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The Forensic Engineer in State and Federal Court

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Abstract

This paper outlines the legal system in the United States, the different types of courts, the differences between criminal and civil law, and the role of forensic engineering experts involved in civil lawsuits. After providing a summary of relevant procedures employed by civil and criminal courts, the paper describes the basic principles and requirements for the selection and work of a forensic engineering expert in both the state and federal court system. This paper outlines the role and function of forensic experts (specifically forensic engineers), in the United States court system. It is not a treatise on the legal system but on the role of experts. The paper presents the requirements typically used in today's legal system to qualify a forensic engineer as an expert witness and to accept his or her work and opinions. Furthermore, this paper discusses who can be an expert witness, the expert's report, applicable standards, conducted research, engineering opinions, and final testimony in court — and how those elements fit into the legal system. Lastly, the paper describes the concept of spoliation of evidence.

Keywords

Forensic engineer, expert witness, expert testimony, Daubert, Frye, spoliation of evidence

Introduction

“Forensic” in this context means the use of science and technology to investigate and establish facts in criminal or civil courts of law. A forensic engineer applies his or her engineering experience to forensic topics. These engineers typically work with civil cases involving accident reconstruction or products/structures that have failed to perform as expected; however, they can also be involved in criminal cases. In addition, they may be called upon to investigate patent disputes and other legal issues that require the input of an experienced engineer¹.

The forensic engineer, when qualified by the court, becomes an expert witness. Experts usually are involved in all processes of civil law. They are indispensable because their task is to explain to the court (the judge or jurors) what happened, how it happened, and how it could have been avoided, making comprehensive scientific methods understandable to the court.

Experts represent various fields and branches of science, including fire and explosions, chemistry, mechanical engineering, motor vehicle reconstruction, biomechanics, structural and civil engineering,

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aircraft, vehicle and vessel design/performance, sociology, skiing, water recreation, and many more. In the case of motor vehicle accident reconstruction, for example, experts might explain and illustrate the reconstruction of the accident, the vehicle design, seat belt and air bag function/design, driver reaction time, driver visibility, sustained injuries, and federal rules/regulations related to a particular accident.

United States Court System

It is important to outline how the court system works in order to establish how the forensic engineering expert works within that process. The United States district courts are the trial courts of the federal court system. Within limits set by Congress and the Constitution, district courts have jurisdiction to hear nearly all categories of federal cases, including both civil and criminal matters. There are 94 federal judicial districts, including at least one district court in each state, the District of Columbia, and Puerto Rico. Three territories of the United States — the Virgin Islands, Guam, and the Northern Mariana Islands — have district courts that hear federal cases, including bankruptcy cases².



Figure 1
A typical courtroom layout.

A typical courtroom is depicted in **Figure 1**.

Although federal courts are located in every state, they are not the only forum available to potential litigants. In fact, the great majority of legal disputes in American courts are addressed in the separate state court systems, which have jurisdiction over virtually all divorce and child custody matters, probate and inheritance issues, real estate questions, and juvenile matters³. They also handle most criminal cases, contract disputes, traffic violations, and personal injury cases.

In criminal law and civil law, either a judge or jury is establishing guilt of the party. Every defendant has the right, guaranteed by the Constitution of the United States, to request his or her case be tried by the judgment of the jury and not the judge. A typical arrangement for the jury in the court is shown in **Figure 2**.



Figure 2
A typical arrangement for the jury in the court.

Criminal Cases

In 2013, there were a total of 91,266 criminal cases filed in the United States courts. In criminal cases, the “prosecution” is the party that brings the lawsuit; the “defendant” is the person accused of the crime.

In a criminal trial, the prosecution must prove the accused’s guilt “beyond a reasonable doubt.” Sometimes, this is a very difficult task to achieve. Therefore, in the absence of conclusive evidence, the accused is acquitted.

At the beginning of a federal criminal case, the principal participants are the U.S. attorney (prosecutor) and the grand jury. The U.S. attorney represents the United States in most court proceedings, including all criminal prosecutions. The grand jury reviews evidence presented by the U.S. attorney and decides whether there is sufficient evidence to require a defendant to stand trial⁴.

