



Sloan Career Cornerstone Center

Profiles of Civil Engineers



Mark C. Reuss, E.I.T.

**Senior Construction Engineer
Bechtel Group, Inc.
Gaithersburg, MD**

Education:

B.S., Civil Engineering, Tufts University
B.A., German, Tufts University
M.S., Construction Management, Stanford University

Job Description:

"As a Senior Construction Engineer, I am responsible for integrating construction needs and knowledge into drawing, specifications, equipment purchase orders, subcontracts, and project schedules."

Advice to Students:

"Civil engineering students should be aware that math and science are essential for engineering, but reading the newspaper and studying history, English, foreign languages, etc. are equally as important. Automation plays a major role in engineering projects so be sure to take plenty of software courses. Studying abroad is one way to investigate how interested you are in working internationally."

Video Transcript 1:

"To be an international participant or someone who works on projects in different parts of the world takes a lot more skills than just designing or working on construction in one location because all of the local factors obviously are different wherever you are and wherever you go. The laws that govern the construction industry, the relationship with the local government, the site conditions, what type of soil there is, all of these things have to be relearned and you have to have the opportunity to be able to learn those things. You also have to be willing to learn a foreign language if your going to be directly active in it. And to move and live just about anywhere and have an open mind to understand that the way you execute projects in one place can be very different from the way you execute them in another."

Video Transcript 2:

"I definitely would recommend it if you can get work in your off periods between semesters or years of school that relates to what you would like to do; it can not only improve your education but help you decide exactly what it is that you want to do after you graduate. Which is a tough decision for everybody."

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Video Transcript 3:

"Try to get diverse, try to learn lots of different things besides just your engineering. Yes, you needed to learn the problem solving but try to get broader and you'll find that your career is a lot more rewarding, at least it has been for me."

Video Transcript 4:

"Graduate School is a stepping stone. If you want to take the next step that you need to get to the next level, some business education, some management education is definitely needed."

Interview:

Ruess: What I like most about being a civil engineer is the satisfaction of building something that improves the quality of life, that is tangible and represents a reach achievement. Anyone looking for a job has to get comfortable with the idea of selling one's strengths. Whether it is a deep specialization or a broad background, you will need to demonstrate how you will help an employer. Marketing includes both a profound knowledge of the product (yourself) and the buyer (the employer). When you find a match between your interests and their needs, the chances of success are high.

Studying abroad is one way to investigate how interested you are in working internationally. Before you book a flight, here are some questions you should think through:

- What do I hope to gain?
- Am I willing and able to adapt to new situations and environments?
- Will the program delay completing my degree?
- Will I be able to transfer credits earned abroad?
- Do I need a visa or other paperwork?
- What are the financial implications?
- Is this program well-recognized in the industry and academia?
- What happens if I want to come home early?

If you are thinking of working abroad, the considerations are similar, plus you should get an agreement from the employer covering any concerns you may have.

Q: Tell me about your background and why you decided to study civil engineering.

Ruess: My background, well I grew up in New York. My parents were immigrants from Germany and they settled in Canada and then moved to New York. And I went to school there, of course, until I was 18 and then picked Tufts University to study civil engineering. Why did I decide to study civil engineering? That's always a tough questions but I knew I wanted to study engineering because of the, the math and science aspects of it. I really enjoyed math and science and wanted to apply those things. So I knew it was engineering but I wasn't really sure which field. And it took some time to really pick it but I selected it based on what I could see that civil engineering did in their work. I liked the aspect of civil engineering that you're outdoors. They are very public projects; they are very common. And there seems to be a lot of interaction with people. I didn't want to be exclusively a designer and I felt that I could use civil engineering as a good background to find a way into careers that -- or into a career that wasn't exclusively design oriented.

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Q: How about the course work and your course of study as an undergraduate? Was it rigorous? Did you feel that you could choose specialties?

Ruess: The course of study for an undergrad or graduate engineer today is rigorous. At least at Tufts where I went, you have to do more course work in the same amount of time as a liberal arts major. So much so that we used to tease them and call them the leisure arts majors. But yeah, it's, it's rigorous and depending on just how well you want to do, you can spend as much time on it as you like. This is one of the things that you learn when you go to college, that you just can't do everything the way you could in high school. Once you learn that lesson, it's pretty key to your survival. But at any rate, it took about a year for me to figure that out. And about a year also to decide on civil engineering. I wavered between chemical and mechanical and ended up deciding on civil.

