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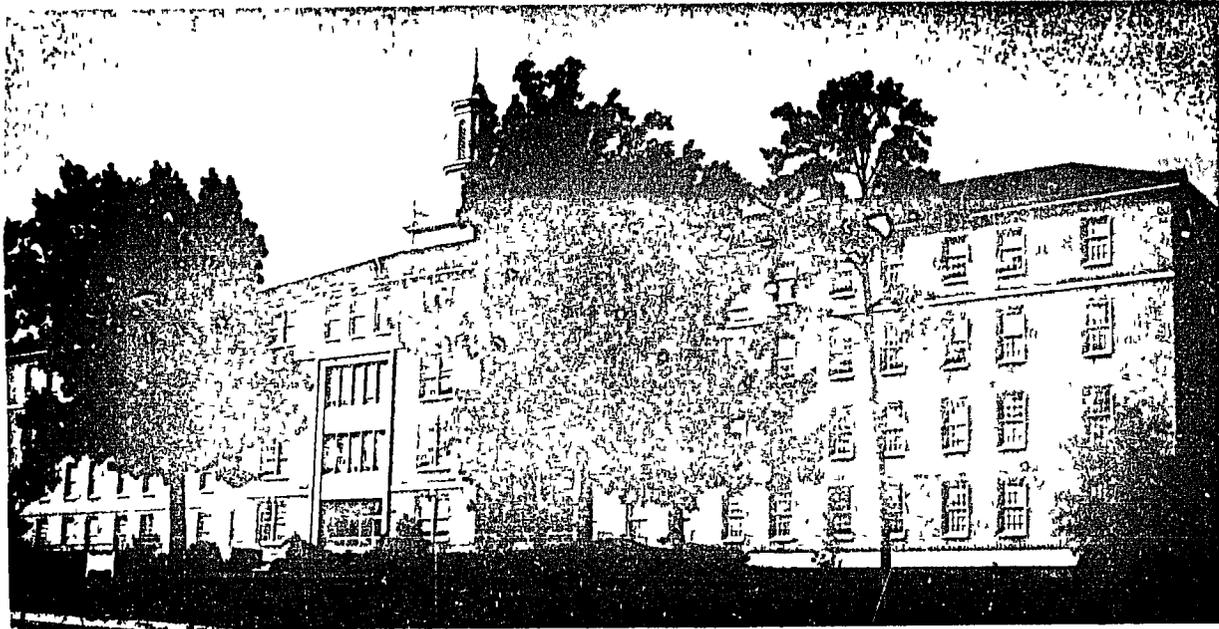
**School of Public Health
University of North Carolina
Chapel Hill, North Carolina**

**REPORT ON THE SEVENTH SESSION
OF THE
INTERNATIONAL PROGRAM IN SANITARY ENGINEERING DESIGN**

Prepared for

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

September 1967



School of Public Health
University of North Carolina at Chapel Hill

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September 1, 1967

Mr. Arthur Holloway, Acting Chief
Community Water Supply Section
Health Service, TCR
Department of State
Agency for International Development
Washington, D. C. 20523

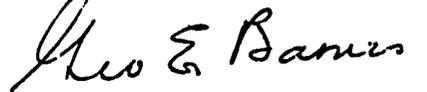
Mr. Theodore J. Wilson
Program Development Officer
Office of International Training
Agency for International Development
Washington, D. C. 20523

Gentlemen:

In accordance with our Contract AID/csd-718, as amended, we are pleased to submit herewith our report on the Seventh Session of the International Program in Sanitary Engineering Design. We wish to thank you and your predecessors for your cooperation and support in all aspects of this important work.

We remain,

Yours very truly,



George E. Barnes
Professor of Sanitary Engineering

Approved:


Daniel A. Okun, Project Director

PREAMBLE

This preamble to the report is written, as in earlier issues, to give the reader some background material relative to the project and its four aspects of (1) training in the U.S., (2) investigations, (3) publications, and (4) training abroad.

The International Program in Sanitary Engineering Design (IPSED) has been in operation since 1962. Earlier reports on the first six 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 his 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 some four 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 men 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 high investment but low operating charges, by more compact and highly mechanized and instrumented processes and structures, sometimes lower in first cost but higher 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 highly 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 so 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 participants, 54 in all thus far, have returned after completing the program, as intended, to do the work needed at home.

Another aspect of IPSED is its investigations. This work has been under way abroad (Peru) and involves laboratory experimentation and field studies focused on the intelligent use of local materials and on simple substitutes for labor saving and mechanical devices commonly employed in design, but unsuited for service in areas where skilled labor is relatively scarce and common labor is largely to be employed. As a result of this effort a laboratory for investigations has been established at the National University.

A third aspect of IPSED is its publication "Water Supply and Sanitation in Developing Countries." This is directed to the dissemination of simple suggestions and brief descriptions of simple but effective methods and devices to be used in water works and sewerage projects, with the intent of enabling project engineers to meet their problems under local conditions. This material is limited to that not readily found elsewhere. Some is original and much is contributed by correspondents abroad.

The fourth aspect of IPSED is the conduct abroad (in Peru) of the academic portion of the program in the language of the country. Hopefully this may develop into a regional program for South America, centered in Lima.

REPORT

REPORT ON THE SEVENTH SESSION OF
THE INTERNATIONAL PROGRAM IN SANITARY ENGINEERING DESIGN

SECTION I - GENERAL

1. Authority: The work herein reported has been carried out under the provisions of Contract AID/csd-718 and amendments, between the U.S. Department of State and the University of North Carolina at Chapel Hill. The contract is an extension of and supersedes the earlier Contract AID/csd-362.

2. The International Program in Sanitary Engineering Design: The International Program in Sanitary Engineering Design (IPSED) came into existence under this Contract 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 contract as amended in accordance with Paragraph 1 contemplates work which may be divided into four categories. These are (1) engineering training (2) investigations, (3) publications, and (4) export of engineering training to foreign countries. The major category is (1), and in this category we have had seven successive groups of foreign engineers who have completed the training program up to and including the present writing. Work in the latter three categories was more recently initiated and has not been discussed in earlier reports.

The engineering training program itself encompasses the following:

- (a) academic phase: a curriculum is set up for a twelve-week 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 issued to participants for reference, together with reprints of technical articles, manufacturers' bulletins, handbooks, and the like, so that the participant has a wealth of material to keep for future 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, generally within North Carolina, a state which is well supplied with excellent municipal utilities of this character. At the end of the course the participant will have worked out and submitted a project design. Since the groups are limited in size (twelve men or less), individual attention is given in the work.

- (b) field trips during academic phase: field trips as mentioned above have been made at various times to plants at Chapel Hill, Durham, Raleigh, Greensboro, Fayetteville, Siler City, Lumberton, Charlotte, Winston-Salem, High Point, and Asheville. Most trips are not to exceed one day's duration, although overnight trips have been made.

**PARTICIPANTS IN THE SEVENTH SESSION OF THE INTERNATIONAL PROGRAM
IN SANITARY ENGINEERING DESIGN**



LEFT TO RIGHT:

First row seated: Ajit Kumar Bhunia (India), Boonsong Seuyouyong (Thailand).

Second row seated: Mohammad Nijat Khan (Pakistan), Samuel Adewole Osobamiro (Nigeria), Thira Kunavipakorn (Thailand), Frank Geddes Chu Cheong (West Indies).

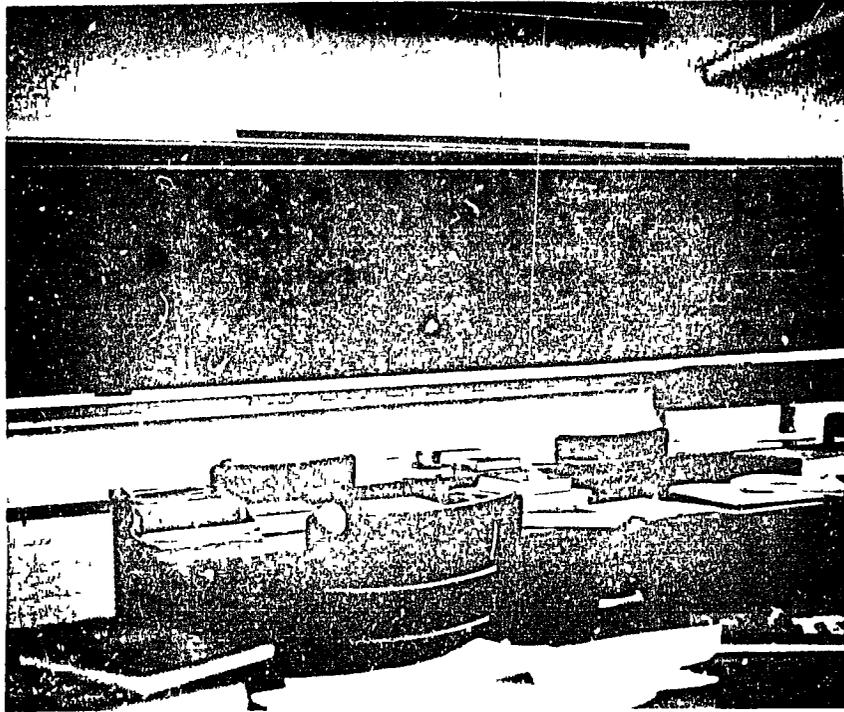
Third row standing: Mirajuddin Nagi (Pakistan), Benedito Eduardo B. Pereira (Brazil), Henrique De Mello (Brazil), Yau-nan Chen (Taiwan).

- (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, men have been sent as far afield as Philadelphia, the Hackensack Water Company, and Dayton, Ohio. A list of collaborating municipalities is given under Par. 5 (g).
- (d) consulting office (internship) phase: here again the participants are individually assigned to engineering offices for an internship period of about seven months ordinarily. These are selected with the participant's needs in mind, in relation to the work done in the indicated office; sometimes he will be working on projects which the firm is handling for the participant's home country. A list of collaborating engineering firms is given in Par. 5 (h).

