects of fire protection products, from sprinkler outlets that used mechanical-style components to the Hugger system for joining high-density polyethylene (HDPE) pipe.

Victaulic also led the way in efforts to gain UL Listing and FM approval of light-wall steel pipe for fire protection services, providing an attractive alternative to threading, which required full-wall thickness standard Schedule 40 pipe. The acceptance of roll-grooved, light-wall pipe swept through the industry, due to the way it reduced system costs.

As we entered a new century, Victaulic remained dedicated to the innovative spirit with which it was founded. In 2003, Victaulic again changed the way fire protection systems were installed, this time with the Series 745 FireLock™ Fire-Pac, a completely preassembled fire protection valve that provides maximum service in a minimal enclosed space, available in 1 1/2" through 6" pipe sizes.

Today, 80 years later, Victaulic continues to forge new paths, advancing the fire protection industry as it continues to develop ground-breaking new products and methods to aid fire protection professionals.

To learn more about Victaulic, visit www.victaulic.com.

Victaulic offers a complete line of fire protection products for wet, dry, deluge, and preaction systems. The company’s product line includes devices, valves, sprinklers, alarm modules, and other sprinkler system components. Celebrating 80 years of piping innovations, Victaulic is the world’s leading producer of mechanical pipe joining systems. Headquartered in Easton, PA, Victaulic has manufacturing and distribution facilities worldwide and employs more than 3,000 people. The company, in partnership with its subsidiaries, develops products for a full range of industrial, commercial, and institutional piping systems.

1988 Introduced 005 FireLock™ Coupling – first rigid grooved-end coupling designed specifically for fire protection services
1991 Introduced the Pressfit® System – first IPS pressed fitting system
1998 Introduced FireLock™ line of valves – engineered to be the lightest, most compact alarm, dry, preaction, and deluge valves designed to date
2003 Introduced 745 FireLock™ Fire-Pac cabinet – a completely preassembled fire protection valve that provides maximum service in a minimal enclosed space, available in 1 1/2" through 6-inch pipe sizes
2005 Introduced FireLock™ EZ – first rigid coupling designed as a lightweight, installation-ready coupling with no loose parts

Fastest Grooved Coupling in the West: The FireLock™ EZ Coupling

The Style 009 FireLock™ EZ, the first lightweight, installation ready coupling with no loose parts, is the fastest Victaulic rigid coupling ever. Users simply stab the FireLock EZ onto a grooved pipe end, join in the other pipe and drive the bolts with an impact wrench. In seconds, you’re done.

The FireLock EZ coupling dramatically cuts installation time, offering contractors an easy solution to increase productivity, efficiency and profitability.
for Engineering and Surveying (NCEES): the Fire Protection Engineering Standard of Minimal Knowledge, Skills, and Abilities and the P.E. Examination Specifications for Fire Protection Engineering. The standard of knowledge briefly describes what the minimally competent FPE is expected to understand (see Figure 1). The figure reproduces the 2004 standard. This standard is regularly updated to reflect changes in the discipline and to assure that all exam graders agree on the requirements.

The P.E. examination specifications list the categories that each exam must test (see Figure 2). Having questions from each category in the specification requires candidates to demonstrate an appropriate level of understanding of all areas in the Standard of Minimal Knowledge, Skills, and Abilities.

Fire Protection Engineering and SFPE

The NCEES documents reflect the discipline of fire protection engineering through state board licensing requirements. But licensing requirements do not necessarily capture all aspects of a discipline. As the professional society for FPEs, SFPE also considers fire protection engineering in license-independent terms. Several SFPE sources describe fire protection engineering and the FPE’s role in engineering design. These descriptions reveal the broad range of activities of the FPE.

The article “Shattering the Myths of Fire Protection Engineering” in this issue of Careers in Fire Protection Engineering magazine defines fire protection engineering as the application of science and engineering principles to protect people and their environment from fire. The definition goes on to say that fire protection engineering includes:

- Analysis of fire hazards;
- Mitigation of fire damage by proper design, construction, arrangement, and use of buildings, materials, structures, industrial processes, and transportation systems;

**FIGURE 1: NCEES Fire Protection Engineering Standard of Minimal Knowledge, Skills, and Abilities**

A minimally competent fire protection engineer must demonstrate 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 fire prevention, detection, control, and extinguishment. As a minimum, a competent fire protection engineer must demonstrate the following:

- **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 and 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 of 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 types, occupant loads, emergency lighting, and the marking of the means of egress.

