What employers want from new hires — and what they’re getting

BY CATHY MURPHY AND SHANON FAUERBACH, P.E.

You hired Joe right out of college. He’s a whiz on the computer and interprets data faster than anyone else in the office. But for some reason, he lacks a clear understanding of the different engineering disciplines’ functions. Then there’s Susie, another brand-new hire. She’s motivated and confident in her abilities, which you think is great. The only problem is that you know she expects to be promoted to project manager within a year. Why does such a bright engineer have such unrealistic job expectations?

In an effort to understand the characteristics that employers want in the young men and women they hire directly from college, researchers at Roger Williams University in Bristol, R.I., conducted a survey of professionals, which is described here. They selected CE News and five other publications to help in their study.

After the university compiled the results, Shanon Fauerbach, P.E., the CE News editor, chaired a roundtable, which was held at Roger Williams University on Nov. 10, 2000, to discuss the findings. As you can see from the description of the panel (below), professionals from a wide variety of experiences participated in this candid discussion about the quality of young engineers and ways to improve civil engineering education and training.

Results of the university’s survey

Civil and environmental engineers were surveyed via the subscriber database of CE News; general business employers were surveyed via subscribers to Inc., Fortune, and Human Resource Executive magazines; information technology employers were surveyed via subscribers to Information Week; and architects and designers were surveyed via subscribers to Architectural Record.

Surveys were mailed to randomly-selected subscribers of each magazine. In total, 1,589 usable responses were returned. The number of responses is fairly uniform across the different industries — 23 percent from CE News, 13 percent from Information Week (IWeek), 24 percent from Architectural Record, 14 percent from Fortune, 11 percent from Human Resource Executive, and 14 percent from Inc.

Most of the survey respondents are between the ages of 35 and 54. They are predominantly male; in fact, CE News’ respondents topped the charts with 98 percent male.

Most of the CE News respondents are employed by organizations with fewer than 99 employees, but 17 percent are self-employed and 19 percent are employed by organizations with more than 100 staff members. Most of the Architectural Record respondents are employed by small organizations as well — 25 percent of these respondents are self-employed, and 49

**THE DISCUSSION PANEL**

**Discussion chair:**

**Roundtable host:**
(IR) Igor Runge, P.H., Ph.D., dean, Roger Williams University’s School of Engineering, Bristol, R.I.

**Participant:**
(SC) Steven Clarke, president, Commonwealth Engineering & Consultants, Providence, R.I.

**Participant:**

**Participant:**
(LR) Louis Ragazzino, P.E., director of engineering, The Louis Berger Group, Inc., East Orange, N.J.

**Participant:**
(JW) John Walsh, program development engineer, South Carolina DOT, Columbia, S.C.

**Participant (via telephone):**
(BN) Bill Nash, quality assurance director, McCarthy Building Companies, Inc., St. Louis

**Participant (via telephone):**
(JS) Jack Strick, corporate recruiting manager, McCarthy Building Companies, Inc., St. Louis

“Instead of using the computer as a tool, it’s now being used as a crutch.”
percent are employed by organizations with fewer than 25 staff members.

By contrast, none of the IWeek respondents are self-employed, 40 percent are employed by organizations with over 100 employees, and 48 percent are employed by organizations with over 1,000 employees. Likewise, over half of the business magazines’ respondents work for employers who staff more than 100 employees, and only 10 percent are self-employed.

The survey results provide a wealth of information as to the difference between what employers expect of their young hires and what they’re getting. It’s also fascinating to compare employers who staff more than 100 employees, and only 10 percent are self-employed.

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In general, the university found that civil engineers were more critical of their new employees compared with respondents from other professions. Specifically, according to “Engineering Job Skills: Perceptions and Preferences,” the university’s summary of the data, civil engineers rated their new employees lower in the following areas: job-specific computer skills, oral and written communication skills, innovative thinking, the ability to self-start, and the ability to learn quickly. On the other hand, CE News respondents were more pleased than other respondents with their new employees’ abilities to analyze and interpret data and with their basic computer skills.

Survey respondents were asked to rank their newly-graduated employees from one to seven, one being the least descriptive of employees. Table 1 shows the respondents’ perceptions of strengths and weaknesses of new employees in comparison with other respondent groups.

