PHYSICAL INFRASTRUCTURE

Final report on the consultancy provided for the Ministry of Health in the Evaluation of the impact of Hurricane Gilbert on the health sector in Jamaica.

April 10, 1989 to May 19, 1989.

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3. ANALYSIS OF FINDINGS

II) PHYSICAL INFRASTRUCTURE

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3. ANALYSIS OF FINDINGS

II. PHYSICAL INFRASTRUCTURE

To assess the impact of Hurricane Gilbert on the physical infrastructure of the health sector, seven hospitals and thirteen health centres in the parishes of Hanover, Kingston, Manchester, St. Catherine, St. James, St. Mary and St. Thomas were visited and a questionnaire administered in each to collect information about the extent and nature of the damage and the pre and post Gilbert condition of the buildings (questionnaire and reports of the visits Annexes P.I.-1, P.I.-2 and P.I.-3).

Interviews and meetings with officials at the Ministry of Health's headquarters and Parish Health Departments provided valuable information and contributed to focus this study. Also private firms of architects were consulted (see list of people met) to clarify the reasons for the utilization in Jamaica of different foreign building codes for the design of health facilities. In this case, the reason is that the legal building code for Jamaica dates from the beginning of this century and is inadequate.

THE NATURE OF THE DAMAGE

The principal damage inflicted by Hurricane Gilbert to the buildings was concentrated mainly in the roofs built with

aluminium or zinc sheets, that were blown away by the wind. And without protection from the rain the timber works for roofing, ceilings, electrical systems, elevators, interior finishes, equipment and furniture were damaged as well. To a minor extent damage was produced to windows without shutters.

Although difficult to estimate, further damage is being inflicted to the buildings by the slow pace of the repairs. The continued exposure to rain and sun is ruining many parts of the health facilities that survived the hurricane (site visits Annexes P.I.-2 and P.I.-3).

But in two of those seven hospitals the problems were due to faulty construction procedures and poor supervision.

At Princess Margaret Hospital the roof collapsed because the steel bars from the columns had no continuity within the top ring beams and also because the steel bars of those beams were so close to each other that the concrete was not evenly poured into its interior. This condition produced a very weak structure where the load of the roof and the effect of the wind generated the bigger structural effort.

The reconstruction of this hospital is currently under way and to make it earthquake proof, the works include the construction

of new structural elements of reinforced concrete from the foundations to the new roof. This criteria deserves strong commendation.

In Cornwall Regional Hospital the external partitions were blown away because they had not been properly anchored to the walls and slabs. Their size increased the effect of the inbuilt defects and prevented a quicker rehabilitation.

In these hospitals there were no casualties because the patients had been evacuated.

The nature of the problems previously described reveal the consequences of inadequate design and poor or nonexistent supervision at critical stages of the works.

The design and construction fields have techniques and procedures that if carried out properly enable the production of safe buildings in almost any climatic condition.

Serious deficiencies were found in the repair work carried out in both hospitals. At Princess Margaret Hospital the screws that fix the sheets of the roof of the Children's Ward had been placed in the "valleys" of the sheets and not in the "crest" where they should be. In the long term this procedure leads to the appearance of multiple leaking points.

In Cornwall Regional Hospital it was detected that the new wooden frames of the big external partitions, already in position in the 9th floor, had been fixed only in the lower part and neither to the walls nor to the slab. In other floors some partitions had similar problems. This situation that could lead to a new collapse was made evident to the Acting Chief Engineer HFMU-MOH who is based in the hospital.

The problems found in these two hospitals were communicated to Mr. Harty, Head of the Health Facilities Maintenance Unit - MOH and liaison officer with UDC in a meeting held May 2, 1989.

But in almost all the other places visited the strong wind had blown away shingles and sheets, particularly light aluminium sheets (Spanish Town Hospital, KPH, Mandeville Hospital) and in some cases whole sections of the roofs (Port Maria Hospital, Noel Holmes Hospital, Cave Valley Health Centre).