**FIGURE 2: NCEES P.E. Examination Specifications for Fire Protection Engineering**

Knowledge Area I – Fire Protection Analysis
- A. Types of Analysis
- B. Information Sources of Analysis

Knowledge Area II – Fire Protection Management

Knowledge Area III – Fire Science and Human Behavior
- A. Fire Dynamics
- B. Human Behavior

Knowledge Area IV – Fire Protection Systems
- A. Water-Based Fire-Suppression Systems
- B. Special Hazard Systems
- C. Fire Detection and Alarm Systems
- D. Smoke-Management Systems
- E. Explosion-Protection and -Prevention Systems

Knowledge Area V – Passive Building Systems
- A. Building Construction
- B. Means of Egress
The Discipline of Fire Protection Engineering continued

- Design, installation, and maintenance of fire detection, suppression, and communication systems; and
- Post-fire investigation and analysis.

The SFPE membership application reflects the above points in its definitions:
- **Fire Protection Engineering** is the application of science and engineering principles to protect people and their environment from destructive fire and includes (1) analysis of fire hazards; (2) mitigation of fire damage by proper design, construction, arrangement, and use of buildings, materials, structures, industrial processes, and transportation systems; (3) design, installation, and maintenance of fire detection and suppression and communication systems; and (4) post-fire investigation and analysis.

- A **Fire Protection Engineer** (FPE) by education, training, and experience (1) is familiar with the nature and characteristics of fire and the associated products of combustion; (2) understands how fires originate, spread within and outside of buildings/structures, and can be detected, controlled, and extinguished; and (3) can anticipate the behavior of materials, structures, machines, apparatus, and processes as related to the protection of life and property from fire.

The SFPE Constitution and Bylaws lists these requirements for Professional Member grade in SFPE:
- A **Member** of SFPE shall be a graduate of an engineering curriculum of accepted standing and shall have completed not less than four years of engineering practice, three of which shall have been in responsible charge of fire protection engineering work. If not such a graduate, see Table 1.

- **Responsible charge** signifies responsibilities of the individual to make decisions for successful completion of work without relying on advice from a superior as to methods, materials, and standards to be applied. It further signifies that these duties are carried out at the discretion of the individual and that they do not necessarily require authority from supervisors except as a matter of form.

---

### TABLE 1: Requirements for the Grade of Professional Member in SFPE

<table>
<thead>
<tr>
<th>Education</th>
<th>Yrs of Eng. Prac.</th>
<th>Yrs. of Resp. Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graduate of an engineering curriculum of accepted standing. (1)</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Bachelor of Science degree in physical science (math, physics, chemistry) from a university of accepted standing. (2)</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Graduate of an engineering technology curriculum of accepted standing. (3)</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Master of Science degree in engineering or science from a curriculum of accepted standing. (4)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Doctoral degree in engineering or science from a curriculum of accepted standing. (5)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Education in engineering or the physical sciences which demonstrates a knowledge of the principles of engineering. (6)</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Baccalaureate degree in a field other than engineering or physical science. (7)</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>No degree. (7)</td>
<td>14</td>
<td>4</td>
</tr>
</tbody>
</table>

Notes:
(1) “Accepted standing” is defined as an engineering curriculum which is ABET-accredited (USA), CEAB-accredited (Canada), FEANI-listed (Europe), the FPE’s engineering curriculum at Illinois Institute of Technology (USA), the FPE curriculum at the University of Lund (Sweden), or equivalent.
(2) “Accepted standing” is defined as college/university (USA) which is an accredited institution of post-secondary education.
(3) “Accepted standing” is defined as an engineering technology curriculum which is ABET (USA) or similarly accredited.
(4) “Accepted standing” is defined as those of the University of British Columbia (Canada), University of Maryland (USA), University of New Brunswick (Canada), and Worcester Polytechnic Institute (USA).
(5) “Accepted standing” is defined as those of the University of California, Berkeley (USA), University of Maryland (USA), and Worcester Polytechnic Institute (USA), or equivalent.
(6) Credit is given based upon college transcripts and grades received in engineering principles, math, and science courses which demonstrate a knowledge of the principles of engineering.
(7) Those without academic qualifications are asked to provide a detailed description of their practice of engineering and of being in responsible charge of fire protection engineering work. Being under qualified supervision for an extended period is essential.

