National Park Service
U.S. Department of the Interior

Virgin Islands National Park

CREQUE MARINE RAILWAY HEAD HOUSE AND RESIDENCE HISTORIC STRUCTURE REPORT



January 2021

CREQUE MARINE RAILWAY
HEAD HOUSE AND RESIDENCE
HISTORIC STRUCTURE REPORT

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Prepared for:
Cultural Resources, Partnership and Science Division
Interior Region 2, South Atlantic – Gulf
National Park Service
2020

Technical Report No. 161/173677
PMIS No. 244620

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January 28, 2021

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About the front cover: North façade of the Creque Marine Railway Head House and Residence January 2020. Source: Helen Juergens

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VIRGIN ISLANDS NATIONAL PARK

Creque Marine Railway Head House and Residence
Historic Structure Report

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FOREWARD

PROVIDED BY THE NPS

Per Statement of Work, dated August 2019, for the Creque Marine Railway Head House & Residence,
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ACKNOWLEDGEMENTS

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MANAGEMENT SUMMARY

MANAGEMENT SUMMARY

HISTORIC DATA

Located along the northern edge of Hassel Island, a small island adjacent to the southern shore of St. Thomas, United States Virgin Islands, the Creque Marine Railway survives as one of the few steam-powered marine railways in the world. In operation for over a century, from the 1840s to the early 1960s, the Creque Marine Railway with its original steam-powered equipment provides an early example of marine vessel repair technology in the Western Hemisphere. The strategic location of the United States Virgin Islands places the Creque Marine Railway within the larger context of nineteenth and twentieth century Danish and U.S. imperialism.

The Virgin Islands served as a trading post for important goods such as sugar cane, cotton, and tobacco. With its natural protective harbors, the island soon grew in reputation as a stopping point for trading ships. In 1840, a group of Dutch businessmen formed the St. Thomas Marine Railway Company and began construction on what was then called the St. Thomas Marine Repairing Slip. This site eventually became the Creque Marine Railway in 1911.

The Creque family purchased the marine railway complex in 1910, made many repairs and improvements to the site, and successfully ran the vessel repair company. In 1978, the Creque family sold the property to the Federal Government. On July 16, 1976, the southern portion of the island became part of the National Register of Historic Places. On August 29, 1978, the boundaries of the Virgin Islands historic district increased to include the Creque Marine Railway. Since this time, the National Parks System has partnered with several organizations to preserve the Creque Marine Railway.

TREATMENT AND USE

The Creque Marine Railway Head House & Residence was listed in the National Register of Historic Places on August 29, 1978, as one of the contributing elements of the nationally significant Hassel Island Historic District (Boundary Increase), located on Hassel Island in the U.S. Virgin Islands.

According to the General Management Plan (GMP) dated July 1994, and the Foundation Document, dated December 2016, the administratively determined Management Category is **"Should be Preserved and Maintained."** A management decision for Ultimate Treatment is not documented, and a treatment approach will be proposed under The Secretary of The Interior's Standards for Treatment of Historic Properties, subject to future confirmation in a planning process as required by Director's Order 28: Cultural Resource Management.

In addition, per the Statement of Work, dated August 2019, the Part II, Treatment and Use, section will be based upon the overall management objectives of previous National Park Service (NPS) studies including the Foundation Document, Resource Management Plan, Historic Resource Study for Hassel Island, Cultural Resource Study for Hassel Island and the Visitor Services Project – Visitor Study. These studies are located in the

Technical Information Center at the NPS Denver Service Center or the NPS Southeast Regional Office.

The proposed treatment and use topics are included herein, under Part II Treatment and Use section of this report.

ADMINISTRATIVE DATA

Locational Data:

Building Name	Creque Marine Railway
Building Location	Virgin Islands National Park, Hassel Island St. Thomas, U.S. Virgin Islands

Related Studies:

Gjessing, Fred. *Historic Resource Study, Hassel Island, U.S. Virgin Islands*. National Park Service. Southeast Archaeological Center. 1980 - 1981.

Griggs, Catherine, *Archeological Resource Survey of Hassel Island, U.S. Virgin Islands*. Southeast Archaeological Center.

Rabb, John C. *Written Historical and Descriptive Data, Addendum to Creque Marine Railway (St. Thomas Marine Repairslip)* HABS Documentation 1985.

Wright, Russel, Thomas W. Richards, and Annie Hillary. National Register of Historic Places Nomination Form. Hassel Island. Historic District. National Register #76001862. July 19, 1976.

Historic Preservation in the U.S. Virgin Islands: Preserving Our Past for Our Future: 2016 – 2021. Compiled by the Virgin Islands State Historic Preservation Office and the Office of Archaeological Research, University of Alabama Museums. September 2016.

Resource Management Plan. Virgin Islands National Park. August 1994. Southeast Archaeological Center.

The Historic Resources of the U.S. Virgin Islands. May 1988.

U.S. Virgin Islands: A Guide to National Parklands in the United States Virgin Islands. Washington, DC: U.S. Department of Interior, 1999.

Cultural Resource Data:

National Register Status: Listed August 29, 1978
NRHP Reference Number: 78003093
Name: Creque Marine Railway; Listed as a contributing element to the Virgin Islands Hassel Island Historic District

Size Information:

Total Floor Area	2,120 square feet, current condition
First Floor Area	2,120 square feet
Second Floor Area	2,120 square feet, no longer extant
Number of Stories	2 originally, 1 currently
Number of Rooms	4, current condition

Number of Bathrooms. 0

PROJECT SCOPE AND METHODOLOGY

Purpose: This Historic Structures Report (HSR) is being produced for the Cultural Resources Partnership and Science Division of the NPS' Southeast Regional Office for the purpose of developing a "treatment approach" for the Creque Marine Railway Head House and Residence, Cistern, and Bolton Beam Engine Equipment, as stated in the GMP, dated July 1994, and the Foundation Document, dated December 2016.

NPS GMP and Foundation Document determined that the Management Category for the building as **"Should be Preserved and Maintained,"** although a management decision for Ultimate Treatment was not documented. The goal of this HSR will be to propose several ways of treating and using this historic property in concert with the previous planning documents for the Virgin Islands National Park, in accordance with all applicable NPS and federal guidelines and in line with the mission of the NPS:

The National Park Service preserves unimpaired the natural and cultural resources and values of the National Park System for the enjoyment, education, and inspiration of this and future generations. The Park Service cooperates with partners to extend the benefits of natural and cultural resource conservation and outdoor recreation throughout this country and the world.

Level of Investigation: The scope and methodology of this HSR report includes a "Thorough Investigation" of the Creque Marine Railway Headhouse, the Cistern, and the Bolton Beam Engine Equipment, as defined by the *NPS-28: Cultural Resource Management Guideline,* under Research Methodology.

The physical investigation of the Creque Marine Railway Headhouse, the Cistern, and the Bolton Beam Engine Equipment included on-site observation and recordation of existing conditions. However, due to the lack of structural integrity of the building's remains and ruins, and due to the significant amount of unstable debris inside and outside the building, the detailed investigative work included only the original historic components and areas of the building that were safely accessible.

Process for Conducting the Work: The on-site investigation included four days of research at the Virgin Islands National Park, with five professional team members consisting of a Structural Engineer, Historic Preservation Architect, Architectural Historian, Environmental Consultant, and a Materials Conservator. A second follow-up trip originally included in the project scope was canceled due to COVID-19 travel restrictions.

Report Format: This HSR deals primarily with the historic context and background information about Hassel Island and the Virgin Islands; incorporated with the original historic building's structure, materials, and equipment. For each component, this HSR provides a developmental history, a description of the building's current existing conditions, a statement of their character-defining features, and treatment recommendations, in accordance with *NPS Preservation Brief 43: The Preparation and Use of Historic Structures Reports*.

SUMMARY OF FINDINGS

The current destruction of the historic fabric on the building, which was recently sustained under Hurricane Irma and Hurricane Maria, is significant.

Due to the extreme damage and loss of the original historic fabric, there are only very few character-defining features or elements left of the original Creque Marine Railway Head House, the Cistern, and the Bolton Beam Engine Equipment. Recommended treatments and uses are presented in the Treatments section.

RECOMMENDATIONS FOR FURTHER RESEARCH

The Virgin Islands National Park's staff has provided the authors with all relevant information regarding the Creque Marine Railway Head House, Cistern, and Bolton Beam Engine Equipment, and the hurricane damage on these elements, from the NPS's archives. Further research of the archives is at the sole discretion of the NPS.

RECOMMENDATIONS FOR IMMEDIATE STABILIZATION OF HISTORIC FABRIC

The two recent 2017 hurricanes (Irma and Maria) have left the Creque Marine Railway Head House and Residence on Hassel Island with only six standing walls and significantly damaged and structurally compromised original stone or brick walls, along with the original iron Bolton Beam Engine and the associated iron equipment. Despite the pre-hurricane stabilization efforts of the NPS, the storms unleashed more energy than the building and the stabilization system could bear.

Due to this current, precarious condition of the original historic fabric and due to the unpredictable weather and earthquake prone environment of the Islands, our team has identified the following immediate, emergency stabilization measures:

- Conduct an on-site investigation by a licensed General Contractor, familiar with historic and/or commercial construction; a licensed Structural Engineer, and a Historical Architect or Archaeologist as soon as possible to determine how to dismantle the components of the stabilization system and the stainless steel cabling to prevent further destruction of the historic fabric, remove all debris without damage to the remaining historic fabric and stabilize all remaining original materials.

- Install a bracing/shoring system (designed by a licensed structural engineer) to secure the two (2) east and west, interior brick and stone walls, which are on each side of the Beam Engine room. These walls are not structurally tied into the exterior walls, the second-floor joists, nor the roof that once supported them. These are in danger of imminent collapse, especially the red brick wall between the Engine Room and the Winch Room. This wall is one of the few remaining character-defining features left in the building, as the original iron drive gear from the Bolton Beam Engine is designed and recessed into the first wythe of brick, with an exemplary brick arch above it. The lower bricks behind the iron

drive gear that support the bricks above are currently in the process of falling out of the wall. It is just a matter of time before the entire brick wall collapses.

- Repair all damage to the temporary, second story perimeter wood and steel plate band, which is acting as a compression ring, in conjunction with the steel pipes that extend to the concrete pads at grade. This temporary shoring system is preventing the stone and brick exterior walls from collapse.

- Remove the steel cables at the top of the exterior walls and replace with a bracing/shoring system, designed by a licensed Structural Engineer. The hurricane winds and the collapse of the brick tower onto these steel cables caused the stone and brick walls (that the steel cables were attached to) to implode, thus causing the walls to tear apart and fall into the interior of the structure. This event also caused all of the wood cross bracing at the walls, which was installed after the first hurricane, to break apart and fall into the interior of the structure. These broken wood members, which are currently swinging from the steel cables should also be removed to prevent further damage to the walls.

- Install a bracing/shoring system, designed by a licensed Structural Engineer, at the stone and brick gable (wall/truss) east end wall, above the perimeter wood and steel plate band. This gable end is currently not being supported. This is the only remaining gabled stone and brick wall left from the original structure, which initially had four (4) of these walls to support the roof.

- Remove bricks, rubble and stone under the supervision of an archeologist or historic architect, from the main floor in the west end room that houses the gearing equipment, as the basement below is where the foundation system for the metal gears is located. This large amount of debris is putting an extra load on the floor, which could result in failure of the floor, causing extensive damage to the gearing equipment and the adjacent walls. Any collected historic materials should be carefully labeled and stored securely.

- Realign the existing heavy timber bracing at the exterior, far east, arched doorway at the Boiler Room. These wood members, which are supporting the 24-inch-thick exterior stone/brick opening, were pushed out of the door frame when the stone and brick walls collapsed.

- Reinstall the missing pipe jack in the main doorway, at the far end of the north exterior wall that leads into the Gear Room. The jack was installed to support the sandstone lintels and doorway header.

- Remove all wild grown vegetation that is adjacent to and growing out of the rubble, stones, brick, concrete stairs, etc., along with clearing the entire perimeter area for the stabilization of the building. Care should be taken so as not to cause any destructive actions to the historic materials.

Note: Any contractor performing any of this emergency work should document all stabilization actions before, during, and after the implementation of the debris removal. In addition, the contractor should stockpile the original historic bricks, rubble, and stones and locate them in a specific area for future use.

PART I. DEVELOPMENTAL HISTORY

HISTORICAL BACKGROUND AND CONTEXT

Located along the northern edge of Hassel Island, a small island, adjacent to the southern shore of St. Thomas, United States Virgin Islands, the Creque Marine Railway survives as one of the few steam-powered marine railways in the world. In operation for over a century, from the 1840s to the early 1960s, the Creque Marine Railway with its original steam-powered equipment provides an early example of marine vessel repair technology in the Western Hemisphere.[1] The strategic location of the United States Virgin Islands places the Creque Marine Railway within the larger context of nineteenth- and twentieth-century Danish and U.S. imperialism.

DANISH WEST INDIES: 1400s–1700s

Christopher Columbus landed in the Virgin Islands in 1493 on his second voyage to the Western Hemisphere. He named the islands for the legendary beauty of St. Ursula and her 11,000 virgins. The Virgin Islands were originally inhabited by the Saladoid culture, ca. 1,000 BCE, after their migration north from the Orinoco River basin in South America; archeological evidence details the decline of this culture at ca. 250 BCE and the rise of the Ostionoid culture at ca. 600 CE. During the last significant period of the Ostionoid culture, ca. 1100 to 1200 CE, the Taino of the Greater Antilles came into power. Archeological evidence does not support a unified culture. The Classic Taino lived throughout the Virgin Islands and the Lesser Antilles. Other Native nations living in the region included the Caribs.[2]

European explorers noted Indian habitation of the Virgin Islands through the late 1500s, however, by the 1600s many, if not all, Native people perished from the spread of new diseases and increased warfare due to exploration of the western hemisphere.[3] St. Thomas, St. John, and St. Croix provided a stopping place after crossing the Atlantic. On April 4, 1607, English explorer Captain John Smith and three ships stopped at St.

[1] John C. Rumm, *Historic American Buildings Survey/Historic American Engineering Record*, HABS/HAER Review (Washington, D.C.: U.S. Dept. of the Interior, National Park Service, Cultural Resources, Historic American Buildings Survey/American Engineering Record, 1980).

[2] Pauline Kupcok, "Part III: Cultural Highlights: A Brief History of the Virgin Islands, U.S.A.," *The Journal of Educational Sociology*, 24: 4 (December 1950): 210–211 and Cain Stoneking, "The Decline of the Tainos, 1492-1542: A Re-Vision" (2009). Student Theses, Papers and Projects (History), 7 – 9. Accessed July 6, 2020. https://digitalcommons.wou.edu/his/213

Another source to read for general history on the Caribbean is Jan Rogozinski, *A Brief History of the Caribbean: From the Arawak and Carib to the Present* (New York: Penguin, 1999).

[3] Ibid.

Thomas to gather wood, water, and sea turtles.[4] Captain Smith's diary did not mention Native inhabitants.[5]

St. Thomas earned the reputation as a safe haven for pirates and privateers during the late 1600s due its natural coves and protective harbors. Pirates frequented the Virgin Islands before it was formally colonized. Charlotte Amalie, then known as Taphus (1666–1691), provided a sanctuary for many from sea life.[6] Little documented history exists regarding piracy due to the nature of the work; one rare source includes a written log on a privateering ship that documented the stolen goods which then resulted in the deaths of the crew. Most pirates did not keep ship logs, leaving much of this history to local legend. Once colonized by Denmark, St. Thomas continued as a haven for those traveling the seas. Under the Danish government, brothers Nicolaj and Adolph Esmit served consecutively as governor of St. Thomas colony from 1680 through 1684. The brothers tolerated and indulged illegal activities in the interest of impeding English vessels.[7]

During the 1600s, European powers began to colonize the Caribbean in an attempt to gain a foothold in the sugar cane industry. In 1671, the Danish West India Company sponsored the first successful, long-lasting colonization of St. Thomas. The Danish colonists arrived February 26, 1672, and worked to establish plantations and sugar cane production on the island. This proved difficult work in the heat, and the colony lacked manpower leading to reliance on slave labor. The first slave trading ships landed in 1673, making St. Thomas a large part of the slave trading market.[8]

The Danish settled the Virgin Islands to capitalize on the economic benefits of the Columbian Exchange, particularly the sugar market. St. Thomas remained a popular stop among merchant traders for its facilities and clear channel markings. Throughout the 1700s, the Danish transported approximately120,000 enslaved people to the colony, mostly for sugar cane plantations. Treated as chattel, Africans experienced horrible conditions in the Caribbean. Upon arrival, traders separated families and assigned individuals to field work or housework or to serve as bombas (overseers) or craftsmen. The labor and environment proved to be so physically taxing that the death rate exceeded the birth rate, resulting in a constant demand to import enslaved people.[9] The slave trade

[4] ---, "Plaque Commemorating the Landing of Capt. John Smith Found Languishing in Fort Christian Basement." Accessed February 10, 2020. http://stthomashistoricaltrust.org/news/2011_September_Newsletter.pdf.

[5] ---, "Prehistory & Early Civilizations," *Hassel Island: Military and Mercantil History Among Natural Wonders*, Accessed March 1, 2020. https://www.hasselisland.org/history/prehistory/. A digital copy of Captain John Smith's diary can be accessed through *Virtual Jamestown* at http://www.virtualjamestown.org/exist/cocoon/jamestown/fha-js/SmiWorks1.

[6] Pickering, Vernon W., *Early History of the British Virgin Islands: From Columbus to Emancipation*. (British Virgin Islands: Falcon Publications International, 1983), 36.

[7] Isaac Dookhan, A *History of the Virgin Islands of the United States*. (Mona, Saint Andrew Parish: University Press of the West Indies, 1994), 108. Note: Adolph Esmit served another term as governor from 1687 – 1688.

[8] ---, *U.S. Virgin Islands: A Guide to National Parklands in the United States Virgin Islands* (Washington, DC: U.S. Department of Interior, 1999), 24–25 and 37–39.

[9] "Slavery," *National Museum of Denmark,* Accessed February 10, 2020. https://en.natmus.dk/historical-knowledge/historical-themes/danish-colonies/the-danish-west-indies/slavery/.

embodied a major component of the Virgin Islands' economy until 1792 when the Danish banned the transatlantic slave trade.[10]

Within the Caribbean, the Danish West Indies extended to St. John (St. Jan) in 1717 and purchased St. Croix, in 1733, from the French. Due to the natural topography of the different islands, each developed differently: St. Thomas built the economy through trade and shipping, St. Croix profited from the sugar plantations, and St. Jan developed animal husbandry (cattle and sheep farms). In 1754, due to the financial struggles of the Danish West India Company, the islands became a royal colony. The Danish West Indies were but a small portion of the Danish composite state extending beyond the Kingdom of Denmark to include the Kingdom of Norway, Iceland, Greenland, the Faroe Islands, the German duchies of Schleswig and Holstein, as well as strongholds along the Gold Coast of Africa and India. To protect their interests, the Danish royal family maintained a large army and navy. The Danish state proved to be a powerful player in world politics and a valuable ally.[11]

Throughout the imperial wars of the 1700s, the Danish state remained non-belligerent, but aligned with different forces to protect their interests. The Hanoverian Alliance (1727) with Britain and France, promised military support in case of Russian aggression. It proved fruitful in the Caribbean during the 1733 slave rebellion on St. Jan, when enslaved people took control of the island for about six months. The situation calmed and Denmark remained in control of their Caribbean colonies with the assistance of the English and French. From 1737 through 1763, Denmark remained an ally of either England or France, carefully balancing the interests of these emerging powers. After the Seven Years War, neither Britain nor France renewed alliances with Denmark. In 1764, the Danish state pursued a Russian alliance and signed the following year.[12]

Throughout the last half of the eighteenth century, trade flourished under Denmark's principles of neutrality. This impacted the Danish West Indies, as Charlotte Amalie on St. Thomas became a free port. However, politics abounded and throughout the Seven Years War, Denmark honored the British "Rule of 1756," meaning neutral ships did not call on colonial harbors if not permitted to do so in times of peace.[13]

After the Seven Years War, tensions increased in the Caribbean due to the growing tensions between the American colonies and Britain. After the American Declaration of Independence, the Caribbean became a channel for gunpowder and other supplies from the French and Dutch to the American Revolutionaries. The British controlled six islands (Jamaica, Granada, Barbados, the Leeward Islands, St. Vincent, and Dominica) in the Caribbean Many interests of world powers— England, France, Spain, Denmark, and the

[10] "The Abolition of Slavery," *National Museum of Denmark,* Accessed February 10, 2020. https://en.natmus.dk/historical-knowledge/historical-themes/danish-colonies/the-danish-west-indies/the-abolition-of-slavery/.

[11] Michael Bregnesbo, "Anglo-Danish Relations, 1714 - 82" *State Papers Online, Eighteenth Century 1714 - 1782 (Part IV),* (Cengage Learning, 2018) Accessed March 2, 2020. https://www.gale.com/binaries/content/assets/gale-us-en/primary-sources/intl-gps/intl-gps-essays/full-ghn-contextual-essays/gps_essay_spo18_4_bregnsbo1_website.pdf

[12] Ibid.

[13] Ibid.

Netherlands—intersected here, particularly through trade. Nations focused on this region as they worked to protect their economic interests.[14]

Robert Morris, of the Pennsylvania Committee of Safety and financier of the American Revolution, chartered the brigantine, the *Nancy*, captained by Hugh Montgomery, to transport gunpowder and arms for the American Revolutionaries. While in port at Charlotte Amalie, Montgomery received notification of the June resolution by Continental Congress to declare independence. In celebration, Montgomery hosted a dinner for the Danish governor and other dignitaries of the colony. As the barges crossed the bay to board the ship for the evening, Montgomery lowered the British flag and raised the Grand Union Flag, the first national flag of the United States of America, to declare his position in the pending war. The Danish government honored the evening with a thirteen gun salute.[15] The following year, while in port at St. Croix on November 16, 1776, the *Andrew Doria*, a ship of the Continental Navy received the first foreign salute.[16]

Throughout the American Revolution, privateers worked to thwart British trade and intercept supplies for the British in America. In the first years of the war, France and Spain placed tremendous pressure on the British, forcing the Royal Navy to defend their colonial interests. In response, Britain enforced stricter neutrality policies, patrolled the waters, and stationed troops throughout the Caribbean. Russia, as well, postured a response in 1780, creating an armed league of neutrality to protect all shipping interests for neutral nations. Due to the Denmark-Russian alliance, Denmark reluctantly joined the league, while promising Britain to never invoke the power of the league in regard to Anglo-Danish trade. These challenges contributed to the British defeat in the American Revolution by siphoning resources away from the war to defend the British colonies and protect their merchant fleet throughout the Caribbean. The Danish successfully commercialized their neutrality in the late eighteenth century, contributing to the growth of the Danish West Indies.[17]

BRITISH INVASION OF THE DANISH WEST INDIES: 1801–1815

The world powers clashed in the Caribbean, again, during the French Revolutionary Wars (1792–1802). Concerned with the Haitian Revolution, the disruption of trade, and the continuation of the League of Armed Neutrality, Britain, in March 1801, invaded the Danish West Indies. The Danish accepted Britain's Articles of Capitulation and

[14] Andrew Jackson O'Shaughnessy, "West Indies in the Revolution," *Encyclopedia of the American Revolution* (The Library of Military History, February 10, 2020), Accessed March 2, 2020. https://www.encyclopedia.com/history/encyclopedias-almanacs-transcripts-and-maps/west-indies-revolution

[15] Thomas Medenhall, "A Flag Episode," *The Proceedings of the American Antiquarian Society* v. XII: October 1897 - October 1898 (Worcester: American Antiquarian Society, 1899) 425-426. Accessed March 2, 2020 https://books.google.com/books?id=u84oAAAAYAAJ&pg=PA425#v=onepage&q&f=false. The story of the *Nancy* is also told in Elizabeth Montgomery, *Reminiscences of Wilmington* (1851) Accessed March 2, 2020 https://play.google.com/books/reader?id=8-MtAAAAYAAJ&hl=en&pg=GBS.PA17 .

[16] O'Shaughnessy, "West Indies in the Revolution."

[17] O'Shaughnessy, "West Indies in the Revolution" and Bregnesbo, "Anglo-Danish Relations."

transferred control to the invaders without a shot being fired. British occupation lasted until April 1802 when the islands returned to Denmark.[18]

The second invasion of the Danish West Indies occurred December 1807 during the Napoleonic Wars (1803–1815). A British fleet captured St. Thomas on December 22, 1807, and three days later, on December 25, they captured St. Croix. Once again, Danish officials did not resist. On November 20, 1815, the British returned the islands to Denmark.[19] While under British control, the Danish West Indies were no longer a free port during either the French Revolution or the Napoleonic Wars, limiting trade for the islands.

During the British occupation, soldiers built harbor defenses and support facilities. In a letter to the war office, dated April 13, 1801, General Thomas Trigge wrote the following:

> As the town is considered to be particular unhealthy and the Fort is situated at one of the extremities; I have thought it necessary, as well as on this account, as to afford greater protection to the place to order the Post to be established on the Peninsula which forms the West Side of the Bay; and have directed barracks to be erected capable of containing two hundred men, to be built by contract and completed by the 28 of the next month.[20]

The physical remains of the British occupation include Shipley's Battery on the northwest extremity, and Cowell's Battery on the high ground. In addition to the batteries, Lieutenant Colonel Charles Shipley built an officers' and men's guard house, storerooms, a casemated magazine, palisade, and flagstaff. The British rebuilt a small Danish battery, known as Prince Frederik's Battery, at the harbor mouth and renamed it Fort Willoughby. During the second occupation, from 1807 to 1815, the British constructed another magazine, the Garrison House. Throughout the Napoleonic Wars, Britain assembled large convoys of merchant ships at St. Thomas's protective harbor before starting the journey east across the Atlantic Ocean.[21]

DANISH TRADE: 1815–1840

With free port status, once again, under Danish control, trade and shipping prospered from the 1840s to the 1860s for the Danish West Indies. Following the Napoleonic Wars, St. Thomas rebuilt its trade economy, particularly with the new nation-states throughout South America and by signing a commercial treaty, in 1826, with the United States. By

[18] Richard Cavendish, "The Battle of Copenhagen," *History Today* 51:4 (April 2001) Accessed March 2, 2020. https://www.historytoday.com/archive/battle-copenhagen and ---, "War," *Hassel Island*, Accessed February 10, 2020, http://www.hasselisland.org/history/war/.

[19] "War," *Hassel Island.*

[20] Rumm, *Historic American Buildings Survey/Historic American Engineering Record.*

[21] Fred Gjessing, *National Register of Historic Places Inventory - Nomination Form for Northern Hassel Island Historic District*, August 22, 1978. After British occupation, the forts enforced port duties and customs for the Danish. Cowell's Battery converted to a government signal station and remained in operation until 1974. The NRHP proves to be a valuable source for determining the condition of the property at the time of park ownership.

the 1830s, it had become a regional shipping center, thereby reestablishing the island's importance as a Caribbean port.[22]

After 1839, the British Royal Mail sent post steamers directly from Southampton to St. Thomas. The harbor and Charlotte Amalie proved well equipped to handle the traffic with a floating dock, repairing shops, lighthouses, and bunker facilities. Royal Mail Steam Packet Company built a headquarters, in 1843, on St. Thomas, making the Danish harbor the center of the Royal Mail's extensive activities in the Caribbean. Soon bunker coal became one of the harbor's most important products. On Hassel Island, four coaling companies built docks and profited throughout the late nineteenth century and early twentieth century.[23]

St. Thomas, blessed with an excellent natural harbor, proved to be a key stopping point for West Indian shipping lanes. Its unique geographical position made it a logical distributing center for goods from Europe or the United States to any of the islands in the Caribbean and northern part of South America. The fact that St. Thomas remained a neutral territory and Charlotte Amalie remained a free port throughout its history helped bring an influx of ships to the area. In the 1800s, the island experienced an average of 2,000 to 4,000 ships annually and about 200,000 to 300,000 annual tonnage. Shipping reached its peak in the 1860s and 1870s when the average number of ships calling in port increased to about 4,600 per year with an annual tonnage of 800,000 each year. [24]

Ships required regular maintenance and repair. As ships increased in size throughout the eighteenth century, the method of hauling a boat onto the beach and turning it on its side, became obsolete. Masonry drydocks became one alternative for ship repairs. However, this proved cumbersome and costly. Thomas Morton, an English shipbuilder, patented, in 1819, his idea for a "patent ship" or "the application of a particular kind of carriage to the inclined plane." The carriage was lowered into the water so the vessel could float over top of it and then steadied on the frame with blocks and shore. A power source hauled the vessel and carriage out of the water and up the incline plane. Morton's patent slip spread throughout the English Empire.[25]

Salem, Massachusetts, in 1822, constructed one of the first facilities to utilize Morton's methods in the United States and the design quickly spread along the coastal waterfront towns. These structures were known as "marine railways." Initially, marine railways relied on horse or human power for hauling the vessel from the water, but gradually about the 1830s, steam power was introduced.[26]

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[22] ---, "A Brief History of the Danish West Indies," *Danish National Archives,* Accessed March 2, 2020, http://www.virgin-islands-history.dk/eng/vi_hist.asp.

[23] "19th Century & Trade." *Hassel Island,* Accessed February 10, 2020. (https://www.hasselisland.org/history/19th-century-industry-2/) and "Brief History of the Danish West Indies." More research needs to be included about the importance of coaling stations as well as the end of the sugar boom in 1848, leading to the end of slavery.

[24] Gjessing, NRHP nomination form, August 22, 1978.

[25] Rumm, *Historic American Buildings Survey/Historic American Engineering Record*.

[26] Ibid and Erik Ronnberg, "Marine Railways." *Fitz Henry Lane Historical Archive,* Accessed November 5, 2020. http://fitzhenrylaneonline.org/historical_material/?section=Marine+Railways .

With the rise of steamships, the need for coaling stations in the Caribbean became a new source of income for the Virgin Islands, especially for St. Thomas. While other islands in the Caribbean continued to produce sugar steadily, by the mid-1800s, the Danish West Indies lost money due to poor soil. Sugar prices began to decline, in 1810, with the invention of the beet sugar process. The sugar boom came to an end for the Danish West Indies with the abolition of slavery. St. Thomas survived the end of the sugar boom by serving as a coaling station for steam companies to include the Hamburg-American Line, the Bronsted Company, and the East Asiatic Company.[27]

VIRGIN ISLANDS SLAVE REBELLIONS AND ABOLITION: 1840s

Raw sugar soon became, by far, the most important product from the Virgin Islands, making up eighty-six per cent of the total value of exports to Denmark. Harsh conditions characterized slavery in the Danish West Indies and many voiced concerns regarding the imbalance between the number of free people and the number of enslaved people. In 1725, 4,490 enslaved people lived on St. Thomas compared to the 324 free residents.[28]

St. John's population mirrored that of St. Thomas and, in 1733, a slave rebellion took place. Enslaved people attacked a small Danish garrison, killing those stationed there, as well as others in the area. Enslaved people burned many plantation buildings and sugar fields. Many fled the island. Enslaved people maintained control of the island until the Danish, in an alliance with the French and English, defeated the leaders of the rebellion.[29]

During the late eighteenth century, many people began to question slavery. In 1792, the King of Denmark established a commission to investigate the slave trade. The commissioners found mortality rates high and fertility low among the enslaved people. To maintain the demand for enslaved people, Danish traders imported about 1,000 Africans per year. The commission raised humane, economic, and political concerns regarding the slave trade. In 1803, the Danish king, abolished the Danish Atlantic slave trade.

Slavery continued in the Danish West Indies after 1803, and the sugar production turned a profit until the 1840s in St. Croix. At that time, sugar prices fell, as competition intensified from beet sugar grown in Europe and cane sugar from the larger Caribbean islands with more industrialized ways of production.[30]

Questions continued regarding the morality of slavery and intensified as other world powers abolished slavery. For example, the British Parliament passed the Slavery Abolition Act in 1833, ending slavery throughout the country's colonies. Throughout the

[27] "Transfer Day." *National Museum of Denmark*, Accessed February 10, 2020. https://en.natmus.dk/historical-knowledge/historical-themes/danish-colonies/the-danish-west-indies/transfer-day/; ---, *U.S. Virgin Islands: a Guide to National Parklands in the United States Virgin Islands*, Vol. 157 (Washington, DC: U.S. Department of the Interior, 2001) 88; and ---, "19th Century & Trade." *Hassel Island*, Accessed February 10, 2020.

[28] Waldemar Westergaard, *The Danish West Indies Under Company Rule* (New York: MacMillan Company, 1917), Chapters VI through IX address the institution of slavery in the Danish West Indies.

[29] Westergaard.

[30] Westergaard.

1830s and 1840s, the question of abolition became a growing concern for Denmark. Danish West Indies Governor General Peter von Scholten and his allies advocated emancipation. In 1847, the Danish government ruled for the gradual emancipation of enslaved people over a twelve-year period. Many enslaved people worried they would not live long enough to experience freedom. A slave revolt broke out in Frederiksted, in St. Croix, in 1848, giving the Danish government the opportunity to immediately abolish slavery.[31]

Emancipation, however, did not, by itself, solve the problems of the black population. Living conditions did not improve substantially for the now free laborers, first and foremost because of the changes regarding sugar production. Danish colonial authorities sought to transition from a slave economy to a workforce of free laborers by imposing very detailed regulations. Riots continued to break out among workers throughout the late nineteenth century and early twentieth century, as workers fought for greater economic and social conditions.[32]

UNITED STATES AND THE VIRGIN ISLANDS: 1860s–1960s

President George Washington implemented a policy of United States' non-interventionism. President James Monroe re-enforced this position with the implementation of the Monroe Doctrine. Passed in 1823, this policy opposed European colonialism in the Americas, but recognized and promised non-interference with existing colonies. This balanced the country's explicit desire for territorial expansion as demonstrated through the acquisition of new territories, including the Louisiana Purchase and annexation of Mexican Territory following the Mexican-American War. With the Spanish-American War, in 1898, the United States abandoned its non-interventionalist position.

During the American Civil War, Secretary of State William Seward (1861 – 1869) focused constantly on the nation's security. Throughout the war, the Union Navy sought frequent refuge for its battleships and blockade runners at St. Thomas's harbor. To Seward, who actively argued for American expansion, securing strategic bases in the Pacific and Caribbean promised the protection and growth of American commercial interests, which in turn ensured the United States' position as a global power. In 1867, under Seward's guidance, the United States attempted to purchase the Danish West Indies. The Danish parliament ratified the treaty, but it was rejected in the United States Senate. At the time, Radical Republicans controlled Congress and rejected the treaty on political grounds regarding Seward's support for President Andrew Johnson. Despite

[31] N. A. T. Hall, "The Victor Vanquished: Emancipation in St. Croix: Its Antecedents and immediate Aftermath," *New West Indian Guide*. 58 (1984): 3 – 36.

[32] Hall, "The Victor Vanquished"

Seward's limited success in accomplishing this goal, his tenure drastically shaped United States foreign policy.[34]

Throughout the 1870s, technological developments added to the economic challenges for the Danish West Indies. The advent of the telegraph reduced the need for trading vessels to call at St. Thomas for news and the development of better steam engines resulted in more efficient travel across the Atlantic. Each year, the Danish state covered the deficit from the colony. The economic conditions pulled people and businesses from the islands. In 1902, the Danish government re-opened negotiations with the United States to purchase the islands. Secretary of State John Hay (1898–1905) secured a treaty with Denmark, hoping to secure a safe shipping lane related to the construction of the Panama Canal. The upper house of the Danish parliament rejected the treaty due to nationalistic sentiments.[35]

At this time, Denmark implemented reforms to improve conditions in the Danish West Indies. Public measures included forgiving the colonial debt, reducing colonial government for efficiency, and the passage of the Colonial Law of 1906, granting suffrage to a large portion of the colonial population. Private initiatives fostered an agricultural society to improve sugar and cotton production at St. Croix and harbor improvements at St. Thomas. These improvements included new installations and improved facilities: a large wharf, dredging of the harbor, and the establishment of a Danish steamship line. It proved too late. The economy relied on remunerative coaling, provisioning, and repairing of ships as well as subsistence farming. Many hoped with the opening of the Panama Canal, in 1914, ship traffic would return. However, steamers simply passed by the Danish West Indies on their way to the canal.[36]

With the outbreak of World War I, in 1914, conditions in the Danish colonies remained bleak. The United States renewed interests in purchasing the islands under Secretary of State, Robert Lansing. The policy of unrestricted submarine warfare threatened America's freedom of the seas and impacted their trade under the veil of neutrality. The United States became concerned about threats to their security in January 1917 with the publication of the Zimmerman Telegram. Worried about German occupation of the islands, Lansing approached Danish ambassador Constatin Brun to, once again, propose a purchase of the islands. Brun, concerned about the impact of United States' control on the African population, rejected the offer. He countered, requesting a local plebiscite, United States' citizenship for the island's population, and the promise of free trade. Lansing did not accept the deal, arguing these rights could not be negotiated in a treaty but only guaranteed through Congressional action. Concerned about the failure of the treaty, Lansing gently notified Brun of the possibility of American occupation as a measure of strategic defense against the German Empire. Preferring peace, the Danish government

[34] L.D. Burnett, "The Empire of the World?: Getting Right with William Seward," *The U.S. Intellectual History*, (U.S. Intellectual History Blog: August 9, 2014) Accessed March 3, 2020 https://s-usih.org/2014/08/the-empire-of-the-world/ and ---, "Purchase of the United States Virgin Islands, 1917," *U.S. Department of State,* Accessed February 19, 2020 https://2001-2009.state.gov/r/pa/ho/time/wwi/107293.htm. A point to consider regarding Seward's foreign policy is the passage of the Monroe Doctrine, 1823, and American influence in the Western Hemisphere. This increases in importance with the Spanish-American War and increased European involvement in the late nineteenth century throughout Central and South America.

[35] Ibid.

[36] Ibid.

sold St. Thomas, St. Croix, and St. Jan for $25 million gold coin. The United States took possession, on March 31, 1917, of the Virgin Islands.[37]

Under United States jurisdiction, the economy of the Virgin Islands continued to struggle, particularly after the passage of the Volstead Act, enforcing the Eighteenth Amendment. The prohibition of the manufacture and sale of alcoholic beverages hurt the production of a major island export – rum. Further, it limited ships utilizing the port of St. Thomas because those with alcohol onboard docked outside of U.S. jurisdiction. Financially struggling, the Virgin Islands remained under Naval rule, until 1931, when President Herbert Hoover appointed a territorial governor.[38]

After touring the islands, President Hoover delivered a news conference, March 26, 1931, expressing public regret for acquiring the islands. With the conversion to civilian government, Hoover hoped to "develop some form of industry or agriculture which will relieve us of the present costs and liabilities in support of the population." The first governor, Dr. Paul Pearson, established a rehabilitation program focusing on the creation of farming cooperatives, port improvements, reviving the sugar cane industries, and educational reforms.[39] However, economic and social conditions did not improve. During the Great Depression, many islanders emigrated to the United States looking for work. In 1936, voting restrictions based on income, gender, and property requirements were removed granting universal suffrage, although island residents are ineligible to vote for President or for voting members of Congress. During World War II, the islands served as a launching point for air patrols to detect enemy ships, particularly submarines. The Navy relied on St. Thomas Harbor and its facilities to repair many of the small patrol boats stationed throughout the Caribbean.[40]

Following World War II, the economy slowly improved through the development of tourism. Since 1954, the status of the islands had been that of an unincorporated territory under the administration of the U.S. Department of the Interior. Despite an industry boost in the 1960s with the establishment of Harvey Aluminum Company and Hess Oil Refinery in St. Croix, tourism remains the backbone of the economy.[41]

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[37] Ibid.

[38] Robin Krawitz, "Virgin Islands National Park: Historic Context Development" (Unpublished, December 2019), 4 – 5.

[39] "The President's News Conference of March 26, 1931." *The Public Papers of the Presidents of the United States, Herbert Hoover: Containing the Public Messages, Speeches, and Statements of the President, January 1 to December 31, 1931* (Washington D.C.: Government Printing Office, 1976), 111 and Dr. Paul Pearson, "Report of Virgin Island's Governor*" Committee on Insular Affairs of the 71st Congress* (August 31, 1931), Accessed July 24, 2020 https://history.house.gov/Records-and-Research/Listing/c_038/

[40] Ibid and C. Peter Chen, "US Virgin Islands," *World War II Database*, Accessed March 3, 2020 https://ww2db.com/country/us_virgin_islands. For further research, the World War II Database discusses the use of region by the United States for chemical warfare agents, including Agent Orange.

[41] Ibid.

CHRONOLOGY OF DEVELOPMENT

ST. THOMAS MARINE RAILWAY SLIP: 1840–1910

Hassel Island forms the western edge of St. Thomas Harbor and was initially connected to the mainland by an isthmus, at Frenchtown, west of the commercial area of Charlotte Amalie. The island was first separated in 1860 from the mainland by the Danish government and became known as "Orkanshullet" – Danish for "Hurricane Hole." The island became later known as Hassel Island, after the owners, the Hazzell family. While an ideal safe haven for ships, natural disasters, disease, and the end of profitable sugar plantations on the islands caused a financial deficit for the Danish West Indies. The investors of the Danish West India Company increasingly turned to the Danish national treasury for loans to support the colony.[42]

In 1840, in an effort to draw more business to the islands, a group of Danish businessmen formed the St. Thomas Marine Railway Company. The following year, the firm purchased "all ground in the Small Careening Hole" in the southwest portion of the harbor and started construction. The company subscribers elected L. Rothe[43] as chairman of the enterprise known as the "St. Thomas Marine Repairing Slip." The following year, 1842, Major W. Recht replaced him as chairman.

Construction progressed and, in October 1843, at the Board of Directors meeting, an announcement declared the successful trial of the marine railway. The Board then petitioned the Danish crown for a $50,000 loan to finish the undertaking. The *St. Thomas Tidend,* the local newspaper, reports on November 29, 1843, the second trial run of the marine railway:

> The vessel which was hauled up was a large one and from the east with which it was effected we have no doubt that the slip is capable of taking up vessels with safety of a much larger class… [S]uch an establishment had long been wanted in this part of the world.[44]

Further testing continued and, in January 1844, the local newspaper again described the repairs at the marine railway to the American ship, the *Cora*:

> … the noble vessel when released glided down the inclined plane of the railway easily but majestically… Another vessel the *Romp* was in waiting to be hauled up and repaired, and we are happy to learn that

[42] ---. "A Brief History of the Danish West Indies," and Luther Zabriskie, *The Virgin Islands of the United States of America: Historical and Descriptive, Commercial and Industrial Facts, Figures, and Resources* (1918). Zabriskie wrote, "located on the direct line of communication between European ports and the entrance to the Panama Canal and in addition is in the path of vessels plying between the Atlantic and Pacific ports of these two continents… Its location commands the Virgin Passage to the Caribbean Sea, the easternmost gateway to that body of water." Research at Danish National Archives indicates the increase size in ships made it too difficult to hull over the isthmus.

[43] In the NHRP, his name is recorded as L. Rothschild. Our research discovered that his name is actually Louis Rothe. Rothe lived on St. Croix, which raises the question whether St. Croix served as headquarters for the St. Thomas Marine Railway Company. Rothe served as governor until 1848. Research continues in the Danish National Archives and St. Croix Historical Society.

[44] Rumm, *Historic American Buildings Survey/Historic American Engineering Record*.