It was noted that the failures were concentrated in those buildings constructed with materials that require a significant degree of preventive maintenance to remain safe, such as aluminium and zinc sheets. Before Gilbert many roofs were already leaking and probably many sheets were loose. The sun and wind produce extensions and vibrations that slowly affect the fixing points. Either nails or screws become loose or the

holes bigger and the roof is no longer an adequate protection. Zinc sheets are also subject to corrosion which means that they should not be used in an area exposed to sea wind and/or spray.

THE PRINCIPAL DEFICIENCIES

Apart from the damage produced by Hurricane Gilbert to the physical structure of the buildings, there were serious deficiencies in areas such as:

Communications

- Radio systems could not work because they operated with electricity from the public service.

- Telephones were out of order for several weeks because of fallen posts and severed wires.

This situation prevented the organization of the emergency procedures and increased the stress on the staff.

Electricity

From the seven hospitals visited, three did not have standby power generators (Port Maria, Mandeville, Lucea). Spanish Town Hospital had one but it was out of order and only three had generators in working order (Cornwall, Kingston, St. Thomas).

The lack of electricity interrupted the cold chain that preserves drugs and also made it impossible to perform safe emergency surgical procedures.

Water Supply

As a consequence of the lack of electricity, water was not available and in many cases had to be provided by the Fire Brigade with water trucks.

Apart from this situation, it was evident that it is necessary to reinforce controls on the quality of the water.

THE UNEXPECTED OUTCOME

An unexpected outcome for old hospitals will be a complete replacement of their more damaged parts, which in many cases were already in a poor condition.

The reconstruction works include an unavoidable degree of new materials for roofs, ceilings, electricity, and even floors, as well as the improvement of some areas of the wards, particularly bathrooms. This was evident in KPH, Lucea, Port Maria, St. Thomas. It will be appreciated that some of the institutions damaged will be in better shape once the repairs are done.

THE SLOW PACE OF THE REPAIRS

From the information provided by UDC in the Disaster Rehabilitation Activity Summary Report as of April 25, 1989, the repairs have been completed only in University Hospital, May Pen Hospital and Annotto Bay Hospital. That is to say only 12% of the 25 hospitals listed in the report.

As shown in Tables I and II, the repair work has not been completed in any of the seven hospitals visited. Their operational condition has not been fully recovered (with the exception of Mandeville which did not suffer severe damage). The work is being carried out by UDC in five of those hospitals and that agency will also be responsible for Spanish Town which has only had emergency repairs. Mandeville Hospital will be repaired by the Health Facilities Maintenance Unit - MOH.

According to observations made while visiting the hospitals it has been estimated that Princess Margaret Hospital will take no less than a further five months to be ready, Cornwall Regional Hospital three, Port Maria three (doctor's quarters), KPH two, Noel Holmes Hospital six (work has not started yet in the Administration Building, which is partially without roof, and Laundry which is totally without roof and in the Maternity Ward where hydraulic insulation is required).

In Spanish Town Hospital and in Mandeville Hospital the lack of final repairs is not affecting the operation of the facilities but is an unnecessary inconvenience so many months after Hurricane Gilbert.

Repairs had not started in four of the thirteen health centres visited (Spanish Town and Linstead - St. Catherine, Oracabessa - St. Mary, Cave Valley - Hanover)

According to the information provided in the Status Report for Rehabilitation of Health Centres - MOH dated April 13, 1989 (Annex P.I.-5), from the 196 health centres damaged by Hurricane Gilbert repair work had been completed only in 40 of them; 39 owned by the Government and 1 rented. That is to say 20.4% of the total number.

Work was in progress in 31 health centres (15.8% of the total), 27 belonging to the Government, 2 with ownership undeclared and 2 rented.

This information revealed that in 125 health centres work had not started yet. From that number 59 belong to the Government, 12 are with ownership not declared and 54 are rented. They represent 63.8% of the total number (Table III).

