THE IMPACT OF HURRICANE HUGO ON THE DELIVERY OF HEALTH CARE

ARCHITECTURAL PERSPECTIVE

PAPER TO BE PRESENTED BY T.M. OGRODNIK, M.ARCH., OAA, MRAIC, ARIBA., AT THE UCLA INTERNATIONAL CONFERENCE ON THE IMPACT OF NATURAL DISASTERS - AGENDA FOR THE FUTURE. JULY 10 - 12, 1991, LOS ANGELES, CALIFORNIA, USA.

INTRODUCTION

EVERY YEAR TROPICAL CYCLONES DEVELOP WITHIN THE SIX MAIN TROPICAL REGIONS OF THE EARTH. THE NORTH ATLANTIC, WEST OF THE AFRICAN COAST IS ONE OF THOSE REGIONS. THIS IS, ALSO, WHERE CARIBBEAN ISLANDS ARE LOCATED.

THE 1989 HURRICANE NAMED HUGO, WAS BORNE OUT OF A TROPICAL DEPRESSION ON MONDAY, SEPTEMBER 11, APPROX. 2200 MILES EAST OF BARBADOS-ITS WINDS WERE CLOCKED AT A RELATIVELY BRISK 35 MPH.. AS THE SYSTEM MOVED WEST, IT GAINED IN STRENGTH, QUICKLY REACHING STORM AND THEN HURRICANE CLASSIFICATION (75 MPH WIND VELOCITY) ON WEDNESDAY, SEPTEMBER 13. ON FRIDAY, SEPTEMBER 15, THE WIND SPEED REACHED 150 MPH AND THE LOWEST BAROMETRIC PRESSURE OF 918 MB. WAS RECORDED.

THIS VICIOUS WEATHER SYSTEM, MOST POWERFUL IN THE PAST DECADE, AFTER PASSING NORTH OF DOMINICA AND BATTERING GUADALOUPE, SKIRTED SOUTH OF ANTIGUA, AND EARLY SUNDAY MORNING SMASHED INTO MONTSERRAT, AND AT NOON INTO ST. KITTS - NEVIS. MONDAY, SEPTEMBER

.../2

18, HUGO HIT VIRGIN ISLANDS, AND DELIVERED A GLANCING BLOW TO THE EASTERN TIP OF PUERTO RICO; IT THEN PROCEEDED IN THE NORTH - EASTERLY DIRECTION, TO WREAK HAVOC ON THE MAINLAND USA, MAKING CHARLESTON AREA ITS MAIN TARGET EARLY FRIDAY, SEPTEMBER 22.

HUGO'S PASSAGE, THE SIXTH HURRICANE OF THE 1989 ATLANTIC SEASON, CAUSED SERIOUS DAMAGE TO SUCH EASTERN CARIBBEAN LEEWARD ISLANDS, AS : GUADALOUPE, MONTSERRAT, TORTOLA, DOMINICA, ANTIGUA-BARBUDA, ANGUILLA, ST.KITTS-NEVIS, AND THE NETHERLANDS ANTILLES ISLANDS.

FOLLOWING HUGO'S PASSAGE, PAN AMERICAN HEALTH ORGANIZATION REQUESTED HEALTH AND WELFARE CANADA, INTERGOVERNMENTAL AND INTERNATIONAL AFFAIRS BRANCH TO CARRY OUT HEALTH FACILITIES DAMAGE ASSESSMENT IN MONTSERRAT, ST. KITTS AND DOMINICA.

ON BEHALF OF MY DEPARTMENT, I UNDERTOOK THIS ASSIGNMENT.

DAMAGE ASSESSMENT

FIRST, I VISITED **MONTSERRAT**, BRITISH CROWN COLONY, POPULATION OF 12,000. OUT OF THE THREE ISLANDS ON MY AGENDA, THIS ONE SUFFERED THE MOST DAMAGE. THE DEVASTATION WAS CLEARLY VISIBLE ON THE LANDING APPROACH. THE ISLAND LOOKED BLACK WITH MOST OF THE FOLIAGE AND VEGETATION STRIPED - I THOUGHT AT THE TIME : THIS IS COULD HAVE BEEN CAUSED BY A NUCLEAR EXPLOSION.