> several other vessels are daily expected to avail themselves of the same advantage, of the efficiency of the steam power and capabilities of the cradle to carry up the largest vessel in the merchant service.[45]

Typical repair processes included hull and keel work, painting, cleaning, caulking, seaming, chipping, and sail mending.[46] News continued to spread of the success of the marine railway. The *Bangor Daily Whig and Courier*, in Bangor, Maine, promoted the company on March 6, 1844:

> The harbor of St Thomas is safe, commodious, and easy of entrance to vessels of the largest capacity and all the necessary materials, of the best description, for repairing vessels, are constantly for sale at reasonable prices. The mechanics are as skillful as can be found elsewhere, and the expenses of repairing are more moderate than at any other port in the West Indies.
>
> Masters of vessels sustaining injury at sea, and under the necessity of proceeding to a southern port for repairs, are invited to consider the many advantages enjoyed by St. Thomas, not only as it respects the despatch [sic] and facility with which their repairs can be completed, but for the certainty of finding there everything requisite and necessary to complete them, and at prices varying but little from what would be charged in the principle [sic] cities of this country.[47]

The original nineteenth century facility consisted of a 156-foot-long marine railway, a 200-foot-long pier, a repair shop, a winch house-residence, and facilities for storing coal and other supplies. In 1978, the vacant marine yard had a 60-foot-wide masonry wet dock, two parallel 200-foot-long railways, a 30-foot cradle, an addition to the repair shop, the ruins of the winch house-residence, and an iron cistern.

The Head House, located at the head of the railway, west of the dock and repair shop, was listed in 1978 as in ruins. The structure retained virtually all of the original machinery and equipment used to haul ships for repair and fitting.[48]

The Head House, at times referred to as the Winch House and Residence, is a 6-bay-long, two-story structure set on a stone terrace at the head of the slip atop the incline facing north-northwest to the slip. A flight of 20 brick stairs lead from the north end of the terrace to the shore. The north and south walls and the façade were fenestrated. The building's main entrance was constructed of fieldstone, with brownstone jambs and flat-arch framing leading into the winch room, which occupied the fourth bay. The boiler

[45] Ibid.

[46] Ibid.

[47] Ricks, James. "Marine Railway at St. Thomas." *Bangor Daily Whig and Courier*. March 6, 1844. Bangor, Maine. Accessed December 3, 2019, https://www.maritimeheritage.org/ports/caribbeanTortola.html?fbclid=IwAR1XDR4WT5mqJHuy1PoUbHXWPfDmsEb1KTfS36Hhk8vXpGUgWLmrcao0_q

[48] Ibid. Gjessing notes the architectural detail of the building and comments, "This structure was once one of the best designed in the Virgin Islands." This reads as opinion and needs more evidence to support this conclusion.

room occupied the first two bays, the engine room occupied the third, and the living quarters occupied the final two. Most of the roof has collapsed into the building.[49]

Much of the building's construction has remained the same since its initial building in 1848. Many of the stones used for the construction of the building were harvested from the island's natural stone: augite andesite – a combination of andesite, an igneous rock, rarely entirely crystalline and typically a dense microlithic, and augite, the principle accessory mineral. Andesite were used for structural purposes, although not for decorative work because they did not polish. This stone proved very difficult to work with and was generally heated and broken into pieces by pouring cold water over it. These pieces were then placed together with filler cement with the smoothest side out and the jagged side inward.[50] The cut stone, known as blue bicé (but sometimes referred to as blue bitch, or blue bit) was used to create many of the walls of the Creque Marine Railway Building, and the corners, windows, and doorways were built with brick, which was brought to the islands from multiple locations as ship ballast.[51]

The gabled south end wall featured a brick cornice that formed a triangular pediment and a rectangular window, with wood shutters on wrought iron straps and pintles, was centered on the second-floor level. The wall was constructed of rubble and then plastered. The rear wall was plastered rubble with four doors at the lower level, two of which were elevated approximately one-third of the height between the first and second floors and with projecting landings and stairs. The upper level of the rear wall had two windows and a door that originally opened to a balcony, now missing. The brick cornice continued the full length of the rear wall, stopping at the chimney. The chimney, 10-foot square at its base, changed to an octagon at the eaves line and has an octagonal corbelled cap. A round headed door for cleaning existed in the west base. The chimney was covered with plaster to simulate brick.[52]

The north gabled wall, plastered rubble, had three full length round headed windows on the first floor, with three rectangular windows directly above the second level. The cornice returned across the gable end, creating a triangular pediment, which had a small round window. The wall was set on a slightly projecting base and has an eight-course brick water table.[53]

The first floor of the south part of the structure, the first two bays, housed the two large cast iron boilers for the steam engine. A single run stair, 44 inches wide, was built along the windowless south wall. At the time of the 1978 National Register of Historic Places nomination, the stairway collapsed, but the timber stair horses remained. One entered from the exterior only, at the rear, and served the residence on the upper floor. A storage

[49]Rumm, *Historic American Buildings Survey/Historic American Engineering Record*.

[50] The filler cement composition is a mixture of water, sand, and seashells as well as a byproduct from molasses. It may have included cut coral and ground into concrete. George Perkins Merril, *Stones for Building and Decoration, Volume 25* (John Wiley & Sons: New York: 1891), 243.

[51] In Charlotte Amalie, Skytsborg or Blackbeard's Castle's (National Register #91001844) foundation and walls are constructed of the same material. Approximately 10,000 bricks per trip were used as ballast. (http://den-vestindiske-arv.dk/en/the-project-and-the-website/construction).

[52] Gjessing, NRHP nomination form, August 22, 1978.

[53] Ibid.

area, with a door in the southeast corner, was provided under the stairs. The stairway was separated from the boiler room by a 16-inch-thick brick wall that ran the full depth of the room, 36 feet. The north wall of this room was cut stone set in a lime and molasses mortar with two windows, and a door at the east end opened into the engine room. The wall projected through the upper space and had a gable. The window jambs are lined with brick, the sill and head are wood and had louvered blinds. The doorway had a semi-circular head with louvers, was framed with a simple, beaded casing and has a four-panel door on iron butts. The lock was missing. The east wall contains two six foot two inch segmental arched doorways, with double louvered doors and iron shutters. The floor was raised three feet six inches to form a platform over the boilers. All interior walls were plastered.[54]

The two cast iron boilers serviced the steam engine in parallel from 1912 until 1940, when one of the units failed. The remaining boiler lasted another ten years before failing. Originally, boiler fuel consisted of a type of wood indigenous to St. Thomas and Tortola, neighboring islands. However, the expense of shipping the wood to provide constant fuel supply proved too much. During the 1940s, the Creque family replaced the steam engine winch with compressed air from a gas compressor, but this proved unsatisfactory. When use of the facility became sporadic, operators relied on a gasoline winch.[55]

The second space from the south was the engine room, one bay in width, with a stair to the upper living quarters accessible from the exterior and from the next room at the rear. The partition separating the stair from the engine room is brick with a four-light square window. The north wall was brick, with a door connecting to the winch room at the east end of the wall This door is of exceptional design, with a semi-circular arch, paneled reveals and intrados, engaged pilasters with molded capitals and a paneled keystone. The east wall has a single round-headed opening with a wood casing and a double set of shutters, the outside pair paneled and the interior pair louvered. The brick lines jambs have been plastered, as have the interior walled surfaces. The floor is wood except for the area supporting the steam engine, which rests on cut stone.[56]

The wood-fired steam engine that powered the railway winch was built in Hamburg, Germany by the Bolton Company. This engine consisted of a walking-beam engine; it has a fulcrum made of two central A-frames joined at the top. The engine was originally painted red and green and includes a 15-inch bore and 30-inch stroke, D-slide valve, cruciform connecting rod, and a device on the eccentric enabling the engine operator to reverse the machine's direction. Manually unlatching the eccentric rod and thereby manually operating the slide valve, the worker allowed the eccentric to slip on the crankshaft until a stop on the eccentric engaged dogs fixed to the crankshaft; this process advanced or retarded the motion of the eccentric approximately 180 degrees with respect to the piston. This allowed the reversing of the engine's direction and playing out the chains on the cradle to lower it on the way. The engine operated under constant loads and was thus designed without a governor. The only major parts missing from the engine are

[54] Ibid.

[55] Rumm, *Historic American Buildings Survey/Historic American Engineering Record*. As far as can be determined at the completion of this report, the machinery is original.

[56] Gjessing, NRHP nomination form, August 22, 1978.

the box end bearings, along with the strap joining the walking beam to the connecting rod and the beam to the piston rod.[57]

The engine gears directly to the winch without any disconnect or clutch arrangement. The winch had the availability of two gear ratios depending on the size of the load being hauled, the gear shift being accomplished through a moveable gear splined to the driveshaft. Many of the gears, particularly the large forward cog gear, exhibit signs that they have been repaired. During World War II, the U.S. Navy would use the site for barge hauling, often rupturing gears. Many of the smaller gears showed worn or broken teeth. Hauling was accomplished with either a heavy malleable iron chain or an iron cable around a drum on the middle gear shaft depending on the load size. The iron chain did not extend the full distance from winch to cradle but was supplanted by seven or eight wrought iron rods 23 feet long; an eye-U-bolt shackle connected these rods to one another.[58]

A lightweight chain keeper paid out the iron chain that passed under and then across the cog gear from the powerhouse. During the leading edge of the chain from the powerhouse, the chain keeper prevented the heavy iron links from accumulating in the winch pit and fouling the gears or excessively wearing down the stone piles supporting the assembly. Above the cog gear, a chain hoist facilitated the chain keeper in lifting the chain from the gear.[59]

The winch room is one bay wide, with a 7-foot 4-inch central entrance lined with sandstone quoins and a keyed sandstone flat arch. The jambs are cased with wood and there are the remains of a pair of double shutters, hung on large wrought iron straps and pintles. A stone ramp leads to the floor level, with an iron rail to control access to the winch chain, sections of which remain on site. The rear of the winch room has a partition enclosing another stair to the upper level. The stone north wall is decorated with galletting and has a full gable. This wall had a semi-circular arched doorway to the room to the north and is 23 inches thick. The winch is composed of a series of cast iron reduction gears set into a stone lined pit let into the floor. The largest of the gears, the chain drive, is 10 feet in diameter. The winch appeared to be complete.[60]

The north part of the structure had two segmental arched windows, rather than the flat arched windows used elsewhere. The room, in 1978, was inaccessible. A 30-foot-wide shed roof addition to the north side and a later two-story frame porch added to the front wall in the north-east corner.[61]

The second floor, only part of which was visible from the ruined stairways, was divided into three major spaces: over of the boiler room (Bays 1 and 2); the main space over the engine and winch rooms (Bays 3, 4, and 5); and a smaller room over Bay 6. The roof

[57] Rumm, *Historic American Buildings Survey/Historic American Engineering Record* and Gjessing, NRHP nomination form, August 22, 1978. Subjective comment guessing this to be the original engine and noting its excellent condition.

[58] Rumm, *Historic American Buildings Survey/Historic American Engineering Record*.

[59] Ibid.

[60] Gjessing, NRHP nomination form, August 22, 1978.

[61] Ibid.

system, which most was missing in 1978, was a heavy timber frame with a ridge pole. The ceilings were wood plank, tongue and grooved, and the walls were plastered. The walls in the larger central space were scored in a diamond pattern, and retained their painted wainscot, chair rail, and base. All openings on the second story were rectangular, with brick lined splayed jambs, wood heads and sills and double louvered blinds. An interesting feature was that the upper floor was insulated for noise from the lower level by the placement of plaster batts between the floor joists.[62]

Following some improvements to the slip in 1844, the company directors announced plans to erect a large, prefabricated cast-iron cistern to hold "400 Puncheons of Water."[63] The purpose of the cistern was to provide water flow to the boilers and fill a tank for supplying water for use in the residence. Directed by gutters, the cistern was filled by rainwater from the powerhouse roof. A large cistern, 42 feet by 24 feet by 6 feet deep, for the collection and storage of rainwater is located 20-feet west of the Head House. Built on a grid of brick piers, 52 feet 4-inch square with a 22-inch spacing, the cistern is situated on a slight hill, 5 feet 4 inches above grade at the east and 3 feet at the west. The walls and floor of the cistern are made up of 6 × 6–foot cast iron panels, bolted together at the flanges and provided with cross braces and round central bosses for the tie rods. The top edge has 12-inch-wide wood splash boards. There was no covering to the cistern, which is crisscrossed with tie rods and cables. The cast iron distribution pipe to the Head House was partially destroyed in 1978.[64]

By the end of the first operating year, 1845, the repair slip aided 50 vessels. The following year, a company report, showed 58 vessels totaling 11,604 tons, but the company remained $50,000 in debt. The company continued to average 50 ships per year, and engineering problems, unspecified in the reports, challenged operations. In late 1854, a section of the rails broke off when hauling a ship, forcing operations to cease during repairs. Mr. Wilkins, the company superintendent, replaced sections of defective rail and extended the cradle.[65]

St. Thomas Marine Repair Slip continued to struggle throughout the 1860s, particularly with an incident, in 1867, involving the *Gem of the Sea*. On the stocks for cleaning and repairing, the vessel toppled on its port side. A board of inquiry found the railway foreman, Shipwright F. Pradine, utilized unsuitable bilge blocks for bracing the vessel in the cradle. The company was cited for negligence and paid the owners $2,139 for compensation.[66]

CREQUE MARINE RAILWAY SLIP: 1911–1978

The 1867 hurricane season battered St. Thomas. The Marine Repair Slip lost its coaling jetty and most of its wharfage; the buildings lost their roofs but remained standing. The subsequent earthquake and tsunami caused further damage to the island. The company

[62] Gjessing, NRHP nomination form, August 22, 1978.

[63] *St. Thomas Tidende*, October 1, 1844.

[64] Gjessing, NRHP nomination form, August 22, 1978 and HABS.

[65] Rumm, *Historic American Buildings Survey/Historic American Engineering Record*.

[66] Ibid.

completed repairs and, in 1868, resumed operations. Despite steady business, the company struggled to maintain the property. Starting about 1905, local advertisements were posted in the *St. Thomas Tidende* for the sale, lease or rental of the property. Henry O. Creque, a local owner of an ironmongery business became interested in the property. He submitted a sealed bid to the local auction house for the nine-acre property not to exceed $7,000 with provision that it be protected against auction expenses. When the initial payment came due, it included interest as well as auction and attorney fees. Creque contested this, but later paid all fees under protest. At the shareholder's meeting in November 1910, board members accepted the offer.[67]

The National Bank of the Danish West Indies financed the purchase and starting in 1911, Creque supervised the repairs to the shipyard with the order of single side rails in 10-foot lengths, middle and side carriages ordered from the British Engineer's Import Agency. The *Tidende*, detailed the work in the November 8, 1911, edition:

> The progress made with the repairs on the dock since January 2 last, coupled with the discovery that the damage reported to have been sustained by the foundations and rails, are quite unfounded; that the granite blocks forming the railbed have been found quite intact; and the rails under the water are in even better shape than on shore, warrant the issuance of the statement that as soon as such parts of the rolling stock as have been found necessary to order out from the builders in Scotland, shall have come to hand, enabling completion of repairs to the dock cradle and re-laying of new rails in place of those missing from the railbed near the powerhouse, it is expected that March 1912 will witness the reinauguration of the dock capable of lifting vessels of 1500 tons.

Creque worked to dredge the channel as well to reach the adequate depth needed to facilitate the coaling of vessels up to and above 500 tons. In April 1912, after completing all repairs, the Creque Marine Railway opened.[68] Following the dredging, Creque planned to establish the "Henry O. Creque Coal Depot" to be a venture independent of the Creque Marine Railway Slip but utilizing the existing coal jetty on the site.[69]

A two-story building housed the winch and boilers and also served as a residence. Prior to 1910 the acting superintendent lived there and the Creque family occupied the

[67] Rumm, *Historic American Buildings Survey/Historic American Engineering Record* and https://valeriesims.com/creque-marine-railway-history/ accessed December 18, 2019.

[68] Rumm, *Historic American Buildings Survey/Historic American Engineering Record* and https://valeriesims.com/creque-marine-railway-history/ accessed December 18, 2019.

[69] Rumm, *Historic American Buildings Survey/Historic American Engineering Record*. Further implicates the importance of the coal industry at this time, more research about the Creque Coaling Depot will be conducted and how it affected the Slip. A note in the *Tidende* presented Creque's plans for building "spur pits" and stated further that "the fuel oil tanks, which are to be fitted up on the site ... will be the last and most distant of the several projects to claim attention." [52] In 1918, one author wrote of the fuel depot that "There are accommodations for coal supplies, but very little business is being done at present along these lines." [53] By Mr. Harley's time, the tanks were being used to store excess boiler feed water and the coal jetty was no longer in use.

residence from 1910 through the mid-1940s. The Head House fell into ruins after vacancy from fiscus vines, wind damage, and a fire in the 1960s.[70]

During the Historic American Engineering Record (HABS) site visit, portions of the cradle rested in bushes along the railbed with parts of chains, track, and scrap metal. Workers at the Creque Marine Railway during the 1930s and 1940s recalled employing three cradles: 27 feet, 37 feet, and 110 feet. Mr. Creque described a cradle, in 1933, as follows:

> Length of present cradle 150 feet. Breadth 24 feet. Cradle built of greenheart, renewed in its entirety 3 years ago, originally built for 1000-ton capacity. Largest vessel hauled out up to the present was the Molasses Hopper I45, 165 feet long, 34 feet beam.

Workers recall regular maintenance to the cradles about every three years. For ballast, they relied on scrap metal and used ropes instead of winches for maneuvering the bilge blocks.[71]

Hauling a vessel up on the railway was a fairly simple process, which required much preparation. Workers began readying the railway for a ship the day before it arrived, adjusting the cradle to fit the hull of the craft. At five o'clock, on the morning of hauling, workers fired up the boilers. The cradle was fitted with ballast blocks and the steam engine's direction reversed to run the cradle to the end tracks, marked by a piling set in the seabed.[72]

Directed by flags on either side and on the center rod of the cradle, the ship docked in the slip. Underwater divers assisted the keel into place while a crew of workers held guide ropes and shifted the keel and bilge blocks. When properly positioned and aligned on the cradle, so that its load was evenly distributed and with the blocks locked in place to hold the ship steady, the winch hauled the ship out of the water. The entire process required six to nine men. If not properly positioned, the ship backed off the cradle and the sequence repeated.

As the cradle ascended the railway, workers placed additional blocks under the ship's hull. If the chains were used in hauling, the 23-foot lengths of iron rod were linked between the cradle and chain. When the ship moved two rod lengths, the cradle was secured to deadbolts in the rail bed, and the rods removed as the chain was paid out of the powerhouse by the chain-keeper. This process was repeated every two rods. If cable was used, the hauling process was continuous and the able wound around an iron drum on the cog gear-shaft. Depending on the size of the ship and the mean employed, hauling lasted anywhere from an hour to the entire day. When operations were finished on one vessel, it was secured to deadbolts. If a day's operations included a large and small ship, the larger craft was hauled out first using the big cradle and both tracks; rods or the cable were then passed under the cradle to either of the two parallel tracks and a smaller cradle, using one

[70] Rumm, *Historic American Buildings Survey/Historic American Engineering Record*. Some research has suggested that at some point the workers worked shifts and stayed on site sleeping in the second story dormitory, we will elaborate on this possibility. The Creques converted the office on site into a residence.

[71] Rumm, *Historic American Buildings Survey/Historic American Engineering Record*.

[72] Rumm, *Historic American Buildings Survey/Historic American Engineering Record*.

set of rails, hauled out the smaller craft. Ships requiring extensive repairs were usually hoisted off the railway and moved to one side using rollers and skids.[73]

A small repair shop was located to the southwest of the masonry wet dock at the base of the marine railway. A twentieth-century advertisement highlights the services of the Creque Marine Railway as "docking, caulking, cleaning, repairing, painting, scraping, chipping, and metaling" in the "Smithy and Workshop on the Premises." At the Creque Marine Railway, records support that primarily cleaning and painting operations on yachts and pleasure boats made up the bulk of the work. By the 1930s, employees noted the repair shop was hardly used and then only for welding. Most of the machinery was removed, although in the 1980s, lathers, saws, and an early diesel engine remained.[74]

Rusting tanks adjacent to the repair shop remained from the Creque Fuel Depot. In 1918, one source noted "accommodations for coal supplies, but very little business is being done at the present along these lines." Staff from the later decades note the tanks held excess boiler feed water and the coal jetty was no longer in use.[75]

Creque died in 1915 and his son, Herman O. Creque inherited and operated the family business. At the time of his death, January 1949, the property was bequeathed to his wife and, later, their five children. The family continued operations until 1957 under the leadership of Henry O. Creque, Jr. The marine railway regularly employed ten people. The company hauled everything from yachts and tugboats to barges, lighters, and freighters on their way. They were proud of their work and of their operations, and their repair invoices were often accompanied by personal reflections on the work performed.[76]

During World War II, the Navy leased the facility from the Creque family and used it in hauling out barges and mine-sweepers for cleaning and light repairs allowing Mr. Creque to continue to use the railway for work on small private pleasure crafts, yachts, and motor launches. In mid-1944, the Navy returned the facility to him after completing the following repairs:

- Renewal of 500 feet of 1 ¼ inch cable
- Rebricking boiler uptake
- Rebuilding and replacing approximately 150 feet of track
- Replacing greenheart cradle timbers

Following Henry Creque Jr.'s passing in 1957, the family closed the marine railway for a few years until the late 1950s, when the facility was leased to William Hurst. Due to non-use the railway began to deteriorate markedly during this period. For example, the track had buckled so severely in places that it caused the cast iron wheels on the cradle to snap. Hurst installed a downhaul on the railway allowing the cradle might be controlled during launching rather than running freely down the track. He employed 16 to 20 men who

[73] Ibid.

[74] Ibid.

[75] Ibid.

[76] Ibid.

would occasionally haul up three small freighters weighing 400 to 500 tons, for the purpose of dry-docking since no other facilities were available.[77]

A Mr. Dollard leased the marine railway in the early 1960s, but he too experienced difficulty with the facility due to its great deterioration. The last reference to a marine railway on Hassel Island appeared in 1965, stating that a "slipway for vessels up to 1,000 dew. with a 9 ft. draught is operated by St. Thomas Shipbuilding and Drydock Co." Apart from the hauling of the *Carnival*, the yard had been dormant for over a decade. In 1978, the Creque family sold the property to the federal government.[78]

VIRGIN ISLANDS NATIONAL PARK: 1978 –2020

On July 16, 1976, the southern portion of Hassell Island became part of the National Register of Historic Places. On August 29, 1978, the boundaries of the Virgin Islands National Park historic district were increased to include the Creque Marine Railway. Since coming under the jurisdiction of the National Park Service, the Head House and Residence has endured damage from multiple hurricanes. In 1995, Hurricane Marilyn was responsible for the collapse of the residence portion of the building.

In the early twenty-first century, the Virgin Islands National Park, the Saint Thomas and Hassel Island Preservation Trust, the Saint Thomas Historical Trust, and other organizations have been working together to preserve the different historic sites on the island including Frederik's Battery / Fort Willoughby, Shipley's Battery, Cowell's Battery, and the Garrison House, and the Hassel family cemetery. One project includes the Creque Marine Railway Metal Conservation Project led by Virgin Islands National Park Archaeologist and Cultural Resource Manager, Ken Wild, and funded by the Friends of Virgin Islands National Park. The project worked to preserve the material history of the Creque Marine Railway. The industrial debris included the slipway engines and equipment; tools used to repair the vessels such as lathes and drill presses; coaling equipment; blacksmith table positioning winches; and marine devices like mooring bells and diving bells. The tropical and salt-laden climate heavily rusted the artifacts. The team removed rust layers, strengthen weakened metal, and sealed objects to protect from further deterioration. The team painted and sealed the objects with historically appropriate colors.[81]

In 2011, the Virgin Islands National Park received funding to continue work on the Hassel Island Historic Trails Project, an interpretive trail linking the various cultural sites of the island. In 2016, the Virgin Islands State Historic Preservation Office and The Office of Archaeological Research University of Alabama Museums created a five year (2016–2021), state-wide preservation plan for the U.S. Virgin Islands; Creque Marine Railway is a part of this preservation plan. With the coordination of the Virgin Island National Park, the St. Thomas Historical Trust, and the Friends of the Virgin Island National Park a series of signage, walking trails, and stabilization efforts for some of the

[77] HABS and https://valeriesims.com/creque-marine-railway-history/ (Accessed December 18, 2019).

[78] Ibid. More research documenting the 1960s fire is being conducted.

[81] ---, "Creque Marine Railway Metal Conservation Project." *Hassel Island*, Accessed December 18, 2019. http://www.hasselisland.org/projects/cmr-metal-conservation/

historic structures on the island are in progress. The Creque Marine Railway is included in these goals with the goal of creating a museum and interpretation center. This would provide an important engagement with the historic narrative of St. Thomas and ultimately a sustainable model for tourism at this historic site.[82]

In 2017, Hassel Island experienced a great deal of damage from Hurricane Irma (Category 5) and Hurricane Maria (Category 5). The Creque Marine Railway Building was no exception, and most of the steam tower has collapsed on the southern side. The pitched stone wall in the center is gone, which leaves just one wall on the eastern side, while a large section of the western side has been badly damaged, as well. There have been no efforts to stabilize the Creque Marine Railway Building since the hurricanes.



Figure 1. 1700s Map of St. Thomas and St. Jan: Originally Hassel Island was not separated from St. Thomas, but rather a peninsula creating several coves as part of Long Bay or St. Thomas Harbor. (National Museum of Denmark, https://en.natmus.dk/historical).

[82] *Historic Preservation in the U.S. Virgin Islands: Preserving Our Past for Our Future (2016 – 2021)* Compiled by: The Virgin Islands State Historic Preservation Office and The Office of Archaeological Research, University of Alabama Museums (September 2016) 20. Accessed July 23, 2020. http://oar.museums.ua.edu/wp-content/uploads/sites/6/2016/09/PreservationPlan2016-2021.pdf.



Figure 2. View of the harbor, looking towards Hassel Island, circa 1910 (M/S Maritime Museum of Denmark https://mfs.dk/en/knowledge-center).



Figure 3. Creque Marine Railway, circa 1910 (M/S Maritime Museum of Denmark https://mfs.dk/en/knowledge-center).

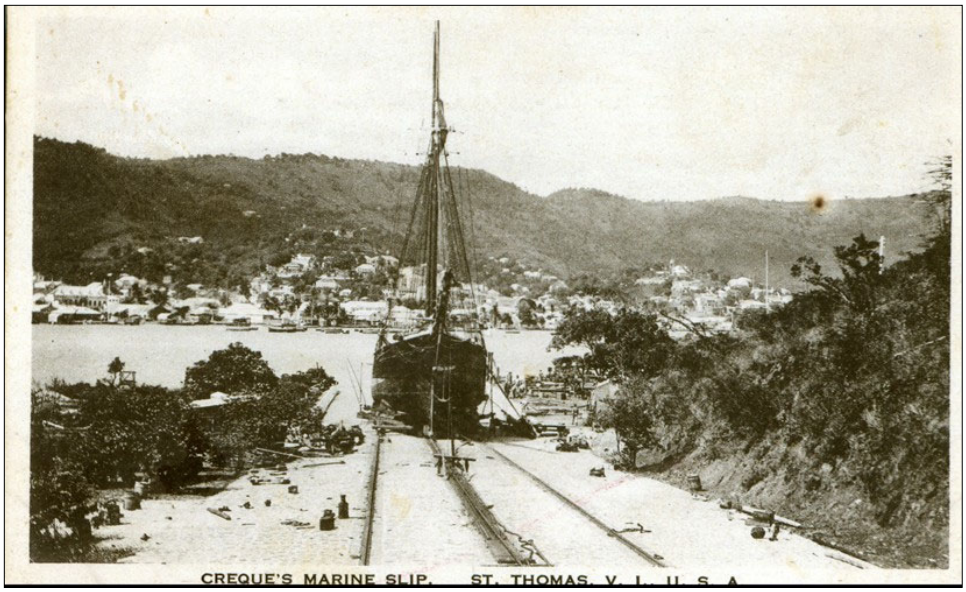


Figure 4. Schooner being winched from harbor at Creque Marina Railway Slip, unknown date, (https://valeriesims.com/damage-creque-marine-railway-hurricanes-irma-maria/).



Figure 5. Found in the Creque Family Photographs, the above picture dates to July 11 – 19, 1912 of Dutch schooner, The Venture. Taken by Clare E. Taylor, Creque submitted the picture to the New York Nautical Gazette which featured a story September 25, 1912. At the time, this was the largest vessel, 195 tons, to date to be lifted at by the Creque family since purchasing the railway two years earlier. (Valerie Sims. "Creque Marine Railway." Accessed November 5, 2020, http://valeriesims.com/category/creque-marine-railway/).



Figure 6. In 1920, *The Meteor*, a schooner about 75 feet by 25 feet, captained by Captain Prince arrived at Creque Marine Railway for repairs (Valerie Sims. *"Creque Marine Railway."* Accessed November 5, 2020, http://valeriesims.com/category/creque-marine-railway/).



Figure 7. On May 4, 1921, Herman Creque logged the arrival of the mail schooner, *Virginia*, owned by Captain Abraham Mardenborough, for repairs and services. Creque logged her dimensions as 60 feet in length and 25 feet wide (Valerie Sims. *"Creque Marine Railway."* Accessed November 5, 2020, http://valeriesims.com/category/creque-marine-railway/).



Figure 8. The schooner, *Gaviota*, being repaired, in 1921, at Creque Marine Railway (Valerie Sims. *"Creque Marine Railway."* Accessed November 5, 2020, http://valeriesims.com/category/creque-marine-railway/).

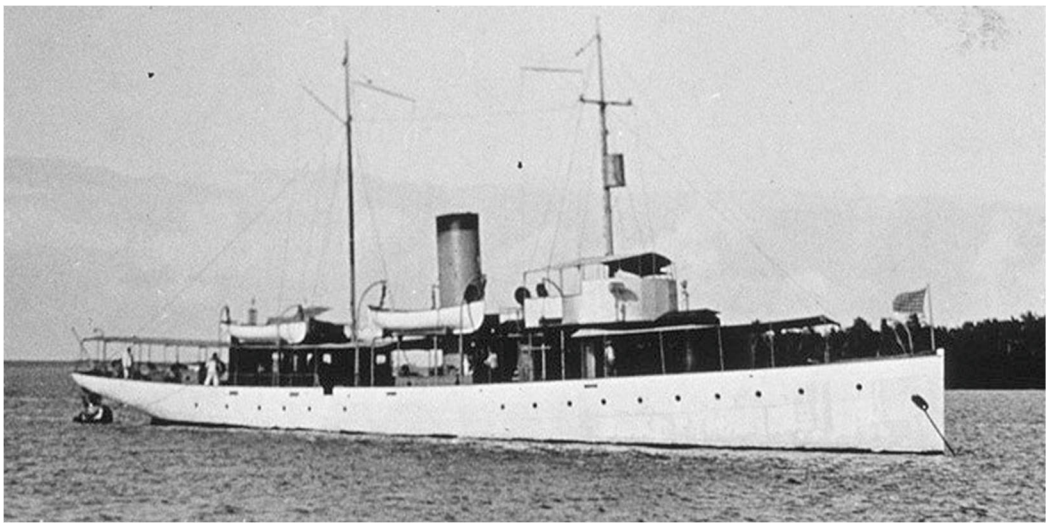


Figure 9. In August 1924, after a deadly hurricane, the "Gale of 1924," struck Tortola and the United States Virgin Islands, the *USS Ranger* transported workers to assist those in need. The following year, she received regular maintenance – cleaning and anti-corrosive paint to the hull – at Creque Marine Railway (Valerie Sims. *"Creque Marine Railway."* Accessed November 5, 2020, http://valeriesims.com/category/creque-marine-railway/).

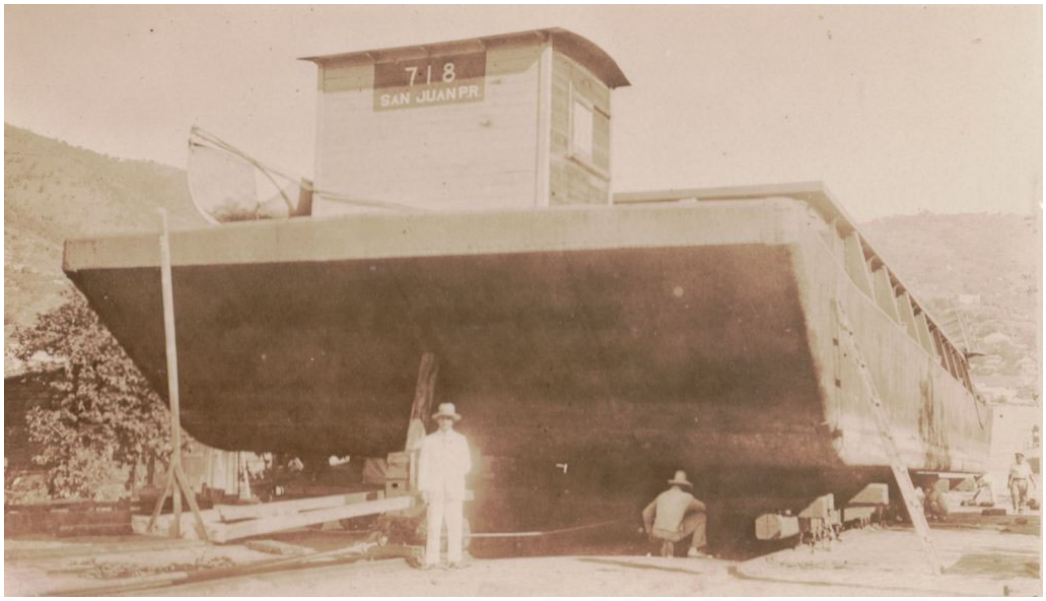


Figure 10. On December 28, 1926, a representative from United Sugar Company in Humacao, Puerto Rico discussed with Mr. Creque (Hermann?) the cost to haul the company's barge. At Creque Marine Railway the price was 75 cents/gross ton, plus launching and each day on the rails. In 1930, the barge arrived at the slip. The workers pumped out water and repaired the hull plates for a total cost of $3,200 (Valerie Sims. *"Creque Marine Railway."* Accessed November 5, 2020, http://valeriesims.com/category/creque-marine-railway/).

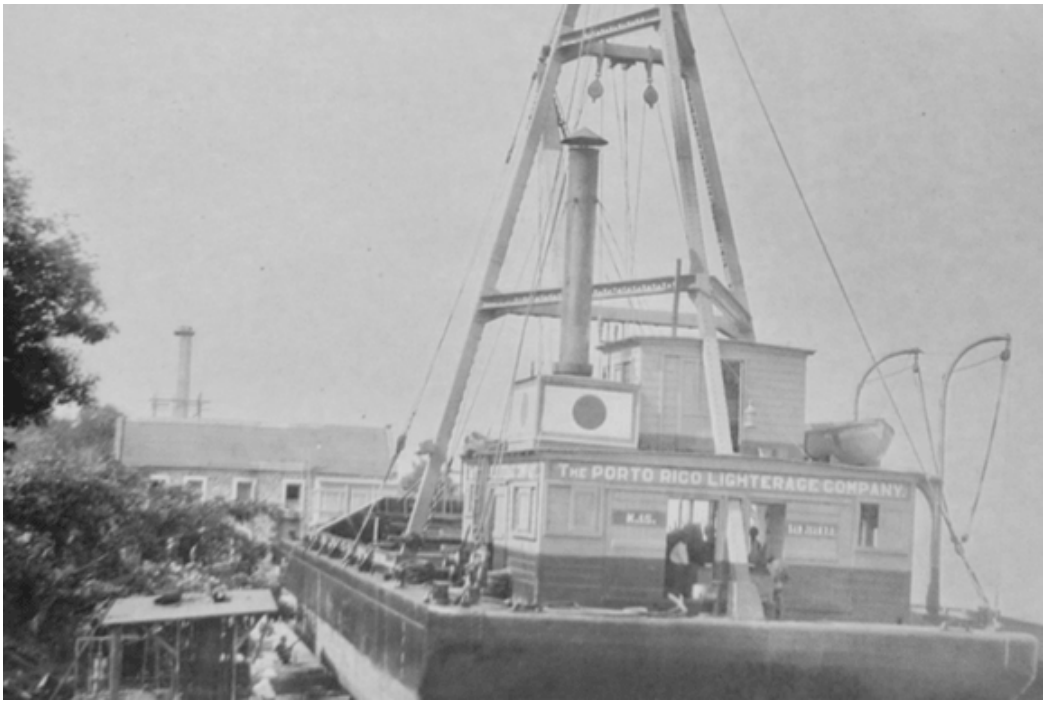


Figure 11. Sims notes boat owners, following the September 1932 San Ciprián hurricane, wrote to reserve space at Creque Marine Railway for repairs. The above photograph shows a boat belonging to the Porto Rico Lighterace Company in the slip (Valerie Sims. *"Creque Marine Railway."* Accessed November 5, 2020, http://valeriesims.com/category/creque-marine-railway/).



Figure 12. In 1937, the *El Caribe*, an oil tanker, hit a coral reef near Saona Island off the southeastern tip of the Dominican Republic. With the hull badly damaged, the 226-ton tanker made her way to Creque Marine Railway for repairs (Valerie Sims. *"Creque Marine Railway."* Accessed November 5, 2020, http://valeriesims.com/category/creque-marine-railway/).



Figure 13. The sloop, *Sora*, in 1942 at Creque Marine Railway (Valerie Sims. *"Creque Marine Railway."* Accessed November 5, 2020, http://valeriesims.com/category/creque-marine-railway/).



Figure 14. Creque Marine Railway Head House with chimney, unknown date prior to 2017 hurricane season (https://valeriesims.com/damage-creque-marine-railway-hurricanes-irma-maria/).



Figure 15. Creque Marine Railway Head House and Cistern, unknown date prior to 2017 hurricane season (https://www.hasselisland.org/sites/creque-marine-railway/).



Figure 16. Bracing System installed circa 2009 as part of stabilization project for the Creque Marine Railway (NPS).



Figure 17. Creque Marine Railway Slip, unknown date prior to 2017 hurricane season (NPS).



Figure 18. View of Creque Marine Railway Head House, unknown date prior to 2017 hurricane season (NPS).



Figure 19. North elevation with chimney intact, 2007 (NPS).



Figure 20. Creque Marine Railway North elevation, unknown date prior to 2017 hurricane season (NPS).



Figure 21. North façade with Living Quarters porch intact, facing southeast, unknown date prior to 1978 (NRHP nomination form).



Figure 22. Interior of Living Quarters, facing southwest unknown date prior to 1978 (NRHP nomination form).



Figure 23. South façade of Living Quarters, unknown date prior to 2017 hurricane season (https://valeriesims.com/damage-creque-marine-railway-hurricanes-irma-maria/).



Figure 24. Flywheel and Winch Room before hurricanes Irma and Maria, 2007 (NPS).



Figure 25. Winch Room with shutters and original floor joists prior to hurricane damage, 2007 (NPS).



Figure 26. Gear System in Winch Room, unknown date prior to 2017 hurricane season (https://valeriesims.com/damage-creque-marine-railway-hurricanes-irma-maria/).



Figure 27. Boilers, unknown date prior to 2017 hurricane season (https://valeriesims.com/damage-creque-marine-railway-hurricanes-irma-maria/).



Figure 28. Photographic evidence of damage after hurricanes Irma and Maria, 2018 (Anne Finney).



Figure 29. Creque Marine Railway Head House post hurricanes Irma and Maria, 2018 (Anne Finney).



Figure 30. Boilers post hurricanes Irma and Maria, 2018 (Anne Finney).



Figure 31. Engine Room before hurricanes Irma and Maria, 2007 (NPS).



Figure 32. Engine Room post hurricanes Irma and Maria, 2018 (Anne Finney).



Figure 33. Intact flywheel wall before hurricanes Irma and Maria, 2007 (NPS).



Figure 34. Flywheel wall post hurricanes Irma and Maria, 2018 (Anne Finney).

PHYSICAL DESCRIPTION AND CONDITION ASSESSMENT

This HSR for the Creque Marine Railway Building and Cistern is unique as compared to most NPS HSRs, due to the extensive amount of damage and loss of the building's historic fabric, from the recent Hurricanes Irma and Maria. This section of the HSR, Physical Description and Condition Assessment, will make an effort to document the damages, the pre-hurricane stabilization efforts by NPS, and any remaining historic and structural integrity left of the original building materials and site elements that were decimated by the storms.

Prior to the unforeseeable devastating Hurricane Irma Category 5 storm in 2017, the NPS had made a strategic effort to save, protect, and mitigate damage to the historic fabric of the Creque Marine Railway Building by installing a stabilization system. However, Irma's unprecedented strength and intensity put such extreme forces on the building that the stabilization efforts were not substantial enough to protect the historic fabric from the resulting damage and loss. Many of the walls are still standing, albeit precariously, and the original iron Bolton Beam Engine and the associated iron equipment is still intact.

The original historic materials of the Creque Marine Railway Building have been left in ruins, and, subsequently, the building's site on Hassel Island left with mounds of rubble

and debris from the historic bricks, stone, and wood framing. Still standing or intact are six 2-story sections of the original exterior and interior brick and stone walls, the iron equipment of the original 1840 Bolton Beam Engine, the Cistern, the steel railway, and the slipway, all of which can be classified as the only character-defining features that remain on the site.

Unfortunately, the two main character defining features of the original structure were lost to multiple hurricanes and a burning event. First, the 60-foot-tall brick chimney that serviced the boilers for the Bolton Beam Engine and second, the gable roof with the original roof tiles. These two historic architectural design elements, alone, made the building distinguishable when viewing Hassel Island from St. Thomas Harbor. These visual elements, similar to a lighthouse, aided the ship's captains in navigating their massive ships to the marine repair facility, through St. Thomas harbor to Hassel Island.

The extensive destruction caused by these climate events, on the Creque Marine Railway Building and on all the Virgin Island National Parks' cultural, natural and operational resources ***cannot be overstated***. The Creque Marine Railway Building's remaining historic fabric has been so thoroughly compromised and left vulnerable; it is likely the building may not survive another catastrophic event, unless remedial action is taken immediately.

The description of the remains of the original building materials, the equipment, and the stabilization system follows.

HURRICANE DAMAGE

The U.S. Virgin Islands along with the Virgin Islands National Park, (St. John Island and Hassel Island), are located in what is known as Hurricane Alley, an area of the Atlantic Ocean that stretches from the west coast of northern Africa to the east coast of the Southern United States and Central America.[83] Even the name, Hassel Island, the site of the Creque Marine Railway Building, is named "Estate Orkanshullet", when translated from Danish means "Hurricane Hole".[84]

Scientific research has estimated that over 21 hurricanes have hit the Virgin Islands since 1871. Hurricane Irma, the strongest on record to hit the islands was on September 6, 2017 when the eye of the Category 5 storm passed directly over the islands with over 185 mph winds. Two weeks later, on September 20, 2017 Hurricane Maria, Category 5 just missed a direct hit onto St. Thomas but caused significant flooding and mudslides with 64 mph winds. The most recent storm was Hurricane Dorian, Category 1, which hit on August 28, 2019 with wind gusts up to 111 mph, but did not have any direct effect on the site.[85]

The devastation from Hurricanes Irma and Maria could be seen on NASA's satellite images from space, which showed the amount of devastation and destruction that the entire landscape of the islands had sustained. The extensive flooding and winds from the Irma and Maria storms resulted in severe damage to the islands' infrastructure, washed

[83] Goudzari, Sara "Hurricane Alley Heats Up", *LiveScience* (May 2, 2006), Retrieved 9 September 2008.

[84] https://www.hasselisland.org/main

[85] http://www.hurricanecity.com/city/saintthomas.htm

out roads, downed power lines and communication systems, along with the closure of the regional airports and shipping ports. It was said that what was not blown down by Hurricane Irma, was washed to sea by Hurricane Maria.[86]

On September 4, 2017 the park superintendent, Mr. Randolph Lavasseur, of San Juan National Historic Site, deployed two maintenance groups from the San Juan Park to assist the Virgin Islands National Park and Virgin Islands Coral Reef National Monument in Saint John following Hurricane Irma.[87] No additional stabilization efforts were conducted at the Creque Marine Railway site. The previous stabilization efforts at the Creque Head House took place in 2009 and the project was closed out in 2011. This was a management decision to stabilize the structure for preservation of Hassel Island unrelated to the 2017 hurricane season.