TABLE III

STATUS OF REPAIRS IN HEALTH CENTRES AS AT 13 APRIL 1989

Health centres	Not Started	%	In Progress	%	Complete	%	TOTAL	%
Government Owned	59	30.1%	27	13.8%	39	19.9%	125	63.8%
Rented	54	27.6%	2	1.0%	1	0.5%	57	29.1%
Ownership unspecified	12	6.1%	2	1.0%	0	0.0%	14	7.1%
TOTAL	125	63.8%	31	15.8%	40	20.4%	196	100.0%

All the previous information shows that the works required for the rehabilitation of the hospitals and health centres is going ahead very slowly and that it is urgent to speed up the process. With the hurricane season approaching, the degree of unpreparedness of the physical infrastructure is a cause for serious concern.

ESTIMATED COST OF THE DAMAGE

In April 1989 a conference was held in Kingston, Jamaica, involving the United Nations Development Programme/Office of Disaster Preparedness (ODP)/Caribbean Natural Disaster Preparedness. In the initial session the coordinator for disaster preparedness of the Jamaican Ministry of Health,

Dr. Marion DuCasse, disclosed that damage produced by Hurricane Gilbert to the hospitals was J$66.8 Million, and to the health centres J$9 Million. This makes a total amount of J$75.8 Million.

The magnitude of that figure and the extended period of time that it will take to have all the health facilities fully operational again stresses the importance of adopting methodologies for the design and construction of buildings-able to withstand predicted seismic and wind forces. (The estimated cost of the rehabilitation of the hospitals, prepared by UDC, and of the health centres, prepared by the Ministry of Construction, have been included as Annex P.I.-4 and P.I.-5).

MAINTENANCE

Very few of the buildings visited had a condition better than fair prior to Hurricane Gilbert and that condition increased the damage suffered and the time required for their rehabilitation.

Parish Health Departments and Hospitals have a reduced cadre of artisans and it is difficult for them to carry out proper procedures. In addition, due to budgetary and staff shortages the activity developed by the HFMU-MOH is very reduced.

Currently, a study financed by a USAID grant is taking place and it is expected that the outcome will provide solutions to this problem through the development of a new maintenance system.

Nevertheless decentralization of maintenance and minor repairs was the common aspiration of all the health officials interviewed during this mission in every Parish and hospital. All of them were prepared to be held accountable for carrying out the required procedures if provided with adequate manpower, resources and authority.

THE MISSING LINK

While carrying out this mission, information about health facilities had to be searched for in different areas of the Ministry of Health. There is not a single body responsible for coordinating the activities of planning, design, construction and maintenance of all the facilities that represent a major asset and a significant component in several projects.

An improvement of the coordination of all capital expenditures as well as the development of planning criteria for future projects is required.

THE VULNERABILITY OF THE HEALTH FACILITIES

Projects with large capital components are currently being prepared for the restoration and construction of hospitals and health centres. It is necessary to emphasize that only buildings that will be hurricane and earthquake resistant should be included.

A study of the vulnerability of existing buildings, describing their potential weaknesses, is not available and any degree of preparedness will be uncertain until such a study has been conducted.

If the cost of improving the safety of old buildings becomes too expensive in relation to their actual value their inclusion in those plans should be reconsidered.

Organization of a relief team of experienced architects and engineers that could be "on call" to help manage emergency repairs of the health facilities and help prepare contingency plans could be considered.

