

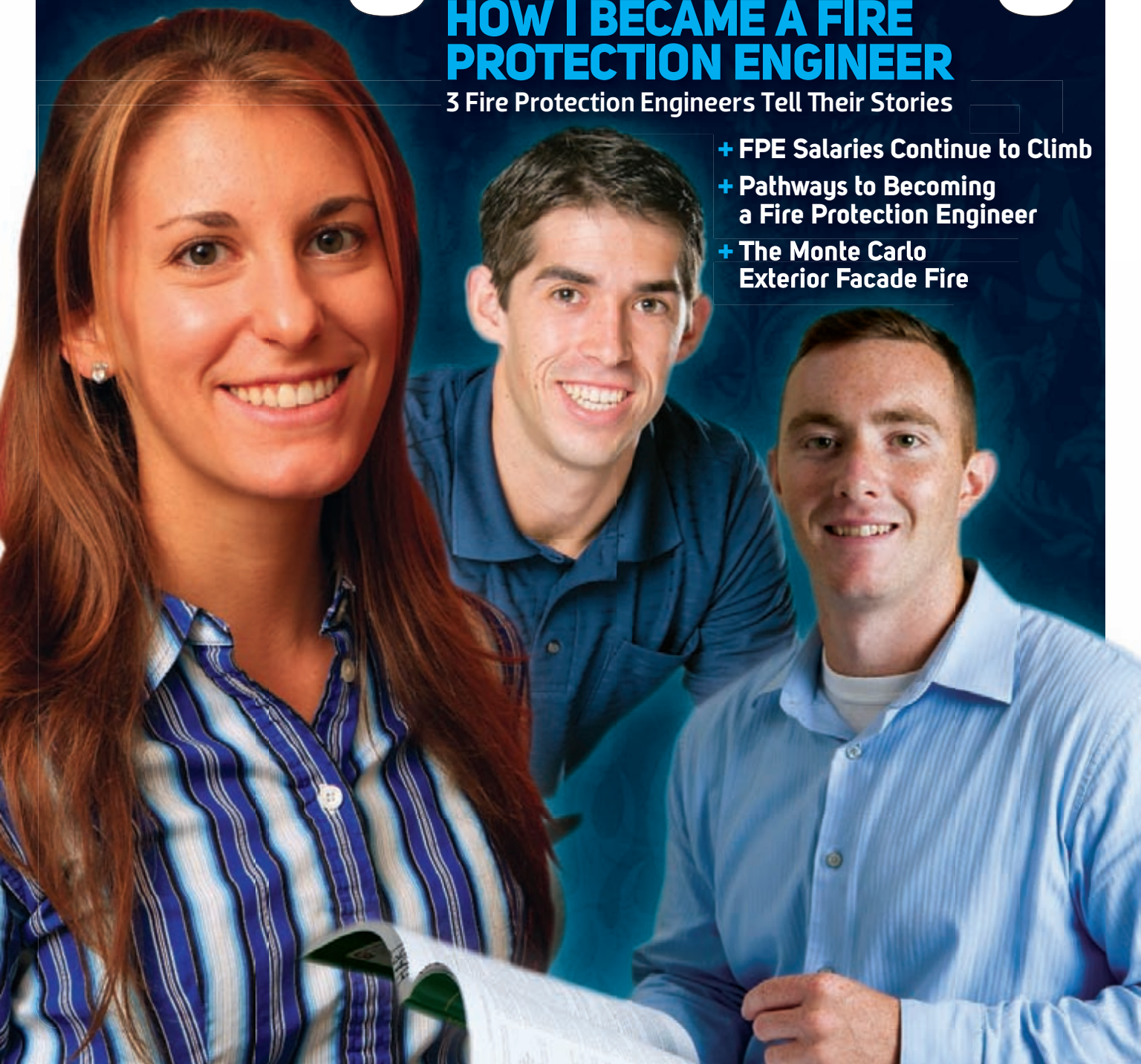
# Careers in **FIRE PROTECTION** Engineering



## HOW I BECAME A FIRE PROTECTION ENGINEER

3 Fire Protection Engineers Tell Their Stories

- + FPE Salaries Continue to Climb
- + Pathways to Becoming a Fire Protection Engineer
- + The Monte Carlo Exterior Facade Fire



# MARYLAND

You only need to know one name for  
**Fire Protection Engineering**  
Education, Training, and Research.

The **only** ABET accredited Fire Protection  
Engineering program world-wide.....

MARYLAND

Largest network of Fire Protection Engineers anywhere  
(1500+alumni, 250 current students, and 20 professors).....

MARYLAND

Faculty that are members of the National Academy of  
Engineering, fellows of SFPE, ASME, and AIChE, and  
recipients of NSF Career and PCASE awards.....

MARYLAND

Online graduate programs for working engineers that  
can be completed in as little as 6-months.....

