Recommendation Regarding Mitigation of Electromagnetic Field (EMF) Exposure

Case No. 08-4

Facts:

A developer retains a contractor to design and build a residential subdivision near several high-voltage power lines. Engineer A, an electrical engineer employed by the contractor, recommends to the contractor and developer to include a protective steel mesh in the homes to be built to mitigate occupants' exposure to interior levels of low-frequency electromagnetic fields (EMF). While Engineer A understands that in the U.S. there are no widely-accepted health and safety standards limiting occupational or residential exposure to 60-Hz EMF, he is aware of and concerned about certain scientific research concerning possible causal links between childhood leukemia and exposure to low-frequency EMF from power lines. Because of the added cost associated with the recommendation, the developer refuses to approve the recommendation. Contractor directs Engineer A to proceed in accordance with the developer's decision.

Question:

What are Engineer A's ethical obligations under the circumstances?

References:

Section I.1	-	*NSPE Code of Ethics:*	*Engineers, in the fulfillment of their professional duties, shall hold paramount the safety, health, and welfare of the public.*
Section II.1	-	*NSPE Code of Ethics:*	*Engineers shall hold paramount the safety, health, and welfare of the public.*
Section II.4	-	*NSPE Code of Ethics:*	*Engineers shall act for each employer or client as faithful agents or trustees.*

Discussion:

Recognition of risk and its proper management are among the fundamental challenges professional engineers encounter in their professional practice. Engineers and their employers in industry, private practice, construction, and other areas face a variety of difficult decisions and choices in their relations with clients, employees, and members of the public and must balance a variety of considerations.

Engineers and their employers face the potential for liability exposure for a variety of risks, including the risk of loss of life, bodily injury, or damage to property. Sometimes the risks involve a combination of these exposures, while at other times, there is no clear engineering or scientific consensus of the nature or degree of risk exposure. The facts in the present case appear to involve a consideration of these issues.

The NSPE Board of Ethical Review has considered the issue of risk management and its ramifications in more imminent circumstances than the present case. In BER Case No. 89-7, Engineer A was retained to investigate the structural integrity of a 60-year-old occupied apartment building, which his client was planning to sell. Under the terms of the agreement with the client, the structural report written by Engineer A was to remain confidential. Engineer A performed several structural tests on the building and determined that the building was structurally sound. However, during the course of providing services, the client confided in Engineer A and informed him that the building contained deficiencies in the electrical and mechanical systems, which violated applicable codes and standards. While Engineer A was not an electrical or mechanical engineer, he did realize those deficiencies could cause injury to the occupants of the building and so informed the client. However, in view of the terms of the agreement, Engineer A did not report the safety violations to any third party. In determining that it was unethical for Engineer A not to report the safety violations to the appropriate public authorities, the Board of Ethical Review first noted that the facts presented raised a conflict between two basic ethical obligations of an engineer: the obligation of the engineer to be faithful to the client and not to disclose confidential information concerning the business affairs of a client without that client's consent and the obligation of the engineer to hold paramount the public health and safety. In its review, the Board noted that NSPE Code Section III.4 can be clearly understood to mean that an engineer has an ethical obligation not to disclose confidential information concerning the business affairs of any present client without the consent of that client. That provision makes no specific exception to the language. For example, the drafters of the NSPE Code could have provided exceptional circumstances, where such confidential information could be disclosed by the engineer; however, no such provisions have been included.

However, after noting the significance of NSPE Code Section III.4, the Board stated: "We believe under the facts, Code Section II.1.c. should be read in conjunction with Code Section II.1.a. The latter section refers to the primary obligation of the engineer to protect the safety, health, property and welfare of the public. The obligation of the engineer to refrain from revealing confidential information, data, facts concerning the business affairs of the client without consent of the client is a significant ethical obligation. We further believe that matters of public health and safety must take precedence. The NSPE Code of Ethics is clear on this point. Code Section I.1. employs the word 'paramount' to describe the obligation of the engineer with respect to the public health and safety.… We believe Engineer A could have taken other steps to address the situation, not the least of which was his paramount professional obligation to notify the appropriate authority if his professional judgment is overruled under circumstances where the safety of the public is endangered. Instead, Engineer A…'went along' and proceeded with the work on behalf of the client."