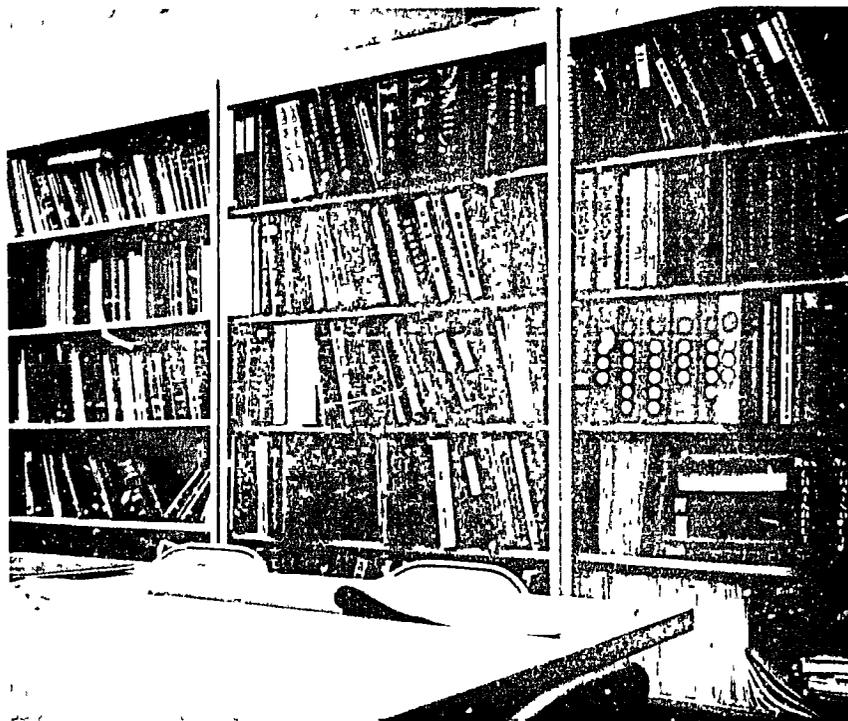
Both in the municipal phase and in the design phase, the staff at UNC is in touch with the participant and his superiors, and monthly reports are received on his work. He is also visited during the stay at his place of work. He is not allowed to drift; every effort is to make his experience cumulatively worthwhile by keeping it under constant supervision.

- (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 participant groups. 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. Perhaps even more attention has been given to married couples where men are accompanied by their wives, as has happened occasionally. Shopping trips have been arranged, as have attendance at church and participation in university student activities.
3. Qualifications and Support of Participants: Prospective participants must be graduate engineers with some practical experience and competence in English. They must have the recommendation of appropriate USA or WHO agencies. Following acceptance by the parties to this Contract, they come to this country for a nominal period of a calendar year, during which time they are paid living and travel expense or stipend. These stipends are financed by AID or by others who may offer scholarships for the purpose (see Par. 4).
 4. Supporting Agencies: The agencies which have given scholarship and financial aid to participants include the Agency for International Development of the U.S. State Department, Pan American Health Organization of the World Health Organization, the World Health Organization itself, the Organization of American States, and the Ford Foundation.

IPSED CLASSROOM AND REFERENCE ROOM



Classroom used by participants during the academic phase of IPSED



Reference room in which plans, specifications, reports, catalogs, reprints, etc., are made available for class use

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 knee-hole office 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: in the main building on campus are maintained two adjoining offices for one faculty member of the staff with a secretary; and a reference room in which plans, specifications, reports, catalogs, reprints, etc., are made available for classroom use.

Headquarters for the program are now housed in a two-story dwelling (308 Pittsboro Street) adjacent to the campus. This has been equipped for program purposes. The rooms downstairs house the program coordinator, two secretaries, files and records, reports, etc. The upstairs has separate rooms for three faculty members whose time is principally devoted to the program, and a room 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 found apartments, as provided for the University on campus, or in private homes if so desired. Participants are issued bicycles, if they so wish, 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: Chapel Hill, Charlotte, Durham, Fayetteville, Greensboro, Raleigh, and Winston-Salem.
Dayton, Ohio; Weehawken, New Jersey; Hartford, Connecticut; Los Angeles, California; Philadelphia, Pennsylvania; St. Louis, Missouri.
- (h) collaborating special schools and conferences: in a number of instances in which the participant has very special interests, he has been sent, during our program, to attend special schools or conferences. Among those which have collaborated in this fashion have been:



HEADQUARTERS FOR THE PROGRAM. Two-story dwelling adjacent to the campus which has been equipped for the program headquarters.



Mrs. Susan B. Pennell
Project Coordinator



Mrs. Carol Westerberg
IPSED Secretary



Mrs. Sandra Dickey
IPSED Secretary



Craige Dormitory, the usual Home of IPSED Participants During their Stay in Chapel Hill



Cafeteria Located Near Craige Dormitory

Engineering, Applied Systems - University of Akron, College of Engineering, Akron, Ohio.

Water and Sewerage Technical School, Neosho, Missouri.

Water Utility Management Course - sponsored by the World Bank and the International Bank, Washington, D. C. (May 14-20, 1967)

Ground Water Development Course, University of Minnesota, Minneapolis, Minnesota.

- (i) collaborating consulting engineering offices for design phase: for taking participants during design or engineering internship phase of the program, we are indebted to the following organizations, many of whom have collaborated in this phase of the program on more than one occasion:

Consulting Firms

| | |
|---|---|
| Albright and Friel Philadelphia, Pennsylvania | Gilbert Associates Reading, Pennsylvania |
| Alexander Potter Associates New York, New York | Greeley & Hansen Chicago, Illinois |
| Alvord, Burdick & Howson Chicago, Illinois | Havens & Emerson New York, New York |
| Black & Veatch Kansas City, Missouri | Hazen and Sawyer New York, New York |
| Brown & Caldwell San Francisco, California | Horner & Shifrin St. Louis, Missouri |
| Buck, Seifert & Jost Englewood, New Jersey | Lalonde, Girouard & Letendre Montreal, Canada |
| Burgess & Niple Columbus, Ohio | Malcolm Pirnie Engineers New York, New York |
| Camp, Dresser & McKee Boston, Massachusetts | Metcalf & Eddy Boston, Massachusetts |
| The Chester Engineers Pittsburgh, Pennsylvania | O'Brien & Gere Syracuse, New York |
| Engineering-Science, Inc. Arcadia, California | Whitman, Requardt & Associates Baltimore, Maryland |
| Gannett, Fleming, Corddry and Carpenter Harrisburg, Pennsylvania | |

6. Professional Staff: The following list includes those who have taken part either on a full-time basis or less than full time, in the instructional or academic phase of the program. Some of those listed at the University are predominantly occupied with IPSED activities, both during the sessions and in between sessions, to take care of all the minutiae of work associated with both planning and execution of the work.

FULL-TIME IPSED FACULTY



George E. Barnes



James C. Brown
(Resident in Peru for IPSED
program during present session)

James C. Lamb III
(Acting Project Director during 7th Session)





Donald T. Lauria



Gerrit v. R. Marais



Frederick E. McJunkin



Daniel A. Okun (Director of IPSED Program. Absent on leave during current session.)

(a) University faculty and staff:

George Eric Barnes, Professor of Sanitary Engineering, B.S.C.E., 1923 (Massachusetts Institute of Technology); C.E. (Hon.), 1935 (Case Institute of Technology); M.A., 1953 (Western Reserve University).

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

Emil Theodore Chanlett, Professor of Sanitary Engineering, B.S., 1937 (College of the City of New York); M.S.P.H., 1939 (Columbia); M.S.S.E., 1941 (University of North Carolina).

James Christian Lamb III, Professor of Sanitary Engineering, B.S.C.E., 1947 (Virginia Military Institute); M.S., 1948, S.E., 1952, Sc.D., 1953 (Massachusetts Institute of Technology). Acting Director of IPSED Program, 1966-67.

Donald Thomas Lauria, Engineering Associate and Instructor in Sanitary Engineering. B.C.E., 1956 (Manhattan College); M.S.S.E., 1965 (Syracuse University).

Gerrit van Rooyen Marais, Engineering Associate and Instructor in Sanitary Engineering, Diploma in Mechanical Engineering, 1945-1950 (Uitenhage Technical College); B.Sc., Civil Engineering, 1952-1955 (University of Cape Town); M.Sc., 1957-1965 (University of Witwatersrand); Diploma of Imperial College (DIC), (University of London).

Frederick Eugene McJunkin, Engineering Associate and Instructor in Sanitary Engineering, B.C.E., 1955 (North Carolina State College); M.S.S.E., 1961 (University of North Carolina).

Daniel Alexander Okun, (absent on leave during current session), Professor of Sanitary Engineering, Head, Department of Environmental Sciences and Engineering, B.S.C.E., 1937 (Cooper Union); M.S., 1938 (California Institute of Technology); Sc.D., 1948 (Harvard University). Director of IPSED Program.

Charles Manuel Weiss, Professor of Environmental Biology, B.S., 1939 (Rutgers University); Ph.D., 1950 (Johns Hopkins University). Acting Head, Department of Environmental Sciences and Engineering, 1966-1967.

(b) guest lecturers: below is a list of individuals who have been invited to make presentations before the IPSED groups, on topics in which they are well-known experts:

| <u>Name</u> | <u>Date and Subject</u> |
|--|---|
| Leonard Board U.S. Public Health Service Washington, D. C. | October 3, 1966 Community Water Supply in Latin America |
| Arthur Holloway U.S. Agency for International Development, Community Water Supply Section Washington, D.C. | October 10, 1966 Planning and Developing Water Supply Programs in Developing Countries |
| Efrain Ribeiro Pan American Health Organization Washington, D.C. | October 17, 1966 Water Supply Programs of International Agencies |
| Harold Shipman International Bank for Recon- struction and Development Washington, D.C. | October 24, 1966 Requirements for Financing International Sanitary Engineering Projects |
| John Marsh E. E. Johnson Division Union Oil Products Co. Minneapolis, Minnesota | October 31 - November 4, 1966 Development of Ground Water and Design of Wells |
| Harry Schwarz North Atlantic Division U.S. Army Corps of Engineers Washington, D.C. | November 7, 1966 Water Resources Planning in the United States at the National Level |
| Herbert Hudson Hazen and Sawyer New York, New York | November 14, 1966 General Considerations in the Design of Water Filtration Facilities |
| E. Robert Baumann Department of Civil Engineering Iowa State University | November 21, 1966 General Considerations in the Design of Sewerage Facilities |
| Rolland W. Simpson Sanitary Division Gilbert Associates Reading, Pennsylvania | November 30, 1966 The Benefits of Water and Sewerage Facilities in Developing Countries |

SECTION II - REPORT ON SEVENTH SESSION

7. Participants: The Seventh Session of the International Program in Sanitary Engineering Design was held during the period September 1966 through August 1967. There were ten participants from seven different countries, as follows:

Name: Ajit Kumar Bhunia

(Sponsored by WHO)

Age: 24

Home: Mohanpur, Dt. Nadia, West Bengal, India

Family: Single

Education: University of Calcutta, B.E. in Civil Engineering,
1963

Present Employer: Calcutta Metropolitan Planning Organization,
Government of West Bengal

Title: Assistant Engineer

Brief Job Description: Designing and cost estimating for water supply, sewerage and drainage facilities as supporting staff to Engineering Consortium consisting of Metcalf & Eddy, Ltd., and Engineering Science, Inc., of U.S.A., engaged in the preparation of Master Plan in Greater Calcutta under WHO. Project India 170.

