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AGENCY FOR INTERNATIONAL DEVELOPMENT  
**PROJECT PAPER FACESHEET**  
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1. TRANSACTION CODE (PUT APPROPRIATE BOX)  
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2. COUNTRY/REGIONAL ENTITY/GRANTEE  
 Interregional - GTS-KPA #21

3. DOCUMENT REVISION NUMBER

4. PROJECT NUMBER: 991-11-995-221

5. BUREAU  
 A. SYMBOL: TAB    B. CODE: 6

6. ESTIMATED FY OF PROJECT COMPLETION: FY 78

7. PROJECT TITLE - SHORT (STAY WITHIN BRACKETS)  
 Ultra Low Cost Shelter

8. ESTIMATED FY OF AUTHORIZATION/OBLIGATION  
 A. INITIAL: MO. 4 YR. 76    B. FINAL FY 78

9. SECONDARY TECHNICAL CODES (MAXIMUM SIX CODES OF THREE POSITIONS EACH)

10. ESTIMATED TOTAL COST (\$000 OR EQUIVALENT, \$1 = \_\_\_\_\_)

A. PROGRAM FINANCING	FIRST YEAR			ALL YEARS		
	B. FX	C. L/C	D. TOTAL	E. FX	F. L/C	G. TOTAL
1. APPROPRIATED TOTAL						
(GRANT)	( 125 )	( )	( 125 )	( 370 )	( )	( 370 )
(LOAN)	( )	( )	( )	( )	( )	( )
OTHER						
U.S. 2.						
HOST GOVERNMENT						
OTHER DONORS						
TOTALS	125		125	370		370

11. ESTIMATED COSTS/AID APPROPRIATED FUNDS (\$000)

A. APPROXIMATE PRIMARY PURPOSE TECH. CODE	FY 76		FY 77		FY 78		ALL YEARS	
	D. GRANT	E. LOAN	F. GRANT	G. LOAN	H. GRANT	I. LOAN	J. GRANT	K. LOAN
SD	125		150		95		370	
TOTALS	125		150		95		370	

12. ESTIMATED EXPENDITURES

13. PROJECT PURPOSE(S) (STAY WITHIN BRACKETS)  CHECK IF DIFFERENT FROM PID/PRP

- A. (FY76 and T.Q.) Build upon the "feasibility phase" work in Bangladesh in the construction of indigenous refugee shelters, and fully involve refugee and other assistance organizations.
- B. (FY77 and FY78) Transfer and adapt the methodology and approach by application to an African and Latin American country and environment, and evaluate the longer-term performance of earlier completed shelters.

14. WERE CHANGES MADE IN THE PID/PRP FACESHEET DATA NOT INCLUDED ABOVE? IF YES, ATTACH CHANGED PID AID/GR PRP FACESHEET.  
 Yes     No

15. ORIGINATING OFFICE CLEARANCE

SIGNATURE: *Henry A. Arnold*  
 NAME: Henry A. Arnold, Director, TA/OST

DATE SIGNED: MO. 3 DAY 31 YR. 76

16. DATE RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION

MO. DAY YR.

# TABLE OF CONTENTS

## PROJECT PAPER

### "Application of Approach, Development and Field Tests of Prototype Ultra Low Cost Shelters in Disaster-Prone Areas"

	<u>Page</u>
Project Paper Facesheet . . . . .	i
Table of Contents . . . . .	ii, iii
PART I. Summary and Recommendations . . . . .	1
A. Facesheet . . . . .	i
B. Table of Contents . . . . .	ii, iii
C. Summary Description of the Project . . . . .	1
D. Summary Findings . . . . .	4
E. Project Issues . . . . .	6
PART II. Project Background and Detailed Description . .	7
A. Background . . . . .	7
B. Detailed Description . . . . .	8
C. Timing of Activities . . . . .	11
PART III. Project Analysis . . . . .	12
A. Technical Analysis . . . . .	12
Environmental Implications . . . . .	13
Shelter Cost . . . . .	13
B. Financial Analysis and Plan . . . . .	14
Budget . . . . .	15
C. Social Analysis . . . . .	16
Social Viability . . . . .	16
Motivation . . . . .	16
Participators' Profile . . . . .	17
D. Economic Analysis . . . . .	17
PART IV. Implementation Arrangements . . . . .	18
A. Analysis of the Recipients' and AID's Administrative Arrangements . . . . .	18
1. Recipient . . . . .	18
2. AID . . . . .	19
B. Implementation Plan . . . . .	20
C. Evaluation Plan . . . . .	20
Reports . . . . .	21
Symposia . . . . .	21

	<u>Page</u>
Logical Framework Matrix . . . . .	22
Appendix A (PPT Chart) . . . . .	23
Appendix B (Letter from Oxford Polytechnique) . . . . .	24
Appendix C (Memorandum from PHA/FDRC, Ms. Sheldon) . . . . .	25
Optional Attachment: AID/TA/OST 75-76, "Feasibility Test of an Approach and Prototype for Ultra Low Cost Housing," Nov. 1975.	

## PROJECT PAPER

### "Application of Approach, Development and Field Tests of Prototype Ultra Low Cost Shelters in Disaster-Prone Areas"

(Short Title: "Ultra Low Cost Shelters")

#### PART I. SUMMARY AND RECOMMENDATIONS:

A. Facesheet and Table of Contents: (see preceding pages)

B. Recommendations: Grant (contract):

FY 76	-	\$ <sup>25</sup> <del>70</del> ,000
FY 77	-	150,000
FY 78	-	<del>150</del> ,000
Project total	-	\$370,000

C. Summary Description of the Project:

Goal: The goal of this project is to contribute to reducing costs and improving the performance of public works (including shelter) as described in KPA #21, and to also contribute to a better life for the very poor in LDCs, and promote, where feasible, an "intermediate technology" approach in response to Congressional guidelines.

Objectives: To demonstrate in varied environmental situations in LDCs a comprehensive design and management approach which utilizes local materials and labor to construct ultra low cost but serviceable and acceptable shelters for homeless, refugees and other displaced persons and to gain acceptance and support of local, national and international assistance organizations to use the approach and methodology.

Description: This Project Paper recognizes and addresses the fact that the temporary or semi-permanent housing of refugees and other displaced or homeless persons in LDCs, such as disaster victims, is normally done through importation of sophisticated solutions which are alien to the local culture, are relatively costly, often do not stand up to the local environment, and often do not involve any "self-help" feature that would occupy and interest the displaced person who is often jobless. Typical imported solutions are western tents (about \$300, delivered), various styles of modular pre-fabs often with corrugated galvanized iron roofings, or plastic "igloos," etc., made on the spot with imported machines. A more appropriate solution then, would be to use some cheap and plentiful local material, put together by local labor (primarily the "displacee" himself), and in a design and construction which is culturally acceptable yet extremely cheap, locally repairable, resistant to the local weather, and built in a very short time, particularly through an organized "mass-construction" approach normally needed in emergency situations. The proposed approach would produce an ultra low cost shelter which on the surface will often resemble what is usually termed a "native hut," as native

huts are also made of "local materials by local labor." The difference, however, is that the approach advocated here utilizes modern management, engineering, architectural, analytical, and other "software" skills common to western developed countries, as opposed to bringing in western "hardware" solutions such as tents, plastic domes, manufactured prefabs, etc. In this sense, the approach is pure "intermediate technology," yielding an "engineered, architect-designed native hut" of local materials but with structural integrity able to resist local environment hazards, optimization of performance versus cost, and management and training techniques for rapid, mass constructions not normally needed nor used in native hut construction. The CMU team recognizes that temporary shelter often evolves into permanent housing. Therefore it is an integral part of the project to develop means and techniques by which emergency shelter can be upgraded economically through self-help into longer term housing. Should the improvements and the financial capacity of the owner of the resulting housing qualify for mortgaging, the team will seek to identify these opportunities.

In 1975, the Carnegie Mellon University multidisciplinary group developed this apparently unique\* "comprehensive approach" by a very limited AID-funded "mini-research" project to check the feasibility of their approach in a most difficult situation, i.e., working with the multitude of refugees and homeless in Bangladesh, and collaborating with the international assistance organizations operating there. The feasibility study included only several months of field operations, but nevertheless showed that:

- (1) The assistance organizations were interested enough to work with the team (and indeed did sponsor some dozens of experimental shelters);
- (2) designs of sufficient structural integrity could be made at an acceptably low cost (about \$10 per person at official conversion rates);
- (3) nearly 100% local materials (e.g., bamboo, thatches, and jute) would suffice;
- (4) local illiterate labor, primarily refugees and other displaced homeless persons could be taught to do the actual construction;
- (5) construction could be rapid (e.g., one day);
- (6) designs resistant to the local elements (floods and cyclonic storms) could be developed;
- (7) displaced and homeless persons would be willing to move into the structures; and

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\*See Appendix B for a letter from a researcher at Oxford Polytechnic, England, who is investigating emergency shelter provision worldwide, and who states the Carnegie Mellon University multidisciplinary approach is unique.

(8) upgrading (improvement) into semi-permanent housing, or returning the basic materials to the market stream would be easily done, if desired. This feasibility study was completed four months ahead of schedule, and a report is now available, published as AID/TA/OST 75-26, "Feasibility Test of an Approach and Prototype for Ultra Low Cost Housing," November, 1975.\*

It is clear that the limited activities in Bangladesh under the feasibility study are insufficient to extrapolate success even in Bangladesh, and certainly not in other areas of the world such as Africa and Latin America. This Project Paper then describes a complete project to delineate, test and expand the application of this comprehensive approach in other situations and environments, on other continents as well as completing the essential work in Bangladesh, as a tropical Asian environment. For this purpose \$150,000 is budgeted for FY 77 for work in arid and semi-arid environments in Africa (probably Ethiopia) and the same amount in FY 78 for an undetermined country in Latin America (perhaps a country subject to earthquake disasters). Within the remainder of FY 76, and through the transitional quarter, \$70,000 has been budgeted to build upon the feasibility work already done in Bangladesh, taking advantage of the investment in time and cost, contacts made, and shelters to be evaluated. This phase would include such things as

(1) longer term and more intensive training, and development of training aids,

(2) improving shelter designs to lower costs and increase performance,

(3) monitoring and testing the performance of those experimental shelters built under the feasibility study, particularly following their performance through wind and flood seasons,

(4) expanding contacts with international assistance organizations and governments,

(5) developing in conjunction with local authorities and VOLAGS a management plan for an operational project in an FDRC designated disaster "repeater" country,

(6) expanding the concept to fit the shelter within its communal context, including sites, spacing and sanitary facilities,

(7) continual dialogue with displacees and assistance organization leaders, to determine acceptance, suggested improvements, etc.,

(8) applying the comprehensive approach to a wide range of design variations required within Bangladesh and potentially usable in other parts of Asia,

(9) disseminating the methodology, acceptability and performance of the model constructions to the federal and village governments, and to voluntary assistance organizations, to attract

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\*Copy attached, or available from TA/OST, AID, Department of State, Washington, D.C. 20523.

funding and leadership for full-scale, operational applications, and

(10) building and training a cadre of local people in the methodology in order to gain the "multiplier effect."

The FY 77 and FY 78 efforts would apply the project in African and LA environments. There will be a certain amount of overlap required, i.e., the monitoring and testing in Bangladesh in FY 76 will carry over into FY 77 and 78 for longer term evaluation, and preliminary arrangements for the FY 77 activity in Africa will need to be started in FY 76. The methodology is explained in the aforementioned feasibility study report.

