| | | |
|---|---|---|
| CECW-EH-Y<br><br>Pamphlet No. 350-2-1 | Department of the Army<br>U.S. Army Corps of Engineers<br>Washington, DC 20314-1000 | EP 350-2-1<br><br>15 Nov 94 |
| | Training<br><br>CAREER DEVELOPMENT OF HYDROLOGIC AND HYDRAULIC ENGINEERS | |
| | **Distribution Restriction Statement**<br>Approved for public release; distribution is unlimited. | |

DEPARTMENT OF THE ARMY
U.S. Army Corps of Engineers
Washington, DC 20314-1000

EP 350-2-1

CECW-EH

Pamphlet
No. 350-2-1

15 November 1994

# Training
# CAREER DEVELOPMENT OF HYDROLOGIC AND HYDRAULIC ENGINEERS

## 1. Purpose

This pamphlet describes professional development necessary for hydrologic and hydraulic engineers to successfully advance and perform specialized hydrologic engineering studies. It will serve to improve the efficiency of employees and the quality of their products.

## 2. Applicability

This pamphlet applies to all HQUSACE elements, major subordinate commands, districts, laboratories, and field operating activities having civil winks responsibilities.

## 3. References

*a. ER 15-2-14,* committees on Tidal Hydraulics, Channel Stabilization, Water Quality and Hydrology.

*b. ER 350-1-416,* Headquarters, U.S. Army Corps of Engineers (HQUSACE) Centrally and Locally Sponsored Long-Term Training (LTT) Program.

*c. ER 690-1-958,* Army Civilian Career program for Engineers and Scientists (Resources and construction)

*d. ER I11O-2-146O,* Hydrologic Engineering Management.

*e. EP 1165-2-1,* Digest of Water Resources Policits.

*f. Memorandum dated 3 December 1990 (by Chief of Engineers).* Subject Army Civilian Training, Education and Development System (ACTEDS) for Civilian Career program for Engineers & Scientists.

## 4. Requirements

ER 1110-2-1460 lists and explains the activities of hydrologic engineering within the civil works functions of the Corps of Engineers. The Army Civilian Training, Education and Development System (ACTEDS) plan provides training and development guidance for hydraulic engineers who aspire to a key position in their career field. This pamphlet describes the requirements for hydraulic engineers to further their professional development with the U.S. Army corps of Engineers.

## 5. Scope of Hydrologic Engineering Activities

*a. General.* Hydrologic engineering is a part of civil engineering practice in which applications of professional knowledge of hydrologic and hydraulic principles are key elements in water resources development and management decisions. The scope includes the natural and management processes affecting the water cycle from precipitation on the land surface through the ultimate return of water to the sea or inland sink. Technical methods of analysis include field measurement and observation, mathematical and statistical analyses, and models. Outputs from hydrologic engineering studies include water availability as expressed by surface and subsurface yield; water surface elevations and water surface profiles, sediment processes; modeling of watershed catchment processes, flood hydrograph development and surface infiltration; probability analysis of flood or drought frequency, risk of project failure, and reliability of supply; reservoir regulation requirements for water supply, navigation, power generation, and flood control; water quality effects of natural phenomena and project operations; and groundwater level changes due to recharge and

withdrawal. The hydraulic engineer must also be knowledgeable of and able to communicate in related legal, social, economic, plan formulation, administration and management areas.

(1) Hydrologic engineering is a key element in many programs of the Corps of Engineers. Hydrologic engineering studies are an integral part of planning, design, construction, operations, and maintenance of civil works Projects and other special studies.

(2) Hydrologic engineering studies are performed in the Federal interest in the areas defined in EP 1165-2-1. Those areas include navigation, flood damage reduction, shore protection stream bank erosion control, hydroelectric power, recreation, water supply and quality management fish and wildlife, wetlands conservation, regulatory program, and special programs.

(3) Activities of a programmatic nature managed by CECW-EH include water control, elements of the dam safety program, reservoir sedimentation, hydrometeorology studies, hydrologic data collection, hydrologic studies, the cooperative stream gaging program, and hydrologic design for flood control and navigation.