Q: And talk a little bit about your year abroad or your study abroad. What drove you to do that?

Ruess: When I started studying engineering, I realized that because there are so many courses required and four years to do it, those four years sound like a long time but they're really not. I wanted to do more than just engineering, get to take some of these other fun courses that everybody else was taking except for us because we didn't have as many electives. So I thought the best way to do that would be to get a double degree, get a B.A. and then select -- I had a strong interest in German because of my background -- selected a major that I really liked and then be able to take all those electives. So, so that's what I did. It took some summer studies and it allowed me to study abroad for a semester which was a good marriage between the two. I studied in the southern part of Germany, nice old country town and a lot of old theologians and farmers studied there, so it was neat, nice setting.

Q: Were you involved with any professional societies or ASCE or anything like that as an undergraduate, or any kind of engineering societies at all?

Ruess: I was very involved in the ASCE as an undergraduate. I ended up in the board. I served as different roles, secretary and vice president and ultimately president of the, of the Society and really enjoyed the projects. In fact, when I was a senior I started and initiated, over the objections of many, a playground construction project in a town close to the university that had nothing but an asphalt lot and was in a grade school. And we raised the money, purchased all the equipment, did all the site work and installed all the equipment in one weekend. And it was students from the school, it was parents of students from that school that we were doing it for, this grammar school, and even I had some friends come from out of town who helped. It was a lot of fun. It was a great project. And I've done actually four other playgrounds. It's something I just like to do on the side 'cause it's really satisfying to do stuff with kids.

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Q: How well do you think that your undergraduate experience ... for life in the real world, both in terms of -- both the technical matter that you were taught and also the way that it was taught to you. Did you learn how to work in teams because that's the way that real work happens or did you feel that it was mostly you by yourself?

Ruess: Engineering education today has two major components to it. One, there's a lot of technical part that you just simply have to learn. And it's not the most glamorous of things but you absolutely need that foundation, you have to know how to calculate roads, you have to understand mechanical systems, you have to know about materials and go through all of that in order to provide the foundation. The other part of it is that schools have begun to realize that a lot of engineers in practice didn't have all the skills that they needed in terms of communication skills, presentation skills, dealing with the public, appreciating other factors because just the box of the calculations and how many pounds are going to be on this beam. You need to know that but also what are the environmental ramifications of galvanizing that piece of steel and is there a way that might be more environmentally friendly? What is the impact of trucking this beam through this town going to be? Do I have to find another route? All of the peripheral issues really aren't on the periphery any more, they are just as important and sometimes more important than the basics, the essence of engineering design and construction. So like I said, universities have realized this and they are starting to emphasize these things more. And subjects that were not previously required subjects like English and composition were electives and they're even talking about going to a five year program because it's difficult to do those two things in four years. It's really asking a lot of a student. But if you do do that and you complete the studies of both the technical side and the soft side or the peripherals, then you end up with some skills that are very valuable to society. It's a good combination to have.

Q: How about coops or internships? Did you have any of those experiences while you were in school?

Ruess: I worked summer times for a company that provided a scholarship, partial, for my undergraduate education. And I actually wasn't in civil engineering specifically, it was in a manufacturing facility. And at that time, this country was still building planes, military planes, and that's what I was doing. I started in subassembly and then ended up doing some design and composite materials and some failure analyzes, specific problem solving, primarily structural engineering as it applies to aerospace. And did that every summer and they'll pay for tuition and got some experience. And the assignment was close to my home so that was -- it was a good thing to do. I definitely would recommend it if you can get work in your off periods between semesters or years of school that relates to what you would like to do, it can not only improve your education but help you decide exactly what it is that you want to do after you graduate. Which is a tough decision for everybody.

Q: Okay, so right after grad school, talk about how you were recruited and you came here and what you did from then to now.

