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NOTE: This is a summer '65 program description. It is expected that these programs will be continued during summer '66.

Engineering Desk
PEACE CORPS
Washington, D. C. 20525

CIVIL ENGINEERS NEEDED FOR CHALLENGING
PEACE CORPS ASSIGNMENTS IN FIVE DEVELOPING NATIONS

Five developing nations - Pakistan, Colombia, Brazil, Venezuela, and Ethiopia - have asked the Peace Corps for more than 60 Volunteer civil engineers. Volunteer civil engineers presently are working in Ecuador, Malaysia, Pakistan, Peru and Tunisia.

The civil engineering/rural public works program in Pakistan is typical of the responsibilities and challenges in a Peace Corps engineering assignment. Volunteers assigned to the other programs will perform similar tasks.

There are now 85 Peace Corps Volunteers working in the Rural Public Works Programs of the Eastern and Western Provinces of Pakistan. About one-third of these men are engineers with varying degrees of experience ranging from recent civil engineering graduates to men with long years of experience in our own country and overseas. The remaining two-thirds are called engineering assistants, which means they have some substantial experience in construction work which is useful in improving construction techniques and in supervision and organization of rural construction programs.

This Rural Public Works Program was conceived and initiated in 1961 and its beginning coincided with the winter 1961 arrival of the first group of Volunteers in East Pakistan. Some of these Volunteers were able to provide valuable technical assistance in planning, designing and supervising the construction of sluice gates, small bridges and drainage systems which led to the success of this pilot program in its first year. The principal problems faced were water control and transportation. To quote the official Government of Pakistan evaluation: "The Comilla ... Program proved workable. The record of accomplishment is outstanding. Thirty four miles of Khals (drainage ditches) were cleared, 14½ miles of embankments-cum-roads were constructed, four dams to prevent sand erosion were built, twenty-six culverts were installed, and four large regulators set up. In one considerable area, for six years the summer rice crop has been largely drowned, and the first transplanting of the fall amon paddy had also been drowned. The first year after the local works projects were done, there was a good rice crop and there was no loss of amon transplantation." Success led to expansion of the program throughout Pakistan.

The value of Peace Corps Volunteers in this important development effort became quickly apparent. A careful survey by the Government of East Pakistan revealed that the greatest program need was for middle-level skills and that the "principal sources of technical assistance will be the appointed staff followed by the Peace Corps ... There is little or no technical skill available in the rural areas of Pakistan. Volunteers make it possible to build dams and bridges that will stand, buildings that are strong and economical and drainage ditches that drain."



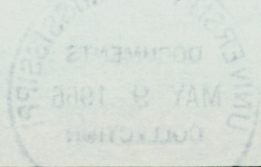
Peace Corps participation in this program is an excellent example of the effective interrelationship of U. S. efforts to assist other countries in their economic development efforts. The Rural Public Works Program is partially financed by the proceeds of the sale of P.L. 480 (Food for Peace) grains in Pakistan. The objectives are: (1) to develop local government institutions by making local bodies responsible for planning, deciding, executing and accounting for capital investment of the local level, (2) providing jobs for hundreds of thousands of people during the off season, and (3) building up the necessary economic infrastructure, i.e. roads, markets, irrigation ditches, protective embankments, etc.

Peace Corps Volunteers provide not only technical know how but a sense of management and organization and a confidence that something can be accomplished, normally lacking in the villages of Pakistan. The transformation from almost total reliance on central authority to local democracy cannot be accomplished overnight. Volunteers ease this transition by helping the villagers plan and successfully implement projects for which they are responsible. The growth in capacity of local institutions to plan and administer this program during the past three years has been truly amazing and our Volunteers have helped.

A major part of the Peace Corps Volunteers' contribution to the Rural Public Works Program is found in the difficult to measure area of developing confidence and skills in others and in their intangible influence on attitude towards work, self-respect and self-government.

