



Editorial Stephen Mraz | Senior Editor

Wanna buy a bridge?

hen a major section of the Bay Bridge in San Francisco collapsed during the 1989 Loma Preita earthquake, officials at the **California Dept. of Transportation** (Caltrans) leapt into action to

replace the span. Their team of experts estimated it would cost \$1 billion and be finished by 2003, give or take.

The bridge was completed late last year at a cost of \$6.4 billion, so far. By the time all the bills and interest get paid, it will likely tally over \$12 billion. Were there any warning signs that the project would be so late and so expensive? You tell me:

• Was it wise to assign a lawyer to be project manager? He had no engineering training and his previous job was Assistant Chief Counsel for California. While he was overseeing bridge construction, he fired or reassigned several experts in welding, testing, and bridge construction when they raised concerns about safety and quality. A least two of these mentioned that the project manager "repeatedly told them not to record their concerns in writing, either on paper or e-mail, but rather to communicate orally," according to a California Senate report that looked into the cost overruns on the bridge.

Firing whistle-blowers is standard operating procedure (one of the unwritten ones) at Caltrans, where the motto seems to be "Go after the troublemaker, not the trouble," according to a California State Senator.

• Was it wise to hire a Chinese crane-building firm that had never built a bridge to handle the construction? Apparently the Chinese firm was the low bidder, coming in \$250 million below the nearest competitor. What could go wrong?

Soon after production began in China, it was discovered the firm was welding in wet and rainy conditions, a cardinal sin, according to welding experts. They continued welding in the rain for years on the project. Wet welds are prone to hydrogen contamination, one of the major causes of cracked welds. The company also stored completed bridge sections outside in the rain where they partially filled with water. A report was filed saying this would cause corrosion in inaccessible areas of the parts. The prime contractor dismissed concerns saying any rust "would be insignificant and unmeasurable." Caltrans accepted this without comment for parts that would be suspended for 150 years (hopefully) in a foggy environment close to seawater.

In a telling anecdote, the prime contractor and others kicked in a total of \$500,000 to train Chinese welders in proper techniques. Many, if not all, of the workers skipped the training, and nothing was done.

I hope the bridge lasts its 150-year design life, but I fear that will have as much to do with dumb luck as good engineering.

(For more details on this project, check Charles Piller's coverage in the *Sacramento Bee.*)





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2014 SALARY ENGINEERING BYTHE SURVEY ENGINEERING BYTHE Numbers

Salaries and satisfaction inch up, exceeding expectations.

he surveys have been returned and the data collated for this year's look at engineering salaries and attitudes. And judging by one key finding, average salary, engineers are doing well. Last year they earned an average salary of \$89,200. That figure rose a respectable 5% this year to \$93,000, far outpacing the 1.3% raise expected by respondents for this year.

Engineers are also more content these days, with 82% saying they felt fairly compensated for their work. Last year, only 66% said their pay was fair. This favorable view regarding pay likely affected how engineers looked at their jobs overall. Job satisfaction, for example rose, going from 90% satisfied in 2013, with only 18% extremely satisfied, to 97% satisfied this year and 50% extremely satisfied.

HIGH ON THE PROFESSION

This somewhat rosy year in terms of salary seems to have colored engineers' opinion on their profession. Last year, a third of the respondents said they had Average age of the typical engineer

Years of experience for the average engineer

Number of hours engineers put in to the job each week

Percentage who say the career is as promising today as it was 5 years ago

Percentage who say their paychecks grew in 2014

Percentage who say their company is funding part of their retirement

Percentage who say their company plans to increase engineering jobs this year



considered leaving the engineering profession; this year that was down to about a fifth. And an overwhelming 93% say they would recommend engineering as a profession to a young person, a slight rise over last year's 90%.

Comments from engineers who would tell youngsters to go into engineering include:

• "Engineering is an exciting, ever-changing field with lim-

itless opportunities to solve problems and make positive impacts on industry and society. The world will always need engineers, and an engineer-trained mind is a practical tool in many aspects of life."