Weeks later after the second hurricane, Maria, hit the islands, the NPS's Western Incident Management Team assisted all six of the NPS Caribbean parks with more stabilization efforts, including those in the Virgin Islands National Park. In addition, a facility assessment team was dispatched to assess all of the park structures and infrastructure, along with a Caribbean Hurricane Emergency Rehabilitation Team who developed

Objectives to move parks out of the stabilization phase:

- Objectives that would transition the parks into recovery
- Strategic plan for the recovery with the overarching mission to reopen the parks and
- Financial plan for each phase.[88]

GENERAL SITE DESCRIPTION

The site for the Creque Marine Railway Building is located on the northwest side of Hassel Island, which is part of the Virgin Islands National Park and is just off the southern coast of St. Thomas, in the Caribbean's, U.S. Virgin Islands Territory. St. Thomas is the second largest, (32 sq. miles/83sq.km.) of the three islands that make up the unincorporated Territory, the other two being St. John and St. Croix.[89]

St. Thomas has a population of 51,634 (2010) and hosts the capital town of Charlotte Amalie.[90] The two islands in St. Thomas harbor, (also known as Charlotte Amalie harbor), are Water Island, which is a residential area and **Hassel Island**, of which the NPS' parcels were listed in the National Register of Historic Places in 1978.[91]

[86] Jiang, Sunny C., Muyue Han, Srikiran Chandrasekaran, Yingcong Fang, and Christina A. Kellogg. "Assessing the Water Quality Impacts of Two Category-5 Hurricanes on St. Thomas, Virgin Islands." *Water Research* 171 (March 2020): 115440. https://doi.org/10.1016/j.watres.2019.115440.

[87] ---, "Closure Due to Hurricane Irma", *National Park Service,* (September 4, 2017) https://www.nps.gov/saju/learn/news/closure-due-to-hurricane-irma.htm

[88] https://www.nps.gov/saju/learn/news/stabilization-work-continues-at-national-parks-of-the-caribbean.htm

[89] "CIA – The World Factbook-US Virgin Islands". Archived from the original on May 16, 2016.

[90] "U.S. Virgin Islands-2010 Census Results. Census.gov US Census Bureau

[91] https://www.nps.gov/viis/index.htm

To reinforce its historic significance, the Virgin Islands National Park was also designated by the United Nations' Education, Scientific, and Cultural Organization (UNESCO) in 1976 as one of the first protected areas of the International Biosphere Reserve, as it is one of only 30 areas containing both marine and terrestrial ecosystems.[92] The Virgin Islands National Park was the only biosphere in the Lesser Antilles, until the Park was withdrawn from the designation in 2017.[93]

This international designation is in keeping with the historic context of the Virgin Island's strategic site location and role, in global trading and maritime history, as characterized by the fact that the Creque Marine Railway Building is one of the oldest surviving facilities of its kind in the Western Hemisphere.[94]

Hassel Island

Hassel Island forms the southeastern edge of a natural harbor, known as Charlotte Amalie harbor, to the southeast of St. Thomas island.[95] The 136-acre island, measures approximately one mile long by 1800 feet wide, with the highest elevation point at the southern tip, at 267 feet above sea level. The Creque Marine site elevation is approximately 18 feet above sea level.[96]

Hassel Island is classified as having a subtropical forest ecosystem, with a climate ranging from dry to moist. Geographically, this area of the Caribbean experiences well-defined rainy and dry seasons, with the wet season often experiencing harsh storms, including hurricanes. Most of the island is covered with a dense growth of thorny scrub brush, shrub-like tropical vegetation, cacti and various succulent species. It is stated that there is a total of 299 species of flora with 20 of the species having been listed as endangered. The islands are composed of volcanic rocks and their sedimentary products. The topsoil is very thin in most locations typically not more than approximately 75 centimeters deep.[97]

Through this subtropical ecosystem, there is a 3 mile/4.8-kilometer-long, hiking trail that runs the length of the island, which starts at the dock of the Creque Marine Railway Building, goes to the two highest points on the island, Fort Shipley and Cowells Battery, and ends at the Garrison House. The trail connects 14 different historic ruins of early 19th-century English fortifications, mid-19th-century shipping and coal stations, a Leprosarium, the Hazzell Family Cemetery and Fort Willoughby.[98] All the historic

[92] US Dept. of Interior, National Park Service, Foundation Document, (December 2016): 3.

[93] McCarthy, John "Trump Removes St. John's Virgin Islands National Park from UNESCO Biosphere Reserves list", *Virgin Islands Free Press*, (June 19, 2017), https://vifreepress.com/2017/06/trump-administration-removes-st-johns-virgin-islands-national-park-unesco-biosphere-reserves-list-delegate-congress-stacey-plaskett-clueless-even-happened/

[94] Creque Marine Railway, Title Sheet - Creque Marine Railway, Charlotte Amalie, St. Thomas, VI Drawings from Survey HAER VI-1, *Library of Congress*, https://www.loc.gov/resource/hhh.vi0026.sheet/?sp=1

[95] https://www.hasselisland.org/

[96] Gjessing, Fred. *Historic Resource Study, Hassel Island, U.S. Virgin Islands*. National Park Service. Southeast Archaeological Center. 1980 - 1981.

[97] https://www.hasselisland.org/nature/ecosystem/

[98] NPS Hassel Island Trail Map, *Virgin Islands National Park, National Park Service*, http://www.hasselisland.org/wp-content/uploads/HasselIsland_TrailMap_PDFdownload.pdf

properties were listed in the National Register of Historic Places in 1978 as part of the Hassel Island Historic District.

The NPS acquired about 95% of Hassel Island in 1978. Currently however there are two land parcels owned by the Virgin Islands Government, one parcel owned by the Virgin Islands Port Authority, six parcels owned by the Amalie Holding II LLP entity, and three private in-holdings, with the US Government owning the rest of the land area.[99]

Site at Building

The NPS site area at the Creque Marine Railway Building is located on the northwest section of Hassel Island, on a land parcel that is 6.54 acres in size.[100] The front of the building was constructed on the site facing Charlotte Amalie harbor to the north, northeast. Along with this marine railway repair building, the site includes a dock, iron rails, slipway, defunct mechanical equipment, and a cistern.

The 200-foot-long slipway, where the ships first entered the site for repairs, lies about 360 feet northeast from the main north entrance of the building. On both sides of the slipway, the original stone walls stand 3 feet above the waterline, measuring 2 feet wide. In 2017, the walls were capped with 4 inches of concrete. On top of the west slipway wall there is one original iron, double mooring bollard that the ships tied onto, which was left in place and skim coated around at the base. The bottom of the slipway has an inclined plan and two iron rails that lead into the water.

About 40 feet to the northeast of the slipway walls, lays the concrete slab where the original large machine repair shop was located. Currently on top of the slab and scattered around amongst the vegetation, there are numerous and varying pieces of historic iron machine tools and parts.

The North main entrance to the building has a 145-inch-tall doorway, which opens directly into the gear room for the beam engine. Just outside and directly in front of this doorway is a concrete inclined ramp where the original iron pulley/spool was located. It had been used to wrap an iron cable around, which was attached to the iron chain that was hooked to the ships to pull them out of the water onto shore. The original iron pulley/spool and the iron chain are now missing from the site. Their whereabouts is unknown. The rest of the site on this north side of the building has been cleared of the vegetative growth that was starting to work its way inside the walls of the ruins. About 15 feet from the north wall, the Park has installed a 4-foot-high wood fence to help keep people out of the ruins.

At the site area directly adjacent to and about 10 feet from the east stone wall of the building, there is a steep rocky slope that continues up approximately 170 feet to the top of the island, where Ft. Shipley is located.[1] The base of this east wall has a 2- to 5-foot-deep pile of debris, mainly bricks and mortar that once formed the 60-foot-tall chimney.

[99] GIS Division, Office of the Lt. Governor 1088 Kongens Gade, Kings Quarter, St. Thomas US Virgin Islands, https://usvi.mapgeo.io/datasets/properties

[100] GIS Division, Office of the Lt. Governor 1088 Kongens Gade, Kings Quarter, St. Thomas US Virgin Islands, https://usvi.mapgeo.io/datasets/properties

According to the location of these brick remains, is appears that the chimney fell in the northwest direction, landing in both the interior and exterior of the building.

From the building's south brick wall, the Cistern is located about 40 feet to the south. This was used as a catchment for water to feed the two boilers inside the building. The area in between the two structures has seen new growth of 10- to 20-foot-tall scrub brush, however the vegetation at grade is fairly sparse. Also, in this area there is a wood post fence which matches that on the north. This was put in place by the Park as a protective measure.

From the East brick wall of the Creque Marine Railway Head House the shoreline lies 90 feet away. This is the area on the site where most of the building and vegetation debris is located, which extends from the base of the east wall out to about 50 feet to the northwest. The 2- to 3-foot-deep pile of debris contains the stones, bricks and mortar from the walls, and some wood framing members that may have been part of the roof or floors in the east bay that was once the residence of the building. The area beyond the debris pile to the shoreline is mainly rocky coastline with scattered 10- to 29-foot-high shrubs and sand.

Following this shoreline area back to the north where the dock and slipway are located, the remnants of the storms are evident. There is trash from the island scattered throughout the dock area, amongst the adjacent vegetation at the dock and in the water edge as well. Trash frequently collects in this area and the Park has not had the resources to initiate the clean-up of the site, due to the other resources in the park needing more immediate attention. In addition, the entire site, especially around the building, is overgrown with newly regenerated vegetation, as a result of the hurricane's damage to the landscape.

CREQUE MARINE RAILWAY BUILDING – DESCRIPTION AND CONSTRUCTION

The construction of the Creque Marine Railway Building began in 1841 and was completed in 1843. Since that time the building has been subjected to over 21 hurricanes, 1 fire and all of the other unrecorded storms and earthquakes in the Virgin Islands Territory. The resulting destruction has taken its toll on the building's remaining historic fabric and materials. The original roof and 60-foot-tall chimney has been destroyed, however 80% of the original walls are still standing along with the original Bolton Beam Engine and related iron components. Another character defining decorative element which survives is the striking brown cut sandstone framing the main entrance on the north facade.

The original 2 story, exterior walls and the two main interior gable walls were built with locally available, large irregular shaped stones, typically known as rubble masonry construction (Figure 35). The exterior stone walls on the East and West ends of the building, along with two interior gable stone walls were constructed as part of the structural system to support the original roof. At the top of these walls the stone was laid to a center peak of 39 feet 3 inches (from the Boiler Room finished floor) to mimic the slope and profile of the original gable roof. These four gabled stone walls supported the

roof's wood ridge beam, which ran the length of the building. The wood ridge beam then supported the wood roof joists, roof decking and exterior roof material.



Figure 35: Overall North Elevation with vegetation 10' in front of building and growing on top of walls with horizontal perimeter wood stabilization band and steel posts for shoring, 2020 (Helen Juergens).

The original gable roof including the wood ridge beam, wood rafters, wood plank decking, and original roofing material was lost to a fire in 1967 (Figure 36). Since Hassel Island, along with the Creque Marine Railway Building, did not become part of the Virgin Islands National Park until 1978, this fire would have been a catastrophic event that preceded any historic preservation guidelines or mandates to accommodate for the missing roof. From historic photographs, it is clear that the original gabled roof, along with the 60-foot-tall chimney to the building, were the two of the most significant character-defining features of the building, as seen from St. Thomas harbor. Both are now gone.



Figure 36: Original East perimeter stone gable wall in 1977 showing the remains of the original gable roof wood framing and the original 2nd level wood floor joists (Russell Wright, National Register Photo).

The building elevation is divided into six bays, while in plan the building is divided into four main rooms which each house a critical piece of the iron equipment that powered the winch system (Figure 37, 38). From the east side of the building going west, they include:

Bay #	Bay/Room Name	Level	Historic Use
Bays 1 & 2	Boiler Room	First Floor	2 Original Iron Boilers
		Second Floor	Storage
Bay 3	Engine Room	First Floor	Original Bolton Beam Engine
		Second Floor	Storage & Office
Bay 4	Winch Room	First Floor	Original Winch/Gears
		Second Floor	Storage & Office
Bays 5 & 6	Living Quarters	First Floor	Work Area
		Second Floor	Creque Family Residence

Bays 1-4 remain standing. Bays 5 & 6, the original Living Quarters for the Creque family, were destroyed in 1995 by Hurricane Marilyn. The building debris, rubble, and ruins from these west end bays is strewn from the edge of the original building almost down to the water's edge. Amongst the rubble and debris field, a significant amount of vegetation has grown and in some cases is growing out of the building ruins.

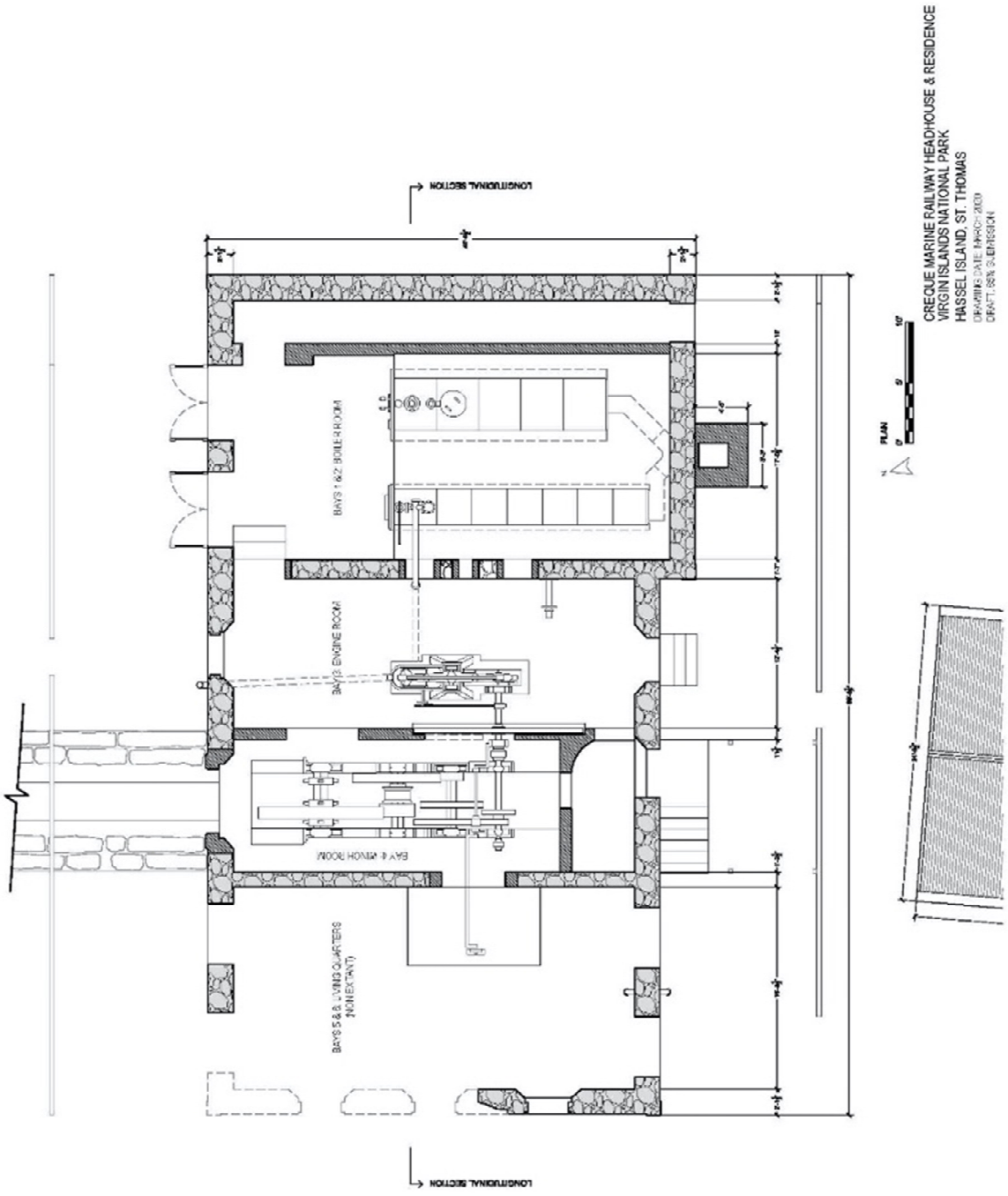


Figure 37. 2020 Existing Conditions Drawings, plan view.

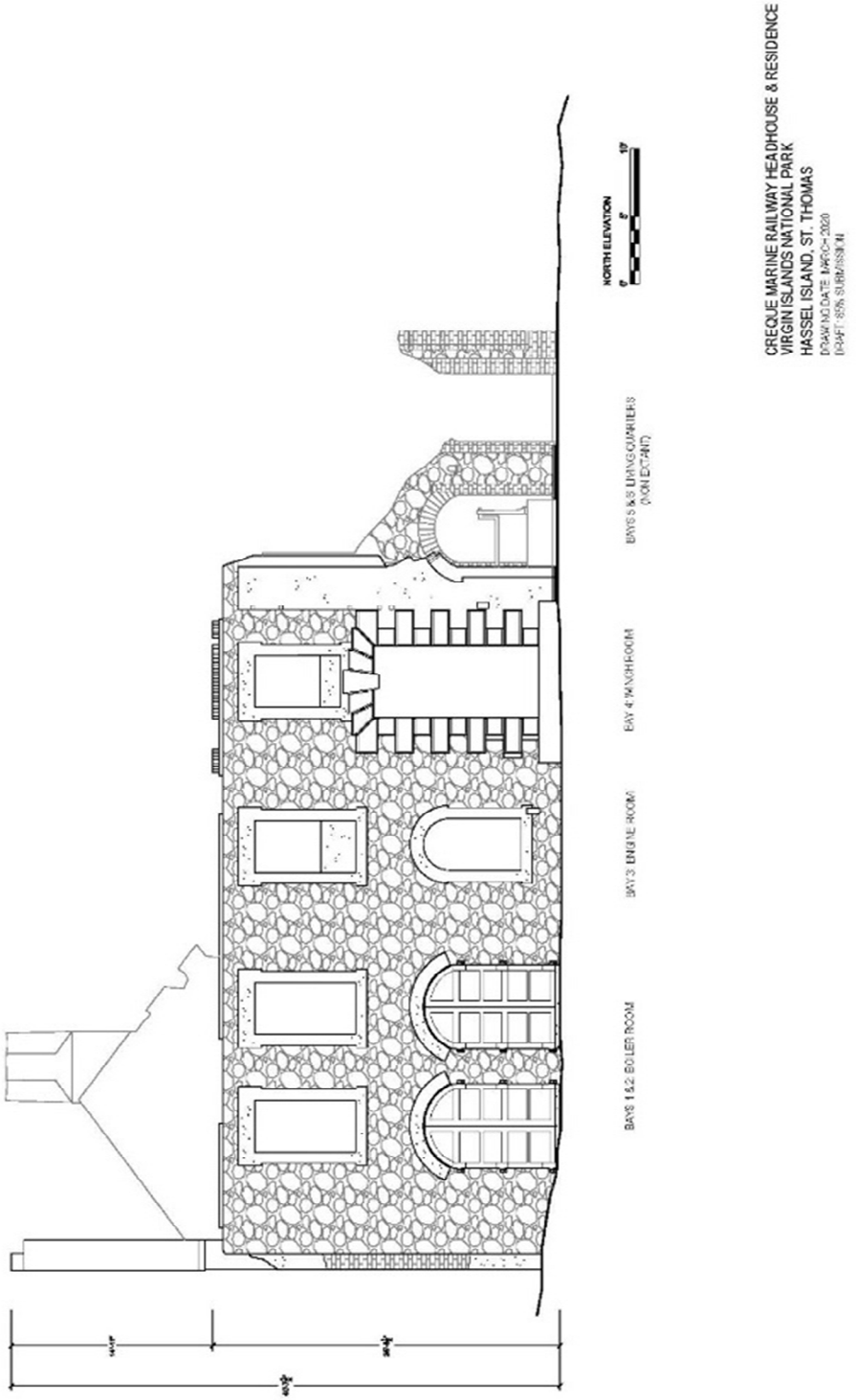


Figure 38**. 2020 Existing Conditions Drawings, North Elevation.**

Exterior Features – North Elevation

The North Elevation of the building faces northeast towards St. Thomas harbor and aligns with the 200-foot dock and slipway where the massive sailing ships were brought to shore for repairs and servicing. To hoist the ships out of the water with the winch system, the rooms that housed each piece of iron equipment for the winch were placed on the north side of the building facing the dock.

What can be considered to be the main entrance to the building is on the west end of the North Elevation and leads to the Winch Room (Bay 4), which is where the original seven iron gears are located (Figure 39). These iron gears turned the iron cables and iron chain, which first pulled the ships from the water onto the slipway cradle from the dock. Depending on the load of the ship being hoisted to shore, these gears adjusted the gear ration of the power coming from the original Bolton Beam Engine. The gears are located directly in front of the main entry door on the west end of the north wall, which aligned directly with the slipway and dock.



Figure 39: North Elevation at West corner showing horizontal stabilization band and system at 2nd floor and steel supports at entry door into Winch Room, 2020 (Helen Juergens).

The 40-foot-6-inch-long North wall of the building, as well as all of the exterior walls, including the two main interior demising walls, are built with easily available, large irregular shaped, mostly volcanic stones, known as “Blue Bicé”, laid up as rubble masonry construction (Figure 40, 41). Due to the irregular shape of the stones no consistent coursing pattern was used. However, there are some wall portions throughout the building where a coursing pattern was attempted but not on a consistent basis. A lime cementitious mortar was used to fill the voids between the stones, which provides for a stronger wall and assists in keeping water from penetrating into the joints. This is possibly one reason these load bearing stone walls are still standing, despite the damage they have endured from numerous hurricanes.

The main varying types of geologic stones, but mostly volcanic, which were used to lay up the wall, are of random sizes varying from 18 inches to 8 inches in any direction. (Typically, a size of stone that one human laborer could carry and stack on top of each other.) The spaces between the joints of these large irregular stones were filled with smaller flatter stones, which filled the voids and stabilized the adjacent stones.

The laborers were careful to select stones that had a smoother surface for the exterior and interior faces of the wall, as none of the stones appear to have been mechanically planed or smoothed by hand tools. The stone pattern on the lower portions of the North wall have a random, rubble stacking pattern and the upper portion of the wall between the 2nd story windows has a somewhat horizontal coursing pattern. The stones were laid to create a 24-inch-thick wall which received its vertical stability from the compression strength of the stones and its lateral stability from the perpendicular wood framing members at the second floor and at the roof. The exterior face of the stones, or rubble, on the north wall have a hand applied lime cement mortar to the front face of the stones, around the locations where the stone joints come together. The center front face of the stones are still exposed, which makes for a façade finish that is about a 50 percent random stone pattern with the rest being the white/gray lime cement finish. This cement mortar/coating prevents water from entering the joint cavities between the stones.

Typically where the door and window openings penetrate the stone walls, a 6- to 1-foot-8-inch-wide by 24-inch-thick section of bricks were toothed into the 24-inch-thick stone walls for the door and window frames to create strength and a flat, even surface for the door and window frames to attach to. This door detail changes at the main entry door on the west end of the North Elevation at the Winch Room. Here, intermittently there are six courses of brick, varying from 6- to 18-inch-wide toothed into the rubble stone and in between each of these brick sections is a 14-inch high × 15-inch or 30-inch-wide piece of sandstone. These sandstone pieces at the jamb and head of this main entry door form one of the main decorative and discerning design elements of the north façade.



Figure 40: North Elevation of load-bearing perimeter wall, showing typical "Blue Bicé" local stone, rubble pattern construction with lime cement, hand applied mortar at joints to prevent moisture from infiltrating the joints, 2020 (E. Anderson).

On the east end of the North Elevation there are two arched, 113-inch-tall, door openings that lead to the Boiler Room (Bays 1 & 2), which have the toothed in brick jamb detail. The brick jambs for each of the doors are supporting the original pair of double hung, iron plate arched doors that open to the exterior. A unique and clever feature of these door jambs is an 18.5-inch-high radiused area in the side of the jamb 40 inches above grade. This allowed for removal of the round iron boiler units should they need servicing or replacement (Figures 41, 42). This character defining feature should be preserved as part of the future treatment for the structure.



Figure 41: North Elevation showing original historic East and West iron doors into Boiler Room, 2020 (Helen Juergens).



Figure 42: North Elevation showing original historic East and West iron doors into Boiler Room, 2020 (Helen Juergens).

At the four upper level windows, these brick jambs, in addition to the sills and headers have been covered with a 1-inch-thick by 9½-inch wide coating of cement plaster (Figure 43). It is undetermined as to if these cement surrounds at the upper north windows are part of the original design from the 1840s construction. Currently these windows do not have any window glazing, or wood window frames and there are no remnants of such pieces scattered throughout the debris that could be found.

The 1977 Historic American Buildings Survey (HABS) drawings indicate that there were two sets of wooden shutters on the upper level windows. One set on the exterior were the storm shutters that swung out and the second set on the interior swung inside the second-floor rooms of the original Creque Residence (Figure 44). According to the drawings there was a window installed between the two sets of shutters, but the pattern and type of window is unknown. No physical remnants of the windows, nor shutters could not be found on site.



Figure 43. North Elevation showing original decorative lime cement plaster surrounds around original historic window openings, 2020 (Helen Juergens).

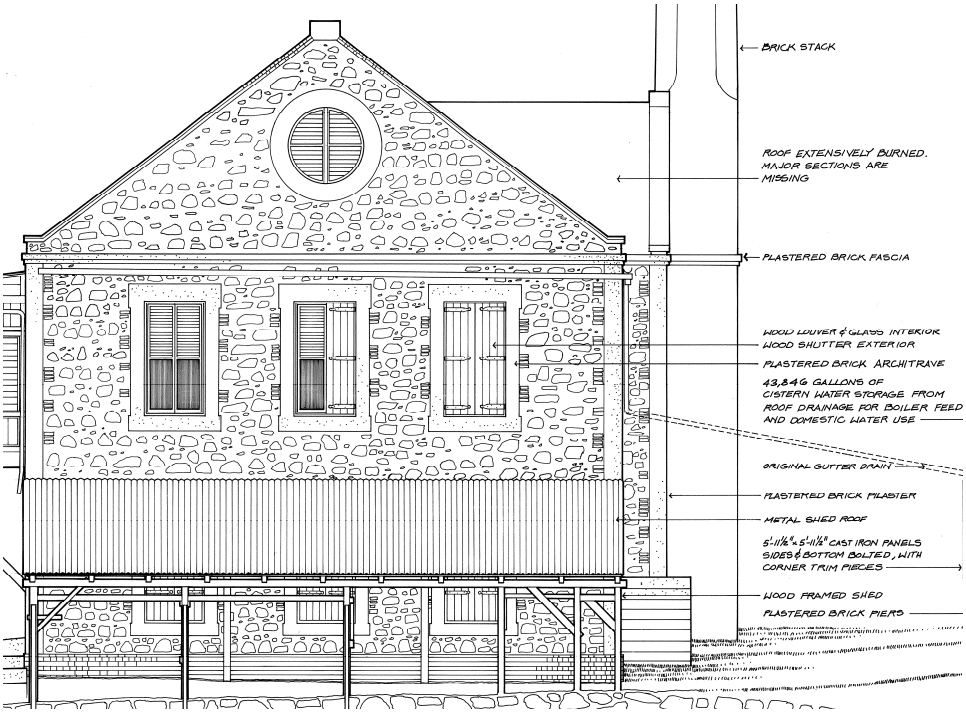


Figure 44. HABS drawings West Elevation of original Living Quarters which is no longer extant. This drawing provides evidence of the windows and shutters, of which no physical evidence remains.

At the top of the north wall (as well as the other exterior stone walls and the interior brick walls), the top wood sill plate that the wood roof rafters attached to, is missing. This condition has left the top course of all the stones and bricks exposed to the elements. At the cracks and joints between these stones and bricks, small trees and vegetation can be seen growing at the top course of all the remaining original historic walls.



Figure 45. Top course of interior stone demising wall showing typical condition of vegetation growing up through the cracks of the stones, 2020 (E. Anderson).

Although unexpected, it is appears that this type of rubble wall construction method has been quite successful in protecting the structural integrity of the building, as this 2-story north wall is still almost vertically plumb and has stayed intact, despite the multiple hurricane damaging winds it has seen, since it was erected in 1841.

Exterior Features – East Elevation

Surprisingly, the construction of the East Elevation wall appears to be different than the wall on the North and South Elevations. As noted in the site description, the 40-foot-long, East wall is approximately 15 feet away from the steep rocky slope to the east, which is on the backside away from the ocean climate. This steep slope alone may have protected the east wall from the damaging winds and rain.



Figure 46. Elevation of original historic East Wall showing coursing detail of rubble stones construction. East wall absent of lime cement plaster finish. 2020 (E. Anderson).



Figure 47. Exterior Elevation of original historic East Wall, showing lower portion of wall at 4 feet 0 inches above grade, indicating dark brown lime concrete plaster at joints between stones. 2020 (E. Anderson).

Unlike the North wall, the East wall appears to have been built with only one type of dark gray, volcanic stone, in lieu of several different geologic stone types (Figure 46). The East wall was built with the same rubble construction technique as the North wall, however there is no exterior cement coating covering the random joints at the stones. Consequently, there is nothing stopping the water from penetrating the top portion of the wall through the crevices, cracks and joints between the stones. However, the lower portion of the wall, up to approximately 8 feet above grade, a dark brown lime cement plaster was applied at the joints between the stones, to prevent water penetration at this lower level (Figure 47). It is surmised that this darker brown plaster, in lieu of the white on the North and South elevations, could have been due to the use of molasses as a binder in the plaster mix. This was a typically used historically in the area, as the molasses was a by-product of the sugar cane production on the islands.

It is surmised that because this East wall is basically protected from the extreme winds and rain, that the exterior plaster cement coating was not necessary. Also, should any water have penetrated the upper portion of the wall into the interior of the building, it would have been into the first floor East Stairwell and the second story Storage Area. These utilitarian uses may not have called for such water protection.

Like the North wall, this East rubble stone wall is also 24-inch-thick, but was built with a gabled top plate, which matched the angle of the original slope of the wood roof rafters. The East wall is still standing, but was pulled out of plumb, when the temporary stabilizing structural cables and bracing, along with the historic walls and framing, were shifted to the east when the hurricane toppled the 60-foot-tall chimney, which fell on the east end on the building. (Figure 48) This event is what compromised the structural stability of not just the East wall, but the entire structure as a whole. Currently there is a wood scaffolding system on the exterior side of the East Wall that extends up to the second-floor level. In addition, the wall has been shored up in three locations with steel posts that connect to the top perimeter, horizontal wood stabilization beam and are anchored to concrete pads at grade.

There is a 3-foot-deep pile of homogeneous brick rubble pieces, mortared together chunks of brick, and individual bricks that have a black and yellow surface found along the full length of the base of the East Wall underneath the scaffolding. These bricks are the remnants of the 60-foot-tall, hexagonal chimney that was constructed on the South Elevation of the building to service the two iron boilers in the Boiler Room (Bay 1).



Figure 48. Exterior grade at East end of structure showing original historic bricks from 60-foot-tall chimney that fell due to the hurricanes and the diagonal steel support and concrete pad of stabilizing rods, 2020 (E. Anderson).

Exterior Features – South Elevation

The South Elevation is similar to the North Elevation in the rubble stone construction technique and pattern. About 2 feet from the East corner on the South Wall on the main level, there is a 5-foot-high door entrance into the original 3-foot-wide staircase which accessed the second floor Storage Area (Figure 49). Currently the stairway is inaccessible due to the downed bricks from the original chimney, the East Stairway's west wall, the wood members and remnants of the staircase and the wood floor joists from the second-floor framing system (Figure 50).



Figure 49. Doorway to original, now missing, second floor. Radiused bricks from the toppled chimney lay in the bottom of the East stairwell. 2020 (E. Anderson).



Figure 50. Interior of original stairwell to the now missing, original second floor storage area. Original chimney bricks at bottom of stairwell. 2020 (Helen Juergens).

This original brick demising west wall, between the Staircase and the Boiler Room is of total loss. When the 65-foot-tall chimney fell to the northeast, a large percentage of the original bricks fell onto the brick demising wall, causing almost the entire length of the brick wall to twist, buckle or disintegrate into pieces. The bricks from the chimney fell over the exterior East Wall, landing onto the ground creating the 3-foot-deep pile of rubble, almost the full length of the wall.

The 5-foot-3-inch-wide and 4-foot-5-inch deep, rectangular brick base of the chimney is to the west of the stairway door opening and was built on the exterior side of the South Wall (Figure 52). The rectangular brick base extends vertically up to approximately 35 feet where at that point the brick is angled in at the corners of the base to form the hexagonal perimeter form of the chimney. The rectangular portion of the base has been coated with a cement plaster finish, where a decorative rectangular pattern matching the walls in the Living Quarters, was etched in when the plaster was wet. At grade on the South face of the rectangular brick base of the chimney is the ash box, where the coal ash can be removed (Figure 53). The remaining upper portion of the tower was built with yellow brick, as can now be seen on the ground at the base of the east wall. These yellow bricks are stained black from the coal smoke and soot emitted from the boilers.



Figure 51. Top remaining portion of octagonal brick chimney. Originally one of the main character-defining elements of the historic structure. 2020 (E. Anderson).



Figure 52. Square brick base of octagonal chimney, 2020 (Helen Juergens).



Figure 53. Grade access on South elevation at square brick base of chimney for coal ash removal, 2020 (Helen Juergens).



Figure 54. Detail of original historic radiused brick from toppled chimney, 2020 (E. Anderson).

As stated previously, the 60-foot-tall chimney servicing the two boilers in the Boiler Room was one of the most character defining elements of the original structure, which clearly identified the building from St. Thomas harbor. The total loss of the chimney is the greatest loss to one of the buildings most character defining elements (Figure 51).

Adjacent to the chimney, to the west on the main level, there are two door entrances. One door entrance is the back entry into the Engine Room (Bay 2) and the second door is into a Stairwell that led to the second floor Living Quarters (Bay 4) which are now extant. The original wood stair risers and treads are no longer intact and appear to be part of the rubble at the bottom of the stairwell. Also, at the bottom of the stairwell, in the south wall, there is an arched brick opening to what appears to be an entrance into a crawl space below the Winch Room (Bay 3).

At the west end of the South Wall, on the main level, adjacent to the Stairwell, there are two 10- to 15-foot-tall vertical brick and stone wall sections (ruins), where two original doorways were located (Figure 57). The 24-inch-wide wall sections clearly show the rubble stone on the interior of the wall and the brick door jambs on the exterior face on both sides of the wall, as this wall section split at a door opening (Figure 56).



Figure 55. Remaining interior side of original Southwest corner of Living Quarters, 2020 (Helen Juergens).



Figure 56. Detail of interior side of original Southwest corner of Living Quarters, showing stone and brick wall construction at original window openings, 2020 (Helen Juergens).



Figure 57. Remaining exterior side of original Southwest corner of Living Quarters with original door openings, 2020 (Helen Juergens).

The second story portion of the wall ruin is completely gone. Of the two doorways, one of the arches is still intact while the header of the other is gone. The wall jambs on both doorways have the same architectural detail at main North Wall, where the brick has been toothed into the rubble stone wall.

The southwest corner of the original building footprint is located at the far west end of the South Elevation at the remaining freestanding vertical stone wall section. At this location an 8-foot-wide × 16-foot-high × 2-foot-1-inch portion of the original West wall can be seen. Again, this wall section shows the interior rubble stone with the exterior brick facing (Figure 55).

Two exterior sets of concrete stairs provide access at the south elevation. One set leading into the Engine Room consists of 3 steps with no landing that projects south from the building façade. The other set runs along the southern façade leading to the stairwell behind the Winch Room. This set consists of seven steps and a landing. It is possible there are more steps below the current grade that are not visible due to vegetation and rubble coverage.

Exterior Features – West Elevation

The 1-foot-2.5-inch-thick rubble stone wall at the West Elevation, was originally the interior demising wall between the Winch Room (Bay 3) and the now missing Living Quarters (Bay 4), of which the upper level was used only part-time by the Creque family.

As stated previously, this 40-foot-long, stone wall was constructed as part of the structural system to support the original roof. At the top of this wall the stone was laid to a center peak of 38 feet (from the Winch Room finished floor) to mimic the slope and profile of the original gable roof. This gabled stone wall was one of four that supported the roof's wood ridge beam, which ran the length of the building. The wood ridge beam then supported the wood roof joists, roof decking and exterior roof material. Again, the roof and framing members was destroyed over 53 years ago from fire.

The lower, main level was used as a residence for the laborers that worked on the ships at the facility (figure 58). The bottom portion of the wall is the exposed gray, volcanic stone to 11 feet 5 inches above the finish floor of the Winch Room, at which point the 11-inch horizontal band which indicated the location of the second-floor wood joists. These were placed at almost 12 inches on center as the pockets for the wood joists can be seen, although they are now filled in with a cement plaster.

On the South end of the stone wall at the main level there is a 64-inch-wide by 67-inch-high, arched yellow brick opening that lead into the Winch Room from the main level in the last Bay 4. This brick is also toothed into the adjacent rubble stone wall and the arch is extremely well constructed as the arch circumference is uniform and evenly spaced.

Many of these arched door and windows openings throughout the building indicate that there were some skilled craftsmen working on the construction. On the west side and at the base of this arched opening there is a solid concrete platform 12 feet long × 6 feet wide × 3 feet 6 inches high, with 6-foot-wide concrete steps on the north side of the platform.



Figure 58. Northeast corner of Living Quarters at demising wall with the Winch Room. Interior walls of residence had decorative white scored plaster on 2nd floor with exposed stone walls on the main floor level. 2020 (Helen Juergens).



Figure 59. Yellow brick arch door opening at demising wall between Winch Room and Living Quarters, 2020 (E. Anderson).



Figure 60. Yellow brick arch door opening looking west from inside the Winch room. Demonstrates the quality of the workmanship of the masons. 2020 (E. Anderson).

Interior Features – Winch Room (Bay 3)

At the northwest corner of the building there is a full two-story pilaster, which is the remains of the North Wall of the Living Quarters (Bay 4). Around the corner to the North Elevation, there is the 145 inches tall × 62 inches wide, main entry opening, with the sandstone jamb and header which leads to the Winch Room (Figure 61).



Figure 61. North Elevation at main entry into Winch Room. Note sandstone jambs and upper keystone at header. 2020 (Helen Juergens).



Figure 62. Current condition of Winch Room looking through main entry door on North Elevation. 2020 (Helen Juergens).

This is where the original seven iron gears for the winch system are located. These iron gears turned the iron cables and iron chains, which went from the main entry opening out to the ship (Figure 62). The winch system then pulled the ships from the water onto the slipway cradle from the dock and onto dry land. Depending on the load of the ship being hoisted to shore, these gears adjusted the gear ration of the power coming from the original Bolton Beam Engine, in the adjacent room.

Once inside the Winch Room the floor is filled with stone rubble, to about a 4-foot depth, which consists of the stones from the upper portion of the west gabled demising wall. This is equivalent to approximately 22 cubic yards of stone falling on top of the finished floor inside the Winch Room. These stones fell on top of the floor, the iron gears and a few fell into the crawl space below the gears. The largest of the circular gears is 9 feet 8¾ inches in diameter with 72 teeth and is connected to the six smaller gears, as can be seen in the 1977 HABS equipment drawings. Upon visual inspection, it does not appear that the iron gears and the associated iron connecting hardware was damaged, however, until the stone are removed, it cannot be determined the extent, if any, of the damage (Figure 63).



Figure 63. Current condition of Winch Room showing the fallen stones from the walls and the temporary stabilizing structural system, 2020 (Helen Juergens).

The 1977 HABS drawings indicate a narrow crawl space under the floor to accommodate for the rotation of the largest iron gear of the winch system (Figure 64). However, upon visual inspection at the site, albeit looking through mounds of rubble and debris to the floor area where the largest gear is anchored in the crawl space, it is possible there could be a larger basement area under the winch room floor, possibly to accommodate for all of the gears of the winch system. If this is the case the floor could be a framed wood floor and the stones from the wall could collapse the floor at any time. Removal of the stones should be undertaken immediately so as not to further damage the gear equipment.

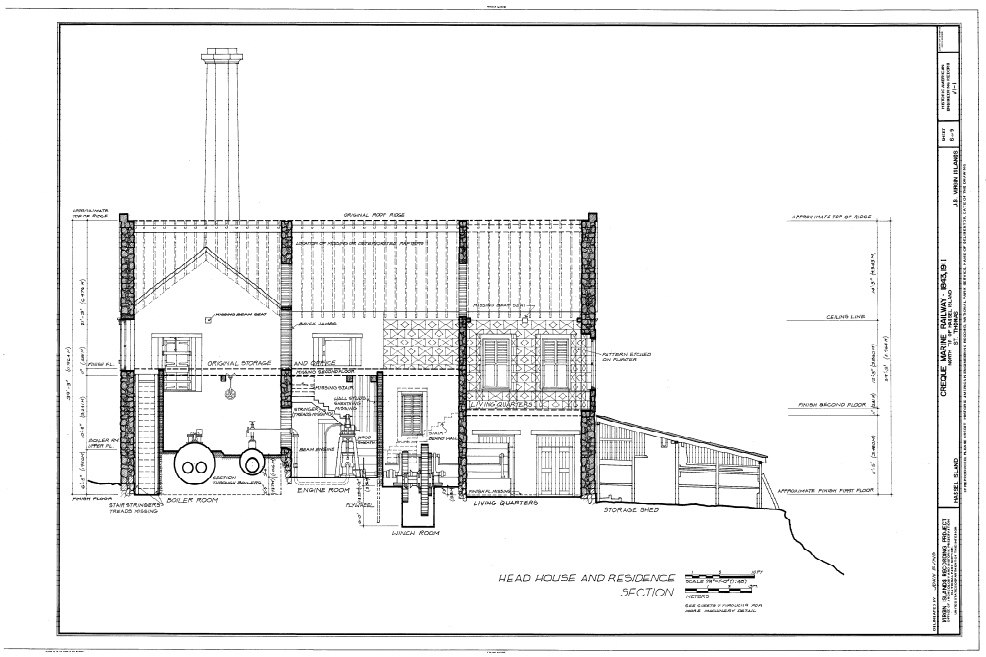


Figure 64. HAER Drawing indicating the crawl space below the steel gears in the Winch Room. Due to the amount of building debris, the crawl is inaccessible (HAER Drawing).



Figure 65. Photo indicating amount of debris covering the steel winch gears, 2020 (Helen Juergens).

When the gabled stone wall between the Winch Room and the Living Quarters collapsed, it took any remaining original wood floor joists that framed the second floor above with it. The debris fell on top of all the exposed gears, but it appears no damage was done to the iron equipment. Again, due to the amount of debris and rubble there was no way to inspect, nor ascertain the extent of damage to the floor in the Winch Room.

The east interior brick wall of the room is in eminent danger of collapse and is discussed further in the following section, Interior Features-Engine Room (Bay 2). At the north end of this brick wall there is a doorway that provides access from the Winch Room to the Engine Room (Figure 66).



Figure 66. West side of original historic red brick demising wall between Winch Room and Engine Room. Note the amount of spalling on the historic bricks and the significant amount of missing mortar from the brick mortar joints. 2020 (E. Anderson).



Figure 67. East side of original historic red brick demising wall between Engine Room and Winch Room indicating the significant amount of missing mortar from the brick joints. 2020 (Helen Juergens).

Interior Features – Engine Room (Bay 2)

The Engine Room (Bay 2) is the location of the original iron Bolton Beam Engine, which sits 3 feet to the west of the circular, 8-foot-diameter iron drive gear, which it powers. The floor of this room appears to be concrete slab on grade, for supporting the weight of the iron engine. There is an iron plated trough centered below the engine, where its vertical drive shaft connects to the circular, 8-foot-diameter iron drive gear. The iron drive gear is built into and recessed into the first wythe of brick on the west brick demising wall (Figures 67 and 68).



Figure 68. Disintegration of brick flywheel wall, which is 8 inches thick made of 2 wythes of brick, at steel flywheel. 2020 (E. Anderson).



Figure 69. Disintegration of brick flywheel wall, facing northwest, 2020 (Helen Juergens).