Environmental Assessment: This is an exploratory project which in itself will not have a significant environmental effect. When methodologies and materials requirements are better understood, and when operational programs are planned, it will be necessary to assess the environmental impact of the various feasible alternatives. This point will be addressed during the implementation of this project.

It should also be noted that the project activities are localized in refugee camps established by local governments and refugee assistance organizations. The environment within the camps will obviously be improved by the project activities, as the Carnegie Mellon approach includes camp planning, organization and facilities, including sanitary engineering, as ancillary goals in addition to the objective of improvement of the shelters themselves. To some extent, the contractors may also be able to influence local authorities to take environmental aspects and potential impacts more seriously into consideration when they establish new camps or relocate old ones. Environmental impact of material usage will be minimized by cultivating, on site, materials which can be used for new construction and repairs.

As with the feasibility study, this project would be sponsored and managed by TA/OST, but with the close collaboration of the AID Housing Office, and the Office of Foreign Disaster Relief and Coordination, both who strongly endorse the project. The same team of Carnegie Mellon University professors, Charles Goodspeed and Volker Hartkopf, augmented by the experienced subcontractor, Fred Cuny of "Intertect," Dallas, Texas, would lead this larger effort, starting about February, 1976, or as soon as possible, thereafter.

#### D. Summary Findings

An analysis of the feasibility study shows that even in the difficult Bangladesh context it was feasible to:

- (1) use locally available materials (e.g., bamboo, jute, and thatch in Bangladesh);
- (2) avoid use of high energy materials;

- (3) use local semi-skilled and unskilled labor, including the refugees themselves;
- (4) interest the refugee assistance agencies in financially sponsoring some experimental constructions;
- (5) maintain a very low cost: (Note: about \$10 per person seemed to be the lowest cost obtainable for a minimal but adequate shelter in the inflation-ridden Bangladesh context, but further efforts are needed to lower the cost more);
- (6) develop training systems for teaching the technique and approach;
- (7) design for wind and flood resistance; and,
- (8) build something people would agree to live in for a limited period.

Answers are incomplete, however, on:

- (1) further variations on the prototypes in different environments;
- (2) longer term performance and acceptability;
- (3) materials and management for mass production;
- (4) large scale training techniques;
- (5) prototype performance through a cyclonic storm season and a flood season;
- (6) study of post-construction adaptations made by the shelters' inhabitants;
- (7) expansion of information to and involvement of refugee assistance agencies;
- (8) replenishment or restoration of resources (e.g., bamboo replanting);
- (9) engineering analysis of various prototypes;
- (10) further structural and material optimization and cost reduction;
- (11) minimization of environmental effects;
- (12) maximization of "intermediate technology;"
- (13) relationship to promotion of small industry development and
- (14) applying and testing the entire approach in a different environment and context in Africa and Latin America;
- (15) publishing and distributing results.

To address these points, the new project includes further work in Bangladesh, with subsequent moves to an African country such as Ethiopia, and then to a Latin American country, as yet undetermined.

Any delay in funding this contract risks loss of members of the interdisciplinary team which worked on the feasibility study, including an LDC-experienced subcontractor. Furthermore, extended delays in monitoring the acceptability and performance of those shelters already built in Bangladesh lessen the value of those activities.

The project meets all relevant criteria established by law. The project also responds to Congressional guidelines which stress

direct assistance to the poor (Comment: There are few poorer in the world than refugees or other "displaced" persons) and the use of intermediate technology. As explained earlier, the project concept is to employ appropriate western "software," i.e., engineering and management techniques, instead of imported Western "hardware," i.e., tents or other structures to develop locally-based shelters. In this respect, the project is ideal as an "intermediate technology" approach. No Western, capital-intensive equipment, materials or facilities are involved.

#### E. Project Issues

A USAID/Bangladesh cable questions (1) cost, (2) complexity of construction, and (3) resale by recipients.

Re (1), "cost" ten dollars of local currency per person (converted at the official rate at the time) would seem much better than imported solution (a tent is about \$300 foreign currency, delivered). Nevertheless, a prime objective in this project is to reduce costs even more.

Re (2), "complexity" Carnegie Mellon found no difficulty in teaching local unskilled people to make the shelters, which are simple, and not complicated. For example, local people completed a camp by themselves. In the new project, visual aids, such as flip charts, will be used to explain assembly procedures, and additional procedures will be developed for mass construction.

Re (3), "resale," these native-style shelters seem less likely to be sold than alternatives, such as tents, and in any case they still would provide housing for the family purchasing the shelter. As there are no foreign imports involved, it would not seem attractive to the black market, but if it were dismantled, most of the materials, e.g., bamboo would simply re-enter the local market stream. If sold intact, it provides shelter for the purchasing family, indicates that there is a market for this level shelter, and indicates the quality and design is acceptable.

There are no other issues; all Bureaus support the project based on PID review. The Disaster Relief and Housing offices support the project, the previous work has been publicized in a housing speech by Mr. Murphy and in WAR ON HUNGER, and a Carnegie Mellon presentation last October was exceptionally well received by AID attendees. Additionally, a British researcher involved in a UNDRO (U.N. Disaster Relief Organization) sponsored major investigation on emergency shelter provisions and disasters states that this group and its approach is "unique" in the field.

## PART II. PROJECT BACKGROUND AND DETAILED DESCRIPTION

### A. Background

The U.N. Human Settlements Group estimates world housing shortages to be 1.5 billion units by the end of the century. Many of these shortages will continue to be of the "displaced-person" type, caused by natural disasters (earthquakes, floods, typhoons, and hurricanes), and by wars, fires, political upheavals, and slum clearance decisions. In developing countries, the displaced people under such circumstances are characterized by mass moves in a destitute or nearly destitute condition from traditional sites to new areas. They have no employment and very few possessions. They are truly "at the bottom of the ladder."

In the Fall of 1973, an interdisciplinary working party was formed at Carnegie Mellon University to address the refugee housing problem in developing countries. The University supplied minimal funds to initiate the project. Since then, the team, consisting of architects, engineers, planners, and sociologists, has worked to develop universally applicable processes and methods designed to provide temporary, intermediate, and ultimately long term housing at ultra low cost. In the Winter of 1973-74, a Prototype "I" unit was designed and tested in the Carnegie Mellon Laboratory, and during February 1974, a field test (still under University funds) was undertaken in Guatemala. The tests were intended to realize the design by means of local labor, to evaluate the effectiveness of the training documents and models developed for the transfer of information, and to examine the adaptability of the construction process and product with respect to local conditions, materials and skills.

During March and April, 1975, under a modest AID funded "Small Research Project" a series of modified prototypes were constructed under actual relief conditions at various camp sites in Bangladesh. This was accomplished under the joint sponsorship of A.I.D.'s Office of Science and Technology (responsible for project management), the Office of Foreign Disaster Relief Coordination (interested in application potentials for post-disaster shelters), and the AID Housing Office. The construction of units in Bangladesh was funded by several voluntary agencies, including the Bangladesh Red Cross, Mennonite Central Committee, Save the Children Foundation, and OXFAM. Over forty housing units were built with that support, and in one camp construction is still ongoing. The progress achieved to date is documented in the Project Report entitled "Feasibility Test of an Approach and Prototype for Ultra Low Cost HOusing" (November 1975). A copy is either attached to this Project Paper, or obtainable from the Office of Science and Technology, A.I.D., Department of State, Washington, D.C. 20523.

## B. Detailed Description

The specific objectives of the project for the contract period are:

1) To continue work on the existing shelter designs, incorporating those changes suggested by field experience and the reviews of various voluntary agencies who have participated in the construction activities of the past year. The experience gathered and criticisms voiced are being incorporated into further improved units. Particular concerns are:

- a. to further facilitate construction techniques and processes;
- b. to decrease costs;
- c. to improve the life span of components and
- d. to enhance the cultural acceptability of the structure;
- e. to monitor and evaluate the adaptations made by residents to the structures built in the camps; and
- f. to make an environmental assessment directed towards predicting and assessing any adverse environmental effects of large-scale applications.

2) To expand the scope of the work to other regions with differing climate, topography and socio-economic constraints. It is proposed that a target disaster-prone country in Africa and Latin America (tentatively Ethiopia and one of the Andean or Central American earthquake prone countries) will be selected. The program in Africa and Latin America will be in three phases. First, prototype units are to be constructed in several environmentally different locales primarily with the funding of voluntary agencies. Second, the experiences gathered -- either directly during construction or later by observing the way people use and modify the shelters -- will lead to improved designs and modification of the construction procedures. Third, the improved designs will be tested in follow-up projects in actual relief environments in the same country.

3) To continue the broader aspects of the program, i.e., the use of large numbers of the existing shelter designs or modifications thereof in a large scale relief operation in an environment similar to the environments in which testing has begun under the feasibility study. The team will conduct a detailed case study based on the use of the shelters in the construction of a complete or a substantial portion of a refugee camp. The team will interest potential contributors among the VOLAGS active in the test region and prepare an integrated management plan for this construction project.

4) To continue and expand development of the methodology and procedural approach to the design of emergency shelters. During the feasibility study, a format for a "Decision Tree" was developed and circulated to various VOLAGS and relief housing specialists. Under the proposed contract, the team will incorporate the suggestions offered and produce a working model of the Tree for field evaluation in the program outlined in 3) above. Also, during the program outlined in 2) above, data on the African and Latin American target populations and relief situations will be gathered, analyzed and structured using the Decision Tree. The comprehensive information will relate to the:

- a. Types of disasters;
- b. Affected populations;
- c. Socio-economic characteristics of the populations;
- d. Average size and density of community settlements;
- e. Interpretation that local people give to foreign relief operations including emergency shelters;
- f. Current average family size and age structure, and likely trends in the next few decades;
- g. Family systems (joint, extended, nuclear) and other relevant customs as they relate to utilization of space (also the extent to which such customs and mores may be relaxed in times of crisis);
- h. Management capabilities by the local people of larger temporary settlements;
- i. Availability and costs of building materials commonly used by the people, including possible substitutes;
- j. Conditions for the transfer of technology;
- k. Construction techniques and material selection as they relate to indigenous housing;
- l. Environmental effects of mass shelter projects.

5) To continue and expand research related to maximum feasible use of indigenous materials in emergency shelters in a wide variety of environments, specifically concentrating on materials found in semi-arid and mountainous terrain. During the past year, the team has concentrated on developing improved techniques for stabilizing soil which could be used in conjunction with the designs utilized in Bangladesh. In preparation for the expanded work proposed herein, a second team was formed under the direction of the existing team to expand the perimeters of the soils

research program. The task of this new team, which has been funded to date from internal Carnegie Mellon and INTERTECT sources, is to review the current soils research at Carnegie Mellon for possible wider application as well as to review all current soil stabilizing techniques and methods used, or of possible use, in building emergency shelters. The team obtained a test site in West Texas and carried out a series of preliminary projects in January 1976.

The objective of this part of the program for the proposed contract is to develop one or more low-cost soil stabilizing methods and materials for use in emergency housing which can be found or obtained locally or can be made available within twenty-four hours at sites all over the world in the necessary quantities. It must, in addition, be capable of application by local unskilled labor using the most rudimentary tools. While there have been a number of studies on low-cost materials of construction (e.g., the Monsanto Research Corporation ongoing study of low-cost roofing, AID/CM/ta-c-73-12), the materials described do not meet the criteria for ultra low-cost housing, in that they generally require substantial amounts of sophisticated chemicals and specialized equipment in addition to indigenous materials.

6) To expand contacts and the input of voluntary agencies, local governments, and the various U.S. governmental officials concerned with emergency shelter. The consultant to the project, Mr. F. C. Cuny of INTERTECT, has recently been named to an UNDRO task force to study the problem of emergency shelter in the developing countries and will coordinate between this project and the UNDRO project.

