

Forensic Engineering: Is it for you?

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You've probably heard the term forensic used in many contexts – especially with the number of TV programs featuring high-tech forensic methods to solve crimes. You may have some electrical engineering friends that have been involved in forensic engineering. And, as you listened to their stories and how rewarding the work is, both intellectually and financially, you may have wondered whether you should investigate what it would take to get into that line of work. Well I hope this article will help you with that decision.

What is Forensic Engineering?

Wikipedia provides the following definition: “Forensic science (often shortened to forensics) is the application of a broad spectrum of sciences to answer questions of interest to a legal system. This may be in relation to a crime or a civil action. The word *forensic* comes from the Latin adjective *forensis*, meaning "of or before the forum." In Roman times, a criminal charge meant presenting the case before a group of public individuals in the forum. Both the person accused of the crime and the accuser would give speeches based on their side of the story. The individual with the best argument and delivery would determine the outcome of the case. This origin is the source of the two modern usages of the word *forensic* – as a form of legal evidence and as a category of public presentation.”

In modern times, the matters before the civil and criminal courts are frequently highly technical in nature. This is certainly true in the electrical engineering area. Therefore, the accused and the accuser retain experts to present the technical sides of their stories. In electrical cases, these experts are forensic electrical engineers.

How I Became a Forensic Engineer

I did not start out as a forensic engineer. Nobody does. I stumbled into it.

As a youngish electrical engineer, I moved to Chicago and my neighbor was an attorney with a personal injury case in which his client was injured in an electrical accident in a mobile home. He was struggling and the judge told him his case didn't look good. When he found out I was an electrical engineer he asked me to look at some of the materials, including a report with photos prepared by a firm in California where the accident occurred.

From the materials he provided, I was able to reconstruct the accident, build a crude model and present it in a meeting with the opposing attorneys to demonstrate what had happened. Based on this presentation, the case was settled out of court in favor of my retaining attorney. I was hooked. I found the whole process fascinating.

However, a long time passed between that case and the next case I investigated – almost thirty years. I was working for a large consulting engineering company at the time and the owners were not enthusiastic about their engineers being involved in litigation because of the possible adverse exposure for the firm it might create. So, I did not pursue this work.

However, that was not a bad thing. You do need the experience of working on real engineering projects to develop the repertoire of skills to be a successful forensic engineer. You need to experience equipment failures and engineering design process failures firsthand to develop the skills to know how to analyze them in litigation. As I moved into more senior positions at the engineering company, I was asked to investigate electrical equipment failures and electrical design process failures. This kept my love for forensic engineering alive and also trained me in forensic techniques.

But it wasn't until I started my own firm in 2000 that I worked with attorneys in the forensic engineering arena again. Now forensic engineering or litigation support contributes about 30-50 percent of my company's revenue.

Many other forensic engineers may have started out the way I did. Others were involved in forensic work for their companies, liked it and decided that they would like to continue on after retirement. And yet others, who had developed expertise in some area, decided to exploit this expertise.

The decision to become a forensic engineer and actually doing forensic engineering are two different things. You rarely see job postings for forensic engineers, although there are a number of firms in the U.S. that specialize in forensic engineering. So how do you get into the forensic engineering field? Well, like any other occupation, you must find out who hires forensic engineers. There are three major employers of forensic engineers: attorneys for litigation support, insurance companies for litigation support and facilities inspections, and companies that specialize in forensic engineering.

Which path you choose depends on the type of work life you want. Do you want to be your own boss? Do you want to have a very flexible schedule and work when you want to work? Or do you want another full-time job doing forensic engineering?

If you want to work full time as a forensic engineer you need to approach the firms that do forensic engineering and provide services in an engineering area that you have special skills in. The first place to start is on the Internet. A search for “forensic engineering” or “forensic companies” will produce many companies that you can approach.