TABLE I

PHYSICAL INFRASTRUCTURE - SUMMARY (Questions 1 -9, 11, 13, 18, 19)

PARISH/Health Centre	Construct Date	Independ Structur	CONSTRUCTION MATERIALS: Walls	Roof	Windows	CONSTRUCTION RESISTANT TO: Hurricane	Earthquake	Heavy Rain	Condition before Gilbert	Standby Generator	Operational after Gilbert	Parts Most Affected	Repairs Completed	Repairs Start Date	Estimated Cost of Repairs*	Used as Temporary Shelter	Regularly Maintained
KINGSTON & ST. ANDREW																	
Comprehensive V	1986	Steel	ConcBlock	Zinc	Glass	Yes	Uncertain	Yes	Good	Not Oper	Wholly	Roofs/Ceiling	Completed	Nov'88	Not Avail	Yes?	Yes
Glen Vincent III	1960	ReinfConc	ConcBlock	Slab	Glass	Yes	Uncertain	Yes	Good	No	Wholly	Windows	Completed	Feb'89	$132,115 +	No	No
Olympic Way III																	
ST. THOMAS																	
Isaac Barrant IV	1966	ReinfConc	ConcBlock	Slab	Glass	Yes	Uncertain	Yes	Fair	Not Oper	Partly	Roof/Windows	Partly	Nov'88	Not Avail	Yes	No
Port Morant II	1974	-	ConcBlock	Zinc/ Shingle	WoodLouvres	No	Uncertain	Yes	Fair	No	Partly	Roofs	Partly	Mar'89	$99,323 +	No	No
ST. MARY																	
Port Maria III																	
Oracabessa II	c1920	-	Bricks	Zinc	Glass	No	Uncertain	Yes	Bad	No	Partly	Roof	-	-	$5,210	No	No
ST. JAMES																	
Catherine Hall III																	
Mount Salem II	1983	-	ConcBlock	Alumin	AlumLouvres	No	Uncertain	Yes	Fair	No	CLOSED	Roof	Completed		$40,833 +	No	Yes
HANOVER																	
Lucea IV		-	ConcBlock	Alumin	AlumLouvres	No	Uncertain	Yes	Fair	No	CLOSED	Roof	Partly		$23,000 +	No	No
Green Island III	1951	-	ConcBlock	Zinc	GlassLouvre	No	Uncertain	Yes	Bad	No	Partly	Roof	Partly	Mar'89	$93,398	No	No
Cave Valley II	1982	-	ConcBlock	Alumin	AlumLouvres	No	Uncertain	Yes	Good	No	Partly	Roof	-	-	$25,042	Yes	No
MANCHESTER																	
Cross Keys III	1960	-	ConcBlock	Zinc	Gl/WdLouvre	Uncertain	Uncertain	Yes	Fair	No	Wholly	Wood Wall	Completed	Feb'89	Not Avail	No	No
Lincoln II	1960	-	ConcBlock	Zinc	Glass	Uncertain	Uncertain	Yes	Good	No	Wholly	-	-	-	Not Avail	No	No
ST. CATHERINE																	
Spanish Town IV	1988	-	ConcBlock	Zinc	Glass&Louvr	No	Uncertain	Yes	Very Good	No	Partly	Roofs	-	-	$28,316	Yes?	No
Linstead III	1979	ReinfConc	ConcBlock	Slab	Glass	Yes	Uncertain	No	Fair	No	Partly	Ceilings	-	-	$6,032	No	No

* Estimated by Ministry of Construction

+ Contract sum

TABLE II

PHYSICAL INFRASTRUCTURE - SUMMARY (Questions 1 -9, 11, 13, 18, 19)

