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DEPARTMENT OF ENVIRONMENTAL SCIENCES AND ENGINEERING

School of Public Health
University of North Carolina
Chapel Hill, North Carolina

REPORT ON THE FOURTEENTH SESSION

of the

INTERNATIONAL PROGRAM IN SANITARY ENGINEERING DESIGN

Prepared for

Agency for International Development
Department of State
Washington, D.C.

1974

A I D
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Room 1656 NS

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THE UNIVERSITY OF NORTH CAROLINA
AT
CHAPEL HILL

THE SCHOOL OF PUBLIC HEALTH
DEPARTMENT OF
ENVIRONMENTAL SCIENCES AND ENGINEERING
ZIP CODE 27514

INTERNATIONAL PROGRAM IN
SANITARY ENGINEERING DESIGN

PHONE: AREA CODE 919
966-1171, 966-1252, 966-2129

September 1, 1974

Mr. A. Dale Swisher, P.E.
Environmental Health
Office of Health
Technical Assistance Bureau
Department of State
Agency for International Development
Washington, D.C. 20523

Dear Mr. Swisher:

In accordance with our Contract AID/csd-1888, we are pleased to submit our report on Task Order No. 10 covering all phases of the Fourteenth Session of the International Program in Sanitary Engineering Design.

The work herein reported was carried out under the provisions of this contract between the U.S. Department of State and the University of North Carolina at Chapel Hill.

We wish to thank you and your predecessors for your cooperation and support in all aspects of this important work.

Respectfully,

F. Eugene McJunkin
Associate Professor and
Director, International Program

FEM/tcw

PREAMBLE

The International Program in Sanitary Engineering Design (IPSED) is conducted by the University of North Carolina at Chapel Hill under contract with the Agency for International Development of the United States Department of State. It has been in operation since 1962, and up until 1967, one or two sessions were held each year, depending upon demand. Since 1967, only one session of the Program has been conducted yearly. Earlier reports on the previous twelve sessions of IPSED are on file. It is intended to make each report complete in itself at the risk of some repetition to those who would read them all.

The need for more water for more people in developing countries is recognized as basic. In fact, meeting this need is prerequisite to all other forms of betterment, whether directed to health, social, or economic improvement. The urgency for providing suitable water supply and sanitation facilities is perhaps too obvious to call for prolonged discussion here, and it is more to the point in this preamble to indicate how a specific program has been established and operated to help in the planning and execution of water supply and related projects in developing countries by training engineers for the work in a way not hitherto attempted.

The technical problems associated with the conception, design, execution, and operation of water supply and sanitation projects are inevitably delegated to the engineer for proper solution. Within engineering are many specializations; however, historically and practically, the overall technical responsibility in this type of work has been that of the civil engineer and more recently, that of the sanitary engineer.

Many of the developing countries have not yet provided educational programs for the preparation of this small but important group of sanitary engineering leaders. Traditionally, the relatively few persons in each country who are selected for these leadership roles have been sent abroad for the necessary study, many of them attending schools in the United States or in Europe.

The most troublesome factors encountered with prevailing programs for study in industrialized countries stem from the radical differences which may exist between climatic, socio-economic, and technological conditions in the student's home country and those in the country where his education is secured. There may be great disparity in monetary resources, in the nature of the labor to be used in the work, in the availability of manufactured products and the necessity of importing material, and in habits, attitudes, and traditions generally. All of these factors are intimately related to design. In the United States, for example, most academic programs leading to the M.S. or Ph.D. sanitary engineering degree are necessarily oriented to conditions prevailing in this country because most of our students originate here and will practice here throughout their careers. Accordingly, much of the technology which is taught, especially in the realm of design, is appropriate primarily for application in this country. A foreign student completing such a program and returning to his homeland is usually confronted with the fact that much of this hard earned knowledge would be impractical for direct application under his own local circumstances. In some instances,

the individual views this as a challenge and uses his formal education as a foundation on which to build new technological concepts for developing solutions more appropriate for local conditions. Obviously, however, much of the effort and expense of obtaining his education is less effective than it might have been had the program been tailored more closely to his own specific needs. In other instances, the reaction is much less favorable and leads to increased frustration because of the incompatibility between his educational background and needs of his country. Sometimes the end result may be an attempt to transfer experience or knowledge not at all appropriate, leading to most undesirable consequences.

The newly graduated sanitary engineer entering practice within the United States generally must serve an internship of several years before he is considered qualified to do independent design work. Because of the many excellent design offices in this country, opportunities for professional growth under the guidance of competent professionals are abundant. Unfortunately, however, such opportunities are sometimes limited or absent in developing countries. To compensate in part for this lack of opportunity for the engineer's normal professional development, the International Program in Sanitary Engineering Design, in addition to its intensive academic phase, arranges for each participant to receive on-the-job practical experience in first rate municipal and consulting engineering organizations, under continued University supervision, during his stay in the United States. Perhaps as important to each participant as his engineering training is this direct exposure to American engineering organization and procedure.