Later, BER Case No. 98-9 involved Engineer A, a structural designer of a large commercial building. After construction was complete and the building was occupied, he found an omission in his calculations that could result in its collapse under severe, but not unusual, wind conditions. Engineer A advised the architect and client of the problem. After consultation with the architect, the client, and the city engineer (Engineer B), all agreed upon remedial construction, which could be accomplished over the next few months. At the insistence of both the client and architect, both Engineer A and Engineer B agreed that the situation would be kept secret, with construction accomplished during the evening hours when the building was unoccupied. A storm monitoring and contingency evacuation plan developed by the architect would be used to manage the risk until remediation efforts were completed. In finding that (1) it was not ethical for the structural engineer (Engineer A) to comply with the client's and the architect's desire for secrecy and (2) it was not ethical for the Engineer B, the city engineer, to maintain the secrecy, the Board noted that Engineer A's actions in promptly reporting his findings to the client and providing a corrective design were both ethical and commendable. However, withholding critical information from the building's occupants, whose safety is compromised during the period of several months needed to correct the structural deficiency, is not a valid alternative for the conditions presented. It would seem that Engineer A should have informed the client and the architect that, while he has an obligation of confidentiality to them as clients, he has the paramount obligation to see that the public is protected. He should have stated that he must inform the appropriate authorities unless they immediately develop and carry out a plan to do so. Such a plan, developed in consultation with a public relations firm and legal advice, could have avoided panic and sensational media hype, while protecting the public. The argument can be made that Engineer B, the city engineer, could be considered an "appropriate authority." However, given the magnitude of the situation, it was incumbent for Engineer A, as well as Engineer B, to vigorously advocate actions necessary for public protection and notification to higher authorities. By not doing so, both engineers failed to hold paramount the obligation for public safety. Engineer A could have taken other steps to address the situation, not the least of which was his paramount professional obligation to notify the appropriate authority if his professional judgment is overruled under circumstances where the safety of the public is endangered. This responsibility is outlined in NSPE Code Section II.1.e. Instead, Engineer A "went along" and proceeded with the work on behalf of the client. His conduct cannot be condoned under the NSPE Code.

Regarding the present case, the Board believes the facts and circumstances are significantly different and distinguishable from the facts in both BER Case Nos. 89-7 or 98-9. While the circumstances in BER Case Nos. 89-7 and 98-9 involved clear violations of basic engineering standards along with the potential for the risk of imminent death, bodily injury, and property damage, the facts in the present case involve speculative and debatable issues for which no consensus exists within the engineering profession or the scientific literature. The level of risks involved in this case do not reach a level where the

danger to the public is so imminent and dire that Engineer A is compelled to elevate his concern beyond the point indicated under the facts.

Conclusion:

The issue of residential EMF exposure due to high-voltage power lines is an example of a perceived health risk for which no scientific consensus currently exists on the nature and degree of harmful effect, nor a widely-accepted engineering standard for EMF exposure levels and mitigation. With this in mind, Engineer A has fulfilled his ethical obligation by raising his concerns with his employer, the contractor, and also the developer. Engineer A may wish to document his concerns in writing for the record, but unless there is demonstrated evidence that there are special risks involved, Engineer A may accept the client's decision and continue to perform his services as an employee of the contractor. If Engineer A continues to have concerns regarding this matter, Engineer A may decline further work on the project.

Board of Ethical Review:
Curtis A. Beck, P.E., F.NSPE
Mark H. Dubbin, P.E., NSPE
Robert C. Gibson, P.E., F.NSPE
James D. Lesikar II, Ph.D., P.E., F.NSPE
Monte L. Phillips, Ph.D., P.E., F.NSPE
Mumtaz A. Usmen, Ph.D., P.E., F.NSPE
Michael L. Shirley, P.E., F.NSPE, Chair

NOTE: The NSPE Board of Ethical Review considers ethical cases involving either real or hypothetical matters submitted to it from NSPE members, other engineers, public officials, and members of the public. The BER reviews each case in the context of the NSPE Code and earlier BER opinions. The facts contained in each case do not necessarily represent all of the pertinent facts submitted to or reviewed by the BER.

Each opinion is intended as guidance to individual practicing engineers, students, and the public. In regard to the question of application of the NSPE Code to engineering organizations (e.g., corporations, partnerships, sole proprietorships, government agencies, and university engineering departments), the specific business form or type should not negate nor detract from the conformance of individuals to the NSPE Code. The NSPE Code deals with professional services, which must be performed by real persons. Real persons in turn establish and implement policies within business structures.