HOSPITAL	Construct Date	Independ. Structure	CONSTRUCTION MATERIALS			CONSTRUCTION RESISTANT TO:		Heavy Rain	Condition before Gilbert	Standby Generator	Operational after Gilbert	Parts Most Affected	Repairs Completed	Repairs Start Date	Estimated Cost of Repairs *	Used as Temporary Shelter	Regularly Maintained
			Walls	Roof	Windows	Hurricane	Earthquake										
TYPE "A"																	
Kingston Public	1800/1979	ReinfConc	Brick	Alumin/ Shingles	Glass	Yes	Uncertain	Yes	Fair	Yes	Partly	Windows/Roofs/ Ceilings	Partly	Nov'88	$771,401	Yes	No
Cornwall Regional	1974	ReinfConc	ConcBlock	Slab	Glass/ AlumLouvres	Yes	Yes	Yes	Fair	Yes	Partly	External Parts/ Ceilings	Partly	Mar'89	$1,747,073	Yes	Yes
TYPE "B"																	
Spanish Town	1952	ReinfConc	ConcBlock	Slab/ Zinc/Alum	Glass/ Louvres	Yes	Uncertain	Yes	Fair	NotOper	Partly	Roofs	Partly	Oct'88	$647,708	No	No
Mandeville	1877/1987	ReinfConc	ConcBlock	Alumin	Glass	Yes	Uncertain	Yes	Fair	No	Partly	Roofs	Temporary	-	NotAvailable	No	No
TYPE "C"																	
Princess Margaret	1955	ReinfConc	ConcBlock	Sheets	Glass	No	Uncertain	Yes	Fair	Yes	Partly	Roofs	Partly	Feb'89	$2,736,937	Yes	No
Port Maria	1914/1967	Wood/ ReinfConc	Wood/ ConcBlock	Sheets/ Slab	Alum&Wood Louvres	Yes	Uncertain	Yes	Fair	No	Partly	Roofs/Ceilings	Partly	Feb'89	$924,951	Yes	No
Noel Holmes (Lucea)	1700/1971	ReinfConc (part)	Brick/ ConcBlock	Sheets/ Slab	Glass&Alum/ WoodLouvres	No	Uncertain	Yes	Bad/Fair	No	Partly	Roofs/Ceilings	Partly	Feb'89	$138,857	No	No

* Estimated by Urban Development Corporation

4. CONCLUSIONS

PHYSICAL INFRASTRUCTURE

The following conclusions and recommendations (points 2 to 9) are the basis for the development of a Pilot Plan to achieve for health facilities a level of disaster preparedness that will improve the capability of the system before another major disaster strikes.

They have been organized in the form of priorities or objectives with their related methods of achievement and proposed sources of funding.

They represent an attempt to address the major shortcomings shown by Hurricane Gilbert and the emphasis has been put in the development of practical strategies for the prevention of failures that can paralyse the health care system.

TABLE H

PHYSICAL INFRASTRUCTURE

PRIORITIES	METHODS	RESOURCES
1. To speed up the reconstruction of all the health facilities damaged by Hurricane Gilbert to recover full operational condition before the hurricane season and to prevent further deterioration of buildings and equipment.	The Minister of Health should approach the Minister of Construction and the General Manager of the UDC to impress upon them the urgency of this request. As the layout of the buildings allows different works to take place simultaneously, there are no technical impediments to achieve this target.	IADB is the source of funding for this project.
2. To have a skilled technical team "on call" that could come to the country immediately after a disaster strikes to organize emergency repairs of the damage suffered by health facilities to recover their operational conditions.	PREVENTIVE ACTIVITIES: - to prepare different contingency plans in coordination with the MOH, Office of Disaster Preparedness, the Disaster Preparedness Committee of MOH and PAHO. - to allocate responsibilities to its members and the local staff - to prepare manuals of procedures - to establish a safe communications system, linked with the Ministry of Health - to develop short-term training activities once a year (before the hurricane season) together with the local staff that will be their counterpart. POST-DISASTER ACTIVITIES: - to evaluate the damage suffered by the buildings - to organize initial repairs to recover or preserve operational conditions - to advise on the safety of buildings. - to assist the MOH in the development of the projects for final repairs.	The proposed funding sources for this work are: - Pan American Health Organization (PAHO) - League of Red Cross Societies (LRCS) - UN Disaster Relief Office (UNDRO) - Pan Caribbean Disaster Prevention and Preparedness Project (PCDPPP)

