A 'Smart' Approach to Building Back Better After Hurricane Irma

Adina Donovan Home

Road Town, Tortola, British Virgin Islands

GOVERNMENT OF THE VIRGIN ISLANDS
UKaid from the British people
Pan American Health Organization
World Health Organization Americas
Global Affairs Canada

Introduction

This document provides a case study of the efforts to build back better and smarter at the Adina Donovan Elderly Home in Tortola, British Virgin Islands.

Hurricane Irma impacted the islands on September 6th, 2017 and significantly damaged the facility. The hip roof was removed by the force of the storm and residents in the facility had to be moved to safe areas beneath the concrete roof sections of the structure. The roof's galvanize sheetings and ceiling boards were uplifted leaving a partial skeletal frame of damaged 2"x4" wooden rafters. No hurricane straps were present in the roof structure. This resulted in water damage, loss of electrical fixtures such as lights and fans; however, no medical equipment was damaged. As a result of the roof being damaged, the stairway and ramp areas were exposed to rainfall which left the ground floor vulnerable to flooding.

Photograph 1: Roof Damage from Hurricane Irma

Photograph 2: Damaged Roof Members

Photograph 3 Removed Sheeting

The concrete section of the roof sustained no damage; however, there was water settlement on the slab. Other elements of the facility sustained damage. Some louvered and interior glass louvered windows were damaged, along with one sash window. Hurricane shutters sustained minor damage at the hinges. Two metal doors (including the entrance) with framed glass transom covered by aluminum louvers sustained minor damage; the aluminum louvers were ejected during the storm. A double-swing, wooden door located on the patio also received minor damage. The double-swing metal laundry door was knocked out by high winds. In terms of the electrical system, exterior lighting fixtures were damaged, junction boxes had missing covers, switches and outlets were damaged by water, air conditioner disconnect switches were damaged and an air conditioner condenser was dislodged. The perimeter fence was also damaged as a result of the high winds.

Photograph 4 Damaged Louvered Window

Photograph 5 Damaged Window

Photograph 6 Dislodged Condenser

Photograph 7 Missing Electrical Covers

The facility is one of two (2) elderly homes in the Territory and is very important to the community and the elderly. As such, the repairs are needed to be addressed urgently. In addition, the government of the British Virgin Islands made a commitment early on in the recovery process to build back stronger, helping to ensure that impacts are minimized from similar storms in the future.

The renovations were implemented by the Pan American Health Organization (PAHO) with the financial support of the United Kingdom's Department of International Development (DFID) and the Canadian Government. All of the design and construction, inclusive of subcontracting, was done using local resources, with quality assurance checks from a PAHO Specialist based in the BVI to ensure that the Smart Standards were being applied. The project sought to incorporate the 'Smart' standards as advanced by PAHO in its Smart Health Care concept and is in keeping with the Government of the British Virgin Island pledge to use the opportunity presented by the recovery effort to make the Territory stronger, greener, smarter, more resilient and sustainable.

Background

The Adina Donovan home is located in Road Town, Tortola, the capital of the British Virgin Islands. It is adjacent to the referral health facility in the Territory, Peebles Hospital. It consists of a former residential structure that was converted to health care use which was added onto and expanded over the years. The front portion of the structure consists of one (1) storey, the central portion consists of two (2) storeys and the rear portion one (1) storey. A concrete ramp and stairs with rails provide access to the additions at the rear of the facility. A two (2) storey maintenance building is located at the rear of the site. The roof consists of concrete sections with parapet walls to the front and the rear with a hip roof in the middle section. The majority of the windows are louvered with roll-down hurricane shutters installed. The walls of the main structure and additions are of concrete/concrete blocks. A cistern is located beneath the rear addition.

The facility has 18 residents currently but can accommodate 24. The facility comprises of patient rooms on the lower and upper, rear level, handicapped-accessible bathroom facilities, kitchens on the lower and upper, storage areas, two (2) laundry areas, dining room, seating area, office/administrative areas, a reception area and porch where residents sit outside. Stairs and a ramp provide access to the facility.

