INSULAR ABC'S INITIATIVE
Phase III Task 1 Findings and Recommendations
United States Virgin Islands

October 2015

US Army Corps of Engineers
Honolulu District

Office of Insular Affairs
US Department of Interior

HHF PLANNERS
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Background

The US Office of Insular Affair's (OIA) Insular ABCs Initiative is a multi-phase effort being managed by the US Army Corps of Engineers, Honolulu District via its contractor, HHF Planners. It is a collaborative effort with Insular Governors focused on improving the physical conditions of Insular Area public schools (Commonwealth of Northern Marianas, Guam, American Samoa and the US Virgin Islands).

The project is now in its third and final phase focused on removing the Deferred Maintenance (DM) backlog identified in Phase II. Assessments and recommendations for school sites and buildings were divided amongst four disciplines:

- Architectural
- Structural
- Mechanical, Electrical, Plumbing, and Fire Alarm (MEPFA)
- Civil

The purpose of the Phase III investigation was to:

- Receive updated input from cognizant local agencies and other stakeholders related to school conditions and priorities
- Confirm and review DM work completed since the Phase II condition assessment (2013)
- Update condition assessments for elements of concern
- Evaluate new Health/Safety issues
- Discuss and review issues of particular concern with cognizant local agencies
- Gather information on issues/elements of concern to develop and refine project recommendations to be included in the Work Plan.

This report includes Phase III findings and recommendations for Architectural, Structural, and MEPFA building system conditions. Civil engineer findings and recommendations are addressed in a separate report.

Please direct any questions or comments on this report to:

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ARCHITECTURAL SUMMARY REPORT
UNITED STATES VIRGIN ISLANDS
October 2015

Prepared by:
Mason Architects, Inc.

I. PRIORITIZATION PRIOR TO PHASE 3 SITE VISIT

The Phase 2 survey produced ratings for various Architectural elements, as well as identification of Health and Safety issue. Prioritization of Architectural projects for Phase 3 was compiled from the results of the Phase 2 surveys, based on building element conditions and the potential hazards to building users. The order of priority for projects based on the Phase 2 observations were: conditions that pose an immediate hazard to the health and safety of the building occupants, conditions that if left unrepaired may cause damage to other building components or its contents, and other maintenance and repair projects. The table below shows the architectural elements found in the Phase 2 survey with Health and Safety concerns.

SCHOOL	BUILDING	HEALTH/SAFETY ELEMENT
ST. THOMAS		
Addelita Cancryn JHS	05 - Classrooms	Railings at exterior walkway
		Railings at exterior stair
Charlotte Amalie HS	19-Rooms 1-12	Exterior ramp
		Covered walkway surface
	22-VICA	Exterior ramp surface
	31-Health	Exterior stair landing
Joseph Gomez ES	04-Classroom	Exterior walkways surface
		Exterior stair treads
	07-Classroom	Railings at exterior stair
Joseph Sibilly ES	01-Classroom	Railings at exterior stair
	06-Cafeteria	Exterior ramp surface
ST. CROIX		
Ulla Muller ES	04-Classroom	Exterior stair treads
	09-Music	Concrete Ceiling at walkway
		Railings at exterior stair
Charles Emmanuel ES	02-Classrooms	Railings at covered walkway
	07-Classrooms	Concrete ceiling
		Concrete Ceiling at walkway
Lew Muckle ES	01-Classroom	Railings at exterior walkway
	09-Classroom	Exterior stair surface
ST. JOHN		
Guy Benjamin ES	05-Classroom	Exterior ramp surface

II. SUMMARY OF PHASE 3 MEETINGS AND SCHOOL VISITS

The purpose of the Phase 3 territory visits was to:

- Get input from VIDE and other stakeholders
- Confirm and review DM work completed since the Phase 2 visits
- Update condition assessments of elements of concern
- Evaluate any new Health/Safety issues
- Discuss and review issues of particular concern to VIDE
- Gather information on issues/elements of concern to develop project recommendations

Based on concerns developed during our Phase 2 survey, as well as additional concerns expressed by the VIDE and stakeholders to the project team prior to the Phase 3 visit, the following schools were re-visited during the March 2015 visit:

St. Thomas

- Charlotte Amalie High School
- Jane E Tuitt Elementary School
- Addelita Cancryn Junior High School
- Ulla Muller Elementary School
- Joseph Gomez Elementary School

St. Croix

- Elena Christian Junior High School
- John Woodson Junior High School
- St. Croix Educational Complex
- Evelyn Williams Elementary School

St. John

- Julius Sprauve Elementary School

III. OBSERVATIONS AND ADDITIONAL INFORMATION FROM PHASE 3 VISIT

It was observed that some repair work had been completed since the Phase 2 visits. This consisted mostly of some concrete spall repairs, roofing patching/replacement, soffit repairs, and gutter and downspout replacement. Many of the Health and Safety issues noted in Phase 2 were not specifically resurveyed during this visit as school visits were typically focused on larger issues, but it was not indicated that any repairs had been made to most of those H/S items.

Following is a summary of the schools visited and the issues noted at each school.

A. Charlotte Amalie High School

1. Building 10

   VIDE staff indicated that the roof over one of the exterior stairwells was removed due to excessive spalling. It was observed that this did occur. Removal of the roof is an adequate solution, although it does leave the students exposed to rain, and the stairs could potentially become slippery. In the future spall repairs should be conducted rather than removing the damaged element.

   Summary of the structural column issues noted are described in the structural summary report.


2. Buildings 26

   Concrete spall repair work, roofing repair, and gutter & downspout replacement was performed on the eastern portion of Building 26, and appears to have been adequately completed. A Scope of Work has been prepared for similar work on the western portion of the building.

3. Buildings 19 and 21

   Both of these buildings were observed to have easily repairable gutter and/or downspout issues that are causing damage to the building and potential Safety issues due to wet and slippery walking surfaces. At Building 19, the gutter connections are leaking, and at Building 21 the end of the gutter is missing, allowing water to pour over the building wall and exterior walkway surface. These gutter issues should be repaired.


Building 19


Building 21

B. Jane E Tuitt Elementary School

1. Building 2

This building was being used for storage and as a location for the school's IT equipment during the Phase 2 survey, but it was even at that time known to have structural problems and extensive roof leaks, which have cause damage to the building interior. They buidling is now not in use, and VIDE stated that they are aware that the building may be historically significant, so no renovation or demolition is planned until the building's significance can be accessed.

Re-survey of this building showed that while there is some damage to the building, mostly caused by the leaking roof, that the original portion and additions are fairly clearly defined, and that the building overall appears to have historical integrity. Further signficance evaluations are recommended.


C. Addelita Cancryn Junior High School

1. Classroom Buildings

The Phase 2 survey identified leaking roof issues, which were still present in the Phase 3 visit. Part of the problem at Buildings 2-6 and 13, 14 and 16 appear to be from the use of plywood as sheathing with no proper roofing coating at the exterior walkways/roof eaves. The plywood absorbs moisture, particularly at the ends, becomes warped, and allows moisture to enter the building along the top of the exterior walls.


2. Buildings 8 and 9

Moisture is also entering the Library at Buildings 9 and 10, which has caused extensive formation of mildew, and the closing of the library. It appears the moisture is entering along the upper edge of the lower roof, in part due to missing flashing.

In addition, there is a large hole in the wall on the east side, which allows conduit to be run into the basement. This is allowing moisture (and vermin) to enter the basement, and is a contributer or perhaps the cause of flooding in the basement. Having the electrical equipment in an area that floods is a safety hazard. The electrical equipement in the basement should be relocated, and the hole should be closed up.

D. Ulla Muller Elementary School

1. Buildings 3, 4 and 5

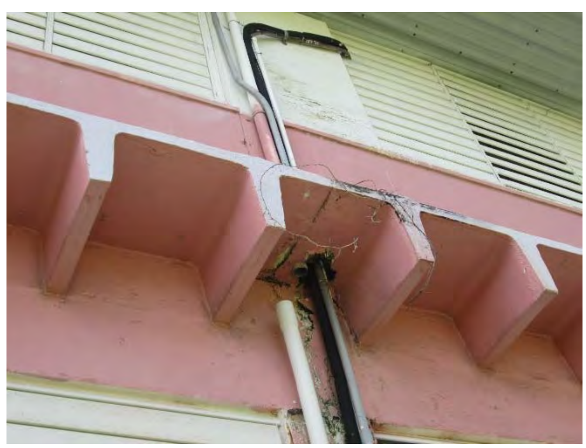
The Phase 2 survey identified some spalling issues, but it appears that the spalling has increased and now poses a safety hazard. The spalling areas should be repaired to prevent injury.

At Building 5, there is also a large crack all the way through one of the cantilevered concrete beams supporting the second floor exterior walkway and the stair. This is a safety hazard and should be immediately repaired.

E. Joseph Gomez Elementary School

1. Building 4

This VIDE reported that a building soffit had collapsed at one of the buildings, injuring a teacher, and that the soffit had since been repaired. The school was visited to view the repair work and to see if any other repairs were needed to address any future danger. It appears that the entire soffit was removed and new eave supports were installed. The repair appears to be thorough and there is no additional danger from the soffit. Some of the gutter and downspout issues noted in the Phase 2 survey have since been corrected, but there are still some problems, like a disconnected downspout allowing roof runoff to run onto the outside of the building.



F. Elena Christian Junior High School

1. All buildings

This school is predominantly constructed of steel framed buildings with an EFIS exterior finish on a metal wire mesh attached to the structure and to metal studs. During the Phase 2 survey, it was noted that the EFIS exterior finish was beginning to fail in several areas, and pieces had fallen off in a few locations. Prior to the Phase 3 site visit, the VIDE expressed that some repair work had been done at the exterior soffits, as a result of portions of the siding falling off, and that the remaining siding was continuing to fail. The Phase 3 site visit confirmed this to be the case. In several locations the EFIS finish had been removed at the soffit, and typically unpainted plywood has been installed in its place. The plywood typically also shows some water damage, and may eventually also be a safety hazard. It is only a matter of time before exposure to moisture causes severe damage to the building structural systems. The exterior finish at these buildings should be removed and replaced.




G. John Woodson Junior High School

1. Entry covered walkway and Ramp

The survey team visited this school to address some MEP issues, but while there it was observed that the plywood ceiling at the entry walkway has incurred some water damage and is becoming disconnected from the structure. The ceiling could possibly fall onto someone below, and is a safety hazard.

It was also noted at the ramp in one of the courtyards that the concrete ramp wall is spalling.


H. Evelyn Williams Elementary School

The VIDE expressed concern about this school for several reasons: the deterioration of some of the steel structural elements, and leaking at the roof, which has caused interior damage and extensive mildew. The Phase 3 site visit revealed that the steel structural elements are continuing to deteriorate, some to the point of being a safety hazard. The structural report has additional analysis and recommendations for the steel elements.

At the roof, some of the metal roofing panels are heavily deteriorated at the end, and have rusted so far up the panel that moisture is getting behind the vertical wall finish. Also, the downspouts in the large concrete gutters are clogged, which is causing water to back up in the gutters. This may also be causing water to get into the building interiors. The concrete gutter wall is spalling in several areas, as is the concrete roof slab. The spalling concrete is a safety hazard and should be repaired.


I. Julius Sprauve Elementary School

The Phase 2 survey revealed extensive concrete spalling at Building 5 (B). In 2014 a construction project was undertaken to repair the spalls. Survey of the building in the Phase 3 visit, as well as review of the construction documents, confirmed that the repair work was successfully accomplished.

The roof of this building is still leaking, causing damage to the ceiling tiles and other interior finishes, as well as creating puddles on the floor and possibly damaging the electrical wiring. Access to the roof was not available at the time of the survey, so further investigation was not possible during this visit. It is suspected, however, that the roof drain may be leaking where the drain sits in the roof structure.

IV. ADJUSTMENTS TO PRIORITIZATION

While none of the Architectural Health and Safety issues noted in Phase 2 were known to have been repaired, the site visits in Phase 3 added some additional issues to the list of Architectural Health and Safety issues. The newly added issues are highlighted in the table below. Guy Benjamin Elementary School on St. John has been closed since the Phase 2 survey.

SCHOOL	BUILDING	HEALTH/SAFETY ELEMENT
ST. THOMAS		
Addelita Cancryn JHS	05 - Classrooms	Railings at exterior walkway
		Railings at exterior stair
Charlotte Amalie HS	19-Rooms 1-12	Exterior ramp
		Covered walkway surface
	22-VICA	Exterior ramp surface
	31-Health	Exterior stair landing
Joseph Gomez ES	04-Classroom	Exterior walkways surface
		Exterior stair treads
	07-Classroom	Railings at exterior stair
Joseph Sibilly ES	01-Classroom	Railings at exterior stair
	06-Cafeteria	Exterior ramp surface
Ulla Muller	03, 04, 05	Spalling concrete
ST. CROIX		
Ulla Muller ES	04-Classroom	Exterior stair treads
	09-Music	Concrete Ceiling at walkway
		Railings at exterior stair
Charles Emmanuel ES	02-Classrooms	Railings at covered walkway
	07-Classrooms	Concrete ceiling
		Concrete Ceiling at walkway
Lew Muckle ES	01-Classroom	Railings at exterior walkway
	09-Classroom	Exterior stair surface
Elena Christian ES	All Buildings	Exterior EFIS siding
Evelyn Williams ES	05 -Classroom	Spalling concrete roof
	12 - Classroom	Spalling concrete gutter wall
	08 - Library	Mildew due to roof leaks
John Woodson JHS	Entry covered walkway	Walkway ceiling
	Ramp	Spalling concrete at side
ST. JOHN		
~~Guy Benjamin ES~~ (closed)	~~05-Classroom~~	~~Exterior ramp surface~~
Julius Sprauve	01-Cafeteria	Exterior finish spalling

V. RECOMMENDED PROJECTS

Following are descriptions of Architectural Health and Safety Issues of prominent concern, along with recommended repair solutions. Smaller Health and Safety projects identified in the previous table, such as railing installation or repair, are not included here, as they entail important but uncomplicated and generally straightforward solutions.

These recommended projects are provided as a means to assist in accelerating the time to complete these projects by providing identification of prominent issues as well as suggested solutions.

1. Broken/detached Railings
   Location: Addelita Cancryn JHS Building 5

Building 5 is a wood-framed building on a post and pier foundation, and has a covered walkway on the entry side with a wood floor structure. The wood joists supporting the base of the railings is damaged (rotted or termite damaged) at one end, and the metal railing has completely fallen off.

Recommended Scope of Work:
The damaged joists should be replaced in order to fully support the metal railing. If the joists are in good condition except at the ends, the joists could be sistered onto so that there is a solid bearing area at each end. Install at least 3 feet of new sistered joist at each damaged existing joist, and bolt through both joists in several locations. Attach the metal railing to the new wood members.