TABLE H

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PRIORITIES	METHODS	RESOURCES
3. To enable every Hospital, Parish Health Department and Health Centre types III, IV and V to remain operational after a disaster Hospitals must retain the capability for the operation of critical areas such as maternity wards, operating theatres, x-ray, casualty, laboratory, pharmacy, neonatalogy, intensive care.	In every facility it will be necessary to install: * Standby electric power generators calculated to allow the performance of emergency surgical procedures and the operation of selected pieces of equipment for diagnosis and treatment of critically ill patients. * Battery operated radio system linking Parish Health Departments, hospitals, emergency vehicles. * Water storage tanks with pumps connected to the power generator, providing at least three days supply of water. * Underground telephone lines to link the hospitals with the Police, Fire Brigade, Parish Health Department, Parish Disaster Committee. A consultant should be recruited to prepare the specifications for the equipment, taking into account: a) Compatibility with existing elements and systems. b) Wherever possible, to choose one manufacturer for type of element to reduce and simplify maintenance requirements. c) Prepare manuals of procedures for maintenance/testing of the equipment. d) Prepare lists of basic spare parts.	The technical assistance could be provided by PAHO. The equipment could be obtained from donors. This possibility has to be explored by the Ministry of Health.

TABLE H

PHYSICAL INFRASTRUCTURE

PRIORITIES	METHODS	RESOURCES
4. To form Disaster Units in every hospital and Parish Health Department for post-disaster emergency repairs, involving community participation.	This Unit has to be organized on a voluntary basis with members of service institutions. They should be entitled to wear honorary badges to make them distinguishable and as a signal of appreciation from the community. This unit must be equipped with adequate tools and have selected materials stored, such as plastic covers for roofs, lumber, electrical wires, pipes and any other element that the members of the Unit believe relevant for the building's safety. All the members should be equipped with battery operated radios and should meet at least every month for a full day of discussions and training, including simulation of the consequences of different disasters to plan their response. The head of the Unit should be a civil engineer or a qualified technician and it is very important to include among the members a master mason and a master carpenter or qualified artisans, plus an electrician and a plumber with sound expertise.	Service institutions such as Rotary, Lions, Kiwanis, should be approached by the Minister of Health to encourage the acceptance of this approach and gather their support to buy tools, equipment and materials. Launching this project could become a very important event with publicity in newspapers and T.V. This could also be an excellent opportunity to create a public awareness of the importance of disaster preparedness. The Pan Caribbean Disaster Prevention Project (PCDPP) could be asked to organize training seminars and activities, providing the services of a Prevention Advisor and bibliography.
5. To decentralize maintenance, minor repairs and emergency repairs of hospitals and health to prevent further deterioration of the facilities.	Parish Health Departments and Hospital Boards must be given authority and resources to carry out maintenance and repairs, either providing materials or spare parts to their staff artisans or hiring local contractors. Health Administrators and Hospital Administrators should be held accountable if the repairs are not effected with enough speed to prevent further damages. A technical auditing system should be established in the Health Facilities Maintenance Unit - MOH, to assess the works.	The source of funding must be the annual budget of the Ministry of Health. The provision of funds should be requested according to estimates provided by the Health Facilities Maintenance Unit in consultation with the Hospital Administrators and Parish Health Administrators.

TABLE H

PHYSICAL INFRASTRUCTURE

PRIORITIES	METHODS	RESOURCES
6. To determine the degree of vulnerability of hospitals and health centres to the effects of hurricanes, earthquakes and other natural disasters. To undertake corrective measures to improve the safety of the buildings to minimise the potential disaster cost.	A team of experienced professionals in health facilities planning, design and construction must be assembled: architect/planner, structural engineers, bio-medical and plant engineers, and supporting technical and clerical staff. This team must conduct initially a survey of all the hospitals and health centres, types III, IV and V. This work must be expanded to all the health buildings of the country in subsequent stages. In every building this study must: a) Identify parts that represent a hazard as well as consider the location in relation with floods, vicinity to industries, etc. b) Determine the works to be done. c) Estimate the amount required to carry out the above discussed works to make the buildings safe and hurricane and earthquake resistant. This team will also be required: - to assist MOH in the selection of qualified firms of architects, engineers and quantity surveyors for the preparation of the tender documents; - to monitor those documents while being prepared; - to approve them before tender.	The proposed funding sources for this work are: - Pan American Health Organization (PAHO) - League of Red Cross Societies (LRCS) - UN Disaster Relief Office (UNDRO) - Pan Caribbean Disaster Prevention and Preparedness Project (PCDPPP)