---

**What Do Fire Protection Engineers Do?**

The SFPE Career Guide states that fire protection engineers:
- Use physics, math, and chemistry to protect people and buildings from fire.
- Analyze how buildings are used, how fires start and grow, and how fire and smoke affect people, buildings, and property.
- Use the latest technology to design systems that control fires, alert people to danger, and provide means for escape.
- Work with other engineers, architects, state and local building officials, and local fire departments to build and maintain fire-safe communities.

FPEs can work in any of the categories listed in the Examination Specifications.
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Built into every Victaulic system is 80 years of innovation and ingenuity. Ingenuity that delivers greater design flexibility and faster system installation to help you complete your projects ahead of schedule.

As a result, you work smarter and more productively while delivering the reliability your customers demand. Working smarter means greater profitability for you.

For information about how Victaulic fire protection systems can exceed your expectations, call 1-800-PICK-VIC today.
Most FPEs do not work in all of them: A typical FPE works in several fields falling under one or more of these categories. For example, a fire-suppression system designer might evaluate the hazard to be protected, select detection methods, and specify fire-suppression system performance. Or a consultant might conduct hazard analyses and compare the overall risk for an entire facility from various combinations of fire protection design options.

Some FPEs are closely involved with project reviews – from design concept to plan reviews to checking installed systems. This close involvement assures that the specified level of fire protection for a facility is achieved.

When so qualified, FPEs’ roles may also include laying out fire protection systems and affixing their seals or stamps to fire protection design documents. They may also include any of the related roles described in the next section. The key is that FPEs can be qualified by experience and training in their work areas.

FPEs’ responsibilities vary with their employers. Employers of FPEs include:

- Consulting firms
- Corporations
- Educational institutions
- Fire protection associations and societies
- Fire-testing laboratories
- Government agencies
- Insurance companies

An area of increasing importance to the discipline of fire protection engineering is performance-based analysis and design. FPEs must learn how to measure and evaluate building fire performance and how to apply this knowledge in the context of performance-based codes. They must understand the uses and limitations of fire models and be able to realistically interpret the results. As the discipline evolves, the need for FPEs to understand and properly use analytical tools, such as fire models, will continually increase.

The SFPE Engineering Guide to Performance-Based Fire Protection Analysis and Design of Buildings, establishes a uniform framework for performance-based analysis and design. To complement this guide, SFPE engineering practice documents and computer model evaluations provide detailed guidance on applying analytical tools.

The SFPE engineering guide and engineering practice documents have put fire protection performance-based design on a logical, uniform framework designed to meet the agreed-upon goals of building stakeholders. They include guidance on developing performance criteria, creating fire scenarios, and evaluating fire protection designs. Implementing this guidance has paved the way for building officials to accept these less familiar, and more complex, designs.

What About Related Fields?

In addition to fire protection engineering activities, the field of fire protection includes many activities that do not require practitioners to have engineering degrees. Fire protection positions could include:

- Alarm/detection system technicians
- Extinguishing system technicians
- Fire marshals
- Fire protection system plan reviewers
- Fire science researchers
- Forensic investigators
- Hazard evaluators
- Industrial fire protection officers
- Insurance company fire protection representatives
- Life-safety professionals
- Process-safety system technicians
- Sprinkler system technicians

As an example, the responsibilities of a sprinkler system technician could include laying out sprinkler systems in accordance with a prescriptive code, calculating sprinkler system hydraulics, or verifying that sprinkler plans meet a specified system design. The National Institute for Certification in Engineering Technologies (NICET) certifies fire protection technicians at four different levels in each of these areas:

- Automatic Sprinkler Systems Layout
- Fire Alarm Systems
- Special Hazards Suppression Systems
- Inspection and Testing of Water-Based Fire Protection Systems

Fire protection engineering and fire protection technology are both integral to the discipline of fire protection engineering. Once again, the key is that fire protection professionals work in their areas of qualification.