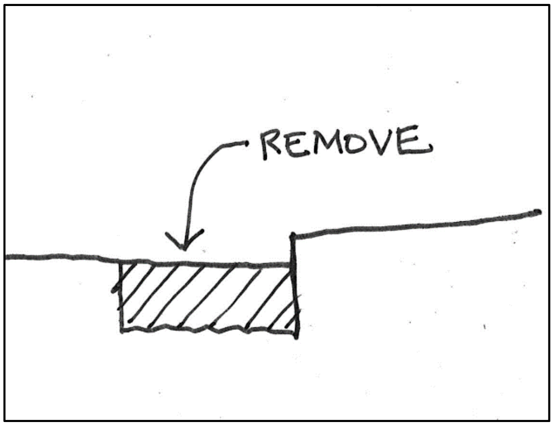
2. Uneven concrete Ramps and walkways
   Location: Charlotte Amalie HS Buildings 19, 22, Joseph Sibilly Building 6

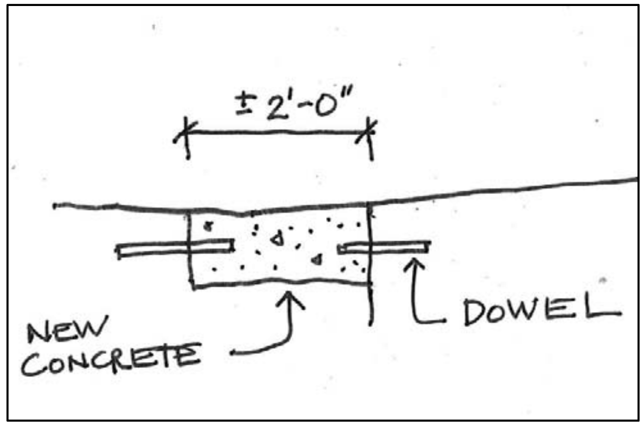
Existing Conditions:
The concrete surface at several ramp and walkway surfaces are in poor condition and are a hazard for tripping. There are holes, spalled areas, rough edge transitions, and unsafe edge conditions.

Recommended Scope of Work:
Where holes or spalled areas have formed, remove all loose concrete and clean area/hole. Patch area with new concrete, ensuring that edges are smooth.

Where uneven edges at transitions are large enough to cause tripping hazards, simply adding a patch along the edge will typically eventually delaminate, and a new transition must be created.

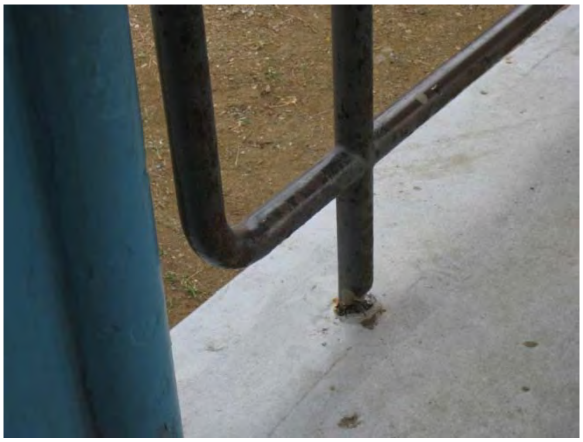
- Sawcut at least 1" deep of concrete across slab at joint, more if doweling is needed. Cut strip wide enough to create smooth transition, at least 2 feet wide if doweling.
- Remove concrete
- Patch to two existing sides, inserting dowels if needed, and creating smooth transition at each edge.


REMOVE


± 2'-0"
NEW CONCRETE
DOWEL

3. Rusted metal railings, spalling connections at concrete stairs/walkways/ramps
   Location: Juanita Gardine ES Building 2,

In several locations, metal railings are heavily rusted at the base, and are a potential hazard due to the possibility of becoming disconnected at the base, and also by creating a sharp, rusted edge that could cut someone.



Recommended Scope of Work:
Where railings are rusted at the base, the railing must be removed and a new metal railing base installed in the concrete.

- Cut railing off at each base and remove railing
- Cut out the metal bases in concrete and remove all loose concrete
- Install new metal railing bases in concrete with hydraulic concrete. Weld bases to railing such that railing is required height.

Where the concrete is spalling or chipping at the curb edge:

- remove the railing base at this location
- Cut curb edge back beyond where curb is cracked or spalling, or remove entire curb.
- Install new fiberglass rebar doweled into existing curb or slab and pour new curb around new metal railing base. Locate new railing base at least 4” clear from curb edge.
- Weld new base to existing railing.

For a chipped stair tread corner:

- Cut railing off at each base and remove railing
- Cut out the metal bases in concrete and remove all loose concrete
- Install new metal railing bases in concrete with hydraulic concrete. . Locate new railing base further back from tread edge.
- Weld bases to railing such that railing is required height.

4. Isolated areas of deterioration of Fluid-applied roofing
   Location:

In some locations, often due to roof slope creating areas of ponding, the fluid-applied roofing has isolated problems but does not yet warrant total replacement. In addition to promoting leaks, the deteriorated areas will allow water to get under the roofing layers, which may cause expanded areas of roofing failure.

Recommended Scope of Work:
If roofing is damaged due impact, it can be quickly patched and will likely last as long as if the roofing was undamaged. But it roofing has deteriorated, it can be patched but will likely last only a few years at the maximum before the entire roof should be re-roofed.

To patch deteriorated area:

- Remove areas of peeling or bubbled roofing
- Thoroughly clean exposed roof surface and roofing around area to be patched
- Install new roofing according to manufacturer's directions

5. Peeling paint
   Locations: various, including Elena Christian JHS; Jane E Tuitt ES, Lew Muckle ES

Paint failure can be due to one or more of several causes, including improper application, water leaks, condensation, plant growth, etc. Paint helps to protect materials from damage due to water, sun, and other environmental components. The loss of an intact paint surface exposes the building to damage; the building should be repainted as soon as possible.

Recommended Scope of Work:

- Identify and eliminate the source of moisture/damage/failure
- Ensure that if building was constructed prior to 1980, the paint has been tested for lead. If required, include appropriate remediation and protection methods.
- Verify the compatibility between the new and existing paint (oil-base, latex, etc.)
- Remove loose and flaking paint
- Clean area to be repainted
- Patch holes, cracks, open joints and other imperfections
- Apply new paint according to manufacturer's directions

6. Spalling concrete (non-structural elements)
   Locations: various, including Addelita Cancryn JHS (Bldg. 8), Ulla Muller ES (Bldgs 3, 4, 5), John Woodson JHS (Bldg. 4), Evelyn Williams ES

Several buildings have spalled concrete areas in both structural and non-structural elements. The spalling is typically caused by moisture getting into the concrete and rusting the steel reinforcing, which expands as its rusts and causes the concrete to crack and eventually break off. Where cracked and spalling concrete is on ceilings or is on columns or walls above, it is a safety concern as they create a falling hazard to the building occupants.

Recommended Scope of Work:
To repair non-structural concrete spalling, the following steps should be taken:

- Remove all loose concrete
- Remove as much rust as possible from steel reinforcing elements
- Replace reinforcing as necessary. Consider using
- Treat steel with a rust-preventing compound
- Fill all cracks and patch spalls with new concrete.

7. Failing EFIS exterior finish
   Location: Elena Christian Junior High School – all buildings

During the Phase 2 survey, it was noted that the EFIS exterior finish of most of the buildings on the campus was beginning to fail in several areas, and pieces had fallen off in a few locations. The Phase 3 assessment confirmed the condition has continued to worsen and more of the exterior finish is failing. The failure appears to be due to moisture and salt penetrating the finish material, either through cracks, joints, or due to a lack of a waterproofing membrane. The moisture then rusts the steel mesh and other steel components, causing the surface material to crack and fall off. In some areas entire panels have fallen due to the rusting of the metal connectors and furring components.

Recommended Scope of Work:

- In areas where no cracks or damage are visible, and there is no sign of moisture infiltration, coat the outside of the EFIS finish with an elastomeric to help keep moisture from penetrating.
- In cracked or damaged areas, remove all plaster
- Treat steel components that retain integrity with a rust-preventing compound
- Replace any steel components that have lost integrity
- Install new plaster finish with a moisture barrier
- Coat exterior of plaster finish with elastomeric

8. Deteriorating Steel beams, leaking roof, spalling concrete
   Location: Evelyn Williams Elementary School

The buildings at this campus have several issues; many of the steel beams supporting the roof structure are exposed, and in several locations the steel beams have severely rusted to the point of losing integrity and the ability to function as required. See the structural engineer's write-up for the repair and replacement of these elements.

In addition, in several locations the metal roofing is rusting at the edges, in some areas it has rusted beyond the wall finish below, allowing water to easily enter the building. Some of the concrete gutters have clogged drains, and are often full of standing water, possibly also causing interior building leaks. Some of the concrete gutter walls are beginning to crack and spall.

Recommended Scope of Work:

- Where metal roof edge is just starting to rust, treat with a rust-preventing compound
- At areas of metal roofing where the rusting is significant (1" or more from edge), install a new piece of metal roofing underneath the existing roofing. New roofing should extend at least 24" into building past wall below, and should extend at least 3" beyond outside surface of exterior wall. Install connectors as required
- Repair cracked and spalled concrete areas by removing loose concrete, removing rust from exposed steel reinforcing, and patching with new concrete.

- Unclog all gutters drains and downspouts and ensure they are working properly. Establish a schedule to check them to confirm they continue to drain.

MECHANICAL, ELECTRICAL, PLUMBING, AND FIRE PROTECTION SUMMARY REPORT

UNITED STATES VIRGIN ISLANDS

October 2015

Prepared by:

InSynergy Engineering, Inc.

I. BACKGROUND AND SUMMARY OF PREVIOUS PHASE II ASSESSEMENT

The initial physical assessment of all of the USVI schools was conducted in 2013 under Phase II of our OIA contract. Based on these surveys, physical condition assessment ratings were developed for the various MEP elements for each of the VIDE schools. Deficiencies identified during the Phase II assessments are summarized by school in the following table:

School	HVAC – Outside Air Provision	HVAC - Maintenance	HVAC - Equipment	Plumbing System/ Fixtures	Water Tank & Booster Pump	Electrical System	Electrical Hazard	Interior Lighting	Exterior Lighting	Telecommunications/Data	Fire Sprinkler system	Fire Pump System	Fire Alarm	Public Announcement (PA) System & Bell System	**Total**
Addelita Cancryn JH	X	X	X	X		X		X					X		**7**
Alexander Henderson ES	X	X	X	X	X	X	X	X			X		X		**10**
Alfredo Andrews ES	X	X	X	X	X	X	X	X			X		X		**10**
Arthur Richards JHS	X	X	X	X			X	X			X		X		**8**
Bertha C. Boschulte JH		X				X		X					X	X	**5**
Charles H. Emanuel ES	X	X						X			X		X		**5**
Charlotte Amalie HS	X	X	X	X		X	X	X					X		**8**
Claude O. Markoe ES	X	X				X	X	X			X		X		**7**
E. Benjamin Oliver ES	X	X	X	X				X					X		**6**
Edith L. Williams ES	X	X	X	X		X	X	X					X		**8**
Educational Complex HS	X	X	X		X	X	X	X			X	X	X		**10**
Elena Christian JHS		X				X	X	X					X	X	**6**
Eulalie Rivera ES	X	X	X	X				X			X		X		**7**
Evelyn M. Williams ES	X	X	X	X				X			X		X		**7**
Gladys A. Abraham ES	X	X	X	X		X		X					X		**7**
Guy H. Benjamin ES	X	X	X	X		X		X					X	X	**8**
Ivanna Eudora Kean HS	X	X	X	X		X		X	X				X	X	**9**
Jane E. Tuitt ES	X	X	X	X		X		X					X		**7**
John H. Woodson JHS	X	X	X					X			X		X		**6**
Joseph Gomez ES	X	X	X	X		X	X	X	X				X		**9**
Joseph Sibilly ES	X	X	X	X		X	X	X					X		**8**
Juanita Gardine ES		X				X	X	X					X	X	**6**
Julius E. Sprauve ES	X	X	X	X		X		X					X		**7**
Leonard Dober ES	X	X	X	X		X	X	X					X		**8**
Lew Muckle ES	X	X				X	X	X					X	X	**7**
Lockhart ES	X	X	X	X		X		X					X	X	**8**
Pearl B. Larsen ES		X				X	X	X					X	X	**6**
Positive Connections ALT	X				X	X	X	X		X			X	X	**8**
Ricardo Richards ES	X					X	X	X					X	X	**6**
St. Croix Central HS	X	X				X	X	X					X	X	**7**
Ulla F. Muller ES	X	X	X	X		X	X	X							**7**
Yvonne E. Milliner-Bowsky ES		X				X	X	X					X	X	**6**
Total	**27**	**30**	**21**	**19**	**4**	**26**	**19**	**32**	**2**	**1**	**9**	**1**	**31**	**12**	**234**

LEGEND =	
X	has deficiency
O	satisfactory
N/A	not available

The phase II assessment also identified the high priority Health and Safety items which pose an immediate hazard to the health and safety of the building occupants which are summarized in the table below (as shown in the Energy Audit, available at the project website):

System	Electrical										Plumbing & Sanitation								Mechanical					Fire Protection					
Hazard	Shock	Shock	Shock, Fire	Health	Shock	Shock	Fire	Falling	Shock, Fire	Evacuation	Injury	Injury	Fire	Sanitation	Sanitation	Health	Sanitation	Sanitation	Health	Fire	Health	Indoor air Quality	Indoor air Quality	Life safety	Life Safety	Fire	Fire Safety	Life safety	
Causes	Pad mounted switchgear is unsafe	No GFCI for receptacle at outdoor, wet area, drinking fountain	Un-coved panel cover, Exposed conductor	Overhead outdoor lamps without cover	Exposed uninsulated conductors	Un-grounded enclosure	Undersized & No over-current protection conductors	Un-coved & Un-secured manhole	Deteriorated & corroded enclosure	Lack emergency illumination	Inadequate support to piping and plumbing equipment	Unpiped relief valve at hot water heater, or wrong termination	Inadequate ventilation to LPG hot water heater	Cristen need service & repair	broken sewage line	No hand wash nearby Cafeteria	Inadequate/Inoperable restroom fixtures and drains, leaking pipes	Inoperable septic system	Mildew due to condensate leak	Hot generator exhaust gas too close the electrical cable	Poor Toilet ventilation	Inadequate outside air	Inoperable airconditioning system	Fire sprinkler system lack of services & maintenance	No Fire suppression system at cooking hood	No ventilator for fuel storage	Deficient Fire alarm system	No Fire alarm and detection	Total
School																													
Addelita Cancryn JH																		X										X	2
Alexander Henderson ES		X	X									X									X	X			X		X		5
Alfredo Andrews ES			X									X		X							X	X			X		X		5
Arthur Richards JHS		X	X																			X			X		X		4
Bertha C. Boschulte JH		X																									X		2
Charles H. Emanuel ES		X													X										X		X		4
Charlotte Amalie HS			X														X		X								X		4
Claude O. Markoe ES											X	X	X							X	X				X		X		6
E. Benjamin Oliver ES			X														X											X	3
Edith L. Williams ES			X														X								X			X	4
Educational Complex HS	X	X										X		X										X		X	X		7
Elena Christian JHS			X						X												X	X					X		3
Eulalie Rivera ES											X	X									X						X		3
Evelyn M. Williams ES																													0
Gladys A. Abraham ES																												X	1
Guy H. Benjamin ES																												X	1
Ivanna Eudora Kean HS																	X											X	2
Jane E. Tuitt ES																												X	1
John H. Woodson JHS												X													X		X		3
Joseph Gomez ES			X														X											X	3
Joseph Sibilly ES			X														X											X	3
Juanita Gardine ES									X												X	X						X	2
Julius E. Sprauve ES																												X	1
Leonard Dober ES											X																	X	2
Lew Muckle ES		X							X												X	X					X		3
Lockhart ES																													0
Pearl B. Larsen ES			X						X					X							X	X					X		4
Positive Connections ALT									X			X									X	X						X	3
Ricardo Richards ES			X									X		X			X										X		5
St. Croix Central HS			X																								X		2
Ulla F. Muller ES			X																									X	2
Yvonne E. Milliner-Bowsky ES			X											X													X		3
Total	1	6	14	0	0	0	0	0	5	0	3	8	1	5	1	0	7	1		1	9	8	0	1	7	1	16	14	93

II. PHASE III SCOPE OF WORK AND FOLLOW-UP MEETINGS AND SCHOOL VISITS

The Phase III scope included refining and confirming the high priority mechanical, electrical, and plumbing (MEP) concerns from the Phase II assessments, coordinating these MEP priorities with needs from other disciplines at a building level and developing conceptual multidisciplinary projects that would allow some of the repair or replacement work to be grouped for more efficient implementation.