CE News respondents were also asked to rank the attributes of their new hires in order of importance, one being most important. Table 2 shows the contrast between the characteristics employers would like to see in their new employees and their perception of the characteristics that actually describe them. One is the characteristic that best describes new employees; 16 is the characteristic that least describes new employees.

Participants ranked the most important skills they want new hires to possess in terms of written communication, oral communication, and teamwork. Table 3 shows the average responses (one means does not prepare students well, while seven means does prepare students well).

Following are excerpts from the discussion:

SF: From the data that came in, it is notable that there were no scores above a six for any of the skills that new hires have,
The expectation that I think employers have for students is changing rapidly right now. … Employers are looking for different things. New opportunities may also indicate that students need to be educated in different areas. That may be one reason why we don’t see the high scores.

JW: I agree that we’ve gotten very specialized and compartmentalized. … It’s really gotten to a point where it’s very difficult to have one engineer with the expertise to take [a project] from beginning to end. … It’s unrealistic to expect someone just coming out of college would be one of those individuals.

RE: Even if they could do it by themselves, I’m not sure they would have the time to do it. … The project delivery expectations of clients … are shrinking … [and] there’s more knowledge in all the subfields of civil engineering. In many cases, we’re still trying to figure out exactly what it is we can do to solve the problems. … The regulations seem to be ahead of the curve.

SF: So, you have experienced engineers who are lacking somewhat of a direction because we are going into new territory, and it’s hard to expect young engineers [to be ahead of that curve].

The group went into a discussion about the characteristics that make the difference in the interview process of new engineers. Several of the participants cited motivation as important. Other characteristics discussed include goals for the future, the ability to accept responsibility, communication skills, and working well with others.

### TABLE 3: Desired Characteristics of New Hires

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>CE News</th>
<th>Arch. Record</th>
<th>IWeek</th>
<th>Business magazines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear expression of ideas</td>
<td>6.38</td>
<td>6.43</td>
<td>6.38</td>
<td>6.29</td>
</tr>
<tr>
<td>Well-reasoned</td>
<td>6.05</td>
<td>6.08</td>
<td>5.93</td>
<td>6.02</td>
</tr>
<tr>
<td>Short and to the point</td>
<td>5.45</td>
<td>5.65</td>
<td>5.42</td>
<td>5.47</td>
</tr>
<tr>
<td>Grammar, spelling, &amp; punctuation</td>
<td>5.36</td>
<td>5.50</td>
<td>5.06</td>
<td>5.48</td>
</tr>
<tr>
<td>Convincing</td>
<td>5.28</td>
<td>5.29</td>
<td>5.21</td>
<td>5.37</td>
</tr>
<tr>
<td>Talk one—too—one with clients</td>
<td>5.80</td>
<td>5.14</td>
<td>5.48</td>
<td>6.09</td>
</tr>
<tr>
<td>Talk one—too—one with employees</td>
<td>5.75</td>
<td>5.85</td>
<td>6.00</td>
<td>5.76</td>
</tr>
<tr>
<td>Speak before a group of clients</td>
<td>4.67</td>
<td>4.54</td>
<td>4.51</td>
<td>5.15</td>
</tr>
<tr>
<td>Speak before a group of empl.</td>
<td>4.28</td>
<td>4.29</td>
<td>4.39</td>
<td>4.56</td>
</tr>
<tr>
<td>Upholds group responsibilities</td>
<td>6.15</td>
<td>6.40</td>
<td>6.29</td>
<td>6.33</td>
</tr>
<tr>
<td>Respects the opinions of others</td>
<td>5.95</td>
<td>6.17</td>
<td>6.24</td>
<td>6.13</td>
</tr>
<tr>
<td>Keeps an open mind</td>
<td>5.83</td>
<td>6.12</td>
<td>5.96</td>
<td>5.96</td>
</tr>
<tr>
<td>Contributes useful ideas</td>
<td>5.76</td>
<td>6.02</td>
<td>5.73</td>
<td>5.89</td>
</tr>
<tr>
<td>Questions assumptions</td>
<td>5.57</td>
<td>5.65</td>
<td>5.50</td>
<td>5.53</td>
</tr>
<tr>
<td>Maintains a degree of objectivity</td>
<td>5.50</td>
<td>5.68</td>
<td>5.72</td>
<td>5.63</td>
</tr>
<tr>
<td>Commits to the groups decisions</td>
<td>5.09</td>
<td>5.31</td>
<td>5.54</td>
<td>5.35</td>
</tr>
</tbody>
</table>

Seven equals strongly desired.