The facility is fenced on the street side with a low concrete wall and low wooden picket fence. A high wall is located along the rear and roadside portion of the property and a chain linked fence is located along the front and northern side of the site.

Pre-Irma conditions

The roof of the facility sustained significant damage but it remained functional. Repairs were necessary as this is a critical facility in the Territory. The facility had a maximum capacity of 24 persons prior to the impact and remained operational throughout the event. The roof consists of concrete at the front and rear one-storey sections and a hip roof in the middle, 2-storey portion of the structure. The roof area that was damaged consisted of a low-pitched hip roof that was constructed of 2 by 4-inch rafters and nailed galvanize sheeting. The roof was not tied with hurricane straps to the rafters. Additionally, the roof was weakened by a termite infestation.

For hurricane protection the building had roll down hurricane and accordion shutters installed. Most of these remained intact during the storm. The structure is connected to the emergency generator located at the nearby Peebles Hospital. The building has its own cistern.

The government made a commitment in the last quarter of 2017 to be greener, smarter, more resilient and sustainable with recovery/rebuilding efforts. The health care sector was identified as a priority area for reconstruction. As one of two (2) elderly facilities in the Territory, it was important that the Adina Donovan Home be renovated in a timely manner and with the commitment of the government in mind.

Post Irma Changes

PAHO, DFID and the Canadian government stepped in to support the project early on in the recovery process and as the government of the Territory had made a commitment to make the recovery efforts more sustainable early on in the rebuilding process, the decision was made to apply the concepts in the Smart Hospital Toolkit to the elderly facility. This included efforts to strengthen the roof, install efficient lighting and air conditioning units to reduce energy use, install a photovoltaic system to offset some energy use and install low flow faucets and toilets to reduce water use.

The impact of the storm presented an opportunity to make the facility more efficient, not only in terms of energy and water use, but in flow, operating spaces, storage spaces and overall space utilization. Former storage spaces were converted into residential areas that accommodate 4 additional beds which increased the capacity of the facility to 28 residents. A new layout to the office area was provided which added for more working space for staff. Additional aims of the renovations included improved hygiene in the kitchen areas and additional counter space. The kitchen area on the ground floor was renovated to include a new stainless-steel sink, new cupboards and a relocated exhaust fan. The cupboards in the kitchen on the upper floor were also replaced. Improvements to indoor environmental quality were made with the addition of inverter-type split air conditioning units and LED light fixtures, efficient toilets and faucets, new furnishing, new appliances, and medical equipment and beds.

