Fort Monroe
Mothballing Plan



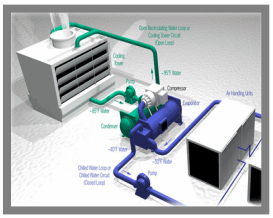

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Table of Contents

List of Figures

List of Tables

PREFACE

This mothball plan is intended to guide the care of those historic structures no longer in continuous use following the September 15, 2011 BRAC mandated closure of Fort Monroe in Virginia. This plan follows guidelines and recommendations set by *Preservation Brief 31: Mothballing Historic Buildings*, the *Historic Fortification Preservation Handbook* (National Park Service, 2003), *The Secretary of the Interior Standards for the Treatment of Historic Properties,* and the National Trust for Historic Preservation. Additional Preservation Briefs on more specific topics have been referenced as required.

Mothballing is defined by *Preservation Brief 31* as the "*[deactivation] of a property for an extended period of time"* and is generally implemented when funds are no longer available *"to put a deteriorating structure into usable condition"*. This type of mothballing will not be necessary for Fort Monroe: the buildings have been recently occupied; are in good, stable condition and in locations where they can be consistently monitored. Following the suggested alternative offered by *Preservation Brief 31* that, *"regular activity and monitoring….are generally preferable to mothballing"*, the mothballing plan for Fort Monroe is structured around regular building inspection and routine maintenance.

As of March 2011, it had not yet been determined which structures at Fort Monroe will be closed. Therefore this plan is designed to give generic guidelines for the maintenance of various structures and equipment. When those structures to be temporarily closed are identified a specific plan can be created utilizing the elements presented here. For those buildings whose needs go beyond basic maintenance, it is advised for caretakers to enlist the aid of preservation specialists to ensure proper care and management (*Brief 31*).

In 2010 National Historic Landmark District and individual National Register of Historic Places nominations were submitted to the state of Virginia. Relevant data from those documents pertaining to the architectural and historic details have been incorporated into this plan. Additionally; photographs and illustrations have been included to aid in the comprehension of the text.

It will be the responsibility of the user to implement the appropriate information contained in this report when responding to any defects that may occur within the buildings and surrounding landscapes. Caretakers should consult the professional advice of experts when needed.

The remainder of this document is divided as follows:

Chapter One gives a brief introduction to the Historic and current context of Fort Monroe.
Chapter Two details a general mothballing procedure to be used at Fort Monroe.
Chapter Three presents guidelines for ventilating the building, maintenance of the mechanical systems, landscaping, animal control and the inspection of interior/exterior of the structures.
Chapter Four offers guidance on structural systems and basic repairs.

Appendix A: Detailed building descriptions of all structures within the boundary of Fort Monroe.
Appendix B: Examples of non-building specific inspection forms.
Appendix C: General check-list for mechanical system inspections.
Appendix D: Heating and AC units found in buildings.
Appendix E: Secretary of Interior Standards for the Treatment of Historic Properties.
Appendix F: Preservation Brief 31 – Mothballing Historic Structures.

1.0: INTRODUCTION AND HISTORIC SUMMARY

In 1609 Fort Algernon was the first fortification built in the area then called "Old Point Comfort". The fort was of an earthwork construction which accidentally burned down in 1612. A masonry-built stronghold, Fort George was built in 1727, replacing the poorly repaired remnants of Fort Algernon. Unfortunately this fort was destroyed in 1749 by a hurricane.

In April 1798 the Secretary of War, James McHenry, appealed to Congress for federal funds to extend the costal defenses of the country. After the attack on and burning of Washington D.C. during the War of 1812, the importance of coastal defenses was again emphasized. Between 1819 and 1834, Fort Monroe was built on the southernmost tip of Old Point Comfort. The complex, named in honor of U.S. President James Monroe, was larger than previous fortifications and made of stone. Designed by French engineer Simon Bernard, it is the largest Third System fortification in the country and features a water-filled moat and a 40-gun water battery (this has since been removed).

During the American Civil War Virginia became a Confederate state; however, Fort Monroe remained in Union control. The fort was nicknamed Freedom's Fortress following General Butler's historic Contraband Decision. During and after the Civil War advances in ballistics technology rendered the first generation of masonry fortifications obsolete. By the end of the 19th century concrete and earth gun emplacements known as the Endicott period batteries were built at Fort Monroe.

From 1858 to 1907, Fort Monroe was home to The Artillery School of Practice. In 1907 the School of Submarine Defense from Fort Totten was integrated creating the Coast Artillery School which was active until 1946. After the Second World War the utilization of the Fort changed from defensive to training. Since then the fort has been the home for Headquarters for the Army Ground Forces (1946)and Continental Army Command until 1962 (CONARC was involved in major military missions since World War II); CONARC evolved into United States Army Training and Doctrine Command (TRADOC) after 1973.

Today, Fort Monroe supports a population of approximately 3,100 people: 1,105 in uniform, 1,991 civilian/contract employees, and 814 family members. Fort Monroe is a National Historic Landmark and includes 189 Contributing Elements to the Fort Monroe National Historic Landmark District. There are four Army-owned buildings, as well as two non-Army owned buildings listed on the National Register of Historic Places.

In May 2005 the Department of Defense recommended Fort Monroe for closure. A Reuse Plan of the Fort by the Fort Monroe Authority (FMA) was officially adopted August, 2008. The plan recommends the best use of the existing resources after the base closes and returns to the Commonwealth of Virginia in September 2011.