Fire scientists might study the physics and chemistry of fire, model fire growth on computers, or explore how to control and extinguish fire. They, too, might or might not have engineering degrees or P.E. licenses. Although they are not usually designing the fire protection systems in common use at the time of their research, their work is essential to developing new engineering solutions to the problem of fire control.

Let’s Spread the Word

We may be fire protection engineers, fire protection technicians, or fire scientists. We might or might not have engineering degrees or P.E. licenses. Whatever our careers and backgrounds, we are all part of this fascinating, ever-evolving field of fire protection. Fire protection engineering, fire protection technology, and fire science work together to make up the whole fire protection engineering discipline. As such, we should all spread the word about the benefits of fire protection engineering and help allay misconceptions about our discipline whenever possible.

Jane I. Latallie, P.E., is with Los Alamos National Laboratory.

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Where do fire protection engineers work?

Fire protection engineers are employed principally by private engineering companies, large corporations, and federal, state, and local government agencies.

What does a fire protection engineer do?

A FPE utilizes performance-based approaches to building fire safety analysis and design, including evaluation and integration of fire protection systems for high-rise structures and industrial complexes; analysis of the level of fire protection applicable to commercial and residential buildings, nuclear power plants, and aerospace vehicles; and the research of fire propagation, detection, and suppression, together with physiological and psychological effects on humans and their responses.

Fire protection engineers are members of design teams involved in the development of new building complexes, such as the campus Comcast Center and the redevelopment of the area around the World Trade Center in New York. Also, fire protection engineers participate in research and development activities to introduce new fire protection products, such as advanced fire detectors and suppression systems, into the market. An area of recent growth includes the involvement of fire protection engineers in fire investigations, including incidents of national interest, such as the attack on the World Trade Center and the Pentagon.

What education and training do I need?

A thorough understanding of the physics and chemistry of fire is needed to predict building system performance and analyze failures. You will be required to demonstrate the ability to use scientific and engineering principles to evaluate structures for the hazards of fire and apply engineering principles in the assessment of performance of fire protection systems. You will learn how to use deterministic and probabilistic methods for analyzing fire safety risk. You will also have an opportunity to use state-of-the-art computer models to simulate fire development, the response of buildings to fire, and fire protection system performance.

Who should pursue a graduate degree in fire protection engineering?

Obtaining a graduate degree in fire protection engineering can accomplish several possible objectives. For those with an undergraduate degree in fire protection engineering, it provides the opportunity to update and enhance their technical background. Some professionals without an undergraduate fire protection engineering background may seek a graduate degree in order to pursue an alternative career path or may have already been involved in fire protection projects and seek to improve their fire protection background. Prospective students must have a bachelor’s degree in engineering or related field in the physical sciences or mathematics.
Is there a benefit to taking only a few graduate courses in fire protection engineering?

Yes! Some professionals may be seeking to improve their technical skills in a particular area of fire protection engineering, such as fire modeling, smoke management, or fire protection system performance. In these cases, professionals may elect to take a single class or a limited number of classes in the desired subject areas. Alternatively, individuals may wish to enroll in a limited number of courses to assist with their preparation to take the Principles & Practice of Engineering examination in order to become a registered professional engineer. Courses in fire dynamics, fire protection systems, and structural fire protection provide a good foundation for their preparation.

Why Maryland?

Drawing upon 50 years of expertise and seeing a national and international need, the University of Maryland’s premier academic and research institution for fire protection engineering began offering its graduate level education to the world via an online education system in August 2003. This practice-oriented, part-time program is focused on educating the working engineer or technical professional to allow them to continue their current work while gaining the expertise they need to advance their career. Since August of 2003, we have enrolled over 60 students with our first two graduates finishing this past August. The faculty teaching in the program are world-renowned with recognition and awards from the Society of Fire Protection Engineers, International Association of Fire Safety Science, American National Standards Institute, and Standards Engineering Society, and have eighteen books published in the field.

How do I take courses online?

The University of Maryland’s Department of Fire Protection Engineering is one of the few places in the world offering degrees in fire protection engineering and has a web-based fire protection option under its existing Professional Master of Engineering Program. Students download Web-casts of each lecture and receive all notes, outlines, and presentations, and participate in online chat sessions with faculty and fellow students in the class, and e-mail questions, homework, projects, and exams with the faculty. FPE student Kathy Kinney says, “I’ve been in the online program from the beginning, and it’s been getting better every term. We are getting better at using WebCT with e-mail and discussion postings; now there are weekly chat sessions. It’s a chance to have a real-time interchange with the professors and other students in the class. We’ve learned to use the tools.”