Duration of Program: 1 year

Training Officer: Mrs. Marvelle B. Toney



Name: Boonsong Seuyouyong

(Sponsored by AID)

Age: 23

Home: 33/1 Soi Tevawest 2nd, Krung Kasem Road, Bangkok,
Thailand

Family: Single

Education: Chulalongkorn University, B.E. in Civil Engineering,
1965

Present Employer: Department of Health, Ministry of Public
Health, Bangkok

Title: Sanitary Engineer

Brief Job Description: Field Engineer

Duration of Program: 1 year

Training Officer: Mr. Theodore J. Wilson



Name: Yau-nan Chen
Age: 35
Home: 14-1-32, Nan-shan Road, Chung-ho Hsiang, Taipei,
Taiwan
Family: Married
Education: National Taiwan University, B.Sc. in Civil Engineer-
ing, 1953
Present Employer: Taiwan Public Works Bureau, P. O. Box 984,
Taipei, Taiwan, China
Title: Senior Engineer

(Sponsored by WHO)



Brief Job Description: To plan and design the municipal water supply project in Taiwan. Now in charge of the planning work for "Tainan Regional Water Supply Project" and "Regional Water Supply Plan for Tsen-wen Reservoir Project."

Duration of Program: 9 months
Training Officer: Mrs. Jane H. Priest

Name: Frank Geddes Chu Cheong
Age: 44
Home: Nelson Street, St. Joseph, Trinidad, West Indies
Family: Married
Education: St. Benedict's College, Trinidad. School certificate Gr. I., 1939; Assistant Pharmacist License, Trinidad, 1944; Training Course in Public Health Engineering, sponsored by Col. Dev. Welfare and Rockefeller Foundation, Granada. Diploma of the Institute of Public Health Engineers, 1947. The Johns Hopkins University, M.Sc., Eng., 1962.

(Sponsored by PAHO)



Present Employer: Water and Sewerage Authority, 15-19 Tragarete Road, Port of Spain, Trinidad, West Indies.

Title: Water Engineer

Brief Job Description: To be responsible for the technical and administrative operations engineering branch of the central water distribution authority. This involves the maintenance of approximately 1500 miles of distribution mains serving approximately 700,000 persons with a daily supply of 40,000,000 gals. per day. There are 42,000 house services involved and 36 balancing tanks. Responsible for the design and construction maintenance of all buildings of the authority; preparation of all technical reports for the authority; and for attendance at meetings and conferences with labor unions, management and authority.

Duration of Program: 9 months
Training Officer: Mrs. Jane H. Priest

Name: Henrique de Mello
Age: 24
Home: Rua Anita Garibaldi 48 Ap. 701, Rio de Janeiro,
(Guanabara), Brazil
Family: Married
Education: E.P.U.C. degree in Civil Engineering, 1964
Present Employer: CEDAG - State Company of Water Supply
of Guanabara
Title: Chief of the Special Plans Service
Brief Job Description: Working on plans for the distribution
system for the State of Guanabara
(Master Plan)
Duration of Program: 11 months
Training Officer: Miss Eleanor S. Silberman

(Sponsored by AID)



Name: Mohammad Nijat Khan
Age: 30
Home: Ponial-Damas, Gilgit Agency, Pakistan
Family: Married
Education: Engineering College, University of Peshawar,
B.E. in Civil Engineering, 1960
Present Employer: Public Health Engineering Department,
Government of West Pakistan, Lahore
Title: S.D.O. Public Health Engineer
Brief Job Description: To prepare design estimates for water
supply schemes, drainage, and sewerage
systems; to execute and supervise the work of over-head tank,
distribution system and install tubewells; to supervise accounts
of works expenditure and office administration.
Duration of Program: 1 year
Training Officer: Mr. Theodore J. Wilson

(Sponsored by AID)



Name: Mirajuddin Nagi
Age: 33
Home: Katcha Nisbet Road, Lahore, West Pakistan
Family: Single
Education: Engineering College, University of Karachi,
B.E. in Civil Engineering, 1960
Present Employer: Public Health Engineering Department,
Lahore, West Pakistan
Title: S.D.O. Public Health Engineer
Brief Job Description: Design, construction, supervision and
maintenance of structures pertaining to
water supply, drainage and sewerage fields.
Duration of Program: 1 year
Training Officer: Mr. Theodore J. Wilson

(Sponsored by AID)



Name: Samuel Adewole Osobamiro

(Sponsored by AID)

Age: 34

Home: 68 Ikorodu Road, Mushin, Lagos, Nigeria

Family: Married

Education: University College, Ibadan, B.Sc., 1954; University of Aberdeen, B.Sc. (Hon.), 1957

Present Employer: Ministry of Works and Transport, Western Region, Ibadan, Nigeria

Title: District Engineer, Oyo

Brief Job Description: Supervision of construction and maintenance of public works and services; roads and bridges, buildings, etc.

Duration of Program: 1 year

Training Officer: Mr. John R. Gilmore



Name: Benedito Eduardo Barbosa Pereira

(Sponsored by AID)

Age: 31

Home: Pamplona St. Apts. 71, Sao Paulo, Brazil

Family: Married

Education: Sao Carlos School of Engineering, University of Sao Paulo - Civil Engineering, 1959
S. P. School of Public Health, Sanitary Engineer, 1964

Present Employer: State of San Paulo, Department of Sanitary Work

Title: Assistant Director, Division of Construction

Brief Job Description: Evaluate water supply and sewerage project plans and specifications for construction planning; plan and schedule project construction for fifth water works and sewerage projects for State Public Works Agency. Analyze construction bids; select contracts; supervise and coordinate work of ten construction engineers and satitary engineering projects.

Duration of Program: 1 year

Training Officer: Miss Eleanor S. Silberman



Name: Thira Kunavipakorn

(Sponsored by AID)

Age: 24

Home: 2152 Rama 4, Kleng Teey, Bangkok, Thailand

Family: Single

Education: Chulalongkorn University, B.E. in Industrial Engineering, 1965

Present Employer: Department of Health, Ministry of Public Health, Bangkok

Title: Sanitary Engineer

Brief Job Description: Field Engineer

Duration of Program: 1 year

Training Officer: Mr. Theodore J. Wilson



8. Academic Program: After the usual orientation in which the participants were made familiar with the University and its activities, and after they had been housed and fairly well settled, the academic program of the session began on September 12, terminating December 8. The detailed curriculum, listing the lecturers, topics, and dates, will be found in Appendix C.

In the Department of Environmental Sciences and Engineering of UNC, Saturday morning seminars are held for faculty and graduate engineers. The IPSED participants are also free to attend these seminars. A list of subjects and speakers for the various seminars concurrent with the academic program of the Seventh Session is given in Appendix D.

9. Field Trips and Meetings Attended: During the academic session, as customary, field trips were made by the group to various waterworks and sewage treatment plants in North Carolina. Also, as will be shown, they were in attendance at several national conferences and technical meetings. The field trips included:

(a) field trips:

October 6 -Chapel Hill, North Carolina, water treatment plant
October 13 -Ramseur, North Carolina, oxidation ponds
Siler City, North Carolina, oxidation ponds
October 21 -Durham, North Carolina, sewage and water treatment plants
October 27 -Raleigh, North Carolina, water treatment plant (construction site)
November 17 -Chapel Hill, North Carolina, sewage treatment plant
December 5 -Greensboro, North Carolina, water treatment plant and to
South Buffalo Creek Sewage Plant

(b) meetings of professional societies and national conferences:

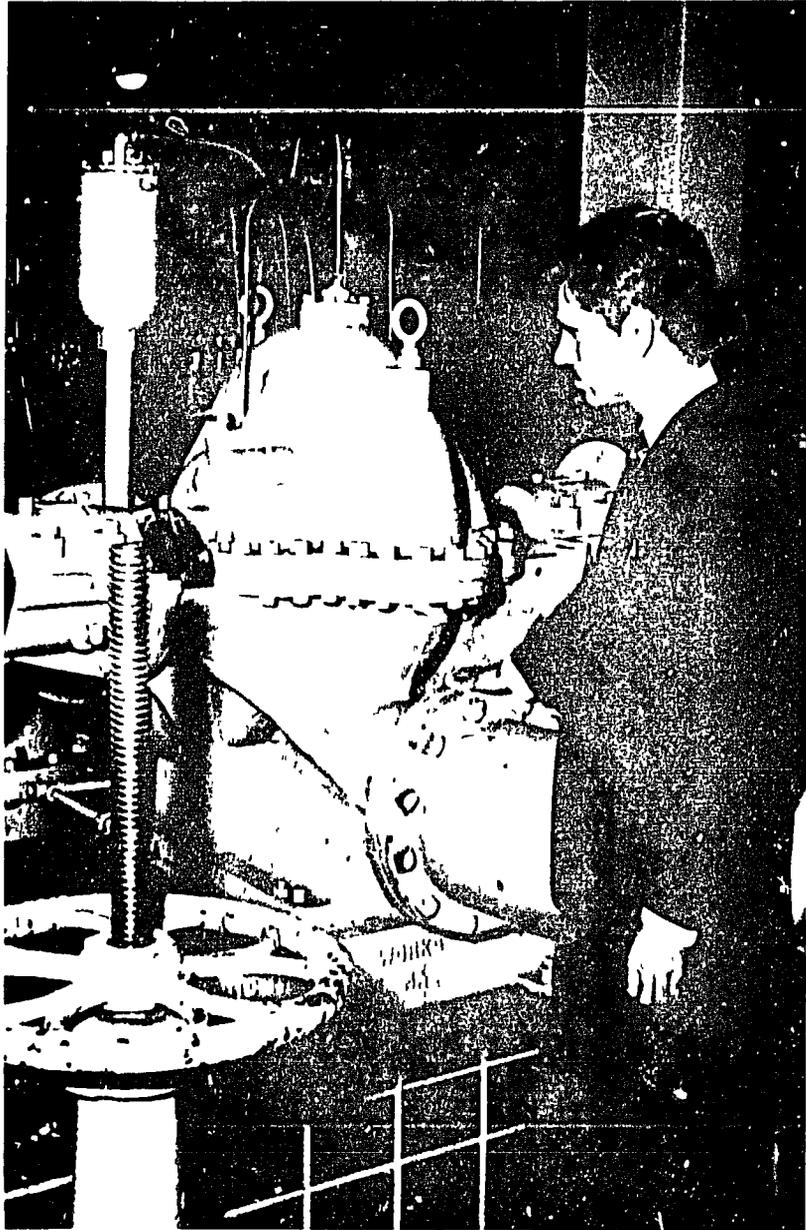
September 25-30: National Conference of the Water Pollution Control Federation, Kansas City, Missouri. Attended by the entire group.