.../3

EARLY REPORTS INDICATED THAT UP TO 80% OF ALL PROPERTY ON THE ISLANDS HAD BEEN DESTROYED AND THE REMAINING 20% HAD BEEN DAMAGED. CONSIDERING THE SEVERITY OF THE HURRICANE AND ITS DURATION (ABOUT 12 HOURS OVER MONTSERRAT) IT HAD ONLY BEEN DUE TO THE EARLY WARNING (ABOUT FOUR DAYS) OF THE STORM'S APPROACH AND THE TIME OF THE DAY (EARLY SUNDAY MORNING), THAT THE CASUALTIES HAD BEEN RELATIVELY LOW. 10 DEATHS AND SOME INJURIES HAD BEEN ATTRIBUTED TO HUGO'S ONSLAUGHT.

AN ESTIMATED 11,000 PEOPLE HAD BEEN LEFT HOMELESS, ELECTRICITY AND TELEPHONE COMMUNICATION HAD BEEN COMPLETELY CUT, WATER SUPPLY, PARTICULARLY TO THE RURAL AREAS HAD BEEN DISRUPTED. FISHING AND AGRICULTURE INDUSTRIES HAD SUFFERED SERIOUS DAMAGE.

AMONGST PUBLIC BUILDINGS WHICH HAD BEEN SEVERELY DAMAGED WAS GLENDON GENERAL HOSPITAL IN PLYMOUTH, AND MOST OF THE COMMUNITY HEALTH CENTRES LOCATED AROUND THE ISLAND.

THE 100 BED, 10 YEAR OLD GLENDON HOSPITAL IS RECTANGULAR IN PLAN, 144 FT. BY 192 FT. AND IT HAS A 6 FT. OVERHANG ALL AROUND. THE BUILDING IS ON A SLOPING SITE AND IS THEREFORE PARTLY TWO-STOREY AND PARTLY ONE STOREY. THE REINFORCED CONCRETE "GROUND FLOOR" CONSISTS IN ONE PART OF SUSPENDED BEAM-AND-SLAB CONSTRUCTION AND IN THE OTHER PART OF SLAB ON GRADE.

.../4

THE FLAT ROOF IS CONSTRUCTED OF 7" STEEL PURLINS SPANNING 16', IN MOST AREAS, ONTO A SUPPORTING SYSTEM OF STEEL OPEN WEB JOISTS. THE JOISTS SYSTEM CANTILEVERS THE 6 FT. OF OVERHANG AND THERE ARE TEXTURED PLYWOOD FASCIA PANELS ALL AROUND THE BUILDING.

THE ROOF STRUCTURE IS COVERED WITH 22 G. ALUMINUM SHEETING. THIS LIGHTWEIGHT ROOF EXTENDS OVER ALL BUT AN AREA IN THE CENTRE, WHICH CONTAINS SURGICAL SUITE AND X-RAY DEPARTMENT, AND TWO OPEN COURTYARDS. THE SURGICAL SUITE AND THE X-RAY DEPARTMENT HAVE REINFORCED CONCRETE ROOF.
THE LIGHT WEIGHT ROOF HAD SUSTAINED MAJOR DAMAGE. MOST OF ITS ALUMINUM SHEETING, AS WELL AS ABOUT 30% OF THE PLYWOOD FASCIA PANELS AND ABOUT 25% OF CEILING HAD BEEN TORN OFF, WHICH IN TURN, CAUSED FLOODING OF THE INTERIOR, MAKING A NUMBER OF DEPARTMENTS INOPERABLE.

DETAILED EXAMINATION OF ROOF DAMAGE REVEALED THAT IT HAD BEEN THE **FIXING BOLTS** OF THE ROOF SHEETING TO THE OPEN WEB STEEL JOISTS THAT FAILED, WITH **CORROSION OF METAL RIVETS** CONTRIBUTING TO THE LOSS OF THE FASCIA PANELS. THE DOORS AND THE WINDOWS, HOWEVER, HAD BEEN LEFT ALMOST INTACT.

IT SHOULD BE NOTED THAT THE FLAT, REINFORCED CONCRETE ROOF OVER THE SURGICAL SUITE AND X-RAY HAD NOT SUFFERED ANY DAMAGE.