If you want to be your own boss, you need to find ways to get the attention of attorneys, principally, and insurance companies. Attorneys are the main source of business for sole practitioners of forensic engineering. They retain forensic engineers as consultants and expert

witnesses in civil and criminal cases. I'm going to assume for the rest of this discussion that you want to have an engineering business that provides forensic engineering services.

Generally, when an attorney needs a forensic engineer for a case his first move is to approach other members of his firm to see whom they have used. If that fails, the attorney will go on the Internet to search or approach firms that specialize in finding experts for attorneys.

I signed up with a well-known firm that finds experts for attorneys. It cost nothing to sign up. When the attorney that needs your expertise contacts the firm and retains you, you bill the firm who in turn bills the attorney. Of course, they mark up your rate, which can price you out of some cases. I am still registered with this company. And, over the years I have gotten some work from them.

Now most of my forensic engineering works comes from referrals or my website. You do need a website. It gives you credibility and is an inexpensive way to provide potential clients with the information they need to decide whether you can help them. Your website is like an online sales brochure, but can be expanded to be much more. It is, however, wise not to include everything on your website. Just enough to whet the attorneys' appetites so that they call you.

I've also used various services that provide listing directories for forensic experts. You pay them to list you under various categories. They then distribute their directory to a large number of attorneys. The idea being that when an attorney needs an expert he or she will look in the directory. My experience with this advertising method was not positive and I no longer use any directory that I must pay to list me.

You can also advertise in magazines that target attorneys such as the publications of state bar associations. When you do that you must be careful how you advertise because the wording in your ad can and will be used against you by opposing counsel. You should not claim that you will help attorneys win cases. That's not your job as an expert witness. So make it very professional. Offer forensic engineering services in you areas of expertise and possibly offer a free consultation and reference to your website. I have not found this method very rewarding and no longer use it either.

As in all businesses, relationships are an important factor in developing new forensic engineering clients. Besides having a website you need to identify where attorneys congregate and try to become part of that group or organization. People hire people they know. Attorneys are no different.

What do I do as a Forensic Engineer?

As a forensic engineer, I perform some or all of the following tasks:

1. Consult with attorneys
2. Analyze cases, including site visits

3. Prepare expert reports
4. Provide depositions
5. Act as an expert witness in a court of law or in front of an arbitration panel

Attorney consulting is what happens when an attorney retains you at the very start of a case to help him understand the technical issues in the case and to advise him on what questions to ask and who to depose (i.e. pose the questions to) and what documents to request. This is the ideal situation. However, I have been involved in many cases in which this did not happen and I had no choice but to use the depositions of the people the attorney had chosen to depose. I still requested the documents that I believed I needed. It just takes longer.

In some cases the attorneys continue to retain you as a consultant as the case progresses because in many states your work is protected from discovery by the opposing counsel when you are a consultant. As soon as the attorney names you as his expert, your work product may be subject to discovery.

Case analysis

This is where the real work is done. You work through the documents that your attorney has provided and the depositions to try to reconstruct what happened in the case. When there are a large number of depositions and documents this process can be very tedious. But it is vital. You must comb through the material to correlate the depositions of each person deposed. You're looking for facts and contradictions. As you continue this digging you generate questions and requests for documents for your retaining attorney who will relay them to the appropriate parties. You may not get satisfactory answers to all of these questions.

Photographs, if they exist, are very useful during this phase. But, be sure you know who took them, why they were taken and whether they still represent the site conditions at the time of the incident.

If it is still appropriate, a visit to the site of the incident can be very helpful to understand what happened. If you do make site visits be sure to take photographs if the site conditions still reflect conditions at the time of the incident. In many of my cases the time that elapsed between the incident and my involvement was so long that a site visit would have been useless. This is not unusual. As you will learn, if you enter this field, cases can drag on for years.

Expert report

The first thing I learned about expert reports is NOT to write one unless specifically requested to do so by your retaining attorney. The last thing your retaining attorney wants is a draft of a report floating about that he's unaware of that may surface during deposition or in court. On the other hand, if the attorney never asks you to write an expert report but does expect you to be his

expert witness – watch out. Without the report containing your opinions you may be at the mercy of the opposing counsel -- if not on direct questioning, certainly on cross examination.