There have also been concrete measurable accomplishments. The program in West-Pakistan began in the fall of 1963. Despite the uncertainties of a new program twenty-six Peace Corps Volunteers have participated in the planning, design and/or construction of 33 schools, 16 drainage systems, 20 water systems, 21 roads, 350 culverts, 2 irrigation projects, 7 medical dispensaries, 7 veterinary hospitals, 4 small dams, 2 bridges, 33 local government office and assembly halls, 2 workshops, 49 shops, 5 libraries, 13 other structures and considerable amount of earthwork. Most of these projects are completed or nearly completed and more are planned. Bill "Sluggo" Laughley in the remote district of Dera Ghazi Khan covers part of his 300 by 70 mile area via fifty mile horse and camel back treks. He has full responsibility for execution of a desert area program including seven roads, ten community drinking water supplies, eleven dispensaries, five veterinary hospitals, one combination library-community center and a number of small 40-student schools. Most of these are under construction and he is preparing numerous preliminary designs and estimates for other projects. Two engineering teams in separate mountain areas are involved in road and small dam projects requiring considerable blasting. Another team at Thana Bula Khan have responsibility in their district for the construction of 3 medical dispensaries, 2 veterinary hospitals, a \$20,000 housing colony, a carpet-making center, 9 new schools and repair of older ones, a boys' hostel, 2 libraries, 1 bus station, a poultry distribution center, and numerous other construction and maintenance projects.

The program is not without its problems. In addition to the lack of administrative experience and responsibility at the local level, shortage of materials like cement, the lengthy monsoon season in East Pakistan, the



almost total lack of transportation facilities in some areas and the shortage of skilled craftsmen hamper and delay construction efforts. If this were not so, no real need for Peace Corps Volunteers would exist. The opportunity to contribute to an important economic and social program is present and the Volunteers are taking good advantage of it.

REPORTS FROM VOLUNTEER ENGINEERS

THE RURAL PUBLIC WORKS PROGRAM IN EAST PAKISTAN

by Peace Corps Volunteer Engineer
Robert Burns

In the areas around Comilla, East Pakistan, an experimental program in rural public works was recently completed. The idea behind the experiment was to use the farmers and the landless laborers who are idle during the dry winter season as a work-force to uplift the "monsoon economy." All the available land in East Pakistan is farmed, but lies fallow half the year for lack of water; during the other half, a severe monsoon can destroy the crops. The success of the Comilla program proved not only that local leadership can help solve flood and irrigation problems, but also that such leadership can mobilize manpower and technical resources to offset seasonal unemployment.

On the basis of the Comilla pilot project, the Government of East Pakistan has decided to expand rural public works throughout the province within the next three years. Fifty-four separate areas will try to duplicate the Comilla techniques. Finding qualified technical people to plan, design and supervise a program of this scope is difficult in Pakistan.

Consequently, Pakistan has requested the Peace Corps to supply engineers and construction personnel who would work with government officers in the rural areas and give the necessary technical assistance.

The Rural Public Works Program in its beginning stages poses a human engineering problem. In the first year the problem is to organize the project committees and the villagers. For this program to be a success it requires the civil administration, the engineers, and the villagers to form a partnership that will work as one body.

In Comilla, during both the first and second years of the program, the majority of projects were classified as earthwork projects.

The biggest problem facing the cultivator in the Thana (District) is recurring floods. In parts of the Thana, cultivators have not had a crop for the past five years. The Thana is located close to a fairly large river, which has in the past broken its embankments and flooded sizable portions of the Thana. But most of the flooding comes from canals which have been encroached upon by cultivators seeking to extend their paddy land. This encroaching, coupled with failure to remove silt deposits, reduces the flow and

the water-carrying capacity of the canals. Therefore the water level rises and overflows the canal banks, causing a flood.

Last year there was a canal which, because it was choked with such encroachments, was constantly flooding a ten square mile area. We removed the encroachments and deepened it. When the monsoon came water flowed through the unobstructed canal at a much faster rate and the water level remained normal. This canal is about $3\frac{1}{2}$ miles long. The work was done by village labor under the supervision of two project committees. The technical staff of the Thana Council worked with the project committees in making a pre-work survey to determine the amount of earth to be removed, they assisted in spot checking, and they also assisted in establishing side slopes and grades.

The basic assumption behind the whole Rural Public Works Program is that a large percentage of flooding can be controlled by small local projects which can be implemented by village labor with a minimum of technical supervision. These small projects when completed will protect the cultivators from recurring flood and thereby increase agricultural production.

Although the major aim of the Rural Public Works Program is flood control, irrigation and communication, the Peace Corps Volunteer will in most cases be advising officials on the soundness and feasibility of plans. In the case of earthwork, they will draw up specifications for roads, embankments, and canals. They will also, together with the Thana Council Overseer, supervise construction and verify excavation measurements.