.../5

IT IS ALSO WORTH NOTING, THAT THE PITCHED, CONCRETE TILED, HIPPED ROOF OF THE OLD FOLKS HOME, LOCATED AT NORTH END OF THE HOSPITAL, HAD SURVIVED WITH LITTLE DAMAGE. THIS WAS VERY FORTUNATE, SINCE MOST OF THE HOSPITAL PATIENTS HAD BEEN EVACUATED TO THAT BUILDING.

AFTER THE INITIAL CLEAN UP OF THE DEBRIS, AND RESTORATION OF POWER SUPPLY, SOME PARTS OF THE HOSPITAL WERE MADE FUNCTIONAL, PARTICULARLY THE EMERGENCY AND THE OUTPATIENT DEPARTMENT. THE SURGICAL SUITE HOWEVER, ALTHOUGH IT WAS NOT DAMAGED, IT COULD ONLY BE USED FOR EMERGENCY SURGERY BECAUSE OF THE DAMAGE SUFFERED BY THE INPATIENT AREAS AND SOME SUPPORTING SERVICES.

FLOODING OF THE AREAS, WHICH LOST THEIR CEILINGS, OR THOSE WHERE REPAIRS WERE ONLY TEMPORARY, CONTINUED TO BE A PROBLEM, EVEN FOUR WEEKS AFTER THE HURRICANE HAD STRUCK. FOR EXAMPLE, THE KITCHEN ALTHOUGH LOCATED UNDER THE GROUND FLOOR HAD SERIOUS LEAKS, SO HAD ADMINISTRATION AND OUTPATIENT DEPARTMENTS.

VINYL TILE FLOORING, USED EXTENSIVELY IN THIS HOSPITAL, HAD BEEN DAMAGED BEYOND REPAIR IN THE FLOODED AREAS.

FOLLOWING MY TOUR OF GLENDON HOSPITAL AND ITS GROUNDS I WAS SHOWN A SAMPLE OF THE ISLAND'S COMMUNITY HEALTH CENTRES.

.../6

THE SIX CENTRES I VISITED, SUFFERED EXTENSIVE DAMAGE TO THEIR ROOFS, CEILINGS AND OTHER INTERIOR FINISHES AS WELL AS FURNISHINGS, MAKING THESE FACILITIES VIRTUALLY INOPERATIVE.

ALL COMMUNITY HEALTH CENTRES HAD LOST ELECTRICAL POWER SUPPLY, WITH ONE EXCEPTION : THE PLYMOUTH CENTRE WHICH IS LOCATED ON GLENDON HOSPITAL GROUNDS. THE LOSS OF ELECTRICITY HAD PROVED TO BE ESPECIALLY SERIOUS SINCE ALL PERISHABLE MEDICAL AND DRUG SUPPLIES HAD BEEN LOST AND COULD NOT BE RESUPPLIED UNTIL POWER COULD BE RESTORED. ALSO, WITHOUT REFRIGERATION NO BLOOD, URINE OR ANY OTHER SAMPLES COULD BE TAKEN OR PROCESSED IN HEALTH CENTRES.

BUT EVEN DURING MY VISIT, FOUR WEEKS AFTER THE STORM, ELECTRICAL POWER WAS STILL UNAVAILABLE TO MUCH OF THE ISLAND, DESPITE THE "BLISTERING"* PACE OF RESTORATION OF POWER LINES BY THE U.K., "YORKSHIRE ELECTRICITY INTERNATIONAL" TEAM OF ENGINEERS.

AT THE CLOSE OF MY VISIT TO MONTSERRAT, I MET WITH DIRECTOR OF PUBLIC WORKS, RESPONSIBLE FOR CONSTRUCTION AND MAINTENANCE OF THE ISLANDS HEALTH FACILITIES. AMONGST OTHER ITEMS, WE DISCUSSED THE NEED FOR PROPER BUILDING MAINTENANCE, ASSURING STRICT ADHERENCE TO THE CARIBBEAN UNIFORM BUILDING CODE, THE NEED FOR HEALTH FACILITY PLANNING GUIDELINES, AS WELL AS THE NEED FOR SETTING UP OF AN INVENTORY OF EXISTING HEALTH FACILITY LAYOUTS.

