

Obligation Earth



Over the years, sustainable design has been gaining converts within the engineering community. Now, a new provision in the NSPE Code of Ethics says engineers have a duty to use sustainable design to protect the environment for future generations.

BY JANE BYRNE

Protection of the environment hasn't always been specified as a top priority within professional engineering. Recently, however, NSPE asserted that PEs have an ethical obligation to protect the environment through the use of sustainable design principles. The perceived importance of sustainable design in engineering is growing within other areas of the profession, as well.

"More and more, engineers and engineering societies are recognizing that sustainability is part of ethical obligations for engineers," says Joseph Herkert, P.E., director of the Science, Technology, and Society Program at North Carolina State University.

Herkert, editor of *Social, Ethical and Policy Implications of Engineering: Selected Readings*, feels that the public safety, health, and welfare depend on sustainability in both environmental and societal contexts. He says that today, more people and organizations within the engineering community are recognizing the importance of sustainability.

In January, NSPE added a provision to its Code of Ethics on the professional engineer's duty to protect the environment. The new provision states that engineers

are obligated to follow the principles of sustainable development, which is defined in a footnote to the Code.

The new provision is listed in the Code under the engineer's professional obligation to "strive to serve the public interest." While PEs have always had an obligation to serve the public interest, this obligation has broadened within the last 50 years to include protection of the environment for future generations, says Louis Guy Jr., P.E., F.NSPE, a member of the Board of Ethical Review.

Over the last 50 years, many events have signaled a growing awareness of environmental issues: environmental engineering education began; the Clean Water Act, Safe Drinking Water Act, and Clean Air Act became law; the Environmental Protection Agency was formed; and the first Earth Day was held.

"So I don't think this is an abrupt change," says Guy. "It's more a formal recognition of what had already been incorporated in our national values and in the values that engineers use in their projects—both in design and in operations."

NSPE President-Elect Robert Miller III, P.E., says that the new provision in the Code of Ethics sends a message to all

professional engineers that sustainability is an important issue, that engineers care about the legacy they're leaving.

However, he says, it is difficult to say to what extent engineers should carry these environmental considerations. "You can't legislate all the decisions." The point is that engineers need to consider sustainability and try to make a difference when they can, he says.

Guy agrees. Professional engineers can meet their ethical responsibility to the environment in simple ways, such as taking things like irreplaceable resources into account when planning projects, he says.

Cliff Davidson, a professor in the department of civil and environmental engineering and the department of engineering and public policy at Carnegie Mellon University, points out that engineers have a large effect on many aspects of the world, which in turn affect the environment. "I think that engineers hold a very special role in the shift of society from its current, unsustainable state over into a situation where society is much closer to being sustainable."

Davidson, who teaches a sequence of four half-semester courses on sustainable

engineering, believes that engineers have an obligation to help move society toward an environmentally friendly state. "We should take that seriously," he says.

Through Davidson's sustainable design courses, he hopes to instill in engineering students the idea that sustainability should be a constraint considered when making engineering decisions.

Tradeoffs

"To incorporate solutions that satisfy the desire of the client but do not compromise on health and safety, and are done for the lowest possible cost ... is really an important objective," Davidson says. Sustainability issues have not traditionally been involved in engineering judgments and decisions, but they should be considered as well, he adds.

Important aspects of sustainability within an engineering project—such as the design of a structure—include whether a material will be in short supply in the future and saving energy over the life of the structure, as opposed to simply lowering the cost of construction, Davidson explains.

"Oftentimes, there are tradeoffs. It may be quite possible to produce an engineering design which is inexpensive to build, but in fact may use a lot of energy or a lot of materials." That is not ideal, he says.

For example, designing a building without much insulation or a structure that uses all virgin materials, such as virgin steel or virgin glass, would not be as environmentally friendly as a well-insulated structure that uses recycled materials. It might be cheap, but to add sustainability as a constraint, an engineer must consider the factors of a building's lifecycle, Davidson says.

"That might mean putting more money out to add more insulation to the building, so that even though the total energy used to construct the building may be greater, the amount of energy used to heat the building over its lifetime, plus the energy used to construct the building and make the materials for the building will overall be lower," he says.

Sometimes using recycled materials can be more expensive, but the environmental benefits of that decision may justify the expense, Davidson says. For instance, a number of buildings today are constructed



CLIFF DAVIDSON, AN ENGINEERING PROFESSOR AT CARNEGIE MELLON UNIVERSITY, TEACHES SUSTAINABILITY AS A DESIGN CONSTRAINT.

out of aluminum, which has an energy-intensive production process.