Masonry work will consist mainly of bridges, culverts, sluice-gates, Union Council offices, and water control regulators. Peace Corps Volunteer engineers will prepare all designs and estimates plus doing the field supervision. The bridges usually are brick piers and abutments with a reinforced concrete slab. They vary in span from 8 to 50 feet and have roadways from 12 to 14 feet. The culverts are of three types: box, precast RCC pipe, and Armco pipe. The average size of box culverts is 6 feet by 5 feet, single vent and are a combination of brick and RCC. The sluice gates and regulators are very similar in design to the culverts, the main difference being that they are fitted with vertical lift or flap gates.

RURAL WORKS PROGRAM IN HYDERABAD DISTRICT (WEST PAKISTAN)

by L. R. Seymour, Peace Corps Volunteer

Who Proposes and Sanctions Rural Works Schemes?

All schemes originate at the union council or town committee level. Experience of the last year indicates that local councils have played their roles well in assessing the needs of their own unions and are, therefore, capable of planning rural development in the initial stages.

How are the Schemes Financed?

The Works Program is financed from two sources. They are P.L. 480 funds, and the community or local share. In the case of District Council schemes, the District Council contributes the "local share." In most cases the P.L. 480 share amounts to three fourths of the total cost and the community share amounts to one fourth. In addition, the local council must bear the expenses of maintenance.

How are Projects Implemented?

The program aims at having most of its projects done locally, (departmentally) utilizing local labor to a maximum. The projects are administered by a project committee. This committee usually includes the chairman of the local council and two other council members. Their main responsibilities are to determine how the projects will be implemented, locally or by contractor, to keep records and accounts of the projects, and to supervise and inspect the construction.

In many cases the local community did not have sufficient skilled or unskilled labor available for the construction of their projects. In these cases the projects were given out to a contractor under the supervision of the local project committee. Contractors were instructed to use as much local labor as possible.

What is the Role of the Technical Staff in Implementing Projects?

No project under the Rural Works Program could be uniformly and successfully carried out without the assistance and guidance of the District Engineer and his staff. Approximately 256 projects, both of District Council and union councils, had to be planned, designed and guided. Such a large task needed efficient coordination at every level. The District was supplied with American Peace Corps Volunteer Engineers who are lending their assistance to the District Engineer. They worked almost exclusively with union council projects. For such a large program additional staff was required, some to work on union council projects under the guidance of the Peace Corps Engineers, and others to work on District Council Projects under Supervision of District Engineer; but all working in coordination and conjunction. The result of this first year's experience has been a notable success with the program 90% complete within the expected time, despite the heavy wind and rainstorm that hit the District.

What are the Specific Duties of the Engineers and their Staff?

The duties of the District Engineer and the Peace Corps Engineers are identical:

1. To give technical scrutiny to all proposed schemes and approve them on the basis of their technical soundness.
2. The Engineering Staff provides standard guideline plans for each type of project, including cartage of materials for building.

3. Another duty of the Engineering Staff is to develop clear, well defined and standard operational and organizational methods essential for the proper functioning of the program. They help the local councillors understand the methods of construction, execution of projects and all other technical items concerning the work. From time to time directives and new methods of construction were sent out from the Engineering headquarters. A booklet in the local language, Sindhi, was written by the District Engineer. This booklet described in a precise, simple way the methods of construction necessary to implement the schemes.

4. The Engineering Staff is also required to visit all projects at regular intervals to check on progress and keep in touch with the problems in the field.

AN EVALUATION OF THE PROGRAM

by M. S. Johnson, Peace Corps Engineer

Since the latter part of February 1964, two other American Peace Corps Volunteers and I have had the privilege and pleasure of working with the P.L. 480 Rural Works Program of the Hyderabad District. In February only about 35% of all construction was completed. The Deputy Commissioner (The Project Director) was particularly interested at that time in accelerating the progress of the program. He requested that we assist in the work of the program (1) by lending our technical skills wherever needed and (2) by finding and assisting in unplugging bottle necks that were slowing the progress of the schemes.

Significant Impressions of the Program of this District

There have been several features of this program that have impressed us as being most significant in creating a successful development program. We would like to mention two of these features which we, as Peace Corps Volunteers, feel are particularly significant:

Number 1 is the unusual amount of enthusiasm and interest in the program on the part of all individuals and groups in the District.

Number 2, we feel that probably the most significant feature of this program is the fact that over 90% of these schemes were proposed and implemented at the local or union council level - with every local community contributing a share of the cost for each of its schemes. This single feature may well account for the enthusiastic attitude of these people concerning their schemes.