MARYLAND

Access to the latest research in fire suppression  
and detection, scale modeling of fires,  
evacuation analysis, risk modeling, and forensics.....

MARYLAND

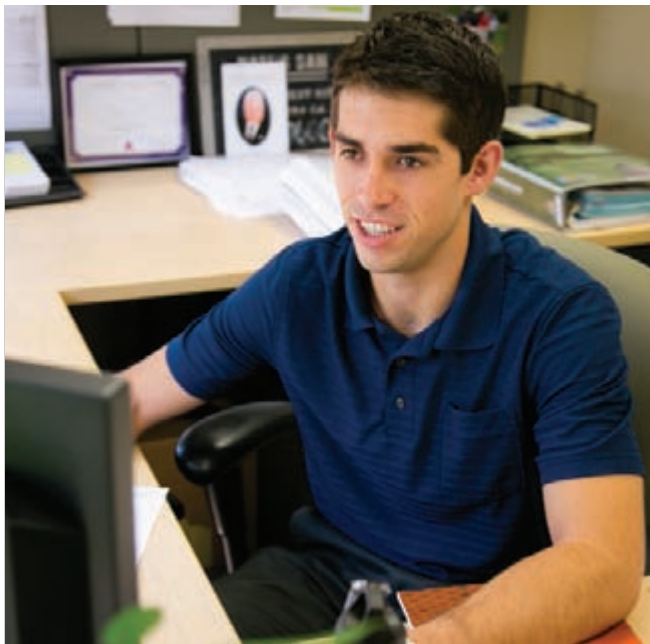
The University of Maryland's online Master's degree and Graduate Certificate in Engineering program in Fire Protection Engineering allow professionals an opportunity to learn the latest technology that they can apply immediately at work. Students can apply for any of four accelerated terms (fall/winter/spring/summer) and start advancing their career today.

**LEARN MORE, GO FURTHER.**

**It's That Simple!**

[www.advancedengineering.umd.edu/fire](http://www.advancedengineering.umd.edu/fire)





## A HIGH-DEMAND INDUSTRY

**Welcome to the fifth 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 bring this 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 that highlights the many opportunities available in fire protection engineering.

This issue features three fire protection engineering graduates discussing their experiences in college and as fire protection engineers. The remaining editorial discusses how fire protection engineering is an exciting and rewarding career.

Please enjoy the fifth *Careers in Fire Protection Engineering* 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 [magazine.sfpe.org/careers](http://magazine.sfpe.org/careers). Thank you for your support, and enjoy your issue!

**Sincerely,  
The Sponsorship Committee**

How I Became a Fire Protection Engineer .....	4
FPE Salary Survey .....	8
Pathways to Becoming a Fire Protection Engineer .....	10
The Monte Carlo Exterior Facade Fire .....	12
Letter from the Engineering Program Manager: FPE is an Exciting & Rewarding Career .....	14

Photos of Krystyna Buda-Ortins: Dennis Brack (dennisbrack.com), photos of Jonathan Hart: Jonathan Kannair (jonathankannair.com), photos of William Fletcher: Gary Payne/ Getty Images (gettyimages.com).

## Careers in FIRE PROTECTION Engineering

*Careers in Fire Protection Engineering* (ISSN 1524 900X) is published bi-annually by the Society of Fire Protection Engineers (SFPE). The mission of *Careers in Fire Protection Engineering* is to raise the visibility of the fire protection engineering profession as an exciting and rewarding career by providing information to engineers and students. The opinions and positions stated are the authors' and do not necessarily reflect those of the SFPE.

### Sponsorship Committee

Special thanks to the Society of Fire Protection Engineers and our key sponsors for making this issue a possibility:

**California Polytechnic State University,  
Fire Protection Engineering Programs**  
Frederick W. Mowrer, Ph.D., Professor-in-Residence/Director  
[www.ceng.calpoly.edu/contacts/](http://www.ceng.calpoly.edu/contacts/) • 805.756.2131

**University of Maryland, A. James Clark School of Engineering**  
Paul Easterling, Director  
[www.advancedengineering.umd.edu/fire](http://www.advancedengineering.umd.edu/fire) • 301.405.7200

**Worcester Polytechnic Institute · Dr. Kathy Notarianni,**  
Department Head, Fire Protection Engineering  
[www.wpi.edu/+FPE](http://www.wpi.edu/+FPE) • 508.831.5593

### Personnel

**Technical Editor:** Fire Protection Engineering,  
Morgan J. Hurley, P.E., FSFPE, Technical  
Director, SFPE

**Technical Editor:** *Careers in Fire Protection  
Engineering*, Chris Jelenewicz, P.E.,  
Engineering Program Manager, SFPE

**Client Services Program Manager:**  
Carol Yachanin,  
Penton Marketing Services

**Production Manager:** Sam Schulenberg,  
Penton Marketing Services

**Creative Director:** Jason Hinman,  
[intersectmedia.com](http://intersectmedia.com)

# HOW I BECAME A FIRE PROTECTION ENGINEER

Three Fire Protection Engineers Tell Their Stories of How They Chose This Exciting Career

Krystyna Buda-Ortins is a fire protection engineer at Appendix R Solutions in Glen Allen, Va., and a graduate of the University of Maryland.