7) To uncover opportunities for gradual upgrading of initial emergency shelters into permanent houses. The team intends to, wherever possible, develop methods and techniques to extend the useful life and increase the standard of liveability of initial shelter so that it can function as longer term housing as the economic, social and environmental situation stabilizes and improves. The Office of Housing at AID will be involved in providing technical and organizational assistance in determining and selecting appropriate social, financial and institutional frameworks, possibly through Indefinite Quantity and Technical Services Contracts.

8) To prepare and publish materials related to the project to include, but not be limited to:

- a. Publications of selected and tested shelter designs;
- b. Publications of construction handbooks suitable for the construction project manager, including materials and labor organization, management, economics, site selection, etc. Texts will be in English, French and Spanish;

- c. Production of diagrammatic flip charts and models suitable for the illiterate, unskilled worker who will construct the shelters on a self-help basis, and possibly an intermediate manual for "foreman" level, if this proves desirable or necessary;
- d. Publications of any other information developed under the project which might be broadly useful;
- e. Publications of bi-annual reports to AID, outlining the progress and interim results of the project, and suggesting subsequent actions which might encourage greater utilization of the results, under a section entitled "Utilization." Potential user organizations and addresses should be listed including suggestions for dissemination of results.

C. Timing of Activities

Attachment A lists the crucial tasks and gives their respective timing.

### PART III. PROJECT ANALYSIS

#### (A). Technical Analysis

The project aims at providing shelter for the poor in developing countries. The people displaced by natural or man-made disasters, or slum clearance decisions are truly at the "bottom of the ladder" in this context. The Carnegie Mellon University approach addresses itself closely to the policies and guidelines established by Congress which are directed to aid the poor in emerging nations. The project does not require western or capital intensive equipment or materials, and is therefore an ideal "intermediate technology" project.

The Carnegie Mellon University approach to shelter design for emergency use in developing countries focuses on:

- 1) the use of locally available materials as well as building skills;
- 2) the augmentation of the effectiveness in the way these materials and skills are employed by means of western technological concepts, such as mass production, engineering analysis, structural optimization, etc.;
- 3) the training of local people to enable them to employ the new techniques; and
- 4) the training of voluntary or local governmental agencies' field personnel who subsidize refugee camps and shelters.

Several major benefits accrue from this approach beyond the primary purpose of providing temporary shelter. The approach:

- 1) stimulates employment and related, small industry development;
- 2) prevents unnecessary outflow of capital for the purchase of foreign machinery or materials;
- 3) is more conducive to existing social and cultural patterns in housing; (western building concepts often are disruptive to local building traditions);
- 4) enhances the technical standard of the local industry; and
- 5) increases the degree of preparedness in the face of recurring disasters.

The Carnegie Mellon University approach has proven its effectiveness in the feasibility study and initial field tests in Bangladesh. During Spring, 1975, the basic approach and "A"-frame prototype shelters were introduced to that country by the team. Several voluntary agencies supported and financed field tests, presumably monitoring and adapting the prototypes long after the departure of the team. Even though the intent of the project was a feasibility study, the multiplier effect is considerable. The appropriate level of the technology employed certainly was a prime factor in overcoming otherwise severe obstacles in those limited trials in Bangladesh.

### Environmental Implications

The Carnegie Mellon shelters are composed of locally available materials. Most of them are natural and require minimal processing such as bamboo, thatch, and jute rope. The processes used in their production are natural and do not create any adverse environmental impact. Also, they consume minimal energy. The disposal of the materials used, after their useful life as a building material ends, does not create adverse effects either, particularly in poor societies with a high regard for the utility of any material.

However, any material used in large scale projects in resource poor countries, such as Bangladesh, can lead to the depletion of resources. Provisions have to be made to replenish these on an appropriate scale. (Therefore, at Mirpur, one of the test sites of the Carnegie Mellon University structure, under the 1975 feasibility study, land has been set aside to grow bamboo for future use in construction and repair.)

Carnegie Mellon University recognizes the issue of the scarcity of resources in that the designs:

- 1) aim at maximizing the utility of each material used (for example, computer programming is used to optimize the structure); and
- 2) do not rely on the utilization of energy-intensive building materials, such as cement, steel, etc.

### Shelter Cost

To conceivably serve the large numbers of people in need, the shelters must be ultra low cost. Carnegie Mellon University recognizes this important constraint and strives to achieve shelter designs which can be constructed for \$5 to \$10 per person for cost of materials. It is realized, however, that below a critical cost no meaningful help can be achieved. It is the aim to find an appropriately balanced cost for each project, in the context of each environment, and relative to other alternatives for adequate, quick and acceptable temporary shelter. Therefore the project's success will not be determined on a precise shelter

cost alone, but on a mix of factors, including cost, performance, acceptability, speed and ease of construction, and other similar objectives described elsewhere in this project paper.

(B). Financial Analysis and Plan

The estimated funding for this project may be summarized as follows:

- FY76 - \$ 70,000 (For work in the remainder of FY76, and the Transitional Quarter.)
- FY77 - 150,000 (For completing a project in Africa, in a different environmental context, and long-term monitoring of earlier constructions in Bangladesh.)
- FY78 - 150,000 (For completing a project in an LA country, in a different environmental context, e.g., an earthquake-prone area, and long-term monitoring of earlier constructions, in Bangladesh and Africa.)

The estimated budget is as follows on the following page.

FACULTY and STAFF	1975 -	Sept. 30, 1976	1976 -	Oct. 1, 1977	1977 -	Sept. 30, 1978
Faculty C MU						
Goodspeed	\$ 5,220		\$11,519		\$12,670	
Hartkopf	4,700		6,200		7,000	
Rosen	1,500		3,000		3,300	
Secretary, C MU	2,000		3,000		3,000	
		\$13,420		\$23,719.00		\$ 25,970.00
Fringe Benefits 15%		2,013		3,557.85		3,895.50
Total Salaries and Fringe Benefits		\$15,433.00		\$27,276.85		\$ 29,865.50
Student Support						
Advanced Building	7,800		16,000		16,000	
Studies-Graduate						
Chemical Engineering			3,500		3,500	
Undergraduate			2,000		2,000	
Total Student Support		\$ 7,800.00		\$21,500.00		\$ 21,500.00
Materials	1,500		4,000		4,000	
Supplies	1,000		500		500	
Communications	1,500		1,000		1,000	
Publications	1,000		1,000		1,000	
Computer Costs	500		500		500	
Total Materials and Supplies		\$ 5,500.00		\$ 7,000.00		\$ 7,000.00
Overhead, 37%		\$10,631.21		\$20,637.43		\$ 21,595.23
Vijai Singh	2,200.00					
Fringe Benefits 15%	330.00					
Univ. of Pittsb.-37.4% Overhead(off campus)	946.22					
Total-Univ. of Pittsb.		\$ 3,476.22				
Intertect, Dallas (inclusive of travel)	20,370.00		61,000.00		57,764.00	
Total Intertect		\$20,370.00		\$61,000.00		\$57,764.00
Travel C MU Only total		\$ 7,320.00		\$12,585.72		\$12,275.27
TOTALS		\$70,530.43		\$150,000.00		\$150,000.00

The estimated budget is viable without any other donor. However, as a project purpose is to interest and involve various assistance organizations and agencies in the project, it is expected that such organizations will fund at a minimum some hundreds of experimental constructions, and at a maximum some thousands of actual shelters, all based on the Carnegie Mellon comprehensive approach to the refugee and displaced person shelter problem, and designs and data developed in the project. While such "outside" expenditures relate closely with the project, it would seem wise to consider this unknown quantity as a measure of the success and utilization of the project, and not as a separate "budgetary contribution." Therefore it is not listed as a direct "input" to the project, nor included in the budget.

The fiscal responsibility of the Carnegie Mellon team and their parent institution has been amply demonstrated in their performance under the \$25,000 feasibility study contract, wherein they accomplished much more substance than usually obtained for such a modest amount.

### (C). Social Analysis

#### Social Viability

One of the prime foci of the Carnegie Mellon University approach is on social viability. This applies to the shelter design as well as to the construction processes and the user evaluations of finished structures which are an important part of the whole approach. The team recognizes three major social obstacles to successful design and implementation of refugee shelter which lie in the differing interpretations of all participant groups,

- 1) the displaced own interpretation of their housing needs;
- 2) the relief agencies' perception of the residents' shelter needs;
- 3) the designers interpretation of the user's (occupants' and agencies') needs and requirements.

#### Motivation

The resolution of these inherent obstacles will partially determine the motivation of all participant groups in the project.

In addition, it is important in this context to recognize the motivation of the residents is directly related to the time interval between the disaster's occurrence and the beginning of relief activities. The more time elapses, the more apathetic residents tend to become, especially in a refugee camp environment. Therefore, the construction processes must lend themselves to rapid relief. Also, it is inherent in human nature to want something better, so a negative answer to the question, "Are you

satisfied with this shelter" needs to be interpreted somewhat.

In order to assess the socio-cultural impact of the structures, Dr. Vijai P. Singh, a sociologist at the University of Pittsburgh, has been assigned the task of follow-up inspection and monitoring. He will visit the test sites and conduct discussions with the occupants, construction personnel, and field staff of the voluntary agencies (VOLAGS) for the purpose of evaluating the project. His reports and evaluations are an integral part of the project.

#### Participants' Profile

The three major participant groups are: the displacees (refugees, homeless and other displaced persons), the assistance agencies (local and international) and the Carnegie Mellon University team. The Carnegie Mellon University "comprehensive approach" aims at improving local building techniques and encouraging self-help; at enlarging the knowledge and abilities of administrators to cope with the wide variety of housing problems.

Displacees are those displaced by natural or man made disasters, or those kept homeless as a result of drastic governmental actions. The level of education, technical skills and capital of the target participants are at the lowest possible levels. Likewise the amount of resources available to these groups are extremely low. However, they do possess a variety of indigenous skills which can be employed in the building process. The Carnegie Mellon approach addresses these skills and strives to expand the opportunities for the participants to utilize them. For instance, flip charts and manuals communicate improved methods of construction and by participating in the construction, new techniques can be assimilated by the residents.

The VOLAG field staffs generally are not housing experts. Proven designs and advanced construction processes, well documented, enhance the effectiveness of the local administrators' ability to respond.

The Carnegie Mellon University team of designers, planners and sociologists gain important insights into the validity of their assumptions through the field tests. The "approach" is a dynamic process, responsive to the social, cultural, capital, resource, and other factors in any local situation where it is applied.

#### (D). Economic Analysis'

The benefits of this project cannot be easily quantified. If an alternative is \$300 for a tent delivered for a family of five, and the Carnegie Mellon approach provides shelter for five for \$50, the saving is obvious. The social benefits of involving the refugees or "displacees" in a self-help activity are not counted in this equation, however. Neither is the fact that the \$300 is foreign currency cost, the \$50 is local. Given the millions of refugees in the world at any one time, the overall

potential for monetary savings is enormous. The \$50 per family is an affordable risk to test the hypothesis in any sense of the word. More meaningful will be the expenditures necessary to travel, discuss, publicize, demonstrate and otherwise "spread the word" to convince VOLAGS and other involved agencies that the Carnegie Mellon approach is viable, cheaper, and culturally better.

Another economic benefit of this project is its potential, if locally successful, of spawning small industry. An imported tent provides no local industry, but cutting and transporting bamboo, replanting bamboo, making stabilized soil bricks, managing local work crews erecting shelters, teaching the techniques to others, all provide the genesis for small industry in rural areas.