There is a red brick arch surround at the recess in the brick that the drive gear spins within. There is less than ¼-inch clearance from the edge of the brick arch to the outside iron face of the circular gear, which appears to be a result of settlement in the brick wall. Many of the bricks in the portion of the wall that backs the circular drive gear, have fallen out of the wall, leaving that half of the brick wall with a hole looking into the Winch Room.

This 8½-inch-thick, red brick wall is made of only 2 wythes of brick, is laid in a running bond pattern and is the demising wall between the Winch Room and Engine Room. The condition of the majority of the brick faces is extremely poor due to the spalling of the fired finish. The wall has lost much of its structural stability, as many of the bricks have shifted out from the vertical plane of the wall; therefore, the compressive strength of each brick, in carrying the load above it is diminished. The mortar joints between the bricks vary from only 1/8 inch to 1/4 inch, which means the cement mortar is doing little to hold the bricks together (Figure 68).

This red brick flywheel wall is in an eminent state of collapse. This brick wall is one of the major character-defining features of the building, due to the arched brick design on the east side of the wall and its integration with the function of the flywheel, as part of the original Bolton Beam Engine system. (Figure 66)

The opposite, east wall of the Engine Room is of 1-foot-6-inch-thick rubble stone wall construction. Currently in front of this wall is the wood scaffold which was erected at the time of the stabilization effort of the building and is still standing. There are two window openings in this stone wall, one with toothed in yellow brick for the window opening and also a door opening leading into the Boiler Room (Figure 70).



Figure 70. East side of original historic stone wall in Engine Room. Top of original gable stone and upper portion of stone wall fell during the hurricane storms. Notice toothing of bricks into stone wall to create smooth window jambs and sills. Yellow brick originally brought over from Denmark as ship ballast. 2020 (E. Anderson).



Figure 71. Interior of Engine Room showing missing roof and destroyed second floor framing system. Scaffolding at East wall and steel cables above are remnants of the temporary structural stabilization system. 2020 (E. Anderson).

The original second floor roof framing system in the Engine Room and throughout the entire interior of the historic structure was destroyed by the hurricane storms from the falling building debris and by the movement in the temporary stabilizing structural system and its steel cables. These steels cables were tied to the upper perimeter wood compression ring at the exterior of the building which was supported by temporary 2 story diagonal steel rods anchored to the ground. They are also tied into some of the historic second floor wood framing system.

When the 60-foot-tall chimney toppled during the storm, to the east end of the structure, these steel cables along with all the attached historic materials were shifted and pulled to the east by the weight and energy of the falling bricks from the chimney. The destroyed remains of the original historic wood framing members are either hanging precariously or lying on the floor of the Engine Room. However, the original historic second floor wood beam that supported the second-floor wood joists is remaining (Figure 71 and 72).



Figure 72. Temporary stabilization system above the Engine Room. Original pockets for wood floor joists can be seen in red brick wall, which is the west character defining wall in the Engine Room with the steel flywheel. 2020 (E. Anderson).

Interior Features – Boiler Room (Bays 1 & 2)

The Boiler Room houses the original 5-foot-diameter, cylindrical iron boiler, which used coal to heat the water to create steam and the original 4-foot-diameter boiler, which acted as a storage pressure tank for the steam, which was sent to power the Bolton Beam Engine. These two iron tanks sit side by side about 4 feet apart and about 2 feet above the floor. It is unknown as to what is supporting the two pieces of equipment. The 1977 HABS drawings show a building section through this area of the boilers, which shows the two pieces of equipment encased in some type of chamber. The front face wall of this chamber is covered with the white/yellow brick, laid in a bond pattern at the top and an English pattern at the bottom, most likely to help support the weight of the iron tanks. At intermittent locations in the front face of chamber's brick wall there are approximately 4 square openings, each about 8 inches × 8 inches square, that most likely provided for airflow around the iron tanks inside the chamber (Figure 75).

The HABS drawings also indicate that the curved tops of the two iron tanks are exposed about 9 to 18 inches above the top of the chamber lid, which is shown as being about 5 feet above the finished floor. It is assumed that the top of the chamber is also covered with brick, but due to the massive amount of building wreckage, debris, stone rubble and vegetation that fills the entire space of the Boiler Room, it is impossible to see the top of the chamber, let alone the original floor.



Figure 73. Interior of Boiler Room showing full extent of original historic building debris and rubble from hurricane damage, in addition to the amount of vegetation growing on top of the original boilers. 2020 (Helen Juergens).



Figure 74. Interior of Boiler Room showing full extent of original historic building debris and rubble on top of the original two iron boilers and the supporting brick platform. Note one of the temporary stabilizing steel cables in the foreground. 2020 (Helen Juergens).

The room is filled with dozens of downed wood framing members that were part of the pre-hurricane stabilization efforts. Tangled in wood framing members are the downed steel cables used for the stabilization system (Figure 73).

At the main floor level of the Boiler Room, below these entangled structural building components there are mounds of volcanic stone that came down from the top of the demising wall between the Boiler Room and the Engine Room (Figure 74). This original stone demising wall was designed and constructed as part of the structural system of the original roof. At the top of the wall the stone was laid to a center peak of 21 feet 3 inches to mimic the slope and profile of the gable roof, similar to the east exterior stone wall. These gabled stone walls, of which there were four total, supported the roof's wood ridge beam, which ran the length of the building. There are numerous 10 to 15 feet tall, locust type, shrub trees growing up through the rubble stones and debris, making it difficult to discern the full extent of the damage to the historic fabric (Figure 75).



Figure 75. Interior of Boiler Room with top of original western stone gable wall and upper portion of second story stone on top of original historic boilers and brick platform. Note all the downed original historic second floor wood framing members and attached temporary structural stabilization steel cables. 2020 (Helen Juergens).

The east brick wall of the Boiler Room, which was the original demising wall between the Boiler Room and the Stairwell, is about 60 percent demolished. It appears that the top of this brick wall terminated at the top of the perpendicular wood floor joists. The bottom of this wall was located along the east side of the boiler chamber and could have possibly lined the inside of the chamber (Figure 76).

The portion of the brick wall from the top of the chamber lid to the top of the second-floor joists, twisted into the stairwell and the rest of the bricks fell onto the floor of the stairwell taking the original wood staircase framing with it.



Figure 76. Original East brick demising wall between Boiler Room and East stairwell, destroyed when 60' tall brick chimney fell onto of wall. Note remaining East gable stone wall, which is the only remaining gable stone wall still standing. 2020 (E. Anderson).



Figure 77. Demolished original East yellow brick wall at Boiler Room, at south end of wall. 2020 (E. Anderson).

Interior Features – Staircases (East & West Ends)

The original East brick stairwell which led to the now missing original second floor, was demolished during the hurricane storm when the 60-foot-tall brick chimney fall on top of the west wall of the stairwell, taking the original wood staircase with it. The original bricks from this wall, in addition to the original bricks from the chimney, lay at the bottom of the stairwell to a depth of almost 4 feet from grade (Figure 78).

The remaining west wall is currently shored up with temporary wood bracing but is close to total collapse. The wood framing members that formed the stair treads and risers have been shattered or broken and are lying at the bottom of the Staircase. Further investigation was not possible due to the precarious nature of the wall.



Figure 78. Original East Stairwell, The bricks shown are the original bricks from the chimney. The wood staircase was also demolished. 2020 (E. Anderson).

The original Southwest brick stairwell, that accessed the now missing original second floor, which was the Creque family part-time residence is somewhat intact, but the wood staircase inside was demolished and the wood risers and treads are lying at the bottom of the stairwell. The interior side of the stairwell's brick walls, leading to the Creque Residence were coated with a white plaster, where a decorative rectangular horizontal pattern was etched into the finish while the plaster was wet. This decorative pattern can be seen on the interior walls of the Creque Residence and on the exterior face of the original historic brick chimney (Figure 79).



Figure 79. Original Southwest Stairwell to the now missing second-floor Living Quarters. The original wood staircase was demolished and lies at the bottom of the stairwell. 2020 (Helen Juergens).

This stairwell also led to the crawl space below the Winch Room to access all the winch equipment and gears, which is now inaccessible due to all the building debris as the bottom of the stairwell. The wood stairs leading to the crawl space under the Winch Room were also demolished (Figures 80 and 81).



Figure 80. Original West stairwell showing previous location of wooden stairs to Winch Room crawl space. Also shows the plaster finish at upper portion of red brick wall that led to the Living Quarters. 2020 (Helen Juergens).



Figure 81. Original Southwest Stairwell to the crawl space under the Winch Room to access the winch gears and equipment. 2020 (Helen Juergens).

CREQUE MARINE RAILWAY BUILDING – STRUCTURAL SYSTEM

Structural System – The original Creque Marine Railway Building was originally a 6-bay-long, 2-story structure, as shown in Figures 82 through 89, which are sourced from the 1977 HABS. In this report, it was stated that there was a fire in the 1960s that destroyed the roof and second floor. The entire structure of the last two west bays of the headhouse (that were living quarters), along with a storage shed on the west side and a second level porch on the north end completely collapsed sometime during the 1990s. The cause of this collapse has not been confirmed. At the time of this January 2020 site inspection and from review of dated site photographs, it appears that the entire structure has suffered extensive damage, mainly due to two Category 5 hurricanes in 2017: Irma, followed two weeks later by Maria. The following is a list of the structural systems of the Creque Marine Railway Head House and Residence building.

1. Building Foundation and Machine Pits: From a draft report by John Jameson in October 1992, a shovel test was performed and found weathered limestone approximately 3 feet below the ground surface. Normal building practice would indicate that the building and pit foundations extend at least 6 inches into the weathered limestone layer.
2. Walls:
    a. Exterior – Rubble and rock mortared construction roughly 25 ½ inches wide: Only the east gable wall and the north and south walls from Bays 1 thru 4 remain fully intact with no noticeable leaning of the walls, but there are areas of noticeable cracking (see Figure 90). The exterior north and south walls roughly, each about 18 feet high by 16 1/2 feet long, and west gable wall, about 39 feet high at the peak and 37 feet long, of the last two bays that housed the living quarters collapsed sometime during the 1990s. Only portions of the first level exterior wall, approximately 9 ½ feet high, remain (see Figure 91). The current west exterior wall, between Bays 4 and 5, is a rubble and rock mortared construction roughly 15-inches wide. Originally, it was a gable wall about 39 feet high at the peak, but the portion above the second-floor level collapsed to the west along with the living quarters bays in the 1990s. All the exterior walls appear to have been repointed in the last 15 to 20 years. There are also areas where small bushes are growing on the walls with their root system penetrating the mortared joints.
    b. Interior – Rubble and rock mortared construction for the 19-inch-wide gable wall, about 39 feet high at the peak, between Bays 2 and 3. An eyewitness interviewed during the site inspection stated that during Hurricane Maria in 2017 the upper portion of this wall just above the second-floor level collapsed. This portion of the wall from this event fell into Bays 1 and 2, destroying the interior cable and wood bracing system along with wooden scaffolding that was installed around 2009 by the NPS (see item 7, below). There are also two brick-mortared interior walls. One wall is 11-inches-wide, located between Bays 3 and 4, and the other wall is 9-inch-wide, located between the stair well and the boiler in Bay 1. Due to the collapse of the interior gable wall and destruction of the interior cable and wood bracing

system the 9-inch-wide stair well wall has partially collapsed toward the east exterior gable wall and the 11-inch-wide wall is leaning approximately 2 to 3 inches to the east and is being held in place by what remains of the wood bracing system (see Figure 92). A portion of the 11-inch-wide wall is also missing around the flywheel (see Figure 93). These two brick-mortared interior walls are not bonded into the exterior walls. There are many mortar areas of all the interior walls that appear to have been repainted in the last 10 to 15 years. Detailed inspection of these walls was limited due to the wall and bracing debris along with excessive vegetation overgrowth.

3. Floors – Bays 1 through 4:
    a. First floor – according to the 1977 HABS drawings the boiler room floor, Bays 1 and 2, and the living quarters floor, Bays 5 and 6, are at the same elevation with the engine room, Bay 3, 2 feet 5 inches and the winch room, Bay 4, 1 foot 3 inches above this level. The boiler room also had an upper floor 6 feet 5 above this level that surrounded the sides and ends of the two boilers. All the floors appear to be covered with different sizes of 2 feet to 2½ inches thick paver stones although this could not be confirmed in many areas due to the excessive amount of building wall debris and wild vegetation along the debris from the destroyed interior bracing system (see Figure 94).
    b. Second Floor: Completely missing but there are beam pockets in the three gable walls. These pockets have been filled with mortar, but it appears they were for 3 × 9 inches timber beams at roughly 30-inch centers that supported a wood floor that was used for storage and an office (see Figure 95).
4. Roof: Completely missing at the time of this inspection. The 1977 HABS drawings and report noted that the roof was severely burned by a fire in the 1960s with major sections missing. The drawings do show the location of missing or deteriorated roof rafters (see Figure 86).
5. Chimney: Located on the southeast side of the headhouse centered between Bays 1 and 2 with a ten-foot square base that transitions to an octagonal shaped stack just above the original roof ridgeline. The upper octagonal portion of the octagonal approximately two feet above the original roof ridgeline is missing. An eyewitness interviewed during the site inspection stated that this portion of the chimney collapsed during Irma in 2017. The chimney fell to the east and landed just beyond the east exterior gable wall but there was no noticeable damage to this wall from this event. The debris of the chimney is partially covered by vegetation overgrowth as well as portions of the steep embarkment which appears to have also collapsed. The remainder of the chimney is in fair condition with moderate mortar joint deterioration and spalling of the plastered finish (see Figure 96).
6. Finishes: All exterior and interior doors and windows and the two wooden stairs are missing except for the two sets of exterior hinged cast iron doors in the north exterior wall of Bays 1 and 2, the boiler room, remain. These doors are in poor condition as they are out of alignment and there is corrosion between the metal bar border frame and the cast iron door (see Figure 97).
7. Building bracing system addition – according to NPS personnel this system was installed by an NPS maintenance team from Puerto Rico around 2009 (engineering/construction drawings are not available):

a. The exterior bracing consists of 2 3/8-inch OD galvanized steel pipes set about 10½ feet from the building exterior and running diagonally up to the midpoint of the second level windows of the building. At their base they are welded to ¾-inch × 10-inch × 10-inch steel base plates anchored into 12-foot × 12-inch concrete pier caps on 1-foot-7-inch × 1-foot-7-inch footers. At the top, the pipes are welded to ¾-inch × 10-inch × 10-inch steel plates which are bolted to a perimeter horizontal 2-foot × 12-foot wood board band that runs around the perimeter of the entire building except around the chimney. This wood board band is connected at the corners with a ¾-inch-thick L-shaped steel plate. Portions of this wood board banding was destroyed as a result of the 2017 hurricanes, but all the diagonal galvanized steel pipes are intact and show no signs of damage (see Figure 98).
b. The interior bracing system consists of ¾-inch stainless steel cables and wood bracing installed in a horizontal crisscrossed pattern at about the mid-point of second level windows of the building. One of the cables runs through the second level opening in the east exterior gable wall and then diagonally down into a concrete footer at ground level. Approximately 95 percent of this interior bracing system was destroyed as a result of the collapse of the interior gable wall during the hurricane Maria in 2017 (see Figure 99).
c. Along with the bracing system, about 30-inch wide wood scaffold walkways that are about 2 feet below the wood board band level were installed on both sides and along the entire length of the east and interior gable walls. The two sections of the scaffolding in Bays 1 and 2 were completely destroyed as a result of the 2017 hurricanes with the other two scaffolding suffering only moderate damage (see Figure 100).

CISTERN CONSTRUCTION

Structural System – The cistern, a roughly 42 feet by 24 feet by 6 feet deep cast iron tank, is designed for the collection and storage of rainwater. It is located 20 feet west of the headhouse and is situated on a slight hill 5 feet 4 inches above grade at the east and 3 feet at the west.

1. Foundations: The cistern is supported by 4 rows of 7 roughly four feet square plastered brick piers (28 total) spaced at roughly 6 feet center to center. These piers are generally in fair condition with spalling plaster sections and moderate mortar joint deterioration but there are three piers that are severely damaged and in need of repair (see Figure 101).
2. Tank: The walls and the bottom of the cistern are made up of 6-foot × 6-foot cast iron panels, bolted together at the flanges and crisscrossed with tie rods and cables (see Figure 102). There are areas of the cast iron wall that have cracked, some of which have been repaired (see Figure 102). Because of the roof structure it was not possible to inspect the interior of the tank.
3. Roofing: The entire tank was covered with corrugated metal roof on a wood framing system in 2011. See Figure C8 for 2011 roof plans. This roof is in good condition except the gutter line needs to be cleaned as the drains to the tank interior appear to be plugged (see Figure 103).

4. The cast iron distribution pipe to the headhouse was destroyed in 1978. Since the roof was installed in 2011, rainwater is collected to fill the cistern. A 4-inch-diameter plastic pipe was installed through the bottom of the tank at the location of the old cast iron pipe and according to a witness interviewed on site during our inspection it runs to the slipway area although this was not confirmed (see Figure 104).

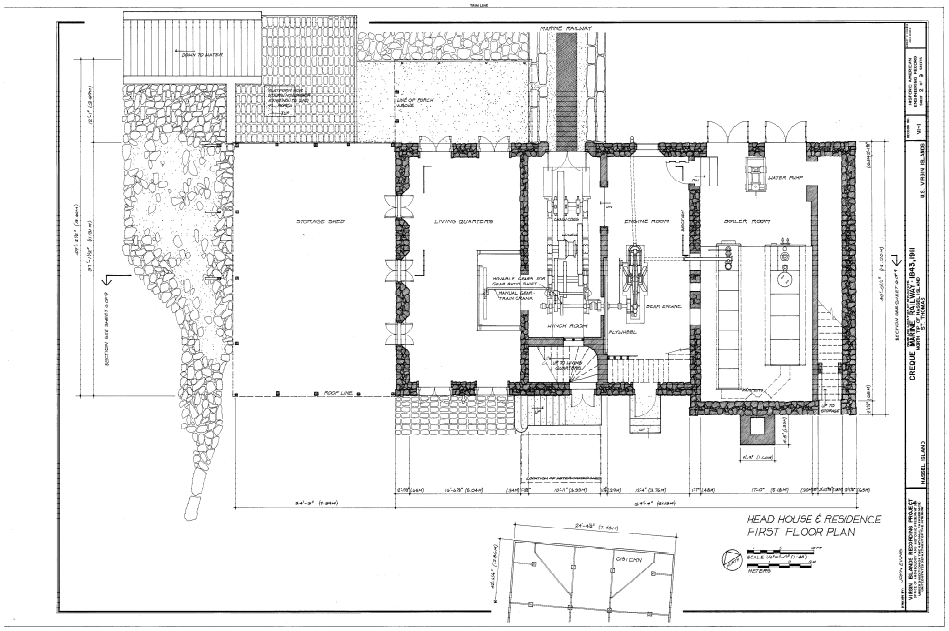


Figure 82. Headhouse & Residence First Floor Plan, 1977 HABS drawings.

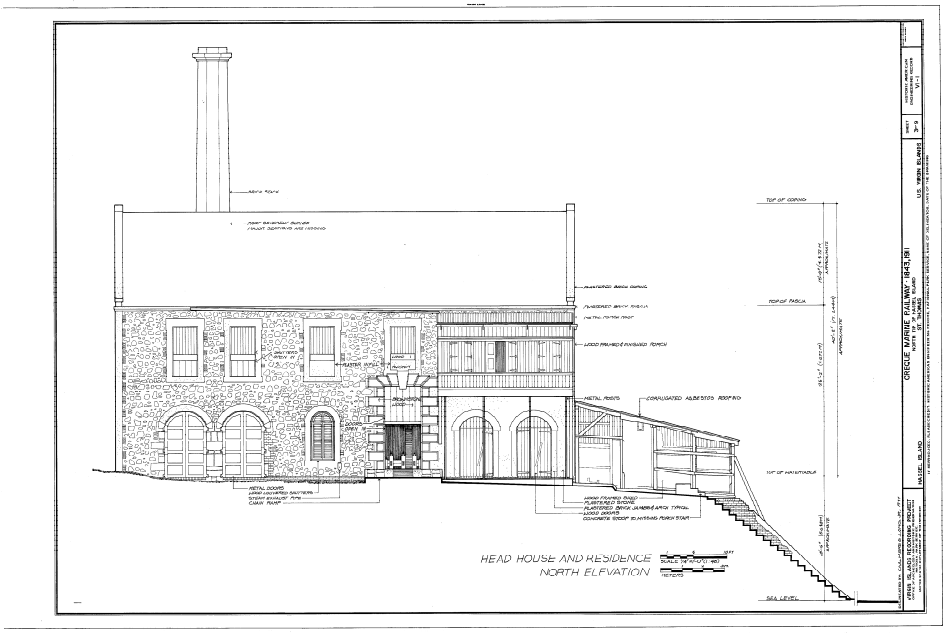


Figure 83. Head House & Residence North Elevation, 1977 HABS drawings.

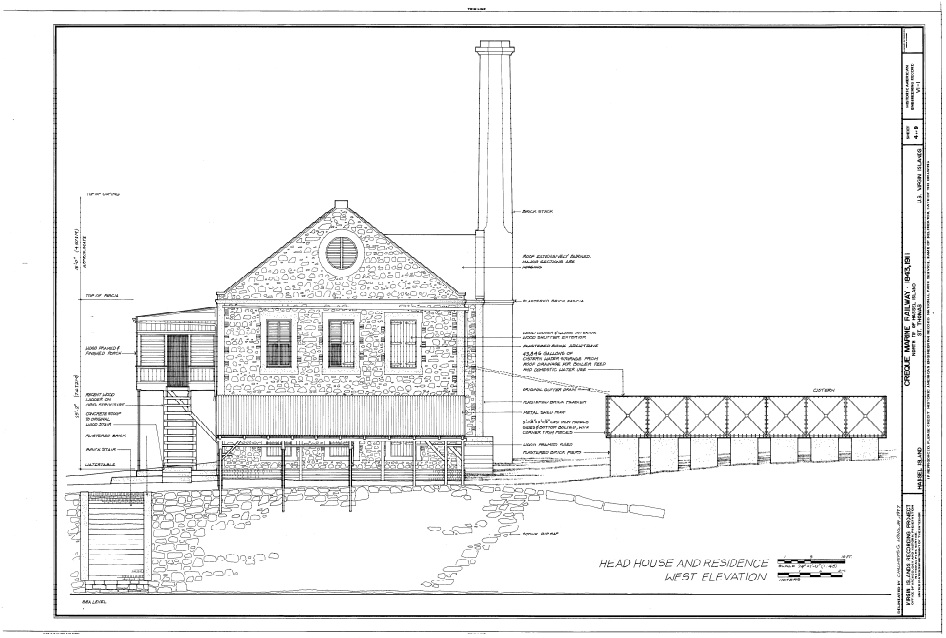


Figure 84. Head House & Residence North Elevation, 1977 HABS drawings.

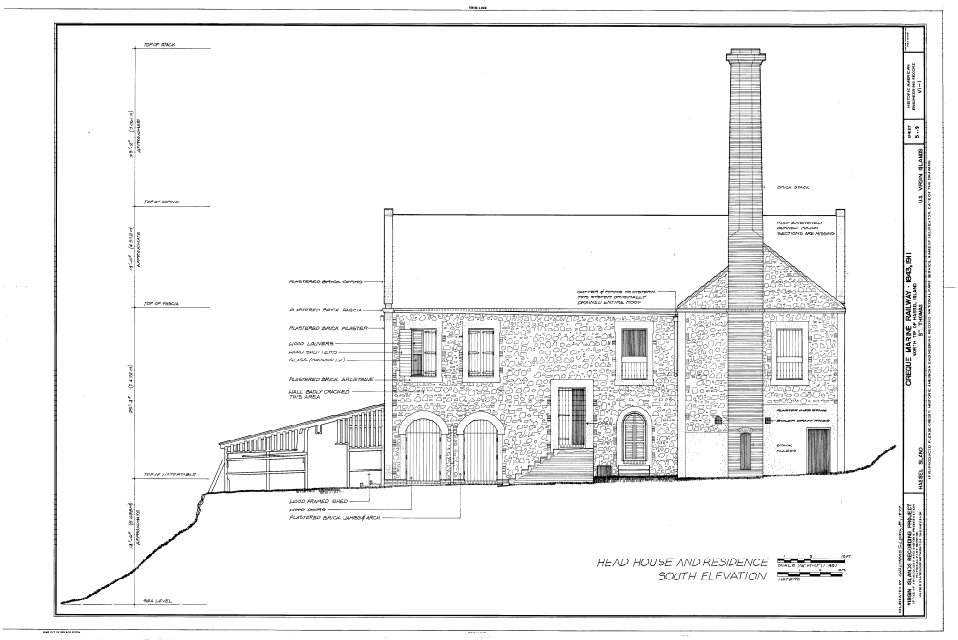


Figure 85. Head House & Residence South Elevation, 1977 HABS drawings.

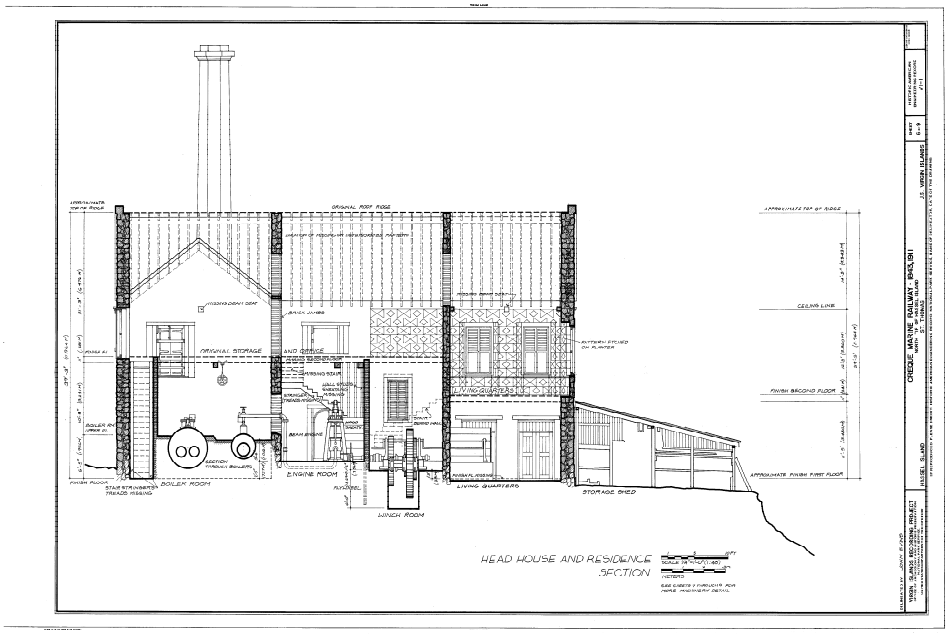


Figure 86. Head House and Residence Section, 1977 HABS drawings.

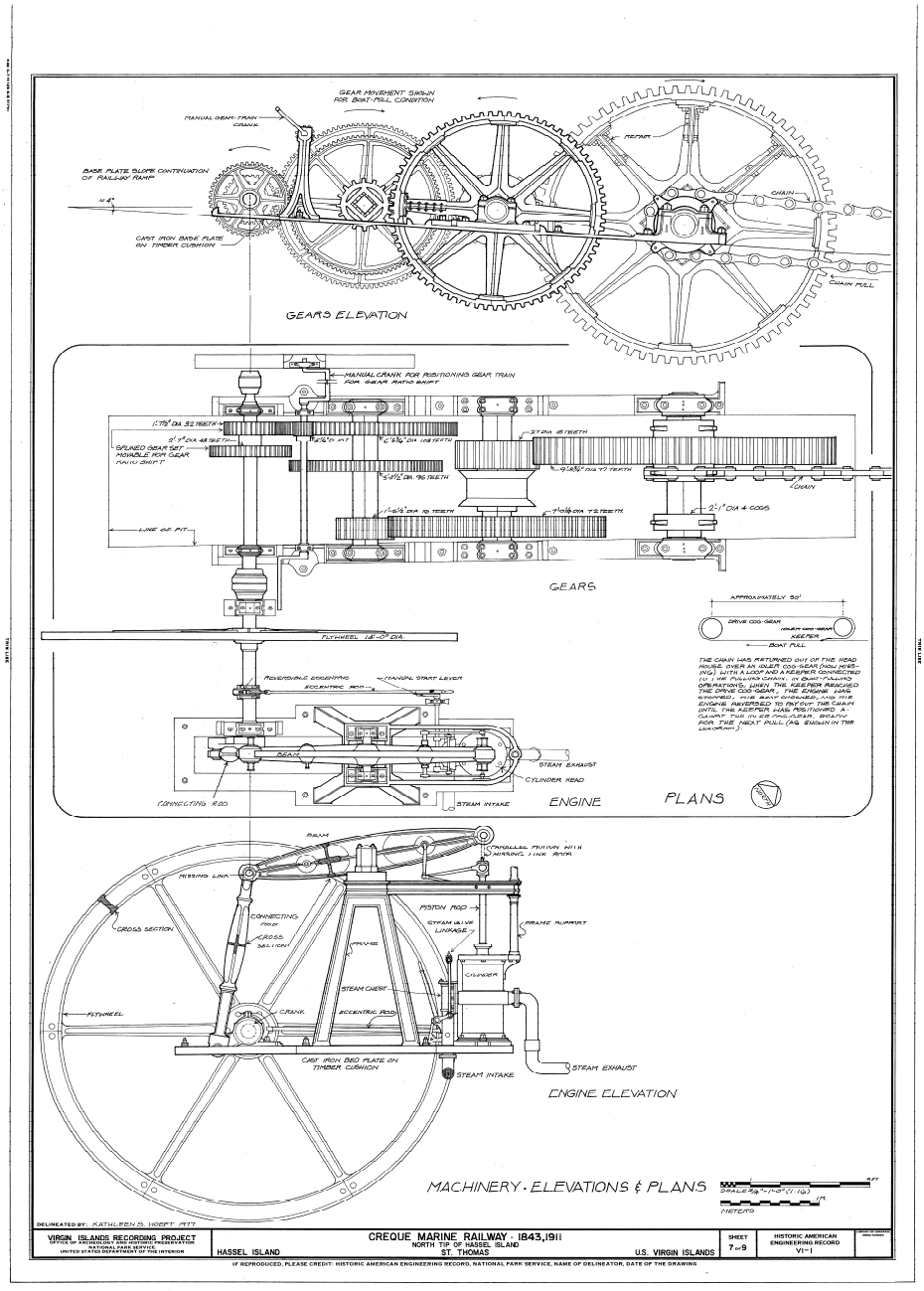


Figure 87. Machinery – Elevations & Plans, 1977 HABS drawings.

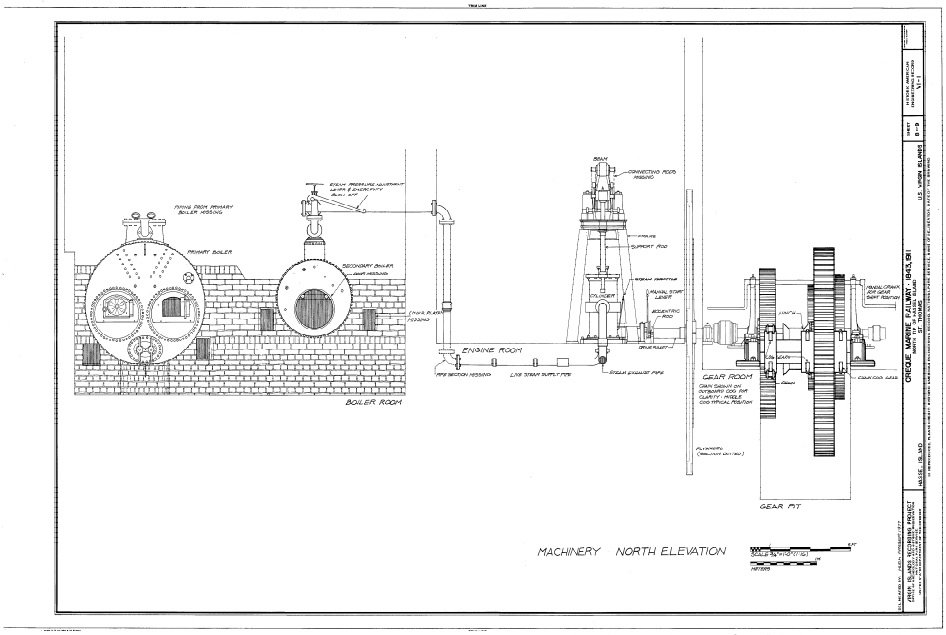


Figure 88. Machinery – North Elevation, 1977 HABS drawings.

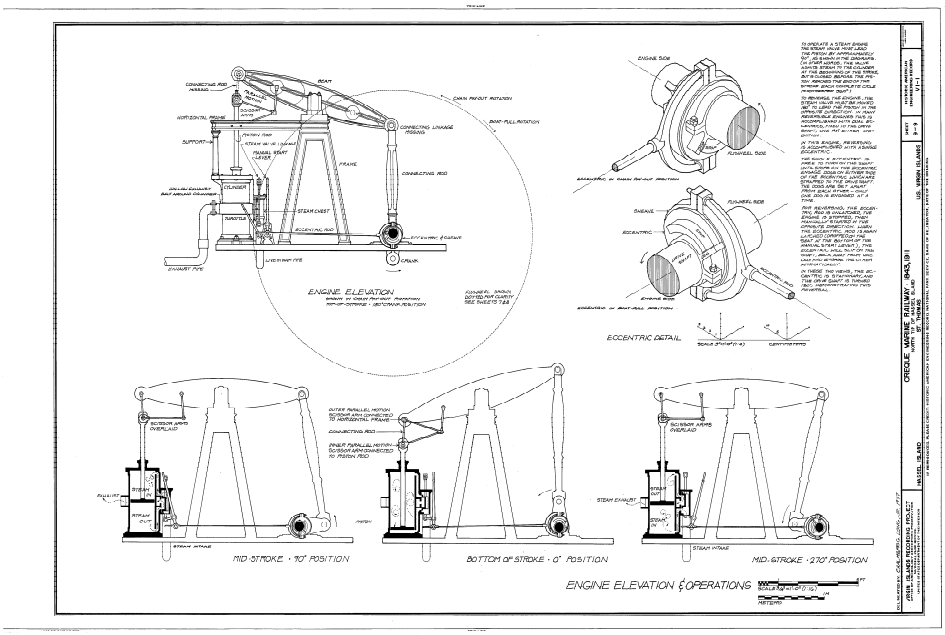


Figure 89. Engine Elevations & Operation, 1977 HABS drawings.



Figure 90. North elevation, Bays 1-4. 2020 (Helen Juergens).



Figure 91. Remains of Living Quarters, Bays 5 & 6. 2020 (C. Cheney).



Figure 92. 11-inch-wide Interior Red Brick Wall. 2020 (C. Cheney).



Figure 93. Missing portions of 11” interior red brick wall. 2020 (Helen Juergens).



Figure 94. Interior debris in boiler room, Bays 1-2. 2020 (C. Cheney).



Figure 95. Second level floor beams. 2020 (C. Cheney).



Figure 96. Chimney from South Elevation. 2020 (C. Cheney).



Figure 97. North wall cast iron doors. 2020 (Helen Juergens).



Figure 98. North wall exterior bracing. 2020 (Helen Juergens).



Figure 99. Interior bracing system, Bays 3 & 4. 2020 (C. Cheney).



Figure 100. Wooden scaffolding. 2020 (C. Cheney).



Figure 101. Cistern brick support pier. 2020 (C. Cheney).



Figure 102. Cistern interior, circa 2010 (NPS).



Figure 103. Cistern roof and South elevation of Head House. 2020 (C. Cheney).



Figure 104. Modern replacement cistern drainpipe. 2020 (C. Cheney).

BOLTON BEAM ENGINE AND EQUIPMENT

Description of Non-Structural Pathologies

At the heart of the Creque Marine Railway House there is a mechanical cast iron system, which partially occupies three sections or rooms on the first floor of the building structure. The boiler room, the engine room and the winch room. This three-part mechanical system was designed to work as one unit where each portion had a specific

function. The triad cast iron system originally installed over two centuries ago has been impacted by a number of repairs, wear and tear, interrupted use, and later adaptations. It has been exposed to the elements, the presence of the local fauna and flora and severe climatic changes including two recent category 5 hurricanes in 2017. The following listing is the result of the most recent survey of the boiler, engine, and the winch rooms.

Boiler Room

The Boiler Room located in Bays 1 and 2 is made of two separate cast iron equipment; the primary boiler and the secondary boiler. These two cylindrical units are built-in within a brick system which travels horizontally on the direction from Bay 1 to Bay 2

Access: The access to this equipment is limited due to the overgrown vegetation throughout the room, and the excessive uneven brick and larger timber debris (Figure 105). This physical obstruction seems to have been caused by the bracing system pulling inwards from presumably environmental conditions or a combination of unknown external factors.

Metal: the cast iron material seems stable although there is extensive corrosion at different levels throughout the mechanical system. The levels of dampness and relative humidity within the region and the present localized humidity is generally a key factor which allows for the rapid biological growth and accelerates the corrosion process in all types of metals. Fluctuation of humidity, wind patterns, and air flow also contribute to the deterioration of stones and metal.

The difficult access to the boilers impedes a better assessment of the actual condition. The secondary boiler is missing a door which is trapped among a pile of rubbles (Figure 105). There is loss of material towards the entrance of this boiler and the deterioration is presumably scattered throughout the boiler as the top area of the system is covered with vegetation, brick debris and timber from a previous collapse (Figure 106). The main boiler has two smaller doors that are partially open. One of the doors is twisted possibly from the weight and the pressure of the heavy debris on top of the system (Figure 107). The piping connected to the secondary boiler is severed due to the weight pressure of the collapsed timber (Figure 108).

Vegetation: some of the existing vegetation is tall and strongly rooted within the walls and floors. There is also biological growth in the form of simple plant colonies which seem to be causing biodegradation of the metal (Figure 109). The rooting of plants throughout the stones and the metal brings more dampness into the already corroded metal and promotes the passage of salts within the bricks. Weather fluctuation generally allows salts to invade the stones causing damage and deterioration.

Engine Room

The Engine Room located in Bay 3 is the iron original Bolton Beam Engine and a series of interconnecting iron components, including the 8-foot-diameter iron drive gear. The Beam Engine and connected iron equipment is anchored to the ground through a stone

slab which is supported by oversized timber beams. These timber beams travel perpendicular towards the ground surrounding an iron plated pit in the concrete slab and are anchored to massive foundation stones. This system can be partially seen through an opening at the base of the Beam Engine (Figure 110).

Access: There is overgrown vegetation and fallen bricks around the engine, and although the slab supporting the Beam Engine seems stable there are structural cracks and fissures all around it. Some timber components of the internal bracing system have previously fallen intersecting the engine equipment (Figure 111). Still there is enough room to examine the equipment, however precaution needs to be exercised when evaluating the area.

Metal: the cast iron material seems stable although there is extensive surface corrosion at different levels throughout the mechanical system. There are remnants of a green cast believed to be part of the original coating of the equipment (Figure 112). There is also flaking, delamination, and blistering of surfaces throughout the equipment (Figure 113).

Vegetation: some of the existing vegetation is tall and there is also biological growth in the form of simple plants scattered throughout the surface. In some areas there is a green powdery cast similar to biological growth; in other areas the green coloration appears to be remnants of an old paint barrier. There is also biological growth throughout the stone slab which supports the engine beam.

Between the engine room and the winch/gear room there is a flywheel system embedded in a brick wall. In the original design the flywheel was connected to the engine beam. The metal component of the flywheel seems stable although corroded throughout. The original paint coating-like on its surface has peeled due to deterioration of the metal. The base of the system is buried in brick rubble from a previous wall collapse.

Winch Room

The Winch Room is located in Bay 4 and it is made of a series of gears made of cast iron. The system is partially obstructed by larger rubble stones, debris, timber presumably from a prior collapse of walls and the building bracing system (Figure 114).

Access: The excessive amount of debris, timber, and oversized stoned on the ground makes the assessment of this equipment difficult.

Metal: the cast iron material seems more stable in this room. There is corrosion throughout the gear system, however the corrosion seems more uniform. This assessment is limited solely to the exposed portion of this system as the rubble material surrounding the gears impedes the assessment of the portion underneath the debris. There is also remnant of a lighter red coating that is peeling off throughout the surface due to deterioration of the metal .

Vegetation: There is existing scattered vegetation throughout the room. Biological growth is present also on stones and portions of the gears surface. The amount of debris

surrounding the system and the room makes it difficult to assess the lower portion of the gear including the pit area under the equipment.



Figure 105. Main boiler showing damaged door. 2020 (C. Cheney).



Figure 106. Frontal interior of secondary boiler showing loss of metal material due to deterioration. 2020 (C. Cheney).



Figure 107. Main boiler showing damaged doors. 2020 (C. Cheney).



Figure 108. Severed piping system over secondary boiler damaged due to collapsing bracing system. 2020 (C. Cheney).



Figure 109. Secondary boiler showing physical, biological and chemical deterioration. 2020 (C. Cheney).



Figure 110. Supporting slab showing underground area in Engine Room. 2020 (C. Cheney).



Figure 111. Engine Room equipment, general view showing current condition. 2020 (C. Cheney).



Figure 113. Green coating on surface of equipment in Engine Room. 2020 (C. Cheney).



Figure 112. Corrosion showing on flywheel next to engine beam. 2020 (C. Cheney).



Figure 114. Rubble and debris present throughout the Winch Room. 2020 (C. Cheney).

SIGNIFICANCE AND INTEGRITY

The Creque Marine Railway Building was listed in the National Register of Historical Places on August 29, 1978, as part of the Northern Hassel Island Historic District. It is located on Hassel Island in the bay of Charlotte Amalie, off the coast of St. Thomas in the U.S. Virgin Islands.[1] The building was constructed in the 1840s by the Danish Orkanshullet Island Coal and Oil Fuel Depot Company and served as a ship repair facility. In the late 1880s, St. Thomas' was a strategic geographic location for maritime trade, resulting in a prosperous economy; it was one of the main shipping repair and coaling stations in the Caribbean up until the World War I.[2] Research consensus is that the Creque Marine Railway is the oldest steam-powered marine railway in the Western Hemisphere.

The historic significance of the Creque Marine Railway Building is described in the 1978 Hassel Island Historic District (Boundary Increase) Nomination Form, now over 40 years old. It remains as significant and relevant in 2020, despite its post hurricane condition. Much of the historic and physical integrity of the building, as identified in the nomination form, was recently damaged beyond repair or lost as a result of the storm damage from Hurricane's Irma and Maria in 2017. (Refer to Part I of this HSR for further description of the hurricane damage and Part II for the emergency/stabilization recommendations and treatment options.)

The historic integrity, as identified in the NPS National Register Bulletin "How to Apply the National Register Criteria for Evaluation" is the ability of a property to convey its significance through possessing most of the following aspects: location, design, setting, materials, workmanship, feeling, and association. To maintain the historic integrity of any historic structure it is important to retain and preserve its character defining features. Unfortunately, two of the most significant original character-defining features (brick chimney and tiled, gabled roof) of the Creque Marine Railway Building have been lost either from the recent storms or a previous fire. These two features are described as follows:

- **Brick chimney:** A 60-foot-tall, brick chimney that serviced the boilers that powered the original iron Bolton Beam Engine. The chimney toppled onto the remaining brick wall to the east. Not only was the top 30-feet of the brick stack destroyed, its impact caused the east interior brick wall at the staircase to buckle and twist, resulting in loss of the brick at the second story portion northeast corner of the wall and destruction of the original wood staircase. The loose brick from the interior wall is piled up and lying on the floor of the stairway and the multiple layers of brick from the chimney are lying where they fell, on the outside of the exterior east stone wall.
- **Tiled, gabled roof:** Originally, the Creque Marine Railway Building had a tiled, gabled roof, which was an integral part of the structural integrity, tying the building walls, floor, and roof framing together. This roof, along with the chimney, were the two main visually defining features, which could be seen and recognized by ships arriving into port from St. Thomas harbor. It appears that the original gabled roof and roof materials were destroyed by fire in 1967, which was prior to the NPS acquisition of Hassel Island and the building in 1978.