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PRIORITIES	METHODS	RESOURCES
7. The Ministry of Health must set the example in its own building programs by producing hurricane and earthquake resistant buildings.	As there is not an updated building code for Jamaica that legally replaces the old document from the beginning of the Century, everything is left to the proficiency of the professional team engaged. To improve that situation, the following procedures are suggested: a) The MOH must require that every new facility is designed to fulfill the provisions to prevent the hazards from natural disasters that are described in several building codes, for example: * Building Code of the National Research Council of Canada, * South Florida Building Code, * California Building Code b) Every architectural or engineering firm selected by the MOH must present a statement explaining which building codes have been applied to develop their work: * This will facilitate evaluation procedures in case of damage by hurricanes or earthquakes.	The Permanent Secretaries-MOH/ Construction should approach the authorities of the Jamaican Institute of Architects and the Jamaican Institute of Engineers to inform them of this procedure. An exchange of ideas about the future application of. the Caribbean Uniform Building Code (CUBIC) is encouraged.
8. To prevent the practice of poor construction techniques and avoid potential risks to life and property.	The Ministry of Health must require from every architectural or engineering firm that is hired, the adequate and continuous supervision of construction. This work has to be carried out by full time engineers and clerks of works to ensure that the plans and specifications are followed. Supervisors must have the authority to issue stop orders in the event that the contractors are not complying with the specifications laid down. The architectural and/or engineering firms must present every month a comprehensive report on the progress of the works to the Project Manager (MOH).	The fee for supervision will have to be paid by the MOH.

TABLE H

PHYSICAL INFRASTRUCTURE

PRIORITIES	METHODS	RESOURCES
9. To organize, coordinate and monitor all the activities related with health facilities planning, design and construction carried out by or for the Ministry of Health either with its own funds or with the participation of foreign funding agencies or donors.	To ensure inclusion of Health Facilities Planning, Design and Construction in the improvement of planning capability in MOH to make provisions for planning and monitoring of all capital expenditures. A Health Facilities Architect/Planner should be appointed as the executive officer for the Ministry's Facilities Planning and Monitoring Committee. He will be part of that Committee and will also participate in the Ministry's Disaster Preparedness Committee. This Architect/Planner will coordinate with the different Project Managers on planning, tender and construction of health facilities. The Health Facilities Maintenance Unit, whatever its final organization, should coordinate with Health Facilities Planning for: a) the development of plans for maintenance and refurbishment of the health facilities b) the post-disaster emergency work and final repair work. Health Facilities Planning will develop planning criteria for future projects and advise on the development of new health facilities or the upgrading of existing ones.	Technical assistance could be provided to: a) Develop in detail the role and activities of the MOH Planning and Evaluation Unit to include Health Facilities Planning. b) Prepare the terms of reference for the positions to be filled. c) Assist in starting the activities of Health Facilities Planning by providing the services of consultants to work together with local counterparts to refine targets and procedures.

