PAN AMERICAN HEALTH ORGANIZATION

DIPECHO HOSPITAL PROJECT

RETROFITTING OF

1. CHEST WING BUILDING
2. THE LABORATORY

OF

VICTORIA HOSPITAL

CASTRIES, ST. LUCIA, WEST INDIES

COMPLETION REPORT

ROLAND THEOBALDS C. Eng.

CARIBBEAN CONSULTING ENGINEERS (ST. LUCIA)
P. O. BOX 407
CASTRIES, ST.LUCIA, WEST INDIES

Tel : 758-452-3013
Fax : 758-453-6479
E-mail : cce@candw.lc

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VICTORIA HOSPITAL RETROFITTING

CONTENTS

SECTION 1.0

THE INTRODUCTION

1.0 INTRODUCTION

Victoria Hospital is located in Castries, the capital of St.Lucia, overlooking and on the southern perimeter of Port Castries. The hospital comprises of a number of building structures of varying ages and of differing construction types and structural strengths. The buildings of the hospital were the subjects of condition surveys undertaken by Tony Gibbs of CEP in 1993 and 1996 and funded by the Pan American Health Organization (PAHO). The studies highlighted potential weaknesses in the structures and made recommendations for remedial action.

PAHO subsequently followed up the studies by commissioning a programme of improvement works at the hospital, which in addition to strengthening selected buildings, could also act as a demonstration of the retrofitting process for hospitals throughout the Caribbean.

PAHO accordingly retained Caribbean Consulting Engineers, in July 1999, to review the studies undertaken by Tony Gibbs, identify a structure or structures suitable for retrofitting within the confines of the established budget of US$150,000.00, propose a suitable retrofitting programme and project manage the refurbishment programme.

The programme commenced with comprehensive briefing sessions with Tony Gibbs followed by a detailed review of the earlier generated reports. Further visits to the site and extensive discussions with Augustin Compton, Project Officer, Ministry of Health (MOH) and Cosmos Andrew, Victoria Hospital Service Engineer helped to determine ongoing programmes at the facility and establish priorities for future work there.

A number of buildings/structures identified in the studies were eliminated from this retrofitting programme as the MOH indicated that these would have been subject to their own ongoing and future upgrading/reconstruction programmes. Three (3) buildings were finally shortlisted for possible improvement under the programme. These were :

- The Chest Wing Building
- The Laboratory
- The former Nurses Home

Preliminary works programme and cost estimates were generated for the remedial works to the three buildings and further discussions were held with the PAHO supervising consultant, Tony Gibbs, on the issue.

It was finally agreed that the Chest Wing Building because of actual and potential problems with its roofing and window systems would become the main focus of attention under the programme. It was also agreed that improvement work would be conducted on the Laboratory, whose glass window systems were regarded as offering inadequate resistance to rain storms.

The Nurses Home building was eliminated from the programme.

SECTION 2.0

THE PROJECT

2.0 THE PROJECT

2.1 Funding

The Pan American Health Organization (PAHO) through funding provided by DIPECHO made an allocation of US$150,000.00 available for the retrofitting and strengthening works programme. Additional funding was made available to cover the costs of consultancy and project management services.

2.2 Scope of Services

CCE was required by PAHO to undertake the following:

- Identify a structure or structures suitable for retrofitting under the defined programme.
- Prepare a scope of works for the improvement programme
- Prepare drawings and other pertinent details for the retrofitting
- Prepare specifications, conditions of contract and tender documents for the works
- Identify suitable contractors and conduct the tender process
- Review and evaluate bids received
- Provide recommendations for the award of a contract
- Monitor and supervise the construction programme
- Prepare interim and final payment certificates for the works
- Report regularly on the construction process
- Submit a completion report on the retrofitting exercise.

2.3 The Chest Wing Building

The Chest Wing Building is a two storied reinforced concrete and blockwork structure set on the eastern slope of the hospital compound, overlooking the city of Castries. The original construction comprised of corrugated asbestos roof sheeting with a hardboard ceiling underneath, aluminium louvre framed windows, timber doors and vinyl tiled floor.

The upper level (ground floor) houses a medical ward whilst the lower level is utilised for the storage of medical supplies. The main structural elements (i.e. main, roof and ring beams, columns and floor slabs) are of reinforced concrete. Timber purlins span the full length of the building and provide support for the asbestos sheeting which is affixed with screws. The building's partitions are all of timber construction save for those in the toilet/shower areas where construction is of concrete blockwork. The floors and walls of the toilets are finished with ceramic tiles.