*Fire Protection Engineering* spoke with three fire protection engineers to find out about everything from college classes to searching for a job to trends in the profession.

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

**Buda-Ortins:** I first heard about fire protection engineering at a week-long “exploring engineering” summer camp I attended at the University of Maryland. We learned about all different types of engineering, like mechanical and electrical, but fire protection stood out for me. We completed fire simulations and learned about how different openings in rooms in

buildings could have different effects on a fire. I was definitely ready to learn more.

**Hart:** My high school physics teacher told me about WPI’s program, and the Society of Fire Protection Engineers (SFPE) provided the details on the education and careers. I thought that fire protection was a really interesting and unique field of engineering.

**Fletcher:** I was at Cal Poly getting ready for graduation and contemplating my next step. Job opportunities in civil engineering were scarce at the time. I saw an announcement on Cal Poly’s website about approval of a new fire protection engineering MS program. I explored the SFPE website and met with two faculty members of the fire protection engineering

William Fletcher is a fire engineering consultant at Aon Fire Protection Engineering (Aon FPE) in San Diego and a graduate of California Polytechnic State University (Cal Poly).

department at Cal Poly. I really liked the human element, the diversity and the opportunity there was on the West Coast.

**FPE: What attracted you to the field? How did you ultimately decide to enter?**

**Buda-Ortins:** Fire protection engineering is just so applied, and it has really good job placement. Compared to the other engineering programs, it's more in demand.

**Hart:** As someone who came from a family of firefighters, I thought that fire protection engineering was a great opportunity to pursue something that was similar in its objectives and also met my interests in engineering. I was essentially sold on the career from the start, but I think the wide variety of career paths and great job placement that graduates have were things that made my decision even easier.

**Fletcher:** I grew up in a rural area of San Diego where wildfires were an annual threat to our community, and when I was younger my family experienced a fire in our home. Being able to work in the fire protection industry and having the opportunity to really make a difference hit home for me. I was fortunate to receive an internship from Aon FPE in San Diego. The internship's goal was to show me as much about the fire protection engineering field as possible. All of these factors made my ultimate decision



very easy because fire protection engineering combined my experience from the internship, the opportunity to make an impact on society using engineering, and the opportunity to be a part of something really special.

**FPE: What were some of the highlights or memorable moments of engineering school?**

**Buda-Ortins:** Generally it was really great to have a sense of community, with such a small class of students in my program. I'll never forget attending all the SFPE events. Class-wise, the fire modeling class and the fire lab class were my favorites.

**Hart:** Two large group projects as a part of my undergraduate degree were certainly memorable and helped prepare me for the collaborative teamwork that is required of most issues in the real world. In

**"WPI's fire protection engineering curriculum provides you with the basics of fire science and fire dynamics and then builds on that with a variety of classes."**

Jonathan Hart is an associate fire protection engineer at the National Fire Protection Association (NFPA) in Quincy, Mass., and is a graduate of Worcester Polytechnic Institute (WPI).



the fire protection engineering program, it was always good to work in groups.

**Fletcher:** I've had quite a few highlights. The first was being a part of the first cohort in Cal Poly's program and going through the program with a great group of friends. Founding and being the President of the Cal Poly SFPE Student Chapter was very memorable because we educated the campus, and we created the chapter from scratch. We gained connections within the society.

**FPE: What is your overall assessment of your school's program? Did it prepare you adequately for the "real world?"**

**Buda-Ortins:** Yes, I think it gave me a really good basis for the understanding of fire, especially now that I'm in the nuclear plant fire protection field. The field uses a lot of analyses and assesses different fire sources and combustibles. My education provided me with a foundation of understanding for examining these types of scenarios.

**Hart:** WPI's fire protection engineering curriculum provides you with the basics of fire science and fire dynamics and then builds on that with a variety of classes. This also gives students a multi-faceted education in showcasing the different post-graduate opportunities.

**Fletcher:** Cal Poly's program carries the school's philosophy of "learn by doing," which produces graduates with solid practical foundations and real situational experience. I was able to jump in the first day at my job and made a smooth transition from classroom to job.

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

**Buda-Ortins:** Definitely check out the summer camps and Saturday programs, or at least play an engineer for a day. Get involved in your school through events, get to know people, do internships and be a part of the engineering society.

**Hart:** Get in contact with a local fire protection engineer who can tell you about the academic demands and their career path (and maybe even their colleagues, too)!

**Fletcher:** Email professors or local fire



protection engineers, and apply for internships, or shadow someone for the day. Be involved in your major's student society.