- "If you like technology and problem-solving, it's a great profession."
- "It offers rock-solid employment security, good pay, and a

highly satisfying career."

Those who would not recommend engineering to young adults have a much different view:

• "I would recommend getting an engineering degree because of the fundamentals it teaches, but I would not advise making it a career. There

are too many levels of bureaucracy to get through to get things done and too many decisions are made by outside forces. Instead, I would urge them to get a job that offers more direct control of the decisions being made."

- "Historically, engineers have worked long hours under very stressful conditions for pay that is not much more than that of a lot of blue-collar workers. And since salaried personnel don't receive additional compensation for working more than 40 hr/week, engineers earn much less than blue-collar workers on an hourly basis."
- "The level of respect the profession once enjoyed from employers and society is no longer there. Engineers are viewed as just extremely high overhead."

THE KEYS TO HIGHER PAY

Slicing the survey data in search of the attributes and habits of those earning the highest salaries uncovers some expected and unexpected findings. For example, earnings track well against education level. Those working as engineers with only a high-school diploma or less take home an average of \$70,800. Every educational addition adds to the paycheck, even if it's







only attending college but not earning a degree. It tops out with Ph.D.s in engineering earning \$105,000 annually.

One indicator that doesn't quite correlate as you might think it should is "years spent in engineering." Our survey indicates that those with 30 to 34 years of engineering under their belts pull in the most, an average of \$100,000. Meanwhile, those with the most years of experience, 40 or more, rake in almost 10% less, \$91,800.

The number of hours an engineer works every week also has an odd correlation to earnings. Engineers who earned the most



put in 51 to 55 hr weekly at the office to take home \$103,100. The workaholics, the ones spending the most hours in the office each week, 60 or more, make less, \$95,400. Interestingly enough, almost half of those living in the office for 60 or more hours work for smaller companies with revenues of less than \$5 million. Overall, when it comes to hours, most engineers (68%) put in 36 to 50 hr at their desks and earn an average of \$90,400.

Company size appears to be a good indicator of pay, with larger companies paying more, except for a small blip at the top. Engineers working at companies with \$5 billion to almost \$10 billion in revenues earn the most, an average of \$113,100. The largest firms, those with revenues over \$10 bil-

lon, pay their engineers a bit less, an average of \$111,000.

Another factor with an anomaly at the top is job title. The highest-earning individuals have titles such as technical director, director of engineering or R&D engineering manager (\$110,500), department or section head (\$105,400), or vice president/vice president of engineering (\$105,300). Meanwhile engineers who have managed to make it to the top as owner, CEO, president, partner, or executive manager make \$93,900, a 10% drop. The lowest-paying title in our survey turns out to be software-engineering manager, a position that

pays \$60,000 per year. Strangely enough, those with a software-engineering title earn more, \$66,700.

If we combine all these "high-pay" indicators, the result would be an engineer with a Ph.D. who has worked as an engineer for 30 years in a company with \$5 to \$10 billion in revenues, putting in 51 to 55 hr/ week as director of engineering. Unfortunately, statistics being what they are, there was no one in our survey who met all these qualifications.

Bonuses are another source of compensation, and nearly 20% of all respondents claim they will earn a bonus of \$10,000 or more this year. When the data was broken down to focus on the engineers who pulled in these five-figure (or more) bonuses, it revealed that most of them held fairly lofty titles such as owners, CEO, president, chief engineer, or director of engineering. But 10% of these "bonus babies" were bench-level design and project engineers. Most had



over 25 years as engineers, though the majority (51%) had less than 14 years with their current company. This makes it likely that they are working at the second or third firm in their career or that they started a company and are doing well. The survey also shows that these engineers earned their bonuses based mainly on company or division performance and their own personal performance. Engineers who cashed in big on bonuses also managed to earn an average salary of \$121,200. Meanwhile, 27% of them added another \$10,000 or more in stock options while 23% earned yet an additional \$10,000 or more from other sources.