The effort of the Commission is guided by three priorities:

- Keep Fort Monroe open to the public for educational and cultural purposes.
- Advance economic sustainability.
- Respect the rich history and contributions of this fort and region to the United States.

In June 2009 the Army, along with 32 Consulting Parties, signed the Fort Monroe Programmatic Agreement (PA), a legal document which establishes the preservation guidelines to help manage the historic properties which make up the Fort Monroe NHL District after leaving federal ownership. The development of a mothball plan is a requirement of the Programmatic Agreement.

2.0: MOTHBALL PROCEDURE

The mothballing plan for Fort Monroe is intended to preserve the historic structures in their existing condition while they are unoccupied by preventing damage from the elements, pests, vandalism, or neglect.

"*Preservation is defined as the act or process of applying measures necessary to sustain the existing form, integrity and materials of an historic property. Work, including preliminary measures to protect and stabilize the property, generally focuses upon the ongoing maintenance and repair of historic materials and features rather than extensive replacement and new construction.*"(*Secretary of Interior Standards*)

Unless it is critical to the survival of the structure, there will be no extensive or major repairs while the building is unoccupied. If repairs are deemed necessary the evaluation by a subject matter specialist shall be sought. The specialist, as required by the terms of the Programmatic Agreement shall consult with the Army or Fort Monroe Historic Preservation Officer (FMHPO), as appropriate, in order to avoid or minimize adversely affecting significant historic materials and features. Once a treatment plan is decided upon, the Army or FMHPO, as required by the terms of the PA shall consult with the SHPO for concurrence, and the other consulting parties for review and comment. The structures should not be boarded up and left alone for an undetermined amount of time; rather each building should be maintained in a stable state ready to be converted back into a useable condition with minimal effort. The responsibilities of the caretakers are to use the mothballing plan to prevent any serious deterioration while the structures are unoccupied. The subsequent plan is divided into three stages:

- Stage One: Stabilize those structures slated to be closed.
- Stage Two: Perform a Condition Assessment.
- Stage Three: Perform regular building inspections and maintenance.

Details of each stage and how to implement are discussed in the remainder of this section. This plan was designed off the premise that the buildings are in good, stable condition prior to mothballing. It also takes into account that the buildings are marketable from a commercial or residential standpoint and that their preservation is a financial investment by the local reuse authority. The buildings are also protected by a signed Programmatic Agreement that has no expiration date, therefore, the guidelines laid out by Preservation Brief 31, where designed to "*protect buildings for periods of up to ten years*" are appropriate and relevant. If the marketability of these buildings changes and at 10 year preservation span will be exceeded a more aggressive mothballing plan be established.

2.1: Stabilization

The first stage in the mothballing process is stabilization, which is designed to "*slow down the deterioration of the building while it is vacant*" (*Brief 31*). Stabilization can include but is not limited to: "*structural reinforcement, weatherization or correcting unsafe conditions*" (S*ecretary of Interior Standards*). It is important to remember that generally when structures are mothballed they are already in a deteriorating condition and stabilization is designed to make the structure safe in order to perform the condition assessment. As of September 2010, large-scale stabilization is not anticipated because the buildings have been continuously occupied and maintained until recently (September 2011). However; small-scale stabilization is necessary to get the structures ready for a period of reduced activity. Furthermore, initial stabilization places a structure in a condition which not only retards further deterioration but can also be maintained for the duration of the vacant period. Unless absolutely necessary (i.e. a collapsed roof) any stabilization required should be performed to detract as little as possible from the overall historic character of the building (S*ecretary of Interior Standards*).

Table 1: Basic Stabilization

Pest Control	Inspect for damage or intrusion Seal accesses; close chimney flues, vents, grills and louvers. When appropriate install wire screens over accesses
Electric	Shut off breakers for mechanical systems **excluding** those required for mothballing (i.e. HVAC)
HVAC	Winter: set thermostat to 56-58 degrees to avoid freezing Summer: set thermostat to 78-80 degrees to avoid mold and mildew *Walk-In Freezers shall be left at the minimum temperature to keep the air conditioned and then have their doors secured by padlocks
Landscaping	Irrigation systems tied to buildings shall be attached to an air compressor and blown out of all standing water. The master valve on the systems shall be locked out
Water	Turn off water supply; drain pipes and sink traps fill with antifreeze Water coolers and fountains shall be valved off and drained
Housekeeping	To aid in future inspections, clean/sweep all floor and surfaces; remove all appropriate furniture
Security	Evaluate points of entry for potential illegal access and vandalism. Provide either roving security, automated sensors with local alarms or board up and secure window and all but one door with plywood.

2.2: Condition Assessment

A condition assessment is the second step in the mothballing process; taking place after identifying and stabilizing structures for temporary closure. The assessment is designed to establish a baseline record for the "as is" conditions which are to be maintained and compared to during scheduled building inspections. Each structure is to have a packet, binder or some other organizational system to house all building information and each inspection form. It is recommended for this to accompany the team during inspections. All structures are to have a site plan with each room being identified (i.e. a number), along with a general location map. Furnishings need to be removed prior to starting the assessment unless they are to stay as part of the mothballing plan. (*Brief 31*)

The assessment requires both written and photographic documentation most of which is to be obtained during the initial building inspection. The documentation may incorporate information previously gathered, such as that found in the Appendices; however, a current detailed site inspection is still mandatory. The building inspection is to also include any concerns regarding building security and the specific mechanical systems in operation. It is important to remember the condition assessment outlines the historic, mechanical and structural elements of the structure that could be subject to damage during the mothballing period and will be compared to in subsequent inspections. Therefore any additional information left pertinent to the structure should also be recorded.