Ruess: At the time when I graduated from Stanford for graduate school, the job market was pretty tight. And Bechtel came to campus, interviewed 150 people, invited 45 to the home office for a second interview of which I was one, and hired two, of which I was not one. So I asked to keep my name in the hopper so to say and they did and the project opportunity came

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up and I got a call. I came for the interview to this facility and ended up getting hired here and that was in 1991 so that was my first assignment with Bechtel was right here at the Rodeo Refinery which is about 40 miles from San Francisco, which I liked a lot. A place to play and a place to work so that worked out okay. I was here for about a year and things changed, we didn't have as much work here as we did when I initially started. So I looked around for other assignments. And the power project came up all the way across the country in a very different climate and a very different place called Syracuse, New York. And it was 100 megawatts cogen plant, grassroots construction that was being constructed and about a one and a half year schedule was the duration of the construction portion. So they had an opening to work on civil architectural aspects of that construction project and I took it. So I picked up, moved to Syracuse and worked there for about a year and a half. And in the construction business you continually work yourself out of a job, the better job you do, the earlier you have to look for the next one. So when that one was over, I had to go through that process again and came to, back to the west coast to work at a refinery, the Chevron refinery which is just down the freeway from here about ten miles. And worked there as the project civil engineer for another grassroots plant. That was a good sized plant, it was about a \$250 million plant and there was quite a bit of excavation and foundation and steel work. So a hard core, traditional civil engineering assignment and really the only one that I've had, ironically, since graduating as a civil engineer. You don't always do exactly what you study, only you may apply portions of it. But a lot of people find that even when you talk to people in the business world. The education that you get sometimes is more of a tool than precisely the career that you end up pursuing and the winds of business blow you in different directions. So after the Chevron project, again I had to look for another job. There was an opening in another refinery, another grassroots project for reformulated fuels construction. Now reformulated fuel was an environmentally mandated project that all refineries in California were required to undertake in order to produce cleaner burning gasoline. So all the facilities in this area were doing it and Bechtel did quite a bit of work at several of them and this was one of the ones that we were working at. And I worked for the first six months in the office with the engineering and procurement groups as a constructability coordinator, construction coordinator and my primary responsibility was to inject construction knowledge into the design and procurement processes, from a schedule standpoint, from a material standpoint. If I lay out all of the factors that we now know have a tremendous influence on construction costs, scheduling and quality and yet without the construction presence in the past at those stages of the project, those considerations were not taken. So this is something that's relatively new concept in construction, probably in the last ten years it has taken to be a popular one. And I was real excited to do it because it was my first contact with home office personnel directly. Obviously in prior projects, telephone conversations are very common but to be working together with those other groups allows you to understand the different aspects of an EPC or engineering procurement construction project. So that was six months and then once that was completed, they kicked me out of the office. They said get this construction guy out of here, put him to work, we need to make some money. So I worked on the field portion of the job at that point, constructing foundations and installing towers, pipe, equipment, everything that is required for a refinery facility. I did that for about another year and then another opportunity came up.

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Q: How do you deal with moving around with this job?

Ruess: It's very difficult. And families do do it and some families turn out very well but there are a lot of problems associated with it. There can be. Not everybody has problems but kids particularly when they reach a certain age, they want to have their friends. And when they're in high school, they don't want to move around two or three times over the course of those four years. So I have some doubts about how long I'm going to be able to do this because I would like to have a family at some point and I don't know for sure that the two can mix very well. It has been done but I have also heard of folks who maybe would have done things a little bit differently if they had to do it over again. So I have to factor that into the whole picture. And hopefully things will turn out, you never know what's going to happen in ten years. If you think you can plan it, think again. So just keep an open mind and just continue to follow what seems to be the sensible way. But where were we?

Q: What did you do after working at the Tasco Refinery?

Ruess: After working at the Tasco Refinery for about a year, which is the average duration of a project assignment as a construction engineer -- at least it has been for me -- I came to another refinery, the refinery that I started at in 1991, so I came full circle here in Rodeo working in a totally different capacity though from the first time I was here. The first time that I was here I was working as a field engineer. And as a field engineer you work either with direct hire labor, construction crafts, and interpreting drawings and reviewing work that is completed for adherence to drawings and specifications. This time, what I did and what I had been doing is working as a scheduler, planner, cost engineer, what the industry calls project control. And project controls is a completely different animal because he focuses on numbers and performance and schedule bar charts. Here at this facility the position is more than that because they combine it with a field coordinator role, which is really my favorite part of the job. Because I like to work with the construction crafts, the foreman, and explaining them what the priorities are, how things should be done, what requirements are placed upon the different activities that they do from an environmental standpoint or specifics to the facility, those kinds of things. That's the most fun because you get to interact with a lot of different people. But the other part of the job is developing the plan, developing a schedule based on all the activities that had to take place, in this case in a very short period of time. And the reason that it's a short period of time is that the projects here are maintenance turnarounds. That's the contract we're working on is maintenance turnarounds. And we do have other smaller construction projects but primarily it is maintenance turnaround. And what you do in a maintenance turnaround is you open everything up, you clean it, you service it, you replace those parts of equipment that need to be replaced and you flip the switch and hope it all starts back up again, okay? And the durations are very short because plants are very valuable. One of the plants makes \$250,000 a day and you certainly wouldn't want to be responsible for a day's schedule but on the contrary you try to find ways to save time wherever you can. It makes for a very fast paced, frenetic environment where you need everything today. So that's what I've been working on and here a year, ends up being a series of turnarounds in different plants separated by planning periods in between. So that's what I've done here and it's actually been a long assignment of about two years, coming up on three years. So I'm overdue to move on to another assignment.