In a criminal trial, the burden of proof is put on the prosecution. Defendants do not have to prove their innocence. Instead, the government must provide evidence to convince the jury of the defendant’s guilt. As stated earlier, the standard of proof in a criminal trial is proof “beyond a reasonable doubt,” which means the evidence must be strong enough that there is no reasonable doubt that the defendant committed the crime.

If a defendant is found not guilty, the defendant is released, and the government may not appeal — nor can the acquitted be charged again with the same crime in a federal court because the Constitution prohibits “double jeopardy” or being tried twice for the same offense.

If the defendant is found guilty, the judge determines the defendant’s sentence according to special federal sentencing guidelines issued by the United States Sentencing Commission⁵.

Civil Cases

In 2013, there were 284,604 civil cases filed in United States courts. In civil cases, the “plaintiff” is the party that brings the lawsuit; the “defendant” is the party being sued.

In a civil trial, apart from contract law, the plaintiff attorney hires a forensic engineer to prove the case “within reasonable scientific probabilities,” which means “more likely than not” or with more than 50% probability.

A federal civil case involves a legal dispute between two or more parties. To begin a civil lawsuit in federal court, the plaintiff files a complaint with the court and “serves” a copy of the complaint on the defendant. The complaint describes the plaintiff’s injury, explains how the defendant caused the injury, and asks the court to order relief. A plaintiff may seek money to compensate for the injury, or may ask the court to order the defendant to stop the conduct that is causing the harm. The court may also order other types of relief, such as a declaration of the legal rights of the plaintiff in a particular situation.

To prepare a case for trial (in criminal or civil cases), the litigants may conduct “discovery.” In this stage of the process, litigants must provide information to each other about the case, such as the identity of witnesses and copies of any documents related to the case. The purpose of discovery is to prepare for trial by requiring the litigants to assemble their evidence and prepare to call witnesses. Each side also may file requests, or “motions,” with the court seeking rulings on the discovery of evidence or on the procedures to be followed at trial.

One common method of discovery is the deposition. During this stage, a witness is required under oath to answer questions about the case asked by the lawyers in the presence of a court reporter, a person who is specially trained to record all testimony and produce a word-for-word account called a transcript.

To avoid the expense and delay of having a trial, judges encourage the litigants to try to reach an agreement resolving their dispute. In particular, the courts encourage the use of mediation, arbitration, and other forms of alternative dispute resolution, designed to produce an early resolution of a dispute without the need for trial or other court proceedings. As a result, litigants often decide to resolve a civil lawsuit with an agreement known as a “settlement.”

If a case is not settled, the court will schedule a trial. In a wide variety of civil cases, either side is entitled to request a jury trial under the Constitution. If the parties waive their right to a jury, then the case will be heard by a judge without a jury.

At a trial, witnesses testify under the supervision of a judge. By applying rules of evidence, the judge determines which information may be presented in the courtroom. To ensure witnesses speak from their own knowledge and do not change their story based on what they hear another witness say, these parties are kept out of the courtroom until it is time for them to testify. A court reporter keeps a detailed record of the trial proceedings. A deputy clerk of the court also keeps a record of each person who testifies and marks any documents, photographs, or other items introduced into evidence.

As the questioning of a witness proceeds, the opposing attorney may object to a question if it invites the witness to say something that is not based on the witness’ personal knowledge, is unfairly prejudicial, or is irrelevant to the case. The judge rules on the objection, generally by ruling that it is either sustained or overruled. If the objection is sustained, the witness is not required to answer the question, and the attorney must move on to the next question. The court reporter records the objections so that a court of appeals can review the arguments at a later time, if necessary.

At the conclusion of the presentation of the evidence, each side gives a closing argument. In a jury trial, the judge will explain the law that is relevant to the case and the decisions the jury needs to make. The jury generally is asked to determine whether the defendant is responsible for harming the plaintiff in some way and the amount of damages that the defendant will be required to pay. If the case is being

tried before a judge without a jury, known as a “bench” trial, the judge will decide these issues. In a civil case, the plaintiff must convince the jury by a “preponderance of the evidence” (i.e., that it is more likely than not) that the defendant is responsible for the harm the plaintiff has suffered⁶.

The vast majority of non-criminal cases in the United States are handled in state courts, rather than federal courts. For example, in 2013 in Colorado, roughly 97% of all civil cases were filed in state court.

