4.12.3.20. Recommendations

Investigations often require further effort, whether due to the receipt of additional information, a need for additional analyses or further testing, or other activity beyond the forensic engineer's initial scope of work identified during the investigation. Further effort may also be recommended due to limitations of the work that arise during the work. For whatever reason, if appropriate and acceptable to the client, interim reports may present recommendations for further investigation.

If appropriate and acceptable to the client, a final report unrelated to a continuance of the investigation may present recommendations on, for example, repair schemes or safety issues. In some instances, recommendations may be required, such as when cost estimates are also being prepared based upon recommended repair schemes.

4.12.3.21. Disclaimers and Limitations

It is typical to include a general disclaimer in any forensic engineering report, as the investigation will always be limited as described above. Although a report may be "final," additional information may come in from other sources for many reasons, including discovery proceedings, receipt of others' reports, or additional investigative activities. The forensic engineer must therefore reserve the right to amend the report to the extent dictated by the new information.

Additionally, if not stated elsewhere, state the limitations on the investigation activities themselves. These may include limitations due to funding, time, access, general scope restrictions, or any other reason. Generally, these will already have appeared in the section addressing the scope of work of the investigation.

The report should describe how it can be used, if that is not already described in the scope of work, should be included. The *National Practice Guidelines for the Preparation of Structural Engineering Reports for Buildings*, (CASE 2012), published by the Council of American Structural Engineers, contains several possible disclaimer statements, in addition to information on other report types.

4.12.3.22. Signature

The report should provide the name, affiliation, and title of those taking technical responsibility for the preparation and contents of the report. This may be done either at the beginning of the report on the title page or after the disclaimer. The report should bear professional engineering seals and signatures as required by law.

4.12.3.23. Photographs, Charts, Graphs, and Figures

Where not included in the main body of the report, separate sections at the end of the report may contain photographs, charts, graphs, and figures.

4.12.3.24. Appendices

Additional appendices may include other useful data such as photographs, hand sketches, field notes, miscellaneous correspondence, detailed test data, calculations and the qualifications of the individuals responsible for the investigation. While it can be convenient to place a copy of all referenced documents in the appendices, thus providing a single information source for later reference, the size and volume and ensuing difficulties with distribution and storage of attempting this may be prohibitive.

4.13. CONCLUSION

The task of performing a forensic investigation can be daunting and difficult; however, at times it is the most intellectually challenging endeavor in the field of engineering. The forensic engineer is often required to visually examine an object, component, or system that was physically damaged or mechanically compromised by natural or manmade effects. The extent of damage of the object, component, or system can range from a simple fracture or failure of a small component utilized in a medical device prototype which may result in injury to a single patient, to catastrophic collapse of a structure resulting in the loss of many lives. The forensic engineer's task of helping discover and describe the cause of the incident must be driven by ethical standards as exemplified in the ASCE's Code of Ethics.

The reputation of the forensic engineer rests on the care and judgment of the forensic engineer, and on the practicability of the forensic engineer's recommendations. Forensic engineers have a responsibility to meet the standard of care of forensic engineers in providing their services. A principal means of showing that level of care has been maintained is the creation and preservation of accurate records of the forensic engineer's investigation, and the production of a clear and responsive report.

4.14. REFERENCES

ANSI Essential Requirements: Due Process Requirements for American National Standards,(2012), American National Standards Institute (ANSI), Washington, DC.

ASCE/SEI 41-06, Seismic Rehabilitation of Existing Buildings, (2006) American Society of Civil Engineers, Reston, VA.

ASTM International, West Conshohocken, PA.

Council of American Structural Engineers (CASE) and American Consulting Engineers Council (ACEC), (2012), A Guideline Addressing the Preparation of Structural Engineering Reports for Buildings, CASE 962-A, Washington, DC.

Chapter 5
Ethics

5.1. INTRODUCTION

This chapter on ethics could—if brevity were its only goal—begin and end with a simple recitation of the ASCE *Code of Ethics*, including Canon 3.c which specifically applies to expert witness services: "Engineers, when serving as expert witnesses, shall express an engineering opinion only when it is founded upon adequate knowledge of the facts, upon a background of technical competence, and upon honest conviction" (ASCE 2006) However, this simple canon lacks the shades of nuance that typically enter the discussion whenever engineers consider whether their (or others') work has crossed a line from ethical to unethical practice or behavior. Often, the question of whether an action—or even a single answer to a question—falls within the ethical practice of forensic engineering can only really be asked within the context in which the action is taken. For this reason, this chapter will take up the topic of ethics in a range of contexts, starting with situations where there is likely to be little or no debate, and escalating the examination of ethical issues through the dispute resolution process. Topics span the range from taking on an assignment, up to and including providing testimony in the courtroom, where situational ethics is most likely controversial.