**FPE: How did you decide where to work? Was it easy to land your first job?**

**Buda-Ortins:** I had a lot of options—most being standard fire protection design. I was searching for something different and landed a job in the nuclear fire protection engineering industry.

**Hart:** While I was still in grad school and interning for the Fire Protection Research Foundation, a position had opened up at NFPA; I applied and was given the job. Considering I hadn't truly begun my full-time job search at that point, I would say it was easy to land my first job.

**Fletcher:** Before I graduated, I was contacted with several offers. The opportunity to go back to San Diego, the opportunity for growth, the resources available, and their support of the program at Cal Poly made the decision really easy.

**FPE: What was the most memorable part of your first job?**

**Buda-Ortins:** The way everyone has helped me so much. Coming in, I didn't know what I

was doing or how the company operated, so I was eased into the projects, and the friendly atmosphere definitely helped my comfort.

**Hart:** It would have to be walking into NFPA meetings and realizing that the people in the room are the ones who wrote a lot of the materials we used in my classwork. FPE is still such a small community that you can really get to know the leaders in the field.

**Fletcher:** It's great working with the team. I was able to start on some big projects right away because I was an intern, so I was very lucky.

**FPE: Is your job satisfying? Why?**

**Buda-Ortins:** Absolutely. My job is similar to trying to crack a code—very meticulous, but very satisfying once you get the final result.

**Hart:** I definitely think so. The mission of NFPA is, in part, "to reduce the worldwide burden of fire," and I think that's something that drives all fire protection engineers to take pride in their work.

**Fletcher:** It's very satisfying. I do something different every day, and I am continually learning and challenged by the projects. I get to work with a variety of people and projects, and it's something I really enjoy every day. 🔥

## WHAT DIRECTION IS THE INDUSTRY GOING?

Jonathan Hart and William Fletcher Give Close Insight on the Future of their Careers

**"This is a field that's constantly evolving. New technologies, unique architecture, and new or different materials all can pose challenges to fire protection engineers. Engineers must use their knowledge to find solutions for these new challenges as they arise."** —Jonathan Hart

**"One of the things I have noticed is the continuous improvements in technology. Some examples are: Building Information Modeling (BIM), performance-based design and the improvement in communication."**

—William Fletcher



**CAL POLY**  
SAN LUIS OBISPO

**FPE** FIRE PROTECTION  
ENGINEERING

**Master of Science in Fire Protection Engineering**  
**Graduate Certificate in Fire Protection Engineering Science**  
**Graduate Certificate in Fire Protection Engineering Applications**

- Cal Poly is ranked as the best public master's level university in the west by U.S. News and World Report for 19 years in a row
- Gain fundamental knowledge as well as practical skills in FPE
- Be ready to enter the FPE workforce and be productive immediately
- Learn-by-doing philosophy
- The only FPE graduate programs on the West Coast

**On-campus or online — the choice is yours**

Cal Poly is currently the only FPE distance program in the US offering live participation in lectures by distance students

For more information: [www.fpe.calpoly.edu](http://www.fpe.calpoly.edu)



# FPE SALARIES REMAIN STRONG

## Highlights from the 2012 SFPE Compensation Survey

Despite the current downturn in the global economy, fire protection engineering salaries continue to remain strong. The median compensation for fire protection engineers who work in the United States is now \$113,748, a slight (3%) increase in total compensation since the previous survey was conducted in 2010.

The Society of Fire Protection Engineers (SFPE) has surveyed the fire protection engineering industry about different aspects of their education, compensation and other employment-related questions since 1976. In the spring of 2012, SFPE conducted its 16th survey, reflecting income for 2011. Over 700 people from 41 countries participated in this year's survey; however, only compensation reported from fire protection engineers who practiced in the United States is reported in this article.

### Highlights from the 2012 survey show that:

- Median income (including bonuses and overtime) for those working in fire protection engineering in 2011 was \$113,748.
- Median income (including bonuses and overtime) for those working in fire protection engineering in 2011 with less than six years experience was approximately \$70,000.
- Compensation is higher for licensed fire protection engineers when compared to those who are not licensed.
- Many organizations that employ fire protection engineers offer excellent benefit packages.

A total of 745 people participated in the survey, of which 604 responses (81%) were from the USA.