As part of Phase III, additional field survey work was conducted from March 9 – 13, 2015. The purpose of the Phase III territory visits was to:

- Get input from VIDE and other stakeholders, including the VIEO, WAPA, and the Fire Marshall
- Confirm and review deferred maintenance (DM) work completed since the Phase II visits
- Discuss and review issues of particular concern to VIDE
- Update condition assessments of elements of concern
- Evaluate any new Health/Safety (H/S) issues
- Gather information on issues/elements of concern to develop project recommendations
- Review and update the energy audit

Based on concerns developed during our Phase II survey, as well as additional concerns expressed by the VIDE and stakeholders to the project team prior to the Phase III visit, the following schools were re-visited during the March 2015 visit:

St. Thomas
- Charlotte Amalie High School
- Joseph Gomez Elementary School
- Bertha C. Boschulte Middle School
- Addelita Cancryn Junior High School
- E. Benjamin Oliver Elementary School
- Lockhart Elementary School

St. Croix
- Elena Christian Junior High School
- John Woodson Junior High School
- St. Croix Educational Complex
- Evelyn Williams Elementary School
- Alexander Henderson ES

St. John
- Julius E. Sprauve School

III. OBSERVATIONS AND ADDITIONAL INFORMATION FROM PHASE III VISIT

The majority of the MEP DM work items identified in Phase II have not been completed, including most of the high priority MEP H/S items.

The primary concern raised during the survey work was that all of the fire alarm systems at the schools were inoperable due to numerous trouble and silenced fire alarm signals. The inoperable fire alarm systems and devices that were previously noted in Phase II have not been restored to full functionality due to the unavailability of parts for the older systems that were installed in 2003, and due to lack of service maintenance support from qualified fire alarm service providers. Based on these findings, and additional concerns raised by the fire department on this issue, the repair and replacement of the fire alarm systems has been elevated to a high priority MEP H/S item.

Additional concerns were also raised on the requirement to upgrade the electrical service to some of the schools due to low overhead lines, and to the lack of adequate fire separation for some of the electrical vaults. Some of these upgrades have been completed, while other service upgrades still need to be accomplished. The electrical service upgrade work in our MEP physical condition rating assessment has been updated accordingly.

Emergency power generators at the FEMA designated emergency shelters were provided by FEMA. These generators should be regularly maintained and serviced.

Additional Energy Conservation Measure (ECM) improvements were also completed as noted in the section covering the Energy Audit Assessment Update.

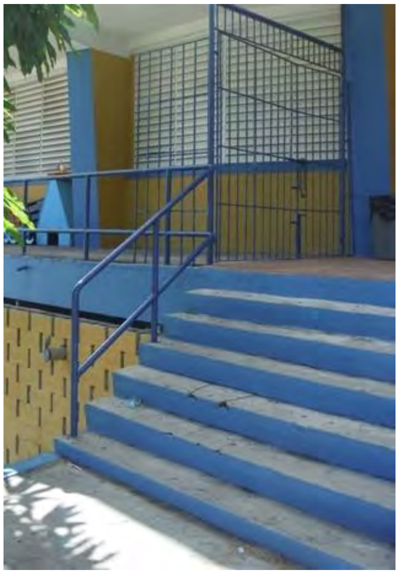
Following is a summary of the schools visited and the issues noted at each school.

A. Charlotte Amalie High School
   1. Building 14

      Locker / restrooms were renovated. All plumbing fixtures, ventilation and lighting systems were satisfactory.


2. Building 05

FEMA emergency power generator engine exhausts were discharged adjacent to stair and walkway which posed health hazard to public. Fuel tank was not vented to outside the generator room. It was a fire safety due the accumulation of fuel vapor at the generator room.



3. Fire alarm system

OIA Phase II survey found the fire alarm system was inoperable and incomplete. The fire alarm system remained inoperable and incomplete throughout the campus in OIA Phase III survey. This poses a safety hazard to the occupants. New fire alarm system should be provided throughout the campus and be upgradable for future voice communication.

4. Electrical System

Trans formers are inside a room at the lower level of the cafeteria building. An enclosed corridor has been added to the front of the transformer room. The electrical room is adjacent to the transformer room with unsealed openings.

B. Joseph Gomez Elementary School

1. Fire alarm system

OIA Phase II survey found no fire alarm system in the campus. Yet fire alarm system was installed in OIA Phase III survey. It was a safety hazard to the occupants. New fire alarm system should be provided throughout the campus and be upgradable for future voice communication.

2. Electrical system

Two electrical services with pole mounted transformers and low lying weather heads. WAPA recommended to have these services relocated to provide ground pad mounted services.

C. Bertha C. Boschulte Middle School

1. Fire alarm system

OIA Phase II survey found the fire alarm system was inoperable. During the OIA Phase III survery, the fire alarm panel power was off and batteries at the fire alarm panel were disconnected, posing a safety hazard to the occupants. The fire alarm system should be serviced and repaired to provide fire detection and notification throughout the campus and be upgradable for future voice communication.


2. Electrical system

250kW standby generator housing (not FEMA generator) is badly corroded. Sensor wires are removed. Control panel covered by plastic. Generator needs repair and service or replacement.



D. Addelita Cancryn Junior High School

1. 08 – Administration and Library

Roof leaks and damage to the air conditioning ducting insulation caused condensation, moisture and mildew issues at the library. These issues posed health hazards to the occupants.


2. Fire alarm system

OIA Phase II survey found the campus did not have fire alarm system. Yet fire alarm system was installed in OIA Phase III survery. It was a safety hazard to occupants. New fire alarm system should be provided throughout the campus and be upgradable for future voice communication.

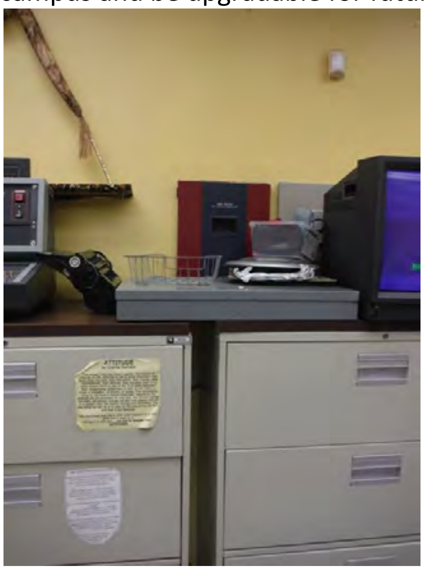
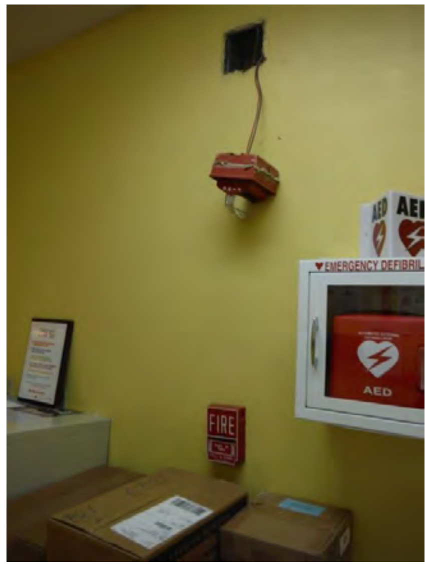
3. Electrical system

Main distribution panels are located at the main building (08 – Admin) basement. The electrical room in this building has an opening on perimeter wall causing flooding during heavy rain. Electrical panels have corroded covers and are vulnerable to flood damage. Main distribution panels and other electrical equipment are recommended to be relocated out of the basement.


E. E. Benjamin Oliver Elementary School

1. Fire alarm system

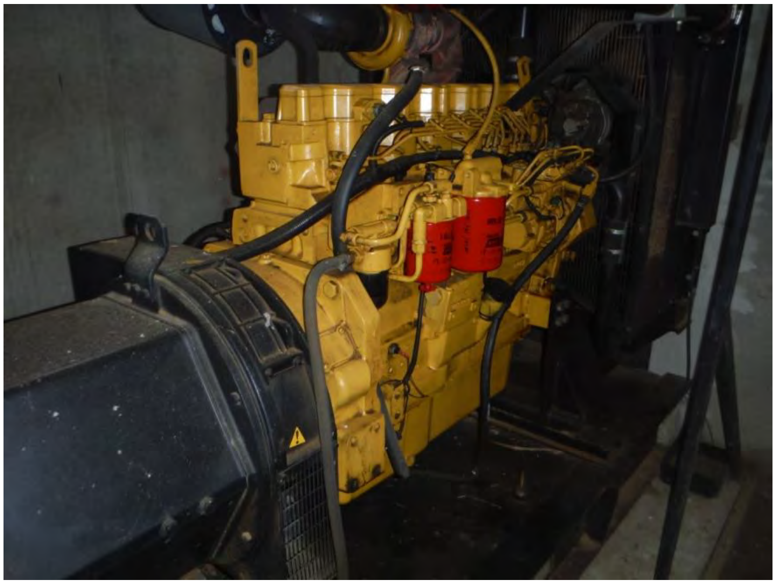
   OIA Phase II survey found the fire alarm system required service and repair. During OIA Phase III, the fire alarm panel power was off. Fire alarm devices were not attached on the boxes. Both fire panel and manual pull station were obstructed. These are safety hazards. The fire alarm system should be serviced and repaired to provide fire detection and notification throughout the campus and be upgradable for future voice communication.

2. Electrical system

   Transformers are located inside a room which has openings in the wall directly adjacent to the main electrical room. Main distribution panel has burn marks.


Standby generator (not FEMA generator) is located indoors in a room adjacent to the kitchen. Generator is in fair condition.



F. Lockhart Elementary School

1. Fire alarm system

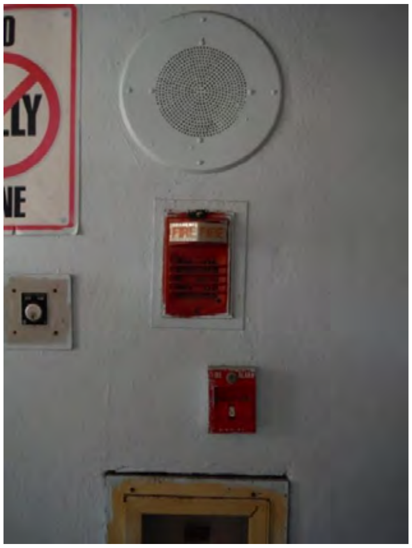
OIA Phase II survey found the fire alarm devices were inadequate. Since the Phase II assessments, the fire alarm was upgraded and now is in good operable condition.. The time and date of the fire alarm panel was inaccurate and should be corrected and be upgradable for future voice communication.

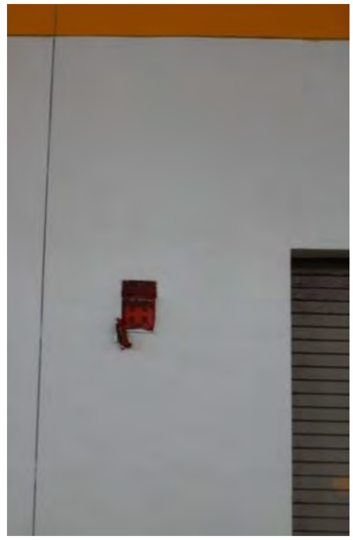
2. Electrical system

   Standby Generator (not FEMA generator) is in fair condition, but battery is missing

G. Elena Christian Junior High School
1. Fire alarm system

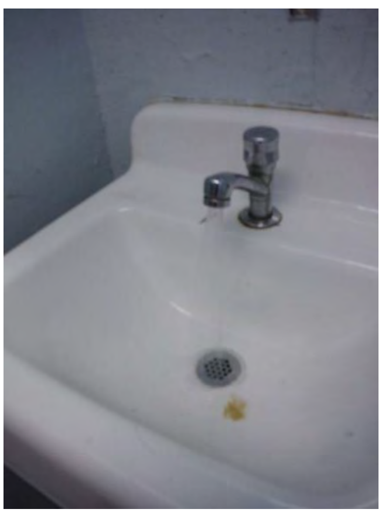
   OIA Phase II survey found the fire alarm system was inoperable. The fire alarm was still inoperable at the start of Phase III. Fire alarm panel was silenced and had numerous trouble and alarm signals. Defected manual pull stations and fire alarm devices need to be repaired or replaced. These pose safety hazards to occupants. Fire alarm system should be serviced and repaired and be upgradable for future voice communication.





2. Low flow plumbing fixtures

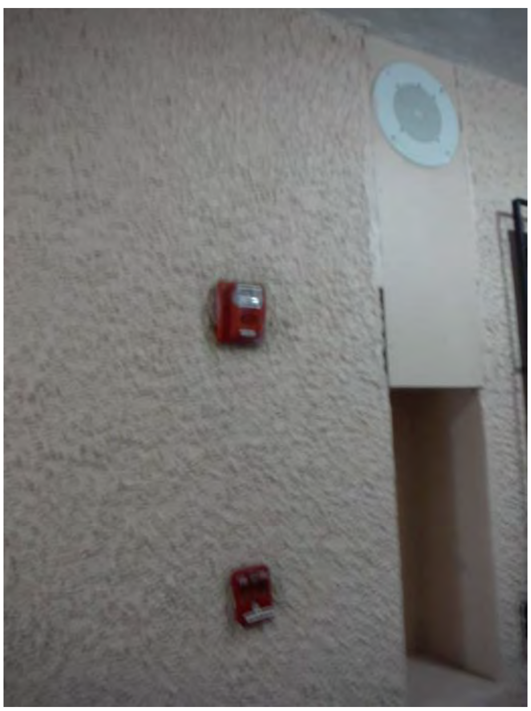
   Low flow fixtures were installed in portion of the school. At Building 01, push button faucets with aerators and 1.28 gallon per flush (gpf) water closets were installed. However, urinals were 1.0 gpf.