In the United States, the tendency in water and wastes treatment plant design has been, over the years, to supplant rather simple processes and treatment devices, generally characterized by relatively low investment but high operating charges, by more compact and highly mechanized and instrumented processes and structures, higher in first cost but lower in operating charges. Overall economy is possible because of the labor saving devices which are incorporated. On the other hand, in developing countries, common labor is cheap and plentiful. More appropriate under such conditions are the simpler concepts of plants more readily constructed and operated with unskilled labor, and not highly mechanized. While generalizations are difficult to make categorically, it is nevertheless obvious that engineering design, construction, and operations in developing countries are not likely to be of the same character as one finds in the more technologically developed countries of the United States and Europe.

With all of the preceding considerations in mind, the International Program in Sanitary Engineering Design was established as a unique educational venture, staffed, equipped and planned for specific ends, quite distinct from the ordinary program of study in a university, and in conformity with objectives indicated in the preceding brief discussion. The report which follows describes in some detail the participants from developing countries and what work they do. The reader will note the unique combination of educational discipline and professional internship which has been working successfully in this program.

A problem associated with study abroad is that sometimes the engineer is tempted to stay abroad, and so the investment in his education is lost to his home country. In the International Program in Sanitary Engineering Design, commitment and orientation are such that all but one of the participants, 120 of the 121 thus far, have returned after completing the program, as intended, to do the work needed at home.

Participants in the Program are brought to the United States for work that takes about a calendar year; shortened programs are arranged in cases where time and funds are limited. This work is carried out in three successive and coordinated phases, which are: 1) a semester of special courses at the University of North Carolina: 2) one month at a municipal waterworks, for operating experience; and 3) an internship of about six months with an engineering organization engaged in the design and supervision of construction of water and sewerage works. The first phase is carried out in classes which all participants attend as a group. The second and third phases are worked out individually for each participant, in such fashion as to insure maximum benefit to him in view of his probable responsibilities after his return to his country of origin. The second and third phases are supervised by the University so that all three phases are properly correlated.

The Fourteenth Session began August 21 with the arrival of the first participant; in all there were 7 men from 6 countries representing Africa, Asia, and Latin America. (See Appendix A for bio-data sheets on participants.) After a five-day orientation, classes began August 31, the last day of class was December 7, exams were over December 21. During the intervening four months, the participants completed the academic portion of the Program which consisted of five courses in the Department of Environmental Sciences and Engineering, various field trips, attendance at a regional professional meeting, and additional special courses taught by visiting consultants.

Orientation was a five day period of acquainting the participants with the area and the campus, settling them in their rooms in the graduate dorm, shopping trips and getting registered. When the participants arrived they were met by someone from the IPSED office, usually the project coordinator and a graduate student from the department. Rooms had been reserved in the graduate dorm, Craige Hall, for the single participants and those without their families. There were also tours of the town and the campus, as well as several welcoming parties given by the IPSED faculty and the Department of Environmental Sciences and Engineering.

The curriculum in the academic phase of the Fourteenth Session of IPSED was similar to that of previous sessions. The academic phase included a one semester course of both refresher and new material in such categories as hydraulics, chemistry, pumping and treatment plant equipment, hydrology treatment processes for water and wastewater, etc. Class schedules are worked out with a faculty advisor assigned from the IPSED staff (See Appendix B for Advisor Roster). Because of the varied background of the participants, substitutions were made in course work to avoid repetition of former work or where there were deficiencies. Much of the material for the courses was duplicated and issued to participants for reference.

Arrangements were made during the Fall for the Municipal and Design phases of the program. Participants were assigned to water treatment plants for one month, usually in North Carolina. For design assignments, effort was made to match a participant's interests with a firm doing work in that area and especially with those firms doing work in a participant home country. (See Appendix H for Municipal and Design Assignment Roster). The IPSED Office helps with travel plans and locating housing for the Municipal phase. The host water plants and design offices are a great help with locating housing for the participants.

REPORT ON THE FOURTEENTH SESSION OF

THE INTERNATIONAL PROGRAM IN SANITARY ENGINEERING DESIGN

Section I - General

1. Authority: The work herein reported was carried out under the provisions of Task Order No.10 of the Contract AID/csd-1888 between the U.S. Department of State and the University of North Carolina at Chapel Hill. The contract is an extension of and supersedes earlier Contracts AID/csd-718 and AID/csd-362.

2. The International Program in Sanitary Engineering Design: The International Program in Sanitary Engineering Design (IPSED) came into existence in 1962. The Program was a joint conception of: 1) the Department of Environmental Sciences and Engineering of the School of Public Health, University of North Carolina at Chapel Hill, and 2) the Agency for International Development of the U.S. Department of State, as part of the latter's global water supply program.

The engineering training program encompasses the following:

a) Academic Phase: A curriculum is set up for a one-semester course of both refresher and new material in such categories as hydraulics, chemistry, pumps and treatment plant equipment, hydrology, treatment processes for water and sewage, etc. Much of the material is written for the course and is issued to participants for reference. In general, mornings are devoted to classes and lectures and afternoons to problem work and design. One day or one afternoon per week a field trip is made to a waterworks or sewage treatment plant, usually within North Carolina, a state which is well supplied with excellent municipal utilities of this character. At the end of the course the participants will have worked out and submitted a project design. Since the groups are limited in size (twenty participants or less), individual attention is given in the work.