.../7

* As reported in "The Hugo News" October 20, 1991

THE SECOND ISLAND ON MY TOUR WAS ST. KITTS (JOINT POPULATION OF ST. KITTS - NEVIS IS 45,000). THIS ISLAND HAD NOT SUFFERED TO THE SAME EXTENT AS HAD MONTSERRAT BUT SUGAR CROP, A PRIME SOURCE OF FOREIGN EXCHANGE, WAS DEVASTATED. FORTUNATELY, ONLY 5% OF HOUSES HAD BEEN DESTROYED, AND ONLY 5% OF ISLANDS POWER POLES HAD BEEN DOWNED. TWO DEATHS HAD BEEN ATTRIBUTED TO HUGO IN ST. KITTS - NEVIS AREA.

HEALTH CARE FACILITIES, HOWEVER, HAD NOT FARED AT ALL TOO WELL. EARLY REPORTS INDICATED THAT THE MEDICAL SYSTEM HAD BEEN OVERBURDENED.

JOSEPH N. FRAN HOSPITAL, 20 YEAR OLD, 172 BED, PRINCIPAL HOSPITAL OF ST. KITTS, HAD SUFFERED SEVERE DAMAGE AND HAD BEEN PARTIALLY EVACUATED. ITS ROOF HAD BEEN BLOWN OFF AND FLOODING HAD MADE MANY WARDS UNUSABLE, EVEN UP TO THE TIME OF MY VISIT.

THE MATERNITY, PEDIATRICS, SURGERY AND PATHOLOGY WARDS, AS WELL AS THE NURSING QUARTERS, CLASSROOMS, SURGICAL SUITE, AND X - RAY DEPARTMENT HAD BEEN RENDERED INOPERABLE.

ALL COVERED WALKWAYS, JOINING HOSPITAL WARDS, HAD LOST THEIR ROOFS, MAKING PATIENT, HOSPITAL STAFF AS WELL AS EQUIPMENT AND SUPPLIES CIRCULATION BETWEEN THE WARDS DIFFICULT IN THE RAIN.

.../8

FORTUNATELY ELECTRICAL POWER, AS WELL AS WATER SUPPLY WAS RESTORED SOON AFTER THE STORM HAD BLOWN OVER.

AT THE TIME OF MY VISIT, REPAIRS TO THE ROOF OVER THE NURSES CLASSROOMS WERE BEING CARRIED OUT, BUT THE CONDITION OF THE ROOF WOOD STRUCTURE GENERALLY, WAS VERY POOR. IN PLACES VEGETATION HAS TAKEN ROOT, FURTHER DETERIORATING ROOF STRUCTURE.

JOSEPH N. FRAN HOSPITAL, CONSISTS OF WIDELY DISPERSED WARDS, CONNECTED BY WALKWAYS AND ATTRACTIVELY LANDSCAPED COURTYARDS.

THIS TYPE OF LAYOUT HAS MANY ADVANTAGES IN APPROPRIATE CLIMATIC AND SITTING CONDITIONS. IN MY OPINION, EVEN IF THE STRUCTURE WERE "HURRICANE - PROOF", ITS ACTUAL SITTING IN BASSETERRA AND ITS LAYOUT CREATED ADDITIONAL PROBLEMS, WHICH ALTHOUGH NOT ATTRIBUTABLE TO THE HURRICANE, ARE NEVERTHELESS WORTH NOTING.

THE HOSPITAL IS LOCATED ON A SITE, JUST BELOW THE HILLS, AND IS THUS PRONE TO FLOODING AT ANY TIME IN HEAVY RAIN. IT IS ALSO SITUATED DIRECTLY UNDER THE APPROACH TO THE AIRPORT AND IS SUBJECT TO THE AIRCRAFT NOISE. ADDITIONALLY, THERE IS THE QUESTION OF SAFETY.

.../9

YET ANOTHER CONCERN WAS REVEALED - THE ONE HAVING TO DO WITH THE COMBINATION OF THE WIDELY DISPERSED, PAVILION TYPE HOSPITAL LAYOUT AND ITS REMOTE AND ISOLATED LOCATION. THIS ADDITIONAL CONCERN RELATES TO THE SAFETY OF THE HOSPITAL STAFF AND PATIENTS ALIKE. THE HOSPITAL GROUNDS ARE UNPROTECTED , ALLOWING INTRUDERS AN EASY ACCESS TO SOME PARTS OF THE HOSPITAL.

HAVING COMPLETED MY BRIEF DAMAGE ASSESSMENT OF THE HOSPITAL, I THEN VISITED SIX OF THE ELEVEN EXISTING COMMUNITY HEALTH CARE CENTRES.