It is concluded that any measure of success in this project will have sizeable economic, social and political benefits.

#### PART IV. IMPLEMENTATION ARRANGEMENTS

##### (A). Analysis of the Recipients' and AID's Administrative Arrangements

###### 1). Recipient

The project will be administered jointly by the principal investigators Dr. Charles Goodspeed, Assistant Professor of Civil Engineering, and Professor Volker Hartkopf, Assistant Professor of Architecture, within the multidisciplinary graduate program of Advanced Building Studies, directed by Prof. Hartkopf. The program, which is unique, is sponsored by the Departments of Architecture, Civil Engineering, and the School of Urban and Public Affairs. It was developed to respond to challenges confronting the breadth of professions engaged in making and changing the built environment. The objective of the program is to provide advanced training for persons who can constructively engage in the planning, design, construction and operation of the built environment by considering the interrelated aesthetic, technological, financial and managerial aspects of building problems, embedded in a systems approach.

The Advanced Building Studies Program provides an excellent framework for the kind of studies necessary in the development and test of ultra low cost shelter. Architects, engineers, planners and sociologists for instance, can address problems which cut across many disciplines.

Also participating in the project at Carnegie Mellon University will be Steven Rosen, Ph.D. from the Department of Chemical Engineering, who will be responsible for the soils and chemical research.

Carnegie Mellon University is an ideal setting for the proposed work. It is a small university with top caliber faculty, and in each of the areas contributing to the built environment, it has a successful history of flexibility and experimentation in interdisciplinary studies and programs.

During the previous AID funded feasibility project, the Carnegie Mellon University working party included two major consultants. The prime consultant for the project will be Dallas-based INTERTECT with Frederick C. Cuny, PIC, assigned the role of coordinator for INTERTECT. Mr. Cuny has had extensive experience in emergency housing and refugee camp programs and has worked with a wide variety of relief organizations throughout the developing world. His role will be to provide insights into the administrative and operational problems encountered by VOLAGS and to conduct the field tests in coordination with the on-site VOLAGS. Secondary consultant will be Dr. Vijai Singh, Associate Professor of Sociology at the University of Pittsburgh. Prof. Singh has had extensive experience in population dynamics and is a consultant to several developing countries. His role will be to provide a detailed evaluation of the social and cultural impact of the shelters on the displacees, and to report on evolutionary changes made by the occupants of the units. Both consultants have participated in the project at all levels to date.

The Carnegie Mellon University - INTERTECT team is unique in that it is the only team so comprised and so integrated, that is conducting research in refugee/emergency shelter for the developing countries. The combination of resources at Carnegie Mellon University and experience at INTERTECT provide the basis for conducting a highly successful project that can be realistically implemented.

2). A.I.D.

This project will be jointly sponsored by AID's Disaster Relief Office (PHA/FDRC), Housing Office (SER/H), and Office of Science and Technology (TA/OST), which will retain management. This project also has the endorsement, in principal, of all AID offices which to date are familiar with the concept, i.e., PHA/PVC, the Bangladesh desk, the ASIA/Office of South Asia Affairs, the ASIA/Office of Eastern Asian Affairs, SA/TD, and SER/ENG. The Office of Refugee and Migration Affairs of the Department of State is also interested in the concept.

Evaluation will be by normal AID evaluation procedures. Particular attention will be given to opinions from the field and from refugee and disaster relief organizations, or other potential users of the ultra low cost shelter system. As stated earlier, the UN refugee offices (UNDRO and UNHCR) are very interested in the project, as are numerous VOLAGS, and may wish to collaborate during the course of the project, or afterwards. Such collaboration will be encouraged, particularly in the field

activity of the project. Funding will be incremental, by fiscal years.

(B). Implementation Plan

The implementation plan and the milestones are outlined in Attachment A. This document is coded to show the relationship between activities and those parties responsible for implementing those actions. Milestones are also identified. Monitoring of the Implementation Plan will be carried out by the Office of Science and Technology (TA/OST). Evaluation will be conducted as designated in "C" below.

Above and beyond the funds provided for the project by AID, the logistic support required to conduct the project will be provided by the local VOLAGS and the host governments concerned. This support will consist of provisions of materials, labor, and any local transport required to construct the shelters. No specific arrangements have yet been outlined, but the approach has proven successful in the past and it is felt that it will continue to be so.

Project implementation at the level of the beneficiaries will be the responsibility of the Carnegie Mellon University-INTERTECT team. Based on the results of the past feasibility test of the approach, this area of activity will be expanded to include development of techniques wherein the refugees can participate to a greater extent in the decision making process, particularly as it relates to site selection, siting of structures, labor participation, and evaluation of project actions affecting them.

(C). Evaluation Plan

The project will be evaluated in several ways. At the regional (Asia, Africa, Central America) level, evaluation will be by a small team organized by AID. Annual evaluations (PAR) will be made by the project administration (TA/OST), in coordination with SER/H and FDRC, and others as desired.

In addition, a selected outside consultant may be retained to conduct further evaluations, or otherwise participate should it be desirable. Evaluation will examine the degree to which local governments and VOLAGS participate in the project, the extent to which budget constraints are met, and the degree to which project objectives are met.

The project will also be evaluated in terms of the contractor's ability to meet the milestones (see Attachment A) within their timing commitments. Evaluations of field and technical aspects will be made jointly by AID/Washington, concerned AID Missions, and concerned VOLAGS.

## Reports

Contractors will submit milestone reports throughout the contract period. These reports will be in sequence with the Implementation Plan (Attachment A) and will be submitted within thirty days following completion of the milestone. Milestone reports will be brief statements outlining the project achievements since the last reporting period (milestone), identifying issues and problems, and proposed actions to be taken relative to resolving any obstacles to the project's successful conduct.

Reports will include a description of the progress of the approach and prototypes comprising a comparison of units, their performance and the socio-cultural implications encountered to date. It should include vital comments by VOLAGS and/or the host governments. If amendment to the contract appears necessary because of this "feedback," a proposal for amendments should be made and justified.

A final project report will be submitted at the end of the project period outlining the results of the project, strategies for continued implementation, and a comprehensive evaluation of the project, the approach and methodology, and the degree to which project objectives were met.

## Symposia

If, after dissemination and completed evaluation, positive results are shown during the third year of this proposed project, then Carnegie Mellon University may submit a proposal to AID for sponsoring a dissemination program focusing world-wide attention on this approach. This might be by an "International Conference on Emergency Shelters."

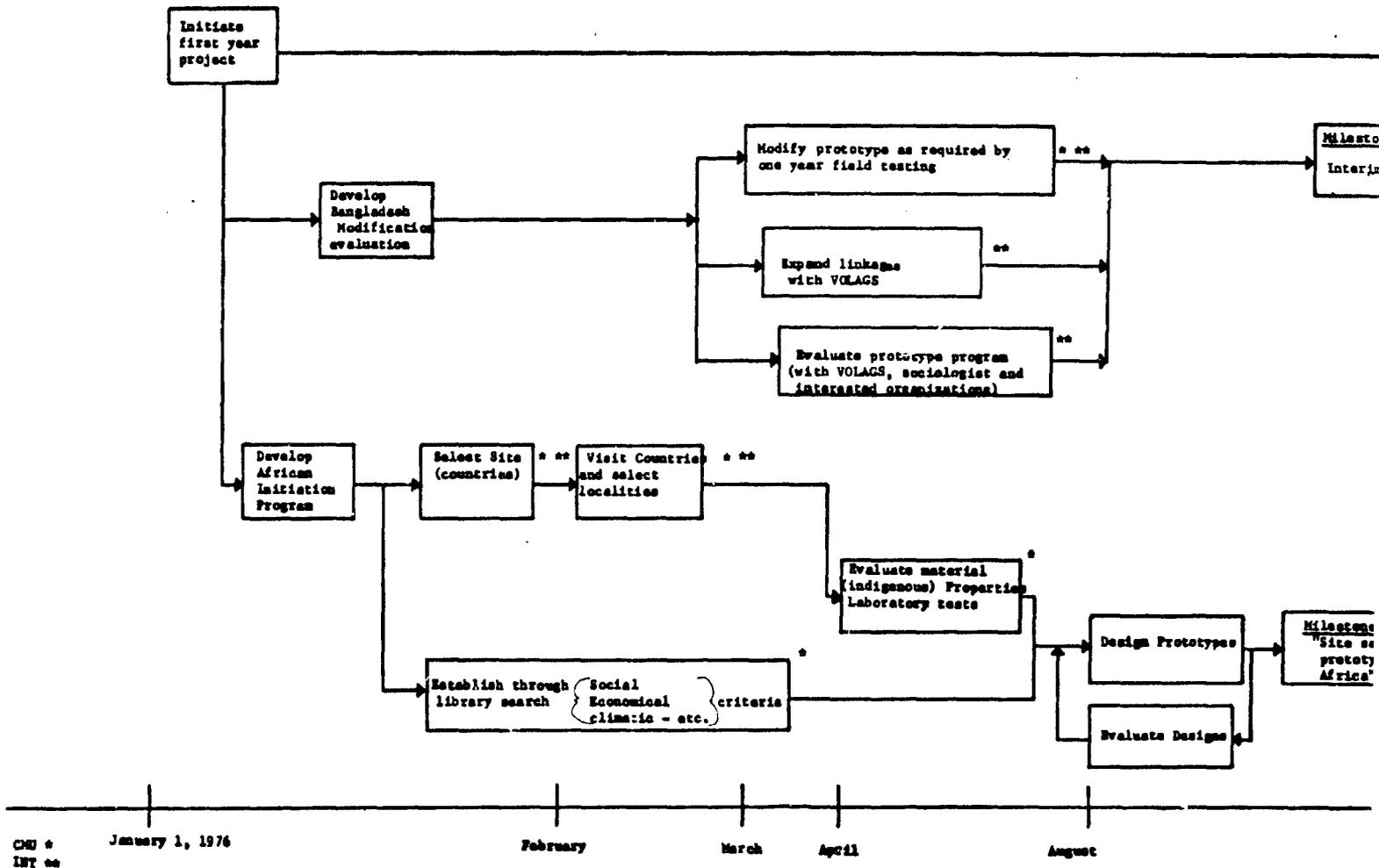
PROJECT DESIGN SUMMARY  
LOGICAL FRAMEWORK

Life of Project: 1976 to FY 1978  
From FY 1976 to FY 1978  
Total U. S. Funding \$370,000  
Date Prepared: March, 1976