Participants in IPSED can receive, at their option, up to eleven semester hours of postgraduate credit for successful completion of the courses. Application for enrollment for credit may be made after arrival at the University. Those students not enrolling for credit attend all lectures but may have a lighter work load, at the option of the teacher.

b) During the semester the participants went on several field trips. Locally, the participants went to the Chapel Hill and Durham water works. For the past few years an extended field trip has been undertaken by the participants, two trips have been to the southeastern United States; last year's trip went north to New York City. This year the group attended the 9th Congress of the International Water Supply Association in New York City, September 10 - 16, 1972. In October, they attended the Water Pollution Control Federation in Atlanta, Ga., October 9 - 13, 1972. The participants also attended a Conference on the Environment, Nov. 30 - Dec. 3, 1972 on the University of North Carolina campus.

c) Municipal Phase: In the municipal phase; following the academic phase, the participants are assigned individually to various waterworks for operating experience to learn the intricacies of operating and sometimes of management problems. Most of the municipalities selected are within the State; at times, for special reasons, participants have been sent as far afield as Los Angeles, California, and St. Louis, Missouri. A list of collaborating municipalities is given under Paragraph 5-g.

d) Consulting Office (Internship) Phase: In the consulting office phase, which follows the municipal phase, participants are assigned individually to engineering offices for an internship period varying in length but ordinarily about six months. These are selected with the participant's needs in mind and in relation to the work done in the particular office. In many instances, he will work on projects which the firm is handling for the participant's home country. A list of collaborating engineering firms is given in Paragraph 5-h.

e) Corollary Activities (Professional and Social): As part of their program, the participants are escorted by a member of the UNC staff to one national meeting of the major technical societies, both to listen to important papers and to enlarge their professional acquaintance. In the past, national meetings of the American Water Works Association, the Water Pollution Control Federation, and the American Society of Civil Engineers have been attended by participants. They have also attended some state and regional meetings of these societies closer to Chapel Hill and near their consulting assignments. On the social side, the UNC staff has been host to the various groups, all of which have been in the faculty homes on occasion for informal get-togethers. Special attention is given to married couples where participants are accompanied by their spouses. Shopping trips have been arranged, and arrangements are made for participants to take part in University student activities.

3. Qualifications and Support of Participants: Prospective participants must be graduate engineers with some practical experience and be competent in English. They must have the recommendation of their sponsoring agencies and firms. Following acceptance by the parties to this contract, they come to this country for the period of their fellowship, usually twelve months, during which time they are paid living and travel expenses or stipend. These stipends are financed by the supporting agencies, WHO, AID, or by others who may offer scholarships and fellowships for the purpose (see Paragraph 4).

4. Supporting Agencies: The agencies which have given scholarship and financial aid to participants include the Agency for International Development to the U.S. State Department, the Pan American Health Organization, the World Health Organization itself, the Organization of American States, the Ford Foundation, and the United Nations. In addition, participants are sometimes supported by the government of their home country, through the World Bank or some other organization.

5. Facilities for Conduct of the Program: Facilities for the conduct of the Program include:

   a) Campus Classroom: There is set aside for the exclusive use of the participant groups a classroom especially equipped for their convenience, with individual desks for each man. The room has visual aid equipment, including projectors for motion pictures and slides and screen.

b) Extra Classrooms: On occasion, especially with guest lecturers, who come to the Program for selected topics on which they are particularly well known experts, a larger classroom is used and the regular graduate students (degree candidates) are invited to attend along with the participants.

c) Office facilities and Clerical Staff: In the main building of the School of Public Health, there is a reference room in which plans, specifications, reports, catalogues, reprints, etc. are kept and made available for classroom use.

Headquarters for the Program is a two-story dwelling (308 Pittsboro Street) near the School of Public Health. This has been equipped for Program purposes. The rooms downstairs house the project coordinator, and IPSED secretary, and, in addition, files, records, reports, etc., relating to the Program and to the Department. On the second floor, there are four separate rooms. Three are used by faculty members whose time is principally devoted to the Program, and the fourth houses a draftsman and is used for drafting and map files.

d) Shop and Laboratory Facilities: These are available and have been used for building special equipment for the Program.

e) Car Pool: Frequent field trips for inspection of municipal treatment plants demand the use of cars from the University car pool, or from other sources such as chartered buses, on occasion.

f) Lodging and Transportation: Participants are housed in one of the newer dormitories on campus. Married couples are assisted in locating appropriate housing - apartments or houses. Participants are issued bicycles, if they wish one, for use around campus and in town.

g) Collaborating Municipalities: A number of municipalities, principally in North Carolina, have been most cooperative in receiving participants for experience at the local treatment plant, during their municipal "phase." Among these have been cities listed below.

North Carolina: Charlotte, Durham, Fayetteville, Greensboro, Raleigh.