YOUNG AND OLD ENGINEERS: THE DIFFERENCES

A new feature in this year's survey was the addition of the following question: "Do you feel today's engineering students graduate with enough knowledge and skills?" The replies were practically a statistical dead heat, 50.7% said yes and 49.3% said no. But when the replies are tabulated for just those engineers with less than 10 years of experience, 55% indicated they thought newly hired engineers were well trained in college. Drilling down even farther, asking only engineers with less than a year of experience working as engineers, the figure climbed higher with 66% saying

new hires are qualified. Still, that means a third of new hires in effect say they aren't up to the task of engineering yet. This is strong evidence that colleges or engineering companies should pick up the pace on educating students and new engineers in real-world design and engineering.

When asked why they thought recent engineering grads had the knowledge and skill to make a living in the profession, comments from engineers with over 10 years of experience included:

- "An engineering education provides a good base, but the nature of engineering work tends to be highly specialized, so more knowledge is always needed. It would be impossible to teach everything."
- "U.S. engineering schools are superior to any others in the world. The current crop of engineering students has the knowledge and skills to begin in my area of expertise, aerospace engineering. But they still need mentoring



by experienced engineers to be truly effective."

Comments from new engineers, those with less than 10 years of experience, included:

• "The current engineer grads get the basic tools to be engi-





neers. They just need to acquire the experience it takes to make good engineering decisions."

• "The technical abilities are there, but the bigger picture, understanding how businesses actually work, is lacking."

More senior engineers who feel engineers right out of college are unprepared for the working world said:

- "It's incredibly variable among grads, but generally the breadth and depth of understanding engineering basics and principles seems to be in decline."
- "They need more real-world training, especially on documentation. They need to know how to determine factors such as tolerance and material requirements. They can't determine these things through trial and error. They also need how to work in teams and understand that all details are important, not just the ones they want to deal with."

Newer engineers who feel recent engineering grads lack the needed skills commented that:

- "Engineering schools focus too much on research activities that bring universities grants and recognition. New engineers do not have the practical skills and problem solving methods companies use day to day to stay in business."
- "There isn't enough hands-on work in college. New grads





know the theory, but are not ready to work."

When the survey asked for concerns — "issues that keep you up at night" — the results showed that despite the age gap, engineers all worry about the same things. The top answers for

SALARY BY TYPE OF DESIGN					
TYPE OF DESIGN	SALARY	RESPONDENTS			
ICs and Semiconductors	\$127,100	0.4 %			
Military	\$116.400	2.9 %			
Medical	\$106,500	4.5 %			
Computer and peripherals	\$103,400	1.6 %			
Software	\$102,700	1.3 %			
Avionic, marine, space	\$101,900	3.6 %			
Power devices	\$100,800	1.5 %			
Communications	\$96,100	1.3%			
R&D	\$92,900	11.2 %			
Safety/security	\$92,400	1.5 %			
Appliances	\$88,800	1.1 %			
Test & measurement	\$88,700	4 %			
Industrial controls	\$89,100	11.1%			
Mobile equipment	\$84,000	3.4 %			
Packaging	\$83,600	1.9%			
Consumer	\$83,100	5.5 %			
Components & subassemblies	\$82,600	5.2 %			
Material handling	\$79,100	5.4 %			
Automotive	\$78,800	5.7 %			
Machine tools/automation	\$78,400	10.1 %			
Other	\$93,900	16.6 %			





engineers who have made it past the 10-year mark are looming deadlines (32% chose this one), product-reliability issues (29%), and product-quality issues (26%). Those were the same result, and nearly the same percentage of respondents for engineers with less than 10 years' experience: looming deadlines (30%), product-reliability issues (29%), and productquality issues (29%).

There was one major (and predictable) difference between older and younger engineers. While almost 13% of older engineers worried about age discrimina-

tion in the workplace, only 4% of the younger generation did. Their time will come.