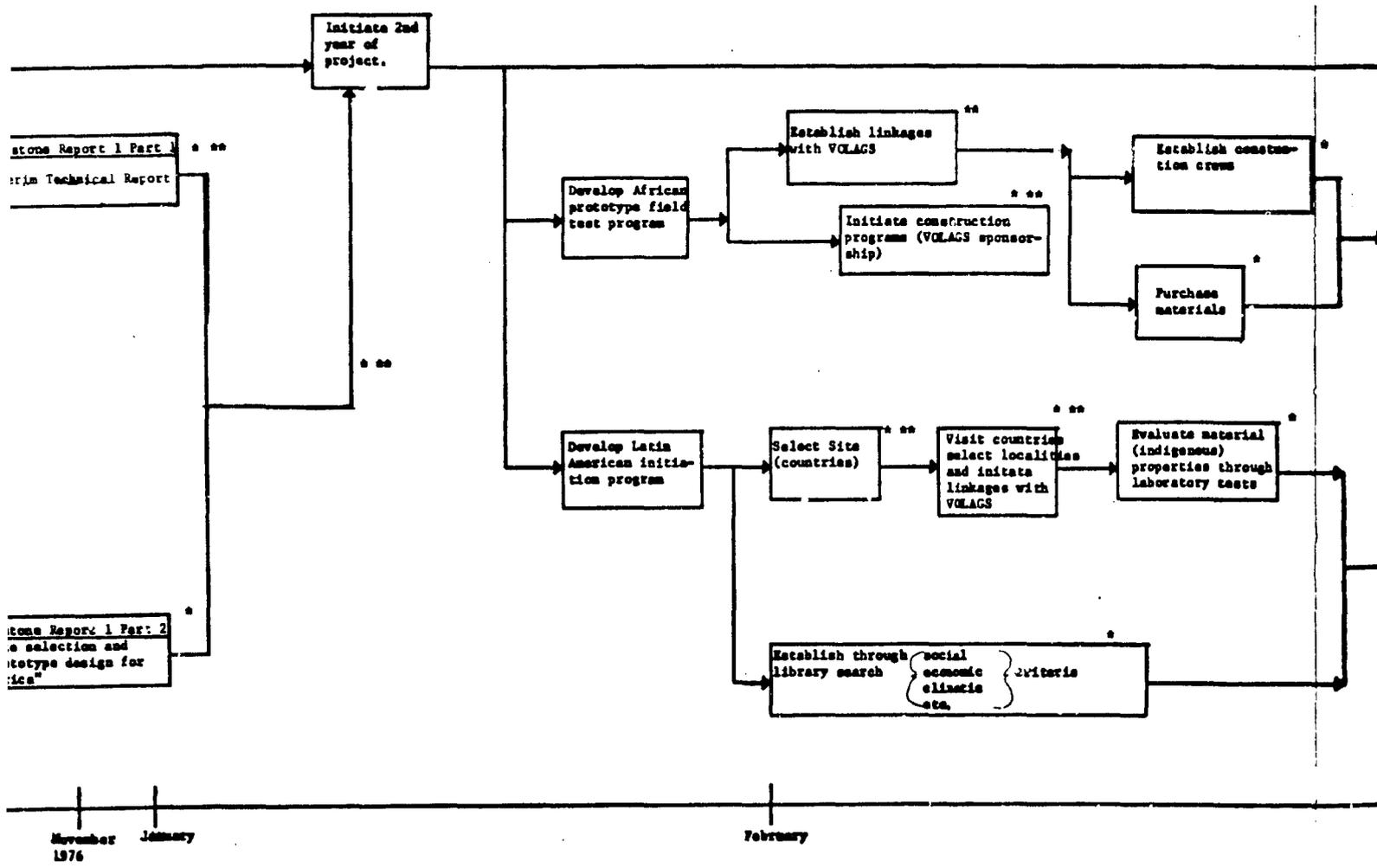
Project Title & Number: Application of Approach, Development and Field Tests Prototype Ultra Cost Shelters in Disasterprone Areas

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>Program or Sector Goal: The broader objective to which this project contributes:</p> <p>a) EPA-21 "Reduce Public Investment Cost," i.e. reduce costs and/or improve performance of public works, including shelter</p> <p>b) Assist the poor in LDCs</p> <p>c) Promote "intermediate technology" in LDCs</p>	<p>Measures of Goal Achievement:</p> <p>a) Amount of savings (especially foreign currency savings) when compared with conventional, imported relief shelters (e.g. tents). Comparative resistance of shelters to elements.</p> <p>b) Homeless better housed than before?</p> <p>c) Costs and construction predominantly local.</p>	<p>Comparative cost records, technical performance monitoring records, interviews, questionnaires, self and independent evaluations.</p>	<p>Assumptions for achieving goal targets:</p> <p>Presence of a homeless or displaced person population, inadequately sheltered.</p> <p>-Political stability sufficient for project to proceed.</p> <p>-Assistance organization's no local government willing to help bring homeless</p>
<p>Project Purpose:</p> <p>To demonstrate in LDCs a comprehensive approach which utilizes local materials and labor to construct ultra low cost shelters for homeless and other displaced persons, and gain acceptance and support of voluntary and other assistance organization to utilize the approach and methodology.</p>	<p>Conditions that will indicate purpose has been achieved: End of project status.</p> <p>Assistance organizations support the building of meaningful quantities of shelters using the Carnegie-Mellon approach, in an Asian, African and LA LDC.</p> <p>-Shelters are acceptable (i.e. not abandoned).</p> <p>-Shelters are very low in cost in comparison with alternatives of equal performance.</p> <p>-Shelters continue to be built and improved, without Carnegie-Mellon guidance.</p>	<p>Records of assistance organizations who monitor construction of shelters using C-M approach. Acceptability evaluations and observations. Costs and technical performance records. Reports printed.</p>	<p>Assumptions for achieving purpose:</p> <p>Same as above</p>
<p>Outputs:</p> <p>a) built, tested, modified, monitored, and evaluated experimental and demonstration shelters on three continents through comprehensive multi-disciplinary approach.</p> <p>b) local labor trained; local resources utilized.</p> <p>d) "ultralow" costs achieved.</p> <p>e) optimized mass construction techniques and processes, while maintaining structural integrity both at management and labor level.</p> <p>f) trained managers, structures adapted to several levels of cultural requirements.</p> <p>g) environmental impact minimized</p> <p>h) assistance organizations informed, trained and involved.</p> <p>i) "intermediate technology" utilized</p> <p>j) management procedures developed for large volume construction.</p>	<p>Magnitude of Outputs:</p> <p>a) hundreds of shelters of varying designs built in various environmental and cultural situations in the Asian, African and LA context.</p> <p>b) Shelters built by hundreds, through local labor (many self-help, with local materials (nearly 100%))</p> <p>d) costs prove minimal, e.g. \$10/person.</p> <p>e) mass construction techniques, etc. developed for technically acceptable shelter on mass scale; coaching aids developed (handbooks, designs, charts etc.), for</p> <p>f) dozens of managers trained</p> <p>g) hundreds of homeless living in shelters.</p> <p>h) environment relatively undisturbed</p> <p>i) dozens of assistance agencies involved</p> <p>j) management procedures accepted by most relief agencies.</p>	<p>Records and self-evaluation: Independent evaluations, including relief organizations, IMA/Do, refugee representatives, special evaluation team</p>	<p>Assumptions for achieving outputs:</p> <p>Same as above</p>
<p>Inputs:</p> <p>a) capabilities and experiences (including 1975 feasibility study) of Carnegie-Mellon interdisciplinary project team.</p> <p>b,c) self-help and other local labor</p> <p>d) local, cheap, plentiful materials</p> <p>e) training in the C-M approach by C-M.</p> <p>f) participation and support of assistance organizations.</p> <p>g) subcontract with F. Cony Assoc. (INTERTECT)</p> <p>h) minor subcontracts with U. Pittsburgh and with local LDC suppliers, etc.</p>	<p>Implementation Target (Type and Quantity)</p> <p>BUDGET:</p> <p>FY-76 - \$ 70,000 (Bangladesh)</p> <p>FY-77 - 150,000 (AFR country)</p> <p>FY-78 - 150,000 (LA country)</p> <p>TOTAL \$370,000</p> <p>Budget is primarily for salaries, overhead, travel costs, subcontracts, and local materials and minor subcontracts.</p>	<p>Commitments of voluntary relief organizations.</p>	<p>Assumptions for providing inputs:</p> <p>Same as above</p>

PLANNED PERFORMANCE TRACKING NETWORK CHART (PPT)



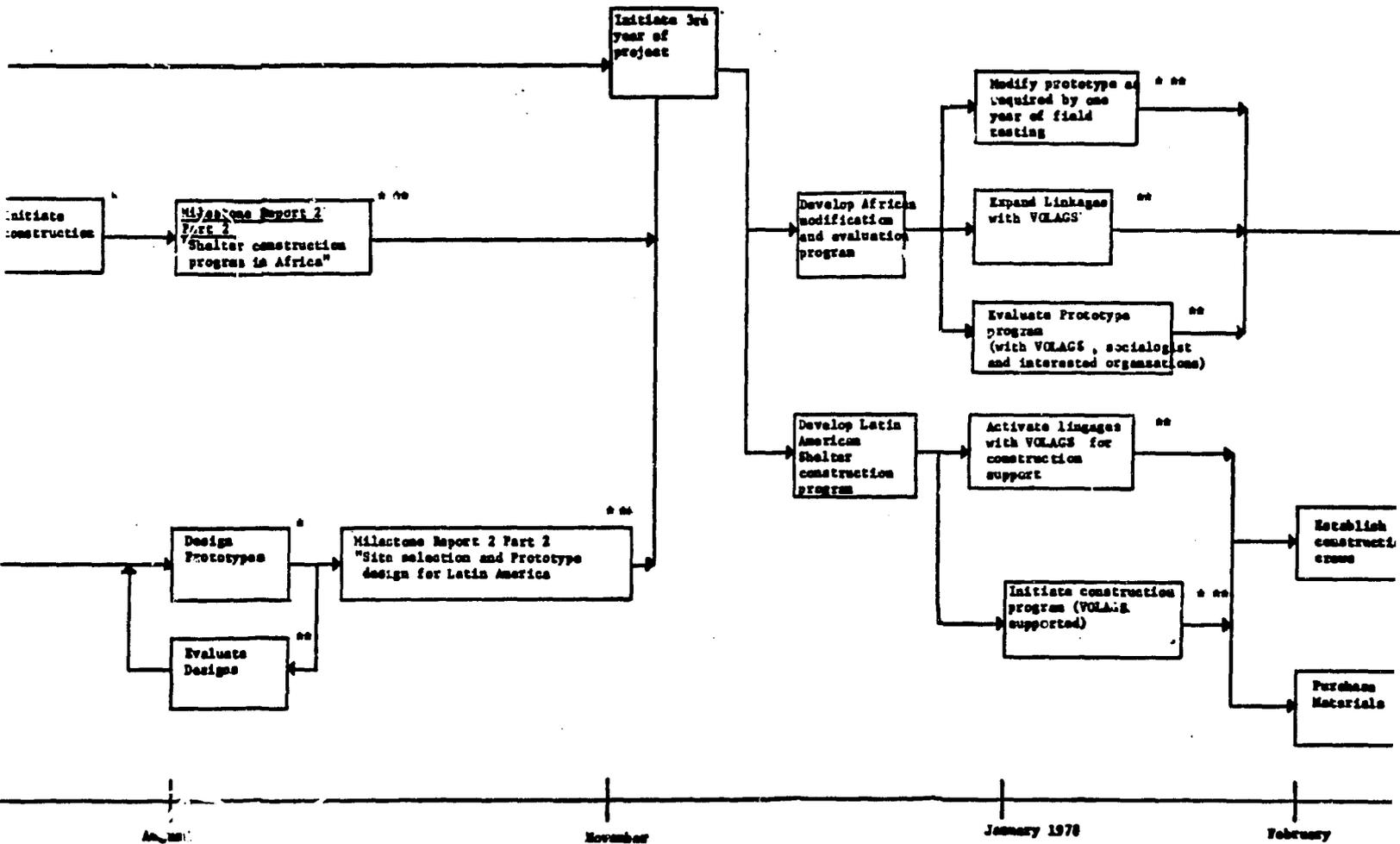
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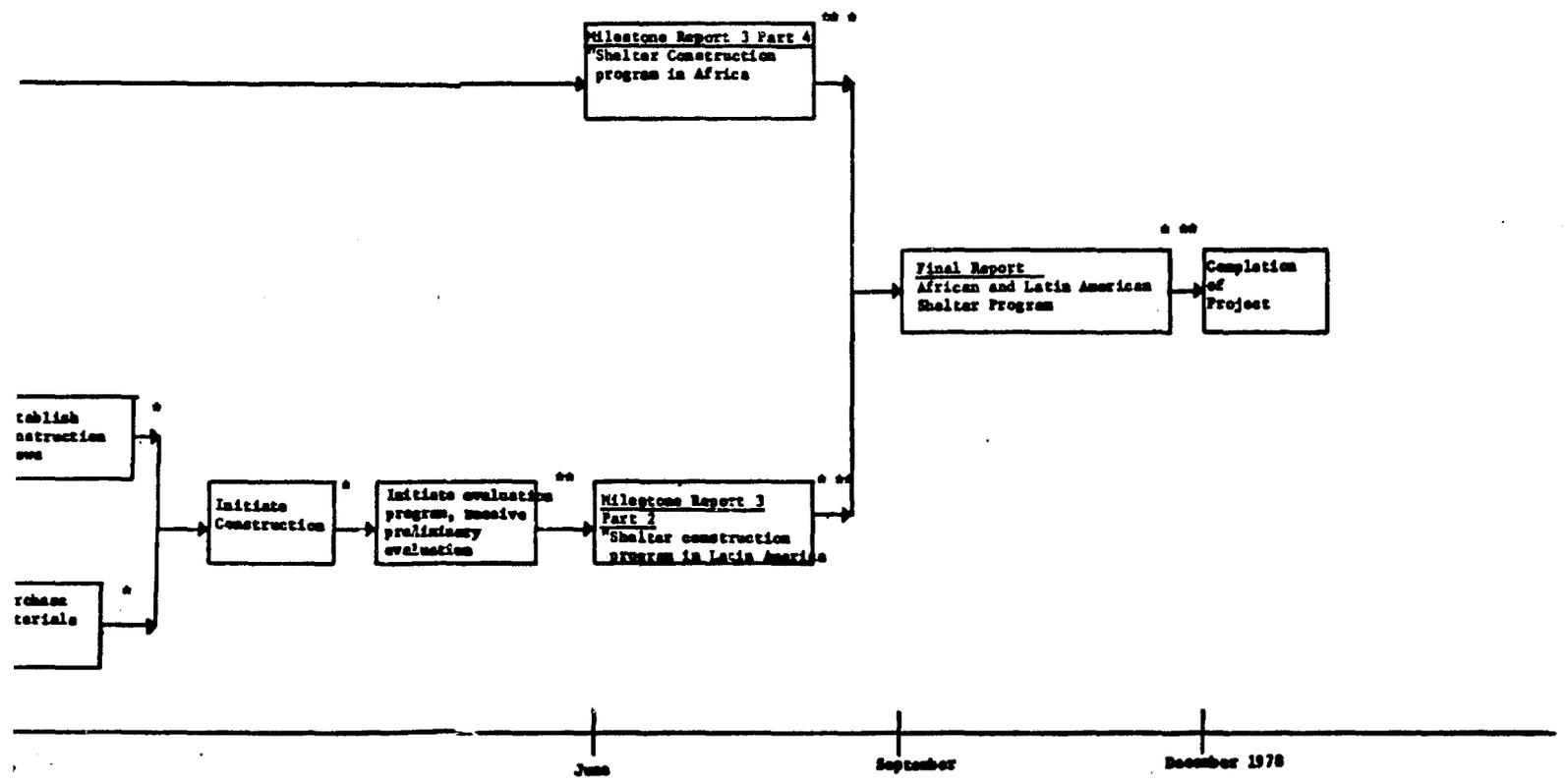