Many state court civil cases produce quick default judgments or pretrial settlements. However, when considering only the cases that actually go to trial, state courts are the dominant forum for civil cases. For example, in Colorado, in 2002, there were 79 civil trials in federal court (41 jury and 38 non-jury), and 5,950 civil trials in state court (300 jury and 5,650 non-jury)⁷.

Who Can Be an Expert Witness?

The U.S. court system recognizes two types of witnesses: a lay witness and an expert witness. The lay witness (also called a “fact witness”) is the one who can testify regarding personal observations, but is not allowed to express his or her opinions. The expert witness is the one who can express opinions while testifying in court.

The expert is a person who, because of education and years of experience, can help the judge and jury to understand the technical aspects of the case. Furthermore, an expert witness is someone who is called upon to testify because of specialized knowledge or training that makes the expert knowledgeable about a particular subject matter. This person is generally used during a trial to prove or disprove a claim.

There are two important types of rules applicable to forensic work: “The Federal Rules of Civil Procedure,” which govern civil proceedings in the United States district courts, and “The Federal Rules of Evidence,” which govern the admission or exclusion of evidence in most proceedings in the United States courts. Rules 26 and 27 of “The Federal Rules of Civil Procedure” discuss disclosure, deposition, and requirements for an expert to produce the last four years of testimony in trial and deposition.

The most current version of Rule 702 of “The Federal Rules of Evidence,” which was originally adopted in 1975, was adopted in 2013. It governs the admission or exclusion of evidence in most proceedings in the United States courts and outlines procedures related to expert witnesses.

Rule 702 of “The Federal Rules of Evidence,” reads: “If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education may testify thereto in the form of an opinion or otherwise”⁸.

There are several expert witness qualifications that one must meet in order to be considered an expert witness in a trial or deposition. Although there is no set standard for being considered, determining

who is eligible to act as an expert witness usually requires an examination of the person's educational background, years of experience, and knowledge in the realm or field of the particular case being tried. Any combination of these expert witness qualifications will be taken under consideration when choosing witnesses for a case⁹. For each case, the judge decides whether a person is qualified to participate as an expert. A potential expert, despite education, extensive knowledge, and years of experience, may not be accepted by a judge.

Federal judges are known for their critical attitude and high expectations when choosing a potential expert. In the United States, there is no license that would give an expert a guarantee to be approved as an expert by a judge. A productive engineering expert has to know more than his or her own area of experience (engineering aspect); he or she also has to understand the overall legal framework (forensic aspect).

Rule 702 provides guidelines that expert witnesses are expected to understand. First, an expert witness must base testimony on "sufficient facts or data." As an expert witness, the expert has to convince the court that those facts provide a solid basis for the opinions given. An expert witness may not solely rely on instincts or experience in the industry. The expert cannot rely on unsupported statements that rest solely on the authority of the expert witness. This concept is known as an "ipse dixit," which means "he himself said it" in Latin.

An expert witness, who could be hired by the defense or the prosecution, must determine the set of facts and data that will support any conclusions reached. To guide an expert witness, Rule 702 adds that an expert's testimony must be "the product of reliable principles and methods." The expert should already be familiar with the principles and methods used by others in the field. An expert witness has to be prepared to reference and explain any commonly accepted regulations, standards, or guidelines that govern the industry. Finally, Rule 702 dictates that an expert has to have "applied the principles and methods reliably to the facts of the case"¹⁰.

The court may perceive an expert as objective when the expert has historically worked for both sides of cases: plaintiff and defense. Always working for defense attorneys or for plaintiff attorneys may suggest bias. If an expert chooses to always work for one side or the other, even for what seems to be good reasons, doing so may restrict the expert's choices of future work.

A good thing to remember as an expert witness is, as defense attorneys say, all defendants are entitled to a legal defense and are innocent until proven guilty. An expert does not resolve the right or wrong of a case. The expert brings his or her expertise and knowledge to the court, presents the analysis and findings, and then provides impartial testimony.