Lighting is provided generally by fluorescent tube fittings in the wards and corridors and by incandescent fittings in other areas.

The Chest Wing Building was completed in 1975 and the combination of continuous use and minimal maintenance is readily apparent.

A thorough and detailed inspection of the Chest Wing was thus conducted to determine the need for repairs/upgrading consistent with PAHO's objectives, the preparation of a scope of works and associated cost estimates for undertaking the required work items.

2.4 The Laboratory

The Laboratory is housed in a multi-storied structure adjacent to the Emergency Services department at the southern (main) entrance to the hospital. Like the Chest Wing the Laboratory consists of reinforced concrete structural elements, with however a corrugated zinc roof sheeting. Large awning type glass windows are utilised for natural lighting and these units are the main causes of concern in that building.

The roof and ceiling of the Laboratory have been subject to an earlier retrofitting exercise undertaken by the MOH and accordingly were not included in this programme of works.

SECTION 3.0

INSPECTIONS OF BUILDINGS

3.0 INSPECTIONS OF BUILDINGS

3.1 Chest Wing

The most critical components in a building are the structural elements as these determine the extent of resistance to hazards such as high winds and earthquakes. Other important non-structural elements in a building include the roof, doors and window systems. The beams, columns and slabs of the Chest Wing were all inspected for possible tension, compression and shear cracking, evidence of deterioration of reinforcing steel, concrete spalling and other associated signs of potential structural failure. There was no evidence of distress in the structural elements and accordingly our attention was directed elsewhere.

The corrugated asbestos roof was inspected and evidence of deterioration of the sheeting was manifest. The sheeting was cracked in many areas and had been repaired by sealing the cracks with mastic tape. In other areas where sections of the asbestos sheeting had been broken off corrugated zinc sheeting had been inserted. The asbestos had also commenced deterioration, having been in place for over twenty years.

Asbestos has been utilised as roof sheeting in a number of residential and public buildings in St.Lucia and although the material is no longer used for such purposes and replacement undertaken it still widely exists. Asbestos is not a particularly strong material and is subject to fracture under load. During the passage of a hurricane wind borne objects are likely to fracture and shatter such roof systems thereby reducing the protection offered. In addition to its structural weakness, deteriorating asbestos releases particles into the atmosphere, which are extremely hazardous to the human respiratory organs.

The two factors outlined above on the weakness and hazards posed by the asbestos underlined the decision that the roof had to disposed of and replaced.

The aluminium louvre framed windows of the Chest Wing were also source of concern. The fixtures had generally lost their handles and the blades had become distorted with wear the end result being that the windows could never be fully shut. This inability to close the windows meant that protection offered against wind and driving rain was reduced.

Accordingly the window system was included in the retrofitting list.

The electrical lighting system had been installed at the time of construction in the mid 1970's. Fixtures were deteriorating and corrosion had set in. Our concerns were that this situation could result in an electrically induced fire. The upgrading of the wiring and fixtures was thus deemed a priority item.

There was evidence of termite attack on the wood elements of the building and thus we opted to undertake anti termite treatment of the structure and adjacent grounds in order to eliminate this hazard.

To complete and round off the retrofitting work we had to repaint the entire structure, inside and outside, as a consequence of the retrofitting. This also had the inevitable effect of enhancing its appearance.

3.2 The Laboratory

The Laboratory was in far better shape than the Chest Wing having been subject to several MOH refurbishment programmes. One critical item not addressed was the poor window system. Large awning windows at the upper and lower levels serve the laboratory. Opening/closing mechanisms of these windows have all failed resulting in windows remaining partially shut, thus offering poor resistance to driving rain and wind In addition because the Lab is a temperature controlled environment loss of cooling through these openings is continuous. The replacement of all awning windows at the upper level became a priority item.

In addition to windows replacement such other minor but useful work items such as providing "egg-crate" storage units for the placement of sample bottles to prevent loss during tremors were proposed.

SECTION 4.0

DESIGN, DRAWINGS & TENDER DOCUMENTS

4.0 DESIGNS, DRAWINGS & TENDER DOCUMENTS

We were unable to obtain drawings, particularly of the Chest Wing, hence base plans, roof layouts and elevations had to be created from measurements taken of the actual building. We chose to replace the aluminium windows of the Chest Wing with a similar type though of much more robust construction. The asbestos roof was replaced with 24 gauge Colour Clad a material widely used in St.Lucia and, when properly installed offers high resistance to wind forces and will not shatter under impact loading.