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Q: Where are you going next?

Ruess: I just recently got transferred to K&A, senior construction engineer. That was a big day. And I'm going to work in a place called Gaithersburg, Maryland which is just outside of Washington, D.C. We have an office there. It is one of the major offices that Bechtel has and the power portion of our company is centered there. And it's also -- has a reputation of being one of the forerunners in automation and technology within the company. I'm very excited about going there to the office. I'm going to be working on a couple of different things there. First I'm going to work on proposals, beating the street a little bit, putting together proposals for clients and potential clients and hopefully presenting them. I'm not exactly sure what I'm going to be doing but that's part of the excitement and the adventure of it, just show up and see what they need. And I said there were two parts. The other part of the job, which will become my primary job at some point, probably after about six months, is constructability.

Q: What does that involve?

Ruess: The new job is going to start in proposal writing, the presentation, and change to a position in the constructability hit team in the Gaithersburg office. This is a group of individuals who review potential projects, new projects, for ways to inject construction knowledge into the design and procurement phases of the project in order to make the project cheaper to build, cheaper to build, less expensive and save schedule time. Some of the concepts that come into play are modularization, prefabrication, site layout, selection of vendors, dimensional components. As an example, use signs that are available commonly in building construction materials. So all the issues that allow a project to be built more easily. And in the past, they haven't been considered as much as they are today. And then this team is specifically responsible for making sure that that happens. I'm going to join that team and I'm really excited about it because the group is a legendary group. Maybe not legendary but at least it's known throughout the company. So I'm not sure how long I'll be there. It'll probably be the usual one to two years and then when something comes up, another project, another opportunity, I'll move on and hopefully there will be one. Usually there is and your job security is your performance. And if you're a good performer, you have job security because they'll always find a place to utilize you somewhere. You have to be flexible and it may not be exactly in the location that you want to work but projects are just that way. They don't build all of the projects that are happening at one time in the same location which happens to be exactly where you want to live. So when you choose a career as a construction engineer or you at least choose to work for a time as a construction engineer, you accept in a large company at least the fact that you will have to move around, around the country and around the world potentially. So mid-sized construction companies can be local and, of course, small companies are local. And if that's what you choose, to stay in a region and work with a smaller or a mid-sized company, then that's a little easier to stay in one region. You may have a little longer commutes, that varies from year to year, but that makes it more interesting. Some people enjoy that. They don't like to go to the same office every day, to the same desk for 40 years and this is a job that allows you to have some variety in your life.

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Q: How is it when you move?

Ruess: When you move for the company, the company is responsible for paying the expenses associated with that move. and by and large, they do. And you're not going to -- the moving program is set up so that you don't have to pay to move and you don't end up profiting from the move. And that's the way it should be. Now the little things like oh gosh, you have to find a new doctor now and a new hardware store, those are inconveniences that you just have to live with. And they take extra time but it's part of the package. And I've been satisfied with the way my moves have gone. So it becomes routine. After you do it a couple of times you know what to expect and what's expected of you and as long as you're willing to look at the new parts of your location where you're going to be, go out and find the things you need to find, it works out fine.

Q: What do you do on a typical day here?