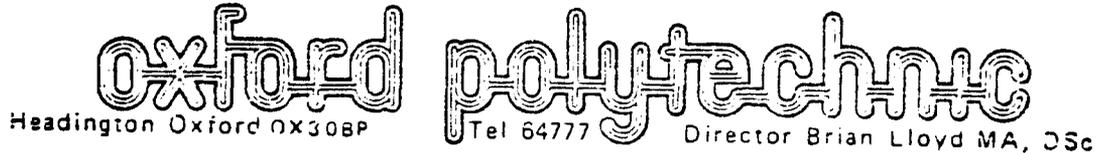
stones Report 1 Part  
 r:m Technical Report

stones Report 1 Part 2  
 selection and  
 prototype design for  
 "ice"

Establish through library search { social economic climatic etc. } & water







Department of Architecture  
Research and Development Group

24 November 1975

Mr William L Littlewood  
TA/OST Room 2842, N.S.  
Agency for International Development  
Department of State  
Washington DC  
USA

Dear Mr Littlewood

I am writing to say that I have heard of the recent research proposal which is a further development of the Carnegie/Mellon, ultra-low cost housing project in Bangladesh.

I have spent some time studying this proposal and consider it to be tremendously worthwhile since it is quite unique in attempting to resolve the problem of extreme low cost housing using indigenous materials and skills.

From a recent study I have undertaken on all international research on emergency housing, I know for certain that no research work of this nature is proceeding anywhere else, and in my opinion there is no organisation other than the C-M/Intertect group that is capable of undertaking this study.

My own role is that I have recently been formulating a research proposal which the United Nations Disaster Relief Organisation (UNDRO) is about to undertake. This study is a major investigation on emergency shelter provision and disasters.

If you require any further information, please contact me.

Yours sincerely

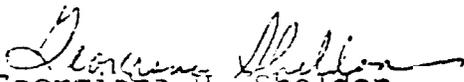
  
Ian Davies

UNITED STATES GOVERNMENT

# Memorandum

TO : TR/OST, William H. Littlewood

DATE: November 13, 1962

FROM :   
PEP/FDRC, Georgiana H. Sheldon

SUBJECT: ~~PEP~~ Carnegie-Mellon University - Ultra Low Cost Housing

Bill Dalton was very impressed by the Carnegie-Mellon presentation on ultra low cost housing. In particular, their contention that such housing can be provided anywhere at low cost using material and labor which is available locally.

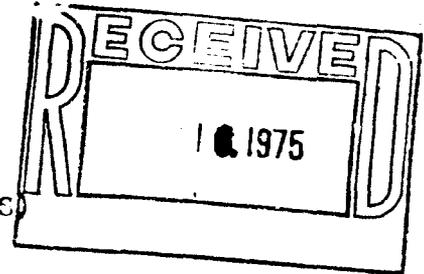
I would like to meet with you to discuss where we might go from here and the extent to which FDRC should become involved in the support of the Carnegie-Mellon work. We are particularly interested in seeing Carnegie-Mellon attempt to develop a scheme for low cost housing in an area lacking botanical resources.

ASIA/OP,  
Mr. John McCann

TA/OST, Mr. William Littlewood

December 15, 1975

ASIA/TD, Herbert W. Dodge



PID: Ultra Low Cost Housing, KPA #21 (GPS)  
PID: Low Cost Roofing - Utilization, KPA #21 (GPS)

As a result of your explanations given by telephone today concerning Ultra Low Cost Housing and Low Cost Roofing, the Asia Bureau has the following comments:

Ultra Low Cost Housing

1. This Bureau suggests that the project be renamed Low Cost Shelter Research for Refugees-Disaster Victims.
2. We understand that there are two objectives desired under proposed funding.
  - a. To further analyze the results of experiments underway in Bangladesh.
  - b. To conduct additional research in Africa and Latin America to develop designs incorporating rudimentary local building materials for environments that are different from that of Bangladesh.
3. This Bureau will be interested to see objective observations made by design professionals and refugee-disaster victim coordinators in the fields where this research is being conducted.
4. We expect that suitable arrangements will be made with USAIDs and host countries finally selected for conducting this project in such way that there will be suitable administration and monitoring of the project.
5. On the basis of this position, we would agree to proceed with this project.

Low Cost Roofing - Utilization

1. It is our understanding that initial R and D work has been done in close conjunction with the three countries selected for continued experimentation and that this work is at a stage requiring detailed implementation on the part of host-country specialists in order to realize to the fullest extent the benefits of the previous R and D by MRC. It is also understood that in each country significant conclusions about materials and production methods have been reached to enable host-country "carry on" of the project.
2. It is understood that suitable arrangements for continuing this work are being made, with the USAID concerned and in conjunction with appropriate host-country agencies, as the means of suitable administration and monitoring of project activities.
3. This Bureau will anticipate receiving the MRC report describing work accomplished to date.
4. On the basis of this position, we would agree to proceed with the project.

ccs:

TA/PPJ, Mr. Carl R. Fritz  
ASIA/CCD, Mr. Frank Collins, Jr.  
ASIA/DP, Mr. John McCarthy

Clearances:

ASIA/CCD:FCollinsJr (subs)  
ASIA/DP;JMcCarthy (subs)

ASIA/CCD/UEA:ABJacobs:jd:12/15/75

TA/OST

OK  
fret

PLANS DIVISION COMMENTS

PID/XXXXXX (Crossout inapplicable)

NAME: S.V. Lehky

DATE: 12/9/75

COUNTRY: (A) Bangladesh, (B) Undetermined AFR and LA countries

PROJECT TITLE: Ultra Low Cost Housing - FY77 - TA/OST Grant

1. Relationship to the DAP

N/A

2. Relationship to the Mandate

The project will assist the poor (refugees), dislocated by natural disasters, political upheavals, war, slum clearances, etc.

ect Design Issues

Bangladesh has raised three main issues:

- 1) Cost too high for the target population.
- 2) Fabrication/construction techniques too complicated.
- 3) Resale by recipients - the shelters are provided free of charge.

The project approval is subject to satisfactory resolution of these issues.

See Forward final approval

~~As mentioned~~ with reference to OST reply (p2 157)

1) Cost issue may still be unsatisfactory for Bangladesh participation of construction Technicians across member of OST

Does not address issue raised by Durr  
Gibib Jan

4. Other Issues

Why are Asian countries excluded under this project? In Asia they have also their share of natural disasters, political upheavals, etc.

Maybe selection of another Asian feasibility site where disasters are not frequent occurrences (as Bangladesh) would be preferable. What about Pakistan or Philippines?

Jan

Lenky

Date: DEC 1 1975

MEMORANDUM FOR: Members of the Research and Development Committee

FROM: TA/PPU, Carl R. Fritz

SUBJECT: Approved Project Identification Document

Attached is a copy of a Project Identification Document (PID) which has been approved by the Assistant Administrator for Technical Assistance for project design and the drafting of a Project Paper (PP):

Project Title: Ultra Low Cost Housing, KPA #21 (GTS)

Project Number: 931-11-995-221

Initial FY: 1976

Responsible Office: TA/OST, William H. Littlewood

If you have any comments, questions or issues which you would like to see addressed in the PP, please send them directly to the responsible office listed above with a copy to TA/PPU. They should be received by that office within two weeks/ [REDACTED] so that the comments can be addressed by the drafter.

The draft PP will be submitted to the Research and Development Committee for review and comment. However, we encourage your comments as early in the design process as feasible so that the project can be responsive to Agency concerns.

Attachment: a/s

cc: TA Technical Office

TO : AA/TA, Mr. Curtis Farrar

FROM : TA/PPU, John *[Signature]* Gunning

SUBJECT: PID Clearance

Project Title: Ultra Low Cost Housing, KPA #21 (GTS)

Begins FY 1976.

1. The PID complies with the following AA/TA instructions if the appropriate block is checked. Otherwise, comments are attached.

- a. Main points of Program Guidance #3 covered.
- b. AA/TA budget review comments have been incorporated or adequately appealed in the narrative.
- c. Proposed funding is within limits described in TA Bureau FY 76/77 Program Submission to PPC and/or as amended by current OYB.
- d. Dates of PP development, approval and project initiation are realistic and consistent with the Program Submission.

