

## Quality of Products—Defective Chips

### Case No. 08-2

#### **Facts:**

Engineer A is an electrical engineer working in quality control at a computer chip plant. Engineer A's staff generally identifies defects in manufactured chips at a rate of 1 in 150. The general industry practice is for defective chips to be repaired or destroyed. Engineer B, Engineer A's supervisor, recently announced that defective chips are to be destroyed, because it is more expensive to repair a defective chip than it is to make a new chip. Engineer A proceeds on the basis of Engineer B's instructions. A few months later, Engineer B informs Engineer A that Engineer A's quality control staff is rejecting too many chips, which is having an effect on overall plant output and, ultimately, company profitability. Engineer B advises Engineer A's staff to allow a higher percentage of chips to pass through quality control. Engineer B notes that in the end, these issues can be best handled under the company's warranty policy under which the company agrees to replace defective chips based upon customer complaints. Engineer A has concerns as to whether this approach is in the best interest of the company or its clients.

#### **Question:**

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

#### **References:**

- Section I.6. - *NSPE Code of Ethics: Engineers, in the fulfillment of their professional duties, shall conduct themselves honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and usefulness of the profession.*
- Section II.4. - *NSPE Code of Ethics: Engineers shall act for each employer or client as faithful agents or trustees.*
- Section II.3.a. - *NSPE Code of Ethics: Engineers shall be objective and truthful in professional reports, statements, or testimony. They shall include all relevant and pertinent information in such reports, statements, or testimony, which should bear the date indicating when it was current.*
- Section II.1.b. - *NSPE Code of Ethics: Engineers shall approve only those engineering documents that are in conformity with applicable standards.*

#### **Discussion:**

Engineers play a critical role in connection with the quality of products and materials within their responsibility and control. Engineers employed in industry often are required to balance a variety of considerations in order to accomplish their goals and objectives. Among these considerations are time schedules, quality control/quality assurance procedures, workforce issues, budgets, and other factors.

A good example of the dilemmas faced by an engineer and an analogous situation to the one presented to the NSPE Board of Ethical Review is in BER Case No. 88-5. In that case, Engineer A was employed by a computer manufacturing company. She was responsible for the design of certain computer equipment several years ago. Engineer A signed off on the drawings for the equipment and although Engineer A's design was properly prepared, the equipment manufacturing process was faulty and, as a result, the equipment became too costly and suffered mechanical breakdown. The manufacturing division made a number of recommended modifications to her design that it believed would help reduce costs in the manufacturing process. Engineer A's analysis of the manufacturing division's recommendations revealed that they would reduce the reliability of the product and greatly increase the downstream costs to the company through warranty claims. Engineer A's supervisor, who was not an engineer, asked Engineer A to sign off on the changes for the new computer equipment. There was nothing to suggest that the equipment would pose a danger to the public health and safety. Engineer A raised her concerns to her supervisor but nevertheless agreed to sign off on the changes without further protest. In deciding that Engineer A did not fulfill her ethical obligation by signing off on the changes without further action, the Board determined that the case raised a fundamental issue concerning the professional integrity of engineers and the ethical obligations engineers owe to their employers, clients, and others. A key question for the Board was, "How far must engineers go in stating concerns in matters which directly involve their judgment as professional engineers but do not directly impact upon the public health and safety?" The Board noted that it was clear from the NSPE Code of Ethics and from previous Board of Ethical Review opinions that in matters involving the public health and safety, the engineer has an ethical obligation to "stand firm" and take action to protect the interest of the public. The NSPE Code is replete with provisions which reinforce the view that engineers have a fundamental obligation to the public welfare and if their judgment is overruled under circumstances which endanger the public, the engineer should notify employers, clients, or such other authority as may be appropriate.