- **Written Documentation**

All architectural and historic information for the building should be included with the information packet (*Brief 31*); this information can be found in Appendix A, DPW building files or within the National Register of Historic Places District nomination. A walk-through of both the interior and exterior should record the existing conditions of the entire building, room by room. This is to include

any damage resulting from humans or the environment (i.e. water damage, warped wood, etc) and usual/historic features (i.e. wood moldings around fireplaces).

- **Photographic Documentation**

Photographs of the interior and exterior are to be taken illustrating the existing conditions. Identifying information is to be written on the back (i.e. room number, wall location, elevation, etc.) along with the date. Pictures are to be taken from the corner of each room to obtain floor and ceiling details. (*Brief 31*) Particular details such as existing damage, previous repairs or unusual details should also be taken. Appendix A lists significant features for certain buildings, pictures of these features are to be taken during the condition assessment survey. Include when possible, older photographs.

2.3: Scheduled Maintenance

Regularly scheduled inspections and maintenance are central to successful mothballing (*Brief 31*). Maintenance and inspections are preventative measures against vandalism and damage from the elements or neglect. After structures have been identified for temporary closure, gone through stabilizing and a condition assessment, an inspection form and schedule shall be developed to address the individual conditions and concerns of each structure. Each structure should be visited at least once a month. Suggested guidelines for inspections are included in Tables 2, 3 and 4 and broken down into 1-3, 6 and 12 month increments (*Brief 31*). This should be coordinated between the installation manager, engineering specialist, historic resource specialist and/or landscape architect. Aside from regularly scheduled inspections, unscheduled and informal inspections may also be necessary. Examples of inspections forms can be found in Appendix B – these will need to be adjusted as buildings for mothballing are identified. Appendix C contains detailed inspection procedures for those utilities currently in use at Fort Monroe and Appendix D lists all the heating and AC units at Fort Monroe, along with serial number, make and model.

In addition to Regular Inspections, the following additional inspections should be considered.

- **Unscheduled Inspections**

Fort Monroe is subject to flooding, high winds and rain. Structures shall be inspected prior to major storms to insure sump pumps are operable and structural elements such as windows and doors are secured. Flood mitigations procedures such as sandbags and flood gates may be required depending on the severity of the storm. Building inspections should take place following a storm (when conditions allow) identifying any damage which may need to be addressed. The Fort Monroe Disaster Preparedness Plan should be consulted prior to and after major storm events for guidance.

- **Informal Routine Visual Inspections**

Visual inspections during drive-bys will be part of the daily routine of the caretaker's staff. These inspections are not typically documented but useful in identifying immediate needs in-between scheduled inspections.

Table 2: Monthly Inspection

Exterior	Walk around the structure checking for exterior damage, standing ground water, vandalism etc.
Entrances/Windows	Ensure all exterior windows/doors are closed and secure; check for leaks or damage
Landscaping	Keep grasses at an appropriate length to allow inspection of the building drip line and foundation as well as preventing damage to the structure; remove weeds from around utility areas and sidewalks
Moisture	Check for moisture build- up or warping; make sure humidifiers are operable and draining
Ventilation	Air out the building; check that the structure is properly ventilated; make sure interior doors are open for cross-ventilation; open storm coverings to prevent mold build-up
Batteries	Inspect fire or security alarm batteries (if applicable) and test system
Lights	Ensure lights are operable and undamaged
Fire Extinguisher	Sign off on inspection tag every 30 days
Pests	Inspect interior and exterior pay careful attention to all access areas
Utilities	Inspect the sump pump, humidifiers and AC units

Table 3: Seasonal (6 Month Inspection)

Structure Exterior	Clean gutters; ensure downspouts are removing water away from the foundation; clear out storm drains
Landscaping	Trim/prune trees and bushes; remove any dead or downed branches; ensure foliage is not in direct contact with the structure
Batteries	Replace fire / security alarm batteries
Pests	Inspect the crawlspace for pests
Utilities	Inspect the HVAC systems

Table 4: 12 Month Inspection

Structure Exterior	Document staining and damage; perform spot repairs if needed
Roof	Inspect for leaks or damage; repair any missing shingles
Structure Interior	Spot repairs and touch-up painting
Pest	Complete pest inspection
Utilities	Inspect heat pump, boiler, chiller, cooling tower, duct system, AC unit, radiators (as applicable)

3.0: GUIDELINES

This section outlines basic guidelines for maintenance and/or repairs which may be encountered during the mothballing period. The guidelines presented here are just an overview, further details can be found in Appendices E and F. If repairs go beyond what has been outlined here the evaluation by a subject matter specialist shall be sought. The specialist, as required by the terms of the Programmatic Agreement shall consult with the Army or Fort Monroe Historic Preservation Officer (FMHPO), as appropriate, in order to avoid or minimize adversely affecting significant historic materials and features. Once a treatment plan is decided upon, the Army or FMHPO, as required by the terms of the PA shall consult with the SHPO for concurrence, and the other consulting parties for review and comment. Details found in this section cover: ventilation, mechanical systems, landscaping, animal control and interior/exteriors of structures.