Some Problems Encountered

With a development program involving over 250 projects, with 77 local governing bodies implementing them and with relatively little supervision

or assistance (other than monetary) - there were of course many problems and bottlenecks. Some are still with us. Much was learned from these problems and from our attempts to solve them. The difficulties most frequently experienced by the union councils are discussed below:

1. Remote Locations

As could be expected, those communities in remote or hard-to-reach areas as a rule experienced many more difficulties in implementing their projects than those more favorably located. (This is a good case for building better link roads.) Difficulties in communication, in getting skilled labor and materials to the site, and in having to pay high cartage rates were typical problems. These difficulties naturally had their effect on the progress of the schemes and the morale of the people involved.

2. Materials or Funds not Readily Available

Throughout the district, as everywhere, the supply of cement was always a problem. In many cases the availability of bricks without a prohibitive cartage cost was a problem. As a result, many new kilns were built. Third and fourth quarter allocations of P.L. 480 funds were not released from the Provincial Government on time. This delay was felt right down to the union council level and slowed the progress of schemes a great deal this spring.

3. Problems Experience by Project Committees and Union Council Chairmen

Projects suffered in cases in which the project committees were not taking enough interest in the work. In some cases the union council chairmen and/or the project committee chairmen were at fault for not putting forth enough initiative. In other cases the work suffered because the project committee chairman was sick or lived outside his union council and the union council chairman would not or could not appoint any other man as chairman of the project committee.

Of course, there were the cases in which funds were leaking or not "well spent." Many times contractors were doing substandard work and overcharging. Many schemes were not adequately inspected or watched over by the project committee or by an overseer. By improving our drawings and estimates and by increasing the inspection of projects by our administrative and technical staff, we hope to reduce this problem significantly.

4. Technical Problems

Some of the schemes did not have standard drawings and estimates made for them. The standard estimates did not allow enough margin for the union councils in remote areas having higher cartage rates. The union councils had these problems to contend with along with the variety of construction problems encountered on any project. They some times had to wait long periods of time before they could get a drawing and estimate prepared for them or before they could have a technical person assist them with a problem during the construction of their schemes.

5. Shortage of Overseers

As elsewhere, this District was and is still very short of technical people to work on the Rural Works Program. Overseers are in particularly short supply. It is a major problem. We have only four overseers in the District at present, and one new employee is being trained for the position. The overseer is generally overworked, underpaid (if he is honest), and often lacks adequate experience and knowledge concerning his work. With his low pay scale, the overseer is constantly under temptation and pressure to engage in dishonest activities in connection with his work. Private firms or other government organizations offer better working conditions, more pay, and better job security.

To help overcome this problem, we are now in the process of upgrading the positions of our overseers and other technical personnel in the Works Program of this District. Qualified men will receive attractive enough salaries to be competitive with similar positions elsewhere. A training program will be set up for all overseers in the District to increase their knowledge and effectiveness concerning their work. We are also hiring carefully selected men who are interested in becoming overseers and training them ourselves with the promise of a good future salary as overseer and an attractive salary as a trainee. All of this is being initiated, along with a closer supervision of overseers by the District Engineer and the Peace Corps Engineering Team.

6. Shortage of Adequate Transportation

The lack of adequate transportation for the Program's technical and administrative work is another major problem. This lack of transportation has been detrimental in our attempt to provide technical assistance where and when it is requested. It has limited the touring of both technical and administrative staff to the projects, especially those in more remote locations.

Ideally, there should be one jeep with one overseer in each taluka - to be used exclusively for the Rural Works Program. At present there is only one jeep available in the entire district for the Rural Works Program exclusively. This is the Peace Corps jeep. This jeep is on tour constantly, of course, but it is not adequate for serving the entire district in this work. It is hoped that arrangements will be made in the near future enabling the District to purchase transportation to be used exclusively for the Rural Works Program.

THE PEACE CORPS ENGINEER'S FIELD PROBLEMS

by Volunteer William Hein
Engineering Advisor

From a technical point of view, the Volunteer will find little difficulty in handling the survey problems in Pakistan. His main problems will arise

in two areas: (a) the degree of accuracy and subsequently the type of equipment that will be needed, and (b) the utilization of survey data in the office.

The problems of design are many and will vary widely with the different experiences of the Volunteers. One common to all, however, will be brick and masonry design and construction.

Volunteer engineers point out that the brick structures in Pakistan are over-designed, that is, they are generally much stronger than any minimum specifications would call for, and that the structural designs now in use could serve as models in many cases for future designs. But since brick is so cheap the drawbacks of over-design are minimal.