The engineers most concerned about age discrimination are the 35 to 39-year olds, with approximately 20% "losing sleep" over it. Of those you would think most concerned about age discrimination — engineers with more than 40 years' experience — only 10% include it on their list of concerns.





WHAT ASPECTS

OF YOUR JOB





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engineering by The numbers

THE GENDER DIVIDE

Women remain underrepresented in engineering—and the situation isn't improving

ike past surveys, relatively few female voices were heard in this year's Salary & Opinion Survey. Only about 3% of our 3000 responses came from women. So, to get a better understanding of some of the issues facing women in the field, *Electronic Design* teamed up with IEEE Women In Engineering—the professional association's wing dedicated to promoting women engineers and scientists—on research that paralleled our annual salary survey.

For this project, we solicited responses from nearly 400 women involved in design engineering, engineering management, and executive management at OEMs. These women shared their insights on general industry subjects as well as issues specific to women in engineering.

Engineering, of course, remains a male-dominated profession. The Congressional Joint Economic Committee recently reported that only about 14% of the engineers currently working in the U.S. are female. While that's a significant improvement from the early 1980s when women made up a mere 6% of the engineering workforce—it still indicates that a serious gender divide exists in the field.

What's more, the profession's gender disparity may be getting worse, not better. According to the U.S. Census Bureau, the percentage of women holding STEM jobs is on the decline—mainly because their share of computer occupations dropped to 27% after reaching a high of 34% in 1990. "We have seen an increase in women employed in STEM occupations, but they are still underrepresented in engineering and computer



occupations that make up more than 80% of STEM employment," said Liana Christin Landivar, a sociologist in the Census Bureau's Industry and Occupation Statistics Branch.

Women make up 51% of the U.S. population and 47% of the workforce, so it's clear that some issue or issues are preventing their proportionate representation in one of the working world's more lucrative professions.

Because the number of women participating in our main Salary Survey was so small, it probably does not offer a statistically significant insight into the compensation disparities between men and women. That said, for the sample on hand, income between the sexes differed by about 10% (\$106,869 in total compensation for men vs. \$97,357 for women).

However, this disparity isn't based on a direct comparison of women and men holding the same positions or in the same situations. For example, the sample of women who participated in the Electronic Design survey were, on average, much

younger (45 years of age vs.

53 for the men) and had nine fewer years of engineering experience than the men we heard from (18 years for women vs. 27 years for men).

On the other hand, when we looked at the 400 participants in the separate survey of women conducted with IEEE, we found that they had much higher levels of education than the average participant in our main survey. For example, 42% hold

a master's degree (compared to just 30% in our main survey)—while 23% have a doctorate (compared to 9% in our main survey). ARE WOMEN IN ENGINEERING AFFORDED THE SAME OPPORTUNITIES FOR CAREER

So rather than focus on issues related to compensation, we decided to use data from both surveys to compare how men and women engineers differ in their views about the profession generally and their jobs specifically. We also asked women to open up about their experiences working in a male-dominated occupation, as well as offer advice to young women who might consider entering the field.

DOES IT START IN SCHOOL?

The minority status of women in engineering becomes evident to them while still in school. On average, women estimate there were 13.5% fewer woman engiARE WOMEN IN ENGINEERING AFFORDED THE SAME OPPORTUNITIES FOR CAREER ADVANCEMENT IN **MANAGEMENT** POSITIONS AS MEN?



neering students on graduation day than when they first entered college. While some suggested that the rigors of an engineering education were partly to blame for the drop-off, others cited the paucity of mentors for women among the faculty and staff as a major contributing factor.

"The lack of mentorship—especially from women faculty members—was clearly one reason for the dropouts," commented one survey participant. "The support of women faculty toward women students is non-existent. There are not many women faculty members at universities to begin with, and the majority of them are not supportive to students at all. They do not put their weight in at the admission committee when it comes to admitting more women students to the engineering

programs. As a matter of fact, most male and women faculty members do not care about gender bias and gender equality issues at all."