3.1: Moisture

Moisture build-up within a structure is almost inevitable when it is in use. The problem starts when the structure is vacant and moisture build-up is uncontrolled. *"Once the exterior has been made weather tight and secure, it is essential to provide adequate air exchange throughout the building." (Brief 31).* Excessive build-up of moisture may also weaken the structural components. Information for this section has also been taken out of *Preservation Brief 39: Holding the Line: Controlling Unwanted Moisture in Historic Buildings.*

Causes (aside from natural disasters, i.e. floods, hurricanes or storms):

- Building materials
- Condition of roof – missing shingles, slates, tiles, etc., faulty flashing or gutters, holes.
- Drainage system
- Moisture generated during occupancy
- Type, operation, and condition of heating, ventilating, cooling, humidification/ dehumidification, and plumbing systems
- Changes of the seasons
- Air infiltration
- Landscaping

Prevention:

- Check the cross ventilation in the attic, basement and crawl spaces; clean vents and remove any barriers built in front of vents or openings such as wood or metal panels (both of which are improper solutions to prevent pest intrusion).
- Open doors and windows on opposite ends of the building during routine inspection.
- Check eave vents and clean if necessary.
- During the summer season and dry days in the winter, allow air to flow through the building by opening windows and interior doors or open all transom windows on structure. Proper ventilation in the summer is often more imperative than in the winter (*Brief 31*).
- Add exhaust fans or whole house fans to increase air flow through the building if necessary.
- Perform repairs immediately.
- Use a regular maintenance schedule.
- Add insulation to exterior pipes which may be subject to freezing.

Recommended Temperature Settings in Vacant Buildings:

- 56-58 degrees in the winter, to avoid freezing drain and water supply pipes.
- 78-80 degrees in the summer, to avoid mold and mildew formations in buildings.

Before any treatment can take place a careful study needs to take place to ensure the appropriate methods are being taken. All sources of moisture problems are not always immediately known. Moisture will often travel from the source and can be challenging to diagnose. In some cases a study lasting several months or over the course of at least four seasons is required to diagnose a problem. (*Brief 39*) Consulting records on the buildings repairs, additions, maintenance may help track down a not-so-visible cause.

Signs of a possible problem could be, but are not limited to, any of the following:

- Standing water, mold, fungus, mildew, etc.
- Wet stains, erosion, salt deposits on interior or exterior materials.
- Flaking or peeling paint, wallpaper, plaster or moisture blisters.
- A musty smell.
- Warped, cracked or rotted wood.
- Spalled, cracked or eroded mortar joints.
- Condensation on windows or walls.
- Ice dams

General treatments: those specific to material types are found in the remainder of this report

- Physical treatments should always be reversible.
- Should not alter the historic integrity of the structure.
- Regular maintenance and repair will avoid large scale replacement repairs.

3.2: Mechanical Systems

Not all systems covered here are going to be applicable to each structure. The initial survey (condition assessment) is to make note of which systems are in operation. The information presented here are guidelines; reference Appendices C and D, as well as the manufacturer recommendations for specific instructions.

3.2.1: Heat Pump

Maintenance is to occur yearly.

Exterior Unit:

- Lock out and tag out electrical service
- Clean coil every spring. Using a coil cleaner, spray the coil and rinse with clean water.
- Clean slab by removing weeds and debris around the heat pump.
- Inspect fan for balance; check axel rotation, the shaft shall turn without oscillations.
- Verify temperature inside structure. If not within norms check the refrigerant charge.

Figure 1: Exterior Condenser Unit

Interior Unit: This includes generic guidelines and those specific to the furnace and air handler

- Lock out and tag out electric or gas service.

- Clean the evaporator coil.
- Change the filter as needed.
- Once a year clean the blower with compressed air or spray cleaner.
- Lubricate the blower bearings yearly.
- Check the balance of the blower and inspect the shaft.

Furnace (secondary source - gas burners):

- Lock out and tag out gas service.
- Clean the fire box.
- Inspect and clean burner assembly with wire brush and fin comb.
- Inspect the heat exchanger for cracks or other damages.
- Open junction boxes, check wiring and connections.

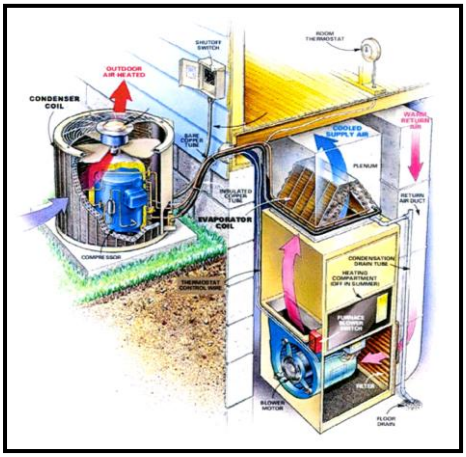


Figure 2: Heat Pump System

Air Handler (secondary source - electrical coils):

- Lock out tag out electrical service.
- Clean electrical coils with compressed air only.
- Open junction boxes; check wiring and connections.