Ruess: In my work as a turnaround planner, my typical day really is a typical two days. Because there's a typical day for outside of turnaround periods and there's a typical day for during turnaround periods. A typical day for outside of turnaround periods is planning projects, looking at jobs, looking at equipment, talking with different foreman in different disciplines to get their input to the basis of the schedule, ensuring that long lead time items get purchased by working with procurement people, those kinds of activities. So I would spend about half the time in the plant reviewing equipment, meeting with people, and about half the time using that information to develop the plan at my computer and use various scheduling tools to capture that information. And your standard software programs, spreadsheets and word processing and electronic mail, which we all live and thrive on now. So that's a typical day outside of the turnaround period. Now within the turnaround period, the day is much different. The day is coming to work early, preparing for what we have to do that day, because I have to know before everybody else what the plan is for the day so that I can express and communicate to them what the priorities are, give them the direction they need to go forth and tackle the job of the day. The days are long, hard, fast paced, because of the revenue stream that these plants produce. So it can be anywhere from 12 to 16 hours a day during a turnaround which is a hard day. But the good side is it's not forever. If you do your job, the turnaround comes to an end and the plant starts back up again. So they vary in duration from two days to about six weeks depending on the size of the plant and how much work needs to be done. So it's much more of a field intensive day during the turnaround, interacting with people and monitoring progress. And then a portion of the day, a small portion of the day, is spent in the office updating the tools so that I can produce a schedule for the next day, can produce cost reports that tell how we're doing against the plan, schedule reports and say how we're doing against the time line and present those to management. So there's a coordination component, there's a communications component through everything and there is a report production component to it. And the turnaround period most of the time is focused on coordination and leadership of the crafts in the field and the units. So that's the typical and the atypical day.

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Q: Well, what do you like to do outside the office that balances work?

Ruess: Hobbies. Everybody has to have hobbies. Now, just as there's a typical day of work outside of the busy period and a typical day of work inside the busy period, my personal life has to adjust accordingly. When I'm in a turnaround basically I drop nearly everything else. Because when you're here for 12 to 16 hours there is not much time or energy left for outside interests. But between turnarounds I get to pursue some hobbies. And I've got an unusual set of hobbies that are weird and varied, and the reason they're weird is because they're varied. I like the arts but I also like sports. I like to watch the arts and participate in the arts. San Francisco has wonderful theater, musicals, opera, everything. I like to see the concerts and go to the shows. But I also like to do a little bit of singing and dancing on my own. I'm a member of a chorale and I take ballroom dance lessons which is lots of fun. Sports, I'm a big sports fan. I like to go to the games, the Giants, the A's, occasionally the 49ers if you can get a ticket. And that's a lot of fun, spectator sports. But for exercise and for fun I like to bike and hike, which there's great biking and hiking in the Bay area. And a little bit of roller blading, tennis, golf, as much as I can squeeze in. So there's a lot to do in this area and you never run out of opportunities for recreation or outdoor sports or whatever it is you like to do.

Q: How about the way you see your specialty changing? First of all, do you think that your specialty has value?

Ruess: If there is a stereotype of construction engineering that a college student would have that were negative, then it might be that it's for people who can't handle the techie side of design work, that the upper level problem solving is too much for them so they have to go playing in the field. But the positive side of the perception -- now I don't know that this is really fully known and appreciated. I didn't really understand it completely when I was an undergraduate student, that the positive side of construction engineering is all the other aspects of your job besides the technical portion. If you like to do other things besides just problem solving, if you like to relate to people, if you like to be outside working on a project, that doesn't have to mean picking up a shovel and digging dirt, but working with the people who do, then construction engineering is a good field or a good specialty, within the field of civil engineering.

Q: Have there been substantial changes in the time you've been working here?

Ruess: New technology in construction is something that this country is trying to advance but really has a worldwide reputation as being behind other countries. And research and development area tends to be more of the informal type. Companies don't have large research and development centers. Overhead budgets are smaller here than they are in other countries, Europe and Japan. There's been a lot of studies about it and a lot of talk about it but you still find in this what I call informal research and development, creativity. Basically all the day-to-day problem solving that you do, how am I going to form this to maintain access through the area and still support all of the loads on a windy day? It takes some innovation to find a way to encompass all of those needs and that happens every day. And it's not captured in an R&D budget that becomes a statistic and it doesn't form the basis for revolutionary change in the industry. But it does allow incremental progress and the industry is doing things like prefabrication, like jump forms, and those advances in construction are becoming more and more common. Research and development in Bechtel is primarily a service function where