ALL CENTRES VISITED SUSTAINED VARIOUS DEGREE OF DAMAGE TO THEIR ROOFS AND INTERIORS BUT HAVE UNDERGONE SOME REPAIRS. HOWEVER, RAINWATER LEAKAGE PERSISTED, MAKING FUNCTIONING OF THE CENTRES DIFFICULT.

ONE COMMON PROBLEM WHICH ALL ST KITT'S COMMUNITY HEALTH CARE CENTERS HAVE HAD, AND I WOULD PRESUME STILL HAVE, WAS **TERMITE INFESTATION**. TERMITES NUTRITION CONSISTS OF CELLULOSE OBTAINED FROM WOOD
AND WOOD PRODUCTS. THEREFORE, BUILDING ELEMENTS WHICH ARE CONSTRUCTED OF WOOD ARE CONSUMED BY THIS INSECT. HUMID AND HOT CLIMATES ARE IDEAL LIVING CONDITIONS FOR TERMITES, BUT THEY CAN BE FOUND EVEN IN CANADA.

.../10

TERMITES CONSUME THE INSIDE OF WOOD STRUCTURAL ELEMENTS MAKING THE STRUCTURE PRONE TO FAILURE IN STORMS AS WELL AS IN EARTHQUAKES. IN FACT THERE ARE CLAIMS THAT TERMITES DO MORE DAMAGE TO BUILDINGS THAN FIRES, HURRICANES AND EARTHQUAKES COMBINED. IT IS, THEREFORE, A GOOD IDEA NOT TO USE UNTREATED CONSTRUCTION TIMBER IN THE AREAS WHERE TERMITE INFESTATION IS LIKELY.

DOMINICA (POPULATION 77,900) WAS THE LAST ISLAND WHICH I TOURED. IT SUFFERED EXTENSIVE FLOODING, AND LANDSLIDES SEVERELY DAMAGED COASTAL ROADS AND THE ISLAND'S SEAWALL. WATER SUPPLY WAS DISRUPTED AND TELEPHONE COMMUNICATION WAS COMPLETELY CUT OFF.

PRINCESS MARGARET HOSPITAL IS LOCATED IN THE CAPITAL CITY OF ROSEAU. NEITHER THE CITY NOR THE HOSPITAL SUFFERED ANY DAMAGE FROM HUGO, ALTHOUGH SCARS FROM HURRICANE DAVID ARE STILL VISIBLE. IT APPEARS THAT LESSONS LEARNED FROM DAVID HAD BEEN LEARNED WELL AS IS EVIDENCED, BY THE JUST COMPLETED, LOUIS PASTEUR POLYCLINIC.

THIS HEALTH FACILITY HAS BEEN DESIGNED TO WITHSTAND NOT ONLY HURRICANE WINDS, BUT ALSO SEISMIC FORCES.

AFTER THE MORNING TOUR OF SOME PARTS OF THE HOSPITAL AND THE POLYCLINIC I WAS SHOWN FOUR (OUT OF THE TOTAL OF SOME FIFTY) COMMUNITY HEALTH CLINICS.

.../11

THE MASSACRE HEALTH CLINIC IS A NEW BUILDING, AND SIMILARLY TO THE POLYCLINIC, IT, MAY SERVE AS AN EXAMPLE OF AN APPROPRIATE CONSTRUCTION FOR THIS TYPE OF A FACILITY IN THE HURRICANE ZONE. THIS SMALL BUILDING, CONSTRUCTED OF REINFORCED CONCRETE AND CONCRETE BLOCK, CONTAINS IN ADDITION TO THE CLINIC FUNCTIONAL SPACES : NURSE'S RESIDENCE. THE FACILITY IS ACCESSIBLE TO THE HANDICAPPED, HOWEVER, AT THE TIME OF MY VISIT, THE ACCESS FROM THE MAIN ROAD TO THE CLINIC WAS UNMANAGEABLE FOR VEHICULAR TRAFFIC BECAUSE OF THE POOR CONDITION OF THE ACCESS ROAD.