When requested to do so, you write your expert report giving your professional opinions about the areas of concern to your retaining attorney. But you report them as you see them not the way he or she may like to see them. That is very important. It's fine to have your retaining attorney review your report to ensure it meets the format requirements of the jurisdiction and uses the correct legalese, and to correct any typos or grammatical errors, but you cannot allow the attorney to change your opinions. You may be asked during deposition whether your retaining attorney has reviewed your expert report and made any changes to it. If the attorney has changed your opinion to reflect his or her position in the case your expert report may not be accepted. This may adversely affect your reputation as an expert witness.

You must write your expert report at a level that jury members will have no trouble understanding. Since the average adult reading level in the U.S. is about ninth grade, that's the level to shoot for in your report. The review function in Microsoft Word provides word count and reading level so that you can check your report readability level and revise as required.

Resist the temptation to become an advocate for your retaining attorney's client -- that's the attorney's job. You are not qualified in that area and it can seriously hurt your credibility since your job is to explain what happened, not play attorney.

Deposition

When you have submitted your expert report, the opposing attorney may request to depose you. After going through a long series of questions to establish your qualifications or lack thereof to provide opinions in the case he or she will ask you how you formed your opinions and will attempt to knock holes in your opinions.

This is where some engineers have a problem. If you are not prepared to have attorneys attack your opinions and credentials, sometimes very aggressively, you should probably not become a forensic engineer.

The other things that many engineers have a problem with in deposition is answering just the question asked. Engineers are, generally, by nature helpful. They want to explain everything about an issue. Like the old story of asking an engineer the time and he will explain how his watch works. That's not what's required in deposition. Only answer questions and offer explanations when specifically asked to do so. As with your expert report, do not become an advocate for your retaining attorney's client.

Sometimes the opposing attorney deposing you can be very difficult or downright obnoxious. This may be a tactic on his or her part to upset and fluster you so that you'll trip up answering their questions. It's a game to some degree. And the way to play it as a forensic engineer is to

remain calm. Take your time. You are the expert -- the opposing attorney is not. And do not get defensive or argue with the attorney. Remember, your deposition may be read to the court at some point so it is important that you conduct yourself in a professional manner at all times despite the provocations of the opposing attorney. Your retaining attorney will intervene if the opposing attorney becomes too egregious.

Expert Witness

About 90 percent of the cases I have worked on have settled out of court. However, if the case does continue to court or arbitration you may be asked to provide expert testimony. This can be stressful but no more so than being deposed. In fact, if you weather the deposition in good shape you'll do fine in court because the judge will ensure that the opposing attorney does not get out of hand. In court your task is to educate the jury so that it can make an informed decision. So, address your remarks to the jury. Since the jury may be provided with a copy of your expert report it is important that it be written at about the ninth or tenth grade level so that the jury members can easily understand it. This can be challenging. You also need to review your report before testifying because considerable time may have elapsed between when you wrote it and when you testify.

Make eye contact with as many jury members as possible. Don't talk down to the jury. Don't try to be funny. This is serious business to the jury. Speak slowly if you have a normal tendency to speak fast. Make sure the jury can hear you. If in doubt, ask them if they can hear you clearly.

What do Attorneys Look for in a Forensic Engineer?

Attorneys retain forensic engineers for one reason only – to help them win their case. With that in mind, they look for certain characteristics in forensic engineers they are considering as consultants or expert witnesses. In some cases they may use one forensic engineer as a consultant and another as an expert witness.

They always want someone who has the education and expertise in the electrical area of the case. Without such education and expertise, the opposing counsel will easily discredit you as an expert and your testimony may not be allowed in court. Assuming that you do have the required education and expertise, the attorney may ask about your experience in providing depositions and expert testimony.