The other character-defining features of the Creque Marine Railway Building that were not damaged by the hurricane storms, retain their integrity, and are still relevant are as follows:

- **The original iron Bolton Beam Engine:** As indicated in the registration form, the engine was built in Hamburg, Germany, around the 1840s by the Bolton Company and is most likely the original engine for the facility. Also intact are the iron boilers that produced the steam for the engine and the massive and multiple iron gears that moved the winch system and the iron chain, all of which powered the hoisting of the large ships out of the water for maintenance. The equipment is all in its original locations within the structure but is surrounded by the wall ruins, the stones and bricks from the fallen portions of the walls, the broken wood floor joists, and the components of the stabilization system including the iron cables, wood bracing, and wood beams.
- **The Eastern stone Gable wall**
  The original exterior wall at the eastern end of the Head House is largely intact. It is the only remaining gable of the four original stone gable walls. The gable tops of the other three have collapsed.
- **The Sandstone Door Frame**

The main entrance on the North elevation that leads into the Winch Room is framed with striking brown sandstone. The decorative sandstone detail is still intact without any apparent spalling.

Although the design, materials, and workmanship of the standing character-defining architectural features have been compromised by storm damage, the aspects of their historic integrity relating to location, setting, association, and feeling remain intact.

The geographical location of the Creque Marine Railway Building on Hassel Island, St. Thomas, within the Virgin Islands in the Caribbean, places the building in the epicenter, directly between the European ports and the Panama Canal in the late 1800s when maritime activity was booming. Significant maritime events included major British military actions, commercial and industrial expansion of the Danish empire, development of the sugar trade and major international mail delivery hub. All this shipping traffic allowed for St. Thomas to become one of the main shipping repair and coaling stations, which led to the initial success of the Creque Marine Railway Building. The Creque Marine Railway Building serves to reinforce the international and global significance of the Virgin Islands National Park.

PART II. TREATMENT AND USE

USVI BACKGROUND FOR TREATMENT AND USE

Creque Marine Railway Head House & Residence was listed in the National Register of Historic Places on August 29, 1978 as one of the contributing elements of the nationally-significant Hassel Island Historic District (Boundary Increase), located on Hassel Island in the U.S. Virgin Islands. In the listing, the head house is referred to as the Creque Marine Railway Building.

According to the ***Resource Management Plan*** (RMP) signed by the Regional Director, October 1994, and the ***Foundation Document***, dated December 2016, the administratively determined Management Category for the Creque Marine Railway Building is noted as "***Should be Preserved and Maintained****."*

Although a management decision for Ultimate Treatment of the Building is not documented in either report, a treatment approach for this Historic Structures Report will be proposed under ***The Secretary of the Interior's Standards for the Treatment of Historic Properties***, subject to future confirmation in a planning process as required by ***Director's Order 28: Cultural Resource Management***.

In addition, per the NPS *Statement of Work*, dated August 2019, Part 2 Section: Treatment and Use, will be based upon the overall management objectives of previous NPS studies including, but not limited to, the ***Foundation Document, Resource Management Plan, Historic Resource Study for Hassel Island, Cultural Resource Study for Hassel Island and the Visitor Services Project – Visitor Study***. These studies are in the Technical Information Center at the NPS Denver Service Center or the NPS Southeast Regional Office.

The proposed Treatment and Use topics to be presented with the 85% HSR Submittal are included herein, under the Part 2: Treatment and Use Section of this report, per the NPS *Statement of Work*.

REQUIREMENTS FOR TREATMENT

The NPS Creque Marine Railway Building operates under an NPS Resource Management Plan (RMP), signed by the Regional Director, in October 1994 and most currently the NPS Foundation Document, Virgin Islands National Park and Virgin Islands Coral Reef National Monument completed in December of 2016. As indicated by the Park, an NPS General Management Plan was never completed for the Virgin Islands National Park. It was administratively determined that the Management Category for the Creque Marine Railway Building is "***Should be Preserved and Maintained**."*

In order to Preserve and Maintain the structure, there are numerous federal, state and local laws, codes, regulations and guidelines that delineate the requirements for the treatment of historic structures and buildings in general. The following multiple documents and their requirements for treatment of the preservation and future design of the Creque Marine Railway Building, are those that address the overriding mandate of the National Historic Preservation Act NHPA. The applicability and status of these listed documents below, needs to be confirmed by the selected Architecture & Engineering (A/E) team prior to commencement of the design phase for the building. These lists are not intended to be all inclusive but are being offered as a starting reference point for the A/E team.

FEDERAL REQUIREMENTS FOR TREATMENT & GUIDELINES:

The overarching federal law for the treatment of historic properties is treatment of historic properties is *Section 106 of the National Historic Preservation Act (NHPA)*, which mandates that federal agencies, including the National Park Service (NPS), take into account the effects of their actions on historic properties listed or eligible for listing in the National Register of Historic Places. NHPA's implementing regulations can be found in the Code of Federal Regulations (CFR), Title 36, Chapter VIII, and Advisory Council on Historic Preservation, Part 800 –Protection of Historic Properties, otherwise known as *36 CFR Part 800*.

Section 106 of the NHPA requires Federal agencies to take into account the effects of their undertakings on historic properties and allows for review and comment from the American Council of Historic Preservation (ACHP), the independent federal agency that promotes the preservation, enhancement, and sustainable use of the nation's diverse historic resources, and advises the President and Congress on national historic preservation policy.

In an effort to assist with the adherence and compliance to the NHPA statues and regulations, the Secretary of Interior has issued *The Secretary of Interior's Standards for Historic Preservation Projects*, as guidelines for the treatment of historic properties and structures.

Likewise, the National Park Service has published several related guidelines instrumental in assisting with compliance and adherence to the federal laws for treatment of historic structures. The main NPS policy document is the *2006, NPS Management Policies*, which states the basic principles governing the management of cultural resources in the national park system, consistent with law and the Secretary of Interior's Standards. (For clarification, this guideline, succeeding others of the same title that were designated NPS-28 in the previous NPS directives system, elaborates on these policies and standards and offers guidance in applying them to establish, maintain, and refine park cultural resource programs.)

One of NPS' outstanding resources to be used in developing treatment options for the Creque Marine Railway Building, which facilitate adherence to the *2006 NPS Management Policies*, are the *NPS Preservation Briefs*. These are a series of over 150 individual publications that provide information on preserving, rehabilitating and restoring individual components of historic structures. These NPS Publications help in recognizing and resolving specific building items, such as, but not limited to, Historic Concrete, Roofing for Historic Buildings, Repointing Mortar Joints, Making Historic Buildings Accessible, to name just a few.

The list of applicable Federal Requirements for Treatment & Guidelines includes:

- *Section 106: National Historic Preservation Act (NHPA)*
- *36 Code of Federal Regulations (CFR) Part 800: Protection of Historic Properties*
- *American with Disabilities Act (ADA)*
- *The Secretary of Interior's Standards for Historic Preservation Projects*
- *2006 NPS Management Policies*
- *NPS Technical Preservation Briefs* – over 150 Separate Publication Briefs

STATE & LOCAL CODES & GUIDELINES, TO BE USED AS REFERENCE FOR TREATMENT:

While the preservation and design of federal government properties and facilities are not bound by any state or local jurisdictions "adopted" building codes, regulations or laws, typically the National Park Service, "uses" these codes as guidance, except where compliance of these code, would needlessly compromise the integrity of the historic building.

To note, federal agencies typically do not "adopt" codes in the same manner as state and local governments incorporate model codes into their statutes or laws for the purpose of regulating construction within their jurisdictions. Instead, the Federal agencies "use" the International Codes (I-Codes), *which have been developed by the International **Code** Council, are a family of fifteen coordinated, modern building safety **codes** that help ensure the engineering of safe, sustainable, affordable and resilient structures.*

The International Code Council is a nonprofit association that provides a wide range of building safety solutions including product evaluation, accreditation, certification, codification and training. It develops model codes and standards used worldwide to

construct safe, sustainable, affordable and resilient structures. Many state and local jurisdictions have adopted these codes, often with amendments that incorporate local environmental characteristics.

The list of adopted and applicable codes of the U.S. Virgin Islands, Department of Planning and Natural Resources Department includes:

- *Title 29 of the Virgin Islands Code*
- *International Building Code*
- *International Mechanical Code*
- *International Energy Conservation Code*
- *National Electrical Code*
- *Uniform Plumbing Code*
- *Design Guidelines for Hurricane Resistant Buildings, October 20, 2017, Legislature of the Virgin Islands*
- *USVI Construction for a STRONGER HOME 4th edition, 4/13/2018*
  Appendix – Stronger Home
  Appendix – Part 2
  (Although this amendment to the code applies to residential construction, the overlying structural concepts may be applicable to commercial structures, including the Creque Marine Railway Building. The A/E team will need to confirm current codes, recommendations and guidelines at the time of design, as new information from professional engineering and code research agencies is being continually updated.)

NPS CLIMATE CHANGE GUIDELINES FOR TREATMENT OF HISTORIC STRUCTURES:

As the prominent U.S. Federal Agency focused on the preservation of the nation's cultural resources and historic structures, the National Park Service, along with several other federal agencies, has led the way in establishing guidelines to help mitigate, or at least minimize the effects that climate change is having on our unique, significant and wondrous resources.

"In 2014, NPS Director Jonathan Jarvis signed Climate Change and Stewardship of Cultural Resources, a Policy Memorandum outlining the NPS position on responding to climate change and its potential effects on cultural resources, emphasizing our stewardship and preservation program mandates."

The *CRCC Strategy* represents an important step in providing direction for implementing the policies and direction of the 2014 Policy Memorandum.

"In 2016 the National Park Service (NPS) celebrated the centennial of its 1916 Organic Act and the 50th anniversary of the passage of the National Historic Preservation Act (NHPA), which established the framework for the current national preservation program. The National Park Service Cultural Resources Climate Change Strategy (CRCC Strategy) responds to the mandates of both Acts.

The CRCC Strategy provides guidance for NPS managers to anticipate, plan for, and respond to the real and potential effects of a changing climate on the cultural resources the 1916 Act commits us to protect unimpaired for future generations. Under the NHPA, it further provides guidance to our many partners in the national historic preservation program to recognize and respond to a wide range of environmental changes that are threatening cultural resources in communities throughout the Nation"
The list of applicable NPS Climate Change Guidelines includes:

- *2014, NPS Policy Memorandum, Climate Change and Stewardship of Cultural Resources,* signed by Director Jonathan Jarvis
- 2016 NPS *Cultural Resources Climate Change Strategy (CRCC Strategy)*
- 2016 NPS *Climate Change Impacts on Cultural Resources* by the Climate Change Response Program

FEDERAL, STATE & LOCAL FLOOD REQUIREMENTS FOR TREATMENT:

Due to awareness of climate change and its impact on cultural resources, the requirements for treatment of flood mitigation are quickly being developed, adopted and implemented by Federal, States' and Local governments, often working together, to meet this global challenge. Please refer to the end of this section, *FEMA Building Code Resources for Hazard-Resistant Provisions*, for a greater listing of Federal requirements for flooding adaptation.

National Park Service Requirements for Treatment for Flood Adaptation

In December 2019, the National Park Service issued The Guidelines on Flood Adaptation for Rehabilitating Historic Buildings, which "was produced in response to a request for technical preservation guidance specific to historic properties at risk of flooding." This was a collaborative effort between NPS and numerous federal agencies including, Advisory Council on Historic Preservation (ACHP), the Department of Housing and Urban Development (HUD), the Federal Emergency Management Agency (FEMA), and the Federal Railroad Administration (FRA).

Also included were preservation partners, design and other technical professionals including, The National Conference of State Historic Preservation Officers (NCSHPO), the National Association of Tribal Preservation Offices (NATHPO), and the National Trust for Historic Preservation. State Historic Preservation Offices (SHPO) and Tribal Historic Preservation Offices (THPO) throughout the county,

The goal of the *Guidelines on Flood Adaptation for Rehabilitating Historic Buildings* is to provide information about how to adapt historic buildings to be more resilient to flooding risk in a manner that will preserve their historic character and that will meet *The Secretary of the Interior's Standards for Rehabilitation*. These guidelines should be used in conjunction with the *Guidelines for Rehabilitating Historic Buildings* that are part of *The Secretary of the Interior's Standards for*

the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, and Restoring & Reconstructing Historic Buildings, issued in 2017. Like the *Guidelines for Rehabilitating Historic Buildings*, these guidelines are intended to focus primarily on historic buildings and their site and setting.

- *NPS 2019 - The Guidelines on Flood Adaptation for Rehabilitating Historic Buildings*

U.S. Virgin Island's Requirement's for Treatment with FEMA & NIFP

The U.S. Virgin Islands, Department of Planning and Natural Resources currently has a draft document on Flood Damage Prevention, out for public comment, which is intended to ensure that the U.S. Virgin Islands regulations are consistent with current requirements of FEMA and the National Flood Insurance Program (NFIP) and that they provide local jurisdictional needs including consistency with the land development codes, and be properly coordinated with the Virgin Islands Building Codes. These regulations, in combination with the flood provisions of the Virgin Islands Building Code, shall be known as the Floodplain Management Regulations of U.S. Virgin Islands.

- *Floodplain Management Regulations of U.S. Virgin Islands* – Public Draft released by The U.S. Virgin Islands, Department of Planning and Natural Resources

Coordination with the Virgin Islands Building Code

Title 29 Virgin Islands Code, Chapter 5 Building Code, adopts the Virgin Islands Building Code and directs the Commissioner of the Department of Planning and Natural Resources to administer and enforce the building code. The Virgin Islands Building Code includes certain provisions that apply to the design and construction of buildings and structures in flood hazard areas. Therefore, these flood provisions and regulations are intended to be administered and enforced in conjunction with the building code.

Establishment of Flood Hazard Areas

The U.S. Virgin Islands was accepted for participation in the National Flood Insurance Program on October 15, 1980. The Flood Insurance Study for the U.S. Virgin Islands dated April 16, 2007, and all subsequent amendments and revisions, and the accompanying Flood Insurance Rate Maps (FIRM), and all subsequent amendments and revisions to such maps, and the Advisory Flood Hazard Resources Maps created by FEMA on April 26, 2018, are hereby adopted by reference and serve as the basis for establishing flood hazard areas. Where the building code establishes flood hazard areas, such areas are established by this section. Maps and studies that establish flood hazard areas are on file at the Department of Planning and Natural Resources.

FEMA Building Code Resources for Hazard-Resistant Provisions:

As the current deteriorated condition of the Creque Marine Railway Building is mainly due to the environmental destructive forces suffered by the Virgin Islands, it will be imperative that the new design of the building take into account the current lessons-learned, codes, and guidelines addressing hazard-resistance construction. Again, upon initiating the design phase of the project these and all other applicable codes, not shown, should be researched by the selected A/E team.

To that end, FEMA has compiled a list of documents that provide guidance on the hazard-resistant provisions in the building codes for property owners, engineers and design professionals, building codes officials, and the general public. The FEMA website and information is being offered here in an abbreviated manner only. So as not to misconstrue the succinct references to the documents, it is advised that the reader refer to the FEMA website for the entirety of its data.
https://www.fema.gov/building-code-resources

ALTERNATIVES FOR TREATMENT

Since the construction of the Creque Marine Railway Head Houses in the 1840's, the structure has borne the brunt of no less than 20 major hurricane events, as identified by NOAA records.[1] Astonishingly, about 50% of the original historic stone and brick walls, along with the Bolton Beam Engine and all of its related components, are still standing, albeit precariously and in an eminent state of collapse. Since much of the historic fabric has persevered through the Virgin Island's cycles of environmental devastation, the treatment selection will be unique as these destructive changes to the building have been deductive (destroyed from the storms) in lieu of additive (which is the typical scenario where additions/alterations have been cobbled on) to the original historic structure.

Treatment of a Structure vs. Treatment of a Ruin:

The fact that at least 50%, if not more, of the original historic fabric of the Creque Marine Railway Head House has been destroyed and left in a current state of eminent collapse, underscores the notion that this historic structure can virtually be considered, at this point in time, an architectural ruin. However, since this historic structure is the earliest steam-powered marine railway in the Western Hemisphere and played a significant global role in the 19th-century shipping industry, its preservation is paramount.

In developing the following five Alternatives for Treatment, to ensure compliance of each, *The Secretary of the Interior's Standards for the Treatment of Historic Properties* address four treatments: preservation, rehabilitation, restoration, and reconstruction.[2] Because of the structure's current state of disrepair, all four of these treatments will need to be employed to save this building from total ruin.

Preservation and stabilization will be required of the remaining historic fabric including the stone and brick walls. Rehabilitation and repair will need to be performed on almost all the remaining fabric, that has not been destroyed, as it is virtually all damaged. Restoration will be required of several of the character defining features that are still intact. A reconstruction is recommended for the fallen portion of the brick chimney that serviced the still-intact boilers that ran the original Bolton Beam Engine. Discussions of each of these character defining features follows in these alternatives for Treatment.



Figure 116. The Creque Marine Head house in the current state, 2020 (Helen Juergens).



Figure 115. The Creque Marine Head house before the 2017 hurricane damage.



Figure 117. An artist's rendering of the original Creque Marine Railway Complex.

Emergency Stabilization Measures:

In 2017, Hurricanes Irma and Maria left the Creque Marine Railway Head House in its current state, at the stage where a building starts to become a ruin, despite the strategic efforts of the NPS and its pre-hurricane stabilization measures. With this current history as a starting point towards preservation, it is critical to note that inherent in each of these five Alternatives for Treatment, the plan must begin with the implementation of the Emergency Stabilization Measures, which are noted in the Recommendations for Treatment section of this report. It is recommended that these measures be completed as quickly as possible, if not immediately, and prior to the A/E design effort, so as not to lose any further historic fabric from future storms or hurricanes.

Preservation/Restoration Treatments Common to all Five Alternatives:

Each of the following five Alternatives for Treatment include the following recommendations for the various conditions of the individual original historic architectural components. Each of the following treatments is in alignment and adherence with the Secretary of Interior's Guidelines, which is clarified in the treatment sections of this report.

- Reconstruction of the fallen portion of the original historic brick chimney. The chimney, which serviced the boilers to the Bolton Beam Engine, is one of the more significant elements given its visibility. The original historic bricks are lying on site where they fell, and the original configuration of the chimney is documented in the HABS drawings.
- Stabilization, Preservation and Rehabilitation of the remaining exterior and interior stone and brick walls.

- Stabilization, Preservation and Rehabilitation of the remaining door and window openings at the brick headers, jambs and sills.
- Preservation of ALL the cast iron components of the Bolton Beam Engine system, including the two boilers in the Boiler Room, the Bolton Beam Engine and adjacent flywheel in the Engine Room, and all the gears in the Winch Room.
- Reconstruction of the second-floor framing system.
- Preservation and Rehabilitation of the two sets of arched iron doors on the north elevation that provide access to the Engine Room containing the two boilers.
- Stockpiling any of the salvageable historic elements for reuse and/or display, including the bricks, stones, wood stairs, doors, windows, hardware, etc.
- Removal of the non-historic Cistern roof.

Period of Significance: 1848-1940

The primary use of the Creque Marine Railway Head House had not changed in its over 170-year history. The structure was constructed to house and operate the Bolton Beam Engine, provide offices and storage for the Creque business, and serve as a part-time residence for the Creque Family. To set the structure's major period of significance during its original construction and use around the 1840s would necessitate a complete renovation and restoration. Per the Secretary of Interior Standards, there is not enough historical documentation nor physical evidence to propose this date and subsequent treatment. It is recommended that the period of significance include the time when the gable roof was in place, as this is the last date when the major character defining features of the building were still intact and the building was still functioning as a marine railway repair facility. The period of significance should be from 1848, when the construction on the building was finished by the St. Thomas Marine Railway Company to 1940 when the steam-powered equipment became defunct under the Creque occupation. After this era the U.S. navy leased the property refocusing its function, following which the building began to go into disrepair.

Interpretive Program:

Success of any of these five alternatives is dependent on a simultaneous and coordinated effort between the development of the Interpretive Program and the Building Program for the preservation and design of the building.

The Interpretive Program would set forth the final interpretive themes and spatial and display requirements based on the goals outlined in the 2016 Foundation Document. The Building Program would define the exact sizes, uses, quantities, and quality of the spaces, coupled with the code & technical requirements. This effort would become part of the decision-making process that helps to identify the final scope of A/E work to be performed, which will be evaluated against the project budget. This programming process for both the Interpretive Program and the Building Program is instrumental in garnering agreement and buy-in from all the multiple and various types of stakeholders.

Refer to the Visitor Use and Appropriate Activities Section of this report for discussion regarding the opportunities for the building in the development of the Interpretive Program.

ALTERNATIVE #1:

Begin with implementation of Emergency Stabilization Measures described in the Recommendations for Treatment section. Protect/Stabilize/Repair existing original historic stone and brick walls, then add a new protective, freestanding roof structure. Reconstruct fallen portion of original historic brick chimney. Leave existing interior historic stone and brick walls, along with the Bolton Beam Engine, in an open-air plan for the NPS Interpretive Program.

NOTE: This Alternative #1 is applicable, only if the park decides to treat the original historic fabric and elements, as a stabilized and preserved "ruin", similar to the current NPS Annaberg Plantation site on St. John Island.



Figure 118. New site walls, to protect historic walls, new roof and interpretation on inside of structure. NPS Wesleyn Chapel, Women's Rights National Historical Park.



Figure 119. Original historic walls preserved of NPS Wesleyn Chapel, site of the Seneca Falls Convention, the first Women's Rights Convention. NPS Women's Rights National Historical Park, Seneca Falls, NY.

Advantages to this approach:

- Adding a new gable roof structure will aim to preserve and protect the remaining portions of the exterior and interior historic fabric including the stone and brick walls, the Bolton Beam Engine and its metal components, which are all major character defining elements of the historic building.
- A new gable roof structure will reflect the original profile of the building, especially when viewing the building from Charlotte Amalie across the harbor to Hassel Island. This option would allow the visitor to reimagine or envision the historic landscape view with the silhouette of the original roof.
- The original stone gable walls, wood roof framing, second floor framing, and roof are what structurally tied the building together. The addition of a new gable roof, along with other new framing members could provide the needed structural stability to support the remaining exterior and interior stone and brick walls and structurally tie all of these building components together again.
- A new gable roof structure and modern roofing materials are easily discernable from the original historic fabric, so as not to be misinterpreted as a reconstruction effort.
- This design solution would be one of the more cost-effective measures, when considering a budget.
- Many of the original character defining architectural features of the building have been destroyed over time, one of the most important being the brick chimney that serviced the boilers for the Bolton Beam Engine. This option would correct that and give the building some of its identity back. The reconstruction of the historic brick chimney is feasible because the original

historic stones and bricks are still on site, lying where they fell after Hurricanes Irma and Maria, and the HABS drawings documentation is available to support this option. This supporting material evidence and documentation is in keeping with the requirements of the Secretary of Interior Standards.

Disadvantages to this approach:

- If a new gable roof structure is not designed with the correct scale, it could ruin the visual impact of the historic form of the building both from across the harbor and up close. In addition, careful design studies would be needed to ensure that the new size and materials of the roof and roof overhang, do not visually obstruct the view of the remaining historic exterior stone walls. As an example noted above, the roof at the NPS Wesleyn Chapel at Women's Right's National Historical Park, has a tendency to overshadow the original brick walls of the historic chapel. The Creque Marine Railway Head House will have a similar design situation, should this option be selected.
- Provides for a minimal amount of square footage for the Interpretive Area, especially considering that the Bolton Beam Engine and its components account for most of the floor area within the building.
- With the outdoor, open air venue, the Park is limited to the type of Interpretive Program & Displays that can be used.

Challenge to this approach:

- Due to an insufficient amount of historic data and a lack of physical material evidence of the original roof system, a new gable roof structure would need to be designed as not to misinterpret any of its components as being a part of the original building, per the *Secretary of Interior's Standards.*
- In an open-air structure, special consideration would need to be given to the preservation of the Bolton Beam Engine and its components, which would need to be addressed in the design brief to the A/E team.



Figure 121. Free standing structure offers some protection of the original historic stone and brick walls, the Bolton Beam Engine and its metal components, but does not provide much wind protection. Size and scale of a new structure would need to be considered.



Figure 120. Original historic walls at NPS Wesleyn Chapel, were preserved, a new roof added with site development. Interpretive program conducted on interior of historic walls. Seneca Falls Convention, the first Women's Rights Convention. NPS Women's Rights National Historical Park, Seneca Falls, NY.

ALTERNATIVE #2:

Begin with <u>implementation of Emergency Stabilization Measures described in the Recommendations for Treatment section.</u> Protect/Stabilize/Repair existing original historic stone and brick walls, then insert a non-intrusive interior protective structure inside the exterior stone walls. Install interior and/or exterior structural brace work/framing in context with historic fabric. Reconstruct the fallen portion of the original brick chimney.



Figure 122. Old farmhouse ruins in Dumfries, Scotland, with new nonintrusive structure built inside the historic walls. Highlights, preserves and provides structural stability to the original remaining stone walls. Photo by Sergio Pirrone.

Advantages to this approach:

- This treatment option lends an integral structural stability to the remaining original historic stone and brick walls, which aids in their preservation.
- Provides a modern design solution to the missing roof that visually replicates the original historic gable roof. This type of new roof interpretation would not be viewed as part of the original historic fabric, nor as a reconstruction effort. As shown in the picture above, the new modern farmhouse roof and walls, which were structurally inserted into the historic stone wall ruins of the farmhouse, were all covered in the same black EPDM roofing material. This material treatment allows for the new modern addition recede into the background, thereby highlighting the original historic stone walls, giving them a greater sense of visual importance and prominence.
- Can clearly identify the new design and modern materials from that of the original design and the historic building materials.

- A new internal structure on the inside of the perimeter of the original historic stone and brick walls can provide both structural stability to the original walls, and also protection of the cast iron components of the Bolton Beam Engine.

Disadvantages to this approach:

- If a new internal wall/roof structure is not designed correctly, it could ruin the visual impact of the historic form of the building.
- Waterproofing where the new internal structure is adjacent to the original historic structure will be a challenge. Due to the extremely high potential that the building will experience recurring hurricanes with wind driven rains and flooding, the civil engineering and architectural design will need to focus on draining water away from the building, ensuring water drains through the original and new wall materials, that the soils and the new foundation system can provide the required structural load carrying capacity when the ground is saturated with water, and that the building materials and roof are well ventilated in order to prevent mold and deterioration of the materials, among other concerns.

Challenge to this approach:

- The infill material for the new modern internal structure could be solid masonry, concrete, acrylic, structural glass, etc. in order to withstand future winds, rain and storms. This option provides an opportunity to use new technologically developed siding, roofing and glazing options. Window & door openings would be framed according to *The Secretary of the Interior's Standards*.



Figure 123. Ruins of a former parchment factory repurposed into new residence in Northamptonshire, UK. Will Gamble, Architects. Photo by Johan Dehlin.



Figure 124. Ruins of a former parchment factory repurposed into new residence in Northamptonshire, UK. Will Gamble, Architects. Photo by Johan Dehlin.

ALTERNATIVE #3:

Begin with implementation of Emergency Stabilization Measures described in the Recommendations for Treatment section. Protect/Stabilize/Repair existing original historic stone and brick walls, then ghost-in the perimeter outline of the missing original roof & brick chimney with steel or other type of sustainable material. Add a visually non-intrusive internal structure(s) to protect the original interior brick and stone walls and original historic mechanical equipment.



Figure 125. Franklin Court – Ghost Structure at NPS Independence National Historical Park Photo by NPS.

Advantages to this approach:

- Provides a silhouette or ghosting of two major character defining elements that are now missing. When combined with the existing, original historic elements it could prove quite successful in creating a visual essence of the original structure, without recreating the missing elements.
- Design of a minimal gable roof chimney structure could reflect the original profile of the building, providing views from Charlotte Amalie across the harbor to Hassel Island. Similar to Alternative #4, this option could recreate the essence of the historic landscape view, mimicking the silhouette of the now missing roof and chimney.
- This structural framework could be creatively designed to not only recreate the visual profile of the building, but also provide the structural support necessary to stabilize the existing original historic stone and brick walls.
- This option would be one of the more cost-effective options when considering a budget.
- Given an insufficient amount of historic data and a lack of physical material evidence of the original historic roof, this option eliminates any concerns about the materiality of a new modern roof structure.

- Opportunity to create a new viewing platform inside the perimeter of the exterior historic stone walls, located underneath the new steel framework. This internal platform could be set below the top course of the exterior stone walls at the original second floor level, so as not to be seen from the outside of the historic structure. This would allow for the current view of the remaining wall elevations to stay intact. This platform could provide protection to the mechanical equipment and the interior historic materials below, along with providing an upper deck from where the visitors could view the harbor. This would be a similar view as to what the Creque family experienced in their upper level Living Quarters on the west end of the building. This type of venue could be utilized for a dynamic Night Sky interpretive program, as mentioned in the 2016 Foundation Document.

Disadvantages to this approach:

- This option does not provide any additional enclosed space or square footage for the Park to expand their Interpretive Program.
  Combining two major treatment approaches, a preservation and repair approach with a visual recreation approach, would have to be designed carefully to meet *The Secretary of the Interior's Standards*. The end result would be about 50% preservation with 50% visual recreation.

Challenges with this approach:

- Waterproofing and protection of this remaining original historic architectural fabric and elements, along with the components of the Bolton Beam Engine, becomes the main design and technological challenge to the A/E design team.



Figure 127. Franklin Court Ghost Structure at NPS Independence National Historical Park. Photo by NPS.



Figure 126. Historic structure adapted into a rooftop deck. Note floor level placed below the top of the brick parapet wall so as not change the visual look of the façade elevation on the exterior of the building.

ALTERNATIVE #4:

Begin with i<u>mplementation of Emergency Stabilization Measures described in the Recommendations for Treatment section.</u> Protect/Stabilize/Repair the existing original historic stone and brick walls, then reconstruct/repair three additional character defining elements: Reconstruct the fallen portion of the original brick chimney, reconstruct/repair the stone gable walls and repair the interior red brick wall at the flywheel of the Bolton Beam Engine. Also, add a type of visually non-intrusive internal structure(s) to protect the original interior brick and stone walls and original historic mechanical equipment, including the two boilers, the Bolton Beam Engine, the flywheel and all the gears in the Winch Room. This option could be used in conjunction with any the other proposed Alternatives.

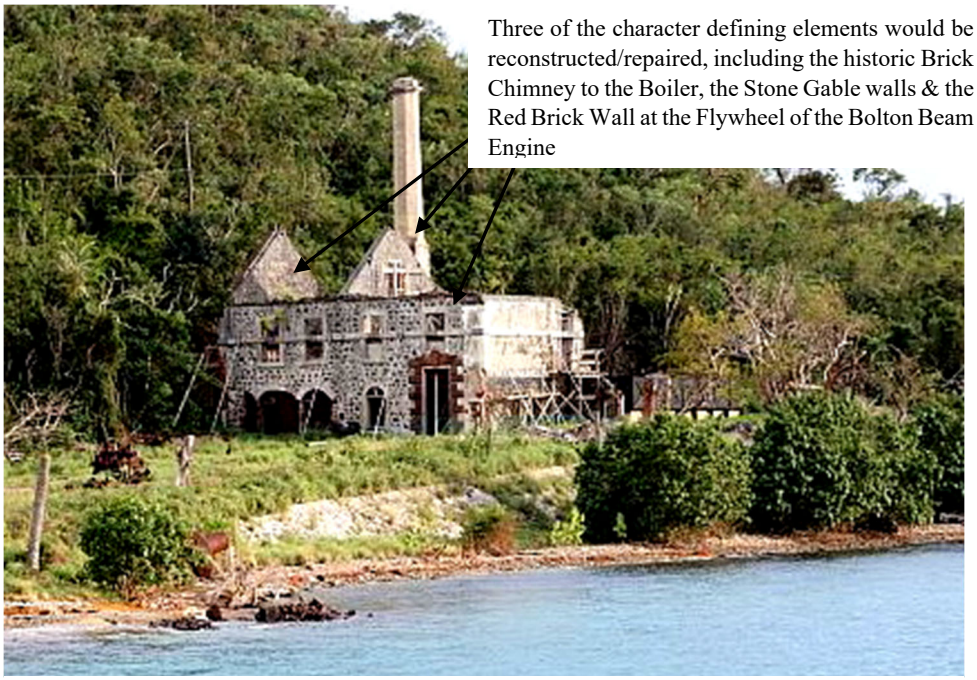


Figure 128. Creque Marine Railyway Head House before hurrican Irma.



Figure 129. Creque Marine Railway Head House showing damage after Hurricane Irma. Destroyed were the Brick Chimney and the center Stone Gable wall, along with the interior stairways and interior brick walls (Valarie Sims).

Advantages to this approach:

- As can be seen in the before and after photos of the Marine Creque Railway Head House, the current state of the structure is transitioning into a ruin. The hurricanes destroyed most of the character defining and identifying original architectural features of the building, one of the most important being the brick chimney that serviced the original boilers. This option would correct that and give the building some of its identity back.
- The reconstruction of the historic brick chimney is feasible because the original historic stones and bricks are still on site, lying where they fell after Hurricanes Irma and Maria, and the HABS drawings documentation is available to support this option. This supporting material evidence and documentation is in keeping with the requirements of the Secretary of Interior Standards.
- A precedent for this type of post-hurricane, "as-is" appearance via a preservation/repair/restoration treatment approach has already been set at Virgin Islands National Park on St. John Island at the Annaberg Sugar Plantation, a former sugar factory and plantation, which is part of the Annaberg Historic District on the National Register. Note that the Park is currently developing a Treatment Plan for the storm damage to the Annaberg ruins, that will include hurricane repairs and stabilization. The Park has stabilized the original historic fabric and maintains the Annaberg site as a ruin with very little restoration. The treatment plans for both sites could be coordinated for ease of implementation and preservation consistency.
- Similar to establishing a set of *"design guideline standards"* for a university campus, this option could set a unifying approach to the preservation and

treatment of all the historic architectural structures within the Virgin Islands National Park boundaries.
- Combined with the NPS Annaberg Sugar Plantation, this treatment option can serve as an opportunity for the development of an Interpretive Program that emphasizes the "real-time" effects and degradation of climate change on the built and natural environments. In essence the Creque Marine Railway Head House becomes its own interpretive display.



Figure 130. VINP Annaberg Sugar Plantation on St John's Island. Photo: Holiday Homes St. John.

Disadvantages to this approach:

- Continuous maintenance is the main disadvantage to this option. The Park's experience with maintenance on the Annaberg stone wall ruins is one of constant removal of the incessant and rapid growth of the tropical vegetation. This ends up being an on-going program of "preservation through prevention."
- Similar to Alternative #3, this option does not provide any additional space or square footage for the Park to expand their Interpretive Program.
- This minimalist type of approach to the preservation of the building does not serve to highlight the significant, international history of the Creque Marine Railway Head House.



Figure 131. Visitors at VINP Creque Marine Railway Head House on Hassel Island before Hurricane Irma.



Figure 132: Visitors at VINP Annaberg Sugar Plantation on St John's Island. Photo: VInow.com.

ALTERNATIVE #5:

Begin with i<u>mplementation of Emergency Stabilization Measures described in the Recommendations for Treatment section.</u> Protect/Stabilize/Repair existing original historic stone and brick walls, reconstruct the fallen portion of the original brick chimney, and construct a new modern addition around and adjacent to the historic walls, to expand the NPS Interpretive Programming opportunities as stated in the December 2016 Foundation Document.



Figure 133. "When it came to reviewing a new use of the 14th century Norwich Cathedral Refectory, the Cathedrals Fabric Commission of England deemed the original historic, 1m thick walls untouchable so, the decision was made to build a new structure inside the ruin walls. The architects opted to 'bridge the gap' between the ruin walls and the new structure with the subtle introduction of another masonry walling material. This solution provided for an obvious differentiation between the two buildings, and the two time periods." Photos by Tailormade.

Advantages to this approach:

- This option preserves all of the original historic fabric, adds modern elements to replace the missing original character defining elements and includes a new modern addition to increase the square footage for the multiple

Interpretive Programs and displays as indicated in the 2016 Foundation Document. The modern elements to be added would include a new gable roof structure, new glazing in the original window openings, new doors in the original door openings and a new non-intrusive structural framework to secure the historic walls. The prime location for a new addition would be where the two-level Creque Family Living Quarters were located, on the west end of the building, which was destroyed by Hurricane Maria. The sections of the original historic stone and brick walls that formed the perimeter of the Living Quarters (Bays 5 & 6), on the north, west and south walls were toppled by the hurricane.

- The new modern addition for this option could be treated in a couple of different advantageous ways per the Secretary of Interior Standards. The first proposed option would be to design an addition that replicates the exterior form and using the same footprint of the missing Creque Living Quarters, including the roof, walls and the visual replication of the original window and door openings but would use modern materials that are of one tone and color, monolithic and/or homogeneous. This subdued material treatment would allow for the visual dominance of the stone walls that are of various materials and colors and of the brick walls that are also of various types and colors. This infill addition would mimic the original building form. This is possible, since the HABS drawings document the building in its entirety, prior to the destruction from the hurricanes, including that portion of the missing Creque Living Quarters. Consequently, the research provides historic evidence and documentation of the original architectural form, plan layout and general materials used. However, further documentation on the exact historic details and the exact specifications of the original building materials is not available. Because this option for the modern addition utilizes a monolithic, subdued modern material, different from the historic fabric, it could not be misidentified as a Reconstruction. The second proposed option would be that the new modern addition pay homage to the original existing structure by visually setting the new structure in the background. This could be achieved through site placement, plan layout, material selection, color choice or form. The creativity and possibilities for this solution are endless and could be quite successful in achieving the historic preservation goals set forth in *The Secretary of the Interior's Standards*.
- This option is the antithesis to the minimalist Alternative #4 approach. This option of preservation of the original historic fabric, reinvention and/or restoration of the missing major character defining elements and the construction of a new addition would provide the Virgin Islands National Park an opportunity to develop one of the world's most renowned facilities to showcase its unique international history and environmental resources through the interpretive themes stated in the 2016 Foundation Document.

Disadvantages to this approach:

- Funding of such a project may be difficult considering the state of current 2020 global affairs, at the time of the writing of this report. However, since the Park has such an extreme and varied spectrum of cultural and environmental resources, finding multiple and various stakeholders and supporters would be easily achievable.

Challenge to this approach:

- Success of this approach would be dependent on a simultaneous and coordinated effort between the development of the Interpretive Program and the Programming of the design for the facility.

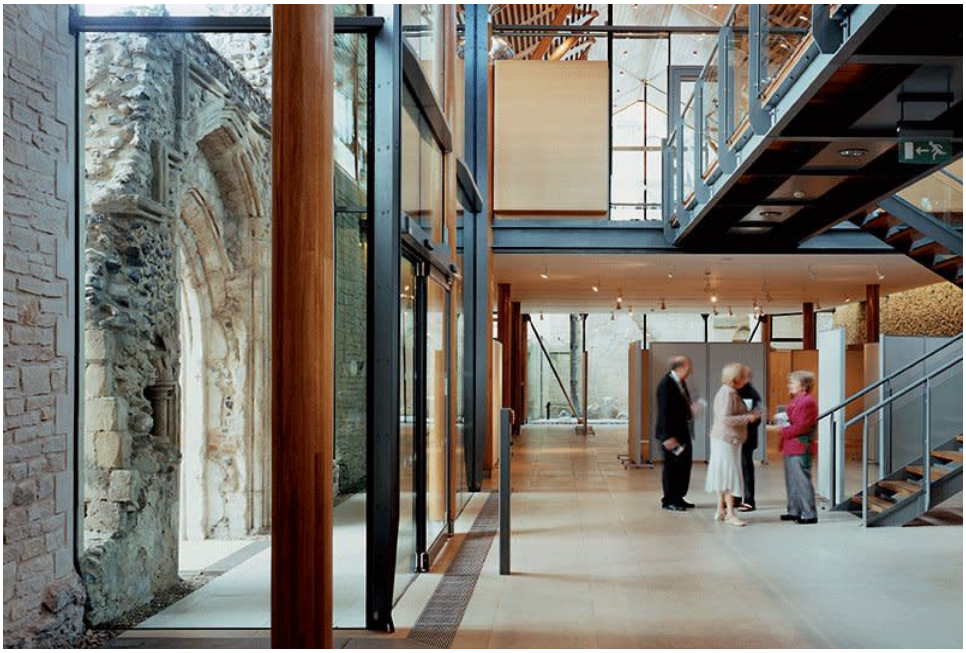


Figure 134. New reception entry hall at the new modern addition at Norwich Cathedral Refectory, Norwich England.



Figure 135. 14th century original ruin entry incorporated into new modern entry at Norwich Cathedral Refectory, Norwich England



Figure 136. Preserved, historic 1m thick, 14th century walls juxtaposed with new modern addition at Norwich Cathedral Refectory, Norwich England. Photos by: Richard Davies.



Figure 137. Former13th century church in Kilkenny, Ireland was preserved with a new addition clad in Lead to create the Medieval Mile Museum which celebrates the heritage of what was once the medieval capital of Ireland. The project was shortlisted for the 2019 Mies van der Rohe Award, as well as being Highly Commended in the 2018 RIAI Awards.



Figure 138. Rather than restore with matching stone, the architects, McCullough Mulvin Architects introduced a new materiality with lead and timber.



Figure 139. Interior treatment of the Medieval Mile Museum juxtaposing the new with the original historic materials. Photos by Christian Richters.

ULTIMATE TREATMENT AND USE

For the selection of the Ultimate Treatment and Use for the Creque Marine Railway Head House, from the list of five proposed Alternatives for Treatment presented, there was a consensus from the NPS Region and Park representatives, to focus on Alternative 4, while utilizing a combination of treatments, or parts thereof, of Alternative 2 and/or Alternative 3. (Note that numbering of these Alternative Treatments is consistent with those presented in the previous Alternatives for Treatment section of this report.)

Of utmost importance to the Ultimate Treatment and Use solution for the total project is the preservation and restoration of the Cistern, the original historic stone and brick walls, the Bolton Beam Engine and all its related components, reconstruction of the fallen portion of the brick chimney, and replication of the original roof form through ghosting, restoration, or addition. The specific recommendations for each can be found in their specific sections of this report.

However, should the Park decide as an alternative to the recommended Ultimate Treatment to treat the remaining historic fabric as a stabilized and preserved "ruin," then the Park could consider adding an outdoor interpretive exhibit space encompassing the entire area of the Creque Marine Railway Site.

ULTIMATE TREATMENT AND USE FOR THE EXISTING HISTORIC STRUCTURE

Alternative 4: Preservation & Reconstruction of Original Historic Character Defining Elements

The goal of all the NPS representatives, is to preserve and reuse as much of the existing historic fabric as possible. As stated in the Alternatives for Treatment section, Alternative 4 achieves that goal by using a combination of treatments including preservation, rehabilitation, restoration, and reconstruction.

In addition, from the Alternatives for Treatment section, Alternatives 2 and 3 offered two options for treating the missing historic gable roof that would structurally stabilize the existing historic fabric. Representatives from the NPS SERO and the VINP staff indicted that these should both be explored as possible solutions to the missing historic gable roof. Both options are being presented as:



Figure 140. Creque Marine Head House prior to Hurricanes Irma and Maria.

Gable Roof Alternative 2:

Rehabilitation via New Internal Non-Intrusive, Integrated, Modern Gabled Structure/Addition

Gable Roof Alternative 3:

Rehabilitation via New Internal, Non-visual, Integrated Roof Deck with Structural Roof Ghosting Framework.

The scope and extent of the rehabilitation or repair efforts of the historic elements will need to be determined once the debris and downed materials have been cleared away during the Emergency Stabilization Phase.

The proposed Ultimate Treatments from Alternative 4, for the original fabric and architectural elements of the historic structure include:

Immediate Emergency Stabilization:

- Immediate Structural Stabilization of the Remaining Original Historic Fabric
- Removal of all Vegetation within the Historic Structure and all Vegetation outside the structure that is affecting the Historic Fabric

Preservation & Rehabilitation:

- Stabilize, Preserve, and Rehabilitate all the remaining, standing exterior and interior stone and brick walls.