Who is a Fire Protection Engineer?

Student Profile
Kathy Kinney, M.Eng.
Fire Protection Engineering candidate

Kathy is a full-time Facility Engineer for Nonreactor Nuclear Facilities at Oak Ridge National Laboratory in Tennessee. She has a bachelor’s and master’s degree in Civil Engineering with a concentration in structures. However, to be more valuable in her job, she needed training and experience in fire protection, especially after 9/11. “I was looking to combine my abilities into a unique skill set to stay on top of the physical conditions in a facility… the University of Maryland’s online program had a recognized national reputation in Fire Protection by individuals outside of the Fire Protection field. Considering that I don’t have to go to class 2-3 times a week, I think it’s an ideal way to get your advanced degree… plus, you have the credentials and reputation of a nationally ranked university behind you to insure you are getting a quality product, and you and your employer know it’s not an online degree mill.”

Faculty Profile
Professor James Milke
Associate Professor and Associate Chair of the Department of Fire Protection Engineering, University of Maryland

Professor James Milke is an Associate Professor and Associate Chair of the Department of Fire Protection Engineering at the University of Maryland. He received his Ph.D. in Aerospace Engineering from the University of Maryland with an emphasis in structures. He received an M.S. degree in Mechanical Engineering and a B.S. degree in Fire Protection Engineering, both from the University of Maryland. In addition, he has a B.S. degree in Physics from Ursinus College. Prof. Milke has served as a Research Fire Prevention Engineer at the Building and Fire Research Laboratory, National Institute of Standards and Technology; as the Fire Protection Engineer for Fairfax County, Virginia; and as a consultant to numerous organizations. Prof. Milke is a fellow of the SFPE and is a member of the National Fire Protection Association, International Association of Fire Safety Science, and American Society of Civil Engineers. He is chairman of the NFPA Technical Committee on Smoke Management Systems and the ASCE/SFPE committee on Structural Design for Fire Conditions. He was a member of the Core Team of the World Trade Center Building Performance Study.

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BY ANDREW VALENTE, P.E.
control, emergency lighting, communications, and exit systems;
• Conducts fire safety research on consumer products and construction materials;
• Investigates fires to discover how they spread, why protective measures failed, and how those measures could have been designed more effectively; and
• Writes investigative reports and provides expert courtroom testimony in insurance and civil litigation cases.

Though loss of life and property due to fire doesn’t register on most Americans’ radar screens, the ongoing threat of terrorist attack does. It has turned people’s attention increasingly to improved safety and security.

With increased awareness comes an overall rise in demand for better fire protection in airports, tunnels, arenas, offices, malls, museums, and other public spaces, making fire protection engineering a hot new career.

VARIETY AND FLEXIBILITY
Fire protection engineers work in a variety of work environments.

Most often, they find themselves working alongside architects and real property owners, adding to a building’s blueprints and recommending ways to meet those clients’ never-ending demand to “build the best building for the best price.”

At the same time, fire protection engineers must, in effect, answer to the public. Their recommendations must adhere at all times to the stringent local and national fire safety codes that govern construction. And they must always respect the fact that local government authorities — namely fire marshals — can turn thumbs up or down on any or all their fire safety solutions.

“My biggest challenge is to juggle my clients’ needs to meet their building and cost goals with the codes and with occupants’ safety,” says fire protection engineer James Lord.

Lord is a fire specialist with UK-based Arup, one of the world’s largest consulting engineering firms.

Based in New York, he works on fire protection for airport terminals, schools, cultural and performance centers, and the city’s new subway line.

“At the end of each day, you can be proud that you’ve found the way to balance the public’s safety and your clients’ demands. That’s what I most like about my job.”

WIELDING INFLUENCE
Another fire protection engineer, Laura Doyle, chose the path after abandoning chemical engineering, first to seek a degree in business — which she learned would take too many semesters — then to study fire protection.

Doyle is a team leader in the fire protection engineering section of General Services Administration (GSA) in Washington, DC.