*b. Hydrologic engineering during planning.* Hydrologic engineering studies develop fundamental technical flood and drought information for reconnaissance and feasibility phases of survey investigations and continuing authority programs, floodplain management and special and national studies.

*c. Hydrologic engineering during design.* Hydrologic engineering studies develop technical material for preconstruction engineering and design studies, post-authorization changes, reevaluation reports, and design memoranda. These studies also provide information for preporation of plans and specifications and handling of water during construction.

*d. Water control management.* Hydrologic engineering studies provide the basis for real-time water control decisions, undertaking emergency management actions, preparing water control manuals, monitoring reservoir sedimentation, evaluating reservoir storage reallocations, and other water control studies.

*e. Regulatory.* Hydrologic engineering studies can be performed for Section 404 permit activities, Federal Energy Regulatory Agency license actions, water quality certification, and floodplain management actions.

*f. Other.* Interagency committees and other Federal, state, and local agency programs frequently request Corps hydrologic engineering studies. Negotiated agreements establish the basis for these studies.

## 6. Professional Development

*a. General.* It is the policy of the Corps of Engineers to foster the professional development of its engineering employees through providing encouragement offering training and education opportunities, and supporting actions toward professional registration. While professional development is primarily the responsibility of the employee, supervisors will offer encouragement and advise on matters important to progress. In the professional development process, there is a need for formal training, professional society participation, technical committee participation, and professional engineer registration in addition to on-the-job training. At the bachelor's degree level, the nation's colleges and university provide broad basic civil engineering education and an introduction to hydrology, hydraulics, and hydraulic design. The basic education needs to be supplemented with specialized advanced course work and training to accelerate development of requisite professional skills. This pamphlet outlines a structure and process for guiding professional development of hydraulic engineers.

*b. On-the-job.* On-the-job training is a continuous process. The entry-level hydraulic engineer needs an experienced mentor with the supervisor carefully selecting a good match. The entry level engineer generally has energy, enthusiasm, openess, and a willingness to learn. The mentor needs to nurture and direct this energy and enthusiasm. The new engineer will make mistakes and needs support and assistance to learn and grow. The mentor must be willing to teach, have patience, and fully explain the duties of the job. The mentor needs to critically review work and provide feedback and be quick to provide praise where appropriate. The mentor can also learn from the hydraulic engineer by listening for new and fresh ideas and the latest technology changes. On-the-job training is the most effective way to gain experience and become competent.

*c. Professional engineer registration.* All engineers are strongly encouraged to become registered professional engineers in the state(s) of their choice to exhibit their professional ability. Professional engineering registration is a mandatory requirement for the Chief, Hydrology and

Hydraulics (H&H) Branch; Assistant Chief, Engineering Division; and Chief, Engineering Division.

*d. Formal training.* Hydraulic engineers should contact their local Training Officer for detailed information on training programs and requirements. Several programs of importance to engineers are described herein.

(1) Short-term training. Hydraulic engineers should work with their supervisors to identify developmental needs. Short courses that meet these needs should be noted in the employee's Total Army Performance Evaluation System (TAPES) objectives statements and attendance scheduled accordingly. Systematic and regular short course attendance is a valuable strategy to follow to maintain professional development. The short courses need not be limited to hydrologic engineering courses. The short comes can be correspondence, in the office, or outside the office. They can be either government (such as the Corps' PROSPECT Program) or nongovernment (such as university-sponsored) courses. Another form of short-term training is executive or technical developmental assignments or programs less than 120 days in duration. Short courses and developmental assignments should be reflected in employee's TAPES objectives statements.

(2) Long-term training. All engineers should consider applying for long-term training. Employees will be competitively selected for this training to develop them for greater responsibility in their career field. Long-term training includes such Army-wide programs as senior service colleges, fellowship programs, university programs, training with industry assignments, and developmental assignments over 120 days. The Water Resources Support Center Professional Development Program is long-term training, 3 to 6 months in duration, designed to provide selected candidates broad training and work experience. Three- to six-month TDY assignments are often available at HQUSACE, divisions, Hydrologic Engineering Center (CEWRC-HEC), Waterways Experiment Station (CEWES), Cold Regions Research and Engineering Laboratory (CECRL), and other offices.