Some attorneys look for extensive experience because they believe that means you are battle-hardened. Others do not, believing that the more experience you have the more baggage you have. Each time you are deposed or provide testimony your opinions go on record and are available to all attorneys. Some attorneys believe that when you have provided extensive opinions in a certain area you may have expressed an opinion that will adversely affect their case. And they know the opposing counsel will find that opinion. They also believe that you

may have become a little arrogant and be difficult to deal with. When you have no history of depositions or testimony the attorney believes that you have no preconceived ideas about what's involved and will take instructions without question (not on your opinions) but on procedural matters.

Another area in which attorneys want information is in any papers or books you may have published on the subject matter of the case. Opposing counsel will find those papers and books and if the contents conflict with your statements in deposition, your expert report or testimony, they will pounce on it to discredit you.

Another thing you need to be careful about is the accuracy of the resume that you provide your retaining attorney. You may have been a member of some society in the past but are no longer. If you still list that in your resume the opposing counsel may find it and use it to question your attention to detail. Once again, it's credibility.

Attorneys like you to have other engineering work besides forensic engineering. It preempts the opposing counsel accusing you of being a "hired gun." It also keeps you abreast of your field and bolsters your credibility.

How you dress is also important when being deposed or providing testimony. Good practice for men is a good quality dark suit with a shirt and tie and polished shoes. Don't go overboard with an Armani suit and a Rolex watch. This can hurt you with the jury. For women a dark business suit, discrete blouse and polished shoes are advisable. Little jewelry and easy on the make-up. For both sexes, good grooming is essential.

And, finally, appearances are important. Attorneys want someone the jury will like and believe. Their choice of forensic engineer will be influenced by how they believe the jury will react to you.

Since attorneys retain forensic electrical engineers to win the case for their clients, this puts forensic engineers in a possibly compromising situation. Your task is not to win the case but to state an opinion about what happened in the incident based on a reasonable degree of engineering probability. Note that I said a "reasonable degree of engineering probability" not "engineering certainty".

With that in mind you may have to walk away from some cases if the attorney is taking a position that your analysis of what happened does not support. You must guard your integrity very carefully in this business. It's your chief credential. Once you have been impeached it will follow you. On one or two occasions in my preliminary discussions with an attorney I voiced my opinion about the validity of his case and he did not retain me, which is how it should be.

What do Judges Look for in a Forensic Engineer?

The main thing a judge looks for is that you have the education and expertise to provide testimony that will help him and the jury (if there is one) to arrive at a verdict. Assuming you have them, the judge then looks at your ability to communicate clearly so that he and the jury can understand your opinion as to what happened.

According to internationally respected litigation consultant Budd J. Hallberg, “Judges tend to look favorably on expert witnesses whose litigation experience is well balanced between plaintiff and defendant work. This demonstrates neutrality and objectivity in case formulation” [1].

What Kind of Money Can You Make as a Forensic Engineer?

In a 2006 article in IEEE-USA *Today's Engineer* entitled, “Forensic Engineering: On the Trail of Truth,” Marvin Specter, executive director of the National Association of Forensic Engineers, stated the work offers “compensation ‘in multiples of the pay’ an engineer might make working for someone else” [2].

I performed a brief review on the Internet of the fees charged by a number of forensic engineering firms. They ranged from \$240-\$600 per hour. Some firms have different rates for preparation work, research, deposition and testimony. Some firms charge the same amount for all aspects of an engagement, including travel. Some charge a different rate for travel time versus working time. Others charge time on portal to portal basis. Thus, there is no one method for charging work time or travel.

My fees fall in the range quoted above. I charge a flat fee for all services and charge time on a portal to portal basis. When I must go out of town for a site visit, deposition or testimony I charge a flat daily or half-daily fee plus expenses. But, it's up to you how you charge for your services.