"Harassment of female students was rampant," reflected another woman engineer. "It is much improved now. Also, in my college years, it was still an accepted practice for women to take care of the home and children in addition to any studies or outside work. The pressures of all of the responsibilities overwhelmed some."

Despite the relatively high average salaries in engineering, fewer than a third (29%) of the women surveyed believe women engineers fare better than those in other

> professions when it comes to achieving equal pay for equal work. About 47% say the opportunities are roughly the same, while one in four say the chances of receiving compensation on par with men is worse in the engineering field than other professions.

> "I think that at certain levels, an engineer is an engineer, and the salary will be the same between men and women," said one survey respondent. "However, I think that the opportunities for advancement for women are lower, which then causes lower salaries."

> This was a common complaint among women: "I get the sense that women in engineering are paid the same as men in the same role, but that women tend to end up in roles that are paid less on average, like QA or tech support."

ARE WOMEN IN ENGINEERING AFFORDED THE SAME OPPORTUNITIES FOR CAREER ADVANCEMENT IN **ENGINEERING** POSITIONS AS MEN?





engineering numbers

INTERVIEW With Nita Patel

IEEE Women In Engineering Committee Chair nita.patel@ieee.org

Why have so few women taken up engineering as a career?

I think there's a component of awareness and stereotypes involved. Awareness in that many people don't know what an engineer does or what it means to be an engineer. There are stereotypes and misconceptions about engineering. Also, there are stereotypes about the capabilities required. I think there's a stereotype



and bias that implies that girls are not capable of pursuing a STEM field. Yes, STEM can be hard, but so are many other fields of study and women are successful in them (*e.g.*, doctors and lawyers).

In your view, what are some of the aspects of engineering that make it a particularly good career path for women?

I think it's a great career choice because there is an incredible amount of flexibility and many opportunities. An engineering/technical background provides many opportunities in terms of type of industry (defense, medical, commercial, space...), type of career (full-time, part-time, independent, team-based...), and level of contribution (individual, team lead, executive...). The analytical and logical skills that you learn through a STEM degree can be applied to many different industries. Also, most engineering careers are project-based, so there is great flexibility in the hours you can set.

What are the biggest challenges women in engineering face?

I think people are aware of and control overt biases. There are still some subtle biases floating around. The perception that engineering is a man's field is still prevalent, so this can be discouraging and prolongs the bias.

Given some of these challenges, would you recommend engineering as a career path for women?

Absolutely, I do not think the challenges are overwhelming. I think the career is very rewarding. Women have a lot to contribute in this field.

What career advice do you have for women currently working in engineering?

Challenge yourself and ask for larger leadership roles. I think it's important to get more women into higher-visibility management roles. I also think women should keep learning. Technology is ever-changing, so we must work to remain technically current and think about expanding our horizons by continually developing professional skills.

What advice do you have for women students who are considering the profession?

Go for it. You will find the technology exciting and the skills you learn will help you throughout your life. \blacksquare

"Women in general ask for less, so men are used to giving them less," opined another. "When in that early discussion with recruiters, women usually do not know what their male peers receive as offers. I used to be shocked to discover that my male coworkers who weren't as smart or productive as I was made more. Now I'm used to it, and I see how they receive more mentoring and guidance from their managers, who are almost all men."

Some women cited work/home balance issues as the reason for the disparity. "Many of the women that I have worked with have had children and, as a result, spend less time at work and require more time off to take care of their children," said one respondent. "I believe this affects their salary. At one company I worked for, a manager even said to me that if he were hiring, he would not select a women because most of them require extra time off to take care of children. This is a man who had a stay-at-home wife and children. Unfortunately, even if a woman does not have children, she would be viewed the same as women with children and have less opportunity to move up."

"At my previous job, I was making 20-25% less than my male counterparts with the same title," one engineer related. "I performed better, accomplished more, but was paid less—and was expected not to complain."