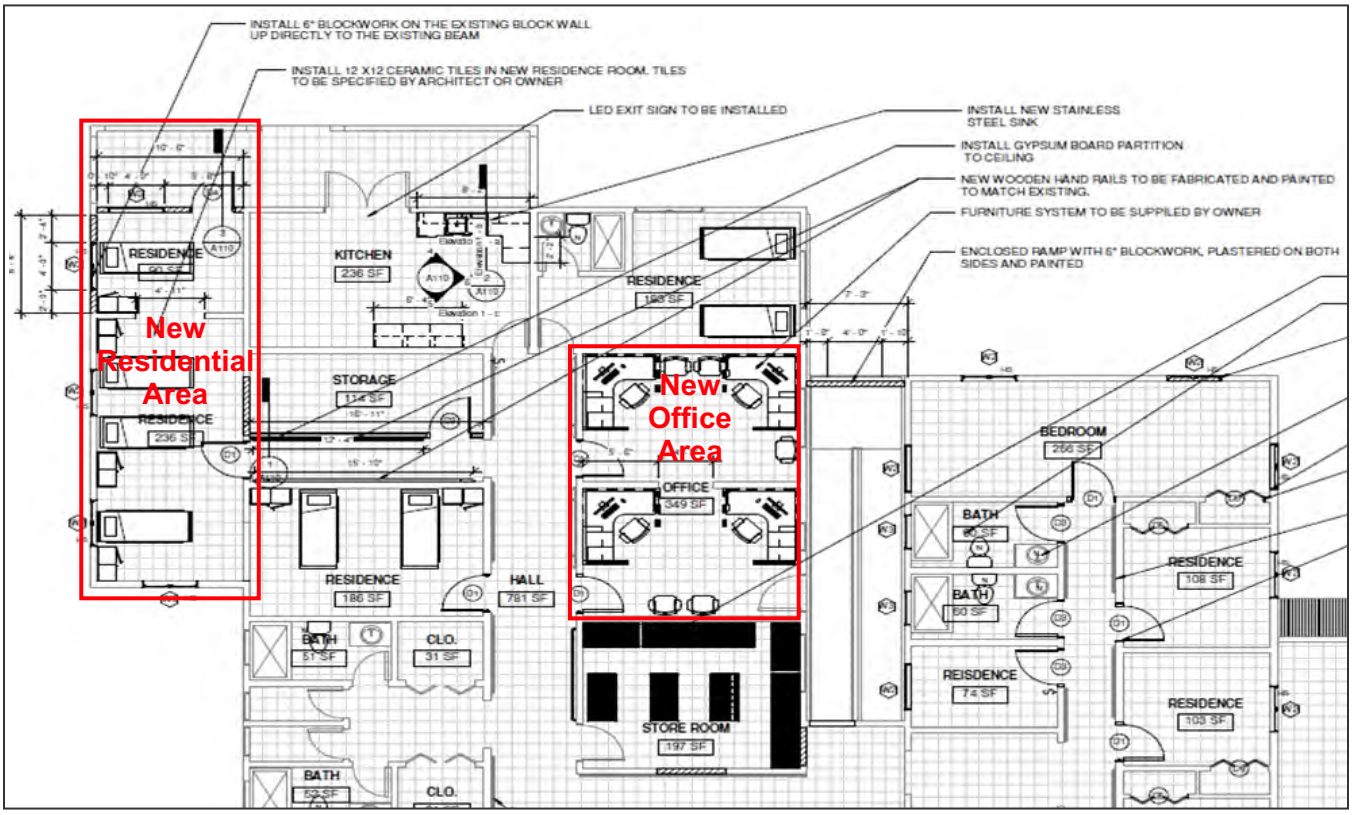
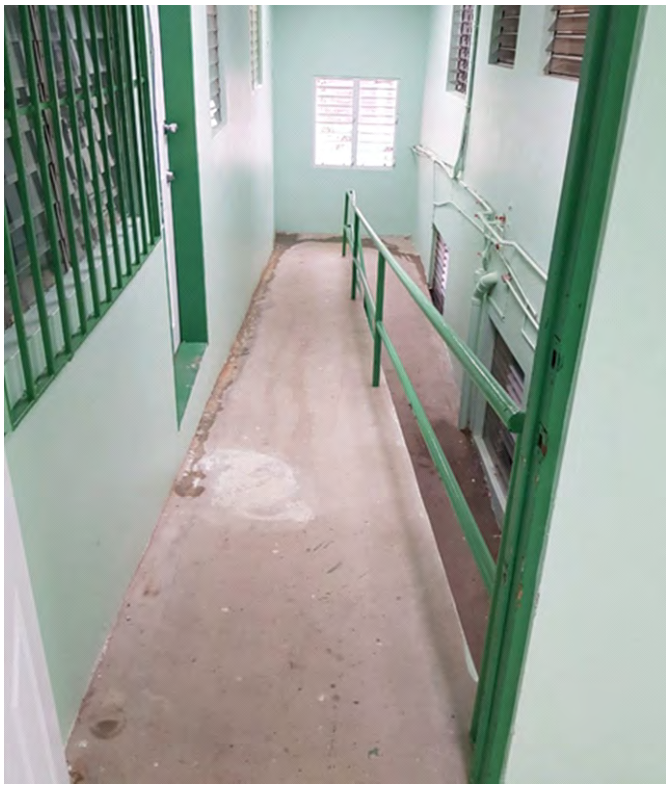


Figure 1 New Areas

As the renovation was being planned, changes to make the facility safer were also included. For instance, the ramp that joined the front and rear portions of the building was open on one side as depicted in photograph below. The open wall was closed up as part of the renovation and a new louvered window added. This allows for safer movement of residents and staff alike while improving lighting to the area.