GSA acts as “landlord” to other government agencies, overseeing nearly 200 federally owned buildings near the nation’s capital.

Doyle enjoys the fact that she has considerable autonomy in her job and that she “can have a definite influence on fire protection policies.”

An out-of-the-ordinary facet of Doyle’s work derives from the unusual character of many of the buildings for which she is responsible.

Not only do her recent clients include the Vice President, cabinet-level secretaries, and the heads of the FBI and the Secret Service, but Doyle is responsible for protecting historic properties such as the Eisenhower Executive Office Building from fire.
“I work not only with architects to improve the life safety treatments inside these buildings,” says Doyle, “but with historic preservationists, who want assurances that the building’s fabric won’t be disturbed or compromised.”

In addition to historic buildings, Doyle works on futuristic properties as well. She has completed fire protection engineering work for the new burn center operated by the Bureau of Alcohol, Tobacco, and Firearms.

The largest burn laboratory in the U.S., the building’s design and construction mandated that Doyle take an extraordinarily creative approach to the fire safety systems, since building codes do not specifically address the one-of-a-kind facility.

EVERY DAY’S AN ADVENTURE

Sometimes, fires turn out to be catastrophes with enormous consequences, such as the Station Nightclub Fire in Rhode Island, in which more than 100 people died and 200 were injured.

Disasters like the Station Nightclub Fire push fire protection into the headlines for weeks.

Routine fire protection engineering – thankfully – isn’t all that headline-grabbing. It’s careful, methodical fact-finding and number-crunching that requires well-tempered engineering and technical competency, a strong analytic mind, and a love of understanding “the way things work.”

But it’s also a job where a lot happens every day.

“You’re never bored by this job,” says fire protection engineer James Lord. “Employers from Day One throw you right into the fire – no pun intended.”

To succeed in a career in fire protection engineering, you need not only the engineering know-how that the university programs provide, but public-speaking and technical-writing skills – and enough poise and self-assurance to present and defend your ideas before both large and small audiences.

Andrew Valente, P.E., is with Arup Fire.

THINK YOU WANT TO STUDY?

Strong academic skills are, of course, a must for secondary school graduates who want to study fire protection engineering. Typically required are:

- Overall Grade Point Average of 3.0–3.5 (out of 4);
- Competitive SAT scores;
- Exceptional oral and written communication skills and strong listening skills;
- High achievement in high school science and math; and
- Completion of advanced high school courses (calculus, physics, trigonometry, plane and solid geometry, algebra, etc.).

In the U.S., students can study fire protection engineering at these institutions:

- University of Maryland (offers both a bachelors and a masters degree in fire protection engineering);
- Worcester Polytechnic Institute (offers a masters degree and a five-year combined bachelors and masters degree in fire protection engineering);
- Oklahoma State University (offers a bachelors degree in fire protection and safety technology);
- University of California at Davis (offers a certificate in fire protection); and
- University of New Haven (offers bachelors degree in fire protection engineering and fire science).

In other countries, students can study fire protection engineering at these institutions:

- Carleton University (Canada);
- Fire Safety Engineering College (Muscat and Oman);
- Hong Kong Polytechnic University (Hong Kong and China);
- Lund University (Sweden);
- Science University of Tokyo (Japan);
- South Bank University (England);
- Swiss Federal Institute of Technology (Switzerland);
- University of Canterbury (New Zealand);
- University of Central Lancashire (England);
- University of Edinburgh (Scotland);
- University of Greenwich (England);
- University of Leeds (England);
- University of New Brunswick (Canada);
- University of Ulster (Northern Ireland); and
- Victoria University of Technology (Australia).

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- University of New Brunswick (Canada);
- University of Ulster (Northern Ireland); and
- Victoria University of Technology (Australia).
Applying Science and Engineering Principles

The field of fire protection engineering offers seemingly unlimited opportunities for the application of science and engineering principles, all with a goal of protecting people and their environment from potentially destructive fire hazards.

Tom Martin, director, contracting support services at SimplexGrinnell, has an M.S. in electrical engineering, and first worked in the aviation industry after graduation. He shares the mindset of an engineer – a love of math, science, and technology; an analytical bent; and a powerful drive to solve problems and create efficient designs. As he moved into fire protection early in his career, he was surprised at how appealing the field was with its never-ending focus on life safety and a chance to make a real difference in the structures that surround us every day.