"It would be of great energy savings—in terms of the aluminum for the building shell—if recycled aluminum were used, even if that recycled aluminum ended up being more expensive," he says.

Engineers must determine how to account for sustainability issues in engineering design, Davidson adds. "This is something that we really have to work on as a profession."

However, he says, it can be difficult to do that because, often, clients insist on the cheapest methods available for completing a project. Still, Davidson feels that engineers should adopt a stand that they will do what is best for society in the long-term, not what is best for the client in the short-term.

Joseph Herkert feels that sustainability in engineering is a balancing act that engineers should be able to handle. He includes a unit on sustainability in the engineering ethics course that he teaches, and he discusses with his students the many factors that engineers have to consider when making ethical decisions.

Historically, engineers have balanced various constraints in their projects, and sustainability is just one more constraint that has to be dealt with, Herkert says. While he admits that it may be a more difficult criterion to meet, he says it is something that needs to be focused on when producing an engineering product.

E. D. "Dave" Dorchester, P.E., chairman of the BER, agrees that engineers have an ethical obligation to consider environmental effects when implementing projects.

"It's deeper than just the environment, too. I think that you have to look at the operating costs of a project as a part of the ethical responsibility," he says.

Engineers should consider the total project, including how it will affect the environment and the community, its long-term operating costs, and the cost of dismantling the project at the end of its useful life, Dorchester says.

"I very firmly think that it is an ethical responsibility of engineers to do those things because no one else is better equipped to do it," he says.

Growth

The term "sustainability" in its environmental context is traced to a 1987 report from the World Commission on Environment and Development. The report summed up sustainability as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

Since then, the concept has flourished. In the corporate world, it's hard to find a company that doesn't tout a commitment to sustainability, whether its a company that relies directly on the earth's natural resources, like Alcoa or Weyerhaeuser, or a company that delivers packages, like UPS.

Many U.S. engineering firms also advertise a dedication to sustainability. CH2M Hill, the global engineering, construction, and operations corporation, issued a 30-page report "Engineering a Sustainable Future" in 2003. The report describes the company's strong commitment to protecting the environment.

Smaller firms, too, have tapped the issue of sustainability. The 120-employee Interface Engineering, a mechanical and electrical engineering firm with four West Coast offices, has adopted the mission of incorporating "green" or sustainable design factors into its projects. In addition, the firm has nine professionals who have been certified by the U.S. Green Building Council for their expertise in sustainable design practices.

In 2002, major engineering organizations showed a commitment to sustainability by supporting the position paper "Engineers and Sustainable Development," published by the World Federation of Engineering Organizations. The paper was presented at the World Summit on Sustainable Development.

opment that year and addressed the roles of engineers to help protect and restore the environment.

NSPE and other engineering groups supported the position paper, with the intent of sending a message to the world that the engineering community supported environmentally friendly practices.

This support for sustainable practices is also reflected in the codes of ethics from many engineering organizations. The American Society of Mechanical Engineers, the American Society of Civil Engineers, the American Institute of Chemical Engineers, and the Institute of Electrical and Electronics Engineers all have incorporated environmental protection principles in their codes of ethics. So, too, have engineering organizations outside the U.S.: the Canadian Council of Professional Engineers; the Institution of Engineers, Australia; the Institution of Engineers of Ireland, the Institution of Professional Engineers New Zealand, and the Engineering Council UK.

Obligation

Ideally, engineers would have a major role in effecting policy change toward sustainable practices; however, the engineering community isn't as active in politics as it could be, Davidson says.

"Now it's all the more important for engineers to become active in trying to promote policies that would make sense for helping the country as a whole," Davidson says. In order to do that, engineers must consider products' lifecycles, he adds.

Looking at the lifecycle of a building or another product that engineers design means looking at the environmental effects of manufacturing, use of the product, and disposal, he says. "That's where we run into a lot of problems."

It can be difficult to convince a client to pay extra costs in order to prevent environmental damage when the product is ultimately discarded. "Yet that's what we're faced with. So it's a matter of figuring out how we can develop policies so that clients will be willing to pay for designs that are environmentally friendly over the long-term, even after the useful life of a product is over," Davidson says.

"The world is at a place right now where the future is literally at stake in terms of sustainability issues," Herkert says. "If we don't start changing the way we educate engineering students to take that into account, it's just going to be that much more difficult."

Davidson argues that not only engineers, but also consumers of products, have an obligation to safeguard resources for the future.

"I think that there's a important ethical overtone to this," he says, "in that one has to ask whether we have the right to save ourselves money and promote maximum levels of comfort now, knowing it will be more difficult for our children and grandchildren to be able to enjoy those same comforts." ■