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specific contracts are filled for R&D. And there are a variety of things that happen that Bechtel does but as an overhead function, the business seems to be so competitive that the market doesn't allow a lot of overhead for R&D. And this is something that ASCE has focused on, in trying to help advance research and development. But the advancements within Bechtel are primarily on the soft side that I have seen in programming, integrating programs that are used by different functions within a project to allow those different programs to communicate with each other, eliminate double data entry, allow fast transmittal of information from home office to site and vice versa. We may have offices in India that are designing facilities in South America and with communications and computer programs, software, where they are today, it's feasible. It's a part of the international market, being able to perform functions in different parts of the world for a project where it makes sense to execute those functions is essential to being profitable in the world market now. You cannot move an entire group of personnel of all different functions and departments to project sites by the hundreds, execute the project, and then leave. That's not the way the market is today. So communications allows you to execute projects from different locations and integrate those functions, even though they're not in the same office or at the project site. And it is the tools that allow this process to happen, that are primarily where Bechtel's advancements have been in the last five to ten years.

Q: Tell us a little bit more about the globality of engineering, has it been overstated, do you think? And you still have to talk about why you decided to go to Germany. I mean, it's not something that a lot of civil engineering students do. But maybe they should, take time off to go abroad while they're still an undergrad.

Ruess: Okay. The globalization of the construction industry is something that we've seen happen here in terms of companies that are from other countries that are bidding on domestic work. I think that was one of the first signs that we saw here in the U.S. Now, U.S. multinational corporations have worked in other countries for years but it wasn't called a globalization. Now why is it a globalization now? The reason it is called that now, I think, is that the nature of the way work is executed has changed so much. It used to be that a multinational corporation would move into a location that wanted a project, bring everything that they needed, execute the project and leave. Now there are groups from all different countries that participate in that project. The bidders are from all over the world and the competition is fierce because they all know the same techniques. One of the things that differentiates the multinationals today and allows them to participate in a lot of projects is the introduction of financing. Developing countries typically cannot have the financing to grow quickly. They need lots of credit. Just like people do when they extend their business or their personal life. And larger MNCs are doing that now, multinational corporations including Bechtel. And it is in some cases a prerequisite to being able to bid on a job. So where does that financing come from? It comes from many different places all over the world. So that is internationalized as well. It could come from the corporation itself or that corporation collects it from different locations and works out all the terms of that financing. So globalization I don't think really has been overstated because communications and shipping are so advanced now that you can just about do anything anywhere and sell them anywhere else. So the market is global and the production is global too. So I don't think that it's overstated. I think it's very real. And to be an international participant or someone who works on projects in different parts of the world takes a lot more skills than just designing or working on construction in one location because all of the local factors obviously are different wherever you are and wherever you go. The laws that govern the construction industry, the relationship with the local government, the

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site conditions, what type of soil there is, all of these things have to be relearned and you have to have the opportunity to be able to learn those things. You have to be willing to learn a foreign language if you're going to be directly active in it. And to move and live just about anywhere and have an open mind to understand that the way that you execute projects in one place can be very different from the way you execute them in another.

Q: Let's talk about ethics...

Ruess: Civil engineering and ethics is something that you don't really think about until you have to for the first time. And that usually happens when you have conflicting goals in the project. Now if you believe in fantasy, all your goals work in concert and there's never a conflict between them. When I say goals, I mean safety, costs, schedule, quality, environmental, etc. Well there will be times when the schedule and costs are in conflict, when cost and the environment are in conflict, when cost and the environment are in conflict, when the quality and schedule and cost are on conflict, sometimes they are just naturally at bay with each other. And it can take some soul searching to make the right decision. And that decision is going to be based and founded on your ethics, the ethics of you as an individual and a professional and your corporation. I think Bechtel has excellent ethics and I feel fortunate that I'm working for Bechtel in that sense because I've never made a difficult decision that I felt was the right decision for ethical reasons that I later had to regret because of the company. It's always been what's been right with me has been right with the company. I feel good about that. Now construction and engineering has in the past come at odds with the environment. Today, after being at odds with each other for some time, the two professions are coming together more and more. Now when I say two professions, someone could say well environmental is a branch of civil engineering, why are you separating the two? And the reason that I say that is that developments and the environment very often come in conflict with each other. But in projects today, design and construction engineers do everything that they can to find ways to make projects more environmentally friendly, more friendly to the community, within the confines of an ethical business process. I haven't found some of the negative sides of construction that you hear about in terms of ethics in practice. Now perhaps that's location, perhaps that's my company or the clients, but I just haven't had a big problem with that. I think that civil engineering and construction is an ethical profession. It is a humanitarian profession because it constructs facilities that improve the quality of life for people. And they can be done, those facilities can be constructed in such a way to incorporate the other parameters that we need to think about like the environment. There's a major civil project ongoing right outside our door on this freeway and it's a freeway expansion which generally is something that environmental folks oppose because they fear that it's a mushrooming process. But it really is a positive step in that it should reduce congestion because it's going to provide a high activity vehicle lane or computer -- commuter lane, diamond lane, whatever you want to call it, for a long distance all the way into San Francisco and Oakland, that that will allow people to shorten their commute times significantly and therefore attract many commuters. So while it is a highway construction project, it should provide net benefit environmentally to, to reduce pollution that results from fast moving traffic, more commuters in multi-occupancy vehicles, more commuters sharing rides. So that example can be applied to many projects. Power plants today have pollution controls built in. The plants that they replace generally were much dirtier. So these things provide net benefits to our environment and to our communities. So in that sense, I think it is a humanitarian profession particularly over the last ten years.