Standard of Admissibility of Experts and Their Opinions

In 1923, the federal court case *Frye vs. United States*¹¹ established the principle that the evidence presented by the experts must be based on the methods and scientific research accepted by experts in the given field. Since 1923, relevancy, in combination with the *Frye* test, was the dominant standard for determining admissibility of scientific evidence in federal courts. *Frye* is based on a 1923 federal court of appeals ruling involving the admissibility of polygraph evidence. Under *Frye*, the Court based the admissibility of testimony regarding novel scientific evidence on whether it has “gained general acceptance in the particular field in which it belongs.” The trial court gatekeeper’s role in this respect is typically described as conservative, thus helping to keep pseudoscience out of the courtroom by deferring to those in the field.

In 1993, the U.S. Supreme Court in *Daubert vs. Merrell Dow Pharmaceuticals*¹² established new rules for the admissibility of scientific opinion presented by experts in federal courts. The *Daubert* standard provides a rule of evidence regarding the admissibility of expert witness testimony during United States federal legal proceedings. Pursuant to this standard, a party may raise a *Daubert* motion, which is a special case of motion *in limine* raised before or during trial to exclude the presentation of unqualified evidence to the jury. The *Daubert* trilogy refers to the following three United States Supreme Court cases that articulated the *Daubert* standard:

- *Daubert vs. Merrell Dow Pharmaceuticals*, which held in 1993 that Rule 702 of “The Federal Rules of Evidence” did not incorporate the *Frye* “general acceptance” test as a basis for assessing the admissibility of scientific expert testimony, but that the rule incorporated a flexible reliability standard instead;
- *General Electric Co. vs. Joiner*, which held that a district court judge may exclude expert testimony when there are gaps between the evidence relied on by an expert and his or her conclusion — and that an abuse-of-discretion standard of review is the proper standard for appellate courts to use in reviewing a trial court’s decision of whether it should admit expert testimony;
- *Kumho Tire Co. vs. Carmichael*, which held in March 1999 that the judge’s gatekeeping function identified in *Daubert* applies to all expert testimony. In *Kumho*, the court continued to grant trial judges a great deal of discretion. The court generally permits trial judges to apply any useful factors that will assist the trial court in making a determination of reliability of proffered evidence as deemed appropriate in the particular case. The trial judge may use these factors whether they are identified in *Daubert* or elsewhere. The *Kumho* case also said that gatekeeper judges can use parts of *Daubert*, none of *Daubert*, or other appropriate tests to rule on admissibility of experts. Ultimately, *Kumho Tire* expands the gatekeeping role envisioned in *Daubert* to include all areas of expertise under Rule 702. It reiterates *Daubert*’s desire for flexibility in trial court decisions on both admissibility and the means of determining admissibility — and broadens the applicability of the abuse-of-discretion standard enunciated in *General Electric Co. v. Joiner*.

***Daubert* Decision:**

In *Daubert*, seven members of the court agreed on the following guidelines for admitting scientific expert testimony:

- Judge is gatekeeper: Under Rule 702, the task of “gatekeeping,” or assuring that scientific expert testimony truly proceeds from “scientific knowledge,” rests on the trial judge.
- Relevance and reliability: This requires the trial judge to ensure that the expert’s testimony is “relevant to the task at hand” and that it rests “on a reliable foundation.” (*Daubert vs. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579, 584-587). Concerns about expert testimony cannot be simply referred to the jury as a question of weight. Furthermore, the admissibility of expert testimony is governed by Rule 104(a), not Rule 104(b); thus, the judge must find it more likely than not that the expert’s methods are reliable and reliably applied to the facts at hand.
- Scientific knowledge = scientific method/methodology: A conclusion will qualify as scientific knowledge if the proponent can demonstrate that it is the product of sound scientific methodology derived from the scientific method.
- Factors relevant: The court defined “scientific methodology” as the process of formulating hypotheses and then conducting experiments to prove or falsify the hypothesis, and provided a nondispositive, nonexclusive, flexible set of general observations (i.e., not a “test”) that it considered relevant for establishing the validity of scientific testimony:
 1. Empirical testing: whether the theory or technique is falsifiable, refutable, and/or testable.
 2. Whether it has been subjected to peer review and publication.
 3. The known or potential error rate.
 4. The existence and maintenance of standards and controls concerning its operation.
 5. The degree to which the theory and technique is generally accepted by a relevant scientific community.