(3) Hydrologic Engineering Education program (HEEP). This 12-month program is a part of the HQUSACE-sponsored long-term training program. The objective of HEEP is to increase the skills and experience of engineers in the hydrologic engineering field The program consists of 9 months (two semesters or three terms) of study at the selectee's university of choice followed by summer assignment (approximately 3 months) at CEWRC-HEC, CEWES, or CECRL. Employees interested in applying for HEEP can contact CECW-EH at (202) 272-8500 for information on suggested accredited universities and the developmental assignments.

(a) Nominee requirements. Nominees will normally be in the 0810 civil engineering/hydraulics job classification field employed in a district division, headquarters, laboratory, or other Corps agency. The nominee is expected to have an interest in or show excellent promise in hydrologic engineering and will be expected to make the Corps of Engineers their career employer. Normal civil service rules concerned with service time required foIlowing government-sponsored training will be followed. Nominees will normally be GS-11/12 engineers possessing a bachelor's degree with a minimum of 4 years of civilian experience with the Corps of Engineers, including at least 2 years in the hydrologic engineering field.

(b) Application procedures. Applicants must follow the application procedures provided in ER 350-1416. Applications are due to HQUSACE (CEHR-D) 15 January of each year however, local Human Resources offices Will set an EARLIER suspense for applications to be submitted to them. Selections will be announced in March of each year.

(c) Program curriculum. Study programs pursed by the student must be a university-approved course of study within an accredited advanced degree program. The emphasis of the specific program will be designed by the student commensurate with his or her interests and consistent with the needs of the Corps. Normally, this will be determined in consultations between the applicant and his or her supervisor at the time of application. The following is a list of course topics that are expected to be a major part of the study program curriculum. The courses taken will, of course, be dependent on spcific offerings of the university attended. Most course offerings will carry 3 or 4 hours of credit.

- Hydrologic Systems.
- Open Channel Hydraulics.
- Hydraulic Structures.
- Statistical Analysis in Water Resources.
- Advanced Mathematics for Engineers.
- Erosion and Sedimentation.
- Urban Water Management.

- Water Systems Modeling.
- Water Resource Management Institutions.
- Water Law.
- Graduate Seminar/Project
- Engineering Hydrology.
- Hydraulic Systems.
- Unsteady-Flow Hydraulics.
- Water Resources System Annalysis
- Design of Water Resource Systems.
- Operations Research.
- River Mechanics.
- Control of Floods and Droughts.
- Economic and Environmental Aspects of Water Resources.
- Engineering Project Management
- Groundwater Hydrology.

Following two semesters (three quarters) at a university, the student will arrange for approximately a 90-day assignment at CEWRC-HEC, CEWES, or CECRL to work on a specific hydrologic or hydraulic engineering applications problem The student assignment could be: working on a problem from their home office; participanting in a research project or assisting with resolving a policy question. The desirable project is one that would be completed with a technical report In some instances, it may be possible to acquire university credit for the project and subsequent report. Students should make these arrangements by contacting: Director, CEWRC-HEC; Director, Hydraulics Lab, CEWES; or Techhical Director, CECRL.

*e. Professional society participation.* Professional society participation provides self development for the hydraulic engineer. There are numerous professional societies for the hydraulic engineer. The most prominent are the American Society of Civil Engineers, Society of American Military Engineers, National Society of Professional Engineers, American Public Works Association, American Water Resources Association, American Geophysical Union, and the Society of Women Engineers. All engineers in the Corps are encouraged by the Chief of Engineers to become active members of professional societies.

*f. Corps technical committees.* The Corps has four technical committees that have memberships comprised of hydraulic and hydrologic engineers Tidal Hydraulics, Channel Stabilizaton, Water Quality, and Hydrology. The purpose, objectives, scope of activities, composition and other general information for these committees are contained in ER 15-2-14.

FOR THE COMMANDER:

R. L. VANANTWERP
Colonel, Corps of Engineers
Chief of Staff