**Table 1:** Total Compensation vs. Years of Work Experience

Experience	# of Respondents	10th Percentile	25th Percentile	50th Percentile/Median	75th Percentile	90th Percentile
Less Than 6 Years	75	\$60,000	\$62,450	\$70,000	\$84,272	\$95,860
6 to 10 Years	67	\$72,200	\$80,900	\$96,200	\$106,500	\$120,000
11 to 15 Years	78	\$83,000	\$91,234	\$107,750	\$124,650	\$149,600
16 to 20 Years	70	\$86,015	\$101,106	\$120,000	\$148,000	\$201,000
21 to 25 Years	73	\$96,000	\$109,000	\$127,500	\$144,000	\$158,000
26 to 30 Years	84	\$96,793	\$113,874	\$124,850	\$165,600	\$204,200
31 to 35 Years	83	\$90,000	\$110,500	\$136,000	\$169,150	\$217,200
More Than 35 Years	51	\$102,000	\$114,165	\$135,000	\$157,000	\$180,000

**Table 2: Total Compensation vs. Highest Education**

Education	# of Respondents	10th Percentile	25th Percentile	50th Percentile/Median	75th Percentile	90th Percentile
No Post Secondary Degree	10	\$86,700	\$94,000	\$104,500	\$138,750	\$168,500
Associate	9	\$80,400	\$85,000	\$100,000	\$119,000	\$153,200
Bachelor	268	\$69,753	\$94,120	\$117,000	\$140,000	\$170,000
Bachelor plus Courses	78	\$68,550	\$85,000	\$109,964	\$143,250	\$186,000
Masters	222	\$75,370	\$90,000	\$109,500	\$137,300	\$179,800
PH.D	16	\$96,500	\$102,494	\$132,415	\$148,125	\$156,000
31 to 35 Years	83	\$90,000	\$110,500	\$136,000	\$169,150	\$217,200
More Than 35 Years	51	\$102,000	\$114,165	\$135,000	\$157,000	\$180,000

## COMPENSATION

As shown in **Table 1**, compensation for fire protection engineers increases with years of work experience. When examining compensation and educational levels, survey results are shown in **Table 2**.

To address the question of early career compensation (0-5 years work experience), the data in **Table 3** presents compensation data for fire protection engineers with five or less years of

work experience. As a small number of respondents were reflected in the one-year or less category, no clear indication of typical starting salary was shown in the data.

Survey data also shows that being a Licensed Professional Engineer (P.E.) has compensation benefits. **Table 4** shows the summary of total compensation versus being a Professional Engineer or not.

## BENEFITS

Employee benefits are as important to many as compensation. Many organizations that employ fire protection engineers offer excellent benefit packages. These benefits include 401K plans with or without employer contribution, flexible spending plans with or without employer contribution, medical/dental insurance, sick/holiday/vacation leave, tuition reimbursement and professional membership dues. 🍷

**Table 3: Total Compensation to Early Years of Work Experience**

Education	# of Respondents	10th Percentile	25th Percentile	50th Percentile/Median	75th Percentile	90th Percentile
0 - 1 Years	13	\$59,200	\$60,900	\$63,000	\$69,177	\$71,680
2 Years	15	\$55,700	\$59,000	\$60,500	\$62,234	\$69,140
3 Years	10	\$65,792	\$70,926	\$77,250	\$81,375	\$85,300
4 Years	18	\$65,771	\$67,643	\$75,400	\$82,735	\$89,800
5 Years	20	\$59,967	\$66,656	\$75,140	\$89,250	\$97,290

**Table 4: Total Compensation vs. P.E./Not P.E.**

Education	# of Respondents	10th Percentile	25th Percentile	50th Percentile/Median	75th Percentile	90th Percentile
P.E./P.Eng	389	\$85,000	\$100,000	\$119,500	\$145,000	\$181,128
Non-P.E.	215	\$63,048	\$75,000	\$99,000	\$126,750	\$165,000

# PATHWAYS TO BECOMING A FIRE PROTECTION ENGINEER

By David Young, P.E., and Theresa Chung, P.E.

Artist's rendering of the Great Chicago Fire of 1871 by John R. Chapin, originally printed in Harper's Weekly; the view faces northeast across the Randolph Street Bridge.



Fire protection engineering came of age due to the large-loss fires of the 18th and 19th centuries. One large-loss fire in particular was the Great Chicago Fire of 1871, where Mrs. O'Leary's cow reportedly kicked over a lantern in a barn, and ended up burning Chicago to the ground. Many fire and building codes were developed and revised due to these large-loss fires. However, records of fire protection engineering dates back even further.

In 64 AD, Rome caught fire and burned for six days. It is not known whether the fire was started intentionally or by accident, but the result was that a number of houses were burned, lives were lost, and many were left homeless. Because of the fire, Emperor Nero required a number of changes as to how buildings were to be reconstructed. He required that houses have exterior walls built of fire proof materials and that they would be spaced out to help prevent conflagration. Arguably, this is the first documented beginnings of the field of fire protection engineering.

Back in Emperor Nero's day, there was no profession identified specifically as "fire protection engineering." However, over the centuries the need for applying science and engineering to protect people, property, and their environment from destructive fires grew to what fire protection engineering is today.

Today, many companies employ fire protection engineers to perform diverse and unique tasks. Consulting firms, insurance companies, government agencies, code enforcement agencies, and a multitude of manufacturers and large corporations employ fire protection engineers with one ultimate goal in mind: using science and technology engineering to make our world safer from destructive fires.