### TABLE 4: Value of Student Experiences

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>CE News</th>
<th>Arch. Record</th>
<th>IWeek</th>
<th>Business magazines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profession—related work</td>
<td>6.34</td>
<td>6.47</td>
<td>6.35</td>
<td>6.15</td>
</tr>
<tr>
<td>Internships</td>
<td>5.78</td>
<td>6.05</td>
<td>6.00</td>
<td>5.89</td>
</tr>
<tr>
<td>Classes in student’s major</td>
<td>5.54</td>
<td>5.28</td>
<td>5.16</td>
<td>4.99</td>
</tr>
<tr>
<td>Independent study / research</td>
<td>4.73</td>
<td>4.82</td>
<td>5.08</td>
<td>4.88</td>
</tr>
<tr>
<td>Extracurricular activities</td>
<td>4.13</td>
<td>4.20</td>
<td>4.31</td>
<td>4.61</td>
</tr>
<tr>
<td>Non—profession—related work</td>
<td>4.11</td>
<td>4.37</td>
<td>4.59</td>
<td>4.76</td>
</tr>
</tbody>
</table>

One means does not prepare students well; seven means does prepare students well.
LR: One of the areas that I note on this
strength and weaknesses table is that
computer skills rank the highest … and yet as
you look at the low scores, the written com-
munication skills, [and] the knowledge of the
profession are the lowest ranked. … Twenty
years ago, you could just go and build some-
thing. Today it’s not that easy, and between
environmental regulations and feasibility stud-
ies, there’s a greater need for written skills and
oral communication skills of the entry-level
engineer. … [Graduates have] been weaned on
computers now, and they’re all more than
computer competent.

SC: That’s become a major problem,
because instead of using the computer as a
tool, it’s now being used as a crutch. …
[Designers] should have an idea, before they
enter into the computer what that beam size
and pipe size should look like, and they don’t.
… The problem-solving skills are the things we
should be stressing in the universities. The
computer shouldn’t be a skill, but a tool.

IR: I’ve surveyed students coming out of
school and just a year after they’ve got-
ten their first job. Often, they say something
they didn’t get right out of school is
this so-called “common sense.” Does [this
solution] make sense? Is it logical? Is it reason-
able? … Perhaps they’ve relied too much [on
computers].

SC: But common sense isn’t something
you can teach. … Maybe what’s hap-
pened in recent years is that people more in-
tune with that [way] of thinking haven’t been
going into civil engineering.

BN: That’s an indictment … of all us
individual professionals. We don’t spend
efficient time [going] into high schools, and we
don’t get down to grade schools. … People
don’t understand what civil engineers do. …
We have … an identity crisis. … We don’t
broadcast, vocally, what our needs are and
what we do. If we don’t do that in the market,
then no one’s going to be interested in going
into those things as professionals.

SF: There’s a flip side to all of this too,
though. … The personality of young
engineers … is different than it used to be. They
would be disgruntled in a position if all they
did was sit at a CAD [station] for a year and a
half. … Maybe the industry is not keeping pace
with the changing personality of the new
employee.

SC: Oh, yeah. They all know more than
you do!

RE: We need to … teach … prospective
civil engineers that civil engineering is,
by its nature, a profession that relies on educa-
tion and experience. So, when you initially go
out into the work force, you’re [still]
moving a big part of your education in the profession.

IR: Perhaps the pace of society today is
so rapid, so quick that, by necessity,
many of the employers right now are looking for
somebody fresh out of school who can do
everything. … It seems like most everybody
agrees that the first-time student who’s
employed needs some time to coalesce, needs
some time to understand some of the com-
mon-sense applications, practical matters also
of the business, and that’s very difficult to do in
four years. It’s a paradox almost. You try to get
the students in and out in four years because
education is very expensive, and yet, when they
leave, the employers are expecting them to
come onboard immediately, because they can’t
wait around; there’s so much competition out
there. … We throw them onto the CAD station
and say, “Here. Design this.” And they’ve never
seen plans or specs.