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Q: Is there more diversity in this field now?

Ruess: Well, in the construction side of things, which I see the most, there is progress because there are women and minorities in construction and in some cases there weren't any at all. And obviously society has set that standard. So today I've seen a number of women in construction, I've seen a number of minorities in construction. I live in an area that I consider to be a socially liberal area. I believe that that helps foster participation of minorities in professions where in the past they had not participated. And Bechtel as a company, like most companies today, is trying to advance diversity and doing what they can to promote women, to promote minorities while at the same time maintaining business goals. You wouldn't want to do that simply for that goal; you would want to do it in a way that also advances your company, recognize those folks of different groups who have the talent and abilities and don't allow their skin color or gender to prevent them from advancing. And that, in my view, should be the goal of diversity. And I think that we're making progress, perhaps not fast enough for some people and probably it could be faster but nevertheless it is progress.

Q: Anything that you feel that we haven't talked about that you'd like -- you were once a 21-year-old undergrad. What do you wish you'd known?

Ruess: Well, I thought it would get easier. I really did. I thought -- I had it all figured out, once you graduate college, you don't have to work weekends any more, you don't have to stay up late at nights working on that homework assignment, you don't have to worry about educating yourself anymore and straining the brain. Well, it didn't work out that way because there is continuing education, there's long nights at work. And not everybody does that and not everybody has to do that, but if you'd like to be an active participant and a leader in the company, then you go the extra mile, whether you're a student or whether you're in the business world. So I didn't know that, I didn't appreciate that as much as a senior in college as I do now. But you come to understand that and that's something that you just have to come to accept. Now as far as things that I wish I had known when I was a senior, probably I was fortunate in that if I hadn't gone abroad, I really would have regretted that. And it was a difficult decision to make because it involved some extra work. It was a difficult path to take but it really was worthwhile in the end. And if I had one recommendation to make to -- obviously not a senior because that's too late, but freshman/sophomore, is try to get diverse, try to learn lots of different things besides just your engineering. Yes, you needed to learn the problem solving but try to get broader and you'll find that your career is a lot more rewarding, at least it has been for me. And it's not for everybody. It's not that everybody needs to do all these things but they are out there and if you enjoy being an active participant, the opportunity is there. But you have to start early and realize that if you want to be in project management, you have to study some business too and get some good work experience. So I think that college students are pretty savvy today and they know a lot of these things already.

Q: What are some other parts of your job as a construction engineer -- either financially or personally or professionally?

Ruess: Well, first of all, when you work as a construction engineer, I think from talking to other friends in the industry and looking at salary service, you do make a little bit more money. And everybody wants to know about that. But the rewarding part of construction engineering for me

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is the tangible results are your work. When you're building a project, every day at the end of the day you can say we put this in, we built that, and the concrete placement was a successful one. In 40 years it will still be there and the plant will still be running or the freeway will still be carrying traffic or the bridge, or whatever it is that the project is. And for the rest of your life if you decide you want to go back there and see how it's doing, you can. You can't do that with electrons. You can't do that with chemicals. But you can do it with civil projects. That's why I picked civil engineering and that's the most rewarding part of it for me is the tangible results of your work. And the other part -- and this is not necessarily limited to civil engineering but it is something that is a part of construction engineering and that is dealing with people. As a civil design engineer, unless you're a manager generally you're dealings with people are not extensive. You have to site surveys, you'll be doing the foundation. So you may have a subcontractor doing the borings. But you don't have a lot of interaction with a lot of people. And that's good for some people. Some people prefer that. They are private workers, they like to focus on a problem and solve it. But it's not for me. I need to deal with people and construction engineering provides that opportunity.