3.2.2: Natural Gas

Maintenance on the Natural gas systems is to occur seasonally (every 6 months), then monthly during the heating season. The packages operate like heat pumps and condensers; they are a compact system equipped capable of running from gas or electric

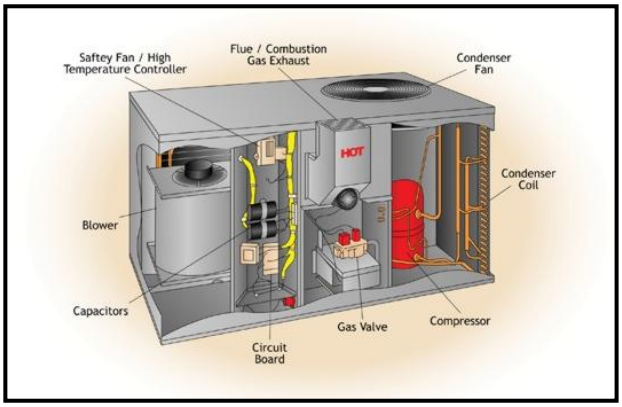


Figure 3: Gas Package System

All Systems:

- Lock out and tag electrical service.
- Every spring clean the coil. Use a coil cleaner: spray the coil and rinse with clean water.
- Inspect fan for balance: check axel rotation to ensure the shaft turns without oscillations.

Electrical System:

- Check wiring and wire connections.
- Check balance of the blower and inspect shaft.
- Lubricate the balance of the blower bearings yearly.
- Clean the blower with compressed air or spray cleaner yearly.

Gas Operation:

- Clean the fire box.
- Inspect and clean the burner assembly with wire brush and fin comb.
- Clean combustion gas exhaust.

Figure 4: Hot Water Boiler

3.2.3: Boiler

Fort Monroe has oil, steam, gas and hot water boilers. Maintenance should be performed seasonally (every 6 months).

- Check the expansion tank for correct air pressure, usually 12/15 psi.
- Inspect the closed loop for leaks.
- Inspect the motor and circulation pump for proper operation.

Annual Inspections:

- Lock out and tag out electricity, water and circulating pump.
- Remove the burner assembly from boiler.
- Vacuum the fire box.
- Clean fire tubes with a metal brush and fin comb.
- Open junction boxes, inspect wiring and connections.
- Open the flow switch and check the switch with the Ohm/Volt meter.

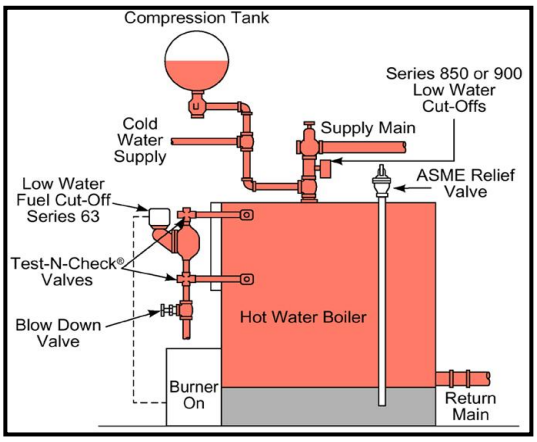


Figure 5: Schematic of a Hot Water Boiler System

Circulating Pump:

- Check circulating pump for leaks: disassemble the pump; check the impeller and shaft (straightness); repair or replace if needed; reassemble the pump with new gaskets.
- Disassemble the pump motor, clean the coals and the rotor; reassemble the pump motor with new gasket.
- Inspect the packing gland, replace if needed.

3.2.4: Air and Water Cooled Chillers

Maintenance should take place at the start of the cooling season (every 12 months) and then monthly during the remainder of the cooling season.

Figure 6: Chiller

Air Cooled Chiller:

- Compressor - check oil level through site glass.
- Lock out and tag out electrical chilled water pump.
- Using a coil cleaner; spray the coil and rinse with clean water.
- Clean slab by removing weeds and debris around the chiller.
- Inspect fan for balance; lubricate axel and check its rotation, the axel shall turn without oscillations.
- Inspect the isolation valve on the chilled water piping and chiller.
- Check amperage with meter according to manufacturer specifications.
- Check refrigerant levels.

Water Cooled Chiller:

- Compressor - check oil level through site glass.
- Lock out and tag out electrical chilled/condenser water and pumps.
- Inspect the isolation on the chilled water piping and chiller barrel.

Condenser:

- Isolate the condenser by shutting off the valves then drain the condenser.
- Open condenser doors on either end of the cylinder.
- Inside cylinder clean condenser tubes with tube brush.
- Reassemble condenser and replace gasket if needed.

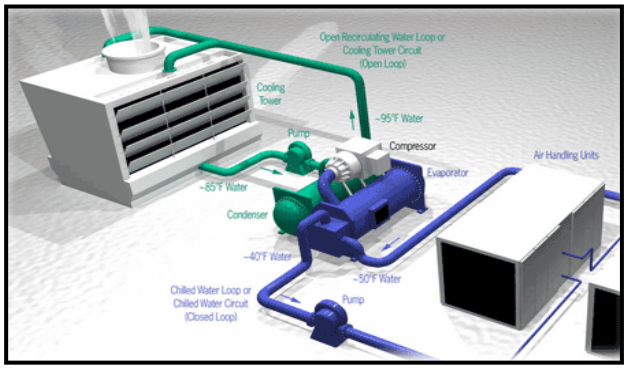


Figure 7: Water Cooled Chiller System

Chilled Water Pumps and Condenser Water Pumps:

- Disassemble the pumps: check the impeller; lubricate axel and check its rotation. The axel shall turn without oscillations, repair or replace if needed. Reassemble the pump with new gaskets.
- Inspect the packing gland, replace if needed.
- Reassemble the pump and replace gasket.
- Check refrigerant levels.