SC: What I think might be happening,
too, is that students are so specialized in
school that they don’t have the ability to have
class common sense about general engineering.

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SF: There are so many professions where
you can get out and go full guns and not
have to wait around for four years of experience
to really make a difference, and it’s a hard thing
for us to alter how the industry works to better
meet the needs of the “new” employee, but
maybe we need to. … Young engineers get frus-
trated that they’re not being given more oppor-
tunities.

SC: Why do we have to change as an
industry? [We could say to] universities,
“Why not educate the young engineers … that
this is a building process of a profession, and
this is what you should be expecting?” … Why

“Perhaps the pace of society today is so rapid that, by necessity, many employers look for somebody fresh out of school who can do everything.”
do I, as an employer [have to] say, “I’m going to send you out to deal with a client.”?

SF: Because maybe we’ll lose [those with] the best potential.

JS: What we’re finding is that … there are universities out there that have changed over the last five years and are creating the type of candidates that we want when they walk out the door. They have both the technical experiences and the practical experiences, and they get both from the classroom and from things like co-op programs and intern programs during the summer. When they walk off the college campuses and into our office, they’re effective immediately. Then there are others who need additional training, and we spend a lot of money training our engineers when they first come in the door. We have formal programs. We have informal programs. We have self-taught programs. So we do whatever it takes to get [new engineers] to effectiveness very quickly.

IR: The new criteria, EC 2000 [ABET’s new requirement that mandates accredited engineering programs to demonstrate that graduates have certain nontechnical knowledge and skills], seems to address all of those issues … the soft skills … that will make you fit better in the workplace, in addition to the technical skills that you’re expected to know.

BN: I hate to [believe] that [educators] have to wait for some accreditation agency to [tell them what] is a minimum requirement that [they] have to do.

IR: You’re right, but unfortunately … we have people in education who have been around for many, many years, who are, if you will, out of touch with the industry, because we do get stuck in textbooks too often. We need to recognize that we have to change, and it’s awfully difficult to make that change. You know, universities across the country, right now, are being challenged. … Most programs are still four-year programs, and we’re being challenged to put more and more into these programs yet reduce the credit hours so the students get in and out in four years, because education is very expensive. And at the same time, [the graduates have] to be effective from day one at [their jobs]. That’s a big challenge, and we welcome anything that we can do … to get the students better prepared — not necessarily train them, but educate them. ***

SF: Maybe we need to incorporate more legal issues into [civil engineering] classes and more professional responsibility discussion, so that there is more awareness in the young employee of the level of commitment [he or she is] making to the public.

RE: There definitely needs to be some legal training and business training. …

In storm water management, a lot of what we do is because of drainage law … many engineers can design a detention pond [well], but they don’t know why they’re doing it. … That’s disturbing to me — the purpose of it is to protect the public, and they don’t know how.

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IR: Would it be correct to say, at this point, that a four-year program in civil engineering, may not be enough?

SC: Oh, I agree with you.

IR: Maybe [today] there’s more reason … that the first level at which you’d [consider yourself an engineer] would be at the master’s level.

BN: There aren’t enough engineers in any of the disciplines. … If you go to a six-year program, where a master’s is the minimum degree, the only thing that’s going to do is decrease the number of [students].

SC: Do we really have a long-term shortage of civil engineers?

BN: In the marketplace we’re sitting in today, there’s not enough people.

SC: Right, but are we on the tail swing of what happened three to four years ago, where during the middle of the peak boom of economic times, the government passed the largest public works bill for highways into law, and we just got one peak flow on top of another? Whereas, in the past, the highway bills or the public works bills have always been used to bail us out of a recession, instead it got signed into law at the exact same time private investing was booming. So, are we only in a temporary shortage or long-term?

LR: I think the engineering profession is competing for those students with the good math skills with other industries, like software development. Now, all of a sudden a student with strong math skills has a range of different areas to go into, as opposed to just the engineering curriculums.

SC: Keep in mind, we haven’t done anything to sell the profession.

JW: We don’t blow our own horn.

IR: Not nearly enough.