Despite these issues, about half of the women surveyed say they are either extremely happy or very happy in their current positions—closely matching the results for men. Digging deeper, 63% of female engineers say they feel sufficiently challenged intellectually with the projects they work on, compared to just 56% of men.

But, despite that satisfaction, 42% of women engineers say they've considered ditching the profession altogether to pursue something else, compared to just over a third of the men we heard from. In fact, 15% of women say they're already looking for a new job, compared



engineering numbers

to only 9% of the men surveyed.

One reason may be that most women (55%) don't believe they have the same opportunities for career advancement in engineering positions as men. "Women tend to promote themselves less than men, even though they are just as capable," noted one women engineer. "In my experience, the engineers who are the most vocal about their accomplishments are advanced to higher levels than those who quietly do brilliant work."

"It's an unconscious bias," claimed another survey participant. "Women do not brag about their achievements or come forward with clear ambition for management positions. Plus, many men don't believe it's possible to have both a family and a management career."

Another woman engineer put it this way: "There is a constant assumption that women engineers must face on a daily basis: that they're not engineers ('You're the admin, right?') or that they're not really engineers ('You're just the tester, right?'). Their voices are not heard in meetings, they're not acknowledged in leadership reviews, and they're discouraged from working on projects that could advance their careers. These micro-aggressions accumulate into reduced career outlook."

"We are not recognized for what we do," summarized another. "Peers, supervisors, and managers get the credit. What we do is forgotten or downplayed. Also, opportunities to be seen are given to male engineers by male engineers first."

The women we surveyed indicated that things get even worse for them if they do get into management. Nearly twothirds (64%) of the female engineering managers we surveyed say they aren't afforded the same career advancement opportunities as men. "We are considered emotional and not able to make the tough decisions that men do," claimed one woman in a management position. "Women are still seen as emotional and needy, so they're not considered for some critical positions at companies," another agreed. "I've been told by management those exact words in previous jobs."

HOW DO WOMEN IN ENGINEERING FARE VS. WOMEN IN OTHER PROFESSIONS WHEN IT COMES TO EQUAL PAY FOR EQUAL WORK?



A smaller number of women described somewhat different experiences. "I think women who treat themselves like people rather than women advance the same as men," said one survey participant. "I've never seen myself as 'the woman in the room,' just 'a person in the room,' and I share my ideas and thoughts accordingly—and I have accelerated quickly at my company."

Ironically, however, this same survey participant also said that her compensation was only in the "21st percentile," while the male engineers who come to her for guidance are in the "90th percentile"—and was thus strongly inclined to leave her job. "It's very demoralizing, and it's too bad for the company that they haven't fixed it."

"Women in engineering have had to contend with men from the start," wrote another woman. "Be it in classrooms or on the job. You learn to live in their world and it helps when it comes to things like putting yourself out there for a raise or promotion."

Some are more philosophical: "As in anything with life, if



NEARLY 1 IN 4 WOMEN HAVE CONSIDERED LEAVING THE ENGINEERING PROFESSION TO SPEND MORE TIME WITH FAMILY. OTHER REASONS ENGINEERS HAVE FOR LEAVING THE PROFESSION INCLUDE:



DESPITE RECENT HEALTHCARE REFORM, THE PERCENTAGE OF ENGINEERS THAT RECEIVE HEALTHCARE BENEFITS FROM THEIR COMPANY CONTINUES TO DROP						
2010	2011	2012	2013	2014		
57%	63%	61%	56%	54%		

you are a go-getter and want to advance in your career you will, but if you are timid and don't afford yourself appropriate connections you will not get the same opportunities."

One reason women have very different experiences is that their companies maintain very different policies when it comes to gender issues. "In my division at IBM, there are an unusually high percentage of managers and engineers who are women compared to other corporations with which I've interacted," wrote one respondent. "IBM has made a concerted effort to advance women in technical roles. Also many of the women in our organization are the best in the world in their fields."