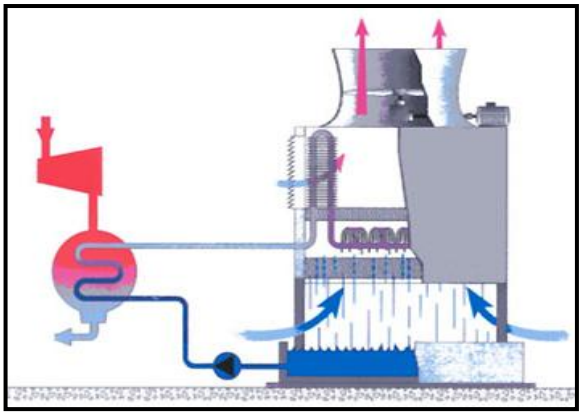


Figure 8: Schematic of a Cooling Tower System

3.2.5: Cooling Tower

Maintenance should take place at the start of the cooling season (every 12 months) and then continue monthly during the remainder of the cooling season.

Visual Inspection:

- Inspect the water level in the cooling water sump.
- Inspect the makeup water float and valve.
- Inspect spray nozzle assembly and drift eliminators.
- Check wafer boards (if applicable).
- Inspect condenser water chemic injection if used.
- Check lines, pumps and chemic level in barrels.
- Inspect and clean make up water float and valve – adjust float level if needed.
- Close the water condenser supply, return valves and open the sump drain line.
- Clean the cooling tower sump using high pressure water.
- Clean the drift eliminator.
- Check the sump heater with an amperage meter.

Figure 9: Cooling Tower

3.2.6: Duct System

Duct cleaning should be performed every 3 or 5 years.

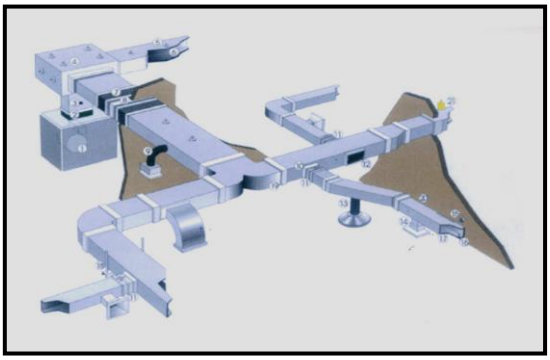


Figure 10: Duct System

Duct System Cleaning:

- Connect a vacuum system to main and secondary duct system to loosen and dislodge debris and contaminates.
- Sanitize the system with an anti-microbial product EPA registered for use in HVAC systems.
- Remove and clean all vent grills and registers.
- Inspect duct system for leaks.

3.2.7: AC Window Units

Maintenance should take place at the start of the cooling season (every 12 months) and then monthly through the remainder of the cooling season.

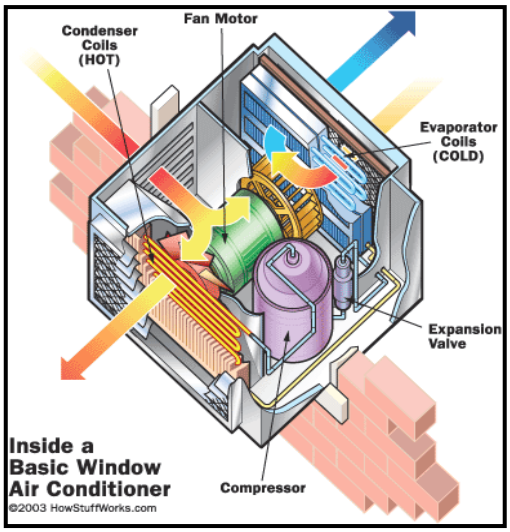


Figure 11: AC Window Unit System

Filter:

- Inspect the filter before cooling season and once a month during summer season, replace it if necessary.
- If using a washable filter, clean the filter with a solution of mild detergent and water. Let the filter dry completely before reinstalling it.

Evaporator and Condenser Coils:

- Clean the evaporator and condenser coils before the cooling season and every month during the summer.
- Use a vacuum cleaner on these components and then a fin comb.

Fan:

- Open the cabinet where the fan is located.
- Clean away any debris with a vacuum and soft cloth.
- Check the fan blade on motor shaft for looseness. Tighten setscrew if necessary.

Note: The fan is installed in its housing with bolts and vibrations can loosen these fasteners. Tighten the bolts if necessary.

Drain Port:

- Remove the drain tube from the drain port, clean the tube with a bleach/water solution to take away the rust and dirt located inside the pipe.
- Clean the inside port with a small tube brush soaked with bleach/water solution.

3.2.8: Radiators and Electrical Baseboard

Maintenance every month at the start of the heating seasons

Radiator:

- Keep the radiator clean of dust and lint.
- Bleed the system by opening the radiator valve and allow trapped air to escape –tighten the valve again when water runs out.

- Look for moisture near the supply valve –if a leak occurs replace the "packing". Turn off the supply valve - loosen the packing nut - wrap the valve threads with the new sealer and tighten the nut down again- reopen the supply valve.
- Have the system flushed by a licensed HVAC technician.
- Connect a hose to the boiler drain and run it outside.
- Open the bleeder valve on the highest radiator in the house or building.
- Allow the system to drain.
- Open the water supply valve and run until the water comes clean from the hose.
- Close all the bleeder valves and start/run the boiler.

Figure 12: Cast Iron Radiator (older version)

Figure 13: Cast Iron Radiator (new version)

Electrical Baseboard:

- Check and clean the electrical baseboard for lint and dust accumulation.
- Use a soft bristle brush or a can of compressed air to knock off contaminates from the coils; vacuum out the debris.
- Check the wire connections and ground wire.