May 14-20: Water Utility Management Course, Washington, D.C., sponsored by the International Bank for Reconstruction and Development. Attended by Chu Cheong, Boonsong, Khan, Nagi, Osobamiro, and Thira.

May 23-31: International Conference on Water for Peace, Washington, D.C. Attended by Boonsong, Khan, Nagi, Osobamiro, and Thira.

June 4-9: American Water Works Association, Atlantic City, New Jersey. Attended by Boonsong, Khan, Nagi, Osobamiro, and Thira.

10. Municipal Assignments: As stated in paragraph 2 (c), after completion of the academic phase of the International Program, the participants are ordinarily assigned individually to some municipality, usually in North Carolina, for a period of one month, during which time they acquire operating experience in a waterworks plant, or sewage treatment plant, or both. The assignments appear as follows:



Mirajuddin Nagi during the municipal phase of his training at the Department of Public Utilities, Raleigh, North Carolina.

Ajit Kumar Bhunia: County Sanitation District, Los Angeles, California

Boonsong Seuyouyong: City of Charlotte, North Carolina

Yau-nan Chen: City of Greensboro, North Carolina

Frank G. Chu Cheong: City of Winston-Salem, North Carolina

Mohammad Nijat Khan: Department of Water Resources, Durham, North Carolina

Henrique de Mello: City of Philadelphia, Pennsylvania

Mirajuddin Nagi: City of Raleigh, North Carolina

Samuel A. Osobamiro: Hackensack Water Company, Weehawken, New Jersey

Benedito E.B. Pereira: Chapel Hill Water Filtration Plant, Chapel Hill, North Carolina

Thira Kunavipakorn: City of Fayetteville, North Carolina

11. Consulting Office (Internship) Assignments: As has been indicated, the value of IPSED to the participant is as much derived from his assignment to an engineering office, for design and general experience, as from any single phase of the program. We have listed in paragraph 5 (h) over twenty engineering firms of first rank in the profession that have been collaborating in this aspect of the work. In making the assignment we can choose the firm he will work with with some discretion, taking into account the work at hand in each office and how it may benefit the participant in view of his probable future. Oftentimes we are able to put him with a firm that is doing work for his own country, which may, in a particular instance, have special advantages. Assignments of the ten participants in the Seventh Session were as follows:

| <u>Participant</u> | <u>Internship Station</u> |
|---------------------|--|
| Ajit Kumar Bhunia | Boston, Massachusetts Metcalf and Eddy |
| Boonsong Seuyouyong | Chicago, Illinois Greeley and Hansen |
| Yau-nan Chen | New York, New York Hazen and Sawyer |
| Frank G. Chu Cheong | White Plains, New York Malcolm Pirnie Engineers |
| Mohammad Nijat Khan | Boston, Massachusetts Metcalf and Eddy |

PARTICIPANTS ON THE JOB IN CONSULTING ASSIGNMENTS



Thira Kunavipakorn
Alvord, Burdick and Howson
Chicago, Illinois



Boonsong Seuyouyong
with Mr. Elmer Ballotti of
Greeley and Hansen
Chicago, Illinois



Yau-nan Chen
with Mr. Herbert Hudson of
Hazen and Sawyer
New York, New York



Samuel A. Osobamiro
with Mr. R. T. Kase of
Gilbert Associates
Reading, Pennsylvania

| <u>Participant</u> | <u>Internship Station</u> |
|--------------------------|--|
| Henrique de Mello | Syracuse, New York O'Brien and Gere |
| Mirajuddin Nagi | Harrisburg, Pennsylvania Gannett, Fleming, Corddry and Carpenter |
| Samuel A. Osobamiro | Reading, Pennsylvania Gilbert Associates |
| Benedito Barbosa Pereira | New York, New York Hazen and Sawyer |
| Thira Kunavipakorn | Chicago, Illinois Alvord, Burdick and Howson |

12. Final Reports and Commentaries: As previously stated, the final reports required of each participant, summarizing his total experience in the program, serve dually for the benefit of the participant and for that of the program administrators.

For the participant, the report is based upon a daily log or diary kept currently up-to-date with his activities. Both the diary and the report constitute a permanently valuable reference source, especially as to accurate recording of names, dates, places and reflections made with the work fresh in mind.

For the administrators of the program, the report gives data of use for adjudging the effectiveness of the work and its impact on the participant. It also contains suggestions, criticisms and comments.

The reports necessarily reflect the attitudes, capabilities, and maturity of the participant, which are diverse because of differences in ages, background, and country of origin.

Some commentaries based on the reports of the participants in the Seventh Session follow:

(1) A common suggestion, made by many participants, is to extend the academic time and to shorten the consulting office (internship) time. The men are aware of the unusual opportunity for classroom instruction, which they may never have again; and they want to make the most of it. Particular value is placed on exercises and problems, and the design problem especially. All lean toward practical applications, and those portions of the instruction pertaining to applied hydraulics, pumps and pumping, plant design, and distribution systems, ground water and surface water yield, are stressed as being quite important and deserving of more time. As a matter of fact, we have already acted on this suggestion, and plan to extend the former 12-week academic phase to a full semester.

PARTICIPANTS RECEIVE CERTIFICATES



Dr. Daniel A. Okun, Program Director, presents Certificates of Achievement to Mirajuddin Nagi and Mohammad Kahn at completion of program.

(2) Also, more status, the participants believe, is wanted than is given by a certificate at the completion of the course. Many participants think a degree is warranted. In this we do not concur; however, by extending the work to a full semester, certain subject matter can be taken concurrently with graduate students who are degree candidates; and graduate credit can be given for these portions of the work if satisfactory class work and examinations are completed.

(3) As a corollary to (1) above, many participants think the consulting phase so long that it gives diminishing returns toward the latter part of the program. Thus it could be shortened by the amount the classwork is extended without lengthening the program as a whole. This also we plan on doing in conjunction with the above mentioned change.

We do not wish to single out individual participants for special mention, but we desire to express our gratitude to the firms who have expressed by letter their satisfaction at the capacity and accomplishment of some of the participants in this particular group. This includes the firms of Metcalf and Eddy, Boston; Hazen and Sawyer, New York; and Gilbert and Associates, Reading Pennsylvania.

Over the several years this program has been in operation, consulting experience has not always been satisfactory. Part of this is owing to poor judgement in making the placements, part is owing to the participants themselves, and part is owing to inappropriate assignment to work in the consulting office. The remedy for this is more contact between the consulting office and Chapel Hill, with perhaps more visits to the participant while at work. Another possibility is a more detailed prearrangement of the work in view for the participant on his arrival to the consulting office, or alternative placement.

The consulting engineering organizations have all been most cooperative in their collaboration with the program.

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 in recognition of the completion of the course of study in the
International Program In Sanitary Engineering Design,

we confer upon

this Certificate of Achievement

This day of 19

Dean, School of Public Health



Project Director and Head,
Department of Environmental
Sciences and Engineering

Professor of Sanitary Engineering
Engineer Associate

SECTION III - PUBLICATIONS

13. Publications: A more recent phase of IPSED is the collection and dissemination on a global basis of practical information concerning water supply and wastes disposal in developing countries. Information on techniques which have proved valuable for water resources problems under the special conditions in developing countries is collected, edited, published, and distributed through a serial publication entitled Water Supply and Sanitation in Developing Countries.

This publication, first published this academic year, has been widely and enthusiastically received. It is now being mailed to some 8,000 engineers in over 100 countries of the globe. Requests to receive the publication are coming in continuously. Announcement of the publication was made at the Tenth Biennial Congress of the Interamerican Association of Sanitary Engineering held in San Salvador in December 1966, and was warmly received. The Congress passed an official resolution of commendation as follows:

"The tenth Biennial Congress of the Interamerican Association of Sanitary Engineering, held in San Salvador, Central America. December 4-14, 1966:

"Considering:

That there exists a growing interest in the promotion of programs of research in sanitary engineering, which has resulted in concrete endeavors in many of the universities and teaching centers in Latin America,

That there exists a need to further the interchange of information about projects presently under way, or completed, in order that they acquire wide recognition by means of appropriate means of communication,

That it is known that through the joint efforts of the Agency for International Development and the University of North Carolina, there has come into existence a publication entitled 'Water Supply and Sanitation in Developing Countries,' which has been generously offered by the aforementioned agencies as a means of disseminating information concerning work of this character,

"Resolves:

1. To recommend to local sections of AIDIS that they help to coordinate the interchange of technical information between the entities that carry out programs of investigation and those who are in responsible charge of the publication entitled 'Water Supply and Sanitation in Developing Countries,' edited by the University

of North Carolina under the auspices of AID, so that they may receive and issue information about investigations that are under way in different parts of the world.

2. To recommend to the editors of 'Ingeniera Sanitaria,' the official organ of AIDIS, that they establish information exchange with the publication named above for mutual benefit.

3. To give recognition to the University of North Carolina and the Agency for International Development, for this valuable contribution to sanitary engineering throughout the continent."

The lead sheet, explaining the reasons for issuing the publication and something of the nature of its contents, is given in Appendix F together with a sample of the articles already issued.