H. John Woodson Junior High School

1. Fire alarm system

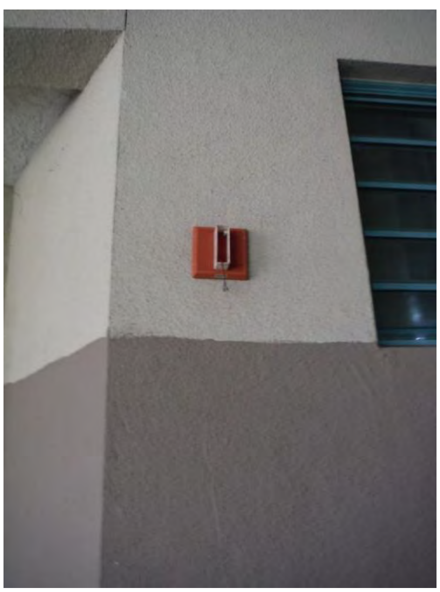
OIA Phase II found the fire alarm system was inoperable. At the start of Phase III, the fire alarm system remained inoperable. Fire alarm panel power was off, wires were removed from the fire alarm panel terminals, and batteries were disconnected. Defected manual pull stations were not repaired or replaced. These are safety hazards to the occupants. Fire alarm system should be serviced and repaired and be upgradable for future voice communication.



I. St. Croix Education Complex

1. Fire alarm system

OIA Phase II found the fire alarm systems were inoperable. At the start of Phase III, fire alarm systems were still inoperable. Power to the fire alarm panels were off, batteries were disconnected, and defected fire alarm devices were not repaired. These are safety hazards to the occupants. The fire alarm system should be serviced and repaired and be upgradable for future voice communication.



2. Fire pump, fire sprinkler and standpipe system

   OIA Phase II found the fire pump, fire sprinkler and standpipe systems required service and repair. At the start of Phase III, no service and repair work had been completed for fire sprinkler and standpipe systems. These pose safety hazards to the occupants. Fire pump, fire sprinkler and standpipe systems should be serviced and repaired.

3. Electrical system

   Main distribution equipment located outdoors in outdoor enclosures are in satisfactory condition. However, equipment enclosures were not locked exposing live electrical parts if opened.

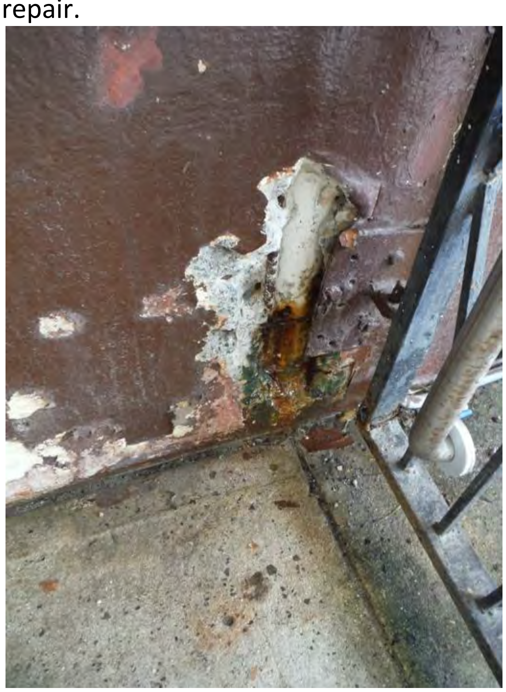
J. Evelyn Williams Elementary School

1. Fire alarm system

OIA Phase II found the fire alarm system was inoperable. At the start of Phase III, fire alarm system remained inoperable. Fire alarm panel had numerous trouble and alarm signals. Defected manual pull stations were not repaired or replaced. These pose safety hazards to the occupants. Fire alarm system should be serviced and repaired and be upgradable for future voice communication.

2. Building 01

At the time of the initial Phase III site visit, the encased down spout was leaking and needed repair.



3. Air conditioners' condensate drain

Air conditioners' condensate drains discharged or dripped to the walkway. These are creating slipping hazards as well as damaging the walkway surface. Condensate drain should be piped and discharged to proper location, such as waste line or dry well.

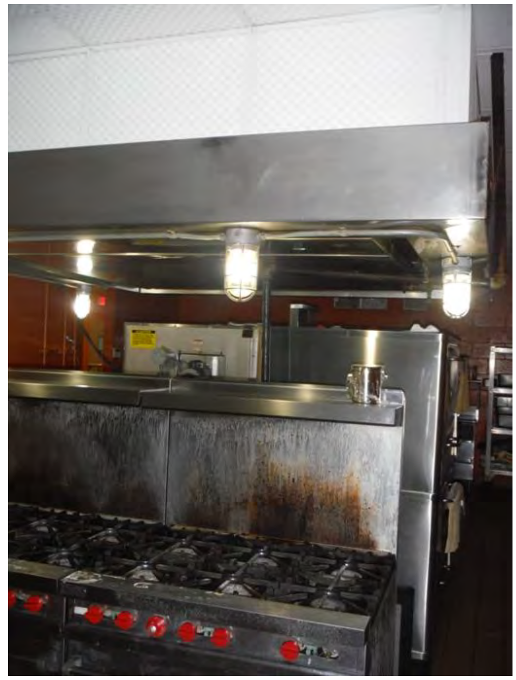
4. Electrical system

WAPA transformer installed in poor location and should be relocated for better access and safety.

K. Alexander Henderson Elementary School

1. Kitchen

   OIA Phase II found that the kitchen hood lacks a fire suppression system. At the start of Phase III, kitchen was being upgraded with new appliances under VIEO's Energy Saving Performance Contract (ESPC). Kitchen hood fire suppression system was not included in the ESPC scope. Lack of fire suppression to the kitchen hood is a fire safety hazard. We recommend including the kitchen hood fire suppression system in the upcoming ESPC.



2. Electrical system

   New WAPA pad mounted transformer installed above roadway and old transformer removed within fenced area.

L. Julius Sprauve Elementary School

1. Fire alarm system

OIA Phase II survey found no fire alarm system at the campus. A fire alarm system was installed prior to the initial Phase III survey, alleviating the safety hazard to the occupants. It is recommended that new fire alarms be upgradable for future voice communication.

2. Electrical system

A 100kW FEMA generator is located at main campus. A 72kW FEMA generator is located at the annex building. Both generators are in fair condition but the 72kW generator doesn’t start and requires servicing.

IV. ADJUSTMENTS TO PRIORITIZATION

While none of the MEP H/S issues noted in Phase II were known to have been repaired, the site visits at the start of Phase III identified additional MEP H/S issues. The facility database was updated accordingly so that these issues would be addressed in the DM Reduction Program work plan. Database updates include:

1. DM cost estimates for the electrical service upgrades for transformer relocation work at C. Amalie, J. Gomez, E.B. Oliver and E. Williams
2. DM cost estimate for the emergency shelter standby electrical power systems for C. Amalie.
3. Changed most of the fire alarm repair work from level 2 and 3 DM items to high priority H/S items

V. ENERGY AUDIT ASSESSMENT UPDATE FOR PHASE III

1. Recap and Update of Phase II Energy Audit Findings

The chart below (adapted from the chart shown on p. 20 of the Phase II report) provides an overview of the ECMs that were recommended for the USVI per th3e 2013 assessment and the revised analysis. At the time of the 2013 assessment, the total annual savings was estimated at $4.4 M (2013 dollars) at a total investment cost of $34.8 M for the Primary ECMs that were recommended.

Based on the follow-up survey, several ECM's were implemented, primarily for replacing T-12 with T-8 lighting and selective replacement of plumbing fixtures with low flow fixtures in the schools in the USVI. Our updated analysis, which has been revised to reflect the implementation of T-8 lighting retrofits, and selective replacement with low flow plumbing fixtures in USVI, is summarized in the table below:

Energy Audit ECM Recommendations	2013 Energy Audit Findings	2015 Revised Energy Audit Findings
ECMs - Electric		
New Solar Hot Water or Heat Recovery System	ECM Recommended – Primary Recommendation	ECM Recommended – Primary Recommendation
Replace T12 Fixtures with T8 LED	ECM Recommended – Primary Recommendation	Already completed
Replace T8 Fluorescent Lamps with T8 LED	ECM Recommended – Primary Recommendation	ECM Recommended – Primary Recommendation
Programmable Thermostats for AC	ECM Recommended – Primary Recommendation	ECM Recommended – Primary Recommendation
Roofmount 30-200 KW PV system	ECM Recommended– Other, feasible if funding permits	ECM Recommended– Other, feasible if funding permits
Fix Supply Air Discharge Duct Leaks	ECM Recommended – Primary Recommendation	ECM Recommended – Primary Recommendation
New Lighting Controls	ECM Recommended – Primary Recommendation	ECM Recommended – Primary Recommendation
New VFDs/High Efficiency Booster Pump Motors	ECM Recommended – Primary Recommendation	ECM Recommended – Primary Recommendation
New Heat Recovery/ Desuperheater System	Not proposed	Not proposed
Insulate Non-insulated Roofs	Not proposed	Not proposed
Replace AC Systems with High Efficiency Units	Not proposed	Not proposed
Retrofit with Ultra Low Flow Plumbing Fixtures	Not proposed	Not proposed
Total Investment ($M) - Primary ECMs	$34.8	$35.0
Simple Payback (years) - Primary ECMs	8	8
Investment Capitalization (years) - Primary ECMs	8	8
Dollar Savings (millions per year) - Primary ECMs	$4.4	$4.2
Percent Reduction in Utility Costs - Primary ECMs	56%	54%
Total Investment ($M) – All Feasible ECMs	$53.7	$53.4
Simple Payback (years) – All Feasible ECMs	10	11
Investment Capitalization (years) - All ECMs		11
Dollar Savings (millions per year) - All ECMs	$5.2	$5.0
Percent Reduction in Utility Costs - All ECMs		64%

Green	ECM Recommended – Primary Recommendation
Blue	ECM Recommended– Other, feasible if funding permits
Tan	Not proposed

The updated analysis, which includes the retrofit of the recently installed T-8 with LED linear lamps for an additional 30% improvement in energy efficiency for lighting, suggests that the implementation of the Primary ECM's will still be cost effective, with the total annual savings for all Primary ECM's totaling $4.2 Million at a total investment cost of $35.0 Million. The total annual savings with all additional feasible ECM's, including replacement of all of the air conditioning equipment with high efficiency units and the replacement of all remaining plumbing fixtures with low flow plumbing fixtures, would increase to $5.0 Million at a total investment cost of $53.4 Million. The implementation of these additional feasible ECM's would also have a significant positive impact on addressing the DM for the replacement and maintenance of these items.

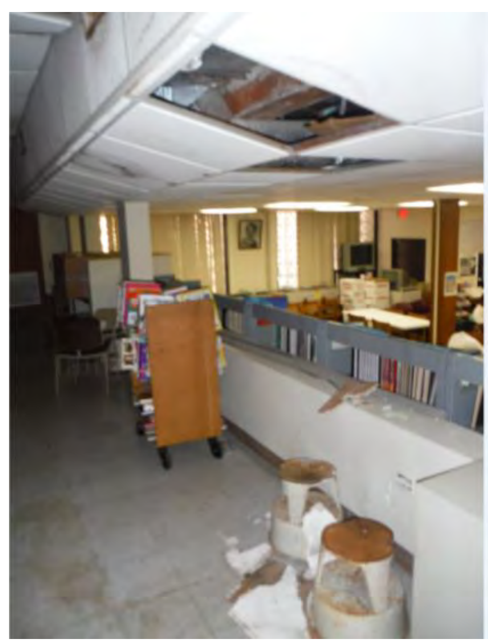
VI. PROJECT RECOMMENDATIONS

Following are descriptions of Mechanical/ Plumbing/ Electrical Health and Safety Issues of prominent concern, as well as some other common repair issues, along with recommended repair solutions. These are provided to assist in scoping these types of projects.

1) HVAC Systems
   a) Air conditioning equipment:
      Most schools at UVSI use unitary air conditioning systems including ducted split and packaged air conditioners. When air conditioners are replaced, the following recommendations should be considered:
      - EPA approved refrigerant, high efficiency system and corrosion protective coating air conditioning equipment should be used.
      - Implement energy conservation programs such as temperature set back or turn off air conditioning based on school activity schedules. Programmable thermostats or centralized controls should be used.
      - Placement of condensing units should consider maintenance accessibility, required operation clearance, acoustical impact to classrooms; minimize penetrations to building envelopes and hurricane protection.
      - Remove old air conditioning equipment and seal all unused penetrations.

   b) Indoor air quality:
      Ventilation should conform to ASHRAE 62.1. Space comfort level should conform to ASHRAE 55.1. HVAC system deficiencies will cause poor indoor air quality, health hazards and damage to building elements and contents.

      Location: A. Cancryn JH Building 08, Office & Library
      Roof leaks damaged insulation of air ducts. Subsequently, condensation occurred on air ducts and aggravated ceiling damage and high indoor humidity issues.



Location: E. Christian JH Building 02, Classrooms & Library
Air conditioners were broken at Library. Library was closed due to high room temperature and humidity.

Recommendations:

- Repair air conditioning deficiencies in timely manner. Repair water leaks and condensation as soon as possible.
- Maintain inadequate outside air and space comfort levels to the occupied spaces per ASHARE standards.

c) Condensate drain:
Location: E. Williams ES.
Condensate drains discharged to sidewalks and overhung eaves. They caused slipping hazards and promote vegetation growth at the eaves, which impact roofing.

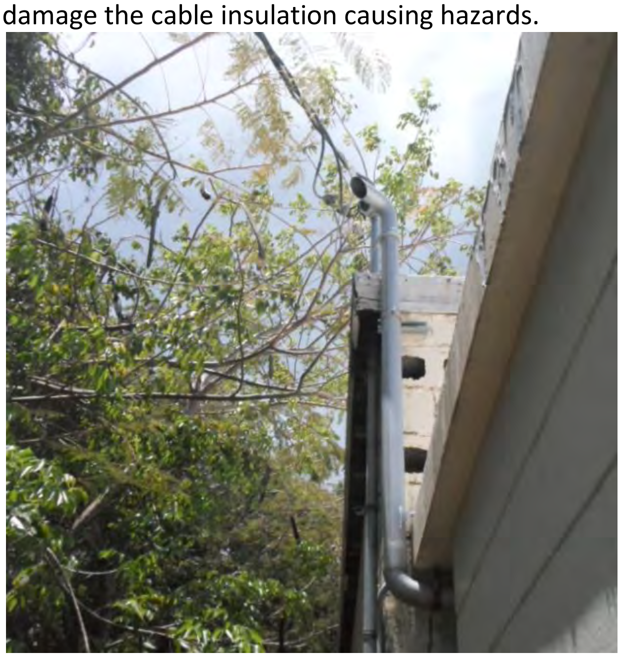

Recommendations:

- Provide proper sized and sloped condensate drain lines to collect and convey the condensate drain. Minimum 1” (25 mm) diameter pipe and 2% slope are preferred. Provide clean out not more than 180 degree change in direction and 50 ft apart.
- Condensate drain should discharge to dry well or indirect drain with P-trap to waste line.