- Stabilize, Preserve, and Rehabilitate all stone and brick, door and window headers, jambs and sills.
- Stabilize, Preserve, and Rehabilitate all structurally stable and intact historic wood elements, if any remain.
- Preserve and Rehabilitate the two sets of arched iron doors on the north elevation that enter the Engine Room and all remaining intact historic doors.
- Stabilize, Preserve, and Rehabilitate all structurally stable and intact historic site elements including, concrete stairs, ramps, landings, and thresholds.
- Preserve and stockpile all salvageable historic materials and elements for reuse and/or display, including but not limited to: bricks, stones, wood beams, wood stairs, doors, windows, hardware, etc. Stockpiles to be located on site adjacent to where the original historic materials fell. Contractor to follow NPS directives on storage and protection of such materials under the guidance of an archaeologist or preservationist.
- Preserve and Rehabilitate the Bolton Beam Engine system with all related iron components, in its entirety. The major components include the two boilers in the Boiler Room, the Bolton Beam Engine and adjacent flywheel in the Engine Room, the gears in the Winch Room, and all related iron connectors, shafts, rods, and hardware. Refer to the Bolton Beam Engine Section for specific details on the proposed treatment of the Bolton Beam Engine.

Restoration

- Structurally Stabilize and Restore the missing brick of the Interior Red Brick Wall at the Flywheel of the Bolton Beam Engine. Along with the Engine, this brick wall is one of the main character defining elements on the interior of the building.
- Insertion of a New Structural Stabilization System utilizing either a Non-discreet Infill Addition (Gable Roof Alternative 2) or a Structural Ghosting Framework System (Gable Roof Alternative 3), to reestablish the Historic Gable Roof Appearance.
- Reconstruction of the Missing West End of the Historic Structure with a new In-Fill Addition to incorporated into and/or integrated with the new Structural System above.
- Visually Recreate the Historic Building Envelope Form or Silhouette

Reconstruction:

- Reconstruction of the 60-foot-tall octagonal original historic brick chimney that serviced the boilers to the Bolton Beam Engine, utilizing the chimney's original bricks that are scattered throughout the building and site.
- Reconstruct (2) interior stone gable walls that provided lateral support to the exterior original perimeter stone walls.
- Reconstruction of the original historic second floor wood framing and flooring. The joist pockets for the original floor structure are still evident on the interior of the stone walls, providing evidence for size and spacing.

Gable Roof Alternative 2: Rehabilitation via New Internal Non-Intrusive, Integrated, Modern Gabled Structure/Addition

The treatment for Alternative 4 above, provides the best solution for preserving the building's historic fabric and for giving the building a visual resemblance of its original form that included the now missing gable roof. By adding the following treatment options, the building gains the additional benefit of integrated structural stability, weather protection for the interior elements, and added floor area for interpretive displays.

These proposed treatments are additive to the proposed main treatments listed above from Alternative 4. In addition, the following treatments are in alignment with the *"New Exterior Additions to Historic Buildings and Related New Construction"* section of the "*The Secretary of the Interior's Standards for the Treatment of Historic Properties"*.



Figure 141. Old farmhouse ruins in Dumfries, Scotland, with new nonintrusive structure built inside the historic walls. Highlights, preserves and provides structural stability to the original remaining stone walls. Photo by Sergio Pirrone.

Gable Roof Alternative 2:

- Insert a non-intrusive protective structure inside the original historic exterior stone walls. The infill material for the new modern internal structure could be solid masonry, concrete, acrylic, structural glass, etc. to withstand future winds, rain and storms. This option provides an opportunity to use new technologically developed siding, roofing, and glazing options. Historic window and door openings would be framed according to *The Secretary of the Interior's Standards.*



Figure 142. Ruins of a former parchment factory repurposed into new residence in Northamptonshire, UK. Will Gamble, Architects. Photo by Johan Dehlin.

- New internal addition to provide structural framework for bracing and stabilizing the remaining historic stone and brick walls, both exterior and interior.
- Install an internal structural system and structural connections that provides lateral and shear strength to the existing perimeter walls. Replace damaged and missing 2nd floor wood beams per structural design for new facility.
- Provide modern design solution to the missing gable roof that visually replicates the original historic gable roof outline and incorporates the reconstructed stone gable walls.
- New internal structure to include an infill addition with modern materials, utilizing the floorplate and building area of the now missing Creque Residence at the west end of the building. New infill addition is required to be "*subordinate and secondary to the historic building and is compatible in massing, scale, materials, relationship of solids to voids, and color*."

- Critical attention to be paid to waterproofing of original historic stone and brick wall, in conjunction with the new internal structure, and especially where the two systems interact.

Gable Roof Alternative 3: Rehabilitation via New Internal, Non-visual, Integrated Roof Deck with Structural Roof Ghosting Framework

Alternative 3 presents another option for the gable roof treatment. This treatment provides for an internal flat roof deck with a structural steel ghost structure to visually replicate the original gable roof.



Figure 143. Optional roof treatment: Historic roof structure adapted into a rooftop deck. Note floor level placed below the top of the brick parapet wall so as not change the visual look of the façade elevation on the exterior of the building.

Gable Roof Alternative 3:

- Create a new roof deck/viewing platform inside the perimeter of the exterior historic stone walls, set below the top course of the exterior stone walls at the level of the original second floor, so as not to be seen from the outside of the historic structure.
- At the top course of the exterior stone wall install a structural gable roof ghosting framework to visually replicate or silhouette the missing original stone gable walls that supported the missing original gable roof.
- Provides a silhouette or ghosting of two major character defining elements that are now missing. When combined with the existing, original historic elements it could prove quite successful in creating a visual essence of the original structure, without recreating the missing elements.

ULTIMATE USE – INTERPRETIVE PROGRAMMING

Interpretive Program & Building Program

Selection and finalization of the Ultimate Treatment option for the existing original structure, (along with the selection of the treatment option for the missing original roof), is directly linked to the Interpretive Program, which dictates the Building's Program and Uses, as envisioned by the NPS representatives and the 2016 Foundation Document.

Success of this combined Ultimate Treatment approach is dependent on a simultaneous and coordinated effort between the development of the Interpretive Program and the Building Program for the preservation and design of the Creque Marine Railway Head House. The Interpretive Program will set forth the selected interpretive themes, spatial, technical, and display requirements. The Building Program will define the exact sizes, uses, quantities, and quality of the spaces, coupled with the codes, technical issues, sustainability goals, and climate mitigation concerns.

This combined effort will become part of the decision-making process that helps to identify the final scope of A/E work to be performed, which is ultimately evaluated against the project budget. This programming process for both the Interpretive Program and the Building Program is instrumental in garnering agreement and buy-in from all the multiple and various types of stakeholders of the Virgin Islands National Park.

Interpretive Themes for Hassel Island in 2016 *Foundation Document*:

Currently, NPS staff representatives envision the interpretive program at the Creque Marine Railway Head House as one that depicts the historical and cultural resources of Hassel Island. The island's history is unique and quite different from the rest of the Virgin Islands National Park, which is focused on the marine ecosystems, terrestrial ecosystems and natural resources. The interpretive program presented at Hassel Island should be reflective of that fact. According to the 2016 NPS Foundation Document, the interpretive themes for Hassel Island may include:

- Indigenous cultures from Pre-Columbian people 3,000 years ago through Danish colonization.
- 18th & 19th century expansion of the Danish colonial plantation system;
- Creque Marine Railway Head House, Bolton Beam Engine & Cistern as the oldest & largest surviving marine railway in the Western Hemisphere, servicing ships from all over the world for over 120 years;
- Story of Hassel Island and its British occupation on the island;
- Sites representing the only Napoleonic War locations on U.S. soil. One of the most diverse military landscapes of the era in the Caribbean, including forts, batteries, barracks, hospitals, pharmacy, guardhouse, magazines, wharfs, blacksmith works, cookhouses, latrines, cisterns, and a cemetery;
- 19th century shipping and maritime repair industries;
- Britain's Royal Mail Steam Packet company as one of the first successful international delivery services;

- West Indies Triangle Trade involving the movement of slave ships and building materials or cargo brought from the slave ships.

Potential Building Uses for Creque Marine Railway Head House:

The following are typical building spaces found in similar NPS Interpretive and Visitor facilities, which are often required to adequately present the Park's unique history, artifacts, and cultural resources:

- Public services and support facilities
- Research and educational facilities or lab
- Display galleries and temporary exhibitions
- Collections management and storage
- Curatorial and administrative offices
- Outdoor research area
- Indoor research and scientific study area
- Park artifact storage
- Library
- General staff services

The implementation of any of these spaces is currently hampered by the lack of utilities present on St. John Island, which has limited the NPS presence on the island to this date.



Figure 145. Historic view of marine railway with ship cradle. From crequemarinerailway.com.

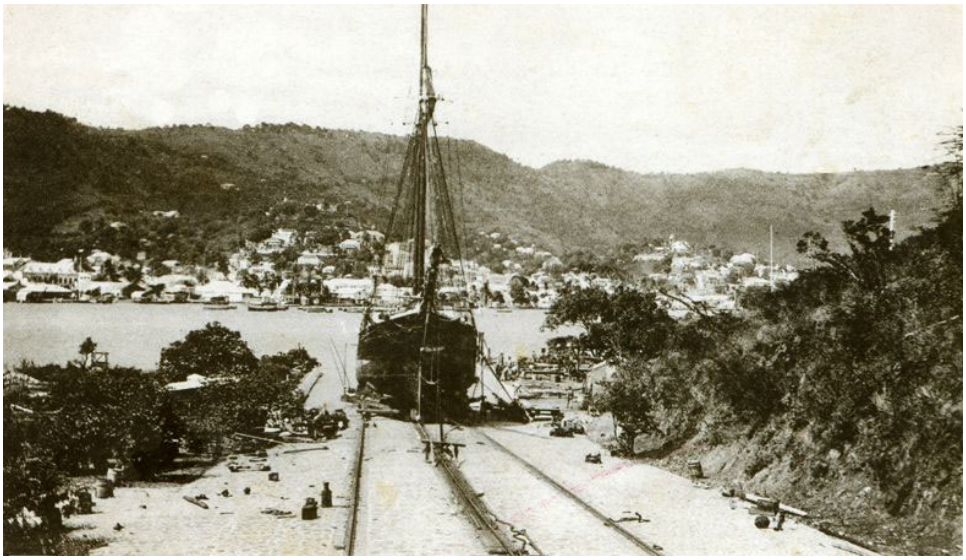


Figure 144. Dutch schooner Venture under repair. July 1912 by Clara E. Taylor.



Figure 146. Historic view of harbor, Creque Marine Railway in background on Hassel Island. From crequemarinerailway.com.

RECOMMENDATIONS FOR TREATMENT

HURRICANE DAMAGE -IMMEDIATE EMERGENCY STABILIZATION MEASURES

Hurricanes Irma and Maria in 2017 have left the Creque Marine Railway Building currently at the stage where a building starts to become a ruin, despite the strategic efforts of the NPS and its pre-hurricane stabilization measures. With these recent climatic events as a starting point towards preservation of the remaining fabric, it is critical to note that inherent in and at the beginning of ***each*** of the five proposed Alternatives for Treatment, the implementation of the Emergency Stabilization Measures must be undertaken.

It is ***highly recommended*** that these Emergency Stabilization Measures be completed as quickly as possible before another climate related event, brings down the rest of the structure. In order to effectively and efficiently save as much of the remaining original historic fabric as possible, it would be beneficial to have the Emergency Stabilization Measures and the Preservation, Rehabilitation and New Construction work be simultaneous efforts, or at a minimum, coordinated efforts.

However, for such a coordinated effort to occur, there are several federally mandated contracting process that would need to occur:

- NPS approval of the Historic Structure's Report,
- Advertisement, Negotiations, and Contracting of an A/E Team
- Design Phase –
  Development of the Building Programming (including a parallel Interpretive Programming effort), Schematic Design, Design Development, Preparation of Construction and Bid Documents
- Advertisement, Negotiations, and Contracting of a General Contractor

Consequently, the simultaneous planning and scheduling of the structural stabilization efforts will be unlikely.

This will most likely necessitate that these Emergency Stabilization Measures be completed in the interim which will call for careful planning, so as ***not to have any more adverse effects*** on the remaining structure. It is recommended that any immediate and interim stabilization measures include the advice of a licensed structural engineer and a historic preservation architect, to develop an interim plan of action and then design an interim structural system that prevents further loss and has ***no adverse effect*** on the remaining historic materials.

The following stabilization measures are in no specific sequence or order and should be developed into a cohesive stabilization plan of action, by the structural engineer and the stabilizing contractor.

- Evaluate the damage to the existing temporary stabilization system and ascertain its removal or incorporation into a new stabilization system. Specifically, the 2nd story, perimeter wood and steel plate band, which is acting as a compression ring, in conjunction with the steel support rods that extend to the concrete pads at grade. This temporary shoring system is currently protecting the stone & brick exterior walls from collapse, by tying them together.



Figure 147. Temporary existing shoring and bracing system at north elevation, using horizontal quasi-compression ring at second floor windows supported by diagonal steel rods connected to concrete pads at grade, 2020 (Helen Juergens).

- Remove the steel cables at the top of the exterior walls and replace with a bracing/shoring system, designed by a licensed structural engineer. The hurricane winds and the collapse of the brick tower onto these steel cables, caused the stone and brick walls (that the steel cables were attached to) to fall into the interior of the structure. This event also caused all the wood cross bracing at the walls, which was installed after the first hurricane, to break apart and fall into the interior of the structure. These broken wood members which are currently hanging from the steel cables should also be removed to prevent further damage to the walls.

- Install a bracing/shoring system, designed by a licensed structural engineer at the eastern stone and brick gable wall above the perimeter wood and steel plate band. This gable end is currently not being supported. This is the only remaining gabled stone & brick wall left from the original structure, which initially had four (4) of these walls to support the roof.

- Remove bricks, rubble, and stone, under the supervision of an archeologist or historic architect, from the main floor in the western Winch Room. The area below is where the foundation system for the metal gears is located. This

large amount of debris is putting an extra load on the raised floor, which could result in failure of the floor, causing extensive damage to the gearing equipment and the adjacent walls. Note: Any contractor performing any of this emergency work, should document all stabilization actions before, during, and after the implementation of the debris removal. In addition, the contractor should stockpile, the bricks, rubble, and stones and located in a specific area for the future reconstruction of the walls.

- Install a bracing/shoring system, (designed by a licensed structural engineer), to secure the two (2) interior brick and stone walls which are on either side of the Engine Room. These walls are no longer structurally tied into the exterior walls, second floor joists, nor the roof that supported them. These are in danger of collapse from even minimal stress.

- Realign the existing heavy timber bracing at the exterior arched doorway of the Boiler Room. These wood members, which are supporting the 24-inch-thick exterior stone/brick opening, were pushed out of the door frame when the stone and brick walls collapsed.

- Reinstall the missing pipe jack in the main doorway, at the far end of the North exterior wall that leads into the Winch Room. This was installed after the first hurricane to support the sandstone lintels and doorway header.

- For vegetation removal refer to NPS report, *2020 Vegetation removal Guidelines from Historic Structures on St. John and Hassel Island.* Remove all wild grown vegetation, adjacent to and growing out of the rubble, stones, brick, concrete stairs, etc. along with clearing the entire perimeter area for the stabilization of the building. Care should be taken so as not to cause any destructive actions or cause any adverse effects to the historic materials.

- The door and window openings have been shored up from the previous NPS stabilization effort, which has saved them from ruin. These need to be re-stabilized, to prevent further collapse.



Figure 148. Temporary existing shoring and bracing system at exterior west wall adjacent to the Winch Room, 2020 (Helen Juergens).



Figure 149. Temporary existing bracing system using steel cables at original 2nd floor framing, 2020 (E. Anderson).

RECOMMENDATIONS FOR TREATMENT

Immediate and Permanent Structural Stabilization

Due to the precarious nature of the existing historic fabric and the connected temporary stabilization cables and system, which is still in place, it is ***highly recommended*** that there be a coordination meeting and process for the Immediate and Permanent Structural Stabilization Methods and Techniques prior to any Preservation Treatment being undertaken on the Creque Marine Railway Head House. This is to ensure that any immediate temporary structural stabilization measures have ***no adverse effect*** on the preservation of the original historic fabric, as identified in the Ultimate Treatment section of this report.

Treatment Scheduling

It is not the intent of these recommendations to specify exact treatments, scheduling, sequencing, processes, or procedures of the rehabilitation efforts on the historic structure. These are intended as prescriptive guidelines only. As a federal agency, the National Park Service has its own procurement procedures for hiring a General Contractor. It is typical in an Owner/ General Contractor Agreement for construction, that the General Contractor is responsible for means, methods, techniques, sequences, and procedures for a project's construction, unless otherwise directed by the Owner or stated in the Contract Documents.

It is therefore critical that the scheduling, phasing, and process of these recommended procedures and treatments be coordinated with NPS, the A/E team, and the General Contractor before commencement of any treatment work, all in an effort to preserve as much of the remaining original historic fabric as possible and not to cause any further adverse effect to the remaining historic fabric.

Vegetation Removal Prior to Treatment

Once the emergency stabilization of the historic fabric has been completed, the first recommendation is the removal of all the vegetation, trees, vines, mold, and algae that is growing on and adjacent to the building, growing in the cracks of the stone and brick walls, growing up through the existing floors, and on the top course of the stone and brick walls. Prior to beginning any removal or mediation efforts of the vegetation, the project should be reviewed by Park Staff for any impacts to the natural and cultural resources.

The VINP has prepared a report on *Vegetation Removal Guidelines from Historic Structures on St. John and Hassel Island,* which should be used as a guide for this removal process. The Park staff has stated that the continual maintenance of removing the vegetation from these cultural resources, throughout the Virgin Islands National Park is an extensive maintenance undertaking with regard to available labor and budget constraints. This should be considered when designing the final site grading, site elements and site access.



Figure 150. Vegetation growing inside the Boiler Room, through the building debris and historic stone/brick work. Typical throughout the structure, 2020 (Helen Juergens).

Recommendations for Treatment of Character-Defining Materials

Original Historic Stone & Brick Walls – Exterior & Interior

Prior to any work undertaken on the remaining historic structure, it is *HIGHLY* recommended that a licensed structural engineer provide a through structural analysis of the existing historic interior and exterior stone and brick walls in respect to any new stabilization and final treatment option. With regard to the final selected treatment option, it is suggested that the A/E design team consider a new foundation, structure, and roof system that is separate and independent from the existing historic stone load bearing walls. This type of design concept will be determined by the structural analysis and further developed in the design process. It is recommended that the original stone and brick be preserved in any stabilization and design solution.

Multiple Stone & Brick Wall Types

As identified in the Existing Conditions section of this report, there are multiple types and sizes of original stone and brick used for the walls in the building. It is recommended that each different stone and brick type be tested for the NPS selected treatments below prior to any treatment procedure undertaken.

Plaster & Mortar Testing for Original Historic Stone and Brick Walls

For any stabilization, preservation, or restoration of the stone and brick walls, it is recommended that a material analysis be completed on any plaster and mortar to receive treatment to ensure material compatibility. Refer to *NPS Preservation Brief 2: Repointing Mortar Joints in Historic Masonry Building*.

Masonry Repairs & Cleaning

- **Sequencing of Procedures:**
  To be clear, should these recommendations for the repair and cleaning of the original historic brick be considered, it is to be determined by NPS along with the A/E consultant and the General Contractor the sequencing of this work regarding the buildings current lack of structural stability. This is critical when assessing the effects of the masonry stabilization, repairs and cleaning, as to which sequencing of procedures, has ***no adverse effect*** on the historic materials.



Figure 151. Stone wall at west side of Winch Room, 2020 (Helen Juergens).

- **Masonry Repointing**
  Once the vegetation has been cleared, the stone and brick walls, including the mortar joints, should be thoroughly assessed for surface damage, salts, mold, decay, or cracks. This assessment will indicate where there are any loose stones or brick, deteriorated stones, bricks or mortar, damp walls and damaged surface plaster, that need repair and/or repointing. Repointing is simply the removal of the old deteriorated mortar and replacement with new to restore the structural integrity of the wall units, to help eliminate water penetration at the joints, and to improve the appearance of the wall.

Due to the fact that there are multiple types of stones and bricks on the Creque Marine Railway Building, assessing the specific and various types of mortar and compositions that were used in each instance will be necessary. Much of the mortar is lime based. Historically there was a lime production kiln on the island to service the construction of the many island structures. "*Traditional mortar used up until the 19th century was lime mixed with water, that was then cured. It was then often combined with sand, crushed shells, natural cements and even animal hair as a stregthener".* [101]

Each different type of stone and brick condition will need to be tested to see which type of mortar formulation was used to select a compatible new mortar to be used for the repairs. Also, careful attention will need to be paid to the color of the mortar used as well as the type of tool that was used to rake the mortar joint so as to match the overall aesthetic look of the historic stone or brick wall. An on-site test sample should be done for each different stone and brick condition for NPS approval, prior to completion of the entire building. It is recommended that a qualified masonry contractor be employed to complete the stone and masonry repairs to ensure that the correct mortar repairs are done.

Many of the historic exterior and interior stone walls that were laid up in a cobbled, random fashion will certainly need to be reviewed for the complete extent of mortar repairs. The east exterior stone gable wall especially appears not to have had much mortar installed in the joints during its original construction. Because this is an exterior perimeter load bearing wall that will most certainly become part of the integral new structural system, this will need to be further investigated prior to any masonry repointing or repairs taking place.

- **Masonry Cleaning**
  It is recommended that the masonry and all building components be cleaned to remove any salts, mold, fungus, chemicals, etc. When the debris and vegetation has been cleared from the site and the building, a thorough review of the stone, brick, and building components can be assessed and a cleaning method selected. Small on-site areas may need to be tested on the multiple different stones and bricks, to ascertain which cleaner works best in which location. As with the selection of the mortar, the selection of the cleaner and the method of cleaning is dependent on the surface to be cleaned and elements to be removed. Luckily, it does not appear that there is much paint or graffiti to be cleaned or removed, so that makes selection of a cleaning method a bit easier. However, due to the multiple types of stones and bricks, the different areas may require different types of cleaning methods. *The NPS Preservation Briefs, 1 Assessing Cleaning and Water-Repellent Treatments for Historic Masonry Buildings, November 2000* lists several different types

[101] Robert C. Mack, AIA, John P. Speweik, *US. Department of the Interior National Park Service, Cultural Resources, Heritage Preservation Series, The NPS Preservation Briefs, 2 Repointing Mortar Joints in Historic Masonry Buildings,* October 1998.

of cleaning methods: *Water Soaking, Water Washing, Water Washing with Detergents, Steam/Hot-Pressurized Water Cleaning, Acidic Cleaners (for non-acid sensitive masonry) and Alkaline Cleaners (for acid-sensitive masonry).* There are also Abrasive and Mechanical Cleaners which would not be recommended for this building due to the extreme amount of pressure or abrasive substance that is used. When cleaning masonry It is always recommended that the gentlest means possible be used.

- **Masonry Water-Repellent Coating**
  This suggested treatment for the masonry is one that is worth noting as a possible solution for the deteriorating brick. However, it is recommended that further research and sample testing be completed *PRIOR* the application of any such product.
  Due to extensive damage of the stone and bricks mainly from wind driven salt water from hurricane storms, and that it is inevitable that these same stone and bricks will suffer through more of these storms to come, a breathable, water-based, water-repellent coating could be applied to the masonry. This often highly contested treatment may be a solution worth exploring for the following reasons:
    1. The historic bricks have been so eroded from storm damage and this condition will only get worse. Essentially, the historic bricks are deteriorating.
    2. The erosion has caused spalling of the fired finish brick, so they are now porous and able to absorb water.
    3. The salts and resulting efflorescence on the stones and brick will continue to deteriorate the brick and stone faces.
    4. Even though a breathable product would be recommended, there is no freeze-thaw cycle in the Virgin Islands that could cause any water trapped in the stone or brick to freeze, causing further damage.

  There are multiple new water-repellent products on the market, that were created for preservation projects by hardening and strengthening the stone and brick by penetrating several inches into the surface. Several are water-based, UV-resistant, eco-friendly to vegetation, and ultra-low low VOCs (no noxious odors or fumes). The following claims made by several of the manufacturers are those that could prevent further deterioration of the bricks and stone. They include:

    - Wind Driven Rains- seals against rainwater intrusion due to “sideways rain” forced by strong winds.
    - Salts – Hardens surfaces to protect against corrosions due to salts and chemicals.
    - Efflorescence – reduces surface salt deposits and mortar hazing.
    - Deterioration – Bonds brick and concrete against surface deterioration, dusting, pitting, spalling, cracking and crumbling.
    - Mold and Algae – Helps to reduce the growth of mold, mildew, lichen and algae on outdoor surfaces.
    - Humidity – Aids in reducing water vapor transmission through substrate.

- Improves Maintenance – blocks the build-up of salts, chemicals and dirt, which makes cleaning surfaces less routine.
- Long-lasting – some come with a 15-year warranty.
- Vapor permeable –Waterproofs bricks, stone, and concrete but still allows the substrate to breathe and dry out. Does not trap moisture inside masonry.

Prior to electing for this procedure and prior to selecting a product from the many manufacturers that are available, it is recommended that several types of products be tested on a few mock-up walls made from the fallen, unsalvageable, damaged bricks from the storms, that represent the different stone and brick wall conditions. Ultimately, this solution is being recommended, especially for the exposed bricks, based on a test and trial period with several mock-ups from the damaged, unsalvageable bricks.

- **Masonry Repair of Red Brick Wall at Bolton Beam Engine Flywheel:** Of all the damaged interior alterations the original red brick demising wall between the Engine Room and the Winch Room is going to be the most difficult to preserve. Many of the bricks have lost their structural integrity. The original craftsmanship is extraordinary, as the mason was able to construct a perfect brick arch into which was inserted the iron flywheel that is connected to and powered by the Bolton Beam Engine. The two-story height wall was laid in a running bond pattern and is only 2 wythes thick, approximately 7 5/8" thick. In constructing the arch, the mason maintained a ½" spacing between the inside face of the brick arch and the circumference of the outside rim of the flywheel. The bricks have lost their strength as the protective fired face of the bricks has eroded away, causing many to spall and crumble. Likewise, the mortar at all the joints has eroded away to where very little can be seen on the wall surface.



Figure 152. Flywheel in the Red Brick Wall, 2020 (Helen Juergens).

These recommendations do meet ***The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring & Reconstructing Historic Buildings*** for the Preservation of Masonry.

> ***The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring & Reconstructing Historic Buildings***
>
> ***Preservation Guidelines: Masonry***
>
> *Identifying, retaining, and preserving masonry features that are important in defining the overall historic character of the building*
>
> *Stabilizing deteriorated or damaged masonry as a preliminary measure, when necessary, prior to undertaking preservation work.*
>
> *Cleaning masonry only when necessary to halt deterioration or remove heavy soiling.*
>
> *Carrying out masonry cleaning tests when it has been determined Cleaning masonry surfaces without testing or without sufficient time that cleaning is appropriate. Test areas should be examined for the testing results to be evaluated. to ensure that no damage has resulted and, ideally, monitored over a sufficient period of time to allow long-range effects to be predicted.*

Evaluating the overall condition of the masonry to determine whether more than protection and maintenance, such as repairs to masonry features, will be necessary.

Repairing masonry by patching, splicing, consolidating, or otherwise reinforcing the masonry using recognized preservation methods.

Repairing masonry walls and other masonry features by repointing the mortar joints where there is evidence of deterioration, such as disintegrating mortar, cracks in mortar joints, loose bricks, or damaged plaster on the interior.

Removing deteriorated lime mortar carefully by hand raking the joints to avoid damaging the masonry.

Duplicating historic mortar joints in strength, composition, color, and texture when repointing is necessary. In some cases, a lime-based mortar may also be considered when repointing Portland cement mortar because it is more flexible.

Duplicating historic mortar joints in width and joint profile when Using "surface grouting" or a "scrub" coating technique, such as repointing is necessary.

Sealing joints in concrete with appropriate flexible sealants and backer rods, when necessary.

Applying non-historic surface treatments, such as water-repellent coatings, to masonry only after repointing and only if masonry repairs have failed to arrest water penetration problems.

Applying permeable, anti-graffiti coatings to masonry when appropriate.

Stone Gable Walls

The original historic four stone gable walls that supported the roof's wood ridge beam, and subsequently the original wood roof rafters and wood sheathing boards, have all been destroyed, expect for the eastern exterior stone gable wall. These walls which ran perpendicular to the north and south load-bearing perimeter stone walls structurally tied the building components together and provided lateral support to the structure.

- Reconstruct the missing top gable portions of the two original interior stone gable walls, using the original stones from the walls.
- Depending on which Gable Roof Alternative is selected from the Ultimate Treatment options, the now destroyed exterior western gable wall could be reconstructed with the wall's original stones and bricks, currently on site where they fell during the storms. Alternatively, the wall could be made a part of the new infill addition where the west wall becomes subordinate to the original historic form and materials by using

non-descript, muted and monolithic materials, to highlight and give precedence to the original historic materials.

- The potential of incorporating these reconstructed stone gable walls into the new structural system will need to be determined by NPS and the A/E team during the design phase.
- Refer to Masonry Treatment section for recommendations on treatment for the stone and brick work.

Gable Roof Stone Truss/Walls



Figure 153. Original eastern exterior stone gable wall that supported the now missing gable roof ridge beam. The original structure had four of these stone walls, this is the only wall left that has not been damaged, 2020 (Helen Juergens).



Figure 154. Original interior wall between the Winch Room and Living Quarters. This wall was one of the original stone gable walls. The upper gable portion was destroyed in the storms, along with the western end of the Head House, 2020 (Helen Juergens).



Figure 156. Original stone gable wall between the Boiler Room and Engine Room. The wall has collapsed from the second floor up to the gable, 2020 (E.Anderson).



Figure 155. Original stone gable wall in 1977 showing the remains of the original wood framing that was destroyed by fire and the remains of the original 2nd level wood floor joists. Photo by:Russell Wright, National Register Photo.

Gable Roof and Roof Framing

The original historic gable roof and roof framing was destroyed by a fire in the 1960s and was one of the main character-defining elements of the original structure. The Ultimate Treatment recommendations offers two options for the replacement of a new gable roof, both of which meet the Secretary of the Interior's Standards: "*Recreating the appearance of visible features of the historic structural system, such as posts and beams, trusses, structural systems, beams, cast-iron columns, above-grade masonry foundations, or load-bearing brick or stone walls, contemporary methods and materials may be used for the actual structural system of the reconstructed building."*

Should a new roof system be selected as identified in the Ultimate Treatment Option, its design is to be considered in conjunction with the preservation of the original historic perimeter load-bearing and interior shear stone walls, which is paramount.

It is recommended that three options be considered for the design of a new roof structure: first, that the roof structure is connected to the historic walls; second, that the roof is semi-attached to the historic walls; and third, that the roof be independent and free-standing from the historic walls. A totally independent, free-standing structural roof, wall, and foundation system that sits within the historic walls could also be considered by the selected A/E design team.

Ultimate Treatment: Gable Roof Alternative 2

Rehabilitation via New Internal Non-Intrusive, Integrated, Modern Gabled Structure/Addition



Figure 157. Gable Roof Alternative 2. Old farmhouse ruins in Dumfries, Scotland, with new nonintrusive structure built inside the historic walls. Highlights, preserves, and provides structural stability to the remaining original stone walls. Photo by Sergio Pirrone.

- Insert a non-intrusive protective structure inside the original historic exterior stone walls. The infill material for the new modern internal structure could be solid masonry, concrete, acrylic, structural glass, etc. to withstand future winds, rain, and storms.
- This option provides an opportunity to use new technologically developed siding, roofing and glazing options. Historic window and door openings would be framed according to *The Secretary of the Interior's Standards.*
- New internal addition to provide structural framework for bracing, stabilizing, and preserving the remaining historic stone and brick walls, both exterior and interior.
- Install an internal, preferably independent, structural system and structural connections that provides lateral and shear strength to the existing perimeter walls. Replace damaged and missing 2nd floor wood beams per structural design for new facility.
- Provide modern design solution to the missing gable roof that visually replicates the original historic gable roof and incorporates the reconstructed stone gable walls.
- New internal structure to include an infill addition with modern materials, utilizing the building area of the now missing Living Quarters at the west end of the building. New infill addition is required to be "*subordinate and secondary to the historic building and is compatible in massing, scale, materials, relationship of solids to voids, and color*."
- Critical attention to be paid to waterproofing of original historic stone and brick wall, in conjunction with the new internal structure, and especially where the two systems interact.

Ultimate Treatment: Gable Roof Alternative 3

Rehabilitation via New Internal, Non-visual, Integrated Roof Deck with Structural Roof Ghosting Framework



Figure 158. Optional Gable Roof Alternative 3: Historic roof structure adapted into a rooftop deck. Note floor level placed below the top of the brick parapet wall so as not change the visual look of the façade elevation on the exterior of the building.

- Create a new roof deck/viewing platform inside the perimeter of the exterior historic stone walls, set below the top course of the exterior stone walls, so as not to be seen from the outside of the historic structure.
- At the top course of the exterior stone wall install a structural gable roof ghosting framework to visually replicate or silhouette of the missing original stone gable walls that supported the missing original gable roof.
- Design steel framework structure with a silhouette or ghosting that can be seen from Charlotte Amalie across the harbor to create a visual essence of the original structure, without recreating the missing elements.

Regardless of which option is selected, critical attention needs to be paid during the design phase to the waterproofing of the original historic stone and brick walls, along with the new internal wall framing system. This newly integrated wall and roof system will need to be able to drain water effectively away from the original historic bricks and stones.

These recommendations do meet *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring & Reconstructing Historic Buildings* for the *Rehabilitation of New Exterior Additions to Historic Buildings and Related New Construction.*

The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring & Reconstructing Historic Buildings

Standards for Rehabilitation

A property will be used as it was historically or be given a new use that requires minimal change to its distinctive materials, features, spaces and spatial relationships.

The historic character of a property will be retained and preserved. The removal of distinctive materials or alteration of features, spaces and spatial relationships that characterize a property will be avoided.

Each property will be recognized as a physical record of its time, place and use. Changes that create a false sense of historical development, such as adding conjectural features or elements from other historic properties, will not be undertaken.

Changes to a property that have acquired historic significance in their own right will be retained and preserved.

Distinctive materials, features, finishes, and construction techniques or examples of craftsmanship that characterize a property will be preserved.

Deteriorated historic features will be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature will match the old in design, color, texture and, where possible, materials. Replacement of missing features will be substantiated by documentary and physical evidence.

Chemical or physical treatments, if appropriate, will be undertaken using the gentlest means possible. Treatments that cause damage to historic materials will not be used.

Archeological resources will be protected and preserved in place. If such resources must be disturbed, mitigation measures will be undertaken.

New additions, exterior alterations, or related new construction will not destroy historic materials, features, and spatial relationships that characterize the property. The new work will be differentiated from the old and will be compatible with the historic materials, features, size, scale and proportion, and massing to protect the integrity of the property and its environment.

New additions and adjacent or related new construction will be undertaken in such a manner that, if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.

Brick Chimney

- The original 60-foot-tall historic brick chimney that serviced the boilers to the Bolton Beam Engine, is to be reconstructed, utilizing the chimney's original bricks that are scattered throughout the building and site, lying where they fell during the storms. These original bricks are on the ground on the exterior side of the original east perimeter wall, inside the east stairwell that went from the now missing second floor office to the exterior ground level door on the east end of the south wall and inside the Boiler Room on top of the boilers. When the chimney fell it partially landed on top of the yellow brick wall between the Boiler Room and the eastern Stairwell. Reconstructing the chimney with these original bricks should be possible due to available documentation of the original octagonal plan and gradated circumference.
- An internal structural steel framework system may need to be designed to help carry the load of these damaged bricks in addition to providing lateral support during the next hurricanes.



Figure 159. Figure Original historic 60' tall octagonal brick chimney with plaster coating in 1977, Photo by Russell Wright, National Register Photo.



Figure 160. Chimney's original bricks after Hurricane Irma. Chimney fell on top of and destroyed the eastern stairwell, 2020 (E. Anderson).



Figure 161. Figure Original historic brick chimney after Hurricane Irma, with top potion of tower destroyed. Photo taken in 2020 (E. Anderson).

These recommendations do meet *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring & Reconstructing Historic Buildings* the *Standards of Reconstruction for the Building's Exterior.*

The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring & Reconstructing Historic Buildings

Standards for Reconstruction

> *Reconstruction will be used to depict vanished or non-surviving portions of a property when documentary and physical evidence is available to permit accurate reconstruction with minimal conjecture and such reconstruction is essential to the public understanding of the property.*
>
> *Reconstruction of a landscape, building, structure or object in its historic location will be preceded by a thorough archeological investigation to identify and evaluate those features and artifacts which are essential to an accurate reconstruction. If such resources must be disturbed, mitigation measures will be undertaken.*
>
> *Reconstruction will include measures to preserve any remaining historic materials, features, and spatial relationships.*

Reconstruction will be based on the accurate duplication of historic features and elements substantiated by documentary or physical evidence rather than on conjectural designs or the availability of different features from other historic properties. A reconstructed property will re-create the appearance of the non-surviving historic property in materials, design, color and texture. A reconstruction will be clearly identified as a contemporary re-creation. Designs that were never executed historically will not be constructed.

Second Floor Wood Framing

The original second floor roof framing system throughout the entire interior of the historic structure was destroyed by the hurricane storms and by some of the temporary stabilizing cables. These steel cables that tied the upper framing together were pulled and shifted to the east side of the building, when the 60' tall brick chimney fell and brought down much of the attached original historic fabric with it.

The reconstruction of this second-floor framing system will need to become part of the new overall structural system to be designed by the A/E team. The goal of this new system is to structurally stabilize and secure as much of the existing historic fabric as possible, which includes the original historic perimeter load-bearing stone walls and any reusable original wood beams, upon determination by the design structural engineer.

The *Legislature of the Virgin Islands issued the Design Guidelines for Hurricane Resistant Building, dated October 20, 2017*, as a reference, to the adopted building codes of the Virgin Islands. As is stated in the document, when discussing the structural design of a structure to help withstand the storms:

> "*ANCHORAGE IS THE KEY, the basic concept for properly securing a structure to withstand hurricane force winds is very simple. Every major component of the structural system must be securely tied to each other and to the foundation so that there is a direct structural link between the roof and the ground. Structural failure will occur first in the weakest link in this chain. Once failure occurs in one part of the structure then the domino theory comes into effect, and other adjacent parts of the structure begin to fall."*[102]

[102] "Design Guidelines for Hurricane Resistant Buildings*", Legislature of the Virgin Islands, United in Pride and Hope* (October 20, 2017) http://www.legvi.org



Figure 162. Temporary stabilization system connected to and overlayed on top of original historic second floor wood beam at the Engine Room. Original pockets for wood floor joists can be seen in red brick wall, which is the character defining west wall in the Engine Room with the imbedded flywheel. Any new wood floor joists could pass through this wall, but it is NOT recommended that they bear any compressive forces onto this wall, 2020 (E. Anderson).

- In reference to the *Design Guidelines for Hurricane Resistant Buildings* the installation of the new second level wood floor joists and wood flooring planks will become one of the structural components that will tie the entire structural system together, from the roof to the foundation. This cohesively designed structural system is the impetus behind the Ultimate Treatment solutions presented in this report.
- It may be possible to reinstall the new wood and/or possibly reused original wood floor joists in the existing original joist pockets in the brick and stone walls. The depth and strength of these joist pockets, along with the structural capabilities of any salvageable wood floor joists for possible reuse, will need to be evaluated and determined by the design structural engineer.
- It is not recommended that the original historic red brick flywheel wall in the Engine Room be used as a bearing wall for any new floor structure. Structural stabilization of this character-defining wall will be critical during the design phase.



Figure 163. Figure Damaged second floor wood joists and stabilization systems, steel cables, and bracing members in Engine Room (Bay 3), 2020 (E. Anderson).

Doors

Preservation of Existing Doors

- Preservation recommendations for the only two sets of remaining doors on the original building, is to preserve and repair both pairs of the arched iron doors that enter into the Engine Room on the north elevation and all the associated hardware.
- Preservation recommendations for the doors and related hardware includes cleaning, repairs, adjustments as needed for smooth opening, preparing the surfaces and repainting with a paint system specifically formulated for iron and metal components.



Figure 164. North wall cast iron doors, 2020 (Helen Juergens).



Figure 165. North wall cast iron doors, 2020 (Helen Juergens).

Reconstruction of Missing Doors
Note: Should NPS decide to select the final Treatment Option that treats the current structure and historic fabric as a ruin, then reconstruction of the missing doors would not be appropriate to the treatment and would therefore not apply.

- For all the missing doors on the original building, it is recommended to reconstruct the doors utilizing the design and material type as shown on the 1977 HABS drawings. Similar to the windows, these drawings are the only documentary evidence of the original style and materials used on the various doors.
- It is recommended that all the missing doors be reconstructed following the different designs and using the same materials as indicated on the HABS drawings, but in a fashion that is not to be misconstrued as being original.
- As there are no physical remnants of the original historic doors, new materials will need to be used for the newly constructed doors. As most of the original doors appear to be wood, it is recommended that the new doors be of a wood species that is resilient to withstand the climatic conditions of the islands.
- It is recommended that any reconstruction work done maintain detailed records of design, implementation, and materials used.

These recommendations do meet *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring & Reconstructing Historic Buildings,* using the Guidelines for Reconstruction for the Building's Exterior and for the Preservation Guidelines.

The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring & Reconstructing Historic Buildings

Guidelines for Reconstruction (of Missing Doors)

Reconstructing a non-surviving building to depict the documented historic appearance. Although the use of the original building materials (such as masonry, wood, and architectural metals) is preferable, substitute materials may be used as long as they recreate the historic appearance.

Recreating the documented design of exterior features, such as the roof form and its coverings, architectural detailing, windows, entrances and porches, steps and doors, and their historic spatial relationships and proportions.

Using signage to identify the building as a contemporary recreation.

Windows

Note: Should NPS decide to select the final Treatment Option that treats the current structure and historic fabric as a ruin, then reconstruction of the missing windows and shutters would not be appropriate to the treatment and would therefore not apply.

According to the 1977 HABS drawings, which is the only documented evidence regarding the details of the windows, the original Creque Marine Railway Building window openings on the interior had a "Wood louver/Glass Interior" and on the exterior had a "Wood Shutter". The drawings also indicate that there are different styles of shutters at the different window locations. No physical evidence seems to be available for these various types of shutters and windows.

- It is recommended that the windows be replaced with new glazing and window framing systems, along with interior and exterior shutters that depict and reference the design of the original historic windows and shutters, using new modern materials. The new windows and shutters should operate in the same type of fashion as the original windows and shutters. It is recommended that the new design and materials, while using the historic design as a guide, incorporate any new technological advancements and materials for hurricane resistance qualities.
- Refer to the Recommendations for Treatment: Original Historic Stone & Brick Walls – Exterior & Interior, section above for treatment of all brick and stone at the window headers, jambs and sills and all plaster window surrounds.
- At interior surfaces of all brick window openings, upon masonry repairs, cleaning and sealing, prepare brick so that it is smooth and free from moisture, dirt and organic matter.
- At exterior windows ensure that mortar joints are raked and sloped to the exterior face to create a slope for water to drain.



Figure 166. Original brick window jambs and sill at 2nd floor of W elevation. Evidence of red brick toothed into the adjacent stone to form a smooth flat surface for the window jambs and sills for insertion of the window frames. Decorative plaster surrounds typical at upper windows, 2020 (Helen Juergens).