In 2000, Rule 702 of “The Federal Rules of Evidence” was amended in an attempt to codify and structure elements embodied in the “*Daubert* trilogy.” The rule then reads as follows: A witness who is qualified as an expert by knowledge, skill, experience, training, or education may testify in the form of an opinion or otherwise if:

- (a) The expert’s scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue;
- (b) The testimony is based on sufficient facts or data;
- (c) The testimony is the product of reliable principles and methods; and
- (d) The expert has reliably applied the principles and methods to the facts of the case.

(As amended April 17, 2000, eff. Dec. 1, 2000; Apr. 26, 2011, eff. Dec. 1, 2011.)

While some federal courts still rely on pre-2000 opinions in determining the scope of *Daubert* as a technical legal matter, any earlier judicial rulings that conflict with the language of *Daubert* are no longer a good precedent.

Although the *Daubert* standard is now the law in federal court and more than half of the states, the *Frye* standard remains the law in some jurisdictions, including California, Illinois, Maryland, New York, New Jersey, Pennsylvania, and Washington. On July 1, 2013, Florida passed a bill to adopt the *Daubert* standard as the law governing expert witness testimony. See Appendix A for full listing.

Although trial judges have always had the authority to exclude inappropriate testimony prior to *Daubert*, trial courts often preferred to let juries hear evidence proffered by both sides. Once certain evidence has been excluded by a *Daubert* motion because it fails to meet the relevancy and reliability standard, it will likely be challenged when introduced again in another trial. Even though a *Daubert* motion is not binding to other courts of law, if something was found untrustworthy by one court, other judges may choose to follow that precedent. Of course, a decision by the Court of Appeals that a piece of evidence is inadmissible under *Daubert* would be binding on district courts within that court's jurisdiction¹³.

Expert witnesses will hear the name *Daubert* frequently when speaking with attorneys. The expert and the attorneys with whom the expert works must anticipate legal challenges to the acceptability of investigations and analyses. *Daubert* standards and challenges guide what an expert witness must understand and how the expert should conduct the investigations, testing, and analyses¹⁴.

The judge can exclude some of the expert testimony (either plaintiff or defense expert) and allow some other part of the expert testimony. An expert witness needs to remember that if the judge strikes him or her as an expert in a *Daubert* proceeding, the expert will not be allowed to testify, and if the expert testifies regarding the liabilities aspect of the case, the attorney will lose the case because the attorney will not be allowed to hire another expert.

Expert Witness Record Requirements

Anyone who testifies as an expert witness is required to provide certain information regarding his or her qualifications, including education, training, and experience. This is provided to opposing counsel as part of the required witness disclosures — typically in the form of a resume or curriculum vitae. There are fairly few procedural rules in place that require experts to provide information beyond what is normally included in a resume or curriculum vitae.

Rule 26 of “The Federal Rules of Civil Procedure,” which governs civil proceedings in the United States district courts, requires an expert witness to provide a written report that includes all opinions, the basis for the opinions, and the information that was considered in arriving at those opinions. The report must include exhibits, such as photographs or diagrams, which will be used in trial to summarize or

support the opinions. Along with the basic qualifications of the witness, education, training, and experience, a listing of all publications authored by the witness for the preceding 10 years must also be provided.

The rule does not differentiate between material that may or may not be germane to the case at hand; all published material for the preceding 10 years must be listed. Copies of the publications or articles do not need to be attached, but a bibliography must be provided. If an article is published more than once, only one needs to be listed as long as the other publications of the same article are substantially the same.

The written report must include the amount paid for the expert's services in the case in question. In addition, the expert will be asked to provide a complete listing of all other cases in which the expert has testified (in trial and deposition as an expert) for the preceding four years. The listing should include case caption, docket number, jurisdiction, and retaining party. There is no requirement to provide case outcome or court verdict. However, in the expert deposition, additional information can be requested by the deposing attorney regarding all other cases the expert has worked on in the past and whether or not the expert testified. Typically, the expert has to comply with these requests, if the requests are not unreasonably burdensome. In revealing such information for ongoing cases where the expert has not yet been disclosed, the expert should not provide any detailed information beyond the case caption and retaining party without the permission of retaining counsel for that case.

A number of states echo the federal rules in their respective civil and criminal procedures. Generally, state courts will follow the federal rules if the issue is not specifically addressed locally. Some states require previous case listings that cover periods greater than those in Rule 26.