The pathway to becoming a fire protection engineer can be as diverse as the companies that employ those engineers. Many times, the genesis of a fire protection engineer is a high school student, interested in fire science and engineering, entering an undergraduate program in fire protection engineering. Schools such as the University of Maryland offer a traditional Bachelor of Science degree in fire protection engineering. Schools, such as Oklahoma State University, University of Houston Downtown, UNC Charlotte, and Eastern Kentucky University, offer programs in fire protection engineering technology.

Additional pathways include students who attend a community college or pursue an associate's degree from a fire science program then transition into a fire protection engineering program. This option gives the student a good foundation for the traditional fire protection engineering program plus it allows the student to "test the waters" regarding their interest in fire protection engineering as a career. It is important for students exploring this pathway to coordinate with an advisor from the program he or she will be transferring to so that the maximum amount of credits can be transferred.

Schools, such as Worcester Polytechnic Institute, offer a five-year, dual degree program. The student can earn a bachelor of science in another engineering discipline and a master's degree in fire protection engineering. Often times, students start to pursue a degree in another engineering discipline and at some point opt to change their major to fire protection engineering. Depending on the engineering discipline, course credit may be transferred to the fire protection engineering program. This takes coordination with an academic advisor to develop a successful transition plan and identify additional courses that may be required to complete the fire protection engineering curriculum.

Another pathway includes individuals who decide to pursue the field of fire protection engineering after they have completed a bachelor of science in another engineering program and gained working experience. Mechanical, electrical,



and structural (among others) engineers often migrate from their degree discipline into fire protection engineering via on-the-job training. This is because fire protection engineers often work on cross functional teams, which are composed of engineers from different disciplines. Today's mechanical or electrical engineer may become tomorrow's fire protection engineer.

Engineering graduates of other disciplines may opt to enter a master's program in fire protection engineering either through an on-campus program or distance learning arrangement. A number of colleges within the United States and abroad offer master's degree programs in fire protection engineering. One of the newest programs established in the United States is at the California Polytechnic State University in San Luis Obispo, California, which provides both on-campus and distance learning opportunities. The University of Maryland and Worcester Polytechnic also offer on-campus and distance learning M.S. degree programs. Distance learning may allow an engineer to pursue a master's degree while still enjoying the benefits of employment. And at the same time, many employers will provide tuition reimbursement.

Additionally, colleges and universities throughout the world offer degrees in fire protection engineering and fire protection technology. These include Carleton University (Canada), Ghent University (Belgium), Lund University (Sweden), University of Canterbury (New Zealand), University of Leeds (United Kingdom), University of Ulster (Northern Ireland), University of Western

Sydney (Australia), and Hong Kong Polytechnic University (Hong Kong). A comprehensive list of the colleges and universities, worldwide, that offer fire protection related degrees is located at the Society of Fire Protection Engineers (SFPE) website at [careers.sfpe.org](http://careers.sfpe.org).

In addition to obtaining an educational background in fire protection, practical experience can be obtained through internships. Career resource centers are the best places to connect with career advisors and be informed of internship opportunities, career fairs, and other on-campus recruiting events.

Whether you're a student or seasoned engineer looking to transition into the fire protection field, the best advice is to expand your professional network by joining an organization like the Society of Fire Protection Engineers (SFPE). Joining a local SFPE chapter allows access to job listings, educational resources and seminars, technical symposia, books and publications, and most importantly, valuable networking opportunities with other professionals in the fire protection community. Additionally, any college student who is interested in the field of fire protection can become a member of SFPE free of charge by going to [sfpe.org](http://sfpe.org).

To get started on your own pathway to a rewarding career in fire protection engineering, check out the Careers in Fire Protection Engineering website at [careers.sfpe.org](http://careers.sfpe.org) for useful resources and information. 🔥

*David Young and Theresa Chung are with Hughes Associates, Inc.*

# THE MONTE CARLO EXTERIOR FACADE FIRE

By Jesse J. Beitel and Douglas H. Evans, P.E., FSFPE

Heat from the flames broke out several windows, and the fire attempted to gain access into the interior of the high-rise tower guestrooms, but automatic sprinklers halted its interior spread.



**Fire spread along the upper portions of the southwest facing exterior facade(s) of the 32-story Monte Carlo Hotel and Casino in Las Vegas, Nev. This article addresses the ensuing forensics investigation, contributing aspects, lessons learned and whether these combustible exterior facades should continue to be allowed.**

Just before 11 a.m. on Friday, Jan. 25, 2008, the Clark County Fire Department was notified that the exterior façade of the Monte Carlo Hotel tower was burning. For more than an hour, the fire continued to propagate across the exterior, both horizontally and vertically. The fire also spread downward in some areas due to burning material falling down from the area of origin, landing on horizontal ledges below.