LR: The NSPE [National Society of Professional Engineers] is coming out with another image campaign. … [They] question a man on the street, “What is an engineer? What do you consider an engineer?” The overwhelming response was, “Old, white men.” You know, some of us in the room may not disagree with that, but that’s not the perception that we want the public to have of an engineer. We want the public to perceive us as the doctor who had to … study for his doctorate, or the lawyer who had to take his bar exam.

SF: And they’ve all earned master’s degrees.

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The participants pointed out that creativity did not rank highly with the CE News respondents. Edinger, who reviews designs of water quality facilities for land development projects for a large suburban-Atlanta county, shared his disappointment in the level of innovation shown by civil engineers in his region. Nash pointed out that the only way to keep up with today’s fast-track schedules and demand for cost-effectiveness is to come up with creative engineering solutions.

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SF: Let’s talk about some of the skills needed to be a manager. Should they be reinforced at the college level, or should they be skills that are reinforced in programs like McCarthy has, where you’re trained … once you’re out in the work force?

LR: Good written and oral skills [may not have been] needed years ago, but today … I don’t think we have that luxury anymore.

RE: I think you have to have good writing and oral communication skills. …

Recently, in fact, NSPE [published] an article in Engineering Times on people who are managing engineering organizations [who] are not engineers. … Many of these positions are going to people who have good management and political skills. … The directors are ultimately making the controversial decisions, so it’s essential that engineers have good manage-
ment or good communications skills so they can relate to their superior — whether they’re the director or whether the organization is being headed up by someone who’s not an engineer. … As engineers, we need to figure out a way to communicate these complex issues — engineering issues — in terms that nonengineers can understand.

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SF: What are some of the ways we could improve [writing skills through] education?

RE: I think there has to be an emphasis on the humanities. It needs to be re-emphasized at the college level. … A lot of those humanity classes were relegated to the trash heap, and they need to be brought back. People need to learn how to write.

IR: Now we’ve talked about a number of issues, and I’m going to put my academic hat on again. We’ve talked about [what] we need to incorporate perhaps more in the education, so that students [who graduate are] more prepared for a job, and that includes management skills, written skills, oral communications skills, ethics, technical skills, more broad-based knowledge, more emphasis on humanities, and it goes on. What can we do as an institution, as a university, as a program? Where can we cut to incorporate more of the positive needs? Is there anything we’re … too good at? How can we get more things into the “box” without increasing the box?

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The group brainstormed and came up with the idea of mandatory, zero-credit, professional seminars offered once or twice a month. The seminars could be taught by local business people, government agencies, or college professors, but preferably people working in the “real” world. The group also suggested using the Internet as a medium for students to interface with professionals.

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SF: [Surveying] has been taken out of the box at many universities. … [which means that the students are not qualified to get what would traditionally be a popular surveying internship]. Do you think that’s a mistake?

RE: I do think that’s a mistake. My father was a land surveyor, and I worked as a rod man and as a transit man when I was in high school and when I was in college. The experience that you gain in surveying … is invaluable.

LR: Recently, I worked with] an environmental engineer with a master’s degree. … When we were doing some plans and I asked her to lay out a base line, she didn’t understand the concept of it. The curricu-

lum for environmental engineering, because it was so focused, had eliminated a lot of the basic civil engineering courses that we all took.

SC: [However,] when you learned the basic surveying principles, you would go out there and you would learn using a rod and a chain. … You could physically figure out what was going on.

IR: It’s been removed from many programs, partly because of new accreditation requirements, and often you don’t get much credit for having surveying in your program. … Many programs are … thinking more and more about incorporating it back into the program [because] that’s what many students do on their first job. … Maybe we have to rethink education, re-engineer education. Why do we need specific math courses, physics courses, science courses? Can we not incorporate these into just-in-time learning?

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SC: Why do we keep worrying about squeezing everything into this box, instead of saying, “This box may have to get bigger.”?

SF: If you’re talking about institutions that charge $25,000 … per year, most families are not able to fully fund [a student’s education]. … We’re expanding a box, and it’s really just costing more money, and maybe dissuading students from doing it.