Figure 14: Electrical Baseboard

3.2.9: Sump Pump

Sump pumps are to have monthly maintenance; as well as before and after significant storms.

Electrical:

- Be sure the pump is plugged into a working ground fault circuit interrupter outlet (GFCI).
- Check the GFCI breaker for a trip. Reset if necessary.
- Check the conditions of the wiring system from the GFCI breaker to the pump.

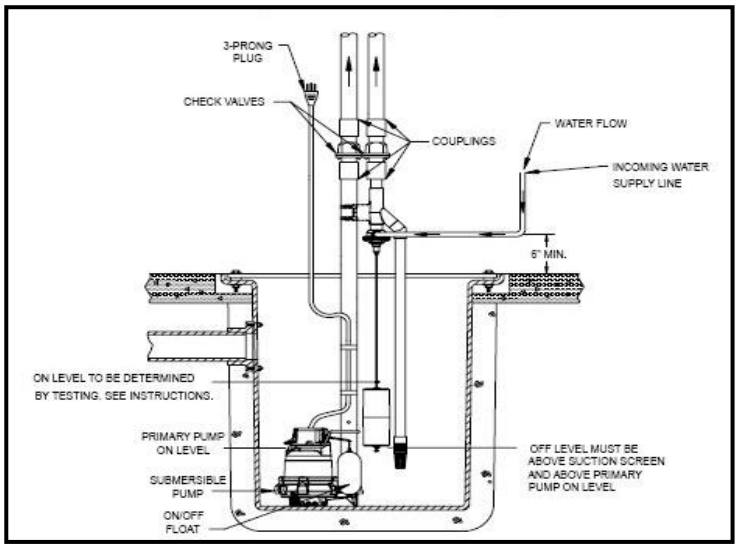


Figure 15: Close Coupled Sump Pump

Motor Pump:

- Clean motor surface and ventilation openings (if applicable).
- Lubricate moving parts; apply appropriate types and quantities of lubricant on the bearings. Correct shaft alignment; incorrect alignment puts a strain on the bearings which can reduce the life of the components and reduce system efficiency.

Mechanical:

- Inspect the pump itself, the pump shall stand upright. Vibration during operation may tilt the sump tank onto one side. This can jam the float arm and disable the pump.
- Check the valve installed on the discharge line. Be sure that the water does not run into the sump pit each time the pump shuts off. This defect may reduce the pump or the switch life, or flood the basement.
- Clean the impeller assembly. The impeller shall be free of dirt, pebbles and mineral deposits; this will keep the pump operating efficiently.
- Check piping system. The pipes shall be tightly connected together and draining water out at least 20 feet away from foundations.
- The vent hole in the discharge pipe shall be clear.
- Periodically pour a bucket of water into the pit to check if the pump starts automatically.

3.2.10: Dehumidifier

Maintenance should take place monthly.

- Replace filter as needed.
- Clean the collection pan periodically with soap water; some of which have drain lines.
- Clean the condenser when clogged with dust and dirt; clean the condenser coils using a vacuum cleaner and a fin comb.
- Lubricate the fan motor bearing with oil (some motors have oil ports) and clean the fan blades.
- Fan and motor hardware: check for any looseness of the fan or motor nuts and bolts; tighten if necessary.
- If a pipe goes from the collection pan to a drain, check if the pipe is connected properly so that the water does not leak out.

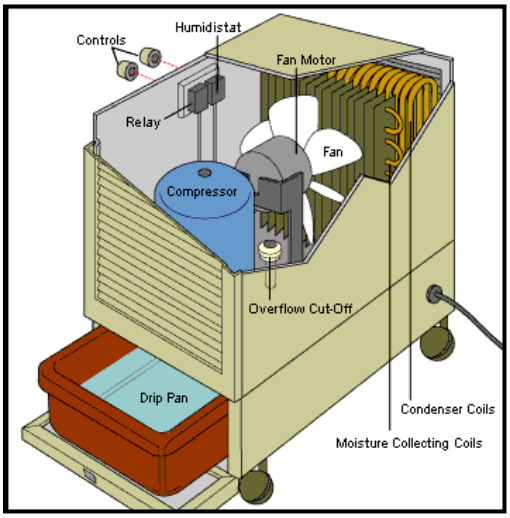


Figure 16: Dehumidifier

3.2.11: Fire Suppression Systems

A total of 35 buildings at Fort Monroe have either a wet or dry fire suppression system. In both cases these systems will be deactivated and drained. Due to the nature of the mothballed building and the reduced activity within the structure, there is a greater danger of damage from leaks or frozen pipes than there is for fire. Appendix A will indicate which buildings have fire suppression systems and the type.

3.3: Landscape Maintenance Recommendations and Schedule

Landscaping is to be done so as not to hinder inspections and at no time should vegetation be in contact with the structure. The following standards for landscape maintenance outline the scope of services and responsibilities to be performed by groundskeepers. The on-site tasks shall include:

Mowing:

- A lawn mowing schedule shall be developed that keeps turf at a proper height to allow inspection of the building drip line and foundation as well as preventing damage to the structure.

Trees, Shrubs and Groundcover:

- Prune as needed so as not to interfere with sidewalks, buildings, signage, fire control utilities, site lighting and traffic visibility on streets.
- Street trees shall be pruned to maintain visibility of street signs, protect trees from vehicle damage and maintain pedestrian safety.
- Remove dead and broken branches as needed.