The expert should maintain a current and continuously updated list of trial and deposition appearances and publications authored. Failing to provide the information required by the disclosure rules could result in the expert not being allowed to testify.

Expert Investigation and Opinion

Expert witnesses are typically hired by both plaintiff and defendant to conduct an independent investigation for the hiring party. In most cases, the expert will perform inspection of the evidence and the accident site. However, not all cases require inspection, or sometimes inspection is not possible. In some cases, the expert will perform testing or participate in group testing.

After completion of steps such as inspection, testing, study, and analysis of the results and available documents, the expert provides a verbal report or prepares a written opinion, if required by the client or the court. In many cases, the expert's work will end with a verbal report to the client, insurance company, attorney, or property owner. In some cases, the expert will be asked to write a report to document his or her opinion so the file can be closed, and a decision on how to handle the claim can be finalized. Some cases, however, will continue, and the expert may be deposed and asked to testify in court.

As mentioned, in federal cases, all methods of expert activities and all the evidence gathered by the expert during the investigation must be presented in a written report. The report must include all the expert's opinions and the basis for such opinions. Federal courts' approach to "The Federal Rules of Evidence" (Rule 702) is so rigorous that a judge will not allow the expert to testify to the opinions and its basis if they are not outlined in the expert report.

Some state courts require a written report; others do not. Many state courts, such as California, Georgia, Louisiana, and Missouri, do not require a written report. State court rules, procedures, and practices are quite different from state to state. When writing a report, an expert witness should have a clear understanding of the state requirements regarding form and content of the forensic report.

Evidence, documents, and expert opinions are public, which means that before the parties are in court, they exchange each expert's complete file no later than 30 days (discovery cutoff day) before the start of the trial. After the discovery cutoff day, the judge may not permit any new evidence, new witnesses, or new expert opinion to be admitted.

Forensic engineers should use the "engineering method" in evaluating cases. This means they should look at all the evidence available to them, perform the evaluation, and then draw conclusions without proffering theories at the beginning of the investigation. This is an important aspect of dealing with *Daubert* challenges, and this is why *Kumho* is important. During the investigation, the experts should not predetermine "fault" before examining all facts and doing a complete analysis. An experienced expert may weigh the relative "importance" of the evidence during the investigation, based on his or her specific experience in the field, and make some judgments on how to proceed with the case.

Spoliation of Evidence

If an inspection is conducted, the expert must proceed with due care to avoid spoliation of the evidence, which is the intentional or negligent withholding, hiding, altering, or destroying of evidence relevant to a legal proceeding.

Spoliation of evidence is a term often used during the process of discovery. It happens when a document, information, or evidence that is required for discovery is destroyed or altered significantly, intentionally, or negligently by a person (attorney, expert witness, forensic engineer, or any other party). Spoliation of evidence concerns are also applicable to physical evidence inspected or tested by a forensic engineer.

When a crucial document or physical evidence is lost by spoliation, the courts may try to infer the original information by applying spoliation inference rule, which is a negative evidentiary inference. When applying the rule, courts will review the altered document with inference against the spoliator in favor of the opposing party.

The theory behind spoliation inference is that when a party has destroyed evidence, it shows that the party had consciousness of guilt or other reasons to avoid evidence. Hence, the court will conclude that the evidence was not in the spoliator's favor¹⁵. The doctrine of spoliation has become a subject of increased attention in the field of discovery as well as in the field of evidence. The doctrine is applied to evidence that a party destroys and that was critical of another party's ability to make its case in court. Spoliation of evidence is prohibited by the American Bar Association's "Model Rules of Professional Conduct," Rule 37 of "The Federal Rules of Civil Procedure," and Title 18 of the United States Code. Sanctions for spoliation may be preventive, punitive, or remedial in nature¹⁶.

Oftentimes, engineering experts are involved with evidence handling and storage. Whether they are a first responder to an accident scene or later in the legal process — when experts must be designated and an inspection is required — they must be intimately familiar with evidence handling standards and procedures. The engineering expert interacts with evidence by logging it and ensuring safe handling and storage; chain of custody usually starts with the engineer as the evidence-collecting entity¹⁷.

The general recommendation for the forensic engineer is to identify and label all evidence, keep careful notes with dates, do not lose or spoliage materials, report all findings objectively, specify units and conditions of measurement, and develop reports with the expectation that the expert will be questioned under cross-examination about every detail.