Out-of-State: Weehawken, New Jersey; Philadelphia, Pennsylvania and Newport News, Virginia.

h) Collaborating Engineering Offices for Design Phase: For taking participants during the design or engineering internship phase of the Program, we are indebted to the following organizations, many of which have collaborated in this phase of the Program on more than one occasion:

Consulting Firms

Albright and Friel
Philadelphia, Pennsylvania
Alexander Potter Associates
New York, New York
Alvord, Burdick & Howson
Chicago, Illinois
Alley, Williams, Carmen & King, Inc.
Burlington, North Carolina
Bechtel Corporation
San Francisco, California
Black & Beatch
Kansas City, Missouri
Brown & Caldwell
San Francisco, California
Buck, Seifert & Jost
Englewood Cliffs, New Jersey
Burgess & Niple
Columbus, Ohio
Camp, Dresser & McKee
Boston, Massachusetts
Carl F. Beuttner & Associates
St. Louis, Missouri
The Chester Engineers
Pittsburgh, Pennsylvania
Cornell, Howland, Hayes & Merryfield
Corvallis, Oregon
Dorr-Oliver, Inc.
Stanford, Connecticut
Engineering-Science, Inc.
Arcadia, California
Ford, Bacon & Davis
New York, New York
Malcolm Pirnie
New York, New York
Metcalf & Eddy
Boston, Massachusetts
National Sanitation Foundation
Ann Arbor, Michigan
Nelson, Haley, Patterson & Quirk, Inc.
Nusshaumer, Clarke & Velzy, Inc.
New York, New York
Office of City Engineers
Wyoming, Michigan
O'Brien & Gere
Syracuse, New York
J.N. Pease & Co.
Charlotte, North Carolina
Piatt & Associates
Durham, N.C.
Gannett, Fleming, Corddry & Carpenter
Harrisburg, Pennsylvania
Gilbert Associates
Reading, Pennsylvania
Greeley & Hansen
Chicago, Illinois
The Harwood Beebe Co.
Spartanburg, South Carolina
Havens & Emerson
New York, New York
Hazen & Sawyer
New York, New York
Henry B. Steig & Associates
Indianapolis, Indiana
Horner & Shifrin
St.Louis, Missouri
Howard K. Bell
Lexington, Kentucky
Hubbell, Roth & Clark
Birmington, Michigan
James M. Montgomery
Pasadena, California
John J. Baffa Associates
New York, New York
Jones, Henry & Williams
Toledo, Ohio
Kennedy Engineers
San Francisco, California
Lalonde, Girourard & Lentendre
Montreal, Canada
Charles T. Main, Inc.
Charlotte, North Carolina
James F. MacLaren, Ltd.
Toronto, Canada
The Pitometer Association
Pittsburgh, Pennsylvania
Smith & Gillespie
Jacksonville, Florida
Stanley Engineering Co.
Muscatine, Iowa
Stanley, Grimble, Robin, Ltd.
Edmonton, Alberta
Stearns and Wheler
Cazenovia, New York
Roy F. Weston, Inc.
Newton Square, Pennsylvania
Whitman & Howard
Boston, Massachusetts
Whitman, Requardt & Assoc,
Baltimore, Maryland
Wiedman & Singleton
Atlanta, Georgia

FOURTEENTH SESSION CURRICULUM

ENVR 170 - WASTEWATER COLLECTION AND TREATMENT (two credit hours). The design of wastewater collection and treatment systems with emphasis on economical methods suitable for labor intensive economies. (See Appendix C for Lecture Schedule).

ENVR 173 - DESIGN OF HYDRAULIC STRUCTURES (three credit hours). Hydraulic design for waterworks and sewerage projects: open channels; backwater curves; siphons; transition sections; dams and outlet works; stilling basins; networks; centrifugal pumps; transients in unsteady flow. (See Appendix D for Lecture Schedule).

ENVR 175 - SANITARY ENGINEERING DESIGN IN DEVELOPING COUNTRIES (three credit hours). Design of public water and sewage facilities including intakes, pumping stations, treatment plants, distribution systems, and wastewater collection works. Design criteria, equipment, and systems for use in developing countries are stressed. Process, mechanical, electrical, and control aspects of design are included. (See Appendix E for Lecture Schedule).

ENVR 181 - GROUNDWATER HYDROLOGY (two credit hours). Groundwater occurence and expoloration; design, hydraulics, drilling, construction, and testing of water wells; opeation and maintenance of groundwater supply systems. (See Appendix F for Lecture Schedule).

ENVR 182 - WATER RESOURCES PLANNING IN DEVELOPING COUNTRIES (three credit hours). Preliminary planning of public water supply and sewerage facilities. Planning objectives and design criteria for developing countries are considered. Course topics include collection and analyses of data, rate studies, capital budgeting, decisions on water quanfity, quality, needs for sewage treatment, location, systems analysis and optimization procedures, sizing of facilities, scheduling (CPM), and financing. Preliminary plans, cost estimates, and planning reports are prepared by students. (See Appendix G for Lecture Schedule).

In addition to these courses, there were visiting consultants, who lectured and/or conducted short courses on special topics.

The visiting consultants are as follows:

David Donaldson - Rural Water Supply Problems in Developing Countries

John Marsh - Well Water Design and Hydraulics

Daniel Okun - Water Supply Around the World

FOURTEENTH SESSION FACULTY

Richard Francis Cole, Director of the International Program in Sanitary Engineering Design, Assistant Professor of Sanitary Engineering, B.S., 1959 (Drexel Institute of Technology); M.S., 1961 (Massachusetts Institute of Technology); Ph.D., 1968 (University of North Carolina); P.E.

Daniel Alexander Okun, Head of the Department of Environmental Sciences and Engineering and Professor of Environmental Engineering, B.S.C.E., 1937 (Cooper Union); M.S., 1938 (California Institute of Technology; Sc.D., 1948 (Harvard University) P.E.