AN EXAMPLE OF WHAT THE ARCHITECT MUST CONSIDER, AMONGST MANY OTHER THINGS, WHEN DESIGNING FOR AREAS WITH SPECIFIC CLIMATIC PROBLEMS IS THE LOCATION OF ENTRANCES. MOST SUCH ENTRANCES CONSIST OF AN OPEN METAL OR CONCRETE GRILL TO ALLOW COOLING BREEZES TO ENTER PATIENT WAITING AREAS.

IN CAMPBELL HEALTH CLINIC, LOCATED HIGH IN THE JUNGLE, THE ENTRANCE WAS POSITIONED TOWARDS THE DIRECTION FROM WHICH PREVAILING WINDS AND RAINS COME, MAKING THE PATIENT WAITING AREA UNUSABLE IN RAINY,

WINDY WEATHER. ALSO, JUDGING BY THE CONDITION OF THE IRON WORK, PERHAPS SOME OTHER MATERIAL, NOT REQUIRING A LOT OF MAINTENANCE, COULD HAVE STOOD UP BETTER TO THE WEATHER.

.../12

MAJOR FINDINGS

- HEALTH CARE DELIVERY SYSTEM, BOTH AT THE PRIMARY (COMMUNITY) LEVEL AND ACUTE CARE LEVEL PROVIDED IN GENERAL HOSPITALS, WAS SEVERELY DISRUPTED DUE TO THE FAILURE OF CRUCIAL BUILDING ELEMENTS, PARTICULARLY ROOF STRUCTURES.
- PAVILION TYPE LAYOUT, WITH WIDELY DISPERSED WARDS, MADE HEALTH STAFF AND PATIENT CIRCULATION DIFFICULT IN RAINY AND WINDY CONDITIONS - COVERED WALKWAYS HAVING LOST THEIR ROOFS.
- THE CHOICE OF CLADDING; FLOOR, WALL AND CEILING FINISHES HAD A SIGNIFICANT ROLE IN MAKING THE HEALTH CARE FACILITIES INOPERABLE.
- EASE OF CARRYING OUT EMERGENCY, AS WELL AS ROUTINE MEDICAL PROCEDURES AND SUPPORTING FUNCTIONS, IN SOME COMMUNITY HEALTH CENTRES, WAS MADE DIFFICULT (AND IF NOT CORRECTED STILL IS) BECAUSE OF INADEQUATE ROOM SIZES AND DYSFUNCTIONAL LAYOUTS (SEE RECOMMENDATIONS: NEED FOR "SPACE PROGRAMMING METHODOLOGY").

- LACK OF POWER SUPPLY HAD ESPECIALLY ADVERSE EFFECT ON THE DELIVERY OF PRIMARY (COMMUNITY) HEALTH CARE.

- ACCESSIBILITY TO THE COMMUNITY HEALTH CARE CENTRES AND HOSPITALS WAS HAMPERED BY BLOCKED , FLOODED AND DAMAGED ROADS, AND CUT TELEPHONE COMMUNICATION.

.../13

RECOMMENDATIONS

TO THE ARCHITECT:

1 - WHEN DESIGNING A NEW HEALTH CARE FACILITY STUDY THE PROPOSED SITE, PARTICULARLY WITH RESPECT TO THE PROBABILITY OF FLOODING; DIRECTION OF PREVAILING WINDS; ACCESSIBILITY TO THE FACILITY UNDER SUCH CONDITIONS AS A HURRICANE MAY PRODUCE; SITE SECURITY (REMOTENESS); CLOSENESS OF AIRPORTS.

2 - OBTAIN INFORMATION ON HURRICANE AND SEISMIC FORCES AND DESIGN CONSTRUCTION OF ALL STRUCTURAL ELEMENTS ACCORDINGLY. PAY PARTICULAR ATTENTION TO THE ROOF SHAPE AND DESIGN.

3 - ADHERE STRICTLY TO THE CARIBBEAN UNIFORM BUILDING CODE

4 - SPECIFY FINISHES AND MATERIALS REQUIRING MINIMUM MAINTENANCE, THAT ARE RESISTANT TO INSECT INFESTATION, WILL TOLERATE HIGH HUMIDITY, AND WILL WITHSTAND HIGH WIND VELOCITIES.