2) Generator ventilation and exhaust
Standby power generator installation should have proper ventilation and exhaust in accordance with manufacturer requirements, Internal Mechanical Code (IMC) and International Fire Code (IFC).

Location: Charlotte Amalie HS Building 5, Auditorium
Normal vent and emergency vents of aboveground fuel tank were not piped to outside per IFC requirements. Generator engine exhausts terminated by the sidewalk did not comply with IMC and IFC, and posted safety and health hazard to occupants.


Location: Claude O. Markoe ES Building 2, Storage
Engine exhaust discharged underneath of the utilities cables. Hot engine exhaust fume could damage the cable insulation causing hazards.



Location: St. Croix Education Complex Building 4, Agriculture / Green House.
Radiator exhausts were not connected to exhaust louvers. Hot air could not leave the room and recirculate to radiator causing generator overheat and operation problem.

Recommendations:

- Require qualify engineer and technician to install and commissioning the standby generator system.
- Install and commissioning system in accordance with applicable codes and standards, and manufacturer requirement and recommendations.
- Consult with fire department for generator and fuel system installation requirements.

3) Hot water heaters

Installation of hot water heater should be in accordance with IMC and National Electrical Code (NEC). Hot water heater should be secured. Temperature and pressure relief should be piped to above floor. Hot water heater should not be installed inside the electrical room.

Location: A. Henderson Building 2, Cafetorium; A. Andrews Building 2, Cafetorium;

Recommendations:

- Install hot water heater in accordance with applicable codes and standards. Provide seismic restraints, relief valve piping and service clearance.
- Relocate hot water heater from electrical room equipment room, or provide separation between hot water heater and electrical equipment.

4) Pipe supports
Piping, and ducting and equipment should be proper to support and secure against gravity, vibration, thrust, expansion and seismic loads.

Location: Charles Emanuel ES Building 01, Library & Cafeteria.
Waste piping was separated due to snapped pipe stripe supports causing waste spilled inside the crawl space.

Recommendations:
- Use proper anchor, hanger and pipe support system, such as steel rod, ring hanger, clevis hanger, and trapeze hanger.
- Use corrosion resistant material and coating for pipes and supports at humid and corrosive environment.

5) Booster pumps and cisterns
Provide reliable water supply to schools for sanitation purposes.

Location: A. Henderson ES Building 01, Classroom
One booster pump was installed without spare pump. School water supply would be affected if booster pump broke.

Location: A. Andrews ES Building 01, Classroom
Sewage pipe runs inside the cistern. Cistern was abandoned due to sewage contamination.

Recommendations:
- Install spare pump as redundancy, or provide a spare pump on site.
- Coordinate with EPA and Health department to maintain water quality assurance program.

6) Kitchen hood fire suppression systems
UVSI schools have kitchens to cook meals at the campuses. Cooking hood should be installed and maintained in accordance with IMC and IFC, including ventilation system, fire suppression system and interlocks to associated systems such as fuel supply and fire alarm system. IFC requires automatic fire suppression system for Type I commercial cooking hood, which generates grease and smoke. Most of the Type I hoods had no automatic fire suppression systems.

Recommendations:
- Install automatic fire suppression systems to Type I cooking hoods in accordance with IMC, IFC, fire department requirements and applicable codes and standards. Systems should be designed, installed and commissioned by qualified engineer and technician.
- If possible, incorporate into the ESPC kitchen renovation projects to complete the project at the same time.

7) Fire sprinkler / standpipe / fire pump systems

Location: St. Croix Educational Complex
Wet based fire protection systems including fire sprinkler, standpipe and fire pump were not maintained and tested in accordance with NFPA standards. Fire hoses were missing at fire hose cabinets. Sprinkler risers were obstructed by combustible materials. Flow test header and fire pump were not maintained and tested. Fire protection systems are fire and life safety systems to protect the occupants and the properties. They should be maintained and serviced regularly to ensure their functions and performance. They should be repaired as soon as impairment is required.




Recommendations:

- Provide regular maintenance to the water based fire protection systems in accordance with NFPA 25.
- Conduct regular tests and fire drills; invite and coordinate fire department participation.
- Establish fire safety awareness program to promote fire safety awareness to the staff and occupants.

8) Fire Alarm Systems
Location: All schools

USVI Fire Department enforces International Fire Code 2012 (IFC). Fire alarm systems should have manual pull stations and emergency voice alarm communication systems (EVAC) throughout the campus, except the previously approved system. Only Lockhart ES fire alarm system was operational during the Phase III survey. Other schools have no fire alarm system, obsolete systems, or systems that are turned off due to unresolved trouble alarms. Fire alarm systems were not maintained and serviced. These are critical safety systems and should be maintained and serviced by qualified technician to ensure reliability and functionality.

Recommendations:

- Install and upgrade fire alarm system in accordance with IFC 2012 and fire department requirement.
- Provide regular maintenance to the fire alarm system in accordance with NFPA 72.
- Fire alarm works should be designed and installed by qualified engineer and technician. Systems should have local support for parts and technical support.
- Create a fire alarm technical team within VIDE to perform the trouble shooting, repair, maintenance and routine testing and certification.
- Conduct regular test and fire drill. Coordinate and invite fire department to participate fire test and fire drill.
- Establish fire safety awareness program to promote fire safety awareness to the staffs and occupants.

9) Electrical Systems
a) Transformer Location
Location: Charlotte Amalie High School and E. Benjamin Oliver Elementary School

Existing transformers are located in a room that is not rated for use as a transformer vault.

Recommendations:

- Install new pad mounted exterior transformer and remove existing transformers from interior room.
- Installation of new pad mounted transformer will require shutdown of electrical services
- Site of new pad mounted transformer will need to be coordinated with WAPA

- Installation requirements per WAPA Standards

Location: Evelyn Williams Elementary School

Existing exterior transformer is not installed in suitable location due to access and safety concerns.

Recommendations:

- Install new pad mounted exterior transformer and remove existing transformer
- Installation of new pad mounted transformer will require shutdown of electrical services
- Site of new pad mounted transformer will need to be coordinated with WAPA
- Installation requirements per WAPA Standards

b) Main Distribution Equipment

Location: Addelita Cancryn Junior High School

Main electrical distribution equipment located in basement of the administration building (Building 8) which is prone to flooding

Recommendations:

- Provide new electrical distribution equipment in new location above grade level and not in flood prone area. Possible location would be a new room adjacent to the existing structure.
- New equipment should be sized for existing power demand plus an additional twenty five percent
- Existing site conditions and building service locations will determine the route to reconnect electrical services.
- Remove electrical equipment from basement area.

c) Service Entrance

Location: Addelita Cancryn Junior High School

WAPA overhead service to electrical service equipment appears to be too low and routed through trees.

Recommendations:

- Convert service from overhead to underground distribution.

- Existing site conditions and coordination with WAPA will determine the route of the new service.
- Installation requirements per WAPA Standards
- New service equipment shall be sized for existing power demand plus an additional twenty five percent

d) Receptacles
Location: Various Schools

Additional or insufficient classroom receptacles.

Recommendation:
- Determine amount of additional receptacles required based on the number of classrooms.
- Upgrade electrical service equipment to accommodate the additional power demand of adding the receptacles plus an additional twenty five percent.
- Upsizing existing equipment will result in power outages for installation.
- Provide new branch circuiting for new receptacles. Routing will be determined by existing site conditions.
- Installation per current code requirements

e) Equipment
Location: Various Schools

Replace damaged or dilapidated electrical equipment.

Recommendations:
- Provide new electrical distribution equipment. If extended outages are acceptable, the existing equipment can be removed and the new equipment can be installed in the same location. If not, the equipment will need to be installed at a new location to minimize the outage time.
- All New equipment shall be sized for existing power demand plus an additional twenty five percent
- Existing site conditions and building service locations will determine the route to reconnect electrical services.
- Installation per current code requirements

STRUCTURAL SUMMARY REPORT
UNITED STATES VIRGIN ISLANDS
October 2015

Prepared by:
Martin & Chock, Inc.

I. Prioritization of Structural Repairs Prior to Phase III Site Visits

A list of prioritization of repair projects was compiled based on the ratings of the Phase II building assessments. The Phase II Assessments entailed rapid observations of damage to non-concealed structural elements. At the top of the list are all buildings with structural damage identified as a life safety issue. Table 1 below presents a summary of all building damage identified as a life safety concern prior to the Phase III site visits.

	SCHOOL	BUILDING ID / DESCRIPTION	LIFE SAFETY ELEMENT
STX	**Charles Emanuel Elementary School**	02-Class Room	CIP Beam & Slab - Roof
		03-Class Room/Storage	Crawl Space
		07-Class Room	CIP Beam & Slab
		07-Class Room	CIP Beam & Slab - Roof
	Juanita Gardine Elementary School	12-Gym	CIP Column - Floor
STJ	**Julius E. Sprauve School**	05-Classroom B	CIP Beam & Slab
		05-Classroom B	CIP Beam & Slab - Roof
		05-Classroom B	Steel Joists, Beams & Slab on Columns
STT	**Addelita Cancryn Junior High School**	08-Admin & Library	Slab Only - Floor
	Charlotte Amalie High School	11-B-2	Slab Only - Floor
		20-Cottage	CIP Column - Floor
	Jane E. Tuitt Elementary School	02-Computer server	Wood Joists
		02-Computer server	Wood Roof Decking
		02-Computer server	Wood/Flat or Pitched
	Joseph Sibilly Elementary School	09-C	CIP Column - Floor
	Ulla F. Muller Elementary School	03-Cafeteria & Classrooms	CIP Beam & Slab - Roof
		04-Classrooms /Main Office	CIP Beam & Slab
		04-Classrooms /Main Office	CIP Beam & Slab - Roof

Table 1 – Summary of Life Safety Items Prior to Phase III Site Visits

II. Phase III Site Visits

The purpose of the Phase III site visits was to:

- Get input from the stakeholders in the Territory
- Evaluate new life safety issues that were not previously identified or conditions that were identified but need to be elevated to the highest level priority.
- Determine if the high priority conditions identified during Phase II have changed appreciably.
- Outline a scope of work for the health and safety items.

Based on the prioritization exercise performed by our office and input from stakeholders in the Territory, the following school buildings were re-visited during our March 2015 visit to all three islands in the Territory:

Monday, March 9, 2015 (Saint Thomas)
1. Charlotte Amalie High School Buildings 10, 20, 26, 29, 30 and Walkways
2. Jane E. Tuitt Elementary School Buildings 2, 4, and 5

Tuesday, March 10, 2015 (Saint Thomas)
1. Addelita Cancryn Junior High School Buildings 2, 3, 7, 8, and 13
2. Ulla Muller Elementary School Buildings 3, 4, and 5
3. Joseph Gomez Elementary School Building 4

Wednesday, March 11, 2015 (Saint Croix)
1. Elena Christian Junior High School Buildings 4, 5, 6, and Walkways.
2. John Woodson Junior High School Building 4 and Walkway
3. Saint Croix Educational Complex Building 3
4. Evelyn Williams Elementary School Buildings 4, 6, and 11

Thursday, March 12, 2015 (Saint John)
1. Julius Sprauve School Building 5

III. General Observations and Additional Findings during Phase III Site Visits

In general, it was observed that several structural repairs had been performed based on the assessments performed during Phase II of the project. The repairs typically addressed life safety issues. In terms of completed repairs, the following buildings are of particular interest:

A. Charlotte-Amalie High School Building 10
B. Julius Sprauve Building 5
C. Elena Christian Junior High School Buildings 1 through 6 and campus walkways

In terms of new life safety damage observed, the following buildings are noteworthy of discussion:

D. Charlotte-Amalie High School Building 30 and the campus walkways
E. Ulla Muller Elementary School Building
F. Evelyn Williams Elementary School Buildings 4 and 11

This section will provide a discussion of the findings at these building locations. Buildings with completed repairs will be discussed thoroughly while buildings with new life safety concerns will only be briefly listed. A thorough discussion on the latter buildings is provided in Appendix A at the end of this report.

A. Charlotte Amalie High School Building 10

Building 10 (Classroom Building) is a two-story building with a flat roof. The building is framed in reinforced concrete, concrete masonry unit (CMU), and structural steel. The second floor and the roof consist of metal decking with concrete topping spanning between structural steel open web joists. The joists are in turn supported on reinforced concrete beams or CMU walls. On the south side of the building, the second floor framing extends beyond the exterior wall of the building to create a walkway for classroom access. The roof slab also extends beyond the building envelope to provide a roof over the second floor walkway. The edge of the walkway framing at both the second floor and at the roof is supported by reinforced concrete beams bearing on structural steel pipe columns. Two reinforced concrete and CMU-framed stairs exist on the south side of the building.

During the Phase II site visit (March 2013) to this school, it was observed that at the second floor, the base of the pipe columns at the walkways had corroded and initiated spalling of the slab edge. The extent of the spalls (open and closed) varied depending on location along the building length. The spalls were likely caused because the base plate at the bottom of the pipe column is embedded on a concrete curb at the edge of slab instead of being raised above the top of the curb. With the observed column base detail, water appeared to pond on top of the curb resulting in corrosion of the column base plate. Although these spalls were a life safety concern (falling hazard to the occupants of the building), a health and safety flag was inadvertently omitted during the Phase II assessment.

Prior to the Phase III site visit, the USVI Department of Education informed the OIA team that repairs had been recently performed to this building to address spalls identified during the Phase II assessments. During the Phase III site visit (March 2015), it was observed that repairs had indeed been performed to the pipe column base plates at the second floor walkway. The repairs were of several different types. In some instances, the damaged and loose concrete around the base plates had been removed and patch repair had been performed. In other cases, a concrete pedestal had been built to encapsulate the bottom of the column including the base plate. A third type of repair in which a portion of the pipe column at the bottom had been cut, removed, and replaced was also observed.

While the repairs appear to have addressed the life safety issue created by the loose concrete around the column base plate, the base plate remains partially embedded below the top of the curb. The repaired base plate is, thus, still prone to corrosion that will eventually spall the repaired curb and slab edge again. The performed repairs are, therefore, only effective in the short term. A suggested long term solution is to construct a new concrete pedestal (with the top higher than the top of the curb) on which the pipe column base plate can be set. The base plate would be elevated from the pedestal by a grout bed.

CHARLOTTE AMALIE HIGH SCHOOL BUILDING 10 COMPLETED REPAIRS

Phase II Site Visit (March 2013)	Phase III Site Visit (March 2015)
	
	
	
	

B. Julius Sprauve School Building 5 Completed Repairs

Building 5 is a two-story building with a flat roof. The building is framed in reinforced concrete and structural steel. The second floor and roof framing typically consists of metal deck with concrete topping over open web steel joists. On the south side of the building (access walkway to the classrooms), the second floor and roof framing is supported on continuous reinforced concrete beams. These concrete beams are in turn supported by structural steel pipe columns. A reinforced concrete stair exists on each end of the building (two stairs total).