George Eric Barnes, Professor of Sanitary Engineering, B.S.C.E., 1923 (Massachusetts Institute of Technology); C.E. (Hon.), 1935 (Case Institute of Technology); P.E.; Emeritus.

James Clement Brown, Associate Professor of Sanitary Engineering, B.S. 1949 (Illinois Institute of Technology); M.S. 1961 (Case Institute of Technology); P.E.

Emil Theodore Chanlett, Professor of Sanitary Engineering, B.S., (College of the City of New York); M.S.P.H., 1939 (Columbia); B.C.S.E. 1941 (University of North Carolina); P.E.

Donald Thomas Lauria, Assistant Professor in Environmental Engineering and Engineering Associate, B.C.E., 1956 (Manhattan College); M.S.S.E., 1965 (Syracuse University); Ph.D., 1970 (University of North Carolina); P.E.

Frederick Eugene McJunkin, Associate Professor of Environmental Engineering, B.C.E., 1955 (North Carolina State University); M.S.S.E., 1961 (University of North Carolina); P.E.

Jabbar K. Sherwani, Associate Professor of Systems Analysis and Hydrology, B.S. (C.E.), 1945 (Punjab University); M.C.E., 1947 (Polytechnic Institute of Brooklyn); Ph.D., 1951 (Utah) M.P.A., 1958 (Harvard).

Charles Manuel Weiss, Deputy Head of the Department of Environmental Sciences and Engineering and Professor of Environmental Biology, B.S. 1939 (Rutgers University); Ph.D., 1950 (Johns Hopkins University).

FOURTEENTH SESSION STAFF

Charlotte Elaine Hermann, Project Coordinator, B.A., St. Andrew's Presbyterian College, (Politics), 1968; M.A.C.T., University of North Carolina at Chapel Hill, (Political Science), 1970.

Peggy Gates Jones, Secretary

APPENDIX A

INTERNATIONAL PROGRAM IN SANITARY ENGINEERING DESIGN

Fourteenth Session - August, 1972

SPONSOR: PAHO

NAME:	Manuchehr Alai
AGE:	Born 1934
MARITAL STATUS:	Married
HOME:	Teheran, Iran
EDUCATION:	Teheran University, Technical Faculty, Teheran 1965, M.S.
EMPLOYER:	Ministry of Health Environmental Health Department Teheran, Iran
TITLE:	In Charge of Water Supplies and Sewage Systems
BRIEF JOB DESCRIPTION:	In charge of water supplies and sewage systems
TRAINING INTEREST:	Any subject related to water and sewage works such as survey, design and construction of water supply and sewage disposal systems, mostly in rural areas, water pollution control, industrial waste survey, etc.
LENGTH OF FELLOWSHIP:	12 months
TRAINING OFFICER:	Jose M. Guerricagoitia

INTERNATIONAL PROGRAM IN SANITARY ENGINEERING DESIGN

Fourteenth Session - August, 1972

SPONSOR: PAHO

NAME:	Joseph R. Christmas
AGE:	7/20/1940
MARITAL STATUS:	Single
HOME:	Saddlers, St. Kitts
EDUCATION:	Univ. of the West Indies (Jamaica), 1969, B.Sc. degree; London University (England), 1971, M. Sc. degree
EMPLOYER:	Water Resources Department Basseterre, St. Kitts
TITLE:	Manager/Water Engineer Water Resources Department
BRIEF JOB DESCRIPTION:	Management and Development of ground and surface water resource. Long-term planning. Management of technical and non-technical staff of about 30 persons.
TRAINING INTEREST:	Engineering (Water Works): Design of Hydraulic structures, e.g. Inlakes, Reservoir, Plumbing, Surveying
LENGTH OF FELLOWSHIP:	12 months
TRAINING OFFICER:	Susan K. Shanley

INTERNATIONAL PROGRAM IN SANITARY ENGINEERING DESIGN

Fourteenth Session - August, 1972

SPONSOR: AID

NAME:	Jou Chau-Sheng
AGE:	April 7, 1941
MARITAL STATUS:	Married
HOME:	Taipei, Taiwan
EDUCATION:	Taipei Institute of Technology, Civil Engineering 1962
EMPLOYER:	Taiwan Public Works Bureau 4, Kai-feng Street Section 1 Taipei, Taiwan
TITLE:	Assistant Engineer
BRIEF JOB DESCRIPTION:	Construction of Water Supply and Waste Water Engineering
TRAINING INTEREST:	Construction and Management of Water Supply and Water Disposal Engineering
LENGTH OF FELLOWSHIP:	1 year
TRAINING OFFICER:	Mr. Theodore G. Markow

INTERN/ ITARY ENGINEERING DESIGN

Fourteenth Session - August, 1972

SPONSOR: AID

NAME:	Liu Tyng-jenq
AGE:	July 15, 1944
MARITAL STATUS:	Single
HOME:	Miao-Li, Taiwan
EDUCATION:	Provincial Cheng-Kung University, Civil Engineering, B.S. of C.E., 1967
EMPLOYER:	Taiwan Public Works Bureau Taiwan Provincial Government Taipei, Taiwan
TITLE:	Junior Engineer of Sanitation
BRIEF JOB DESCRIPTION:	Designing water supply system, investigating water works, including general description, operation, etc
TRAINING INTEREST:	Public Water Supply Orientation and Management
LENGTH OF FELLOWSHIP:	6 months
TRAINING OFFICER:	Mr. Theodore G. Markow