The drawings thus prepared were utilised to determine quantities required for the various work items. Cost estimates for the works were then derived from the bills of quantities generated.

Specifications were prepared reflecting the need for the structures to withstand hurricane force winds and driving rain amongst other naturally occurring phenomena.

Conditions of Contract were prepared in accordance with FIDIC (1987) 4th Edition with special modifications reflecting local conditions and concerns raided by PAHO.

A short list of contractors was generated with the agreement of the MOH and PAHO and finally three (3) firms were invited to bid on the works on the 25th November 1999. Two of the firms submitted priced proposals by the stipulated closing date of 14th December 1999 with the third declining to participate.

Bids were received from·

Charles & Jules Construction Ltd	EC$366,799.00
Renee's Construction Co. Ltd.	EC$430,690.00

I.F. Jeremie Construction Co. declined to bid.

An evaluation of tenders followed and led to a recommendation of award to Charles & Jules Construction at quoted price of EC$366,799.00 and this was agreed to by PAHO.

SECTION 5.0

CONSTRUCTION STAGE

5.0 CONSTRUCTION STAGE

5.1 Chest Wing

After a number of delays the contractor took possession and commenced work on site at the Chest Wing on 20th March 2000. The building was hoarded off and a "no-go" area within a 75ft. radius of the Chest Wing was created and this restriction remained for the duration of the asbestos removal process.

The first priority was the removal and disposal of asbestos roof sheeting. The removal process required that sheets be carefully removed off the roof, without fracturing, gently lowered to the ground level to avoid shattering, wrapping with polythene sheeting, then transported to the dump site for burial. The process adopted in the removal was designed to ensure the minimal generation of asbestos flakes and so to avoid the contamination of neighbouring and occupied hospital facilities. Contractor personnel involved in the handling and disposal of asbestos were required to be appropriately clad in overalls, with respiratory nose gear, gloves and headgear.

The removal task was completed within two days without any hitches, aided by perfect weather conditions. The ceiling was vacuumed to remove any asbestos particles that may have gathered there over the years or may have fallen there during sheeting removal. The ceiling was then dismantled, carefully lowered, wrapped in polythene and sent off to the dumpsite for burial.

The building was finally washed down with water to remove all/any traces of asbestos particles off the walls and floor.

The replacement roof is u-profiled, Colour Clad aluminium zinc sheeting. The material is of 24 gauge (0.6mm) thickness and is strong and durable enough to withstand hurricane force winds, when installed in the manner prescribed by the manufacturers, Caribbean Metals Ltd. The sheeting is pre-painted, white, to enhance durability and to blend in with other adjacent roofs. The sheeting was valley fixed utilising screws with 20mm washers to enhance strength. In addition fixing screws have been placed in the valleys along all the exposed roof edges of the building to provide extra resistance against uplift.

Electrical wiring and switches have been replaced and new fluorescent lighting fittings installed in the wards and corridor. Additional light fixtures have been placed at bed heads.

Aluminium louvre framed windows with extra rib strengthening have been installed throughout the building.

5.2 The Laboratory

Works in the Laboratory have been delayed as a result of the manufacturer Durex Ltd of Barbados not delivering the awning windows on schedule. Windows are being manufactured to a wind resistant specification utilising laminated glass fixed in the frame with structural silicone. The use of laminated glass provides the Laboratory with stronger and more impact resistant windows and thus enhancing building strength during periods of strong wind activity.

Windows are now due to be delivered in the third week of August with installation to follow shortly afterwards.

SECTION 6.0

ADDITIONAL WORKS

6.0 ADDITIONAL WORKS

The contractor's original scope of works was modified after the retrofitting exercise had commenced. The process of washing down the building following the removal of asbestos sheeting, highlighted the poor quality of the timber doors and affected the fixity of vinyl floor tiles in the Chest Wing.

PAHO was approached and agreed to the widening of the contractor's work activity, which was extended to include the replacement of vinyl floor tiles with ceramic tiles and the replacement of wall and floor tiles of the toilet/shower areas. The Ministry of Health, St.Lucia, was requested and agreed to undertake work items not financed by PAHO and undertook the replacement of timber doors, the replacement of cupboards and other fixtures.

The retrofitting works programme on the Chest Wing was completed on the 9th August 2000.