The entire ASCE Code of Ethics applies to all ASCE members, including those members providing forensic engineering services. Forensic engineer members of ASCE are subject to the requirements of the entire Code of Ethics, not just Canon 3.c. which specifically addresses members' obligations as expert witnesses The following chapter sections will explore how the Code of Ethics applies to each aspect of the practice of forensic engineering.

Because questions of ethics can be complicated by context, this chapter will introduce a story about one interaction between engineers who found themselves on opposing sides of an investigation in which a legal dispute seemed inevitable. Aspects of this story will be introduced as they pertain to the sections below.

5.2. THE ASCE CODE OF ETHICS

The ASCE Code of Ethics includes Fundamental Principles, Fundamental Canons, and Guidelines to Practice under the Fundamental Canons of Ethics (ASCE 2006). The Appendix of these *Guidelines* contains the full Code, including guidelines to practice. The reader is directed to the Appendix for the complete language of the Code. The following sections address some of the activities of a forensic engineer where ASCE Code of Ethics principles and canons apply.

5.3. SOLICITATION OF WORK, FIRST CONTACT, PROJECT ASSIGNMENT, AND CONTRACT

Ethical considerations apply first when an engineer is contemplating whether to take an assignment. For simplicity, consider that the initial contact has been made by a party with an interest in knowing why something failed. Perhaps it is the owner of a building where a section of structure has deformed excessively or has otherwise performed in an unanticipated or undesired manner. It may be a contractor who was called back because of a problem that has developed in a completed project. Further, although there is no mention at this point that the investigation may lead to a legal dispute, as a practicing forensic engineer, the contacted party should assume it might. Nevertheless, the forensic engineer may be retained initially to explain what happened and why. Perhaps once these questions have been answered the engineer might be asked to participate in the resolution of a dispute or asked how to perform repairs. Design of repairs is not the subject of these *Guidelines*. However, for an investigation that precedes a dispute, the scope of services included in the agreement between the client and the forensic engineer must reflect what is expected in the initial contract. Further, it may be appropriate and ethical for the engineer to lay out in the agreement, or in a separate letter, the expected, anticipated, or typical scope of services, from investigation through testimony or settlement. If this is not done initially, some clients that are unfamiliar with the process may see the increasing scope of engineering services as "bait and switch" on the part of the engineer.

Consider the following example. Engineer "Q" is asked to investigate the collapse of a building under heavy snow. The assignment comes from one of Q's regular clients, in this case, the insurance carrier that covers the building. Q is later approached by a second party. Explaining that he is already involved, Q suggests the second party call a colleague in a different firm, engineer "R," whom he understands has a strong background in this building type. The second party does so, but R states that he would never take a job that might place him on the opposing side against the designers of such a building. In this case, R has revealed a bias. While this may seem like a possible ethical breach, it may simply be a business decision. If R has worked extensively for designers and contractors specializing in buildings of this type, he may not wish to get involved in an investigation where he might find fault in the work of a former client or associate. In and of itself, R's attitude is not unethical so long as it does not extend to the technical aspects of his work.

5.3.1. Solicitation of Work

In considering how ethics applies to solicitation of forensic engineering assignments, it is appropriate to assume, unless notified to the contrary, that a failure investigation may not lead to a lawsuit. However, solicitations by ASCE

member engineers, including those offering forensic engineering services, must conform to the Code of Ethics, and may also be proscribed or limited by state statutes or regulations.

State registration boards generally have rules regarding allowable forms of solicitation of work by professional engineers. Codes of ethics for professional associations also address this topic. Generally, advertisements placed in phone books, trade journals, or professional society publications are appropriate if the information is professionally and truthfully presented. Some engineering firms advertise in newspapers and on radio and television. The medium of the solicitation is not as important as the content when ethical aspects are being measured. The subject of advertisement of forensic engineering services is included in Chapter 7, "The Business of Forensic Engineering."

The ethical principle and canon that most closely define what is or is not ethical in advertising relate to honesty, objectivity, and impartiality. In the ASCE Code, Fundamental Principle 2 states that "(E)ngineers uphold and advance the integrity, honor and dignity of the engineering profession by," among other things, "being honest and impartial." Canon 3 states that, "Engineers shall issue public statements only in an objective and truthful manner." By its nature, advertising is a form of biased speech, but anything included in an ad must be true. At a minimum, advertising copy should not offer practices that fall outside the principles and canons of the ASCE Code.