TO THE "APPROPRIATE AUTHORITIES":

1 - AUTHORITIES RESPONSIBLE FOR DESIGN AND CONSTRUCTION SHOULD CREATE A DETAILED INVENTORY OF ALL HEALTH FACILITIES IN THEIR AREA. THIS WOULD BE VERY USEFUL, NOT ONLY WHEN PLANNING NEW HEALTH SERVICES AND FACILITIES, BUT WOULD BE A TREMENDOUS ASSET IN DISASTER PREPAREDNESS PLANNING AS WELL AS IN EVALUATING DAMAGE AFTER DISASTER STRIKES.

.../14

2 - DEVELOP A DETAILED **METHODOLOGY FOR CONDUCTING DAMAGE ASSESSMENT.** HEALTH PERSONNEL IN CHARGE OF HOSPITAL WARDS AS WELL AS HEALTH CARE CENTRES SHOULD BE FAMILIAR WITH SUCH A METHODOLOGY; SO WHEN DAMAGE ASSESSMENT IS CONDUCTED BOTH THE ASSESSOR AND THE PERSON GIVING THE INFORMATION ON THE DAMAGE WOULD ABLE TO COMMUNICATE BETTER AND PRODUCE MORE PRECISE EVALUATIONS IN SHORTER TIME.

3 - SINCE POORLY MAINTAINED STRUCTURES ARE VULNERABLE TO DESTRUCTION BY WIND OR SEISMIC FORCES, AUTHORITIES RESPONSIBLE FOR CONSTRUCTION SHOULD ESTABLISH A **BUILDING MAINTENANCE SCHEDULE,** AND MAINTENANCE WORK SHOULD BE CARRIED OUT RIGOROUSLY.

4 - TO ASSURE THAT THE BEST POSSIBLE CONSTRUCTION DETAILS ARE INCORPORATED INTO WORKING DRAWINGS AND INTO HEALTH FACILITY BUILDINGS **"GRAPHIC STANDARDS"** SHOULD BE DEVELOPED FOR THE USE IN THE CARIBBEAN. THESE GUIDELINES COULD BE BASED ON THE BEST EXISTING CONSTRUCTION DETAILS, SELECTED BY A PEER REVIEW.

5 - TO ASSURE THAT ADEQUATE FLOOR AREA IS ALLOCATED TO THE SPECIFIC ACTIVITY OR FUNCTION, AND TO ASSURE THAT PROPER ADJACENCY RELATIONSHIPS BETWEEN ACTIVITY AND FUNCTION SPACES ARE MAINTAINED WITHIN A HOSPITAL OR A HEALTH CENTRE, **"HEALTH FACILITY SPACE PROGRAMMING METHODOLOGY"** SHOULD BE ESTABLISHED,

.../15

AND USED.

(CANADA HAS DEVELOPED, AND IS CURRENTLY USING SUCH A METHODOLOGY.)

FINALLY , I WOULD LIKE TO OUTLINE PRIORITY NEEDS OF THE POPULATION RECOVERING FROM A DISASTER:

- PROVISION OF SHELTER

  (TENTS, BLANKETS, CLOTHING, ROOFING MATERIAL, HAND OPERATED POWER TOOLS, AXES, SHOVELS ETC.)

- PROVISION OF NOURISHMENT

  (FOOD SUPPLIES, BOTTLED WATER)

- PROVISION OF AND ACCESS TO EMERGENCY HEALTH CARE

  (MEDICAL SUPPLIES, ESTABLISHING MEDEVAC SYSTEM)

- RESTORATION OF BASIC UTILITIES

  (SANITATION, WATER PURIFICATION, ELECTRICAL POWER,

  PEST AND INSECT CONTROL SUBSTANCES AND EQUIPMENT)

- RESTORATION OF COMMUNICATIONS

  (PORTABLE SATELLITE TELEPHONE UNITS, HAND-HELD RADIOS)

AS THE VARIOUS EARTH'S POPULATIONS SUFFER MORE NATURAL CATASTROPHES, DISASTER DATA BANKS GROW LARGER AND LISTS OF PRIORITY NEEDS GET LONGER AND BECOME MORE DETAILED.

.../16

REGRETTABLY, THERE IS ANOTHER SOURCE OF DISASTER INFORMATION WHICH MAKES OUR DISASTER DATA BANKS STILL LARGER. THIS EXTRA, BUT PROBABLY AVOIDABLE SOURCE, IS THE **UNNATURAL MAN-MADE DISASTERS.**

NHW - IIA/PAHO MAY 16, 1991