SECTION 7.0

PROGRAMME SETBACKS

7.0 PROGRAMME SETBACKS

The retrofitting exercise was not without its setbacks. The process of short listing contractors was drawn out when the Ministry of Health did not accept the original list and a revised listing re-submitted for approval.

The process of tendering the works, opening of tenders and reviewing the same, was also extensively and unnecessarily drawn out. The Government's Central Tenders board was mistakenly introduced into the process and withheld tender documents from the consultant until 28 January 2000 although the tender period expired on the 14th December 1999. This caused significant delays in the review process thus ultimately delaying the start-up of construction.

The relocation of patients and staff from the Chest Wing should have been completed by the 26th February 2000 to permit the handing over to the contractor on the 28th February 2000 however this process was also delayed and was not completed until the 19th March 2000.

The delays in delivering laminated glass windows have also resulted in a shifting of the Laboratory completion date.

All these above listed factors contributed to the delay in commencement and accordingly in the completion of the retrofitting works.

SECTION 8.0

CONCLUSION

8.0 CONCLUSION

The delays at commencement aside the most critical phases of the works were completed with minor hitches. Co-operation was received from the MOH and Victoria Hospital staff. This project has demonstrated that with proper forward planning and timely execution, hospital structures can be improved to enhance their resistance to natural hazards whilst at the same time extending their useful lives.

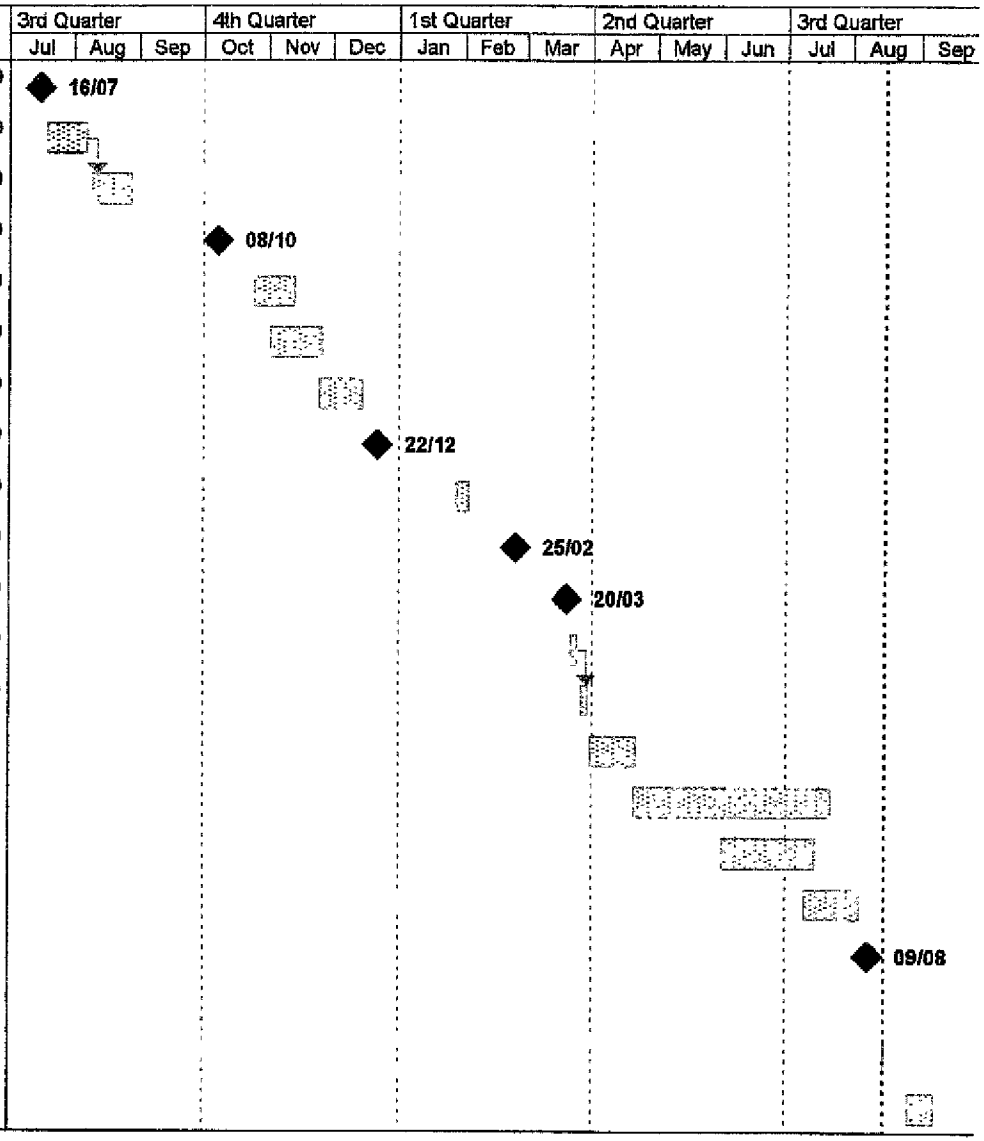
There have been disruptions to the hospital's systems as staff and patients have been temporarily relocated, roads blocked and the medical supplies storage facilities relocated off the compound to facilitate the works.