The engineer may again be involved when evidence must be tested or altered (and documented as such) to be in compliance with standards¹⁸. When evidence is going to be tested or potentially modified or destroyed, the forensic engineer should outline a test and inspection protocol, and all parties to litigation need to agree on such protocol. Furthermore, if practical, all parties to the litigation have to be invited to participate in the inspection and testing. However, sometimes it is not possible to notify ALL parties that may eventually be involved in the litigation. And this is not something that is the responsibility of the engineer – it is at the discretion of the party retaining the engineer. The engineer can advise the hiring party to invite other parties and circulate the protocol, but going beyond that could introduce a conflict of interest.

Expert in Court

Before the trial begins, the hiring attorney typically meets with the forensic engineer to discuss answers to potential questioning. This helps the expert and attorney be ready on everything the expert might come upon during the trial.

Before a potential expert is accepted by the judge as an expert witness, the potential expert is subjected to questioning in court so the judge can make a ruling on the admissibility of the expert. This process is known as *voir dire*. The attorney retaining the expert is attempting to pave the groundwork so the expert will be accepted by the judge. The lawyer of the opposing party tries to degrade the expert's

qualifications and hopes that the judge will strike the expert. This may be done in the presence of a jury. Only after admission by the judge is an expert witness allowed to testify.

Once the engineer is qualified as an expert in the case, the expert will be permitted to provide opinions regarding the subject at hand; however, if the court didn't recognize this engineer as an expert, the engineer will not be allowed to give any testimony. Both the prosecution and the defendant are allowed to attempt a tactic to recognize one's expertise in a particular field.

At the beginning of testimony, the expert delivers his or her expert opinion and answers the questions of the client's lawyer. During this presentation, called direct examination, which can take an hour up to a few days, the expert discusses the investigation, the evidence relied on, and what working methods were used to arrive at his or her conclusions. An example of an expert testifying in court is depicted in **Figure 3**.



Figure 3

Example of expert testifying in court.

After the direct examination, the expert would be subject to cross-examination by the opposing attorney. During this stage, the expert's entire work and opinion may be aggressively challenged. The expert should understand that his or her deposition may be used to confront and challenge the accuracy and truthfulness of the expert's opinion during the trial. Therefore, the expert needs to be very familiar with the deposition content. It is the cross-examination that can either "make" or "destroy" the expert. During the trial testimony (and deposition), the expert witness should not act as an advocate for one party or the other, but rather strictly be an advocate for his or her opinions and go into each case with an open mind. Furthermore, the expert testimony must be not only reliable and technically sound, but it also must be relevant to the case at hand.

The expert witness is a professional and has specialized knowledge in his or her field, which is why it is important to give the court a confident, straight answer that is easy to understand by the jurors. This will help the witness to prove that his or her testimony is credible. It will also help educate the court in determining and understanding difficult technical issues and the evidence. It is very important that the witness has confidence in his or her testimony and is clear in explaining technical aspects of the case so that the jury can comprehend and understand the testimony.

The jury carefully listens (it is hoped) to the testimony of an expert during the direct examination and cross-examination. If the expert is weak during this process — and explanations submitted by the expert are unclear, insufficient, or unreliable — then the jury will take it into account before reaching a final decision. It should be noted that the opposing party usually has his or her own expert, who typically has different opinions, and the expert is subject to the identical process of qualification, admission, examination, and cross-examination.

Conclusion

In conclusion, the forensic engineering expert should keep the following considerations in mind:

- All criminal defendants are entitled to a legal defense and are innocent until proven guilty. Plaintiffs in civil cases are entitled to their day in court but must prove their case — not unlike the prosecutors in criminal cases.
- A forensic engineer should be willing to offer objective analytical skills to attorneys on either side of any case.
- A forensic engineer does not resolve the right or wrong of a case. Instead, he or she brings expertise and knowledge to the court, presents the analysis and findings, and then provides impartial testimony.