During the Phase II site visit (March 2013) to this school, it was observed that the concrete beams supporting the walkway framing at the second floor were in poor condition due to extensive and widespread spalls with severe loss of reinforcing steel and concrete cross section. It appeared that structural steel wide flange beams had at one point been added to strengthen the damaged concrete beams. However, the steel beams themselves were observed to be in poor condition with extensive corrosion and loss of cross section. The supporting steel pipe columns were also observed to be in corroded. Overall, it appeared that the structural integrity of the support system for the second floor and roof framing on this side of the building had been severely compromised. The observed damage was, thus, identified as a life safety condition.

During the Phase II site visit, it was also observed that severe damage in the form of spalls and cracks existed on the underside of the concrete slabs framing the stairs at each end of the building. The spalls were extensive, with severe loss of cross section of the bottom reinforcing bars in the slab. Similar types of spalls were also observed on the roof slab overhang at the north side of the building. All soffit spalls were identified as a life safety issue due to potential falling hazard to building occupants. Prior to the Phase III site visit, the USVI Department of Education informed the OIA team that comprehensive structural repairs had been performed to this building in mid-2013 to address the life safety items identified during the Phase II assessments. The DOE provided the OIA team with documentation (including repair drawings by Paul Ferreras, PE dated May 8, 2013) of the completed repairs.

During the Phase III site visit (March 2015) it was observed that the both the second floor walkway and the stair framing had been thoroughly repaired. At the walkway, the concrete beams had been restored to their original cross section. Structural steel wide flange beams had been added under the concrete beams at each bay. The steel pipe columns had also been repaired and stiffened with structural steel channel reinforcement. All work at the walkway appeared to be in accordance with the repair documents provided by the USVI DOE.

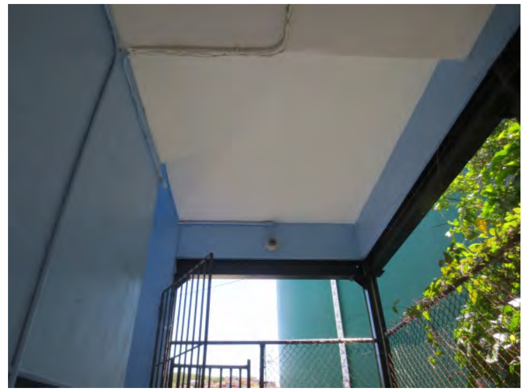
In terms of the stair framing, all spalls were observed to have been repaired. The repairs appeared to be in good condition and in conformance with the repair documents provided by the USVI DOE.

JULIUS SPRAUVE SCHOOL BUILDING 5 COMPLETED REPAIRS

Phase II Site Visit (March 2013)

Phase III Site Visit (March 2015)

JULIUS SPRAUVE SCHOOL BUILDING 5 COMPLETED REPAIRS (continued)

Phase II Site Visit (March 2013)	Phase III Site Visit (March 2015)
	
	
	
	

C. Elena Christian Junior High School Buildings 1 Through 6

All buildings in this high school campus, with the exception of Building 7, are structures framed in structural and cold-formed steel. Floors and roofs typically consist of metal deck with concrete topping over structural steel open web joists. The floor and roof joists are typically supported on structural steel wide flange (W) beams. The beams are in turn supported by structural steel W columns. All structural steel is concealed by non-structural cladding.

During the Phase II site visit (March 2013) to this school, it was observed that the non-structural cladding had failed at several locations throughout the campus. In some cases, the structural steel beams and columns were exposed and were observed to have developed minor to moderate corrosion. At the time of this site visit, no severe loss of cross section was observed in any of the exposed structural steel members. Hence, there were no health and safety items identified on this campus.

Prior to the Phase III site visit, the USVI Department of Education (VIDE) had expressed concerns about the performance of structural and non-structural elements at this school. The OIA team was informed that several elements of the buildings' envelope have warped and in some cases fallen onto the school grounds. The team was also informed that several repairs to these envelope elements have been performed since the Phase II site visit.

During the Phase III site visit (March 2015), it was confirmed that the damage to the non-structural cladding has progressed and worsened. The cladding material appeared warped and in some cases the seams between adjacent cladding panels have come apart creating an avenue for moisture and salt to penetrate through the envelope and reach the structural steel. Progression of the damage was most apparent at the trellis in front of the Building 2 (Library Building) and at the facades of Buildings 4 (Classroom Building) and 5 (Classroom building) facing the interior courtyard.

It was also apparent that repairs to the non-structural cladding had been performed, especially on the side of a second floor spandrel beam at Building 5. It was reported by VIDE personnel during the visit that a large portion of the cladding at this location had recently fallen and damaged a metal railing on the ground floor below.

In terms of structural damage, it was observed that corrosion to exposed structural steel members has continued to develop since the Phase II visit. Increases in corrosion were most evident at two ground floor columns at Building 4 and at several columns on the walkway connecting Buildings 4 and 5. Although damage to the exposed structural steel members has increased, no members with severe loss of cross section were observed. Consequently, no structural life safety flags were added to any of the buildings on this campus.

ELENA CHRISTIAN JUNIOR HIGH SCHOOL BUILDINGS 1 THROUGH 6

Phase II Site Visit (March 2013)

Phase III Site Visit (March 2015)

ELENA CHRISTIAN JUNIOR HIGH SCHOOL BUILDINGS 1 THROUGH 6 (continued)

Phase II Site Visit (March 2013)	Phase III Site Visit (March 2015)
	
	
	
	

D. Charlotte-Amalie High School Building 30 and the campus walkways

At Building 30 (Electrical and Carpentry Shop), there were two structural steel columns that were observed to be severely corroded. Both of these columns had experienced a significant reduction in cross section. These damaged columns have now been identified as a life safety concern.

Damaged steel columns were also observed at the walkway connecting Buildings 10 (Classroom building) and 11 (Classroom Building). The steel columns were found to have lost a significant portion of their cross section. Similarly to the columns on Building 30, the walkway columns are now identified as a life safety item.

The damage observed at these two structures is thoroughly discussed in Appendix A at the end of this report.

E. Ulla Muller Elementary School Building

During the visit to this school campus, a large crack was observed at a second floor concrete beam at Building 5 (Nursery and Special Education Building). The crack, diagonal in orientation, appeared to extend through most of the cross section of the beam. Due to the nature, size, and extent of the crack, this damaged beam has been noted as being a life safety concern. A comprehensive description of damage observed at this building is included in Appendix A at the end of this report.

F. Evelyn Williams Elementary School Buildings 4 and 11

Structural steel beams with severe corrosion and loss of cross section were observed at Buildings 4 and 11 (Classroom Buildings) on this campus. Review of photographic records from Phase II indicates that this damage was an existing condition during the site visit performed during that phase. It appears that a health and safety flag was inadvertently overlooked during that assessment. The damage to these structural steel members has now been flagged as a health and safety concern. The location and extent of the damage is documented in Appendix A at the end of this report.

IV. Prioritization of Structural Repairs After Phase III Site Visits

Table 2 below provides a summary of all building damage identified as a life safety concern per the Phase II and Phase III site visits. Note that the Phase II and Phase III assessments entailed rapid observations of damage to non-concealed structural elements and thus may not have captured all existing life safety issues.

	SCHOOL	BUILDING ID / DESCRIPTION	LIFE SAFETY ELEMENT
STX	**Charles Emanuel Elementary School**	02-Class Room	CIP Beam & Slab - Roof
		03-Class Room/Storage	Crawl Space
		07-Class Room	CIP Beam & Slab
		07-Class Room	CIP Beam & Slab - Roof
	Juanita Gardine Elementary School	12-Gym	CIP Column - Floor
	Evelyn Williams Elementary School	04-Classroom B	Steel Joists, Beams & Slab on Columns & Walls
		11-Classroom B	Steel Joists, Beams & Slab on Columns & Walls
STT	**Addelita Cancryn Junior High School**	08-Admin & Library	Slab Only - Floor
	Charlotte Amalie High School	11-B-2	Slab Only - Floor
		20-Cottage	CIP Column - Floor
		30-S-1, S-2	Long Span Rigid Frames
		35-Covered Walkways	Steel Canopy
	Jane E. Tuitt Elementary School	02-Computer server	Wood Joists
		02-Computer server	Wood Roof Decking
		02-Computer server	Wood/Flat or Pitched
	Joseph Sibilly Elementary School	09-C	CIP Column - Floor
	Ulla F. Muller Elementary School	03-Cafeteria & Classrooms	CIP Beam & Slab - Roof
		04-Classrooms /Main Office	CIP Beam & Slab
		04-Classrooms /Main Office	CIP Beam & Slab - Roof
		05-Nurse/Spec. Ed.	CIP Beam & Slab

Table2 – Summary of Life Safety Items After Phase II Site Visits

APPENDIX A

SUMMARY OF EXISTING CONDITIONS AND RECOMMENDED SCOPE OF WORK FOR STRUCTURAL LIFE SAFETY ITEMS

Summary of Existing Conditions and Recommended Scope of Work for Structural Life Safety Items

A brief summary of existing conditions and a short description of recommended repair procedures is herein presented for all structural damage observed during the Phase II and Phase III site visits and identified as a life safety item. Photographic exhibits are also included to support the summary of existing conditions.

The summaries are formatted on a building-by-building basis. Where a life safety item is common to more than one building of similar construction and within the same school, the recommendations are applicable to all buildings listed in the summary.

The summaries are provided as a tool to assist the United States Virgin Islands Department of Education in determining scope, cost, and schedule when preparing requests for proposals for the design and execution of repair work. The summaries are not intended to be used directly as requests for proposals.

CHARLES EMANUEL ELEMENTARY SCHOOL BUILDINGS 2 AND 7

Existing Conditions:

Buildings 2 and 7 (Classroom Buildings) are two-story building framed in reinforced concrete and concrete masonry unit (CMU). The second floor and roof framing consists of reinforced concrete slabs and beams. Reinforced concrete columns carry the gravity load down to the foundation. The beams and columns create frames that are typically infilled by CMU walls at the perimeter of the building. At the second floor, the slab typically cantilevers beyond the perimeter of the building to create an awning. At the roof, the slab also creates a short overhang with an approximately 6-inch high concrete upturn/curb at the edge.

Several spalls (open and closed) were observed at the underside of the second floor and roof slab. In some cases, bottom reinforcing bars were found exposed. The largest and most extensive spalls on the underside of the slab were found in the stairwell areas. At these locations, loss of cross section at the bottom reinforcing bars was observed.

Large cracks and open/closed spalls were also observed at the edge of the slab at the second floor (awning) and roof (overhang). At the second floor, the edge spalls were located at locations typically coinciding with roof downspouts (in some cases the downspout is missing allowing rainwater to drain directly through the penetration in the roof slab and on to the second floor awning slab). At the roof, damage to the edge of the slab also coincided with the location of downspouts and overflow scuppers. All cracked and spalled concrete on the underside and edges of the second floor and roof slabs were identified as a life safety concern since they constitute a falling hazard to the building occupants.

Recommended Scope of Work:

01 Conduct a survey of all cracks and spalls (open and closed) at both buildings.
02 Fill all cracks and patch all spalls on the underside and edges of the concrete roof slab per approved concrete repair procedures. Replacement/addition of reinforcing bars may be required over portions of the slab where more than 20% the cross section of the existing reinforcing bars has been corroded.
03 A licensed structural engineer shall conduct all surveys, design all concrete repair details, and prepare all required specifications.

CHARLES EMANUEL ELEMENTARY SCHOOL BUILDINGS 2AND 7








CHARLES EMANUEL ELEMENTARY SCHOOL BUILDING 3

Existing Conditions:

Building 3 (Classroom Building) is a single-story pre-fabricated building with a gable roof. The floor of the building is elevated from the ground and consists of plywood sheathing over structural steel open web joists. The joists are supported by structural steel wide flange (W) and channel (C) beams at the building's perimeter. These beams are in turn supported on wide flange (W) stub columns bearing on a concrete footing (post and pier-type foundation). The walls of the building, as well as the roof, are framed in wood.

The structural steel open web joists and beams were observed to exhibit minor to moderate corrosion. The structural steel stub columns, on the other hand, were found to have moderate to severe corrosion. In some cases, the extent of the corrosion in the stub columns has led to severe loss of cross section. The loss of cross section in the stub columns was identified as a life safety concern.

Recommended Scope of Work:

04 Due to the high repair cost of the structural steel stub columns, beams, joists and concrete footings with respect to the total cost of the building, it is recommended that this building be demolished instead of repaired.

CHARLES EMANUEL ELEMENTARY SCHOOL BUILDING 3

JUANITA GARDINE ELEMENARY BUILDING 12

<u>Existing Conditions</u>:

Building 12 (Gymnasium) is a single-story building framed with structural steel rigid frames supporting a cold-formed steel gable roof. The building envelope consists of concrete masonry unit (CMU) walls. On the south and east sides of the building, a cast-in-place reinforce concrete walkway exists as an extension of the building. The walkway is framed by a concrete slab supported by concrete beams in turn supported on 12-inch square concrete columns. A portion of the walkway on the east side of the building connects the Gymnasium with a storage/gymnasium office located on an immediately adjacent classroom building. The walkway framing at this location is separated from the adjacent classroom building by an expansion/joint.

It was observed that the walkway columns on the south side of the building have extensive cracking. No loss of cross section was observed at these columns. Miscellaneous spalls were also observed on the concrete beams at this location.

On the east side of the building, on the other hand, the concrete columns were observed to have cracked and spalled. Reinforcing was exposed at two locations and a severe loss of cross section was identified at one of the columns. <u>Because of the severe loss of cross section and reinforcing, these columns were tagged a health and safety concern.</u> Various cracks and spalls of different size and extent were also observed on the concrete beams and slabs within this portion of the walkway.

<u>Recommended Scope of Work</u>:

01 At the walkway on the south side of the building, fill all cracks and patch all spalls in concrete columns, beams, and slabs per approved concrete repair procedures.
02 At the walkway on the east side of the building, shore walkway concrete beams as required at locations were the concrete columns have experienced a loss in cross section due to severe spalling.
03 At the walkway on the east side of the building, replace all concrete columns were loss of cross section has occurred: Demolish existing column from top of foundation to underside of concrete beam. Install vertical reinforcing dowels at top of foundation and at bottom of concrete beam. Use adhesive rated for exterior exposure to install reinforcing dowels. Install new column longitudinal and transverse reinforcing bars (longitudinal reinforcing bars to lap with vertical reinforcing dowels). Provide adequate clear cover to all reinforcing dowels and bars. Form and cast new concrete column.
04 At the walkway on the south side of the building, fill all cracks and patch all spalls in concrete beams and slabs per approved concrete repair procedures.
05 A licensed structural engineer shall design all concrete repair/replacement details and prepare all required specifications.

JUANITA GARDINE ELEMENARY BUILDING 12

EVELYN WILLIAMS ELEMENTARY SCHOOL BUILDINGS 4 AND 11

Existing Conditions:

Buildings 4 and 11 (Classroom Buildings) are single-story building framed in reinforced concrete, concrete masonry unit (CMU), structural steel, and cold-formed steel. The exterior walls of the building are typically CMU. The building has a hip roof (framed in cold-formed steel) surrounded by a flat roof framed by one way concrete slabs supported on structural steel beams (wide flange sections) on reinforced concrete columns. The flat roof typically constitutes a covered walkway around the building.