As an example of a state statute governing public statements and solicitation of work by licensed professional engineers, the Commonwealth of Massachusetts (CMR 2012) includes the following:

> *4.04: Public Statements*
>
> *Registrants shall issue public statements only in an objective and truthful manner.*
>
> *Registrants shall be objective and truthful in professional reports, statements or testimony.*
>
> *Registrants may express publicly a professional opinion on technical subjects only when that opinion is founded upon adequate knowledge of the facts and competence in the subject matter.*
>
> *Registrants shall issue no statements, criticisms or arguments on technical matters which are inspired or paid for by interested parties unless the registrants have prefaced their comments by explicitly identifying the interested parties on whose behalf they are speaking and by revealing the existence of any interest the registrants may have in the matters.*

4.06: Solicitation

Registrants shall avoid improper solicitation of professional employment.

Registrants shall not falsify or permit misrepresentation of their own or their associates' academic or professional qualifications. They shall not misrepresent or exaggerate their degree of responsibility in or for the subject matter of prior assignments. Brochures or other presentations incident to the solicitation of employment shall not misrepresent pertinent facts concerning employers, employees, associates, joint ventures or past accomplishments.

Registrants shall not offer, give, solicit or receive, either directly or indirectly, any commission, or gift, or other valuable consideration in order to secure work, and shall not make any political contribution intended to influence the award of a contract.

Texas State law has similar wording. In considering the kinds of rhetoric that clearly fall outside these rules, the offer to perform a "free assessment of their case" may violate the third rule on solicitation because it offers to provide a valuable service (something for which an engineer might typically expect to be paid) in exchange simply for the opportunity to be hired. Further, it is not clear how an evaluation can be made to a degree sufficient to tell a potential client that they may have a case without actually performing the preliminary engineering work necessary for an initial understanding of a failure or problem. By offering to perform for free as much engineering as might be necessary to make that determination implies that a decision about what happened, why, and who is at fault can be made before an adequate investigation has been made. If the investigation begins with a commitment to a specific answer, that investigation clearly represents work that is no longer impartial, objective, or unbiased.

In the example story, R called the building manufacturer, explained his experience with pre-engineered steel buildings, and was retained by the manufacturer to investigate the collapse. This example includes no specific knowledge of what passed between R and his new clients, nor what he promised them. R initiated the contact, and the building manufacturer retained him.

5.3.2 Initial Client Contact

The initial client contact will most frequently occur by telephone. Whether the client calls the engineer, or the engineer approaches the client, the first interaction is important in establishing the ground rules for the engagement. If the potential client already knows that a legal dispute is coming, he may be

shopping for legal help as well as technical help. With no knowledge of how an engineer's and an attorney's roles differ, the client may ask up front whether the engineer can prove something. In this case, the engineer is, in effect, being asked whether the engineer is willing to sign on to a case and take a side, even before the engineer knows the facts. It is extremely important to state that engineers cannot be advocates for a client's case, or have an opinion concerning the technical aspects of the dispute, unless and until they perform an appropriately thorough and complete investigation. However, engineers can promise they can and will conduct the appropriate investigation to help determine what happened and why. The engineers will then explain their results in a way that will allow the client and legal counsel to make their best case, or to help them settle their dispute as early as possible if the evidence indicates that is the best they can do. Any response that implies a willingness to adopt a position on the cause of a failure or an attribution of responsibility without adequate investigation or the application of valid and reliable method may mislead the client into thinking that the engineer can be an advocate for the case without an adequate investigation, or independent of the technical evidence, either of which would be unethical.

The forensic engineer should have ethical objectives and principles in mind, as well as business and technical considerations, during any initial contact. The forensic engineer's attitude and tone should convey objectivity, competence, thoroughness, professionalism, financial integrity, and honesty.

If the work is within the forensic engineer's expertise, and the potential assignment meets other requirements of the forensic engineer's business, the engineer will naturally want to provide the services. However, this goal should not control the direction or outcome of the contact. Nor should the discussion focus on ways that the expert could support the client's position, because it would not be possible without an investigation for the engineer to make this conclusion. It certainly is ethical for the expert to assist the client in defining the scope of the investigation, and because the purpose of an expert witness is to assist the trier of fact in answering technical questions where the trier of fact lacks the particular knowledge the expert possesses, it is also ethical and appropriate that the expert witness present as testimony the factual, valid, and reliable technical opinions in the best light for his client. Early in the contact, the engineer should strive to establish whether the topic is in the engineer's field and that the client is willing to authorize a thorough, objective investigation. The client should also be willing to concede that the decision to provide testimony in regard to the findings will occur after the investigation reaches its conclusion. Compensation for the services should be discussed, especially the need to affirm that the client is willing to pay for the investigation even though it may conclude that the client may not prevail in court. Any potential conflicts of interest should be disclosed and a discussion of their impact should occur prior to setting the final terms of the contract.