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Appendix A

Rules of Evidence and Tests Applied by States

Summary Table State	Rule of Evidence	Test Applied
Alabama	Ala. R. Evid. Rule 702	<i>Daubert</i> for DNA; <i>Frye</i> for all else
Alaska	Alaska R. Evid. 702	<i>Daubert</i>
Arizona	Ariz. R. Evid. R. 702	<i>Frye</i>
Arkansas	A.R.E. 702	<i>Daubert</i>
California	Cal. Evid. Code §720	<i>Kelly/Frye</i>
Colorado	C.R.E. 702	<i>Daubert</i>
Connecticut	Conn. Code Evid. §7-2	<i>Daubert</i>
D.C.	N/A	<i>Frye</i>
Delaware	Del. Uniform R. Evid. 702	<i>Daubert</i>
Florida	Fla. Stat. § 90.702	<i>Frye</i>
Georgia	O.C.G.A. § 24-9-67.1	<i>Daubert</i>
Hawaii	Haw. Rev. Stat. Ann. § 702	Some <i>Daubert</i> factors
Idaho	I.R.E. Rule 702	<i>Daubert</i>
Illinois	There is no substantial equivalent to Fed. R. Evid. 702	<i>Frye</i>
Indiana	Ind. R. Evid. 702	<i>Daubert</i>
Iowa	Iowa R. Evid. 702	<i>Daubert</i>
Kansas	K.S.A. § 60-456	<i>Frye</i>
Kentucky	Ky. R. Evid. 702	<i>Daubert</i>
Louisiana	La. C.E. Art. 702	<i>Daubert</i>
Maine	Me. R. Evid. 702	Some <i>Daubert</i> factors
Maryland	Md. R. Evid. 5-702	<i>Frye</i>

Continued

Appendix A — Continued

Massachusetts	N/A	<i>Daubert</i>
Michigan	Mich. R. Evid. 702	<i>Daubert</i>
Minnesota	Minn. R. Evid. 702	<i>Frye/Mack</i>
Mississippi	Miss. R. Evid. Rule 702	<i>Daubert</i>
Missouri	Mo. Rev. Stat. § 490.065(1)	<i>Unique Test for Civil; Frye criminal</i>
Montana	Mont. R. Evid. 702	<i>Daubert</i>
Nebraska	Neb. Rev. Stat. § 27-702	<i>Daubert</i>
Nevada	Nev. Rev. Stat. Ann. §50.275	<i>Daubert “may provide persuasive authority”</i>
New Hampshire	N.H. R. Evid. 702	<i>Daubert (although NH cts. have applied Frye to DNA evidence)</i>
New Jersey	N.J. R. Evid. 702	<i>Daubert for toxic tort cases, certain medical causation cases, Frye other civil cases; Frye for criminal</i>
New Mexico	N.M. R.E. 11-702	<i>Daubert</i>
New York	N.Y. C.P.L.R. §4515	<i>Frye</i>
North Carolina	N.C. Gen. Stat. § 8C-1	<i>Some Daubert factors</i>
North Dakota	N.D. R. Evid. 702	<i>Frye</i>
Ohio	Ohio R. Evid. 702	<i>Daubert</i>
Oklahoma	12 Okl. St. § 2702	<i>Daubert</i>
Oregon	Oregon R. Evid. 40.410	<i>Applies a multi-factor test that includes the Daubert factors</i>
Pennsylvania	Penn. R. Evid. 702	<i>Frye</i>
Rhode Island	RI R. Evid. 702	<i>Daubert</i>
South Carolina	Rule 702, SCRE	<i>Daubert factors</i>
South Dakota	S.D. R. Evid. 702 (SDCL § 19-15-2)	<i>Daubert</i>
Tennessee	Tenn. R. Evid. Rule 702	<i>Daubert factors</i>
Texas	Tex. Evid. R. 702	<i>Some Daubert factors</i>
Utah	Utah R. Evid. Rule 702	<i>Unique Test</i>
Vermont	Vermont R. of Evid. 702	<i>Daubert</i>
Virginia	Va. Code Ann. §8.02-401.1	<i>Unique Test</i>
Washington	Wash. R. Evid. 702	<i>Frye</i>
West Virginia	W. Va. R. Evid. 702	<i>Daubert</i>
Wisconsin	Wis. Stat. Ann. § 907.02	<i>Unique test</i>
Wyoming	Wyo. R. Evid. 702	<i>Daubert</i>

Based on 50 State Survey of Applicability of *Daubert* by:
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