ANNEX P.I.- 1

QUESTIONNAIRE

HEALTH FACILITIES

1. Type and name of Facility

2. Location

3. Age of Construction

4. Materials employed for the construction of:

   - Structure

   - Walls

   - Roof

   - Windows

5. Is there an incorporated capacity by design and construction to mitigate the effects of:

- Hurricanes Yes_____ No_____

- Earthquakes Yes_____ No_____

- Heavy Rains Yes_____ No_____

6. Status of the building prior to Hurricane Gilbert.

Very Good____ Good____ Fair____ Bad____

7. Was there a standby generator installed?

Yes_____ No_____

If yes, was it in working condition? Yes_____ No_____

8. What was the operational condition of the building immediately after Hurricane Gilbert?

Completely operational_____ Partially Operational_____

Closed down_____

9. Which parts of the building were most affected, and to what extent?

- Structure

- Walls

- Roofs

- Ceilings

- Windows

- Others, Please explain

10. Which areas of the building could no longer operate due to the damages and for how long.

11. Has the building been repaired?

Provisionally_____ Partly_____. Completely_____

12. To which office did the damages have to be reported, and what were the procedures required? Please explain.

13. How long did it take from the hurricane until start of final repair work?

14. By whom is/was the work carried out?

15. Who is/was responsible for deciding the nature of the repair work to be done?

16. Who is/was responsible for supervising the reparations.

17. Are there reparation works taking place at present?

Yes _____ No _____

If yes, when are they due to be completed.

18. What is/was the cost of the repairs.

19. Did the building act as a disaster shelter?

Yes_____ No_____

20. Have procedures been developed to establish what precautions must be taken to improve the safety of the building in case of a hurricane?

Yes_____ No_____

21. Are there formal procedures to link the activities of the HC/Hospital with other centres in case of a hurricane?

a) Other health facilities

b) Local authorities

c) Central Government.

22. What are the building shortcomings made evident by Hurricane Gilbert?

23. Had the building been regularly maintained?

ANNEX P.I.-2

SITE VISITS

HOSPITALS

PRINCESS MARGARET HOSPITAL

ST. THOMAS

Site visit made April 13, 1989.

This building was completed in 1955 and has had no major repairs since completion. The personnel interviewed considered that prior to hurricane Gilbert the general status of the hospital was fair.

The major damages produced by the hurricane were the total collapse of the roof of the medical wards and zinc sheets blown away from all other roofs, plus the related consequences in terms of damage to windows, ceilings, the electricity system, elevators, interior finishes and equipment. Also the solar heat collecting panels were severely damaged.

The hospital had a standby power generator and a water reservoir.

Two weeks after the hurricane a temporary plastic cover was placed on the roofs of the Casualty Department and the Administrative Block and was still there, but in poor condition when the facility was visited.

The Repairs

According to the information provided by Marton the final repair work started the first week of February 1989.

UDC is responsible for all the repairs and the work is being carried out by several contractors. Works were almost completed in the Children's Ward but the rest of the buildings will take no less than a further five months to be ready.

Reasons for the Failures

The roof of the main building collapsed because there was a major defect in the construction of the reinforced concrete structure that supported the roof. The steel bars of the columns had no continuity within the ring beam that carried the bigger structural effort.

This also indicates the possibility of poor supervision at the critical stage when the steel bars are inspected prior to pouring the concrete in the molds.

To make this building earthquake proof, the repair work includes the construction of new structural elements in reinforced concrete, from the foundations to the new roof. This criteria deserves strong commendation because it was of no use to do an important investment to make the building safe from hurricanes while ignoring the possible consequences of earthquakes.

A different problem is that of the sheets blown away from the other roofs. In this case the reason for the failure is mainly poor maintenance. The sheets suffer permanent exposure to the sun and the wind. This produces extensions and vibrations that slowly affect the fixing points. Either nails or screws become loose or the holes bigger, the effect is that the sheets provide inadequate protection.

To remain safe, this kind of roof requires to be periodically inspected and maintained, replacing all the faulty pieces.

Problems found in the Repair Work

The screws of the new roof of the children's ward have been placed in the "valleys" of the sheets and not in the crest where they should be. On the long term, this procedure leads to multiple leaking points. This finding was communicated to Mr. Harty, who is acting as the liaison officer from MOH with UDC.

Cost of the Rehabilitation

J$2,736,937.00 (UDC estimates, Annex P.I.-4).