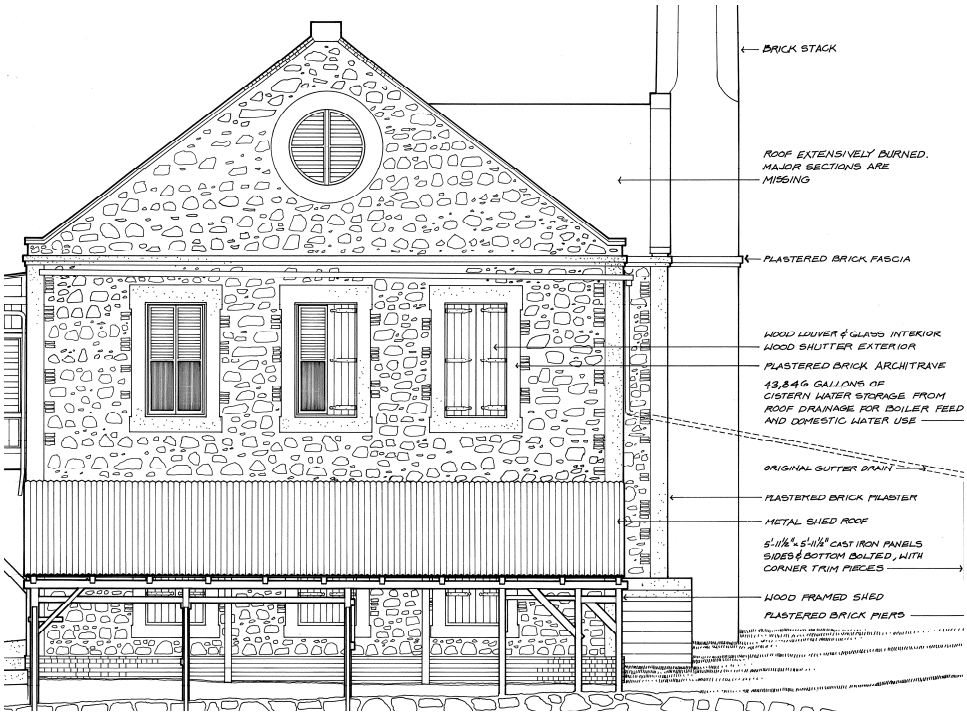


Figure 167. West Elevation from 1977 HABS drawings.



Figure 168. Original brick window jambs and sill at interior wall between the Engine Room and Boiler Room. Historic yellow bricks originally came from Denmark as ballasts from one of the ships. These yellow bricks were used elsewhere throughout the building. The adjacent window has random sized and random colored brick, and the construction was not as finely detailed, 2020 (E. Anderson).

Stairs

The original eastern brick stairwell that led from the exterior to the now missing second floor was demolished during the hurricane storm when the 60-foot-tall brick chimney fall on top of it, taking the original wood staircase with it. The original southwestern brick stairwell that accessed the now missing second floor living quarters is intact, but the wood staircase was demolished. This stairwell also led down to the equipment pit space below the Winch Room to access all the winch equipment and gears. Those wood stairs were also demolished.

Note: Reconstruction of these stairs should only be considered if the second-floor level is reconstructed for a Park use, such as research, interpretive displays, offices, or storage, as a second exit would be required by code.

- Replace both demolished wood staircases with two new staircases to accommodate exiting from the upper floor level, which will be reconstructed in the new infill structure.
- Stair access from the upper level is a life-safety issue for both visitors and staff using the building, therefore a complete review of the 2018 International Building Code, the 2018 International Existing Building Code, the adopted codes of the USVI, Department of Planning and Natural Resources, along with the NFPA 101-2018: Life Safety Code, 2018 edition, for code reequipments is essential. This will indicate the minimum required width, dimensions and materials to be used. This should be part of an overall coordination effort with USVI building officials regarding the buildings new use, occupancy and new fire and life safety building systems.
- It is recommended that the existing historic brick stairwell walls be repaired and reconstructed, but only if they can be designed to meet the exiting requirements stated in the above codes.
- It is not recommended that these two new staircases be made of wood, which is combustible, as were the original staircases. The original staircases were utilitarian in nature and tucked in the back corners or areas of the building. However, the two new staircases are to be designed in keeping with the historic character of the building.



Figure 169. Original eastern Stairwell, to the now missing original second floor, which was partially damaged from the 60' tall brick chimney falling on top of it. The bricks shown are the original bricks from the chimney. The wood staircase was also demolished, 2020 (E. Anderson).



Figure 170. Original yellow brick wall separating the eastern Stairwell and Boiler Room. Brick staircase wall demolished when 60'tall brick chimney fell on top of it. The wood staircase was also demolished, 2020 (Helen Juergens).



Figure 171. Original southwestern Stairwell that accessed the second floor Living Quarters. The original wood staircase was demolished and lies at the bottom of the stairwell, 2020 (Helen Juergens).



Figure 172. Original Southwest Stairwell to the equipment pit space under the Winch Room to access the winch gears and equipment, 2020 (E. Anderson).

Bolton Beam Engine

The Bolton Beam Engine system and all related iron components include the two boilers in the Boiler Room, the Bolton Beam Engine and adjacent flywheel in the Engine Room, all the gears in the Winch Room, and all related connectors, shafts, rods, and hardware. Details of how the system operates can be found in the 1977 HABS report. Changes in relative humidity, wind, and other environmental factors continue to impact the stability of the iron material. Based on the field inspection, the following actions are recommended for the Bolton Beam Engine:

- Clear and remove all vegetation from the equipment areas.
- Remove all collapsed stone/brick debris from the Boiler, Engine, and Winch Rooms on the main floor as well as from the mechanical equipment pit areas under the engine and winch/gears. This work needs to be done under the direct supervision of an archeologist or a historical architect so that the removed wall bricks, rubble, and stone can be stored in a designated area for possible reuse.
- Extra care needs to be taken when removing debris from the top of the 24-inch × 24-inch × 3-inch-thick floor brick slabs over the beam engine and winch/gears pit areas to prevent damage to these slab sections.

- Once the removal and clean-up work has been completed, perform a thorough mechanical inspection of the Boilers, Bolton Beam Engine, Flywheel, and the Winch assembly. The detailed mechanical equipment inspection report contained in the 1977 HABS report shall be used as a benchmark for determining the extent of additional deterioration of all the mechanical equipment.
- Following a thorough condition assessment of the equipment and pending final treatment recommendations for the building envelope of the Head House, treatment of the equipment may include: mechanical cleaning to remove corrosion, cleaning with a polymeric protecting agent, and/or coating with a corrosion inhibiting sealant. Removal of existing corrosion is not recommended if the equipment is to remain in an open-air environment. The existing layer of corrosion actually serves as a protective layer from deterioration due to wind, rain, and salinity.

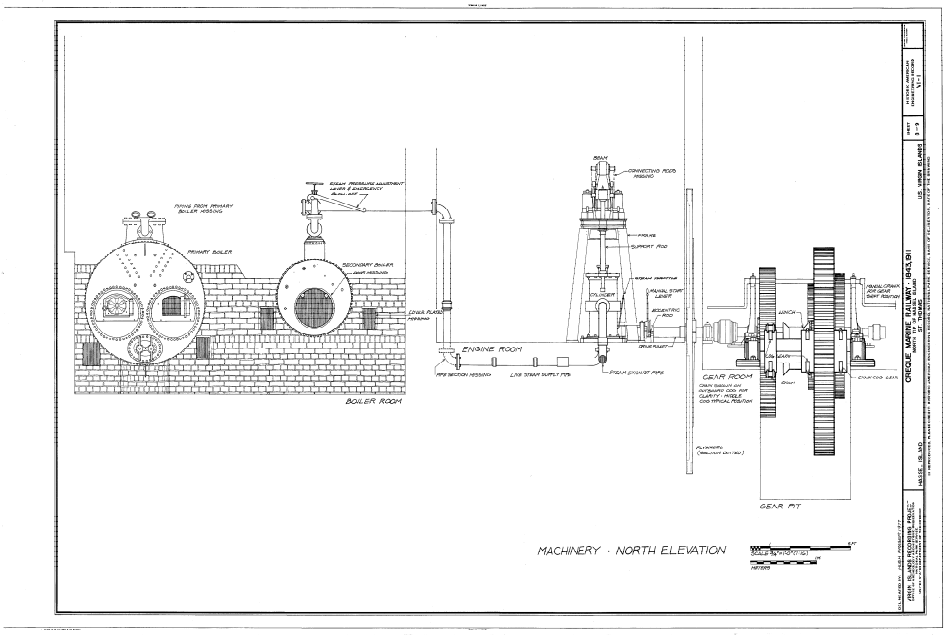


Figure 173. Bolton Beam Engine system in elevation from 1977 HAER drawings.

Cistern

The original cistern is located 20 feet west of the Head House, situated on a slight hill 5 feet 4 inches above grade on the eastern end and 3 feet above grade at the western end. The cistern does not appear to have suffered any storm damage but has some deterioration from general exposure to the elements over time. The plastered brick foundation piers and cast-iron panels that make up the tank are in fair condition. Multiple repairs have been performed on the panels. The entire tank was covered with corrugated metal roof on a wood framing system in 2011. The roof was in good condition, but inspection of the interior of the cistern was not possible due to the

enclosed roof structure. Based on the field inspection the following actions are recommended for the cistern:

- Clear and remove all brush and vegetation as well as all leftover construction material from under and within 10 feet of the entire cistern structure.
- Perform a thorough inspection of all the plastered brick piers in order to develop a detailed repair recommendation which should include repair and repointing the mortar joints.
- Install openings at the gable ends of the sheet metal roof structure to allow access to the interior of the tank for inspection and repair work.
- Clean out all lines that drain into the tanks and install screening over them.
- Repair all cracks in the cast iron plates identified during the inspection
- Replace/reseal all bolted joints
- Determine and implement a plan for the water distribution system if the decision is made to maintain the cistern.
- Consider removal of non-historic cistern roof to return to original configuration.



Figure 174. PVC pipes replaced the original iron fixtures on northern end. Red corrugated metal roof structure installed in 2011, 2020 (Helen Juergens).



Figure 175. Welding and rivet repairs on the western cistern iron panels, 2020 (Helen Juergens).

OVERALL MANAGEMENT OBJECTIVES

The goal of these overall management objectives is to indicate how the proposed Ultimate Treatment recommendations for the stabilization, preservation, and future use of the Creque Marin Railway Head House and Cistern will comply with the multiple NPS approved documents that set forth the NPS planning objectives and management guidelines for Hassel Island and this historic structure. Of equal importance, is to indicate how the proposed recommendations comply with the "***The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring & Reconstructing Historic Buildings".***

The summary of the proposed Ultimate Treatments includes:

Immediate Emergency Stabilization:

- Immediate Structural Stabilization of the Remaining Original Historic Fabric
- Removal of all Vegetation within the Historic Structure and all Vegetation outside the structure that is affecting the Historic Fabric

Preservation & Rehabilitation:

- Stabilize, Preserve, and Rehabilitate all the remaining, standing exterior and interior stone and brick walls.

- Stabilize, Preserve, and Rehabilitate all stone and brick door and window headers, jambs, and sills.
- Stabilize, Preserve, and Rehabilitate any structurally stable and intact historic wood beams and wood flooring.
- Preserve and Rehabilitate the two sets of arched iron doors on the north elevation that enter the Engine Room and any other remaining intact historic doors.
- Stabilize, Preserve, and Rehabilitate all structurally stable and intact historic site elements including concrete stairs, ramps, landings, and thresholds.
- Preserve and stockpile all salvageable historic materials and elements for reuse and/or display, including but not limited to bricks, stones, wood beams, wood stairs, doors, windows, hardware, etc. Stockpiles to be located in a secure area. Contractor to follow NPS directives on storage and protection of such materials.
- Preserve and Rehabilitate the Bolton Beam Engine system and all related iron components in its entirety. The major components include the two boilers in the Boiler Room, the Bolton Beam Engine and adjacent flywheel in the Engine Room, all the gears in the Winch Room, and all related connectors, shafts, rods, and hardware. Refer to Bolton Beam Engine Section for specific details on the proposed treatment of the Bolton Beam Engine.

Restoration

- Structurally Stabilize and Restore the missing brick of the interior Red Brick Wall at the Flywheel of the Bolton Beam Engine. Along with the Engine, this brick wall is one of the main character defining elements on the interior of the building.
- Insertion of a New Structural Stabilization System utilizing either a Non-discreet Infill Addition (Gable Roof Alternative 2) or a Structural Ghosting Framework System (Gable Roof Alternative 3), to reestablish the Historic Gable Roof Appearance.
- Reconstruction of the missing western end of the Head House with a new In-Fill Addition to incorporated into and/or integrated with the new Structural System above.
- Visually Recreate the Historic Building Envelope Form or Silhouette.

Reconstruction:

- Reconstruction of the 60-foot-tall octagonal original historic brick chimney that serviced the boilers to the Bolton Beam Engine, utilizing the chimney's original bricks that are scattered throughout the building and site, lying where they fell during the storms.
- Reconstruct (2) interior stone gable walls that provided lateral support to the exterior original perimeter stone walls.
- Reconstruction of the Original Historic Second Floor on the Interior.

Building Envelope Condition and Materials/Alterations/Integrity:

Building Envelope Condition and Materials of Historic Fabric

Stone and Brick Walls

The remaining elements of the historic building envelope consist of the original historic perimeter stone and brick walls on the north, east, and south elevations. An interior wall which originally separated the Winch Room and the Living Quarters now serves as the western elevation wall. As noted in the Existing Conditions section, the upper portions of the original historic stone and brick walls on the north, west and south elevations of the Living Quarters were destroyed during the storms. Those original stones and bricks are still lying on-site in multiple piles of rubble and debris.

As noted in the Ultimate Treatment recommendations, the goal is to identify, retain, and preserve as much of the original historic load-bearing perimeter walls as possible, as they were in integral part of the structural system that carried the load of the now missing roof down into the foundation system. However, since many of the original historic materials are now destroyed, a new ancillary structural system will need to be designed to help preserve the existing perimeter walls.



Figure 176. Original historic stone & brick wall at west end of North Elevation, at main entry door into Winch Room. Exterior walls of Living Quarters now missing, 2020 (Helen Juergens).

It is recommended that these existing historic load bearing walls remain as such, albeit with the recommended treatments and required structural repairs. The exterior historic stone walls are approximately 26 inches thick and still able to carry their own compressive loads down to the original foundation. The exterior stone walls represent the main building component still standing, despite the damage from multiple hurricanes. To structurally support these walls, a roof framing system, a second-floor framing system,

and a lateral support of the interior walls needs to be installed to structurally tie the historic exterior building envelope together.

The Ultimate Treatment calls for these historic walls to be integrated into a new complementary infill addition or structural framework system, to be designed by the A/E team once the Ultimate Treatment direction has been selected and approved by NPS. Inherent in the structural stabilization recommendations of the proposed Ultimate Treatment options is the visual recreation of the historic building envelope.



Figure 177. Remnants of the destroyed original South and West perimeter stone walls of the missing Living Quarters. This is the proposed southwest corner of the new infill addition, 2020 (Helen Juergens).

Foundation System

To structurally stabilize, preserve, repair, and rehabilitate the existing original historic perimeter walls, the new complimentary structural system will need to have a new foundation system installed adjacent to the historic foundation wall. Investigation of the type and condition of the existing historic foundation wall will need to be completed at the outset of the design phase. The current site debris and instability of the structure prevented any subsurface investigations of these foundations during the on-site assessments for this report.

The design of the new structural system to stabilize the building envelope will need to include a complete and cohesive foundation system plan to accommodate the new structural system. Design of this new foundation system will also need to include a foundation drainage system to direct underground water away from these new foundations.

Again, the key to design of hurricane resistant buildings is to *tie and connect all the structural building components together from the roof to the foundation, to create a uniform system*[103] that can withstand a hurricane event. Every component of the structural system is as critical as the next; all work in concert to maintain the structural integrity of the building envelope.

In regard to the rehabilitation of a foundation and structural system on a historic structure, *The Secretary of the Interior's Standards for the Treatment of Historic Properties*, recommends, "*Limiting any new excavations next to historic foundations to avoid undermining the structural stability of the building or adjacent historic buildings. The area next to the building foundation should be investigated first to ascertain potential damage to site features or archeological resources."*[104]

Gable Roof Condition

The original historic gable roof and wood roof framing system was lost to a fire in 1967. This was the beginning the demise of the structure in multiple ways: the historic building lost one of the significant structural components that had tied the original historic building elements together, it began the degradation of the then exposed second floor system and consequently allowed for weather to start penetrating into the main level below and onto the Bolton Beam Engine equipment, and became the first loss of a main character-defining architectural element of the historic structure. The available physical and documentary evidence is general in nature, and does depict the type overall roof framing system, nor the exact type of finish roofing material.

The Ultimate Treatment recommends two options for the reconstruction of a new roof system that will reestablish the visual appearance of the building form and envelope, in addition to stabilizing the existing historic load-bearing perimeter stone walls. The Ultimate Treatment provides for two optional solutions. The first, **Gable Roof**

[103] "Design Guidelines for Hurricane Resistant Buildings"

[104] The Secretary of the Interior's Standards for the Treatment of Historic Properties

Alternative 2, is for a new non-intrusive, integrated, modern gabled roof structure/addition to be inserted inside the existing historic perimeter stone walls. The second, **Gable Roof Alternative 3**, is a new internal, non-visual, integrated roof deck with an overhead structural roof ghosting framework that outlines the historic roof envelope. Refer to the following *Proposed New West End Infill Addition section* for further details.

Either of these options for the integrated structural/gable roof treatment is in alignment with the *"New Exterior Additions to Historic Buildings and Related New Construction"*, section of the "*The Secretary of the Interior's Standards for the Treatment of Historic Properties".* A new infill addition is required to be "*subordinate and secondary to the historic building and is compatible in massing, scale, materials, relationship of solids to voids, and color*."



Figure 179. Original Historic gable roof, with intact Living Quarters and standing 60' tall chimney, HABS/HAER Photo.



Figure 178. Ultimate Treatment – Gable Roof Alternate 2. Insertion of a non-intrusive protective gabled-roof structure inside the original historic exterior stone walls.



Figure 180. Ultimate Treatment – Gable Roof Alternate 3. New structural ghosting framework silhouettes the historic gable roof.

Proposed New West End Infill Addition (Previous Living Quarters):

The west end bay of the original historic building envelope was destroyed during the hurricane storms, which left the original stones and bricks form the walls laying in piles of rubble throughout the immediate site. The only portion of the west end bay historic fabric that remains is the partial standing perimeter stone and brick wall remnants at the Southwest corner of the building.

The original historic building elements that were destroyed includes the north and south perimeter stone and brick walls, the west stone gable wall, the second-floor wood framing, and the windows, doors, and stairway. Along with the missing roof, this loss of yet more of the load-bearing perimeter stone walls further compromises the structural stability of the remaining building, especially when considering that this west end bay provided some of the lateral stability to the building.



Figure 181. Original Southwest corner of the destroyed western end, location of the Living Quarters. This is the proposed Southwest corner of the new infill addition, 2020 (Helen Juergens).



Figure 183. Ultimate Treatment- Gable Roof Alternative 2 : Old farmhouse ruins in Dumfries, Scotland, with new nonintrusive structure built inside the historic walls. Highlights, preserves and provides structural stability to the original remaining stone walls. Photo by Sergio Pirrone.



Figure 182. Ultimate Treatment – Gable Roof Alternative 3: New structural ghosting framework silhouettes the historic gable roof and provides roof top are for interpretive displays and visitor services.



Figure 184. Prime example of adherence to Reconstructed Infill Additions by The Secretary of the Interior's Standards for the Treatment of Historic Properties provided the new infill addition be "subordinate and secondary to the historic building and is compatible in massing, scale, materials, relationship of solids to voids, and color."[2] Former13th century church in Kilkenny, Ireland was preserved with a new addition clad in Lead to create the Medieval Mile Museum which celebrates the heritage of what was once the medieval capital of Ireland. The project was shortlisted for the 2019 Mies van der Rohe Award, as well as being Highly Commended in the 2018 RIAI Awards.

There are two options in the Ultimate Treatment recommendations which provide a solution to both the recreation of the building envelope form and creation of a new structural system to stabilize the remaining historic walls of the building envelope. (Refer to The Ultimate Treatment section, for the complete proposed options). One option is indicated as, **Gable Roof Alternative 2**, which is the insertion of a non-intrusive protective gabled-roof structure inside the original historic exterior stone walls.

The second option, **Gable Roof Alternative 3**, creates a new internal structural system that incorporates a structural ghosting framework of the original gable roof. This option also creates a new roof deck/viewing platform inside the perimeter of the exterior historic stone walls set below the top course of the exterior stone walls, so as not to be seen from the outside of the historic structure. Both options recreate the visual gable roof line and also incorporate new structurally stabilizing second floor framing.

The new West Infill Addition would utilize the same original floor height and building area of the now missing Living Quarters at the west end of the building. This option would be in adherence with *The Secretary of the Interior's Standards for the Treatment of Historic Properties***,** by "*Identifying, retaining, and preserving a floor plan or interior, spaces, features, and finishes that are important in defining the overall historic character of the building."*[1]

Should this recommended West Infill Addition of the Ultimate Treatment option become part of the Building Program, it is critical that its building envelope, specifically the mass and the form, be in concert with the historic character of the original building and should also be of mainly monolithic materials and neutral color palette.

This option would be in adherence with *The Secretary of the Interior's Standards for the Treatment of Historic Properties* ***provided*** the new infill addition be "*subordinate and secondary to the historic building and is compatible in massing, scale, materials, relationship of solids to voids, and color*."[2]

Brick Chimney

One of the main prominent visual elements of the original historic building envelope, was the 60-foot-tall octagonal brick chimney that serviced the two original boilers for the Bolton Beam Engine (Figure 183). Although not a structural component of the building envelope, the brick chimney played a significant role as one of the main original character defining elements, which identified the building from Charlotte Amalie across the harbor from Hassel Island.



Figure 185. Original Historic square brick base of the destroyed original historic 60' tall octagonal brick chimney on South Elevation, servicing the original boilers, 2020 (Helen Juergens).



Figure 186. Material from the chimney in the eastern stairwell, 2020 (E. Anderson).

The restoration of the chimney is one of the highest priority recommendations in the Ultimate Treatment section of this report. This recommendation does meet with the Secretary of the Interior's Standards for Reconstruction due to the following:

- The hurricane storms destroyed the original historic chimney, which is recommended to be reconstructed. There is currently documentary (HABS Drawings and photographs) and physical (brick materials) evidence available to provide for an accurate reconstruction with minimal conjecture. The chimney's original bricks will be used for the

reconstruction, as they are lying on site where they fell after the hurricane storms.

- The reconstructed chimney is essential to the public understanding of the historic view of the property from the harbor as well as the functioning of the original Bolton Beam Engine, which will be the main interpretive element in the new facility.
- Reconstruction will include measures to preserve the still standing square brick base which forms the base of the chimney.
- A reconstruction will be clearly identified as a contemporary re-creation in the Interpretive Display of the Bolton Beam Engine.



Figure 187. Material from the chimney in the eastern stairwell , 2020 (Helen Juergens).

Exterior Alterations to Historic Fabric:

This the exception of the Cistern, the alterations to the Creque Marine Railway Head House have been deductive (historic fabric and sections destroyed by the storms) rather than additive (with added multiple building additions). Piece by piece the various historic materials, fabric, or elements of the Creque Marine Railway Head House have been destroyed, decimated, damaged or ruined by each passing hurricane or storm event. These following deductive alterations to the historic structure, all of which were original character-defining elements, are now destroyed or damaged include:

- **Demolished West End of the Creque Marine Railway Head House:** The West end of the original historic structure, where the Living Quarters were located, is missing the original historic roof and roof framing, the original historic north, south and west perimeter stone and brick walls, the second-floor wood framing and wood flooring, and all

the original doors and windows. There are a couple of stone and brick standing pilasters at the south end of the site. The surrounding area is littered with piles of the building materials.



Figure 188. Demolished West End of the Creque Marine Railway Head House, 2020 (Helen Juergens).

- **Destroyed Brick Chimney Tower:** The original historic 60-foot-tall octagonal brick chimney that serviced the two boilers toppled over during a hurricane. Its original bricks are still lying on site. For a

complete discussion refer to the Historic Building Envelope Condition section above.



Figure 189. Destroyed Brick Chimney Tower, 2020 (Helen Juergens).

- **Destroyed Missing Gable Roof & Roof Framing:** The original historic gabled roof along with the wood roof framing members were destroyed in a fire in the 1960s. There is little documentary or physical evidence left indicating the exact materials and design of the original roof framing system other than the information on the 1977 HABS drawings. The original gable roof was one of the main identifying elements, when viewing the building from Charlotte Amalie across the harbor to Hassel Island.



Figure 190. Destroyed Missing Gable Roof & Roof Framing (https://valeriesims.com/hassel-island-history-us-virgin-islands/).

- **Demolished and Damaged Exterior Stone and Brick Walls:**
  The damage and destruction of the original historic stone and brick walls cannot be overstated. Every stone and brick wall on both the exterior and the interior needs stabilization, preservation treatment, and repairs. However, of all the original building materials that were used to construct the original structure, the "blue bicé" stone used for the 26-inch-thick perimeter walls and the two interior 16-inch-thick gable walls has proven to be the strongest material and wall system used. With the stabilization efforts of the NPS, they are one of the few remaining character-defining elements left from the original building.

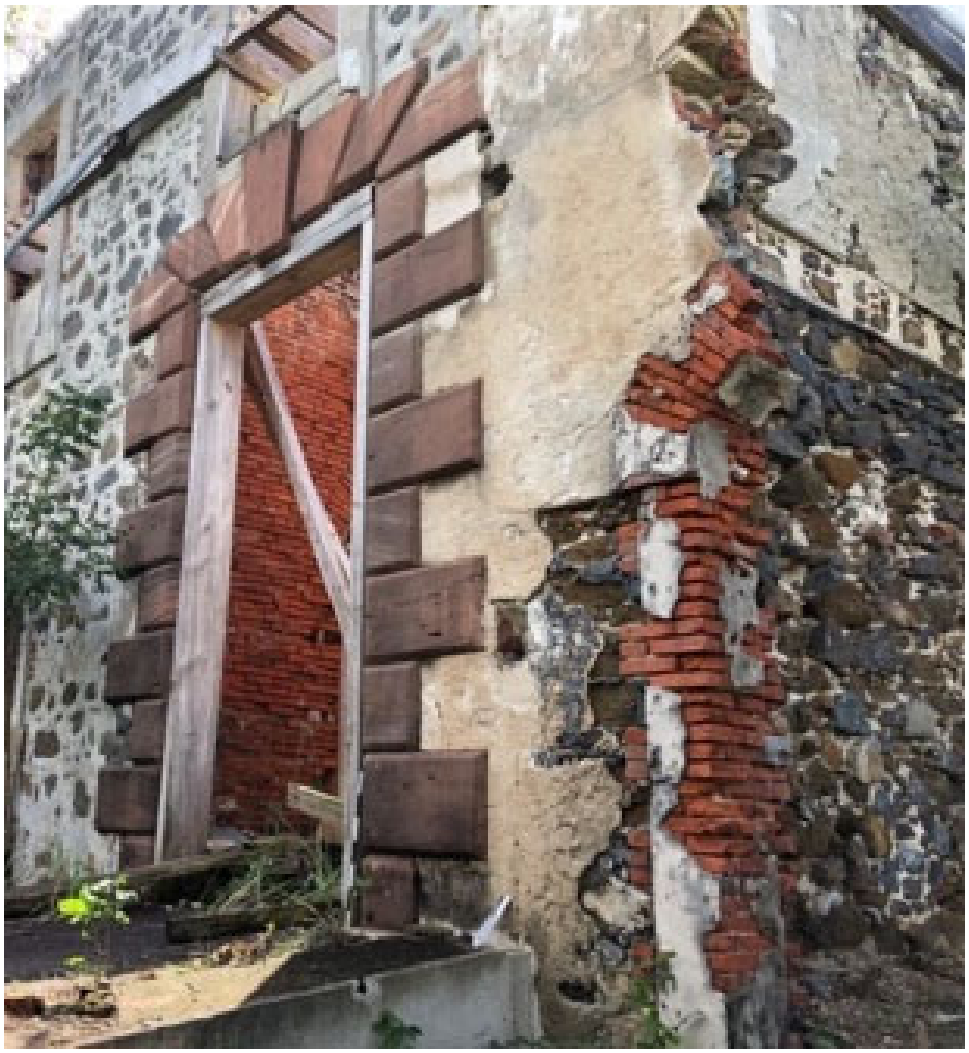


Figure 191. Demolished and Damaged Exterior Stone and Brick Walls , 2020 (Helen Juergens).

Exterior Integrity of Historic Structure:

The Creque Marine Railway was listed on the National Register in August of 1978. *"To be listed in the National Register of Historic Places, a property must not only be shown to be significant under the National Register criteria, but it also must have integrity."*[1] The NPS definition of integrity for a historic resource is, "*Integrity is the authenticity of a property's historic identity, evidenced by the survival of physical characteristics that existed during the property's historic or prehistoric period."*[1]

In considering the Ultimate Treatment recommendations for the building, it is necessary to ensure that these proposed actions will maintain the historic integrity of the historic structure. *The National Register criteria recognizes seven aspects or qualities that, in various combinations, define integrity.*[1] The seven

aspects, and how the recommendations for the Ultimate Treatment meet the criteria of each includes Location, Design, Setting, Materials, Workmanship, Feeling, and Association:

> ***LOCATION*** *is the place where the historic property was constructed or the place where the historic event occurred. The relationship between the property and its location is often important to understanding why the property was created or why something happened.*[105]

The Creque Marine Railway Building is located on the west edge of the shoreline on Hassel Island across the harbor from Charlotte Amalie. The Creque Marine repaired and serviced these ships and is currently the only surviving marine railway in the Western Hemisphere.

> *"Because of its peculiar geographical position, St. Thomas is the logical distributing centre for goods from Europe or the U.S. destined to any of the islands or to the northern ports of South America. It is located on the direct line of communication between European ports and the entrance to the Panama Canal and in addition is in the path of vessels plying between the Atlantic ports of the two Americas or between the Atlantic and Pacific ports of these two continents… Its location commands the Virgin Passage to the Caribbean Sea, the easternmost gateway to that body of water." It also probably helped that the islands under Denmark remained neutral territory, that the port was for most of its history a 'free port' and that the harbor was well protected."*[106]



Figure 192. Hassel Island in relation to St. Thomas.

[105] "How to Apply the National Register Criteria for Evaluation", *National Register Bulletin, U.S. Department of the Interior National Park Service Cultural Resources National Register, History and Education, 1997.*

[106] Luther Zabriskie, *"*The United States Virgin Islands Part I; History to 1916*",* in *The Virgin Islands of the United States of America* (New York: Knickerbocker Press, 1918).

DESIGN *is the combination of elements that create the form, plan, space, structure, and style of a property. Design includes such elements as organization of space, proportion, scale, technology, ornamentation, and materials.*

The design of the Creque Marine Railway Head House is a prime example of how "form follows function". The layout of the plan is directly related to the functions of the Bolton Beam Engine which provided the power to hoist the ships from the ocean waters onto the shore for repairs. The ground level plan was designed with four bays, the first three housing one major component of the Engine. These were the Boiler Room, which housed the two large steam boilers; the Engine Room, which housed the Bolton Beam Engine and the flywheel; and the Winch Room that housed the multiple gears that turned the cables that were connected to the ship. The fourth bay was a work room for the laborers on the ground. Each of these bays were separated by stone and brick walls which helped with fire suppression and noise. The upper level was used for support offices, storage for the business, and the Living Quarters.

This original historic design and floor plan of the remaining portions of the historic building will ***not*** change with the new Ultimate Treatment recommendations. The historic layout will be preserved by repairing and rehabilitating all the existing historic fabric and adding new fabric that will support the design (but cannot be misidentified as part of the original structure).

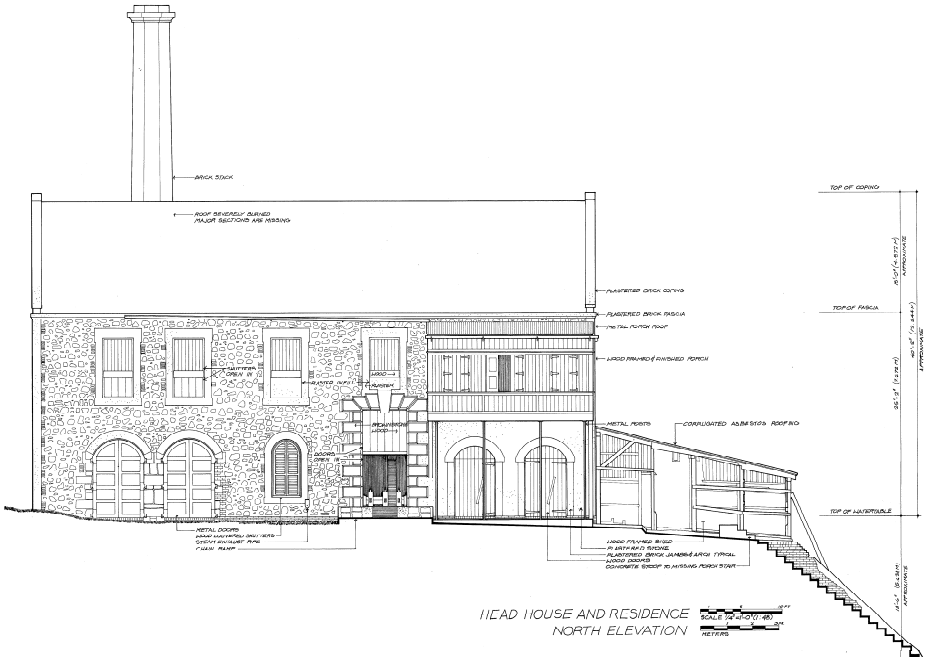


Figure 193. North Elevation from 1977 HABS drawings.

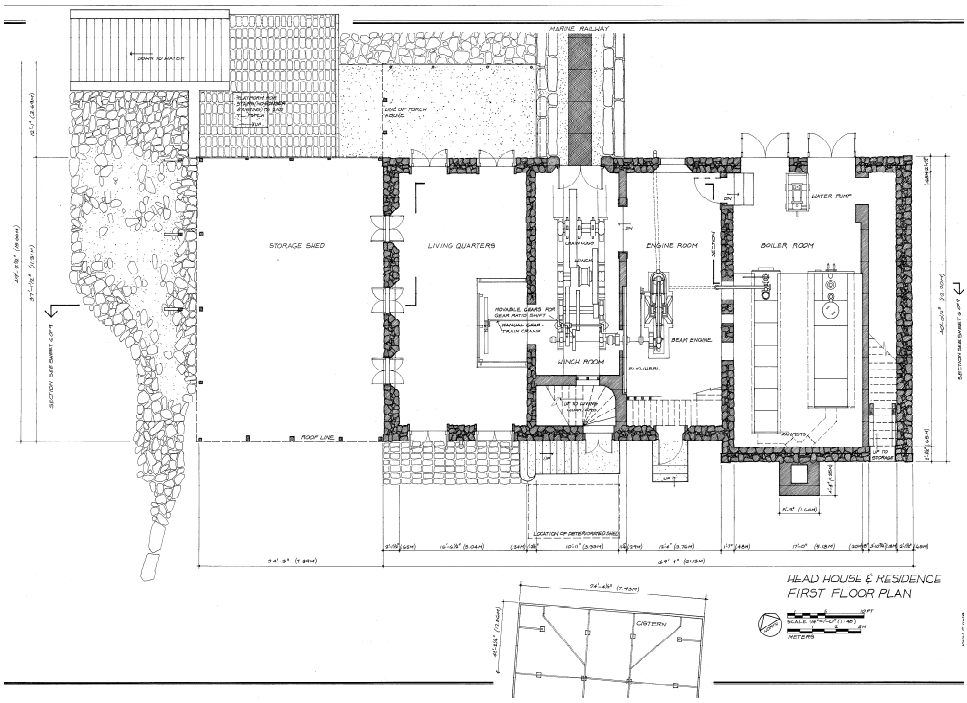


Figure 194. Plan from 1977 HABS drawings.

SETTING *is the physical environment of a historic property. Whereas location refers to the specific place where a property was built or an event occurred, setting refers to the character of the place in which the property played its historical role.*

When the original builders of the Creque Marine Railway Building selected a site location for the new building, they were ingenious in finding a location where:

- The building could be seen and recognized by crew and captains of the incoming shipping vessels.
- The harbor waters were deep enough for a ship to get close enough to the shoreline to access the rails and the steel cables, in order to be pulled from the water.
- There was enough surrounding land adjacent to and around the building for staging, repairs, and loading or unloading of goods, especially with regards to the coal needed to fire the boilers.
- A cistern could be built to store fresh water.
- Lime production for the construction of the stone and brick walls was easily accessible due to the geological structure of the islands.

The original historic ***setting*** of the Creque Marine Railway Building will not be affected by implementing the recommendations to the Ultimate Treatment option.



Figure 195. Creque Marine Head House prior to 2017 hurricanes (NPS).



Figure 196. Slipway, 2020 (Helen Juergens).

MATERIALS *are the physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form a historic property. The choice and combination of materials reveal the preferences of those who created the property and indicate the availability of particular types of materials and technologies. Indigenous materials are often the focus of regional building traditions and thereby help define an area's sense of time*

and place. A property must retain the key exterior materials dating from the period of its historic significance. If the property has been rehabilitated, the historic materials and significant features must have been preserved. The property must also be an actual historic resource, not a recreation; a recent structure fabricated to look historic is not eligible.

The Creque Marine Railway Building's 26-inch-thick perimeter exterior walls are made from the prominent stone on Hassel Island known as *"blue bicé"*. The stone is formally known as augite andesite. Andesite is an igneous rock that is rarely entirely crystalline and typically a dense microlithic. Augite andesite is the combination of augite and andesite - augite being the principal accessory mineral. Andesites were used for structural purposes as they do not polish so are not suited for decorative work.

To use the indigenous island stones as a masonry construction material for the original 26-inch-thick perimeter walls, the larger stones would historically be broken into smaller sizes (sizes that can be hand carried by one mason) by heating the stone and pouring water on to it. The smooth side of the cracked face was laid to the exterior of the wall for a more finished, even appearance. Where the larger adjacent stones left gaps, the small stones were used to fill the void, which is known as a rubble masonry pattern. The exterior joints between the stones were coated with a hand applied plaster made of lime, cement, and water (sometimes a molasses by-product was) combined with sand or seashells as a binder. This plaster was made in the lime kiln on Hassel Island,

The modular brick masonry on the building was used for two of the interior walls at the eastern stairwell and at the Engine Room with the integrated flywheel. In addition, these bricks were toothed into the rubble stone exterior and interior walls to form a strong and flat surface for door and window headers, jambs, and sills. On the exterior these bricks were covered with a decorative plaster surround around the openings to protect them from water damage. These bricks which are multiple colors, materials, and sizes were used as ballast material in the bottom of ships that came from all over the world. Therefore, these bricks are a physical representation of the Virgin Island's role in the international shipping trade.



Figure 197. Detail of yellow brick on interior., 2020 (E. Anderson).



Figure 198. Detail of blue bicé stone on interior wall, 2020 (E. Anderson).

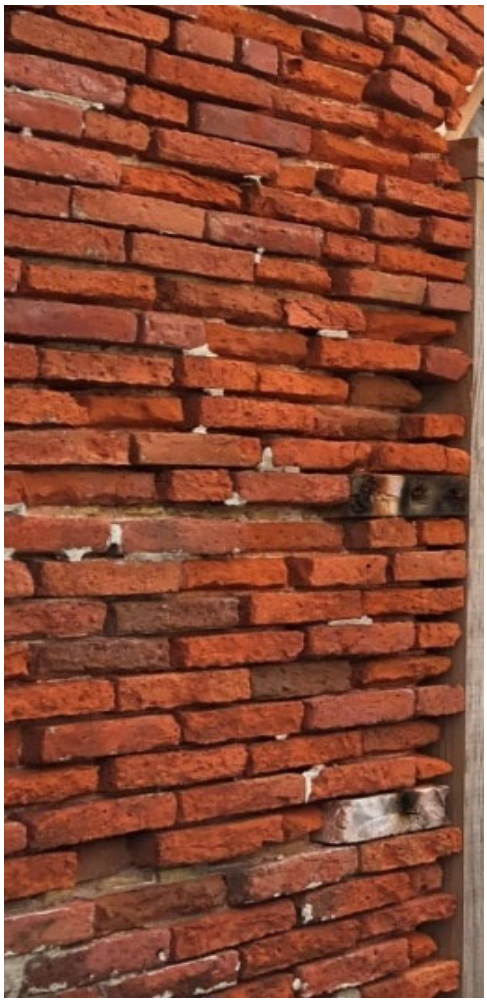


Figure 199. Detail of red brick.



Figure 200. Detail of brown sandstone.



Figure 201. Detail of pointed stone on exterior, 2020 (E. Anderson).

WORKMANSHIP *is the physical evidence of the crafts of a particular culture or people during any given period in history or prehistory. It is the evidence of artisans' labor and skill in constructing or altering a building, structure, object, or site.*

The quality of the masonry workmanship of the exterior perimeter walls is evident in the fact that these walls have experienced approximately 21 hurricane strength storms since 1871 and are still standing. Of all the original historic building components, these walls have shown great resilience due to the high quality of the craftsmanship that built them.

This quality and caliber of workmanship in most prominent in the construction of the brick work throughout the exterior and interior of the building. The quality of the brick arches for the headers of the exterior and interior door and window openings is as high as anything you will find in Europe and the United States. However, the highlight is the brick arch surrounding the flywheel of the Bolton Beam Engine, in the red brick wall separating the Engine and Winch Rooms. Here the

mason was able to maintain a complete and even circumference around the circular flywheel with less than a ½-inch clearance.



Figure 202. Prime example of quality workmanship in construction of the 5' brick arch built within a ½-inch clearance of the outside flange of the flywheel in the Engine Room. 1985 HAER Photo.

FEELING *is a property's expression of the aesthetic or historic sense of a particular period of time. It results from the presence of physical features that, taken together, convey the property's historic character.*

ASSOCIATION *is the direct link between an important historic event or person and a historic property.*

Immediately upon arriving at Hassel Island and viewing the original historic railway onto which the maritime trading ships were hoisted for repairs, one gets an instant feeling for the engineering ingenuity of the industrious workers who built this maritime railway.

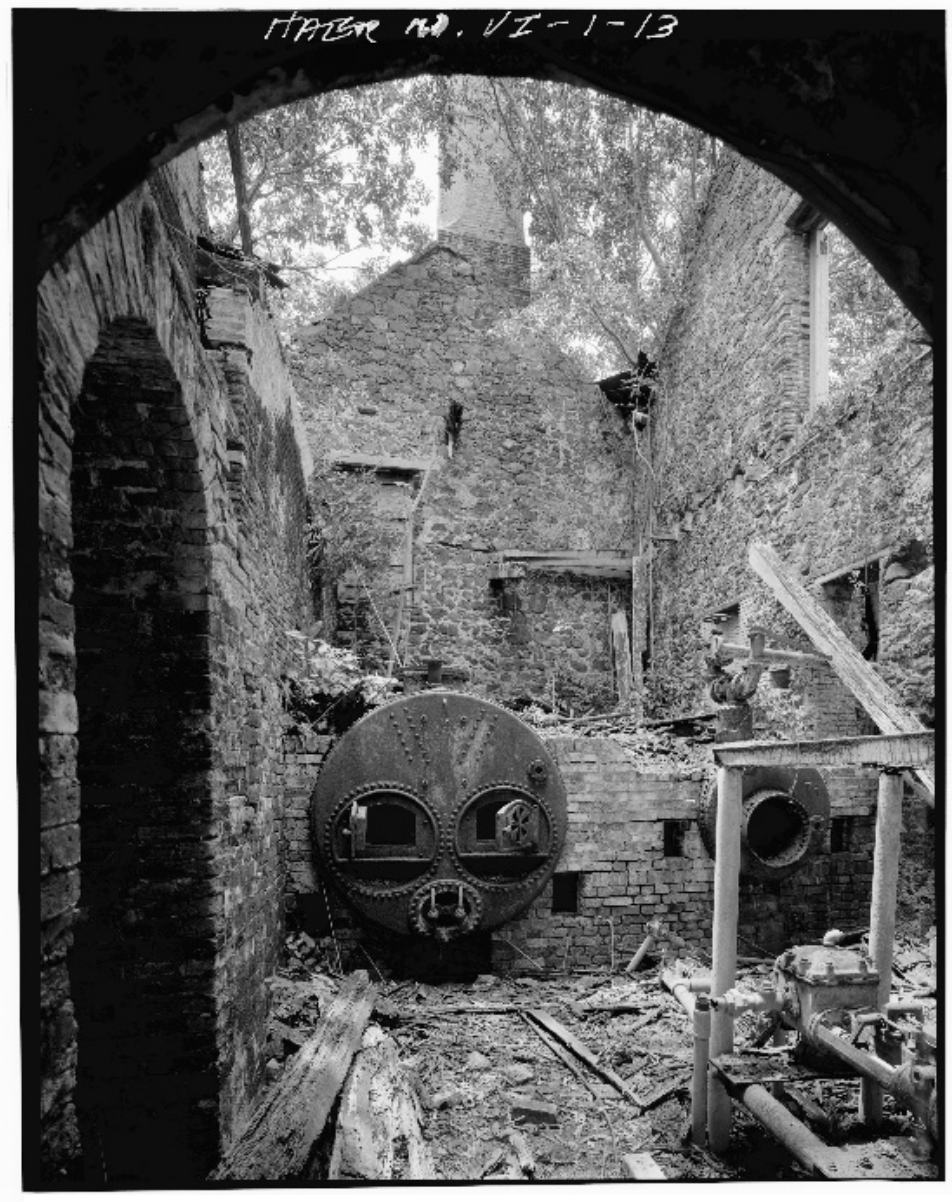


Figure 203. Boiler Room looking South in 1985. HAER Photo.