“There is an overwhelming sense of pride among the entire fire protection community, and that alone can bring a level of gratification rarely found elsewhere,” notes Martin. “My personal and professional growth has reached levels beyond my expectations, working for a stable and reputable company like SimplexGrinnell.”

By education, training, and experience, fire protection engineers recognize and understand the nature and characteristics of fire and the associated products of combustion. They help determine how fires originate and spread, and how they can be detected, controlled, and/or extinguished.

SimplexGrinnell has a history of seeking out and recruiting engineering graduates committed to making a difference in this field, as well as cultivating an atmosphere that allows experienced engineers to grow and make lasting contributions in fire protection. The company is proud of its workforce development and its ongoing commitment to welcoming females and minorities and making employee diversity a major component of its recruitment, employment, and internal growth campaigns.

Multiple Avenues, Unlimited Opportunities

Tom Wall, a project designer for sprinkler systems at SimplexGrinnell, has worked with the company for well over two decades. He says that one of the significant advantages of working for SimplexGrinnell is the opportunity to “flex your muscles” in a variety of business areas. Wall earned his engineering degree from the highly regarded Rose Hulman Institute of Technology in Terra Haute, IN. He then began his career as a design trainee, moved up to lead designer, and then design manager. He then took his knowledge of products and systems, and moved into sales, and eventually headed back to systems designs.
Career Path

“In an organization as widespread in core competences as SimplexGrinnell, both entry-level and more experienced engineers have a terrific opportunity to move into diverse areas related to the fire protection business,” says Wall. “The extensive and wide-ranging network of system design/development teams and district field offices provides the chance to apply your experience and knowledge in systems design, management, sales, and even research. A fire protection engineer can have a significant impact in this field through a whole assortment of disciplines.”

Jason Miller, an A & E business manager with SimplexGrinnell, graduated from the Fire Protection Engineering Program at the University of Maryland. In his role as an A & E business manager, Miller provides educational training and design support to architects and engineers.

“My position at SimplexGrinnell allows me to make the most of my training and experience as a fire protection engineer to assist architects and engineers in developing the goals for the fire protection systems they are designing, choose the appropriate equipment to meet those goals, and assist in the development of clear and concise construction documents to ensure those goals are met through the construction process,” Miller says. “This kind of involvement helps to ensure systems are not only designed and specified properly, but are also developed as an integral part of the overall fire protection strategy of the building.”

**Impacting Sales Operations Management**

Samuel Trotter, a recent SimplexGrinnell hire with an electrical engineering degree, is getting the chance to have an impact in sales operations management. As a regional sales operations manager working out of the Dallas office, Trotter is helping drive consistent sales processes and manage sales opportunities. He wanted to bring his electrical engineering background and years of marketing and sales experience to a company that offered stability and a forward-thinking management team.

SimplexGrinnell offered the right growth potential, while at the same time allowing him to make important contributions to both the industry and the organization.

“It never ceases to amaze me as to the many sides of this profession,” says Trotter. “The company looked at my engineering degree and years of experience in this field and recognized the contributions I could make in the way of market analysis and the development of successful sales strategies.”

**Encouraging Employees**

SimplexGrinnell encourages employees to find their niche, or multiple niches, and as a result has created an atmosphere where engineers can thrive. Although known for years as a respected leader in fire protection products and systems, SimplexGrinnell looks at itself as an industry force in system integration, installation, and high-quality service. The company’s experience in special hazards solutions for high-risk environments helps protect high-value operations where conventional fire protection is not sufficient. By designing, installing, and maintaining fire protection systems that combine detection capabilities with extinguishing agents developed specifically for hazardous environments, engineers at the company have helped create safer work environments in power plants, petrochemical facilities, automotive manufacturing plants, airline hangars, computer rooms, and more.

The philosophy at SimplexGrinnell of encouraging growth and transition among its employees is based on the evidence that the fire protection engineering profession is having, and will continue to have, a significant impact on society.