INTERNATIONAL PROGRAM IN SANITARY ENGINEERING DESIGN

Fourteenth Session - August, 1972

SPONSOR: PAHO

NAME:	Joseph Nguiguti
AGE:	27 (4/13/45)
MARITAL STATUS:	Married
HOME:	Nairobi, Kenya
EDUCATION:	University College, Nairobi, June, 1970, B.Sc. Civil Engineering
EMPLOYER:	Nairobi City Council, Water and Sewerage Department P.O. Box 30656 Nairobi
TITLE:	Assistant Engineer
BRIEF JOB DESCRIPTION:	Design of Water systems, design of sewers, leakage survey
TRAINING INTEREST:	Public Health Engineering 1. Water Resources Planning in Developing Countries 2. Sanitary Engineering Design in Developing Countries 3. Groundwater Hydrology 4. Design of Hydraulic Structures
LENGTH OF FELLOWSHIP:	12 months
TRAINING OFFICER:	Ms. Jeanne LaMotte

INTERNATIONAL PROGRAM IN SANITARY ENGINEERING DESIGN

Fourteenth Session - August, 1972

SPONSOR: IPSED

NAME:	Juan Quintero
AGE:	8/7/48
MARITAL STATUS:	Single
HOME:	Santa Maria, Columbia
EDUCATION:	Swarthmore College, Swarthmore, Pa. B.S.C.E.
EMPLOYER:	
TITLE:	
BRIEF JOB DESCRIPTION:	
LENGTH OF FELLOWSHIP:	6 months
TRAINING OFFICER:	

INTERNATIONAL PROGRAM IN SANITARY ENGINEERING DESIGN

Fourteenth Session - August, 1972

SPONSOR: PAHO/WHO

NAME:	Ram Babu Sharma
AGE:	June 1, 1939
MARITAL STATUS:	Married
HOME:	Dharan, Nepal
EDUCATION:	Central Hindu College, Bernaras, June, 1959, I.Sc.; Jadavpur Univ., Calcutta, June, 1964, B.E.
EMPLOYER:	Local Development Department Ministry of Home and Panchayat Singh Durbar, Kathmandu
TITLE:	Acting Senior Engineer
BRIEF JOB DESCRIPTION:	1. to execute the rural and community water supply and sanitation program jointly run by H.M.G. UNICEF & WHO 2. to execute as civil engineer all kinds of development activities undertaken by the department under the grant-aid scheme.
TRAINING INTEREST:	Community Water Supply and Sanitation
LENGTH OF FELLOWSHIP:	6 months
TRAINING OFFICER:	Miss Nancy J. Berinstein

APPENDIX B

Roster of Participants and Advisor Assignments

PARTICIPANT	PREVIOUS DEGREE	SUPPORT	TRAINING OFFICER	ADVISOR
Manuchehr Alai (Iran) 8/25/72 - 8/25/73	M.S.	PAHO	Mr. Jose Guerricagoitia	Lauria
Joseph R. Christmas (St. Kitts) 8/22/72 - 2/22/73	M.Sc.	PAHO	Ms. Susan K. Shanley	Barnes
Jou Chau-Sheng (Taiwan) 8/24/72 - 2/24/73	B.S.C.E.	AID	Mr. Theodore G. Markow	Cole
Liu Tyng-jeng (Taiwan) 8/24/72 - 2/24/73	B.S.C.E.	AID	Mr. Theodore G. Markow	Brown
Joseph Nguiguti (Kenya) 8/22/72 - 8/22/73	B.S.C.E.	PAHO	Ms. Jeanne LaMotte	McJunkin
Juan Quintero Columbia	B.S.C.E.	IPSED Graduate Student		Cole
Ram Babu Sharma (Nepal)	I.Sc.; B.E.	PAHO	Ms. Nancy Berinstein	Sherwani

APPENDIX C

WASTEWATER COLLECTION AND TREATMENT

Fall 1972

Date	Day	Subject	Assignments
Aug. 31	Th	Characteristics of Sewage	(1) pp. 563-565 (2) Ch. IX
Sept. 5	Tu	Small Treatment Systems	Class Presentation
7	Th	Water Quality	(1) Ch. 28 & pp. 516-521 (2) Appendix
12	Tu	NYC Trip	
14	Th	NYC Trip	
19	Tu	Degree of Treatment	(1) Ch. 28
21	Th	Process of Selection	(3) Ch. 1 & 2 (2) Ch. XIII
26	Tu	Pretreatment	(3) Ch. 4 & 5 (2) pp X1 - X9
28	Th	Primary Treatment	(3) Ch. 8 (2) pp X10 - X17
Oct. 3	Tu	Secondary Treatment - Trickling Filters	(3) Ch 11 (2) pp X17 - X32
5	Th	Secondary Treatment - Trickling Filters	
10	Tu	WPCF Meeting	
12	Th	WPCF Meeting	
17	Tu	Secondary Treatment - Activated Sludge	(3) Ch. 10 (2) pp X32 - X38
19	Th	Secondary Treatment - Activated Sludge	
24	Tu	Secondary Treatment - Lagoons	Reserve Material (2) pp X37 - X43
26	Th	Secondary Treatment - Lagoons	
31	Tu	Land Disposal and Reuse	Reserve Material
Nov. 2	Th	Land Disposal and Reuse	
7	Tu	Sludge Digestion	(3) Ch. 13 and 14 (2) Ch. XII
9	Th	Sludge Disposal	(3) Ch. 15
14	Tu	Industrial Waste Control	Reserve Material
16	Th	Disinfection	(3) Ch. 16 (2) -- X44-end
21	Tu	Advanced Treatment	Reserve Material
23	Th	Flow Meters and Misc. Instrumentation	
28	Tu	Misc. Planning & Design Consideration	(2) Ch. XIII
30	Th	Plant Operation	
Dec. 44	Tu	Financing	(2) Ch. I, II and III
7	Th	Open Session	