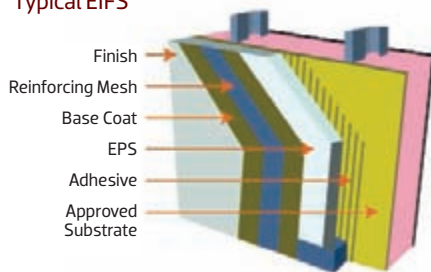
Heat from the flames broke out several windows, and the fire attempted to gain access into the interior of the high-rise tower guestrooms, but automatic

sprinklers halted its interior spread.

Ignition of the exterior wall was attributed to welding on a catwalk on the roof parapet wall—a 30 ft. (9 m) high-screen wall. The exterior cladding materials first ignited on the left side (as viewed from the exterior) of the central core area. The fire then progressed laterally. The adjacent materials on the right side of the central core façade began to burn and the fire continued to propagate laterally over these decorative materials. The fire also moved to the left along the upper portion of the west tower and began to involve the cladding materials.

Once the fire progressed away from the central core area, it appeared that the decorative band at the top of the 32nd floor, the medallions between the windows on the 32nd floor and the decorative band at the top of the wall were the primary mode of lateral flame propagation. Not only did these areas exhibit their own flame-spread, the resultant flames caused the flat area of the wall above to ignite.

## Typical EIFS



## THE BUILDING

The 32-story Monte Carlo Hotel and Casino was constructed in 1994 and 1995.

The plan layout of the hotel was a center tower from which three wings, each approximately 240 ft. (73 m) long, extended.

The exterior wall cladding of the Monte Carlo was an Exterior Insulation and Finish System (EIFS) that was installed at the time of construction. Additionally, it appeared that several decorative architectural details were installed on the exterior wall at the time of construction.

Fire protection engineers were asked to assist in the investigation. The primary questions concerned the installation of the EIFS, as well as potential non-EIFS materials. The questions included:

- Were the materials installed in accordance with code, the tested assemblies and the manufacturer's guidelines?
- If so, were the code requirements, associated tests and manufacturer's guidelines adequate?
- If not, to what extent do these need to be revised?

## THE INVESTIGATION

A few days after the fire, personnel obtained undamaged samples from the west wing of the exterior façade.

The samples were inspected and descriptions were developed. During inspection of the materials removed from the Monte Carlo, smaller samples were removed and subsequently sent to a laboratory for qualitative characterization.

## SAMPLED MATERIALS

The following summary of the various materials installed on the exterior façade is based on visual observations and the laboratory analysis:

The horizontal band at the top of the exterior wall was over 5 ft. (1.5 m) high and contained an expanded polystyrene (EPS) foam plastic core covered with a rigid non-EIFS coating.

The horizontal band above the uppermost guestrooms (32nd floor) was approximately 6 ft.



Image provided by MGM Resorts International

(1.8 m) high and contained up to 3 ft. (0.9 m) thick EPS foam plastic at the upper portion covered with a polyurethane encapsulant.

The horizontal band at the 32nd floor was primarily hollow with a ½ in. (13 mm) thick outer shell comprised of fiberglass and a gypsum-plaster binder.

The horizontal band at the 29th floor was approximately 3 ft. (0.9 m) high and contained 2 ft. (0.6 m) thick EPS foam plastic at the top covered with a rigid non-EIFS encapsulant.

The decorative columns between the 29th and 32nd floors were approximately 2 ft. 4 in. (0.7 m) wide and 6 in. (150 mm) thick with an EPS foam plastic core and an EIFS coating (thinner than required).

Each of the two base wall assemblies sampled contained 5/8 in. (16 mm) thick gypsum wall board covered with 1 inch of EPS foam. The primary difference between the two was that the EIFS coating from the upper sample was noticeably thinner, but in both samples, the EIFS coating was thinner than required.

## INVESTIGATION FINDINGS

Based on the information obtained, the following findings were developed:

The Monte Carlo had, as its exterior wall cladding in the fire area, the following two components: An EIFS system that was installed in the flat areas of the building and on the decorative column pop-outs that extended from the 29th floor to the 32nd floor—the

analysis indicated that these EIFS areas had a non-complying thickness of lamina (the exterior encapsulant).

Decorative non-EIFS materials used for ornamentation—These items included the horizontal band at the 29th floor, the horizontal band at the top of the 32nd floor, the railing at the top of the parapet wall and are believed to include the medallions between the windows on the 32nd floor.

Based on the analysis of the samples, it appears that the EIFS lamina did not have the correct thickness.

The EIFS had additional decorative components applied to it. These were large shapes that contained significant thicknesses of EPS, and these components were not covered with EIFS lamina.

The primary contributor to the progression of the fire was the combination of materials in the decorative band at the top of the wall, the decorative band at the top of the 32nd floor (EPS with a polyurethane resin coating) and the undetermined materials in the medallions.

Flaming droplets and burning pieces of EPS and/or polyurethane caused ignition of the large decorative band at the 29th floor. This decorative band was composed of EPS and had a non-EIFS coating. 🔥

To read the full article, go to [magazine.sfpe.org](http://magazine.sfpe.org).