*x Field comments & OST response are attached.*

] 2. This PID has been in TA/PPU and staff work is incomplete because of  TA/PPU work pressure, or  field office work pressure. We recommend you return the PID for further review prior to your final decision.

3. We recommend the following action:

a. Approval

(1) subject to \_\_\_\_\_

b. Disapproval or delay for reasons specified in attached.

4. AA/TA Action

Approved,

Subject to clarification of USAID Dacca's  
criticisms & resolution at the PP stage

Disapproved

*[Signature]*  
Signature

11/24/75  
Date

# BEST AVAILABLE DOCUMENT

AGENCY FOR INTERNATIONAL DEVELOPMENT

**IDENTIFICATION DOCUMENT FACESHEET**

TO BE COMPLETED BY ORIGINATING OFFICE

1. TRANSACTION CODE (IF APPROPRIATE BOX)		<b>PID</b>
<input checked="" type="checkbox"/> ORIGINAL	<input type="checkbox"/> OTHER	
<input type="checkbox"/> ADD	<input type="checkbox"/> DELETE	DOCUMENT CODE <b>1</b>

2. REGIONAL ENTITY/AREA  
**Interregional-GTS-KPA #21**

3. DOCUMENT REVISION NUMBER

4. SUBJECT NUMBER <b>931-11-995-221</b>	5. BUREAU	
	A. SYMBOL <b>TAB</b>	B. CODE <b>6</b>

6. PROPOSED NEXT DOCUMENT	
A. <input type="checkbox"/> PRP <input checked="" type="checkbox"/> PP	B. DATE <b>09/7/75</b>

7. PROJECT TITLE - SHORT (STAY WITHIN BRACKETS)

Ultra Low Cost Housing

8. ESTIMATED FY OF AUTHORIZATION/OBLIGATION	
A. INITIAL FY <b>7/6</b>	B. FINAL FY <b>7/8</b>

7. PROJECT TITLE - LONG (STAY WITHIN BRACKETS)

Ultra Low Cost Housing for Refugees and Others

Contractor: Carnegie-Mellon Univ.  
Project Mgr: TA/OST, Wm. H. Littlewood

9. ESTIMATED COST (LIFE OF PROJECT) (\$000 OR EQUIVALENT, \$1 = _____)		
PROGRAM FINANCING		AMOUNT
A. AID APPROPRIATED		<b>370</b>
B. OTHER U.S.		
C. HOST GOVERNMENT		XXX
D. OTHER DONOR(S)		XXX
TOTAL		XXX

10. ESTIMATED COST/AID APPROPRIATED FUNDS (\$000)							11. OTHER U.S. (\$000)		
A. LOCATION (COUNTRY CODE)	B. PRIMARY PURPOSE	C. PRIMARY ACTIVITY	ALL YEARS			A. PROGRAM TYPE	B. FIRST YEAR	C. ALL YEARS	
			D. LEAN	E. GRANT	F. LOAN				
SD			70	370					
			(FY77-150)						
			(FY78-150)						
TOTAL									

12. PROJECT GOAL (STAY WITHIN BRACKETS)

To explore in cooperation with LDCs selected technological innovations that can greatly reduce the costs of economic infrastructure activities that are heavy users of public funds. (KPA 21; Reducing Public Investment Costs.)

13. PROJECT PURPOSE(S) (STAY WITHIN BRACKETS)

A. (FY76 and I.Q.) Build upon the successful "feasibility phase" work in Bangladesh in the construction of indigenous refugee shelters, and fully involve refugee assistance organizations.

B. (FY77 and FY78) Transfer and adapt the methodology and approach by application to an African and Latin American country and environment, and evaluate the performance of earlier completed shelters.

Countries involved: (A) Bangladesh, (B) Undetermined AFR and LA countries.

14. TRAINING RESOURCE REQUIREMENTS (STAFF/FUNDS)

15 man days (TA/OST and other AID staffs) per year.

15. ORIGINATING OFFICE CLEARANCE

SIGNATURE: \_\_\_\_\_

TITLE: Henry Arnold, Director  
TA/OST

DATE SIGNED: MO. DAY YR. **10/10/75**

16. DATE RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION

MO. DAY YR. \_\_\_\_\_

AID 1330-2 (5-75)  
**10/10/75**

PID (cont'd)

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Attached is a cable from Dacca which reacts negatively to this PID. The USAID's concerns are; a) the fabrication/construction techniques are too complicated, b) the cost is too high for the target population in Bangladesh, c) the shelters are given free and may be resold or bartered by the recipients.

The CMU team visited Washington on October 20, 1975 to brief interested AID/W personnel on the completed \$25,000 mini-research project. During the briefing and in the question/answer period following the CMU team (an architect, an engineer, and a sociologist) responded to similar questions. Their responses follow.

Cost: the cost achieved is perhaps still "too high". It came to about \$10 per person in local currency. The follow on activity hopes to lower this. On the other hand it is hard to imagine a lower cost alternative. Tents, the traditional answer, are not always available, less durable, less protective from water and wind, probably more expensive and may have a foreign exchange cost. They are also easier to sell or barter.

Construction Techniques: Both the refugees and the PVOs found the new designs strange and therefore assumed it would be complicated to construct. CMU went through a step by step drill of erecting a structure with the refugees. The local people were then able to continue and completed a camp without CMU supervision. CMU has produced how to do it visual aids (without words) on the technique.

Resale by Recipients: The CMU mini research and the proposed follow on are aimed at testing the feasibility of ultra low cost shelters for temporarily housing refugees, displaced persons and other disaster victims. The project is not intended to be for low-income housing although that is a potential use. Conditions of sale would have to be regulated by the LDC or donor.

CMU did write to Mr. Glaeser on September 12, 1975 but we understand X that he has not yet replied (Attachment A.).

PHA/FDRC is interested in this project and may possibly share in the funding (Attachment B.).

September 12, 1975

Mr. Edward Glüser\*  
Center for International Studies  
Cornell University  
170 Uris Hall  
Ithaca, New York 14850

Dear Ed:

It was good to talk to you today; hopefully we can stay in contact, especially since your work in international development is of considerable interest to our group. Possibly, in some appropriate instances, Cornell and Carnegie-Mellon University could share resources by co-sponsoring significant people to lecture in areas of common concern. An example of this kind of person might be Dr. Schumacher of London. (See the copy of my letter to him, which is enclosed).

When on the phone I neglected to mention that Mr. Littlewood asked me to get in touch with you, because he was leaving shortly for Africa and having only very recently located your address, he was unable to write to you personally before his departure. In a few lines I would like to summarize below the points which are of importance to our project and which I hope you can address in your statement.

I. Our work should be seen in the light of the following objectives, they are:

- to be prepared for recurring disasters;
- to have a short response time by not relying on hardware to be transported to the disaster stricken area;
- to provide shelters which are respectful of the cultural values of the people they intend to serve;
- to encourage self help;
- to facilitate the work of administrators both during construction, as well as during the use;
- to aid the poorest man ("bottom up approach");
- to provide shelter which is upgradable, part by part when economic circumstances improve; and

*Attachment A*

to provide shelter which can be dismantled - the part of which can be distributed among displaced persons once they can return to their home area.

## II. Case Study Bangladesh:

### 1). Approach:

The Carnegie-Mellon University approach to disaster relief housing, aimed at providing wind and flood resistant shelter for displaced persons by using materials, skills, and where possible, building forms indigenous to the disaster area, should be contrasted to traditional relief housing.

### 2). Unit Design:

The concept of employing appropriate western "software" (engineering and management techniques) instead of western "hardware" (tents, or other structures) to indigenous housing should be discussed. The software is well documented and it is our intention to distribute the packages (construction manuals for administrators and construction flipcharts to field workers) to all major relief organizations for use in recurring disasters.

I hope this list, together with copies of the interim report, and the unfinished final report, which are sent to you under separate cover, will provide sufficient information for your task. Should you need further clarifications, please call me collect using the number given on the letterhead. My extensions are 6339 and 6703. Naturally, I appreciate your willingness to assess the value of our work.

\*I am providing you with the original German spelling of your name, which I am sure you will appreciate.

Sincerely,

Volker Hartkopf  
Director

cc: Fred Cuny

Vil:md

enclosures under separate  
cover: cc. of letter to Dr. Schumacher  
copy of the interim report  
copy of the unfinished final report  
copy of the proposal

UNITED STATES GOVERNMENT

# Memorandum

TO : TA/OST, William H. Littlewood

DATE: November 18, 1975

FROM : PHA/FDRC,  Georgiana H. Sheldon

SUBJECT: Carnegie-Mellon University - Ultra Low Cost Housing

Bill Dalton was very impressed by the Carnegie-Mellon presentation on ultra low cost housing. In particular, their contention that such housing can be provided anywhere at low cost using material and labor which is available locally.

I would like to meet with you to discuss where we might go from here and the extent to which FDRC should become involved in the support of the Carnegie-Mellon work. We are particularly interested in seeing Carnegie-Mellon attempt to develop a scheme for low cost housing in an area lacking botanical resources.



*Attachment B*



Department of State

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TO SECSTATE WASHDC 8378

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*Copy to 779/111*

AIDAC

F.O. 11652 : N/A  
SUBJECT : REVIEW OF PROPOSED NEW TECHNICAL ASSISTANCE  
BUREAU PROJECTS

REFERENCE : AIDTO CIRCULAR A-464

1. SUMMARY: BELOW ARE COMMENTS ON TAB PIDS FORWARDED TO  
MISSION FOR COMMENT. FOR MOST PART, MISSION OFFICERS  
SKEPTICAL OF UTILITY OF PROJECTS, ALTHOUGH REALIZING  
MISSION DOES NOT HAVE COMPLETE BACKGROUND FOR PROJECTS.  
END SUMMARY.

2. ULTRA LOW COST HOUSING FOR REFUGEES. MISSION HAS  
PREVIOUSLY ADVISED AID/W TO CONTACT MR. EDWARD GLAFER,  
FORMERLY CHIEF OF INSTITUTIONAL DEVELOPMENT, USAID/B, NOW  
IN LONG-TERM TRAINING AT CORNELL UNIVERSITY. MISSION  
BELIEVES CMU FABRICATION/CONSTRUCTION TECHNIQUES ARE TOO  
COMPLICATED AND COST IS STILL TOO HIGH FOR TARGET POPULA-  
TION IN BANGLADESH. WHILE TRUE THAT DXFAM IS PROVI-  
DING REFUGEE SHELTER, THEY HAVE MADE MAJOR MODIFICATIONS  
TO SIMPLIFY CONSTRUCTION AND REDUCE COSTS. FURTHER, SINCE  
THESE SHELTERS ARE BEING GIVEN AWAY RATHER THAN SOLD,  
MISSION IS CONCERNED THAT HOUSES WILL BE RESOLD FOR FOOD  
OR CASH BY RECIPIENTS.

3. DEVELOPMENT OF VITAMIN A DELIVERY SYSTEMS. VITAMIN A  
DEFICIENCY MAJOR PROBLEM IN BANGLADESH. UNICEF CURRENTLY  
INVOLVED IN PROGRAM TO DISTRIBUTE 30 MILLION VITAMIN A

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# TELEGRAM

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PAGE 02 DACCA 04995 150431Z

CAPSULES PER ANNUM. DETAILS OF PROGRAM FORWARDED BY MISSION FOOD FOR PEACE OFFICER TO DR. HORNSTEEN, IAN. JOHN HOPKINS CMR ADVISES THIS PROGRAM GOING WELL COMPARED TO OTHER TYPES DISTRIBUTIVE PROGRAM. BELIEVE VITAMIN A DEFICIENCY CAN BE OVERCOME ONLY BY FORTIFICATION OF FOODS WHICH POOR CONSUME, I.E. TEA, WHEAT, SALT, IF FORTIFICATION CAN BE DONE INEXPENSIVELY. FORTIFICATION OF SUGAR NOT VIABLE ALTERNATIVE IN BANGLADESH.