WASTEWATER COLLECTION AND TREATMENT

Fall 1972

Reading Material

(1) Fair and Geyer, Water Supply and Wastewater Disposal

(2) Okun, Wastewater Collection and Disposal

(3) ASCE, MOP 36

Field Trips

UNC Wastewater Research Center

Parkwood Plant

Research Triangle Institute Stabilization Pond

Durham - New Hope

Durham - Northside

Greensboro

Others to be added

APPENDIX D

ENVR 173 - DESIGN OF HYDRAULIC STRUCTURES

Fall Semester, 1972 Instructor: George Barnes

Lectures - Monday, Wednesday and Friday; 10 A.M., Room 153

Date	Subject
Sept. 1	Hydraulics Review - General Principles
4	Hydraulics Review - General Principles
6	Hydraulics and Energy Gradients
8	Dimensional Analysis and Dynamic Similarity
11	Origin and Basis of Formulas for Friction Losses
13	Minor Losses - "K" factors and Equivalent Pipe
15	Application of Loss Factors in Piping Systems (with gravity and pumping heads)
18	Distribution Systems Analysis - Hardy Cross Method
20	Distribution Systems Analysis - Method of Sections
22	Principles of Open Channel Flow (friction and other losses)
25	Backwater Curves
27	Hydraulic Jump and Applications
29	TEST
Oct. 2	Design of Transition Sections
4	Design of Grit Chamber Belocity Control Sections
6	Reservoir Capacity vs. Demand
9	Design of Stilling Basin
11	Design of Overflow Spillway and Apron
13	Flood Routing
16	Centrifugal Pump - Theory of Operation
18	Centrifugal Pump - Losses and Actual Operation
20	Centrifugal Pump - Types Suited to Various Applications
23	Centrifugal Pump - S pecific Speed
25	Centrifugal Pump - Specifications and Installation Requirements
27	Centrifugal Pump - Pump Characteristic Curves
30	Centrifugal Pump - Drawing Curves from Test Data
Nov. 1	Centrifugal Pump - Systems Head Curves and Applications
3	TEST
6	Pump Starting and Stopping - Wet Wall Design for Unsteady Flow Conditions
8	Water Hammer
10	Measuring Devices - Applications and Limitations weirs, Proportional weirs, Orifices, Venturis, Parshall Flume and others
13	Hydraulic Instruments
15	Hydraulic Gradient through Sewage Treatment Plant
17	Hydraulic Gradient through Water Treatment Plant
20	Design of Dams - Masonry
22	Design of Dams - Earth
27	Alternate Types of Outlet Works - Flood Routing
29	"n" for Large Conduits
Dec. 1	Wet Well Design for Booster Section
4	Siphon Design
6	Sanitary Sewer Design
8	Storm Water Sewer Design

APPENDIX E

ENVR 175 - SANITARY ENGINEERING DESIGN IN DEVELOPING COUNTRIES

Fall Semester, 1972 Instructor: Cole

Lectures - Tuesday and Thursday; 10 A.M., Room 153
Design Lab - Tuesday; 2 - 4 P.M., Room 153
Texts: ASCE, AWWA, CSSE "Water Treatment Plant Design" (1969)
WPCF MOP No. 8; "Sewage Treatment Plant Design"

Date	Subject
Aug. 31	Introduction
Aept. 5	Basis of Design, Period of Design
5	Review of Plans and Basis of Design
7	Field Trip New York City (Int'l Water Supply Congress)
12	" " " " " " " " "
12	" " " " " " " " "
14	Treatment Plant Layout
19	Field Trip - Chapel Hill Water Works
19	Treatment Plant Hydraulics
21	Screens and Intakes
26	Design Lab - Water Treatment Plant Design
26	Aeration and Gas Transfer
28	Water Treatment Processes
Oct. 3	Mixing
3	Field Trip - Durham Water Works
5	Flocculation Basin Design
10	Field Trip - Atlanta, Ga. (Water Pollution Control Federation)
10	" " " " " " " "
12	" " " " " " " "
17	Flocculation Basin Design
17	Design Lab - Water Treatment Plant Design
19	Chemical Handling and Feeding
24	Chemical Feed Installation Design
24	Design Lab - QUIZ
26	Sedimentation Theory
31	Settling Basin Design
31	Design Lab - Water Treatment Plant Design
Nov. 2	Flow Distribution
7	Filtration Theory
7	Design Lab - Water Treatment Plant Design
9	Slow and Rapid Sand Filtration
14	Rapid Sand Filters
14	Design Lab - Water Treatment Plant Design
16	Filter Media
21	Filter Design
21	Design Lab - Water Treatment Plant Design
28	Chlorination
28	Design Lab - Water Treatment Plant Design
30	Instrumentation and Control
Dec. 5	Corrosion
5	Design Lab - QUIZ
7	Special Topics