Jesse J. Beitel is with Hughes Associates, Inc.

Douglas H. Evans is with Clark County, Nevada.

# FPE IS AN EXCITING & REWARDING CAREER

A career in fire protection engineering pays well, provides opportunities for world travel, and offers the chance to work in a variety of environments.

Fire is a danger that can impact entire communities.

For example, each year in the United States more than 3,000 people die and thousands are injured as a result of fire. Because fire protection engineers use science and technology to make our world safer from fire, many of them find satisfaction in their careers.

There are many opportunities for fire protection engineers to make a rewarding and lucrative living. A career in fire protection engineering 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 the government.

Moreover, becoming a fire protection engineer also provides an opportunity to become a licensed professional engineer (P.E.). As with many engineering disciplines, engineering licensure is the “mark” that demonstrates a commitment to high standards that is recognized by all design professionals.

The licensing of engineers is important because of the essential role engineering has in society. Normally, structures and systems that impact the public’s safety are required to be designed by licensed engineers. For example, bridges, roads, electrical systems, drinking water systems and building structures are all required by law to be designed by licensed engineers.

The profession of fire protection engineering is no different. The work performed by fire protection engineers, including the design of fire protection systems, plays a significant role in protecting the health, safety and welfare of the public. These systems alert children to danger when fires occur at schools and control fires that start in high-rise apartment buildings.

As a fire protection engineer, obtaining a P.E. license offers many opportunities for career advancement. For



example, licensure increases the opportunities for promotions and higher salaries. But more importantly, an engineer must be licensed to offer his or her services to the public. To find out more about engineering licensure, visit the National Council of Examiners for Engineering and Surveying (NCEES) website at [www.ncees.org](http://www.ncees.org).

For those interested in becoming a fire protection engineer, local chapters of the Society of Fire Protection Engineers offer scholarships for fire protection engineering graduate and undergraduate students. These scholarships are a great way to offset the rising costs of college.

The award of these scholarships is usually based on a student’s academic record and interest in fire protection engineering. These scholarships can range from \$500 to \$7,000. In past years, many of these scholarships went unclaimed. Additionally, many scholarships are available from colleges and universities that offer programs in fire protection engineering and from private fire protection organizations.

More information about these scholarships and the exciting profession of fire protection engineering can be found at [careers.sfpe.org](http://careers.sfpe.org). Additional information can be found on the Careers in Fire Protection Engineering page on Facebook at [www.facebook.com/careers.sfpe.org](http://www.facebook.com/careers.sfpe.org).

By Chris Jelenewicz, P.E.



## Student Membership Opens Doors

# Join the Society of Fire Protection Engineers today!

Name: \_\_\_\_\_

Address: \_\_\_\_\_

City/State/Province/Zip/Postal Code/Country: \_\_\_\_\_

Telephone: \_\_\_\_\_

Fax: \_\_\_\_\_

Email: \_\_\_\_\_

School: \_\_\_\_\_

Expected Graduation Date: \_\_\_\_\_

Requested Member Login: \_\_\_\_\_

Requested Password: \_\_\_\_\_

**Complete this form and mail to:**

Society of Fire Protection Engineers  
7315 Wisconsin Ave., Suite 620E  
Bethesda, MD 20814 USA

**Or fax to 301.718.2242**

SFPE advances the science and practice of fire protection engineering through its vast membership of more than 4,000 professionals and more than 60 chapters in 14 countries. SFPE promotes the continuing education of fire protection engineers through its publications, conferences, symposiums and distance learning opportunities.

**Benefits of SFPE student membership:**


- A subscription to SFPE's quarterly magazine, *Fire Protection Engineering*.
- Discounts on publications and merchandise.
- Full use of the members-only section of the SFPE website.
- Association with the SFPE chapter in your area.

This will help in writing papers, researching fire protection and finding jobs. **Best of all... it's FREE! Join now!**

**Complete this form and mail to:**

Society of Fire Protection Engineers  
7315 Wisconsin Ave., Suite 620E  
Bethesda, MD 20814 USA

**Or fax to 301.718.2242**



## Become one of the world's most in-demand engineers.

Choose the world's premier fire protection engineering program.

Learn and work among internationally recognized faculty in state-of-the-art fire labs.

Prepare to be on the leading edge of saving lives and protecting property.

### Leading the World to Safety

Worcester Polytechnic Institute offers one of two fire protection engineering graduate programs in the U.S. and the world's only formal PhD program in this heroic science. With significant funding from the public and private sectors, WPI researchers and students are immersed in finding and applying new ways to predict fire behavior and to inform regulatory policy. A five-year BS/MS program gives forward-thinking undergraduates a head start in preparing for the interesting and urgent challenges of fire safety—and a rewarding and lucrative career.

[wpi.edu/+fpe](http://wpi.edu/+fpe)



# WPI