SECTION IV - ACTIVITIES ABROAD
(ACADEMIC PHASES AND INVESTIGATIONS)

14. Activities Abroad: Activities abroad are limited to Peru and are reported as follows:

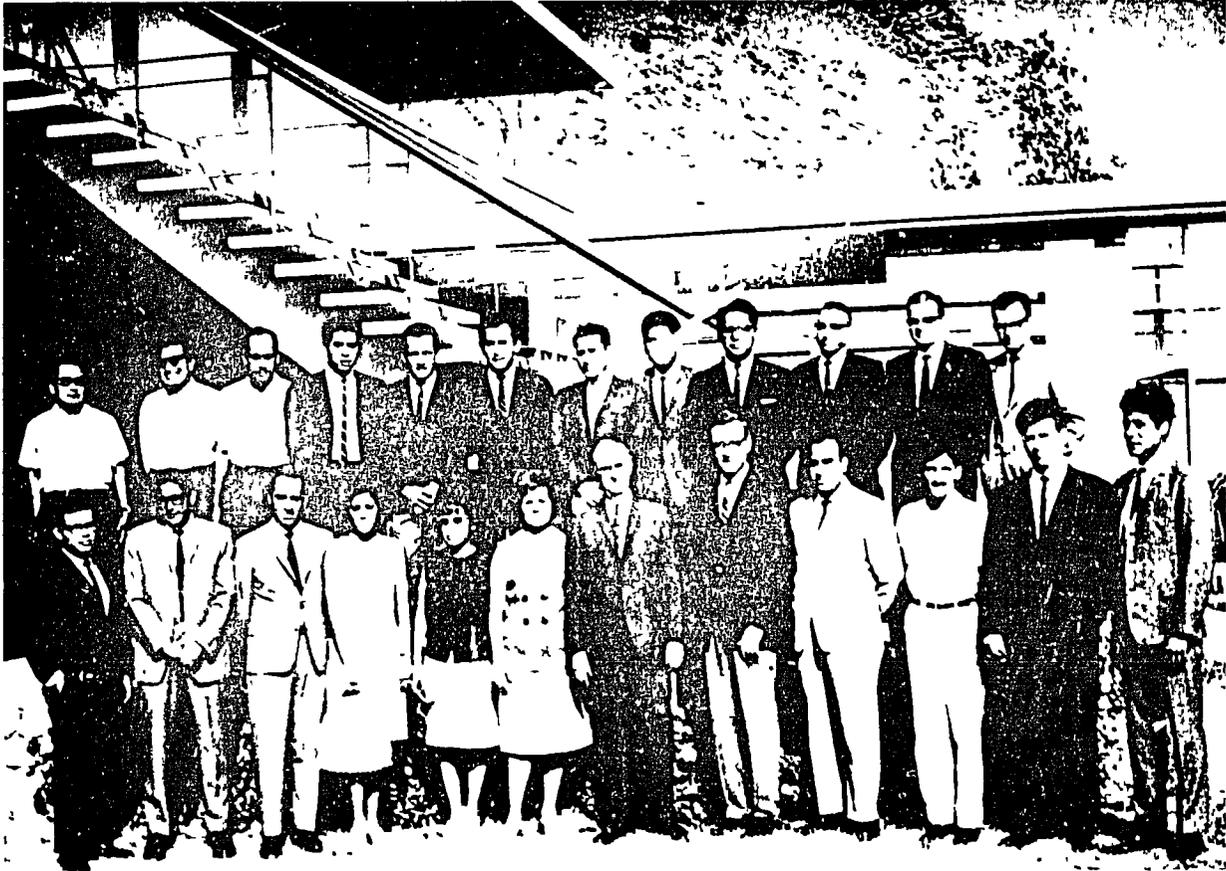
When the academic phase of the IPSED program was offered in its entirety at the National Engineering University (UNI) in Lima, Peru, in 1965, it failed to attract participants. This was largely owing to the fact that men could not be spared or take time out from their regular jobs for continuous attendance over the proposed eleven week period for the course. It was therefore decided to offer selected portions of the course only, to be given separately at such intervals that better attendance would be possible. Treated as separate "courses," these portions of the total course were held as follows:

15. Academic Program 1965-66:

| <u>Course</u> | <u>Dates</u> | <u>Material Covered</u> | <u>Instructors</u> |
|---------------|----------------------|---|--|
| (1) | Nov. 2-12, 1965 | Ground Waters and Wells | Gerald F. Briggs, V. Pres. E.E. Johnson Co. Minneapolis, Minn. |
| (2) | Jan. 24-Feb. 4, 1966 | Hydraulics, Centrifugal Pumps and Head Curves | George E. Barnes, Professor San. Eng., Univ. of N.C. at Chapel Hill |
| (3) | Feb. 21-25, 1966 | Water Treatment Plant Design | Ing. Roberto Blume, Ministry of Public Works, Peru |
| | Feb. 28-Mar. 4 | Sewage Treatment Plant Design | George E. Barnes, Professor San. Eng., Univ. of N.C. at Chapel Hill |
| (4) | July 11-15 | Economics and Finance | Peter Ruderman, Federico Bresani, James C. Brown (UNC) Jorge Pflucker, Rene Espinosa |

Attendance at these four sessions was 30, 26, 17, and 18 engineers, respectively; or a total attendance of 91. This was made up of 68 different participants, which means that participants, on the average, took 1.3 courses each.

IPSED IN PERU



Twenty-five Peruvian engineers attended the second cycle of UNC's International Program in Sanitary Engineering Design at Universidad Nacional de Ingenieria in Lima, Peru, January 24 -February 4, 1966. In the Center of the photo are Professor George E. Barnes (UNC), Lecturer for the cycle, Professor James C. Brown (UNC), International Coordinator for the Program in Peru, and Ing. Augusto Navarro (UNI), National Coordinator for Peru.

16. Academic Program 1967:

The full eleven-week IPSED course was again offered during the first part of 1967, failed to get participants, and consequently was offered only in part, at suitable intervals. The following portions of the course were given:

| <u>Course</u> | <u>Dates</u> | <u>Material Covered</u> | <u>Instructors</u> |
|---------------|------------------|------------------------------|--|
| (1) | Feb. 20 - Mar. 3 | Ground Water and Wells | Gerald F. Briggs, and Joe Mogg, Johnson Division, Union Oil Products Co. |
| (2) | Mar. 6-10 | Hydraulics | Ricardo Corzo, UNI and Ministry of Health |
| (3) | Mar. 13-23 | Pumps and Pumping | James C. Brown, UNC Juan Baselli Fairbanks Morse Company |
| (4) | Mar. 27-31 | Distribution Systems | Carlos Ruiz, UNI and Ministry of Health |
| (5) | April 3-7 | Water Treatment Plant Design | Roberto Blume, Ministry of Public Works Augusto Navarro, UNI James C. Brown, UNC Ronald Boubel, AID |

Enrollment for these five sessions was 28, 11, 13, 13, and 11 respectively or a total enrollment of 76. This enrollment was made up of 40 participants, so that the participants took, on the average, 1.9 courses apiece. However, the attendance at the first or ground water session was more than double that of any other.

17. Commentaries: It will be noted that a substantial portion of the complete IPSED course is lacking in the above series, i.e., (a) elements of preliminary engineering studies, (b) surface water hydrology, (c) development of surface water sources for public supply, (d) water chemistry with design applications, (e) water biology with design applications, and (f) sewage treatment plant design. Thus the effort to conduct the academic phase of IPSED in Peru has fallen a bit short of the results hopefully anticipated.
18. Investigations: Work on laboratory and field investigations is under way and will be reported on in later reports. A paper on the subject was presented before one of the sessions of the AIDIS Congress in San Salvador, by Professors J.C. Brown of UNC and Augusto Navarro of UNI, and another paper on the development of a chlorine diffuser block was presented at the same congress by Carlos Ruiz of Peru, one of our associates on the work. The latter paper was given the citation of the Venezuelan Section, for the best paper presented at each biennial congress.

19. Future: Professor James C. Brown, who has been our resident in Peru throughout this venture, terminates his stay in August 1967. Professor Augusto Navarro of UNI, a former IPSED participant, will carry on the work in accordance with the provisions of a revised contract between UNC and UNI, which will permit continuance for another two years with local talent backed up by consulting service and perhaps intermittent visits from IPSED staff at Chapel Hill, or others.

APPENDICES

APPENDIX A - REFERENCE TO EARLIER REPORTS

Earlier reports pertaining to preceding sessions of the International Program in Sanitary Engineering Design include the following:

| <u>Session</u> | <u>Date of Session</u> | <u>Date of Report</u> |
|----------------|---------------------------------|--|
| 1 | January, 1963 - November, 1963 | March 31, 1964 |
| 2 | September, 1963 - July, 1964 | February 22, 1965 |
| 3 | February, 1964 - December, 1964 | } Sessions 3 & 4 jointly reported January 15, 1966 |
| 4 | September, 1964 - July, 1965 | |
| 5 | February, 1965 - October, 1965 | } Sessions 5 & 6 jointly reported March 15, 1967 |
| 6 | September, 1965 - August, 1966 | |

APPENDIX B - SUMMARY LIST OF PARTICIPANTS AND COUNTRIES OF ORIGIN

In the seven sessions of the International Program in Sanitary Engineering Design, there have been 52 participants from 22 different countries, as follows:

| <u>Group No.</u> | <u>Name of Participant</u> | <u>Country</u> |
|------------------|---|----------------|
| 1 | Eduardo Garcia | Colombia |
| | Zekal Gurgul | Turkey |
| | Francisco de Mendonca | Brazil |
| | Semih Turker | Turkey |
| | Sacit Unal | Turkey |
| 2 | Horace L. Beckford | Jamaica |
| | Salman M. El-Rawi | Iraq |
| | Walter B. Fabian | Costa Rica |
| | Jeff E. Flanagan | USAID Burma |
| | Vincent E. Hemming | Jamaica |
| | Emmanuel A. Ojo | Nigeria |
| | Pedro A. Parada | Bolivia |
| Ali H. Shubber | Iraq | |
| 3 | Andres Bacigalupi | Argentina |
| | Kofi Mensah Addison | Ghana |
| | Felipe Ruiz | Chile |
| | Luckaman Al-Abaddy | Iraq |
| 4 | Kofi Mensah Addison (started with 3, ended with 4) | Ghana |
| | Emilio de la Fuente | Peru |
| | Philip Peng-fei Kuo | Taiwan |
| | Nilo Leite Nassar | Brazil |
| | Augusto A. Navarro | Peru |
| | Muwaffaq B. A. Sulaiman | Iraq |
| | Najeeb Foteh Tleel | Jordan |
| 5 | Benjamin O. Adeyemi | Nigeria |
| | Carlos Guerrero | Bolivia |
| | Nguyen Danh Vang | Vietnam |
| | Tran Phuoc Tho | Vietnam |
| | Nguyen Dinh Vien | Vietnam |
| | M. Zeki Aygen | Turkey |
| | Yuksel Isleyen | Turkey |
| O. Perakyla | Finland | |

Appendix B - continued

| <u>Group No.</u> | <u>Name of Participant</u> | <u>Country</u> |
|------------------|----------------------------|----------------|
| 6 | Zafar Ahmad | Pakistan |
| | Salman Al Mahmoud | Iraq |
| | Alir Doria | Brazil |
| | Syed Husain | Pakistan |
| | Muhammad Khokhar | Pakistan |
| | Francis Obodoechina | Nigeria |
| | Claudius Razafy | Madagascar |
| | Ismail Razee | Pakistan |
| | Ahmet Takaoglu | Turkey |
| | Marina Rosa e Silva | Brazil |
| | Hugo Tejerina | Bolivia |
| 7 | Ajit Kumar Bhunia | India |
| | Boonsong Seuyouyong | Thailand |
| | Yau-nan Chen | Taiwan |
| | Frank G. Chu Cheong | Trinidad |
| | Mohammad Nijat Khan | Pakistan |
| | Henrique de Mello | Brazil |
| | Mirajuddin Negi | Pakistan |
| | Samuel Adewole Osobamiro | Nigeria |
| | Benedito E.B. Pereira | Brazil |
| | Thira Kunavipakorn | Thailand |