In your litigation support agreement you need to be very clear about who is paying you. Is it the retaining attorney or the client? Forensic engineers can't work on a contingency fee basis like an attorney. You must make it clear to the attorney or client that you expect to be paid for your time regardless of how the case is progressing or what the outcome may be. You may need to consult an attorney to help you write your agreement. I advise establishing a four-hour minimum charge and asking for a substantial (10 times your hourly rate) retainer before you start work. If the attorney balks at this, watch out!

You can make good money as a forensic engineer. Just keep in mind that the work may be intermittent, cases can stretch over a number of years and you may experience difficult getting paid if you're not careful.

Pros and Cons of Forensic Engineering

The pros include the following:

- Challenging work
- Great variety
- Well paid
- Flexible working hours
- Almost location independent – you can work from anywhere

The cons include:

- Time span of cases – attorneys don't seem to understand that you need to refresh your memory when you come back to a case after an absence for many months
- Attorneys that try to save money by waiting until the eleventh hour to retain the forensic engineer
- Attorneys that do not give you all of the case documents because they believe you don't need them. You need to be the judge of that.

The Types Of Cases I've Worked On

One of the pluses of forensic engineering is that no two cases are ever identical. This is unlike regular engineering work that can become routine and you end up performing the same calculations over and over again.

I've been involved in personal injury, design error and equipment failure cases. The following is a brief synopsis of some of these cases.

A cable TV technician was working on a cable TV component supported from a medium voltage electric utility pole. As he reached out to the component, he was electrocuted and died. What had happened was that a ground wire running down the pole had been cut about 10 feet above grade and abandoned. However, the top end of the wire, which had been secured to the top of the pole, had come loose and contacted a live conductor. When the technician reached around the pole to brace himself before reaching out to the component, he touched the ground wire and received a fatal shock. I was retained by the plaintiff's attorney.

In another case, an engineering firm had expanded the electrical system of a community college. When the work was completed, the college sued the company claiming that the design was not adequate and the system did not perform as expected. I was retained by the engineering company's attorney to defend the company's design.

For another case, a large electric generator had been shipped to the Far East for installation in an electric generating station. After it was installed the unit was tested to ensure that it would perform properly. During the testing, the unit failed. The generator manufacturer made a claim against its insurance company for the damage. The insurance company refused to pay because it claimed that the event was not covered by their policy. I was retained by the insurance company's attorney to defend their position.

You may have noticed that in the three cases described above, I was retained by the defendants twice and by the plaintiff once. To maximize your attractiveness to attorneys it is good to be retained by defendants and plaintiffs. A 50/50 split would be ideal. My split is about 40/60. If you take only plaintiff cases you are viewed as a plaintiff's expert and may not be retained by defendants' attorneys. The reverse is also true.

I've included a bibliography of a number of books I've found to be useful in conducting my forensic engineering practice. Perhaps you will also find them helpful.

Conclusion

You should now have a feel for what forensic engineers do. The field is challenging and interesting. It is never boring. You can earn a good living with a very flexible lifestyle if you chose to work for yourself. You must recognize that your opinions will be attacked by the opposing counsel and in deposition and testimony opposing counsel will try to discredit you. If you can live with that you will enjoy working as a forensic engineer. Good luck!

References

- [1] *"How to be an Effective Litigation Consultant and Expert Witness,"* Budd J. Hallberg.
- [2] *"Forensic Engineering: On the Trail of Truth,"* By Robin C. Peress, IEEE-USA *Today's Engineer*, September 2006: <http://www.todaysengineer.org/2006/Sep/forensics.asp>.

Bibliography

1. *"The Comprehensive Forensic Services Manual,"* by Steven Babitsky, JD, James J. Mangraviti, Jr., JD and Christopher J. Todd, JD
2. *"The Expert Witness Handbook,"* by Dan Poynter
3. *"The Expert Witness Marketing Book,"* by Rasalie Hamilton
4. *"Writing and Defending Your Expert Report,"* Steven Babitsky, JD, James J. Mangraviti, Jr., JD

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