The net benefit however will result in substantially strengthened buildings, which have also been enhanced to improve users' comfort.

APPENDIX 1

THE TIMETABLE

ID	Task Name	Duration	Start	Finish
1	Consultancy award by PAHO	0 days	Fri 16/07/99	Fri 16/07/99
2	Inspections & meetings with MOH	3 wks	Mon 19/07/99	Fri 06/08/99
3	Preliminary Design	3 wks	Mon 09/08/99	Fri 27/08/99
4	Inception Report	0 days	Fri 08/10/99	Fri 08/10/99
5	Detailed Design & Tender Documents	3 wks	Mon 25/10/99	Fri 12/11/99
6	Shortlisting Contractors	18 days	Tue 02/11/99	Thu 25/11/99
7	Tender Period	14 days	Thu 25/11/99	Tue 14/12/99
8	Tender Opening	0 days	Wed 22/12/99	Wed 22/12/99
9	Tender Review	4 days	Fri 28/01/00	Wed 02/02/00
10	Tender Award	0 days	Fri 25/02/00	Fri 25/02/00
11	Contractor Take over Site	0 days	Mon 20/03/00	Mon 20/03/00
12	Asbestos Roof Removal	3 days	Wed 22/03/00	Fri 24/03/00
13	Ceiling Removal	3 days	Mon 27/03/00	Wed 29/03/00
14	Colour Clad Roof Install	16 days	Fri 31/03/00	Fri 21/04/00
15	Electrical Works	66 days	Fri 21/04/00	Fri 21/07/00
16	Windows Install	32 days	Thu 01/06/00	Fri 14/07/00
17	Tiling	20 days	Mon 10/07/00	Fri 04/08/00
18	Clean up	0 days	Wed 09/08/00	Wed 09/08/00
19				
20	Laboratory	1 day	Wed 16/08/00	Wed 16/08/00
21	Install Windows	2 wks	Mon 28/08/00	Fri 08/09/00



Project Victoria Hospital Retrofitting
Date: Wed 16/08/00

Task
Split
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Split
Rolled Up Milestone
Rolled Up Progress
External Tasks
Project Summary

APPENDIX 2

SUMMARY OF CONTRACT COSTS

APPENDIX 2

SUMMARY OF CONTRACT COSTS

1. General Items (Insurance, Bond etc.)		EC$67,120.00
2. Roof Replacement, Chest Wing Building		EC$100,501.04
3. Windows Replacement, Chest Wing Building		EC$39,063.00
4. Glass Windows Replacement, Laboratory		EC$44,426.08
5. Painting Works, Chest Wing Building		EC$39,513.00
6. Electrical Works, Chest Wing Building		EC$19,320.00
7. Tiling Works, Chest Wing		EC$51760.00
	Total	**EC$361,703.12**

APPENDIX 3

PRINCIPAL PERSONS ENGAGED ON THE PROGRAMME

APPENDIX 3

PRINCIPAL PERSONS

1.	Dr. Dana van Alphen –	Disaster Preparedness Adviser for the Caribbean Region – (PAHO)
2.	Mr. David Taylor -	Health Systems Adviser for the Eastern Caribbean (PAHO)
3.	Mr. Augustine Compton –	Project Liaison Officer for the Ministry of Health St. Lucia
4.	Mr. Tony Gibbs -	Supervising Consultant – CEP, Barbados
5.	Mr. Roland Theobalds -	Local Consultant, CCE, St.Lucia
6.	Mr. Stephen Charles -	Contractor, Charles & Jules Construction, St. Lucia

APPENDIX 4

PHOTOGRAPHS