APPENDIX C - CURRICULUM FOR ACADEMIC PHASE OF SEVENTH SESSION

INTERNATIONAL PROGRAM IN SANITARY ENGINEERING DESIGN
FALL - 1966

1st WEEK - September 8-9

ORIENTATION

| | | | |
|--------------|--------|-------------|-------------|
| 9/8 Thursday | AM, PM | L. Murkland | Orientation |
| 9/9 Friday | AM, PM | L. Murkland | Orientation |

2nd WEEK - September 12-16

INTRODUCTION

| | | | |
|----------------|----|-------------------------------------|-------------------------|
| 9/12 Monday | AM | D. T. Lauria | Program Review |
| | PM | G. E. Barnes | IPSED Facilities |
| | | | Objectives |
| 9/13 Tuesday | AM | F. E. McJunkin & G. v. R. Marais | Group Discussion |
| | PM | G. E. Barnes & D. T. Lauria | Group Discussion |
| 9/14 Wednesday | AM | D. T. Lauria | U.S. Planning Practice |
| | PM | D. T. Lauria | Class Planning Problem |
| 9/15 Thursday | AM | D. T. Lauria | Water & Economic Growth |
| 9/16 Friday | AM | D. T. Lauria | Class Planning Problem |

3rd WEEK - September 19 - 23

BASIC SANITARY SCIENCES

| | | | |
|----------------|----|------------------|-----------------------------------|
| 9/19 Monday | AM | D. T. Lauria | Data: Sources |
| | PM | C. R. O'Melia | Logarithmic Equilibria Diagrams |
| 9/20 Tuesday | AM | D. T. Lauria | Preliminary Planning |
| | PM | C. R. O'Melia | Logarithmic Equilibria Diagrams |
| 9/21 Wednesday | AM | D. T. Lauria | Data: Analysis to Determine Needs |
| | PM | C. R. O'Melia | Logarithmic Equilibria Diagrams |
| 9/22 Thursday | AM | D. T. Lauria | Data: Analysis to Determine Needs |
| | PM | J. C. Lamb | Quality Standards |
| 9/23 Friday | AM | M. M. Hufschmidt | Water Resources |

Appendix C - continued

4th WEEK - September 25 - 30

9/25 Sunday to
9/30 Friday

WPCF CONVENTION - Kansas City, Missouri

5th WEEK - October 3 - 7

BASIC ENGINEERING CONSIDERATIONS

| | | | | |
|------|-----------|----------|---|---|
| 10/3 | Monday | AM PM | D. T. Lauria LEONARD BOARD (U.S. Public Health Service) | Analysis of Data GUEST LECTURER |
| 10/4 | Tuesday | AM | G. E. Barnes | Water Treatment |
| 10/5 | Wednesday | AM PM | G. E. Barnes D. T. Lauria | Water Treatment Inlet & Water Treatment |
| 10/6 | Thursday | AM PM | D. T. Lauria | Water: General Design FIELD TRIP: Chapel Hill Water Treatment Plant |
| 10/7 | Friday | AM PM | D. T. Lauria G. E. Barnes | Water: General Design Design of Water Distribution System |

6th WEEK October 10 - 14

| | | | | |
|-------|-----------|----------|--|--|
| 10/10 | Monday | AM PM | D. T. Lauria ARTHUR HOLLOWAY - (U.S. Agency for International Development) | Water Treatment Plants & Processes GUEST LECTURER |
| 10/11 | Tuesday | AM PM | D. T. Lauria J. C. Lamb | Water Treatment - Filters Stream Sanitation |
| 10/12 | Wednesday | AM PM | G. E. Barnes J. C. Lamb | Sewer Design Stream Sanitation |
| 10/13 | Thursday | | | ALL DAY FIELD TRIP - Ramseur, N. C. - Oxidation Ponds |
| 10/14 | Friday | AM PM | D. T. Lauria J. C. Lamb | Sewerage: General Design Stream Sanitation |

Appendix C - continued

7th WEEK - October 17 - 21

Preliminary Engineering Planning

| | | | | |
|-------|-----------|----------|--|--|
| 10/17 | Monday | AM PM | G. E. Barnes EFRAIN RIBEIRO (Pan American Health Organization) | Chapel Hill Water Plans GUEST LECTURER |
| 10/18 | Tuesday | AM PM | D. T. Lauria J. C. Lamb | Water Plans Waste Treatment |
| 10/19 | Wednesday | AM PM | D. T. Lauria J. C. Lamb | Preliminary Plan: Water Plans Waste Treatment |
| 10/20 | Thursday | AM PM | G.v.R. Marais D. T. Lauria | Oxidation Ponds Sewerage Plans |
| 10/21 | Friday | AM PM | G.v.R. Marais | FIELD TRIP: Durham Sewage Plant Oxidation Ponds |

8th WEEK - October 24 - 28

| | | | | |
|-------|-----------|----------|--|---|
| 10/24 | Monday | AM PM | D. T. Lauria HAROLD SHIPMAN (World Bank) | Cost Estimates: Water Works GUEST LECTURER |
| 10/25 | Tuesday | AM PM | D. T. Lauria G. E. Barnes | Cost Estimates: Sewage Works Hydraulics |
| 10/26 | Wednesday | AM PM | D. T. Lauria G. E. Barnes | Maintenance & Operating Costs Hydraulics |
| 10/27 | Thursday | AM PM | D. T. Lauria | Planning Report FIELD TRIP: Raleigh Water Works Construction Site |
| 10/28 | Friday | AM PM | D. T. Lauria G. E. Barnes | Planning Report Hydraulics |

9th WEEK - October 31 - November 4

| | | | | |
|---------------|---------------------|--|---|----------------|
| 10/31 11/4 | Monday to Friday | | JOHN MARSH United Oil Products Johnson Division | GUEST LECTURER |
|---------------|---------------------|--|---|----------------|

Appendix C - continued

10th WEEK - November 7 - 11

WATER SYSTEM DESIGN

| | | | | |
|-------|-----------|----------|---|------------------------------------|
| 11/7 | Monday | AM PM | D. T. Lauria HARRY E. SCHWARZ - GUEST LECTURER (U.S. Army Corps. of Engineers) | Supply Facilities |
| 11/8 | Tuesday | AM PM | D. T. Lauria G. E. Barnes | Supply Facilities Hydraulics |
| 11/9 | Wednesday | AM PM | G. E. Barnes D. T. Lauria | Hydraulics Pumping Stations |
| 11/10 | Thursday | AM PM | D. T. Lauria G. E. Barnes | Water System Design Hydraulics |
| 11/11 | Friday | AM PM | D. T. Lauria G. E. Barnes | Treatment Facilities Hydraulics |

11th WEEK - November 14 - 18

Water System Design

| | | | | |
|-------|-----------|----------|--|---|
| 11/14 | Monday | AM PM | D. T. Lauria HERBERT HUDSON Hazen & Sawyer | Treatment Facilities GUEST LECTURER |
| 11/15 | Tuesday | AM PM | G.v.R. Marais G. E. Barnes | Design of Oxidation Ponds Hydraulics |
| 11/16 | Wednesday | AM PM | D. T. Lauria | Individual Work Treatment Plants |
| 11/17 | Thursday | AM PM | D. T. Lauria G.v.R. Marais | Filtration Design of Oxidation Ponds |
| 11/18 | Friday | AM PM | D. T. Lauria THEODORE J. WILSON - Round-table Discussion (Agency for Inter- national Development) | Design of Sewage Treatment Plant |

Appendix C - continued

12th WEEK - November 21 - 25

SEWERAGE SYSTEM DESIGN

| | | | | |
|-------|-----------|----------|---|---|
| 11/21 | Monday | AM PM | G. E. Barnes E. R. BAUMANN (Dept. of Civil Eng., Iowa St. Univ.) | Pumps GUEST LECTURER |
| 11/22 | Tuesday | AM PM | G.v.R. Marais G. E. Barnes | Design of Oxidation Ponds Hydraulics |
| 11/23 | Wednesday | AM PM | D. T. Lauria G. E. Barnes | Treatment Facilities Hydraulics |
| 11/24 | Thursday | HOLIDAY | | |
| 11/25 | Friday | HOLIDAY | | |

13th WEEK - November 28 - December 2

SEWERAGE SYSTEM DESIGN

| | | | | |
|-------|-----------|----------|---|--|
| 11/28 | Monday | AM PM | D. T. Lauria D. T. Lauria | Treatment Facilities Treatment Facilities |
| 11/29 | Tuesday | AM PM | D. T. Lauria | Equipment Individual Work |
| 11/30 | Wednesday | AM PM | D. T. Lauria ROLLAND W. SIMPSON - GUEST LECTURER Gilbert Associates | Treatment Facilities |
| 12/1 | Thursday | AM PM | D. T. Lauria G.v.R. Marais | Contract Specifications Specifications |
| 12/2 | Friday | AM PM | D. T. Lauria | Contract Specifications Individual Work |

14th WEEK - December 5 - 8

| | | | | |
|------|-----------|--|----------------------------------|---|
| 12/5 | Monday | ALL DAY FIELD TRIP Greensboro, N. C. Water Treatment Plant | | |
| 12/6 | Tuesday | AM PM | D. T. Lauria D. T. Lauria | Project Supervision Instrumentation & Electrical |
| 12/7 | Wednesday | AM | Arthur Bruestle (ESE Student) | Recapitulation |

APPENDIX D - SEMINARS FOR SEVENTH SESSION

Seminars held weekly on Saturday mornings by the Department of Environmental Sciences and Engineering for the benefit of faculty and graduate students, and also attended by IPSED participants for topics of interest, were presented concurrently with the academic phase of IPSED as follows:

- October 15 "Some Current Studies and Concepts about the Clearance of Non-gaseous Substances from the Lungs," Dr. Paul E. Morrow, Department of Radiation Biology and Biophysics, Medical Center, University of Rochester, Rochester, New York.
- October 22 "The Growth of a New Town, A Unique Social Experiment," Mr. H. F. Hughes, Chief Public Health Inspector, Harlow Urban District Council, Essex, England, and Winston Churchill Fellow, School of Public Health, University of North Carolina, Chapel Hill, N. C.
- October 29 "Water Quality - Some Chemical Aspects," Mr. Morris Ettinger, Chief, Chemistry Section, Cincinnati Water Laboratory, Federal Water Pollution Control Administration, Cincinnati, Ohio.
- November 5 "The Dynamic Control of Water Quality in Lakes and Impoundments," Dr. James M. Symons, Federal Water Pollution Control Administration, Cincinnati, Ohio.
- November 12 "System Analysis and its Application to Environmental Sciences," Dr. Ralph W. Stacy, Professor of Surgery and Physiology, School of Medicine, University of North Carolina, Chapel Hill, North Carolina.
- November 19 "Some Critical Problems in Environmental Sanitation as Met in the Work of the World Health Organization," Mr. George Ponghis, Sanitary Engineer, Regional Office for Europe, World Health Organization, Copenhagen, Denmark.
- December 3 "Scientific Controversy Concerning Low Level Contaminants in the Environment," Dr. Robert A. Kehoe, Former Director Kettering Laboratory, College of Medicine, University of Cincinnati, Cincinnati, Ohio.
- December 10 "Integration of Toxicologic Data, Environmental Evaluations and Medical Surveillance in an Environmental Health Program," Dr. Richard Henderson, Environmental Hygiene Services, Olin-Mathieson Chemical Corporation, New Haven, Connecticut.