The walkway framing was observed to be problematic, especially at the joints between adjacent buildings. At these locations, one building is typically lower than the other and hence water accumulating on the roof of the lower building spills over to the steel framing of the building with the higher roof (only an un-sealed expansion joint separates adjacent building). In two cases, right atop the concrete column support, the steel beam has corroded to the point where the entire bottom flange and the web have been completely disintegrated posing a structural life safety issue. Albeit less in terms of damage, the corrosion has also extended beyond the support area and into the span of the beam.

Recommended Scope of Work:

01 Provide shoring as required at roof slab and beams.
02 Remove the damaged wide flange (W) beams and replace with new structural steel beams. A hollow steel section (HSS) with welded closure end plates is a better replacement shape than a wide flange (W) section since wide flange sections are prone to deterioration from water accumulating on the top of the bottom flange (Alternatively, a reinforced concrete beam could be constructed as a replacement beam).
03 It is also recommended that the new replacement steel beam be seated on top of a new bearing steel plate that would be raised from the top of the existing concrete column by a bed of non-shrink grout. With this connection detail, the bottom flange of the replacement beam and the bearing plate will not be in direct contact with the larger concrete surface on top of the column where water tends to accumulate.
04 Prepare the replacement steel beams (exterior and exposed) as recommended by the Society for Protective Coatings (SSPC). Apply a three-coat system consisting of one primer coat and one mid-coat of epoxy-polyamide and one finish coat of aliphatic polyurethane.
05 Address the roof drainage issues so that rainwater is diverted away from the exposed structural steel beams (see architectural recommendations).

EVELYN WILLIAMS ELEMENTARY SCHOOL BUILDINGS 4 AND 11








ADDELITA CANCRYN JUNIOR HIGH SCHOOL BUILDING 8

Existing Conditions:

Building 8 (Administration and Library Building) is a two-story building with a partial basement. The basement and first floor are framed with reinforced concrete columns, walls, and one-way slabs. The second floor framing consists of metal deck with concrete topping over structural steel open-web joists and wide flange beams and girders. The roof is hipped and framed with metal decking over structural steel beams.

The basement is divided in two areas: one on the west end of the building under the library and one on the east end of the building under administrative offices. Both basement areas are independently accessed and there is no direct connection between the two. On the west area of the basement, moderate spalls were observed on the underside of the first floor slab and beams. Reinforcing was found exposed and moderately corroded. Two thirds of the west portion of the basement house a cistern that, although full of water, is reported to be abandoned. Only a small spall was observed on the underside of the slab above the cistern. The condition of the retaining walls and slab-on-grade at the cistern could not be assessed due to the water.

On the east area of the basement, moderate to severe spalls with exposed reinforcing were observed throughout the underside of the first floor slab. The spalls were extensive and in some cases, the reinforcing bars (bottom bars) have totally corroded away leaving the slab unreinforced for large portions along its span. An area of severe spalling was also observed on an area of the slab were utility piping has been run through the slab. The perforations for the pipes are oversized and reinforcing that was cut was not adequately trimmed back and patched. Hence, slivers of slab in between the pipes have spalled and broken apart from the slab. A large spall was also observed at one of the retaining walls. No damage was apparent on the top of the slab-on-grade. It was reported by the principal that the east portion of the basement floods regularly (an over-sized and unsealed utility opening was found on the top of one of the walls).

Recommended Scope of Work:

05 At the west portion of the basement, patch all concrete spalls per approved concrete repair procedures.
06 At the east portion of the basement, shore portions of the slab were bottom-reinforcing bars have lost more than 20% of their cross section.
07 At the west portion of the basement, patch all concrete spalls per approved concrete repair procedures. Replacement of bottom bars may likely be required over large portions of the slab where existing bars have lost more than 20% of their cross section. Where spalls occur around pipe penetrations, it is recommended that portions of the slab around the pipes be saw cut and replaced.
08 A licensed structural engineer shall design all concrete repair details and prepare all required specifications.
09 Address drainage issues at trench between the east portion of the building and the adjacent 2-story access ramp structure per Civil Engineer's recommendations.

ADDELITA CANCRYN JUNIOR HIGH SCHOOL BUILDING 8

CHARLOTTE AMALIE HIGH SCHOOL BUILDING 11

Existing Conditions:

Building 11 is a three-story building with a flat roof. The building is framed in reinforced concrete and concrete masonry unit (CMU). The second and third floors as well as the roof consist of reinforced concrete slabs bearing on either reinforced concrete beams (at the perimeter of the building) or CMU walls (in between classrooms). On the south side of the building, the second and third floor slab cantilevers pass the exterior wall of the building to create a walkway for classroom access. The roof slab also cantilevers to provide a roof over the third floor walkway. Two reinforced concrete stairs exist on the south side of the building. Extensive retrofits in the form of structural steel channels bolted to the underside of the second, third, and roof slabs exist throughout the building.

It was observed that at the second and third floors, the base of the metal railing posts at the walkways has corroded and initiated spalling of the slab edge. The extent of the spalls (open and closed) varies depending on location along the building length. The spalls are likely caused because the base plate at the bottom of the railing post is embedded on a concrete curb at the edge of slab instead of being raised above the top of the curb. With the current post base detail, water ponds on top of the curb and accelerates corrosion of the post base plate. These spalls were identified as a life safety concern because they pose a falling hazard to the occupants of the building.

Recommended Scope of Work:

01 Conduct a survey of all cracks and spalls (open and closed) on the underside and edges of the floor and roof slabs along the south side of the building, particularly near railing post connections.

02 Fill all cracks and patch all spalls on the underside and edges of the concrete floor and roof slabs per approved concrete repair procedures. At spalls coinciding with locations of railing posts, clean the post base plate and its fasteners free of rust and replace curb reinforcing bars as required before installing patch material. Note that since the base plate of the railing post will remain prone to corrosion damage due to its elevation with respect to the top of the curb, this spall repair solution will only provide a short term solution.

03 As a long term consideration, replace the railing (or bottom portions of the posts and base plates) such that the post base plates are raised from the top of the curb via a grout bed.

04 It is recommended that the railing, particularly the posts and their base plates) be coated with a paint system appropriate for highly corrosive environments.

05 A licensed structural engineer shall conduct all surveys, design all concrete repair details, and prepare all required specifications.

CHARLOTTE AMALIE HIGH SCHOOL BUILDING 11








CHARLOTTE AMALIE HIGH SCHOOL BUILDING 20

Existing Conditions:

Building 20 (Cottage) is a one-story building with a wood framed gable roof. Reinforced concrete beams and columns support the gravity loads from the wood-framed roof. Columns are typically 24 inches square. Foundations for the columns are below grade. Since the building is located on a sloped site, the columns on the south side of the building extend below the first floor of the building. Spalls with exposed reinforcing were observed at several of the concrete columns. On the North portion of the buildings (on-grade backyard porch), the spalls appear to be initiated by corrosion of electrical metal boxes (at receptacles) and metal conduits. In one case, the cracks and spalls in the columns extend to a header beam over a door opening. No exposed reinforcing was observed in this area of the building. On the south portion of the building (suspended front walkway), three columns were observed to be severely damaged. Here, concrete has spalled leaving reinforcing exposed. At one of the three columns (corner column), the cross section of the column has been reduced to less than 50% of its original size. In the front portion of the building, damage to the columns appears to be the result of insufficient clear cover to the reinforcing.

Recommended Scope of Work:

01 At the north portion of the building (on-grade backyard patio), chip and remove metal electrical boxes and conduit at damaged concrete columns. Install new PVC receptacles and conduit as required.

02 At the north portion of the building (on-grade backyard patio), fill all concrete cracks and patch all concrete spalls in columns and beams per approved concrete repair procedures. Fill all cavities resulting from the removal of electrical boxes and conduit per approved concrete repair procedures.

03 At the south portion of the building (suspended front walkway), shore walkway concrete beams as required at locations were the concrete columns have experienced a loss in cross section due to severe spalling.

04 At the south portion of the building (suspended front walkway), replace all concrete columns were loss of cross section has occurred: Demolish existing column from top of foundation to underside of concrete beam. Install vertical reinforcing dowels at top of foundation and at bottom of concrete beam. Use adhesive rated for exterior exposure to install reinforcing dowels. Install new column longitudinal and transverse reinforcing bars (longitudinal reinforcing bars to lap with vertical reinforcing dowels). Provide adequate clear cover to all reinforcing dowels and bars. Form and cast new concrete column.

05 A licensed structural engineer shall design all concrete repair/replacement details and prepare all required specifications.

CHARLOTTE AMALIE HIGH SCHOOL BUILDING 20

CHARLOTTE AMALIE HIGH SCHOOL BUILDING 30

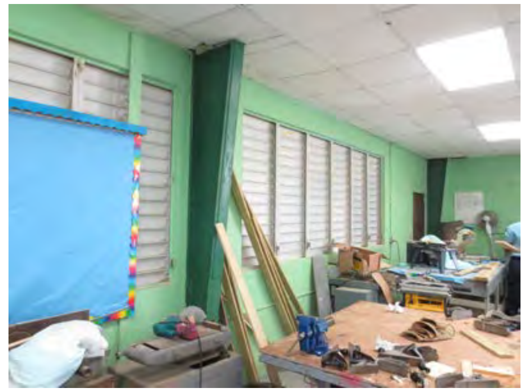
Existing Conditions:

Building 30 (Electrical and Carpentry Shop) is a one-story building with structural steel framing. The framing consists of structural steel rigid frames in the transverse direction of the building. Built-up sections with varying depth are used for the columns and beams in the frames. The frames span the width of the building and support a gable roof framed with cold-formed steel purlins and metal decking. At the base, the columns are connected to the top of the concrete slab-on-grade suggesting and integrated slab-on-grade foundation. Moderate to severe corrosion was observed at the bottom of several of the steel columns that make up the frames. In some cases, more than 50% of the cross section of the column was observed to be lost. The column base plates are severely corroded as well (two base plates have completely corroded away leaving the column practically bearing on top of the slab-on-grade/foundation). Corrosion at the bottom of the columns has occurred because of extensive leaks in the building's envelope (utility penetrations in the perimeter CMU walls and perforations in the roof decking). Because the top of the column base plates are flush with the top of the interior slab-on-grade, water infiltrating through the breaches in the building's envelope pond at the base of the columns. Therefore, the bottom portions of the columns and the column base plates are regularly exposed to rainwater and moisture. Note that this building is naturally ventilated and that there is no cladding/ceiling protecting the steel frames. Therefore, the steel frames are considered exterior and exposed.

Recommended Scope of Work:

01 Perform a survey and assess the condition of all steel columns in the building.
02 Provide shoring as required at the roof beams at locations were corrosion has resulted in loss of cross section at the bottom of the steel columns.
03 Repair all corroded steel columns and column base plates where loss of cross section has occurred: The suggested repair method is to cut-off the corroded portion at the base of the column and replace it with a new steel splice section of equal size and thickness as the existing column. As a preventive measure to minimize future corrosion, it is recommended that the column base plate be raised above the top of the slab-on-grade. This could be achieved by placing a 3-inch thick non-shrink grout bed between the top of the slab-on-grade/ foundation and the bottom of the base plate. The new column splice section would have a base plate shop welded to its bottom and would be fastened to the top of the slab-on-grade/foundation via post-installed anchor rods. The top of the new column splice section would be field welded to the bottom of the existing column.
04 Clean and prepare the steel column and its base plate (exterior and exposed) as recommended by the Society for Protective Coatings (SSPC). Apply a three-coat system consisting of one primer coat and one mid-coat of epoxy-polyamide and one finish coat of aliphatic polyurethane.
05 A licensed structural engineer shall design all structural steel repair details and prepare all required specifications.

CHARLOTTE AMALIE HIGH SCHOOL BUILDING 30



CHARLOTTE AMALIE HIGH SCHOOL WALKWAYS

Existing Conditions:

The walkways connecting the major buildings on the campus consist of structural steel pipe columns supporting a two-way concrete slab. Typical column spacing is approximately 8'-0" on center. Foundations for the columns as well as the column base plates are below grade. Therefore, connection details at the base of the columns could not be observed. Moderate to severe corrosion exists at the bottom of several of the columns, and in some cases, more than 50% of the cross section of the columns has been lost. It is reasonable to assume that the column base plates exhibit similar or more extensive damage than the visible portions of the columns right above grade. Corrosion at the bottom of the columns occurs because the column base plates are embedded below grade. Hence, the bottom portions of the columns are continuously in direct contact with earth, rainwater, and moisture.

Recommended Scope of Work:

01 Provide shoring as required at the walkway roof slab at locations were corrosion has resulted in loss of cross section at the bottom of the steel columns.

02 Remove finish grade to expose the column base plates at all columns and assess their condition.

03 Repair all corroded steel columns and column base plates where loss of cross section has occurred: The suggested repair method is to cut-off the corroded portion at the base of the column and replace it with a new steel pipe splice section of equal size and thickness as the existing column. To prevent the corrosion from reoccurring, it is recommended that the column base plate be raised such that it is a minimum of four inches above grade. To raise the column base plate, it is suggested that a new concrete pedestal be constructed atop the existing foundation. The new pedestal would be connected to the existing foundation via post-installed reinforcing dowels. At the top of the pedestal, the new pipe splice section (with new base plate at the bottom) would be fastened through cast-in anchor rods. Lastly, the top of the new pipe splice section would be field welded all around to the bottom of the existing column.

04 Clean and prepare the steel column and its base and top plates (exterior and exposed) as recommended by the Society for Protective Coatings (SSPC). Apply a three-coat system consisting of one primer coat and one mid-coat of epoxy-polyamide and one finish coat of aliphatic polyurethane.

05 It is recommended that the base plates be raised above grade at all columns per item 03 above, including those were corrosion has not yet resulted in loss of cross section at the column base plate and/or at the base of the column.

06 A licensed structural engineer shall perform all surveys, design all structural steel repair details, and prepare all required specifications.

CHARLOTTE AMALIE HIGH SCHOOL WALKWAYS





JANE E. TUITT ELEMENTARY SCHOOL BUILDING 2

Existing Conditions:

Building 2 (Computer Server Building) is a two-story building of mixed construction. The building is rectangular in plan and has a hip roof. The second floor and roof are framed with wood joists and wood trusses, respectively. At the second floor, perimeter and interior walls are constructed with wood. On the other hand, perimeter and interior walls at the first floor are constructed with masonry. Changes in the type and direction of the second floor and roof framing in the south and east portions of the building suggest that these areas are not part of the original building construction.

It was observed that this building is in an overall detrimental condition. Large cracks and spalls were observed on the exterior masonry walls on the south and east portions of the structure. The second floor framing, particularly on the south portion of the building, was in poor condition due to wet rot of the wood joists and decking. The floor framing was observed to have excessively deflected and a small portion of the framing near the interior stair had partially collapsed. The roof framing over the south portion of the building was also observed to be in poor condition. Several portion of the roof deck exhibit severe wet rot and rainwater is free to infiltrate the interior of the building (the leaks in the roof have likely caused the damage to the second floor framing). Over the original portion of the building, damage to the floor and roof framing was much less extensive than that observed at the south and east extensions to the original building.