Q: What are some of the more mundane and less rewarding parts of your job?

Ruess: Every job has paperwork and filling out the forms to track either contracted changes or to keep records of quality tests that were done can be dry and a little bit of a drag. But you have to do it. And there are portions of every job that are less desirable and in engineering that happens to be it. Paperwork.

Q: Are there any less rewarding parts of the job?

Ruess: Yeah, one of the things that I don't like about work is the politics. And again, this is one of those things that you run into on every job and everybody talks about it but there is some politics in some places and some jobs more than others and when you encounter it, unless you feed on that kind of thing, a lot of don't enjoy it. I like to be valued based on my performance and on our relationship and the politics portion of things turns me off. But you just try to stay away from it, minimize it, don't participate, don't encourage it, and that helps a lot. If you don't participate in it generally, you don't get involved as much as you would otherwise. So that's one of the down sides of work in general. Not as much specific to civil engineering or construction engineering or construction management. But some politics are enjoyable. Politics can also be referred to as diplomacy which is a skill that everybody needs to have, particularly if you're looking towards a project management position. You do need to know how to be diplomatic in your relationships with the community, the building board, the client, the folks who work on the projects. You deal with people at all levels in that position. So while politics can be a bit of a drag sometimes, diplomacy is a tool that you need in the industry if you, if you aspire to that kind of a position.

Q: What did you do after you graduated?

Ruess: Well, I wanted to go to a different location. And the west coast had an appeal for me so I decided okay, that's number one, go to the west coast. Now what am I going to do when I get there? There are some really good graduate schools there and here in the Bay area and I knew that I wanted to go to graduate school and get a Masters. So I thought well maybe move once and then get some experience and then when the time is right go back to graduate

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school. So I applied just in case I wanted to go right after undergraduate, I applied at a couple schools, Stanford and Cal for their construction management program. And I got accepted to both but decided to defer and asked them for recommendations of places to work in the area, companies with this they have affiliations -- and all universities do have corporate affiliations. And they gave me a couple of references and one of them turned out to be a good one and I got a job in San Francisco within a couple of weeks of arriving here. So that worked out well. And I initially started out in San Francisco in an office doing analysis to support claims. Did that for about a year till I got stir crazy and wanted to get outside. And then I worked on the courthouse in San Jose and a jail in San Jose so I spent the mornings in court and the afternoons in jail. It was great. And- once those projects were completed, I went to work for a contractor, Granite Construction, and did some estimating and bidding, just to see what that side of the house is like to work for, try it out. And then I went to graduate school after that. So it was a total of two and a half years after graduating from Tufts that I decided to go to Stanford for graduate school and begin construction management.

Q: Let's talk a little bit about grad school and the process. What was that like? You were going to grad school full time?

Ruess: I was going to graduate school full time. I didn't want to go part-time because I wanted to be able to focus on it and go to a -- my opinion is that the daytime schools are more intense, more focused, and night programs are good and there are some that are excellent, but I just thought the best way to go for education wise was to go in the daytime.

Q: What motivated you?

Ruess: Graduate school is a stepping stone if you want to take the next step that you need to have because if I wanted to stay as a design engineer or a field construction engineer in a discipline, inspecting building construction, going from project to project, and moving laterally, that would have been fine. But to go to the next level, some business education, some management education was definitely needed. And besides, I was just getting bored. I wanted to do something different so I went back to graduate school. And what was the experience like? Graduate school -- I don't know if they're all like this but it was the sprint. And it seemed like two years of fresh material in one year. And I spent a lot of late nights and a lot of long evenings with, with teams working on projects but it was an excellent program. There were people from all different age groups, regions of the world, backgrounds in terms of education and sector of the construction industry that they had been working in. You brought all these people together in a team to do a specific project. For every class you had a project naturally. And it made for a real dynamic environment. And the subjects that we covered were a variety of subjects, a wide variety of subjects, everything from concrete construction to labor relations to organizational design and behavior. And all necessary skills for construction management. That's what makes construction management interesting. It is a conglomeration of so many different facets of business on the management side and the technical side. That's why I picked it.

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