Some companies are making special efforts to address gender disparities, which may account for one interesting statistic from our research: 67% of them told us they'd been contacted by a headhunter or recruitment specialist within the past year, while only 54% of men could make that claim.

"I've always been lucky enough to encounter men who are more than thrilled at finding a woman engineer who can do as good, if not better, a job than her male counterparts," chimed in another. "These men typically afford women the same opportunities for advancement."

And, while it's important not to make unfounded generalizations about behavior and gender, it does appear that women do approach their jobs differently than men. Women,

WOMEN ENGINEERS ARE MORE ACTIVE USERS OF SOCIAL MEDIA FOR BUSINESS



for example, use social media more extensively for their work than men. This gives some credence to the belief that women tend to be more collaborative than their male counterparts.

ADVICE TO THE NEXT GENERATION

Despite the challenges women engineers face, 93% still say they would recommend engineering as a career path to young girls and boys alike. "Engineering has been a satisfying and personally rewarding career for me," said one. "I do believe that women often have obstacles that men don't as engineers, but if they are willing to negotiate those obstacles, it can be a fulfilling career."

"Engineering is an exciting field where you can make a difference," said another respondent. "There are opportunities for both men and women, but I would caution women that they need to be willing to work hard and be prepared to promote their own accomplishments if they want to be noticed and recognized for their skills."

"It is a good career, challenging, and pays well," said another. "Women do well in engineering, but the glass ceiling is low. This still is a field dominated by men, and it is difficult to fit in."

Some respondents suggested that the bigger issue for young people was a general understanding of what the engineering profession was all about. "It's something that I believe more people would enjoy if they had had exposure to it at an early age," observed one engineer. "The U.S. education system does not prepare high school students for careers. Exposure to engineering is minimal to nonexistent before college and that's unfortunate."

Some women suggested that they would only recommend engineering to young boys. "When I meet someone new and shake their hand, there is zero chance that their first comment won't be about my gender," complained one women engineer. "After ten years in the field, it is as sexist as when I first started. I'm tired of having to fight to be seen as an engineer. I wouldn't recommend this field to young women because I think they can get further in other fields that don't have the perception obstacle. Why fight if you can go somewhere better?"

Others shared similar sentiments: "I believe the only women who will continue in engineering with the current work environment are those who desperately love the work itself," one female respondent opined. "Why deal with others minimizing your accomplishments and with constant, blatant discrimination when you can work in a profession where women are more welcome? Why go through difficult engineering courses and social hostility to get paid what someone without an undergraduate education gets paid? Medicine has a large pay gap for women, but women are more socially accepted. My friends that switched to become doctors found it an easier thing, purely because of social reasons. It isn't supposed to be an easy career track, but compared to engineering it was easier for them. Life is short and love of work is not always enough to override all of the pitfalls of being a woman in engineering. But I'm still in it because I love the work."



Young girls need extra reassurance and role models, according to some women. "Young women need more encouragement than men to go into a field that's already dominated by men," said one respondent. "I'm happy to mentor the men who have made that choice already, but young women need to see that there's a place for them here, too."

Others homed in on what they saw as a special opportunity for women. "There are not enough women in the field, and a social stigma exists for girls to pursue math and science in school," said one engineer. "Girls are often not expected to do well in math and science, and a lot of them seem to subsequently believe that they should not even try. I think women should want to succeed for themselves despite pushback or stereotypes." These comments and others highlight the fact that, even in 2014, the engineering field still suffers from issues that have plagued it for decades. Our research may even serve as a cautionary note to men in the profession who are unaware of attitudes and behaviors that unfairly undermine the ability of women to succeed in the field, despite their technical competence.

The study also shows the importance of groups like IEEE Women In Engineering, which can shed light on gender issues in the profession and take a position of advocacy for women. Future studies may show some progress in a profession that—perhaps even more than most others—could theoretically recognize and reward empirically evident technical abilities without any regard whatsoever for gender.