APPENDIX E - INSTRUCTIONS TO PARTICIPANTS ON PREPARATION OF FINAL REPORT

Each participant in the International Program of Sanitary Engineering Design is required to submit a written final report on his total experience during the assignment. This is to be submitted in Chapel Hill following his assignment to the terminal phase of the program (usually with a consulting firm), and immediately before his return to his own country.

The following outline will assist in the preparation of this report. It will indicate the scope of reporting ordinarily to be expected, but need not be followed exactly, in every instance. It should serve rather as a general guide.

Keep a daily log or abbreviated diary of your activities on the program. This will be of help in writing the final report. The diary will constitute a refresher (particularly with respect to full names of persons, places, dates, etc., and will save time in this sense). It will also be a fine memo book for the future.

The purpose of the report is to help us in evaluating your experience, and to plan more effectively for future programs. The report itself will also serve the participant as excellent reference material for the future.

On the next page is a suggested form for the report which you may find useful in its preparation. Content is outlined below.

Report

Identify the writer by full name, permanent address, and office held in your own country. Also give the name of the organization which supplied you with the funds for participation and your adviser.

Substance of the Report:

1. Academic Phase of the Program (dates of attendance):
 - a. discuss topics in which academic work was conducted, such as the world program in water supply, hydraulics, hydrology, development of ground water supply, development of surface supply, conduct of and reporting on preliminary studies, sanitary chemistry, sanitary biology, materials of construction, waterworks equipment, waterworks control equipment, design problems, organization, management, and financing. In this consider adequacy of coverage, suggestions for improvement in any aspect of the work, value of homework or problem sessions, importance of notes and reference material furnished you. Include work on sewerage, if any.

Appendix E - continued

- b. field trips: number and character, what is gained from them; what information of value obtained.
 - c. attendance at national and local waterworks' meetings: papers of major importance to you; value of exhibits; enlarged acquaintance of the profession.
 - d. general commentaries on this phase of the program and suggestions for improvement.
2. Municipal Phase of the Program: Municipality to which you were assigned, and with whom associated on the job; dates of attendance; type and capacity of waterworks (and of sewage treatment plants if included); by whom designed, method of treatment, operating features of collection system, treatment plant, and distribution system; organization of personnel and delegation of responsibilities; financing and rate structure, metering and collection of bills for service; provision for planning and future design. Submit copies of municipal reports or other material that might give some of this information, to supplement your own, or offered in substitution of too much descriptive writing on your part, but not to eliminate basic reporting.
 3. Design Office Phase of the Program: dates of attendance; name of firm and location.
 - a. organization chart, showing chain of responsibilities and their nature for partners or principals, and employees.
 - b. projects handled by the organization illustrative of its scope of operations in preliminary project studies, special investigations, design (structural, architectural, mechanical, electrical, hydraulic, and process), and supervision of construction.
 - c. library and reference material, how organized and effectiveness.
 - d. laboratory facilities, for what purposes used and how effective.
 - e. your own specific duties and assignments, name of your immediate superior. Opportunity for varied or narrow experience, whether or not experience applicable to work in view, in your own country.
 - f. submit sample reports, plans and specifications related to your own assignment, and make suitable reference to them in your report.
 - g. general commentaries on this phase of the program and suggestions for improvement.

APPENDIX E - continued

Form of Report

Put report in binder, with abbreviated title, date, and name of author on the outside of the binder. Make an inside cover sheet, with full title, date, name of author, and his permanent address in the form of a title sheet.

SUMMARY: after writing the report, make a brief summary of its contents for the quick review of the reader. Bind this summary immediately behind the title sheet.

Report

Purpose

Scope

Academic Phase of Program)

Municipal Phase of Program)

Design Office Phase of Program)

Conclusions and Recommendations

see preceding paragraphs

Sign the report on the lower part of the title sheet. It is further suggested that paragraphs be given numbers and appropriate captions, for ready reference.

APPENDIX F - SAMPLE PUBLICATIONS

During the past year the following titles were published in the series Water Supply and Sanitation in Developing Countries:

| <u>Item No.</u> | <u>Title</u> |
|-----------------|---|
| 1 | "Scope of the Publication Series" |
| 2 | "Reduction of Waste by the Use of Constant-Flow Valves" |
| 3 | "Water Supply Using Bamboo Pipe" |
| 4 | "Float Valve Hypochlorite Solution Feeder" |
| 5 | "A Proportional Chemical Feeder for Small Water Purification Plants" |
| 6 | "Individual Household Disinfection and Filter Unit For Turbid Waters" |
| 7 | "Floating Platform Hypochlorite Solution Feeder" |
| 8 | "V-Notch Constant-Head Solution Feeder" |
| 9 | "Floating Bowl Hypochlorite Solution Feeder" |
| 10 | "Bottle Hypochlorite Solution Feeders" |
| 11 | "Characteristics of the Unknown Pump" |

On the following pages are a lead sheet and a sample of the type of publication issued.



WATER SUPPLY AND SANITATION IN DEVELOPING COUNTRIES

AGENCY FOR INTERNATIONAL DEVELOPMENT

UNIVERSITY OF NORTH CAROLINA

GERRIT V. R. MARAIS AND FREDERICK E. MCJUNKIN, EDITORS

September 1966

AID-UNC/IPSED Series Item No. 1

SCOPE OF THE PUBLICATION SERIES

An engineer concerned with water supply and sanitation in developing countries soon realizes how difficult it is to receive and pass on to others information on technical matters in his field. Although much money is being spent on water supply and sanitation, and although the developing countries have many common problems; at present, the engineer in the field can find no regular publication describing new developments, designs and operational experiences.

Why does this happen? First, many people believe that the developed nations have all the necessary technology, which needs only to be exported to the developing nations to solve their problems; second, some have the mistaken idea that efficiency goes hand-in-hand with highly developed technology; and third, others mistakenly assume that "crude" solutions have only limited or temporary value, so why bother to publish information about them.

Conditions in developing countries, however, are so different from those in developed countries that solutions which work in developed countries may be of little value in developing ones, where limited financial resources and manufacturing capacity are the rule; skilled labor is scarce, unskilled labor plentiful; the climate is usually tropical; and elementary facilities are the greatest needs. Such factors must be reflected in solutions for developing countries.

Continuous critical study and appraisal of developments elsewhere and their potential adaptation to local use are necessary. These objectives can best be satisfied by reciprocal exchange of information. The existing international communications for this type of information are primarily conferences, symposia, and intermittent publications by international agencies, with once-only publication and little follow-up of developments reported. Conferences and symposia are infrequent and costly. Their durations are short so that the number of papers that can be discussed is limited. They are attended mainly by administrative engineering personnel--design and field engineers rarely see the proceedings and are given little incentive to contribute and participate. World-wide dissemination of the proceedings is unsatisfactory--an engineer in Africa rarely reads what his counterpart in South America thinks about the same problem.

Recognizing the need for better communication, the Department of Environmental Sciences and Engineering, School of Public Health, University of North Carolina at Chapel Hill, through its International Program in Sanitary Engineering Design (IPSED), is beginning a series of publications on water supply and sanitation in developing countries. The series is sponsored by the Agency for International Development (AID) of the United States Department of State. It is concerned particularly, with activities

This publication series is prepared by the International Program in Sanitary Engineering Design (IPSED) under the sponsorship of the Community Water Supply Branch, Agency for International Development (AID), United States Department of State. IPSED is a program of the Department of Environmental Sciences and Engineering, School of Public Health, University of North Carolina at Chapel Hill. Correspondence should be addressed to Frederick E. McJunkin, Editor, IPSED, Box 630, Chapel Hill, N.C., 27514, U.S.A. Publications are supplied free of charge to engineers working in developing countries and may be obtained from U.S. embassies, U.S.A.I.D. missions, or by writing the University. Material for publication is invited.

of design and field engineers--to assist them by collecting and distributing information, designs, and procedures that experience has shown to be successful under conditions prevailing in developing countries. This series should become a useful means of communication between sanitary engineers in developing countries.

To ensure the greatest flexibility and usefulness, the series will be issued in loose leaf form, using lithographic reproduction. Each subject item will be developed from the information received from contributors, or otherwise available at the University, and published as a separate paper. The treatment will not be exhaustive. As further information becomes available, items will be revised.

Items of information will be compiled from personal communications, reports, papers, literature surveys, etc. The principal source, however, should be from the engineers and administrators presently concerned with water supply and sanitation in the developing countries. IPSED recognizes the severe demands on their time, which, even if they should have the inclination, may not allow would-be contributors to make the effort required to write papers. Furthermore, no information should be lost by default because the contributor is afraid that his English is not good enough. Consequently, IPSED will undertake the responsibilities of compiling and editing. Contributors can, therefore, feel free to send their information in any form, be it pencil notes, sketches, or annotated plans, whatever is most convenient. Full recognition will be given to each contributor and thus readers may personally contact contributors if they wish.

Success of this publication depends primarily on participation by the engineers, administrators, and operators in the water supply and sanitation field in developing countries. No idea, development, procedure, or operation should be withheld, even though it may appear insignificant and commonplace to the contributor. What is considered a well-worn method in one region may be revolutionary in another. The University of North Carolina, serving as a clearing-house, is in a favorable position to evaluate each contribution as information worthy of wider distribution.

IPSED is vitally interested in identifying those design problems in water supply and sanitation that are most common in the developing countries and whose solution would be of value. Thus readers faced with design problems which they have been unable to solve satisfactorily are invited to submit these also. If the problem is of sufficiently general interest and a solution is available, both the problem and its solution will be published.

An abbreviated listing of items to be described or discussed in forthcoming issues includes such topics as wells and well drilling, water rates, estimation of water demand, water distribution systems, novel construction materials, sedimentation and coagulation facilities, slow and rapid sand filters, iron-removal processes, storage facilities, pumps, windmills, hydraulic rams, water services, oxidation ponds, sanitation facilities, disinfection apparatus, solar stills and water heaters, etc. The above is a typical, but by no means exhaustive, listing, and contributed material on other topics would be welcomed. The items distributed with this announcement are illustrative of the spirit and intent of the series.