There are three classes of brick in general use in Pakistan. First class is hard-burnt and perfectly shaped; second class brick have the same quality as first class but are not perfectly shaped; third class brick are not hard-burnt. All second class brick can be used in structural work since it is the uniform strength which is important. Third class brick could be used for structures that do not require great structural strength, such as small village houses.

Volunteer engineers agree that only first and second class brick are acceptable for aggregate in mixing concrete. The handiest measure available is the kerosene tin; one and one-half kerosene tins (six imperial gallons) per bag of cement make a good mixture. Cement that had been stored through one monsoon season should not be used for structural work or aggregate.

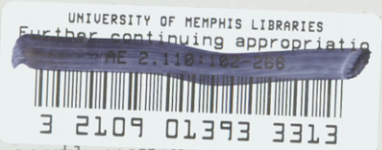
Human Relationships on the Job

Volunteers will face problems in Pakistan which are basically the same as in the United States or any other country - human relations. The Volunteer will have people under him, but probably will not have the power to hire and fire personnel. In all personnel matters, the Volunteer should go through the chain of command.

REPORT BY JACOB FELDMAN, Peace Corps Civil Engineer

Now that my two years in Tanzania, East Africa, as a civil engineer with the Peace Corps are completed, I feel that the Peace Corps can now be assessed realistically for what it is and is not.

I was part of a contingent of 35 - civil engineers, surveyors and geologists - that constituted the first Peace Corps project. We began training in June 1961, and after two months at Texas Western in El Paso and one month in Puerto Rico we flew to Tanzania where we studied the Swahili language for two months before being assigned to our jobs. For the next nineteen months I worked as a resident engineer on a sixty mile gravel road project which was the last link in all weather route between the Indian Ocean and the inland Lake Victoria area. The road was built by an Italian construction



company with an African labor force of 500 men. Modern earth-moving equipment was used. I worked with an English civil servant and two African technical assistants representing the Tanzania government's interest. The road was built for close to \$25,000 a mile. As the proposed plans were both rough and inadequate there were many decisions to be made during the construction period.

Most of my work was concerned with soil mechanics. If a country cannot afford to surface its roads with either concrete or bitumen the use of suitable gravels becomes critical. This necessitated my both locating and testing gravels for paving the 28 foot wide roadway. The job was particularly challenging as the gravels had to serve as a present running surface and as a future base for supporting a bitumenous surface when economic conditions and demand will justify the cost. I has sufficient laboratory equipment available to carry out the Proctor compaction, sieve analysis, Atterberg limit, field density and CBR tests.

The toughest stretch along the 60 mile route was the one mile crossing of the Wembere swamp which prior to the road being built has been impassable to traffic for six months of the year. It was crossed with a ten foot embankment with 4 foot pipe culverts every 100 feet. Most of the road passed through areas of black cotton soil, a type of soil prevalent in Tanzania which is a headache to road builders. It is a black organic soil, with a high clay content, high plasticity, 50% shrinkage and a wet CBR of zero; when wet, it has the consistency of toothpaste, and when dry, it's like rock. As no other soils were available 50% of the embankments on the job were built of black cotton. As a result, the supplying of adequate drainage became particularly important. Two hundred concrete-slab and corrugated steel culverts, plus ten corrugated steel arch bridges were used along the route. The carrying out of an exhaustive soils survey resulted in a saving of \$180,000 in overhaul which we were able to use in assuring adequate drainage.

In addition to my work as a soil mechanic I carried out realignment surveys of the proposed route, quantity calculations for payment to the contractor, and inspection of works - generally trying to see that Tanzania got the most road for its money.

Those of us who served in the Peace Corps feel the Peace Corps has suffered from too much publicity which has emphasized the more dramatic and sentimental aspects of working overseas. If the Peace Corps is to be evaluated as it should constantly be it should be assessed for what it is and not for what it isn't. I wasn't over in Tanzania standing on soap boxes giving speeches for democracy. I did not shape the destiny of Tanzania. It is unrealistic to expect a hand full of Peace Corpsmen in a country of millions to bring about social or economic revolutions. This is not out job or our intention. But we had a very real job to do in helping supply the need for trained and skilled manpower in Tanzania today.

Very possibly the greatest value of the Peace Corps will be the understanding we bring back to America. An understanding one gets by living and working with people of another country. Hopefully this understanding will help America remain sensitive and relevant to the living experiences of the emerging peoples.