Prior to the site visit, the United States Virgin Islands Department of Education mentioned that this building might be considered a historic structure. Such designation has not been confirmed at the time of the preparation of this document.

Recommended Scope of Work:

01 If the building is not classified as a historic structure, it is recommended that it be demolished instead of repaired. This recommendation is based on the high repair cost of the damaged structural members (as well as extensive repairs to non-structural components) with respect to the total cost of the building.

02 In the case the building is classified as a historic structure, repair/replacement of all damaged wood members will be required. It would be of interest to determine if the building extensions on the south and east sides of the structure are classified as part of the historic structure or not. If not, it may be more economically viable to demolish these areas instead of repairing them (note that the worst damage is concentrated on the add-ons to the south and east of the building).

03 A licensed structural engineer shall perform all surveys, design all wood and masonry repair details, and prepare all required specifications.

JANE E. TUITT ELEMENTARY SCHOOL BUILDING 2








JOSEPH SIBILY ELEMENTARY SCHOOL BUILDING 9

Existing Conditions:

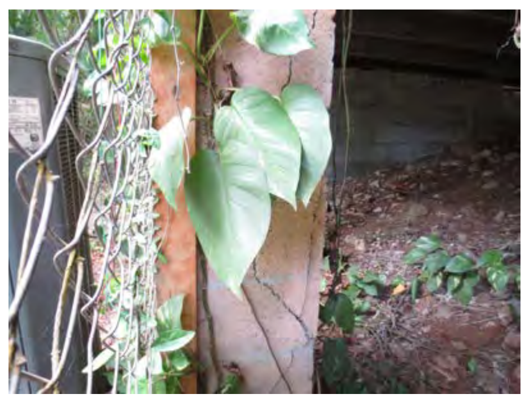
Building 9 is a two-story building of mixed construction. The building is located on a site with a pronounced slope. The first floor consists of single-block concrete masonry unit (CMU) columns and CMU walls (walls are retaining walls on south and east sides of the building) supporting cold-formed steel joists and beams with plywood sheathing. Above the second floor, the framing transitions to wood and consists of single wall construction and sawn lumber roof trusses. Wood sheathing occurs above the trusses.

The single-block CMU columns on the west were observed to have severe cracking that extends across the majority of the cross section. It is unknown whether the columns are grouted. Since these are single-block columns, the extensive cracking is considered a life safety item.

Recommended Scope of Work:

01 Provide shoring as required at the second floor cold-formed steel joist and beams at locations were CMU columns exhibit cracking.
02 Replace existing 8"x16" single-block CMU columns with new 16-inch square CMU columns: Demolish existing column from top of foundation to underside to underside of second floor framing. Install vertical reinforcing dowels at top of foundation. Use acrylic-based adhesive to install reinforcing dowels. Install new column longitudinal and transverse reinforcing bars (longitudinal reinforcing bars to lap with vertical reinforcing dowels). Erect and grout new column (use running bond for placing blocks).
03 Alternatively, replace the existing 8"x16" single-block CMU columns with cast-in-place reinforced concrete columns of equal size. See item #2 above for additional information.
04 Connect existing cold-formed steel joists and beams to top of new column with metal connectors (clips, straps, etc.).
05 A licensed structural engineer shall design all column replacement details and prepare all required specifications.

JOSEPH SIBILY ELEMENTARY SCHOOL BUILDING 9



ULLA MULLER ELEMENTARY SCHOOL BUILDINGS 3 AND 4

Existing Conditions:

Buildings 3 and 4 (Classroom Buildings) are two-story buildings framed in reinforced concrete. Walls and columns are cast-in-place concrete while the floor and roof members are precast pre-stressed tees. Building T has a structural steel and cold-formed steel framed gable roof on top of the flat roof's precast tees.

Moderate to severe spalls were observed at the precast tees at the second floor and at the roof. The spalls are for the most part concentrated on areas where the tees are exposed to weather: at the walkways and at a short overhang around the perimeter of the buildings. In some cases, exposed reinforcing was observed. Closed or partially closed spalls on the underside and on the sides of concrete members are considered a life safety concern for they can detach unexpectedly and fall on building occupants. At the underside of the tees, it was also observed that at the joint between adjacent precast tees, the tooled joint filler has cracked and in some cases fallen. This loose material is also considered a falling hazard and should hence be treated as a life safety issue.

At the precast tees, exposed pre-stressing tendons were observed at two locations on Building 3. It appeared that the concrete had spalled from the underside of the tee's web leaving approximately 4-foot long portions of the tendons exposed. It was not possible to verify the condition of the exposed tendon for the areas around the spall and the tendon itself have been painted white.

Spalls (open and closed) were also observed on the concrete wall that serves as a railing to the second floor walkway that provides access to the classrooms. It was reported by a teacher that a large spall had recently detached from this wall and fallen down to the grounds below.

Spalls were also observed at the bottom of exterior concrete columns near grade. The spalls were moderate, with exposed reinforcing in some cases. Damage to the columns was typically observed to be a result of improper drainage of air conditioning units (water from the units drains directly on to the base of the column).

Recommended Scope of Work:

01 Conduct a structural survey of all exposed precast and cast-in-pace concrete elements. The survey shall document the type, location, size, and extent of all cracks and spalls (open and closed). The survey shall also document the location, extent, and condition of exposed pre-stressing tendons in precast pre-stressed concrete tees.

02 Fill all cracks and patch all spalls in cast-in-in place concrete columns, walls, and beams per approved concrete repair procedures.

03 Fill all cracks and patch all spalls in precast pre-stressed concrete tees per approved concrete repair procedures.

04 Thoroughly clean and remove all rust from exposed pre-stressing tendons in precast pre-stressed tees. Patch the areas around the exposed tendons per approved concrete repair procedures. If it is determined that loss of pre-stressing force in the tendon has occurred, additional reinforcing may be required. A suggested form of additional reinforcing is in the form of glass or carbon fiber sheets bonded to the underside of the web of the affected tee.

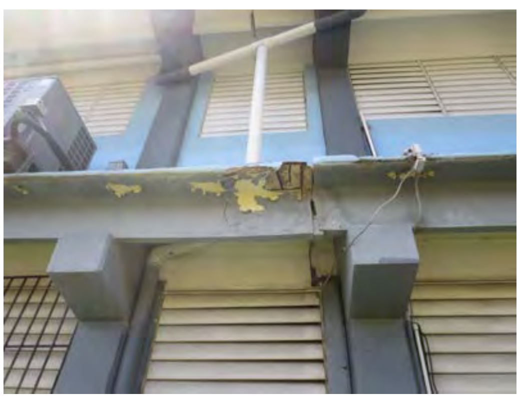
05 Remove all loose and cracked joint fill material from the underside of joints between precast pre-stressed tees. Install new joint filler at all joints.

06 A licensed structural engineer shall perform all surveys, design all concrete repair details, design all pre-stressing tendon repair details, and prepare all required specifications.

ULLA MULLER ELEMENTARY SCHOOL BUILDINGS 3 AND 4








ULLA MULLER ELEMENTARY SCHOOL BUILDINGS 3 AND 4








ULLA MULLER ELEMENTARY SCHOOL BUILDING 5

Existing Conditions:

Building 5 (Nurse/Special Education) is a two-story building framed in reinforced concrete and wood. Walls, columns, and floor slabs are cast-in-place concrete. The gable roof consists of plywood sheathing over prefabricated wood trusses.

On the east side of the building, the second floor framing cantilevers beyond the perimeter of the building to create a walkway for access to the second floor classrooms. Cantilever concrete beams of varying depth typically provide support for this second floor walkway. These cantilever beams were observed to be in poor condition due to severe and widespread spalls with exposed reinforcing. In some cases, the spalls are on the underside of the beam creating a life safety concern (falling hazard).

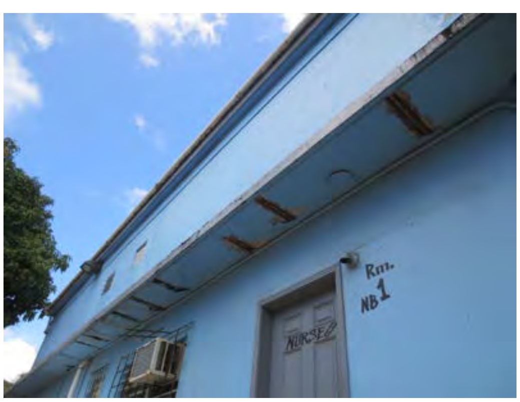
At one location, a simple-span concrete beam instead of a cantilever beam supports the second floor walkway. This simple-span beam spans between the perimeter of the building and a concrete wall supporting an exterior concrete stair. A large diagonal crack extending through most of the cross section was observed near the middle third of the span of this concrete beam. The crack appears to be a shear crack and given the brittle and unexpected nature of a shear failure, the damage on this beam is considered a life safety issue.

On the north, south, and west sides of the building, the second floor concrete slab cantilevers beyond the perimeter of the building to create a short awning. At the underside of this overhang, there are open and closed spalls that coincide with the spacing of what appears to be either reinforcing bars or some type of metal fitting. It has been reported that a large piece of concrete recently detached from the underside of this overhang and fell on top of the entrance to the nurse's room. It was also observed that the underside of the second floor slab at the walkway has been covered up with plywood. It is unknown whether the plywood was added as a protective measure against falling debris from spalled concrete.

Recommended Scope of Work:

01 Provide shoring as required at the second floor walkway slab and beams.
02 Remove plywood sheathing from the underside of second floor walkway slab. Patch all concrete spalls, if any, per approved concrete repair procedures.
03 Fill all cracks and patch all spalls at the cantilever portions of the second floor slab (awning on north, south, and west sides of the building) per approved concrete repair procedures.
04 Fill all cracks and patch all spalls at the cantilever concrete beams supporting the second floor walkway slab per approved concrete repair procedures.
05 Repair, reinforce, and/or replace the second floor walkway concrete beam spanning between building wall and stair wall.

ULLA MULLER ELEMENTARY SCHOOL BUILDING 5



APPENDIX B

SCHOOL CAMPUS MAPS WITH BUILDING IDENTIFICATION NUMBERS

Helber Hastert & Fee

Addelita Cancryn Junior High School

Date: 3/8/2013

0 25 50 100 150 200 250 Feet

N

Helber Hastert & Fee

Charles Emanuel Elementary

Date: 3/8/2013

0 25 50 100 150 200 250 Feet

N

Helber Hastert & Fee

0 25 50 100 150 200 250 Feet

Charlotte Amalie High School

Date: 3/8/2013

N

Helber Hastert & Fee

Elena Christian Junior High School

Date: 3/8/2013

0 25 50 100 150 200 250 Feet

N

Helber Hastert & Fee

0 25 50 100 150 200 250 Feet

Evelyn William Elementary

Date: 3/8/2013

N

Helber Hastert & Fee

Jane E. Tuitt Elementary

Date: 3/8/2013

0 25 50 100 150 200 250 Feet

N

Helber Hastert & Fee

Joseph Sibilly Elementary

Date: 3/8/2013

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N

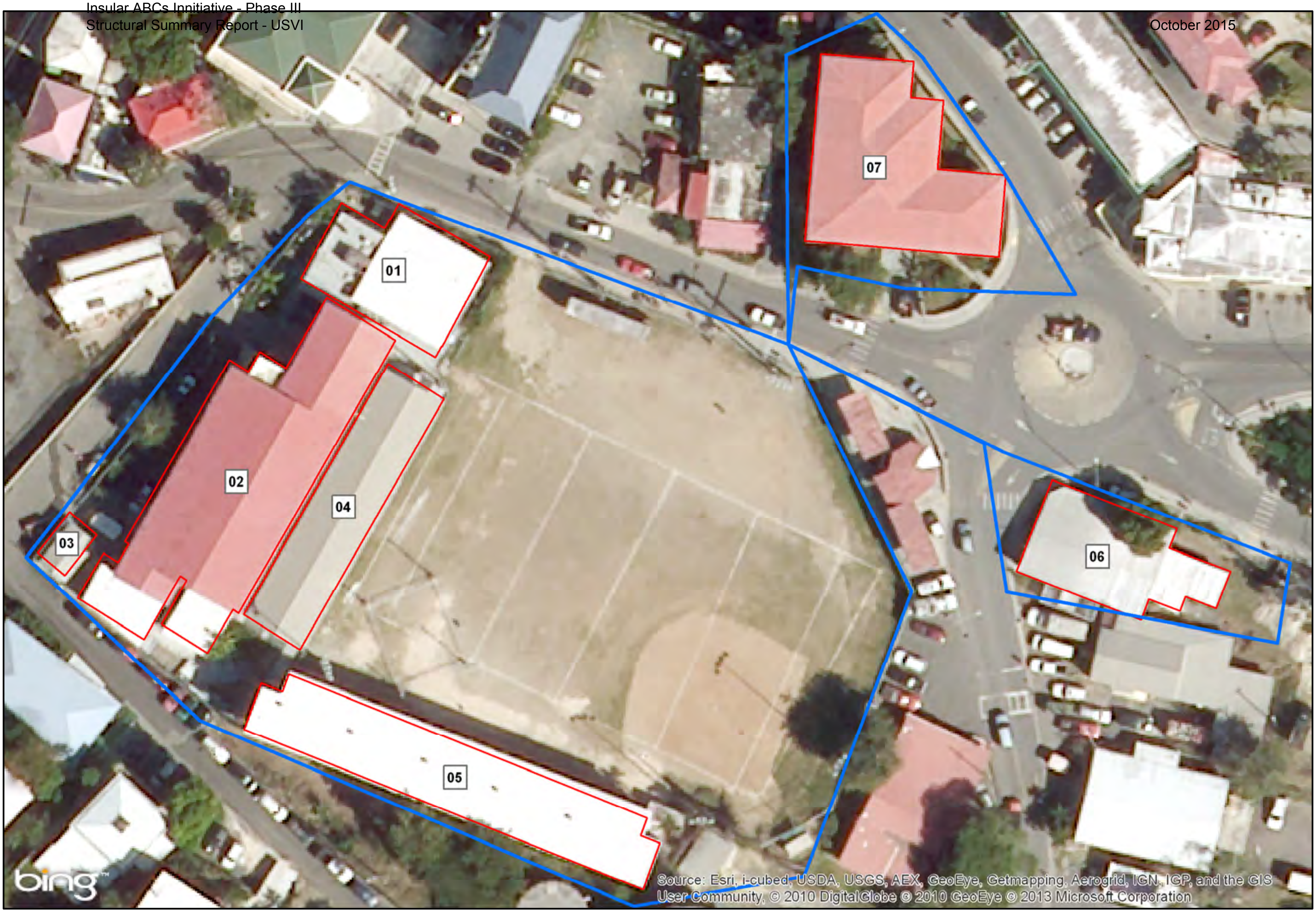
Helber Hastert & Fee

0 25 50 100 150 200 250 Feet

Juanita Gardine Elementary

Date: 3/8/2013

N



Helber Hastert & Fee

Julius Sprauve School

Date: 3/8/2013

0 25 50 100 150 200 250 Feet

N

Helber Hastert & Fee

Ulla F. Muller Elementary

Date: 3/8/2013

0 25 50 100 150 200 250 Feet

N