To repeat, the success and value of this publication series will depend largely on two-way communication between its editors and its readers. Critical comment, suggestions, and especially, information and material for publication are invited.



WATER SUPPLY AND SANITATION IN DEVELOPING COUNTRIES

AGENCY FOR INTERNATIONAL DEVELOPMENT

UNIVERSITY OF NORTH CAROLINA

GERRIT V. R. MARAIS AND FREDERICK E. MCJUNKIN, EDITORS

October 1966

AID-UNC/IPSED Series Item No. 9

FLOATING BOWL HYPOCHLORITE SOLUTION FEEDER

ABSTRACT

A simple chlorinator readily made from local materials and suitable for disinfection of small water supplies is described. It can be pre-set to feed solution at a given uniform rate.

(Key words: Water supply, disinfection, chlorination)

Source of Information A. H. Taylor
Central Housing Board
P. O. Box 20380
Nairobi
Kenya

Introduction

The floating bowl hypochlorite solution feeder was developed in Kenya to provide low cost chlorination of water supplies. It is very similar in operation to the previously reported Floating Platform Hypochlorite Solution Feeder (AID-UNC/IPSED Series Item No. 7) and the V-Notch Constant-Head Solution Feeder (AID-UNC/IPSED Series Item No. 8).

Construction and Operation

Figure 9.1 is a diagrammatic sketch showing the solution feeder and the tank holding the hypochlorite solution. The feeder, shown in more detail in Figure 9.2, consists of a circular bowl of earthenware or plastic with a central hole in the bottom plugged with a tight-fitting rubber stopper. The bowl floats in the hypochlorite solution, desired submergence, stability and trim being achieved by ballasting the bowl with pebbles of quartzite.

Three copper tubes pass tightly through the rubber stopper. Tube A, of 1/8-in. (3 mm) internal diameter, is located at the center of the stopper with its top end at approximately the same level as the rim of the bowl. It is threaded by a taut nylon string or cord stretched vertically from the bottom of the solution container to a cross member at the top. The string serves as a guide to keep the bowl floating on a

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vertical line as the liquid level in the tank falls as the solution is withdrawn.

Tube B, of 1/8-in. (3 mm) internal diameter, allows the solution in the container to flow into the bowl. Inflow rate to the bowl, via tube B, is controlled by the difference in level between the top of the tube and the liquid surface level in the container - the head, H, which can be changed by pushing tube B up or down through the rubber stopper, and thereby altering the inflow rate. Fine adjustment to the flow rate is made by adding or removing pebbles of quartzite from the bowl.

The inflow to the bowl is drained through tube C, of 1/4-in. (6 mm) internal diameter, via a soft plastic tube to the discharge tap set in the side of the container. The diameter of tube C should be large enough to drain the inflow without causing the liquid level in the bowl to rise significantly above the entrance to tube C, as this would be equivalent to adding ballast to the bowl, changing the head, H, and hence the inflow rate via tube B. The top level of tube C should be below that of tube B; otherwise the level of tube C will control the inflow rate.

An alternative bowl arrangement, known as a "floating funnel," is shown in Figure 9.3. This arrangement does not have a guide to control the path of the bowl or "funnel." The guide used in the Floating Platform Hypochlorite Solution Feeder (AID-UNC/IPSED Series Item No. 7) could be adapted for use in either floating bowl or floating funnel feeders.

To stop flow from the feeder, the bowl is lifted above the liquid level in the tank and if equipped with a handle or bail can be stored at the top of the tank when the feeder is not in use. If flow is stopped by closing the outlet at the side of the tank, the bowl will fill and sink to the bottom.

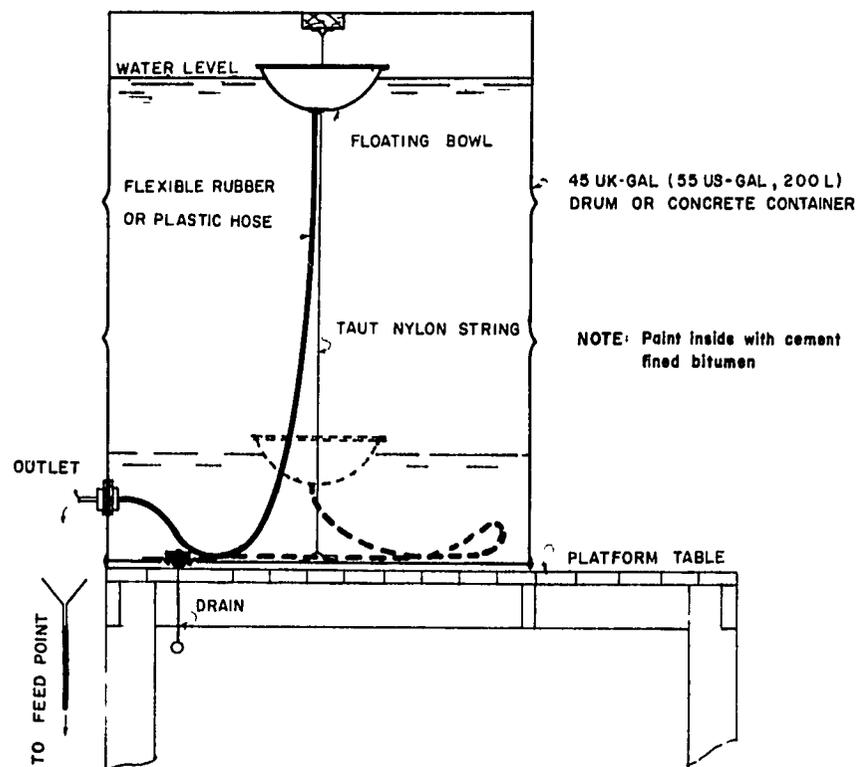


FIGURE 9.1 FLOATING BOWL SOLUTION FEEDER

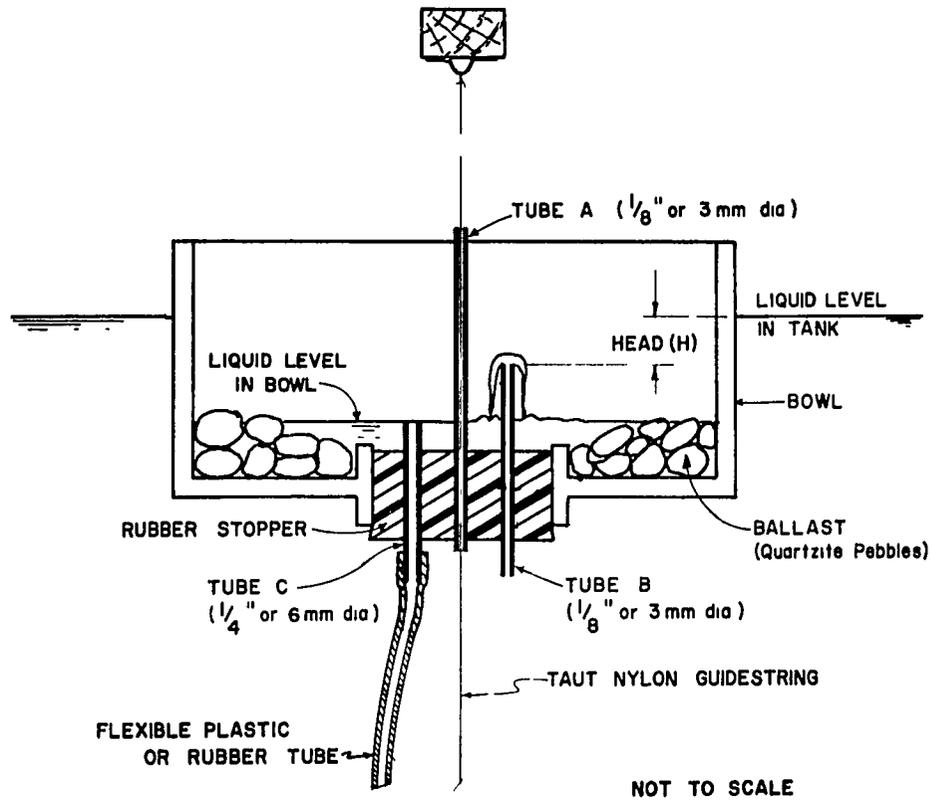


FIGURE 9.2 DETAIL OF FLOATING BOWL (SECTION)

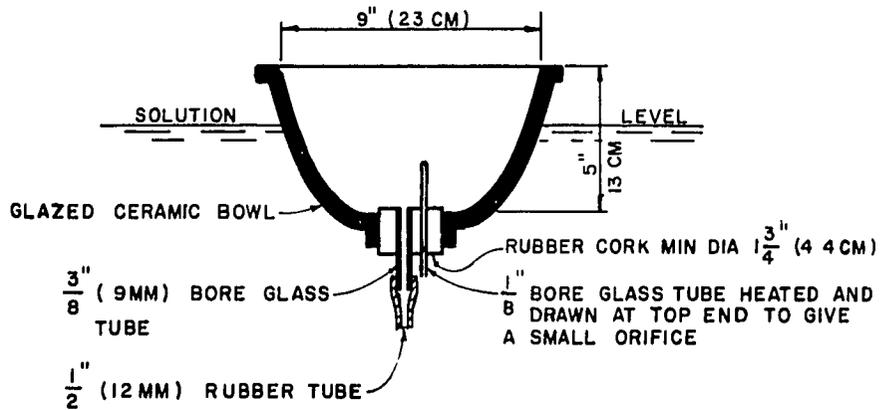


FIGURE 9.3 DETAIL OF "FLOATING FUNNEL" (SECTION)

WHO PUBLICATIONS

The World Health Organization, in its monograph series, has published several books of particular interest to sanitary engineers in developing countries. These include:

"Water Supply for Rural Areas and Small Communities," by E.G. Wagner and J.N. Lanoix (1952). £1 15s. \$6.75 Sw.fr. 20.

"Excreta Disposal for Rural Areas and Small Communities," by E.G. Wagner and J.N. Lanoix (1958). £1 5s \$5.00 Sw.fr. 12.

"Operation and Control of Water Treatment Processes," by C.R. Cox (1964). £1 17s. \$7.25 Sw.fr. 22.

"Snail Control in the Prevention of Bilharziasis," (1965). £1 10s. \$6.00 Sw.fr. 18.

WHO publications may be obtained by payment in local currency directly or through a bookseller, from local agents in a number of countries or directly from: WHO distribution and Sales Unit, Palais des Nations, Geneva, Switzerland. Orders addressed to Geneva must be paid for in one of the currencies quoted.