Photograph 8 Old Open Ramp



Photograph 9 Enclosed Ramp with New Window

Additionally, a stairway on the interior that previously had a low gate and rail as depicted below, was renovated to include a full sized double-door and glass partition. Safety in this area was greatly improved.

Photograph 10 Old Stairway

Photograph 11 Improved Stairway

Best Practice Employed

ROOF

In an effort to build back smarter at this facility, best practices recommended in the Smart Hospitals Toolkit were employed. The Smart Hospital Toolkit recommends that 'the adaptation response to the expectation of higher wind speeds should be to use structural forms with better aerodynamic properties, for example steeply pitched roofs and regular plan layouts'. The hip roof was strengthened and the slope increased. The existing concrete ring beam was removed and a new one installed. Hip rafters, larger than what existed previously, were used along with, 3" x 8" ridge, 2" x 10" fascia and 3" x 6" rafters spaced at 32" on center. Spiral type galvanize nails were used to fasten all wooden roof elements. The 24-gauge, pre-painted galvalume sheeting was fastened to the underlying 3/4" plywood using double screws at every other corrugation at all eve components. 3/16" x 2" x12" galvanized plates/straps with 5/8" x 6" galvanized bolts were used to attach 3" x 6" collars at every other rafter. A galvalume ridge cap was utilized and guttering was added to the new roof that will direct captured rainwater to the existing cistern. See roof details below.