APPENDIX F

ENVR 181 - GROUND WATER HYDROLOGY

Fall Semester, 1972 Instructor: Sherwani

Subject Matter

Potosity and effective porosity. Permeability. Classification of rocks on the basis of permeability.

Geological framework for ground water. Types of aquifers.

Groundwater movement. Darey's law. Aquifer Characteristics.

Steady radial flow.

Differential equations governing groundwater flow. Theis solution. Semilogarithmic approximation. Recovery methods.

Pumping tests to determine formation constants.

Prediction of drawdown for constant, variable and intermittent discharge.

Multiple well systems.

Aquifer boundaries. Method of imagis.

Measurement of Characteristics of wells. Effective well radius. Partial penetration. Specific capacity. Maximum yield of a well.

(Mr. Marsh) Design of wells. Drilling methods. Construction of wells. Sanitary protection of wells.

Exploration for ground water. Hydrologic equation. Safe yield of an aquifer.

APPENDIX G

ENVR 182: WATER RESOURCES PLANNING IN DEVELOPING COUNTRIES

Fall Semester, 1972 Instructor: McJunkin

Lectures - Monday and Wednesday: 9AM, Monday; 10 AM, Room 153

Date	Subject
Sept. 4	Water and Health
	Rationale for Community Water Supplies in Developing Countries
6	Introduction to the Planning Problem
11	International Water Supply Congress (Field Trip)
13	" " " " " "
18	Economics and Public Policy
	Engineering Economics: The Time Element
20	Engineering Economics: The Time Element
	Equivalence
25	Rates of Return
	Comparison of Alternatives
27	Multiple Alternatives and Purposes
	Criteria and Standards
Oct. 2	Benefit/Cost Analysis
4	Capital Budgeting
	Cost Allocation
9	Water Pollution Control Federation (Field Trip)
11	" " " " " "
16	Preliminary Engineering Studies
	Design Periods
18	Population Forecasting
	Water Use
23	Basis of Design
	Economic Project Staging
25	Quiz
30	Critical Path Method
Nov. 1	Critical Path Method Workshop
6	Introduction to Systems Analysis
	Classical Optimization Methods
8	Linear Programming
13	" "
15	" "
20	Other Optimization Techniques
	Review
22	Quiz
27	Estimation of Stream Flows
	Estimation of Floods and Droughts
29	Estimation of Reservoir Capacity
Dec. 4	Extrapolation of Hydrologic Data
	Water Rate Structures
6	Water Rate Structures
	Review

APPENDIX H

FIELD ASSIGNMENTS

PARTICIPANT	MUNICIPAL ASSIGNMENT	DESIGN OFFICE ASSIGNMENT
Manachehr Alai	January 2 - January 31 Water Department City of Fayetteville City Hall Fayetteville, N.C. (Mr. James E. Freeman)	February 1 - August 15, 1973 Camp, Dresser & McKee One Center Plaza Boston, Massachusetts (Mr. Donald E. Cullivan)
Joseph R. Christmas	January 2 - January 14 Chapel Hill Water Filtration Plant University Lake Road Chapel Hill, N.C. (Mr. Max Saunders)	January 15 - March 31, 1973) Deming Pump Company P.O. Box 24 Salem, Ohio (Mr. M.L. Ray)
Jou Chau-Sheng	January 2 - January 31 Dept. of Water Resources City Hall Durham, N.C. (Mr. Wade Brown)	
Liu Tyng-jenq	December 27 - January 26 Department of Public Utilities City of Raleigh Municipal Building Raleigh, N.C. (Mr. J.S. Goodman)	
Joseph Nguiguti	January 5 - January 31 Water Department City of Philadelphia 1160 Municipal Building Philadelphia, Pa. (Mr. Carmen Guarino)	February 1 - August 15, 1973 Gilbert Associates 525 Lancaster Ave. P.O. Box 1498 Reading, Penna. (Mr. Raymond T. Kase)
Juan Quintero	(Graduate Student - UNC)	
Ram Babu Sharma	January 2 - January 31 Water Department City of Pittsboro Pittsboro, N.C. (Mayor W.L. Powell)	February 1 - May 31, 1973 Walters Engineering 1479 S. Wells Ave Suite 4 Reno, Nevada (Mr. Brian B. Walters)

University of North Carolina at Chapel Hill

School of Public Health

Department of Environmental Sciences and Engineering

To all persons to whom this writing may come, Greeting:

Be it known that

_____

has satisfactorily completed the academic phase of the

International Program In Sanitary Engineering Design

This day of 19

_____
Dean, School of Public Health

_____
Head,
Department of Environmental
Sciences and Engineering

_____
Director, International Program
in Sanitary Engineering Design