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Several participants said the most successful new hires have some experience in the industry. This led to a discussion about skills that the industry should offer to interns. Eddinger said the sense of working in a project environment is most important. Raguzzino felt interns should experience a mix of office time and field time. Fauerbach cited field trips directly linked to college course work as important to her development as a young engineer. The group felt the industry should play a role in these trips, offering their own project sites as potential locations to visit. Raguzzino said that professors could also invite practicing civil engineers into the classroom to discuss projects they’d designed. Clarke suggested a seminar setting for the discussions rather than a classroom setting, perhaps coordinated through ASCE student chapters.

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JW: I was surprised that [teamwork] was [ranked] … where it was. … I did notice that the … respondents … [work] largely in firms that were of the smaller size. Seventeen percent of them were self-employed. In an organization as large as mine — we have 5,300 people, and what we do is so diverse — you have to have teamwork to succeed, and not just a traditional design team. Designers used to design [a project] and throw it over the fence to the construction guys. We’re trying to knock down that imaginary barrier now to get teamwork in between construction and design.

BN: Before a project is completely designed, our owners are actually trying a collaborative effort [involving the] architect.
the professional engineers, as well as the contractor … to try and price things and realistically obtain schedules that actually give them the delivery of the building or the structure or process or manufacturing facility.

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SF: Another area I wanted to touch on was job-specific computer skills. In the tally of the CE News participants’ perceptions, they received a … mean score of 4.53; four is considered neutral. So, we can question whether they thought that was a neutrally-needed skill or they only thought that students had a mid-range ability to use job-specific computers and software. … Do you all think that [job specific skills] … should be more a part of their education or something that should be done in training once they’re on the job?

JW: As long as individuals have the basic understanding of what is needed, the software … and the computer skills … [are] moving so fast that if an employee stays with one company any period of time, they’re going to be doing some training.

LR: It would be difficult to implement something into academia, where you taught a student a specific software. … The one common thread, though, is some type of a CAD software.

RE: I would agree with CAD. … Academia needs to be really careful about how they use computers in the construction process, because, particularly with hydrology software and hydraulics, there’s a tendency to rely too much on what the computer says. … It’s more important, in an academic setting, to learn the methodology.

SF: Is it useful to … learn some [industry-specific] computer skills?

RE: It’s useful. … But it needs to be emphasized that it’s a tool and not the engineer.

SC: Why can’t you use, in academics, the computer software … as an independent check of yourself? … You [could] require the student to actually go through the hand calculations. … Keep in mind, the vast majority of these engineering programs are not designed by engineers. So what happens is, you run your TR55, you take that down as gospel, you put your stamp on it and send it on its way. Something happens years down the road, “Oh, we had a problem in that computer model, but it’s your responsibility.”

JW: I see a trend as far as the CAD: the engineers are not doing the drafting. They’re hiring what we call super-techs, and the engineer checks what they do.

LR: We don’t want a graduate engineer … sitting down at a CAD station to crank out calculations.

SC: CAD, on its own, has become a profession.

LR: We can’t expect academia to teach a student how a plan sheet should look. That’s something they experience in the workplace. … The different clients have different requirements for how they want things to look.

BN: Where things are going to go with computer-aided design and drafting, there’s going to be complete 3-D models, and those models are what we’re going to build from. … You’re going to be able to do your construction, concrete forms; all those kind of things are going to come from that initial, fully-designed, 3-D model that’s provided by the design team.

LR: Are you finding, Bill, that even your as-builts and some of your field notes are being developed real time?

BN: Owners mandate that it be done [in] contractual requirements. … [3-D models] enhance everybody’s speed because you’re not dealing with a whole bunch of different sheets of paper. … It isn’t going to be that long before it’s more in place in daily use.

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The last topic discussed was diversity within the profession. Several people saw a trend toward a greater percentage of female civil engineers than in the past, especially in environmental engineering.

Clarke said his firm employs about 25 percent women; however, none of them are full-time — they’ve all “made their own deal” to work different schedules. Clarke said that it’s important to be more adaptable to women, especially those with children, to retain them in the industry. Several participants said they see a greater number of foreign engineers today than in the past.

Nash said that McCarthy looks for minorities and females to hire and that the company tries to encourage minorities to enter the marketplace with internships from a number of schools; the firm has also discussed the sponsoring of minority scholarships.

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We hope that this excerpt from our roundtable serves as a catalyst to improve the civil engineering profession. ♦