The forensic engineer should also obtain background information such as:

- What happened to occasion this call?
- How did the caller obtain the engineer's name?
- What are the circumstances surrounding the failure?
- What is the relationship of the caller to the failure?
- What are all the perceived technical issues, and are they totally within the forensic engineer's expertise?
- Does the caller plan to engage other forensic engineers in the same field? In other fields? Should the forensic engineer recommend that other expertise be brought in?
- What level of effort is expected, and what budgetary or schedule limitations is the caller faced with?
- Has the caller considered the terms of engagement?
- How and when will the engagement get started?
- When will preliminary results of the investigation be needed?
- If an attorney makes the call, will the attorney or his client be signing the contract and paying the bills? It is often preferable for a forensic engineer to contract directly with an attorney to protect the confidentiality of the engineer's work. Where the engineer is contracted with a party, the contract should be clear about the accessibility of the engineer's files and the engineer's duty to the general public.
- What would the caller like to have to further evaluate the engineer's credentials?

The initial contact should also determine the next step. Should the engineer send a resume, return a confirming letter, be available for an interview, become familiar with some of the case circumstances before further negotiations, propose terms of a contract, or schedule a meeting to obtain more details of the case and discuss qualifications, scope, schedule, and any conflicts? The State of California requires professional engineers to provide their services with a written agreement spelling out a few minimal issues (California 2012). This includes engineers providing forensic services. During the initial communication, the engineer's ethical patterns, whether good or bad, are likely demonstrated here and normally carry through the rest of the engagement.

One problem in taking an initial call stems from the practice, among some attorneys, of telling prospective consultants things about a case that are privileged or are not already a part of the public record. Once these have been revealed, the consultants may be disqualified from participating in the investigation even though the caller has no intention of retaining their services. This technique may allow an attorney or other client the opportunity to exclude competent consultants, thereby preventing other interested parties from retaining them. In a situation where you receive a call regarding a failure, it may be extremely important to state right away that you should not be told anything

that is not public information, and that regardless of what you are told, you reserve the right to work on the case for any interested party.

5.3.3. Conflicts of Interest

Before taking any commission, it is important to rule out the possibility of a conflict of interest. If a forensic engineer works for a large firm, a colleague employee may already have been approached concerning the project. Further, any past relationships with any of the interested parties should be explored and revealed. It is typically essential to ask first for the names of all interested parties so you can determine whether there may be a potential conflict, either real or perceived.

Conflicts of interest fall into two categories, actual conflicts and the appearance of conflict. An actual conflict occurs if, related to the current case, there have been prior involvements of forensic engineers (or anyone in the same firm) with any of the other parties on a professional, personal, or institutional basis. An example of an *appearance* of conflict occurs when the engineer has had previous involvement with one of the parties on unrelated projects or has rendered apparently dissimilar positions in prior similar cases or in publications. In either case, the specific facts of the prior and current involvements determine whether the conflict is real. Apparent conflicts can be dealt with fairly easily and are not a basis for discontinuing the engagement. Bias may be claimed due to prior involvements, and may exist, but does not make an engineer unethical. Failure to set the bias aside in favor of objective evaluation of the case at hand is unethical.

Actual conflicts and insoluble appearances of conflict of interest occur when there exists any influence, loyalty, interest, or other concern capable of compromising the forensic engineer's ability to provide an objective and unbiased professional opinion. ASCE (2000) defines a conflict of interest as "any activity, transaction, relationship, service, or consideration that is, or appears to be, contrary to the individual's professional responsibilities or in which the interests of the individual have the potential to be placed above [the individual's] professional responsibilities." ASCE (2000) further states that members are expected to avoid any relationship, influence, or activity that might be perceived to or actually impair their ability to make objective and fair decisions.

Three degrees of conflict of interest for expert witnesses are implicitly defined in the American Bar Association (ABA) Code of Professional Responsibility (Johnson 1991). The ABA's first degree, or *actual conflict of interest*, pertains to interests that are certain to adversely affect the opinion of the forensic engineer. The ABA's second degree is *latent conflict of interest*. These are interests that may have a reasonable chance of affecting opinions of the engineer. The ABA's third degree of conflict of interest is termed *potential*