Chapter 1

Mission, Responsibilities and Challenge

As an engineer in the U.S. Public Health Service (PHS), you are a member of an elite group of individuals participating in the mission of the foremost public health agency in the world. The primary mission of the PHS is to protect and advance the health of the American people and improve the organization and delivery of health services. This is accomplished through research, field investigations, regulatory control, direct patient care, and the provision of technical assistance and health-related facilities.

Engineers in the PHS

The PHS employs approximately 1,200 engineers trained in specialties ranging from the traditional chemical, electrical, mechanical, civil and environmental disciplines to the new biomedical, electronic and software disciplines. PHS also employs approximately 60 architects. Serving in most of the PHS Agencies, engineers are involved in all aspects of PHS activities, operating independently and in concert with other professional disciplines. PHS engineers also serve or have served in assignments with the Environmental Protection Agency (EPA), the National Park Service (NPS), the Bureau of Prisons (BOP), the U.S. Coast Guard (USCG), the National Oceanic and Atmospheric Administration (NOAA) as well as the Department of Energy (DoE).

For nearly 200 years, the PHS has met its responsibilities to improve the health of our nation. The Surgeon General of the PHS is "the nation's family doctor" and supports the Department of Health and Human Service's programs to improve the health of all Americans. The Surgeon General also serves as the head of the Commissioned Corps of the PHS, an all-officer cadre of mobile health professionals. There are approximately 410 engineers in the Commissioned Corps.

Mission of PHS Engineers

Engineers play a vital role in the overall PHS mission to protect and advance the health of the nation. PHS engineers:

- Provide sound engineering expertise in the support of specific agency objectives,
- Use engineering skills to safeguard the public and to research and identify solutions to the many health-related problems that face our nation,
- Remain on the cutting edge of engineering disciplines and technology as we face the health and environmental challenges of the future,
- Provide assistance directly to the American people in the form of professional consultation and the provision of health-related facilities.

The Role of the Engineer in the PHS

Although the mission of PHS engineers has basically remained unchanged, the roles of PHS engineers continue to change over time.

Engineers were first used in significant numbers by the PHS at the beginning of the 20th century to improve sanitary conditions. Cholera, typhoid, plague, and other communicable diseases were still common in the United States in the early 1900s. Medical science was only beginning to appreciate the relationship between micro-organisms, water, and disease. The development and provision of chlorination, water filtration, and sewage treatment by sanitary engineers proved to be the key to preventing water-borne illness. A national program was initiated using PHS engineers to encourage local governments and communities to apply sanitary engineering technology in their everyday lives. The next major objective was the control of malaria through elimination of standing water in heavily populated regions. The efforts of engineers to improve sanitary conditions resulted in the single greatest decrease in morbidity and mortality in U.S. history. These efforts to improve sanitary conditions continue today on Indian reservations.

During World War I and again in World War II, PHS engineers faced the challenge of controlling recognized toxic hazards in war material production facilities. PHS engineers developed the field of industrial hygiene and air pollution control in the United States.

After World War II, PHS engineers became more involved in pollution control with particular emphasis on water pollution and its effects on the environment. Although the health of the nation was improving through the provision of safe drinking water, municipal and industrial pollution of lakes and rivers was on the rise. By the late 1950s, several major bodies of water were no longer safe for fishing or swimming.

Public concern for the environment grew exponentially. In 1970, as a response to that concern, Congress passed major pollution control legislation, and the Environmental Protection Agency (EPA) was born. PHS engineers provided leadership in the early years of the EPA. Today, PHS engineers continue to be major contributors to EPA programs. (For a detailed history of engineers in the PHS, see Chapter 2.)

As technology became increasingly complex, the need for engineering specialties beyond sanitary engineering and industrial hygiene increased dramatically. PHS now uses the skills of virtually every recognized engineering discipline. Development of sophisticated laboratory instrumentation, medical diagnostic equipment, and prosthetic devices demanded the services of skilled mechanical, electrical, biomedical, software and materials engineers. Investigations of mining industry safety and practices called for expertise in the field of mining engineering. Management of the PHS Agencies requires skilled computer engineers. Nuclear engineers are invaluable to the protection of people and the environment from radioactive hazards.

Engineers in almost all disciplines are working in activities that include:

- Technical Consultation
- Regulatory Enforcement

- Facility Design, Construction, Operation, and Maintenance

- Research and Development

Chapter 3 provides a detailed description of engineering specialties within specific agencies.

What does the future hold for PHS engineers? Clearly, development, testing, and regulation of increasingly sophisticated medical devices (e.g., surgery by laser-equipped robots) will continue to place greater technical demands on PHS engineers.