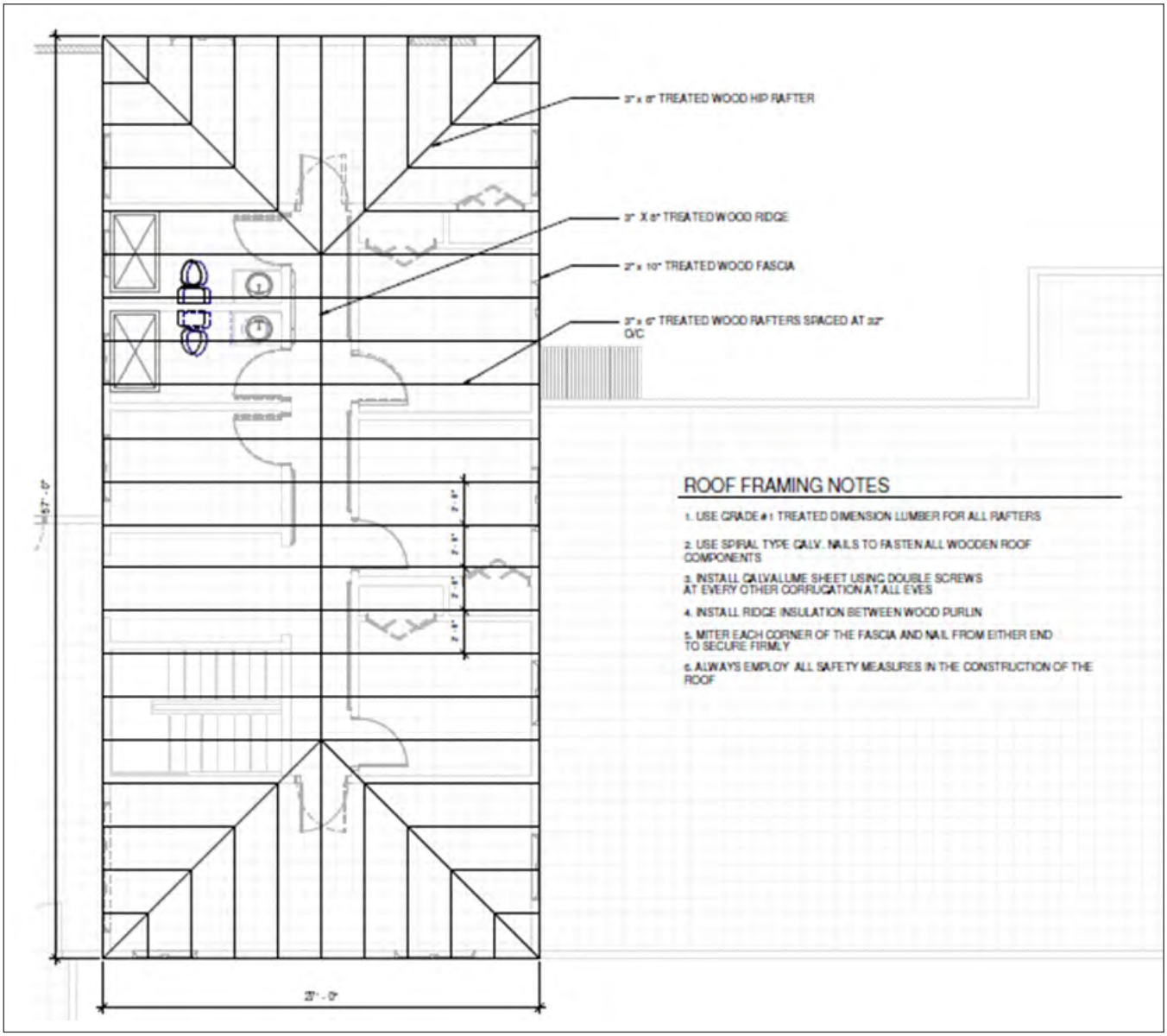


Figure 3 Roof Framing Plan

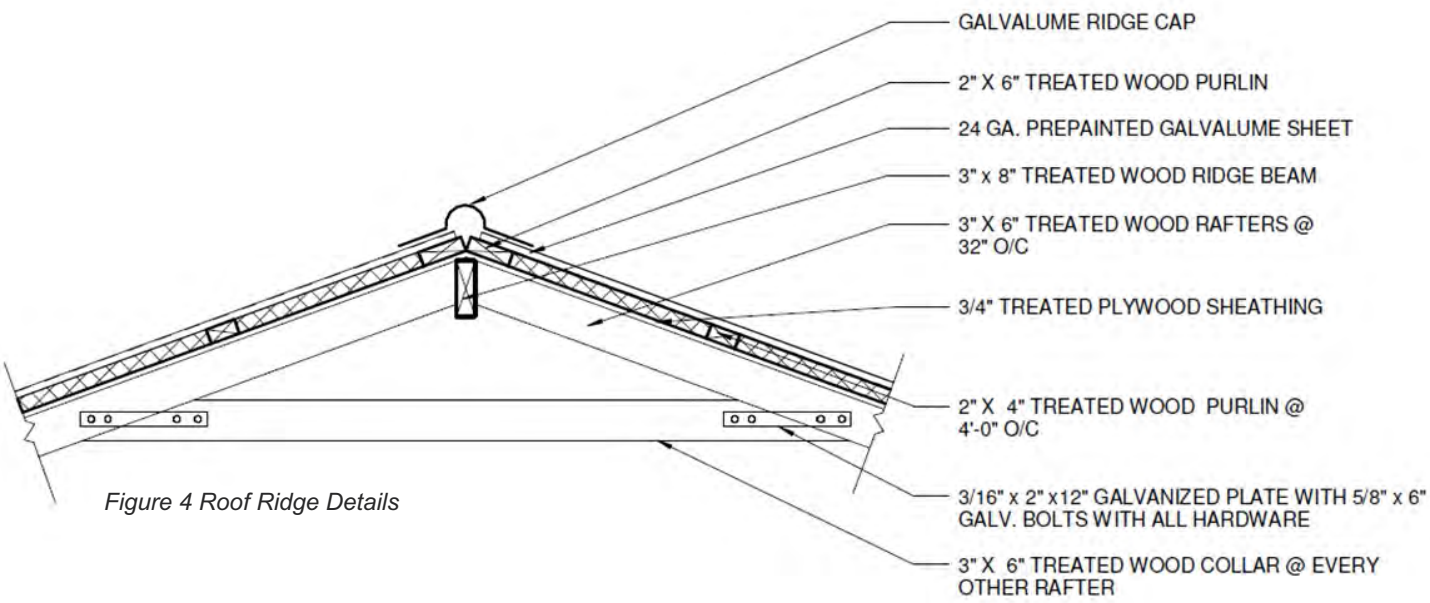


Figure 4 Roof Ridge Details

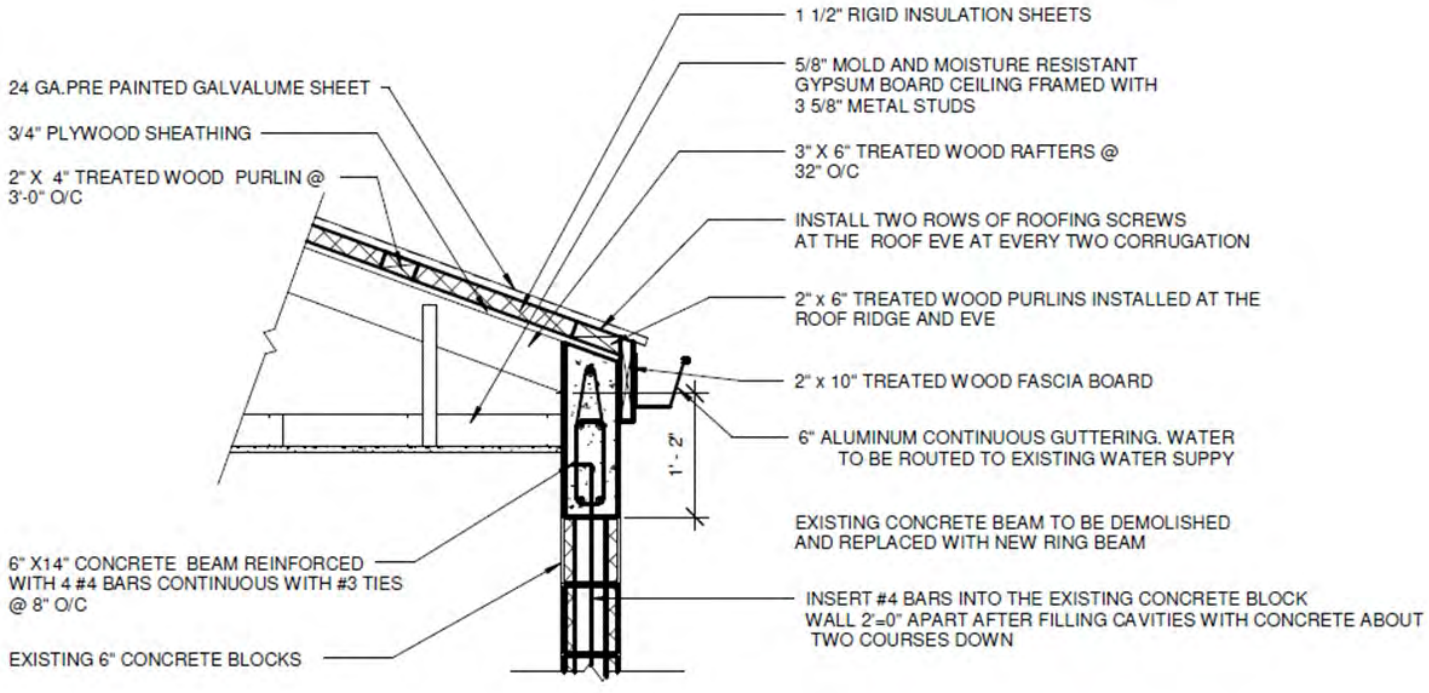


Figure Roof Ridge Details

Photograph 12 Roof Under Renovation

All the wood used in the new roof was treated to prevent future termite infestation.