Figure 204. Winch Room looking South in 1985. HAER Photo.



Figure 205. Engine Room looking North in 1985. HAER Photo.



Figure 206. Railway leading from shoreline with remnants of wooden cradle. Looking towards Charolette Amalie harbor. 1985 HAER Photo.

Interior Condition and Materials/Alterations

Interior Condition and Materials of Historic Fabric

As has been noted in this historic structure report, the damage inside the interior spaces of the original historic structure is due in large part to the fallen original historic building materials, in addition to some of the stabilization materials that were used to help protect the structure prior to the hurricanes. Again, a complete and full assessment of the interiors cannot be undertaken until these piles of building debris and rubble are removed. The recommendation of this report is to salvage and stockpile these fallen original historic building materials and protect those that are still standing to the greatest extent possible. The existing condition of the original historic building materials is described in the following:

Boiler Room – Bays 1 & 2

Approximately 25% - 30% of the historic character- defining materials in the Boiler Room are still standing but will most likely need extensive repairs and reconstruction. The condition, stability, and salvageability of the remaining historic materials will be determined upon clean-up of the building debris, rubble, and vegetation.



Figure 207. Boiler Room looking south, 2020 (E. Anderson).

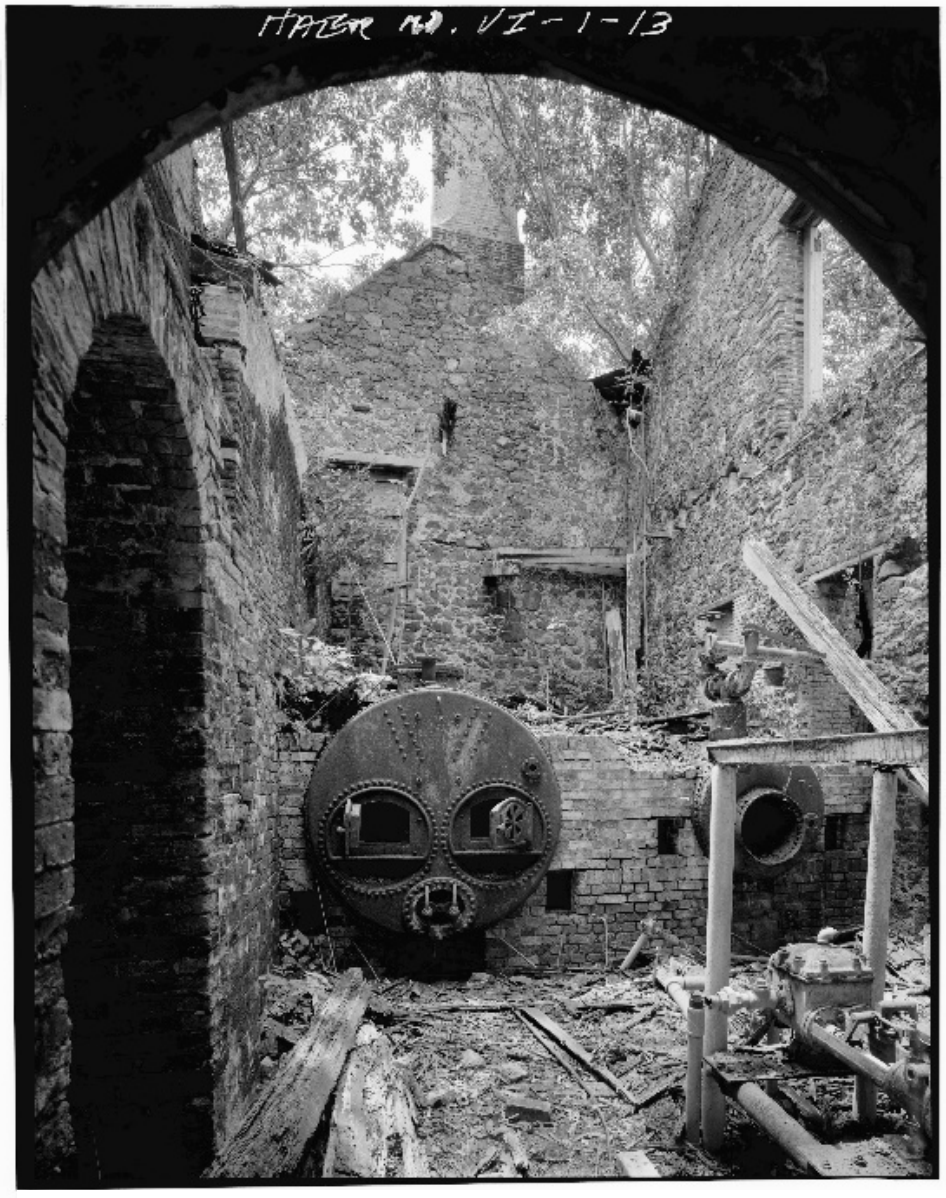


Figure 208. Boiler Room looking south in 1985. HAER Photo.

- The north and south perimeter stone walls and the interior west stone wall are all still standing. However, the upper gabled portion of the west wall was destroyed. The interior east yellow brick wall, brought down by the 60-foot-tall chimney collapse, is almost completely gone.
- The second-floor material collapsed on top of the original brick platform that encases the two original iron boilers.
- The two boilers for the Bolton Beam Engine still appear to be intact but will need to be investigated further once the debris is removed.
- There are multiple trees and vegetation growing on top of the brick platform, both on the building debris and in between the individual bricks that form the top of the platform. This vegetation and debris

should be removed immediately, as the platform may still be able to be restored.
- The door and window openings have been shored up as part of the NPS stabilization effort, prior to the storms, which has saved them from ruin. Their stabilization should be part of the immediate emergency stabilization measures.
- The condition of the original flooring is unknown, as it is completely covered with debris.
- The original gable roof and framing system is missing.
- The original east stairwell that led to the offices and storage spaces on the original second floor level needs reconstruction as the yellow brick wall was destroyed. The wood stairs are demolished and will need to be reconstructed.

Engine Room – Bay 3

Approximately 30% - 35% of the historic character- defining materials in the Engine Room are still standing but will need extensive repairs and reconstruction. The other remaining historic materials are missing or damaged and will need to be repaired, rehabilitated, or reconstructed.



Figure 209. Engine Room looking south, 2020 (Helen Juergens).



Figure 210. ***Engine Room looking north in 1985. HAER Photo.***

- Fortunately, the Bolton Beam Engine and the adjacent Flywheel are all intact. The condition and treatment for these components are documented in the Treatment section of this report.

- The north and south exterior stone walls and the interior east stone wall are all still standing. However, the upper gabled portion of the east wall was destroyed.
- One of the main character-defining elements of the interior of this room, the original historic red brick wall that encases the Flywheel, is in major need of stabilization, preservation, and reconstruction.
- One second-floor original historic wood beam is still intact but the associated wood floor joists and wood floor planking are all missing.
- The door and window openings have been shored up as part of the NPS stabilization effort which has saved them from ruin. Their stabilization should be part of the immediate emergency stabilization measures.
- The condition of the original flooring is unknown, as it is completely covered with debris.
- The original gable roof and framing system is missing.



Figure 211. Original historic arched red brick at Flywheel, showing extent of deterioration and spalling of red bricks, 2020 (E. Anderson).



Figure 212. Original historic arched red brick at Flywheel, showing brick intact. 1977 (Russell Wright).

Winch Room – Bay 4

Approximately 25% - 30% of the historic character- defining materials in the Winch Room are still standing but will need extensive repairs and reconstruction. The other remaining historic materials are missing or damaged and will need to be repaired, rehabilitated, or reconstructed.



Figure 213. Winch Room looking south, 2020 (Helen Juergens).

- It appears that the multiple gears for the Winch are still intact, but a full assessment needs to be done following clean-up of the building debris, rubble, and vegetation. This assessment will need to include the equipment pit space below the Winch Room, where the multiple gears are anchored. The condition and treatment for these components are documented in the Treatment section of this report.
- The north and south perimeter stone walls are both still standing as well as the interior west stone wall that originally separated the Winch Room from the Living Quarters.
- The east red brick wall shared by the Engine Room is again, one of the main character-defining elements of the interior of this room. This brick wall is in major need of stabilization, preservation, and reconstruction.

- The second-floor material and stabilizing debris collapsed on top of the iron gears and down into the equipment pit space below.
- The door and window openings have been shored up as part of the NPS stabilization effort which has saved them from ruin. Their stabilization should be part of the immediate emergency stabilization measures.
- The condition of the original flooring is unknown, as it is completely covered with debris.
- The original gable roof and framing system is missing.
- The original south stairwell that led down to the equipment pit space and up to the second floor Living Quarters is intact but in need of repair. The wood stairs are demolished and will need to be reconstructed.



Figure 214. ***Winch Room looking south in 1985. HAER Photo.***

Missing Living Quarters – Bay 5 & 6

The now missing west end of the historic structure originally housed the part-time Creque family Living Quarters on the second-floor level and a work room for the marine railway workers on the main floor level. This is the location of the new proposed West-Infill Addition as noted in the Ultimate Treatment recommendations and could possibly serve as the new Visitor Entrance and Reception area, along with NPS staff offices.



Figure 215. Interior of the original perimeter West stone gable wall at the west end of historic structure in 1985. The previous Creque family Living Quarters were located at missing 2nd floor. Interior walls of the Living Quarters had decorative white scored plaster on perimeter walls. Evidence of window shutters and window frames. Ground floor served as work room as evidenced by the exposed, non-finished stone walls. 1985 HAER Photo.



Figure 216: Interior of the stone gable wall between the Living Quarters and Winch Room. Previous Creque family Living Quarters were located at missing 2nd floor. Interior walls of the Living Quarters had decorative white scored plaster with decorative diamonds at original ceiling level. 1985 HAER Photo.



Figure 217. Northeast corner of missing west end of historic structure in 2020. Remaining brick remnant at right side of photo in the back is the original southwest corner of the historic structure. This is the location of the new proposed West-Infill Addition as noted in the Ultimate Treatment, 2020 (Helen Juergens).



Figure 218. Original interior side of Southwest corner of missing west end of historic structure in 2020. This is the location of the new proposed West-Infill Addition as noted in the Ultimate Treatment, 2020 (Helen Juergens).



Figure 219. Northeast corner of missing west end bay, wall shared with Winch Room. Interior walls of Living Quarters had decorative white scored plaster on 2nd floor with exposed stone walls in work room on the main floor level, 2020 (Helen Juergens).



Figure 220. Original exterior side of Southwest corner of missing west end of historic structure in 2020. This is the location of the new proposed West-Infill Addition as noted in the Ultimate Treatment, 2020 (Helen Juergens).

Interior Alterations to Historic Fabric

Similar to the Exterior Alterations, the interior historic fabric has been damaged or ruined by each passing hurricane or storm event. The following are the interior alterations to the historic structure, all of which were original character-defining elements, now destroyed or damaged:

- **Damaged Red Brick Wall at Bolton Beam Engine Flywheel:** This wall is one of the most significant interior character defining elements of the historic fabric. Of all the damaged interior alterations in the building, this original red brick wall between the Engine and Winch Room is going to be the most critical to preserve. Its original craftsmanship is extraordinary, as the mason was able to construct a perfect brick arch to surround the flywheel powered by the Bolton Beam Engine. In constructing the arch, the mason was able to obtain a perfect ½-inch spacing between the inside face of the brick arch and the circumference of the outside rim of the flywheel. Amazingly this wall was able to withstand the vibrations of the spinning flywheel while the Bolton Beam Engine and Winch gears were hoisting a ship out of the harbor waters.

The bricks have lost their strength as the protective fired face of the bricks has eroded away during storms, causing many to spall and crumble. Likewise, the mortar at all the joints has eroded away to the point where very little can even be seen on the wall surface. Many of the bricks are falling out of the wall, especially at the flywheel. Because this wall is an integral part of the Engine Room and ultimately a part of the Bolton Beam Engine. The restoration of both sides of this wall is paramount to regaining the structural and visual integrity of this interior wall, which will aid in reestablishing the original character of the historic building.



Figure 221. Red brick wall with Flywheel, 2020 (Helen Juergens).

Interior Destruction of the 2nd Floor Framing System

The second floor of the original historic structure was a significant part of the building's use, from its initial construction to when the Creque business closed.
The second floor housed the support services to the engine including the offices, storage, and Creque family Living Quarters.

In each of the interior building bays, the original wood framing of the entire second floor level, including the historic wood beams, wood floor joists, and wood floor planks were damaged or destroyed from multiple storms and a fire. Not only will the restoration and reconstruction of the entire second floor provide for a compatible new use, it will more importantly become an integral part of the new structural system for the building. To preserve as much original historic fabric, some of the original wood members may be able to be reused in the new structure, but that determination will need to be made by a

structural engineer once the site is cleared and cleaned of all the debris.



Figure 222. Interior of Winch Room, facing south, 2020 (Helen Juergens).

- **Destroyed Gabled Stone Support Walls:**
  The 1977 HABS drawings show four original stone walls that separated the building into bays for the engine equipment. Currently the East End stone wall in the only one left standing in its entirety. Originally the tops of these structural stone walls were built to carry the structural ridge beam for the gable roof. This was an efficient way to design the main structural system for the roof. The ridge beam then supported the wood roof rafters that tied into the top course of the exterior stone perimeter walls. The Ultimate Treatment recommends two alternatives where these walls would be rehabilitated and incorporated into the new roof structure. Rehabilitation is because the original stones that came down during the storms are still lying inside the building where they fell. Both alternatives for the Gable Roof treatment will regain some of the original historic character to the building.

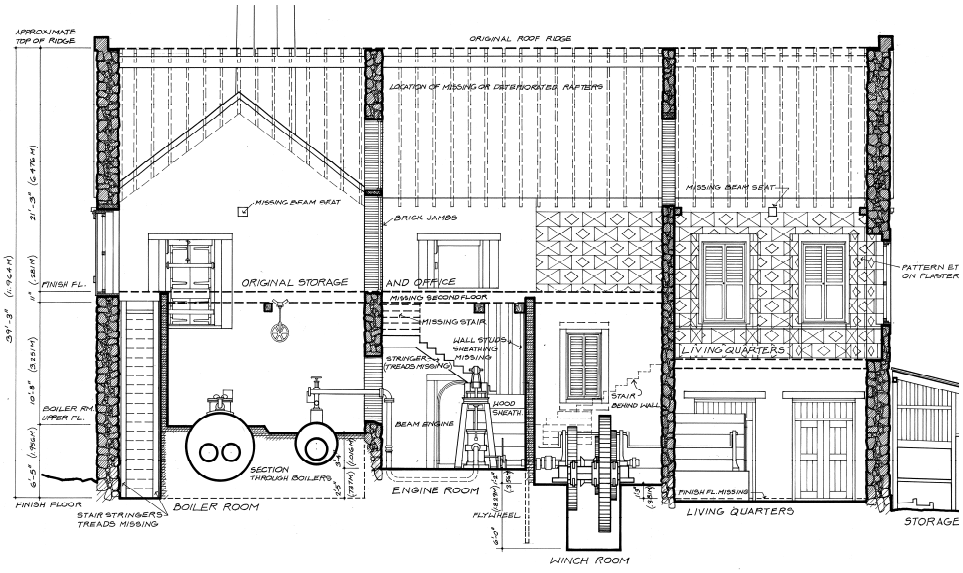


Figure 223. Head House and Residence Section, 1977 HABS drawings.



Figure 224. Structural bracing. 2020 (C. Cheney).

- **Demolished Interior Yellow Brick Wall at East Stairwell:**
  The interior yellow and red brick wall, which separated the Boiler Room and the eastern Stairwell, was brought down when the 60-foot-tall brick chimney fell during the Hurricane. This event also destroyed the wood stairs at this location.

  The original bricks from the wall and from most of the chimney are still lying in the eastern stairwell. This wall is unique to the history and character of the building, as it exemplifies the different brick and stone materials that were used to the construction of the building.

  Again, historical data suggests that many of these bricks and stones were brought to Hassel Island as ballast that weighted the fully loaded ships that came mainly from Europe. As is stated in the 2016 Foundation Document, "*When Europeans arrived, the Virgin Islands became a melting post, inhabited by people from around the world who came to make a new life on the islands. These colonial settlement sate form the 17th century through the 19th century."*

These yellow and red bricks, a standard building material in Denmark, England, and elsewhere in Europe at the time, represent the multiple countries that played a part in international shipping industry of the islands. The building is a patchwork collage of this history.



Figure 225. Yellow and red bricks in the wall separating the eastern stairwell and the Boiler Room, 2020 (Helen Juergens).

Building Systems:

The Ultimate Treatment recommendations for the stabilization, preservation, and future use of the Creque Marine Railway Head House and Cistern include the establishment of a visitor's center at the site. Building Systems will need to be enhanced in order to accommodate for lighting, plumbing, and some accessibility options. This Ultimate

Treatment recommends for the installation of electrical and water services in the immediate area to facilitate future use as a visitor center.

Electrical
First, electrical energy requirements for the new visitor center will have to be established during the design phase in consultation with the A/E firm. A small commercial photo-voltaic system that would be ground mounted with battery or gasoline back-up system would be appropriate for the location and scale of the project. As an alternative, the VI Water and Power Authority (WAPA) could be contacted to provide land line power as a back-up to for the Creque Marine Head House site.

Water
It is recommended that the existing historic cistern to the south of the Head House be rehabilitated as outlined in the Recommendations for Treatment section of this report. Stabilization and restoration of the original plastered brick cistern foundations, cast iron containment tank, and 2011 roof structure would put the cistern back in operable condition. The cistern has a capacity of 44,000 gallons which should be sufficient to supply the visitor center's water needs. The work would involve installing a model water filtration and treatment system.

Plumbing
It is also recommended that a small public restroom be built on site to serve the visitor center. The restroom would most likely use a septic system. Any new restroom construction must be compliant with 2010 ADA and 2009 ICC/ANSI Standards. The installation of the septic system would follow the Virgin Islands Department of Planning and Natural Resources Rules and Regulations (in Appendices). The restroom would need to be sited so as not to have any adverse effect on the historic integrity of the Creque Marine Railway setting.

Vegetation Management:

Rehabilitation and future use of the Creque Marine Railway Head House and Cistern will require a Vegetation Management plan. Vegetation Management will allow for easier visitor access to the Creque Marine Railway site and Hassel Island trail system, improved viewsheds from Charlotte Amalie across the harbor, and greater preservation of the historic landscape. By managing vegetation across the site, the historic building fabric of the Head House and Cistern will be better protected from the destructive forces of plant growth. Guidelines can be drawn from the NPS document *Vegetation Removal Guidelines from Historic Structures on St. John and Hassel Island* (see appendix). The following actions are recommended as part of the Ultimate Treatment Recommendations for the site:

Clearing vegetation along the edge of pathways and trails
When using mechanical means of clearing, crews should be mindful where historic ruins are present. Sensitive areas should be cleared by hand so as not to disturb historic elements of the landscape. This will be important around the marine railway leading up to the Head House as well as the ramps and steps on the western side of the site. Any vegetation cut along a pathway should be cut flush with the ground to avoid trip hazards.

Clearing vegetation around historic sites

Safety precautions are vital when working around and in historic ruins where building elements may be unstable. Before clearing a structure be sure to evaluate the risks and dangerous areas that must be avoided and never remove vines or plants by pulling on them as this can result in a collapse and will assuredly result in damage to the building.

As a general rule on NPS property, vegetation is removed no more than ten feet around a structure. It is important to establish the limits as to what should be removed with a park manager.

As with the trails, caution should be taken around historic buildings and ruins and sensitive areas should be cleared by hand. Within one foot of an historic wall that contains any soft masonry materials such as historic brick or plaster only hand tools such as loppers, hand saws and clippers should be used. If a structure is made of only stone, then a weed-whacker can be used next to the building without damaging the structure. Clearing away from the walls past the one-foot zone can be accomplished with hand tools and weed-whackers where historic fabric is not present. Clearing inside the structure's walls should be accomplished with only loppers, hand saws and clippers and no plants should be pulled as this could be damaging an historic floor that may not be obvious. Mowers can be used were approved for large open areas. The large open space adjacent the slipway can be mowed and or weed-whacked. Removal of plants from the slipway and all masonry ruins can be done with hand tools such as loppers, clippers and hand saw.

Clearing vegetation growing out of historic structures

Embedded roots can damage historic fabric, and in some cases, removing them can further damage masonry materials. In general plants that are one inch or less in diameter that are growing out of the walls have not reached the point where cutting and killing them with herbicide would harm building materials. However, the crew supervisor should emphasize the need for each team member to inspect first to ensure the cutting of the plant is the appropriate action. If the plant is two inches in diameter or more then the plant's removal should be evaluated by a supervisor or park employee to determine if its removal would cause further damage. Plants should not be forcibly pulled out of historic fabric for the safety of the crew and the preservation of the structure.

Procedures for Herbicide use

The use of herbicide is recommended for the elimination of non-native plants and the removal of small plants that are not deeply embedded in historic fabric. According to the *Vegetation Removal Guidelines*, herbicides approved for use in the park include: garlon, roundup, or rodeo and milestone. Garlon is effective in treating most trees and bushes, but only milestone 100% stump application works in treating tan tan. Roundup and rodeo work on grass such as guinea grass. It is recommended that prior to application of any chemical on walls, physical removal of vegetation should be attempted. It is also recommended to test the impact of the chemical on the masonry material prior to application.

Each crew member should receive training by a supervisor on safe herbicide use and application on site should be supervised. Personal protective equipment should be worn by clearing crew and herbicides should only be used according to label directions. See the *Vegetation Removal Guidelines* for a complete list of procedures.

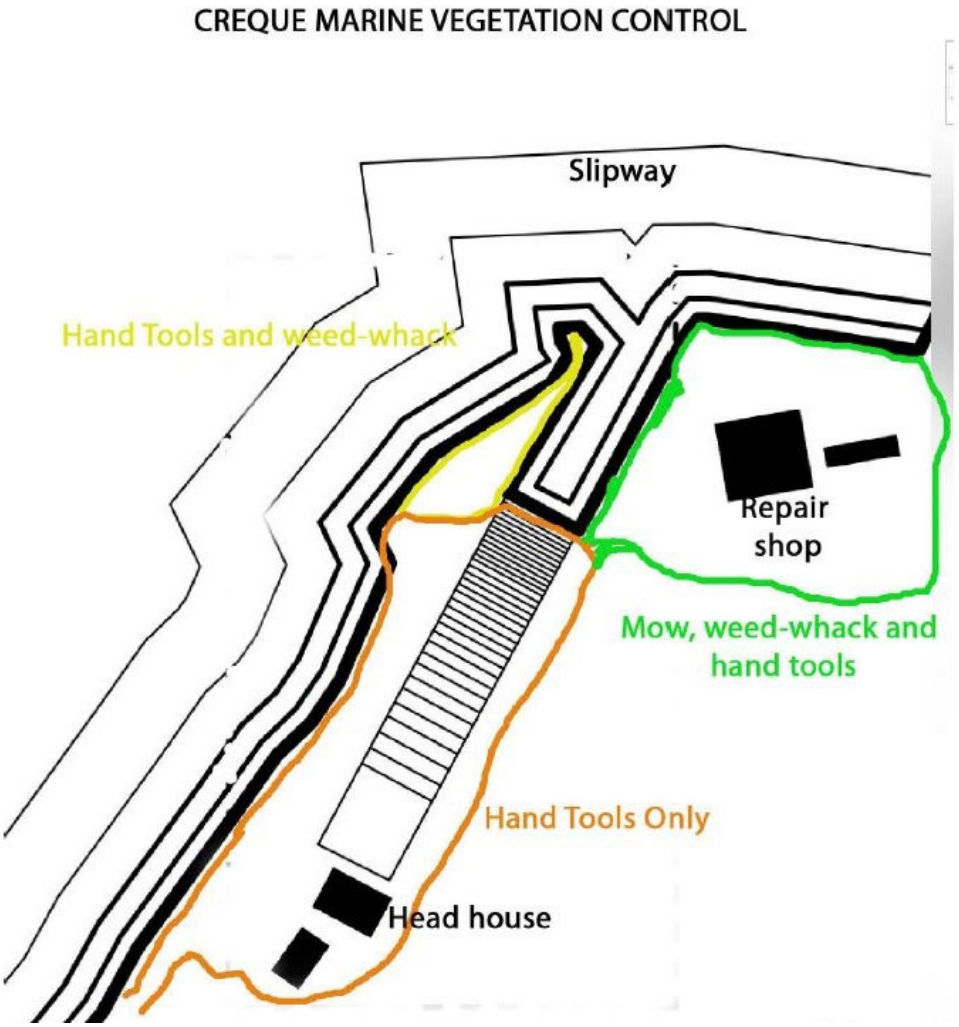


Figure 226. Vegetation Management diagram from the NPS document Vegetation Removal Guidelines from Historic Structures on St. John and Hassel Island.

Setting, Grounds, and Approaches:

The Creque Marin Railway Head House and Cistern are part of a larger cultural landscape on Hassel Island. The complex includes the slipway with access from the harbor, the railway which guided ships out to dry dock, the repair shop and carpenter shop filled with equipment, and the surrounding landscape populated by coaling equipment, mooring balls, and dive bells. The complex is connected to the Hassel Island trail system via a set of steps to the west of the Head House. The cultural landscape component is integral to the significance of the historic resource as it informs on the historic function of the Creque Marine Railway Head House. The surroundings serve as a historic vernacular landscape that evolved through use reflecting the physical, biological, and cultural character of its occupancy. Function plays a significant role in vernacular landscapes, as is certainly the case with the Creque Marine Railway.

Any alterations to the landscape surrounding the Creque Marine Railway should be undertaken in consultation with an archaeologist or historic preservation architect as well as a historical landscape architect. Consideration must be taken for the historic viewsheds from Charlotte Amalie across the Harbor towards Hassel Island. Elements of the Ultimate Treatment recommendations that could have an effect on the setting, grounds, and approaches of the Creque Marine Railway complex include: visitor access pathways, lighting and signage, the construction of restroom facilities, installation of electrical utilities, and of course, alterations to the Head House itself. When designing any onsite docks, pathways, or ramps required by the new use as a visitor center, the new elements should be as unobtrusive as possible and assure the preservation of historic relationship between the building and the landscape. The recommended rehabilitation and repair efforts centered on the Head House described in this report will serve to reestablish the historic silhouette of the building and improve viewsheds of the historic grounds as a whole. The gable roofline and chimney were once visible from across the harbor and served as a landmark for the site.

The remainder of the vernacular landscape is largely intact with the slipway in functional condition, and much of the original equipment and utilitarian objects still in place. Focus, therefore, should be placed on protecting and maintaining the cultural landscape. The Ultimate Treatment recommends the stabilization, preservation, and rehabilitation all structurally stable and intact historic site elements including the concrete stairs, ramps, landings, and thresholds. The greatest threat to the integrity of the grounds is vegetation overgrowth which obscures the historic elements of the landscape and disturbs objects in situ. This report recommends that a vegetation management plan be instituted under the supervision of the Park for regular maintenance of the grounds, as detailed in the section above.

Visitor Use and Appropriate Activities

Interpretive Program

Visitor Use is directly tied to the NPS developed Interpretive Plan for the Creque Marine Railway Building, which has yet to be completed. Success of the visitor experience to the building will be dependent on a simultaneous and coordinated effort between the development of the Interpretive Program and the Building Program, which will dictate the Visitor Uses and Appropriate Activities.

The VINP staff has established an interpretive program and trail system for Hassel Island, which highlights the multiple historical and cultural resources throughout the island. In addition, the *2016 Foundation Document* sets forth the unique and varied historical topics and cultural resources that can be part of the interpretive program and displays at the Creque Marine Railway Head House. The history and cultural resources of Hassel Island are quite different from the rest of the VINP, which is rich is the marine and terrestrial resources. The majority of Virgin Islands National Park is on St. John with Hassel Island serving as an "outpost." Currently, the Park's headquarters building, curatorial and research spaces, etc. are all located on St. John. These programming elements on St. John would need to be considered when developing a building program for activities and space utilization by the Park or by park partners, or historic leasing. Interpretive themes for Hassel Island from the *2016 Foundation Document* include:

> ***"Hassel Island.*** *Strategically situated along the western edge of St. Thomas's harbor, 135-acre Hassel Island provides a glimpse into prehistory and history of the Lesser Antilles. Prehistoric sites on Hassel Island are representative of human occupation of the Virgin Islands prior to European contact. In addition, archeological sites and historic structures reflect the expansion of the Danish colonial plantation system through the 18th and 19th centuries. Other sites on the island include those related to the British occupation of Hassel Island as well as preserved remnants of the only Napoleonic War sites on U.S. soil. These Napoleonic War sites represent one of the most diverse military landscapes of this era in the Caribbean and include forts and batteries, barracks, hospitals, a pharmacy, guardhouses, magazines, wharfs, blacksmith works, cookhouses, latrines, cisterns, and a cemetery.*
>
> *Historical remains on Hassel Island also reflect the mid-19th century shipping and maritime refitting industries. For example, the Creque Marine Railway hauled out and serviced ships from around the world and is one of the oldest and largest surviving marine railways in the world. Britain's Royal Mail Steam Packet Company was one of the first successful international mail delivery services using steamships, and the Virgin Islands was a focal point for the delivery of passengers and mail across the Americas."*[107]

[107] U.S. Department of Interior, National Park Service, Foundation Document Virgin Islands National Park, *Virgin Islands Coral Reef National Monument, U.S. Virgin Islands, December 2016*



Figure 227. Interpretive trail map from the 2016 Foundation Document

The Building Program would define the exact sizes, uses, quantities, and quality of the spaces, coupled with the code & technical requirements. This effort would become part of the decision-making process that helps to identify the final scope of A/E work to be performed, which is to be evaluated against the project budget. This programming

process for both the Interpretive Program and the Building Program is instrumental in garnering agreement and buy-in from all the multiple and various types of stakeholders.

Appropriate Activities for Interpretive Program:

From information in the *2016 Foundation Document* and from comments of the VINP Park staff, the initial, projected appropriate activities for the Creque Marine Railway Building could most likely include:

- Display & Interpretation of the in-situ Bolton Beam Engine and all the related Equipment. Option: Refurbish the Bolton Beam Engine motor and drive train to operable condition, utilizing gas as in its later years.
- Interpretation of the Creque Marine Railway Head House and Cistern through the history of the Creque family, the business, the marine railway function and its historical context within Hassel Island and the construction/workmanship/materials of the building.
- Displays and Interpretation of the entire History of the Hassel Island from Pre-Historic sites to the present.
- The starting point of a self-guided trail tour of Hassel Island which has already been established by the NPS staff.

Visitor Use

There are multiple uses that can be accommodated in the original historic building floor layout, and the following are those visitor uses that could easily be installed in the existing layout without much change to the historical character of the building.

Ground Level: Existing Original Historic Building

- Display galleries and temporary exhibitions

Ground Level: West End Infill Addition (Previous Creque family Living Quarters)

- Entry/Information
- Bookstore/Sales
- Outdoor Seating Area
- Restrooms

Upper Level: Existing Original Historic Building

- Potential tour through Research or Curatorial area

Upper Level: West End Infill Alternative 2

- Potential Public/Park shared Conference Room area
- Park collections management and storage

Upper Roof Deck Level: West End Infill Alternative 3

- Outdoor interpretive display gallery or temporary exhibits
- Roof Deck viewing & refreshment area
- Ship Navigation/Night Sky – daytime and evening Interpretive Programs

Park Administrative Use

Interpretive Program:
As with the Visitor Use, the Park Administrative Use goes hand in hand and is directly tied to the NPS developed Interpretive Plan, which has yet to be completed. Refer to the Visitor Use and Appropriate Activities section for some initial concepts that could be part of a future Interpretive Plan.

Park Administrative Uses:

Should the Ultimate Treatment recommendation of this report be accepted, the Park's Administrative Uses for the building, will be based on an NPS approved final Interpretive Program, and incorporated into the Ultimate Treatment final Building Program. As stated above, from information in the *2016 Foundation Document* and from comments of the VINP Park staff, the initial, projected administrative uses that would be needed for the Park staff may include any of the following:

- A space for the Park to work with Danish Interns who have done research in Danish archives, thereby expanding the historical knowledge base of the park.
- A space for the Park to augment inadequate storage for current collections.
- A space to support the research outlined in the Opportunities for Scientific Studies Foundation Document (Page 10)
  "*The historic landscape is filed with sites from the development of prehistoric culture to early European and African settlements that offer opportunities for research on slavery, epidemic hospitals, fortifications, shipwrecks, maritime operations and industrial evolution"*

With the potential types of Interpretive programs, displays and/or research, mentioned in the Visitor Use and Appropriate Activities section above, it can be projected that the types of spaces that would be needed to accommodate such programs for **Park Administrative Use**, could possibly include any of the following:

Ground Level: Existing Original Historic Building
- Prep/Storage area for Display galleries and temporary exhibitions

Ground Level: West End Infill Addition (Previous Creque family Living Quarters)
- Entry/Reception/Information Desk
- Park Staff Office & Security
- Outdoor Research area

Upper Level: Existing Original Historic Building
- Research and educational facilities or lab
- Park collections management and storage
- Curatorial area
- Indoor research and scientific study area

Upper Level: West End Infill Alternative 2
- Park Office(s) & Support facilities
- Research and educational facilities or lab

- Park collections management and storage

Upper Roof Deck Level: West End Infill Alternative 3

- Support facilities & storage
- Park artifact storage

Visitor Accessibility and Safety

Due to the extensive amount of building debris that has filled the finished floor levels of the interior rooms of the historic building, this accessibility assessment is based on information contained in the 1977 HABS drawings. The actual floor elevations will need to be confirmed once the debris has been removed from all the interior floor levels, prior to, or as part of, the initial design phase in order to have a cohesive visitor accessibility plan.

Existing Historic Structure Accessibility:

Visitor Accessibility would first and foremost be achieved through analysis of the visitor traffic flow pattern from the visitor arrival point at the slipway, walk up to the building following the historic railway, visitor arrival at reception, movement through the interpretive displays, and continuation to the outside trailhead to begin the Hassel Island trail system hike.

The site grades from the arrival point at the slipway to the building following along the railway are relatively flat with a slight slope up to the Head House. Grades will need to be surveyed during the design phase to ensure they meet ADA standards and areas possibly regraded as necessary.

Once at the main entry point to the building on the north facade, there are two current entrances that appear to be accessible, but the site grades at both locations will need to be confirmed. The first accessible entrance point is at the original concrete ramp that leads to the main entry way into the Winch Room, which will be one of the main display areas. From the Winch Room there is a doorway on the red brick historic wall that leads to the Bolton Beam Engine Room, which will be another main display area. From the 1977 HABS drawings, it appears that there is a floor elevation change of approximately 3-4 inches at the door threshold, however, this will need to be confirmed after the interiors have been cleared of debris. It is recommended that a ramp meeting ADA requirement be installed at this location, but this will need to be part of the design effort to ensure there is enough floor area and clearances within the Winch Room display area to install an ADA ramp.

The second accessible entrance point appears to be at the two historic arched doorways into the Boiler Room. The finished floor elevation of the Boiler Room, again one of the main display areas, is about 3 inches above grade which can be seen at the door thresholds on the arched iron doors. Because this is only a 3-inch rise, it would be possible to install a new ADA ramp on the exterior of the building without taking away from the historic character of the structure. These considerations allow for ADA accessibility to the three interpretive display rooms; Winch Room, Engine Room and the Boiler Room.

Once in the Boiler Room, there is an approximate 18-inch rise between the finished floor of the Boiler Room and that of the adjacent Engine Room. The rooms are by a 3-foot-wide door with a set of wood stairs that has 3 risers and 2 treads. In order to provide ADA access between these rooms a new ramp approximately 18-foot-long would need to be installed inside the Boiler Room. When a visitor enters the Boiler Room there is an open area approximately 14-foot-wide × 12-foot-long just in front of the brick platform that encases the two boilers. This open area is where the marine railway workers shoveled the coal into the two boilers. If an accessible ramp were installed in this open floor area, it would take up quite a bit of the open floor area and would compromise the feeling and character of how the space was used historically.

Due to the fact that once inside the Engine Room, the Boiler Room can visually be studied from the existing historic door opening in the dividing wall and that the Boiler Room can be accessed from the exterior of the building, it is not recommended that an ADA ramp be installed inside the Boiler Room to provide access to the Engine Room. This suggestion is an ADA concern that should be given further study in the design phase, once the Interpretive and Building programs have been finalized.

West End Infill Addition Accessibility:

Should the Ultimate Treatment recommendation of constructing an infill addition at the west end of the building as recommended, ADA accommodation would become an integral part of the new addition. The location of the main front entry into the building would be determined in the initial design phase once the Interpretive Program and Building Program have been approved.

Logically the new visitor entrance to the refurbished facility would be through the new west infill addition, with the interpretative display rooms, Winch Room, Engine Room, and Boiler Room behind the visitor reception area. However, this is a suggestion only, and the layout will be considered in the initial design phase, once the Interpretive Program and Building Program are completed. This new entry could easily be made ADA accessible through site grading and possible ramping, as the adjacent site to the new addition has just a minor slope. Once inside the new west end infill addition, access to the Winch Room, whose elevation is 1 foot 3 inches higher than the original finish floor elevation of the now missing original historic west end of the building could be accomplished through three options:

Option 1

Ramp - Access from Existing Historic Structure at Winch Room to New West Infill Addition

Design the west infill addition so that the ground floor elevation aligns with the ground floor elevation of the Winch Room, for access between the two spaces. This would eliminate the need for a ramp inside the new addition. A complete analysis and discussion would need to ensue regarding this solution as it would not be in keeping with the original historic grade, aligned with the intent of *The Secretary of the Interior's Standards for the Treatment of Historic Properties.*

Option 2

Ramp - Access from Existing Historic Structure at Winch Room to New West Infill Addition

The other accessibility option, that would be in adherence to *The Secretary of the Interior's Standards for the Treatment of Historic Properties*, could be to set the new addition's ground floor level at the historic floor level, 1 foot 3 inches below the Winch Room, then add an interior ADA ramp, approximately 15 feet in length for access between the two rooms.

Again, this would need further study in the design phase, as this new addition utilizing the original historic floor plan would be approximately 830 square feet in area. It would need to be studied in the design phase to see how the visitor services and the park administrative services could fit into the new infill addition, along with a new ADA ramp.

Option 3

Elevator or Lift – Access from Ground Level of New West Infill addition to New Second Floor Level

At the new west infill addition, it is recommended that the design team review the NPS program requirements for a reconstructed second floor in conjunction with the ADA accessibility and building code egress requirements. Depending on the use of the space, ADA access may not be required. This will need to be determined as part of the Schematic Design process by the A/E Team. However, should the Park use for the second-floor space necessitate ADA access, then a hydraulic lift or hydraulic elevator could be installed. Should Gable Roof Alternative 3, under the Ultimate Treatment options be selected, this elevator could provide access to the proposed roof deck as well.

Visitor Safety

Upgrading the historic structure to ensure it meets the intent of the applicable building, life-safety, and fire codes will need to be considered during the initial design phase. This phase will require a complete and thorough code analysis of the building based on the building construction type, the occupancy, and the building uses. When evaluating the code requirements and their optional solutions, it is also critical to evaluate how those solutions do not damage or take away from the historic character of the building and are sensitively designed to respect the restoration period of the building.

In addition, Visitor Safety to the Creque Marine Railway Head House should be part of a broader NPS Safety Plan that protects all visitors, park staff, support personnel and stakeholders, while they are experiencing the multiple natural and cultural resources in the Virgin Islands National Park.

Resilience to Natural Hazards:

Located on Hassel Island in the Caribbean, the Creque Marine Railway is subject to a variety of natural hazards ranging from exposure to high salinity rain and fast-growing vegetation to powerful storms and rising sea levels. Changing climate affects the preservation and maintenance of cultural resources. Several recent documents set out approaches for the NPS to address current and future effects of climate change including: *Climate Change Response Strategy* (2010), *A Call to Action* (Action Item 21: Revisit Leopold 2011), *Revisiting Leopold: Resource Stewardship in the National Parks* (2012), *Green Parks Plan* (2012), *Climate Change Action Plan* (2012), and the forthcoming Cultural Resources Challenge. Effective management of cultural resources in an era of climate change requires adaptive strategies. The two main threats to the Creque Marine Railway complex are flooding from rising sea levels and increasingly strong hurricane winds.

- **Flood Adaption for Historic Properties**

  Design plans for the Ultimate Treatment proposal should reference the *Guidelines on Flood Adaptation for Rehabilitating Historic Buildings* published by the NPS in 2019. Before undertaking any work to adapt a historic building or landscape to be more resilient to potential flooding, research about the actual flood risk should be conducted. The design should take into account the characteristics of the potential flooding, such as the direction the water will likely flow, the expected speed and depth of the water, the duration of the flood, whether there will be wave action, the potential for water-borne debris, and the salinity, toxicity, or cleanliness of the flood waters. The applicable Federal, state and local code requirements and regulations must also be considered.

  Spaces, features, materials, and finishes of the historic property affected by the flooding or the proposed adaptive treatment should be documented. The property's existing capacity to sustain and recover from flooding, as well as its physical condition and use, should be evaluated. Those spaces, features, and materials that are important to the historic character and significance of the property should be identified for retention and preservation. In the case of the Creque Marine Head House, critical attention needs to be paid during the design phase to the site drainage, the water table levels, and the foundation design, in order to ensure effective drainage away from the original historic brick and stone walls.

- **Design Guidelines for Hurricane Resistant Buildings**

  Design plans for the Ultimate Treatment proposal should reference the *Design Guidelines for Hurricane Resistant Buildings* published by the Legislature of the Virgin Islands in 2017 as well as the Florida Building Code for hurricane resistant standards. Any new structure and/or roof proposed for the Head House should conform to modern building regulations concerning wind resistance. The proposed gable roof should have proper materials, anchorage, and fastenings. Every major component of the structural system must be securely tied to each other and to

the foundation so that there is a direct structural link between the roof and the ground. The existing masonry walls should be reinforced to withstand strong winds and prevent any further loss due to collapse. Likewise, the reconstructed chimney should be internally reinforced to provide structural stability.

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APPENDIX A. SUPPLEMENTAL DATA

APPENDIX B. EXISTING CONDITIONS DRAWINGS

APPENDIX C. HABS/HAER DRAWINGS

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