In the environmental arena, the role of PHS engineers will become even more prominent as environmental health risks continue to be assessed. In the early 1970s, many people believed that modern technology supported by government grants could reduce, if not entirely eliminate, pollution and associated health risks; however, we now know that the cost of completely eliminating pollution would be enormous. We therefore recognize the need to establish acceptable levels of environmental pollutants based on scientifically determined acceptable health risks. For example, engineers in the Agency for Toxic Substances and Disease Registry (ATSDR) work closely with EPA to assess the health risks associated with the "Superfund" hazardous waste sites.

As research in genetic engineering continues and, tangentially, the pursuit of cures for highly communicable diseases quickens, newer and more modern containment laboratories will be required. This will be one of the challenges facing health facilities design and operations engineers.

The late 1980s and early 1990s saw the passage and implementation of many new drinking water, clean air, and solid waste laws and regulations. One of the greatest challenges of the new century will be continuing the momentum established in the environmental arena in an era of government downsizing. As we continue to strengthen and improve our nation's environmental health, our methods for implementation must also be analyzed and improved. Enhanced management techniques and appropriate technology solutions from PHS engineers working in close partnership with their counterparts in other Federal and state agencies and private industry will be needed to meet this new challenge.

In the late 1990s and the early 21st century, a new role for previously established engineering disciplines is emerging as acts of terrorism against Americans take the center stage of public and government attention. Emergency response and engineering controls to man-made disasters will drive many engineering activities. The survivability of structures to these attacks will be of great importance in the design and construction of government facilities. Our ability to respond in a timely manner with professionalism and competence will be vital to the health and well being of the American People.

The future for PHS engineers will be exciting, challenging, and rewarding, but it will depend on the availability of well-trained, highly motivated, dedicated, professional engineers within PHS.

Responsibilities of the PHS Engineer

As a PHS engineer you have certain responsibilities to yourself, the Department of Health and Human Services, your agency, your profession, and the public. Thomas J. Buchanan -- a fellow of the American Society of Civil Engineers (ASCE), member of ASCE Professional Technical Committee, member of the National Society of Professional Engineers and American Water Works Association, and former Assistant Chief Hydrologist, U.S. Geological Survey -- summarized these responsibilities in five areas. (See "Responsibilities of the Civil Engineer in Government", *Civil Engineering,* American Society of Civil Engineers, January 1984.)

Public Trust

The primary responsibility of the PHS engineer is to ensure public health and safety. The engineer must make certain that his or her professional actions and decisions are geared toward maintaining the public trust. This means ensuring that all actions, whether approving plans or devices, inspecting work, or advising the public, are taken with the highest integrity. Never perform any action or approve any device or work that is outside your own professional competence without checking with your colleagues, supervisors, and/or other consultants as a form of verification. Be aware of temptations by outsiders to compromise the public trust. Read the code of ethics for your discipline as prepared by an engineering society of your peers.

Professional Development

Because government engineers must be at least as competent as engineers in the private sector, PHS engineers should continually take steps toward professional development through continuing education and outside professional contacts. Apart from the obvious benefits to your program, your profession, and the public, you will personally feel more confident, have a greater sense of job security, and enhance your professional stature by maintaining technical competence. Buchanan states: "If the engineer does nothing to improve technical competence during a five-year period, he or she is likely to be completely out of date."

Registration

Professional Registration will enhance your image as a PHS engineer particularly if you are in a position where you are required to approve or inspect the work of registered engineers. Registration also ensures that the engineers whom you supervise have an opportunity to obtain the experience required under a registered engineer so that they themselves may become registered. Finally, registration is an indication of competence and pride in your profession.

Professional Support

Technical societies and organizations exist for the support and benefit of all engineers in the public as well as the private sector. Through professional technical societies, you can expand your knowledge base, as well as your experience with an understanding of others, and thus become a better representative of the government viewpoint and government employees. Many organizations, associations, and societies have

committees and opportunities specifically targeted toward engineers at all levels of government service. You and the public will benefit from the time and effort you devote to increasing the responsiveness of a particular organization or association to the needs of PHS engineers.

Public Service

As a PHS engineer, the taxpayer is essentially your client. You must therefore be fully committed to providing the required services with professionalism, in a timely manner, at a reasonable cost, and with sensitivity to changing public needs and desires. In general, the public should be made aware of all PHS engineering activities to which they are entitled to have access.

The Challenge to Excel

The mission, roles, and responsibilities of PHS engineers, whether at the junior or senior level, translate into a personal challenge to excel in your PHS career. An engineer can progress through a series of work experiences that ultimately leads to his or her career goal, provided that:

- the initiative has been taken to define that goal early in his or her career,
- steps leading to that goal have been actively pursued.

Although there are many resources available to assist PHS engineers with career development, each individual must take the lead role in charting his or her own future.

The Engineer Professional Advisory Committee and the Office of the Chief Engineer are aware that the mission of the Public Health Service cannot be accomplished without a force of competent and satisfied PHS engineers. This handbook provides basic career planning information to help PHS engineers fulfill their responsibilities, excel in their profession, and achieve complete career satisfaction with the Public Health Service.