ROOF INSULATION AND COLOUR

One of the 'Recommended Action Points' for 'Efficient Equipment/Fixtures/Devices and Features' in the Smart Hospitals Toolkit states that one should insulate your roof to reduce heat transfer into the facility and use light paint colours such as grey or white (if surrounding uses/users will not be impacted by glare). The waterproof membrane applied to the concrete portions of the roof is colored white as depicted in the picture above. This will help to reflect light/heat and keep the roof cooler and reduce heat transfer into the facility. Insulation sheets were used in the new roof as noted in Figure 3 above.

Photograph 13 Completed Roof

RENEWABLE ENERGY

Additionally, a Photovoltaic (PV) system was added to the front of the building. The panels were affixed to the concrete roof. This proved to be the most efficient side to place the system as a high mountain to the west shades the western portion of the roof from midafternoon. See photographs below of installed PV system and components. Approximately 20-30% of the energy use of the structure will be offset by the system.

Photograph 14 Photovoltaic System Installed

Photograph 15 PV System Inverter

EFFICIENT EQUIPMENT/FIXTURES/DEVICES AND FEATURES

The lighting was upgraded throughout the facility to LED bulbs. This will significantly reduce energy use and operating costs. Photographs below depict light fixtures that were in the building prior to the storm and the new LED fixtures installed in the hallway of the upper floor.

Photograph 16 Former Typical Light Fixture with Fluorescent Bulb

Photograph 17 Typical LED Light Fixture Installed

Additionally, inverter type split air conditioning units were added to some areas of the facility. These are more energy efficient and should result in reduced energy consumption for cooling. One of the recently installed units is pictured below.

Photograph 18 Typical Inverter Type Split Unit Air Conditioning Installed

As part of the project, the facility received new appliances including a new energy efficient refrigerator and an upgraded stove and oven combination.

Photograph 19 New Refrigerator

Photograph 20 New Stove/Oven

WATER USE REDUCTION

Low flow toilets and aerated faucets were added to the facility. This will reduce water consumption and operating costs. Some of these low flow and aerated faucets are depicted in photographs below.

Photograph 21 Typical View of Old Bathroom

Photograph 22 New Upgraded Bathroom

INDOOR ENVIRONMENTAL QUALITY

Improvements to indoor environmental quality were made with the addition of inverter-type split air conditioning units. See photograph 18 on previous page.

Conclusion

The Adina Donovan Home for the Elderly was damaged during hurricane Irma but a commitment was made by the Government of the British Virgin Islands to build the facility back better in the hopes that future damage from tropical systems will be limited and that the building could be more environmentally friendly and cost less to operate. With the financial assistance of the United Kingdom's Department of International Development (DFID) and the Government of Canada, through the Pan American Health Organization (PAHO), the investments made to strengthen the roof, to add solar panels, to upgrade the light bulbs, add low-flow toilets and aerated faucets, to water proof the roof with a white membrane, to add efficient air conditioning units and otherwise improve air flow and lighting, to add efficient appliances, the building performance should improve and savings realized.

In a recent opening ceremony, the Minister of Health and Social Development expressed his contentment with the works at the home and noted the importance of the elderly facilities in the Territory and the programmes that support the residents. The manager of the facility expressed her gratitude on behalf of the staff and residents for the improvements and modifications made.

This case study shows that it is never too late to incorporate the 'Smart' concept when attempting to build back better after a disaster such as that which impacted the British Virgin Islands in September 2017.

Credits:

Photographs provided by
Ronnie Lettsome, PAHO Consultant, British Virgin Islands
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Ronnielle Frazer, Department of Information and Public Relations,
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