4. INCREASING LEGUME UTILIZATION. BASIC BOTTLENECK TO INCREASING LEGUM UTILIZATION IN BANGLADESH IS LACK OF PRODUCTION. BANGLADESH AGRICULTURAL RESEARCH INSTITUTE ADDRESSING PROBLEM LOCALLY. OUR INFORMATION IS THAT ICTSAT AND AVRDC ALREADY FOCUSED ON LEGUME PROBLEMS, AND THAT INTERNATIONAL AGRICULTURAL DEVELOPMENT SERVICES WILL SHORTLY BE ADDRESSING SPECIFIC BOTTLENECKS. THEREFORE, MISSION UNSURE ABOUT UTILITY OF NEW, SEPARATE PROJECT IN THIS AREA.

5. NATURAL RESOURCES ANALYSIS AND PLANNING. MISSION RELIEVES PROJECT HAS UTILITY BUT QUESTIONS WHETHER EFFORT WILL BE TOO THINLY SPREAD. RELIEVE APPROACH NEEDS TO BE MORE COUNTRY SPECIFIC, PROBLEM ORIENTED, AND MORE CLOSELY TIED TO RELEVANT LDC INSTITUTIONS.

6. LDC INSTITUTIONAL INVOLVEMENT IN NON-FORMAL EDUCATION PROGRAMS. MISSION BELIEVES THAT ISSUE NUMBER ONE OF PID MOST IMPORTANT. WITH 211 (D) GRANTS TO UNIVERSITY OF MASSACHUSETTS, MICHIGAN STATE UNIVERSITY, AND OTHERS, WHAT IS REQUIREMENT FOR BUILDING UP INSTITUTIONAL CAPABILITY IN LDCS. IF INDIVIDUAL LDCS NEED NFE PROGRAM, WHY IS IT NOT IMPLEMENTED AS MISSION RATHER THAN TAB EFFORT?

7. MILS/METHODS FOR NON-SCHOOLED RURAL PEOPLE. MISSION FINDS PROPOSAL RATHER ILL-DEFINED. NFE CONFERENCE AT MSU IN 1974 PRESENTED SPECIFIC MATERIALS AND APPROACHES FOR ILLITERATES WHICH HAD ALREADY BEEN DEVELOPED AND TESTED, ESPECIALLY IN LATIN AMERICA. WHAT MORE IS NEEDED?

8. URBAN FUNCTIONS IN RURAL DEVELOPMENT. MISSION BELIEVES THIS PROJECT COULD BE WORTHWHILE BUT NEEDS BETTER FOCUS. MISSION OF

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# TELEGRAM

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PAGE 03 DACCA 04995 1504317

OPINION THAT STATE-OF -ART MORE ADVANCED THAN PROPOSAL IMPLIES. TO BE RELEVANT TO BANGLADESH, AT LEAST, PROJECT SHOULD FOCUS ON WHAT POLICIES ARE NEEDED TO STIMULATE THE GROWTH OF THOSE SERVICES, AND TO WHAT EXTENT CAN THESE AGRO-SERVICES ABSORB AN EVER-INCREASING NUMBER OF LANDLESS LABOURERS.

9. INTEGRATED PROGRAMMING FOR THE URBAN POOR. MISSION REACTED MORE NEGATIVELY TO THIS PROJECT THAN ANY OTHERS. THE PRESENT PRIORITY IS, QUITE RIGHTLY, ON THE RURAL POOR BECAUSE THEY ARE THE GREATEST PORTION OF THE TOTAL POOR, E.G. NINETY PER CENT IN BANGLADESH, AND BECAUSE IMPROVEMENT IN RURAL ECONOMIC CONDITIONS IS THE MOST EFFECTIVE SOLUTION TO SLOWING RURAL-URBAN MIGRATION. OUR EXPERIENCE HAS BEEN THAT THE RURAL POOR, HAVING ONCE MIGRATED TO URBAN AREAS, WILL RETURN TO THE URBAN AREAS EVEN THOUGH THEY ARE CONSISTENTLY FORCE REMOVED OUT OF THE CITIES TO RURAL AREAS. IN OTHER WORDS, THE POOR HAVE ACTUALLY MADE A RURAL-URBAN COMPARISON AND PREFER THE CITIES. HIGH IMPACT URBAN PROJECTS AND LOW COST SERVICE DELIVERY SYSTEMS WHICH ARE PUT INTO PLACE PRIOR TO IMPROVEMENT IN THE RURAL AREAS WILL ONLY ACCELERATE URBAN MIGRATION, THEREBY GENERATING A DEMAND FOR MORE HIGH IMPACT PROJECTS AND LOW-COST SERVICES. ALL OTHER THINGS BEING EQUAL, THE CITIES WILL ALWAYS BE THE MORE ATTRACTIVE TO THE POOR. THUS THE SOLUTION IS TO TILT THE BALANCE IN FAVOR OF DEVELOPING THE RURAL AREAS FIRST. THEREFORE, MISSION SEES A PROJECT FOR INTEGRATED PROGRAMMING FOR THE RURAL LANDLESS POOR AS BEING MORE IN THE AGENCY'S INTEREST AT THIS TIME.

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10/10/75

## Project Identification Document (PID)

### Ultra Low Cost Shelter for Refugees

#### I. Summary of the Problem, and Proposed Response:

Adequate shelter at a minimal cost is an urgent problem in all developing countries. In addition to low-cost housing, there is often an urgent need for an approach to a "no-cost" house or shelter when political upheavals, natural disasters, war, slum clearance decisions, etc. cause masses of people to move in a nearly destitute condition from traditional sites to new areas. They have no employment and few belongings. They remain from months to years as displaced persons. Tents, or other commonly used disaster-relief oriented solutions cost foreign currency, do not match cultural patterns, do not provide jobs, and (as intended) have a limited life.

A very cheap but adequate solution should use local materials, self-help construction by uneducated, unskilled laborers, be technically sound, adequate and acceptable for a family, be quickly built, and be ultra low-cost, such as \$50 to \$100 per family. Such shelter should be capable of disassembly so that the materials can be reused, and also be designed for upgrading in stages if conditions warrant that it becomes longer term housing than originally intended, and/or if families and assistance agencies can afford some improvements. The methodology of organizing local materials and labor on a large scale must be worked out, published and disseminated.

An interdisciplinary group of architects, engineers, planners and sociologists at Carnegie-Mellon University have developed a prototype ultra-low cost, "A"-frame modular housing system which appears to have great potentials as a universal, easily-erected, wind and flood resistant, extremely cheap structure, in response to the needs identified above. A "small research" study was funded by AID in FY 75 to test the feasibility of the C-MU approach in a specific LDC environment. The difficult site of Bangladesh was chosen and the feasibility test was completed. From all reports, the initial test was very successful, and several private refugee-assistance organizations, such as OXFAM, have already funded additional constructions for test and demonstration. The July, 1975 issue of WAR ON HUNGER, contains an article and photographs on pages 29-31 describing the field activity of the project. Also, the approach (methodology and models) was entered in a field of about 150 competitors in a UNESCO international contest in April, 1975, and won the top monetary prize (fellowships to the Soviet Union).

The "small research", feasibility study has shown that the Carnegie-Mellon University approach and methodology is practical and possible. In addition to further building, training, dissemination, monitoring and testing in Bangladesh, variations will be required for ~~different~~ climates, cultures and natural resource situations. It is

proposed that a full scale GTS project be funded to demonstrate the application of the CM-U approach in Africa and Latin America, to make and test adaptations as required, such as an approach to a dry environment, and to further expand and test the initial work in Bangladesh.

Note should be made that the target groups (refugees and other displaced persons) are the poorest of the poor majority, and this "self-help, indigenous materials" approach serves to provide them directly with a better quality of life than they would otherwise have. The approach is to prove to the refugee assistance organizations and the refugees themselves that native construction, engineered by architects and civil engineers is better, cheaper, and safer than what they would otherwise have, and to encourage replications by the hundreds and thousands.

## II. Financial Requirements and Plans:

The amount of \$70,000 is planned for extending and completing work in Bangladesh in the latter half of FY 76 and the Interim Quarter. This would primarily be used for travel and per diem costs, salaries, and materials for a further series of demonstration houses in varied environmental situations. In FY 77, \$150,000 is required to replicate the project in an African test site, and to continue monitoring performance and obtaining "feedback" from previous operations in Bangladesh. In FY 78, \$150,000 will continue the same application, demonstration and test activities in Latin America.

## III. Development of the Project

Following up on the "small research" feasibility study, this project will fully demonstrate the Carnegie-Mellon approach in Bangladesh by:

- 1) developing for comparison purposes a wide range of design variations required within the country and potentially usable in the region;
- 2) monitoring and testing the shelters over a two-year term to determine performance characteristics and longer-term acceptability;
- 3) disseminating the methodology, acceptability and performance of the model constructions to local governments and refugee assistance organizations to attract funding sources for full-scale, operational applications;
- 4) building and training a cadre of local people in the methodology in order to gain the "multiplier effect".

The present project is intended to build upon the initial work in Bangladesh, to determine whether refugee assistance organizations, the local government, and the refugees themselves will support the indigenous building of these improved ultra-low cost shelters, en masse.

Additionally, this project includes two years of similar work in the African and Latin American contexts, with particular attention to modifying the methodology to address a completely different mix of resources, climate, topography and cultures. A soil-based shelter in a dry area might prove practical for the Sahelian refugees for example. Attention will be given to any "spin-off" benefits which assist the development of more conventional low cost housing, that is, the next step up from the ultra-low cost refugee shelters.

As with the feasibility study, this project would be sponsored and managed by TA/UST, but with the close collaboration of the Housing Office and the Office of Foreign Disaster Relief and Coordination, who highly endorse the approach and project. The same team of CM-U Professors Charles Goodspeed and Volker Hartkopf, augmented by the experienced sub-contractor Fred Cuny of "Intertect" in Texas, would lead this larger effort, hopefully starting about January, 1976. Mr. Cuny is a consultant to the UN Commission on Refugees in Geneva, and has extensive contacts and experience with refugee assistance organizations worldwide.

#### IV. Issues of a Policy or Programmatic Nature.

None foreseen. The project is directly responsive to Congressional mandates, assists the poor majority directly, is modest in size, uses intermediate technology, works with and encourages PVO's (Private Voluntary Organizations), and has humanitarian assistance as a primary element.

#### V. Environmental Assessment:

This is an exploratory project which in itself will not have a significant environmental effect. When methodologies and materials requirements are better understood, and when operational programs are planned, it will be necessary to assess the environmental impact of the various feasible alternatives. This point will be addressed during the implementation of this project.

It should also be noted that the project activities are localized in refugee camps established by local governments and refugee assistance organizations. The environment within the camps will obviously be improved by the project activities, as the Carnegie-Mellon approach includes camp planning, organization and facilities, including sanitary engineering, as ancillary goals in addition to the objective of improvement of the shelters themselves. To some extent, the contractors may also be able to influence local authorities to take environmental aspects and environmental impacts more seriously into consideration when they establish new camps or relocate old ones.