Andy Whitesfield, total service manager at the SimplexGrinnell district office in Cincinnati, speaks about growth and potential from personal experience. “With my degree in fire protection engineering from the University of Maryland, I’ve had an opportunity to become an integral part of a process that applies products to real-world situations and helps make everyday life safer for people. It’s been an extremely gratifying experience. The hands-on work we do and the networking that is generated through industry associations like the SFPE just reaffirm the contributions we make here.”

One of the more appealing aspects of working for a company like SimplexGrinnell is that team members quickly move from the theoretical phase of fire protection into the realm of transferring knowledge and creativity to real-world applications. “We have a rich fire protection heritage at SimplexGrinnell, and it is continuing to be elevated by both the engineers we recruit out of schools across the nation and the more experienced professionals who recognize the value of making SimplexGrinnell their home,” says Daniel Casteel, vice president of sprinkler development and group leader of the company’s newly formed Sprinkler Business Development Team (SBDT). “We are committed to continuing to lead this industry by having the best people in the industry. Through improved design capabilities and expanded sales and services capabilities, we offer many opportunities for employees to enhance their skills and grow within the organization. All of this makes SimplexGrinnell even more attractive as a long-term career path for budding engineers, as well as more seasoned professionals.”
Making a career choice can be one of the most important and difficult decisions a person will ever make. It can determine their future success, life satisfaction, and the overall quality of life. According to Mark Twain, “The secret of success is making your vocation your vacation.” A person who works a full-time, 40-hour work week spends almost a third of their waking hours on the job. As a result, it is important to make a good career choice.

The difficulty of this decision is compounded by the hundreds of options available for someone searching for the perfect career. Nevertheless, the challenge is to find a career that fits your interests and your values. For a person who is looking for a satisfying career that provides a solid income, flexibility, and the opportunity to make a difference, fire protection engineering is an excellent career choice.

The articles in this issue of Careers in Fire Protection Engineering highlight how fire protection engineering is an exciting and rewarding career. More importantly, although fire protection engineers are paid an excellent starting salary and a high industry-wide mean salary, fire protection engineers are hard to find.

Graduating fire protection engineers are in high demand. The number of jobs available to graduates consistently outweighs the number of engineers available to fill them. Because the demand is much greater than the supply, graduating fire protection engineers rarely have difficulty finding employment.

Last January, the Society of Fire Protection Engineers (SFPE) surveyed some of the largest employers of fire protection engineers to find out if they have had difficulties over the last year recruiting qualified fire protection engineers. An overwhelming majority of those surveyed indicated they currently have difficulty recruiting enough qualified fire protection engineers. They also predicted continuing recruitment problems in the next five years.

Each year in the United States, more than 3,000 people die, 18,000 are injured, and $10 billion in property is damaged as a result of fire. In addition to the direct costs from fire, there are indirect costs such as the cost of business interruption. Other costs include damage to the environment, fire insurance costs, and the cost of public fire protection.

Since fire protection engineers use science and technology to make the world safer from fire, it is important for society to keep up with the demand for fire protection engineers.

A career in fire protection engineering also provides an opportunity to work in a variety of work environments and provides the opportunity for world travel. For example, fire protection engineers are employed by a variety of organizations that include engineering consulting firms, large corporations, fire departments, academia, research institutions, fire protection equipment manufacturers, and federal, state, and local governments. They also work in all parts of the world.

Besides all of these excellent reasons to make fire protection a career choice, a person who chooses to enter this profession can truly make the world a better place. Because fire protection engineers go to work knowing they have the opportunity to make a difference, many find satisfaction in their career.

There are many pathways to enter the profession. Some take the traditional route and enter a program that offers a Bachelor of Science program in fire protection engineering. Many students who chose this route entered a bachelor program as transfer students from community college fire science or engineering programs. Others are students who started as bachelor students in other engineering disciplines then transferred to fire protection engineering.

Another common pathway is to enter a Master of Science program in fire protection engineering after completing an engineering program in a different discipline. This pathway is becoming more popular as master programs are now being offered in an online distance-learning format.

People who are interested in making a difference and who find this profession interesting can find more information by contacting SFPE at www.sfpe.org for a free copy of the Guide to Careers in Fire Protection, or by visiting the SFPE Careers Web site at www.careersinfire-protectionengineering.com.

WANTED: FIRE PROTECTION ENGINEERS

Chris Jelenewicz, P.E.
Engineering Program Manager, Society of Fire Protection Engineers

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