This point was most recently illustrated in BER Case No. 84-5. There, a client planned a project and hired Engineer X to furnish complete engineering services for the project. Because of the potentially dangerous nature of implementing the design during the construction phase, Engineer X recommended to the client that a full-time, on-site representative be hired for the project. After reviewing the completed project plans and costs, the client indicated to Engineer X that the project would be too costly if such a representative were hired. Engineer X proceeded with work on the project. In ruling that it was unethical for Engineer X to proceed with work on the project knowing that the client would not agree to hire a full-time, on-site representative, the Board noted that "Engineer X made a professional judgment based upon education, expertise, and experience that a full-time, on-site project representative would be necessary during the construction phase of the project because of the dangerous nature of the project. This was presumably a determination which was made after a careful and thorough weighing

of the costs of the full-time, on-site representative versus the benefits of having such a representative. It may very well be that the state engineering licensure board's rules of professional conduct may not specifically require Engineer X to make the determination that was made; however, it appears that the NSPE Code of Ethics does contain provisions which address this point." The Board concluded by noting, "When the client indicated that the project would be too costly if a full-time, on-site project representative was hired, Engineer X acceded to the client's wishes and proceeded with the work despite the fact that Engineer X believed that to proceed without an on-site project representative would be potentially dangerous. Engineer X did not force the issue or insist that a project representative be hired. Instead, Engineer X "went along" without dissent or comment. If Engineer X's ethical concerns were real, which we presume they were, Engineer X should have insisted that the client hire the on-site project representative or refuse to continue to work on the project. While this might appear to be a harsh result, we think that such an approach is the only one that would be consistent with the NSPE Code of Ethics."

As noted earlier, the ethical concerns involved in BER Case No. 84-5 directly related to the engineer's ethical obligation to protect the public health and safety. In BER Case No. 88-5, much like the present case, the ethical concern was less a matter of the protection of the public health and safety and more a matter of engineering judgment which is being overruled by her supervisor on the basis of nonengineering criteria.

In addition, in BER Case No. 88-5, the Board also noted that the NSPE Code makes it clear that the engineer has an ethical obligation to act in professional matters for her employer as a "faithful agent and trustee." Loyalty is a double-edged concept and also involves an engineer's obligation to "stand firm" in a difference of opinion with an employer on a matter that has a direct impact upon the public health and safety. Specifically, while it is clear that the engineer should act consistently with the interests of her employer and not act disloyally by impugning the motives of her employer in any way, we also think it is vitally important for an engineer whose professional judgment is overruled to clearly explain the reasons for her position and vigorously engage those persons who disagree with her judgments in a serious debate as to the technical issues involved.

In the present case, Engineer A was asked to participate in actions he believed, based upon his technical knowledge, would not be in the long-term interests of his employer. Since he possessed the engineering expertise, experience, and background to make these determinations and was presumably hired to provide that input to the company, it would seem that he would clearly be performing as a "faithful agent and trustee" if he were to make his concerns known to those in management who were most directly concerned with the long-term interests of the company. As the Board said in BER Case No. 88-5, "We cannot see how an engineer could be said to be acting as a 'faithful agent or trustee' by silently assenting to a course of action which will have serious long-term ramifications for an employer."

Engineers should be vocal on technical issues in which they possess knowledge and should not merely serve as a “rubber stamp” on engineering matters. As the Board has noted before, NSPE Code Section II.4. should not be used as a “crutch” for engineers to avoid confronting difficult professional decisions, but instead as a basis for providing their employers and clients with critical engineering judgments and determinations.

Engineer A should express his concerns to Engineer B with the expectation that Engineer B will convey these concerns to the upper level of management. Engineer A should request that Engineer B inform him of management’s response.

Assuming Engineer B fulfills Engineer A’s expectation and reports back to him, Engineer A has fulfilled his ethical obligation regardless of management’s decision.

Should Engineer B decline to convey Engineer A’s concerns to management, it would be ethically permissible for Engineer A to express his concerns directly to management.

**Conclusion:**

Engineer A should make his concerns known to those in management who were most directly concerned with the long-term interests of the company.

**Board of Ethical Review:**

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