Irrigation System Shut Down:

- Irrigation systems tied to buildings or in open areas shall be attached to an air compressor and blown out of all standing water. The master valve on the systems shall be locked out.

Storm Water Drains and Infiltration Areas:

- Check gates regularly for: leaves, grass, soil and other debris. Remove as required to prevent flooding.

Outfalls:

- Check the discharge pipes for any debris which may cause clogging.
- Check embankment conditions surrounding headwall for any signs of erosion.
- Clean the outfall apron periodically (if applicable).

3.4: Animals (Brief 31)

Any kind of animal infestation has the potential to cause serious problems for a closed structure. Insects such as termites, bees, carpenter ants and beetles can all cause serious damage to wood materials by hollowing the interior and reducing the structural strength. Animals can cause further problems by damaging insulation, wiring and plaster or create health hazards from bird or rodent droppings. Before closing the structure any infestations needs to be removed and steps taken to protect the structure from any further infestations. Regular building inspection during the mothballing period is essential because "*the visible symptoms of attacks by insects are subtle and difficult to recognize except in the final stages"*.

- Piles of wood dust or small holes are indications of a pest problem, in addition to the physical presence of insects.
- Windows, doors, crawl spaces, walls, chimneys and basements are all areas at risk.
- Remove any colonies or nests.
- Close chimney flues with plywood caps or wire screens. If using plywood ensure it is properly ventilated.
- Vents, flues or louvers need to be covered with bug mesh or heavy duty wire.
- If possible treat damp or infected wood with insecticides or preservatives.

3.5: Exterior and Interior Spaces

3.5.1: Doors and Windows

- Windows and/or doors may be boarded up providing the method of installation does not damage the opening, sash or frame (see Preservation Brief 31).
- Use screws rather than nails to avoid vibrations from pounding, screws also permit the same hole to be used repeatedly.
- Do not use a crowbar to remove protective paneling.
- Install fire and/or security alarm systems where appropriate.
- Where appropriate reinforce exterior doors and add additional locks.

- If applicable close exterior window shutters.
- Additional screens or protective panels may be built to cover windows and/or doors if the situation requires it.

3.5.2: Interior

- Items which contribute to the historic integrity of the building, are fragile or of value (chandlers, historic door knobs, stain glass windows, etc.), should be removed and stored in a secure, environmentally protected location. Temporary replacements such as inexpensive handles, regular light bulbs and glass may be used.
- Leave the window blinds closed to protect floor and finished walls surfaces from ultraviolet rays.

4.0: STRUCTURAL DETAILS AND REPAIRS

The information presented here is a general outline and has been taken directly out of the *Secretary of Interior's Standards for the Treatment of Historic Properties,* the *National Heritage Preservation Trust, Historic Preservation Maintenance Manual* and *Preservation Briefs: 2, 9, 15,19, 21, 27 and 29.* Please consult these and additional sources prior to starting any repairs. Building materials may be encountered which are not discussed in detail within this report; therefore it is the responsibility of the caretaker to consult specialists to determine the appropriate course of action prior to starting work.

Minor repairs should be addressed during the mothballing period; if major repairs are felt necessary consultation with a preservation specialist and/or a structural engineer is required. If replacement of damaged or deteriorated materials is required then it should be done as soon as possible and only address the damaged sections. All maintenance and repairs are to detract as little as possible from the historic integrity of the structure and in no way compromise the historic content. Replacements are to always be of the same material and color. Cleaning should take place if it is "*necessary to halt deterioration or remove heavy soiling*" and always use the "*gentlest method possible*" (*Secretary of Interior*).

All repairs must conform to the guidelines established by *The Secretary of the Interior's Standards for the Treatment of Historic Properties,* and shall be coordinated with the Virginia State Historic Preservation Office (SHPO). The recommendations covered here are to be undertaken when the structural stability of the structure is compromised. Significant interior features are included in Appendix A: repairs to these features **must** be coordinated with the SHPO prior to commencement of work.

4.1: Masonry:

The masonry types to be encountered at Fort Monroe are brick, mortar, stone (limestone), concrete and stucco. These materials have been used for but are not limited to: walls and foundations, chimneys, columns, and various decorative details.

- Sandblasting is not an acceptable method of cleaning.
- Test area to be cleaned to ensure method is appropriate and to identify potential long-term effects.
- Remove paint only to next complete layer.
- Use hand tools to remove deteriorated mortar.
- Modern/non-historic surface treatments (i.e. waterproofing) are acceptable ONLY after repointing and if traditional methods have been proved to be ineffective (*Secretary of Interior).*

Note: This document is NOT recommending waterproofing but suggesting it is an option as a LAST resort and must be coordinated with the VASHPO.

Figure 17: Crack Monitor Gauge

4.1.1: Concrete (Brief 2)

Deterioration can be the result of many factors; signs are manifested in cracks, spalling, deflection, stains, erosion and corrosion. This section refers specifically to concrete; however the types of deterioration can apply to all masonry types. Care should be taken to identify instructions specific to the masonry before repairing.

Cracks:

- Determine if the crack is active (continuing to expand) or relatively dormant by use of a crack monitor. A widening or shearing of the crack may indicate structural issues.
- Dormant hairline cracks can generally be left alone.
- Cracks smaller than $^1/_{16}$ of an inch can be repaired with a water and cement mixture. If it is wider add fine sand.
- Repairs can re-establish structural integrity with a dormant crack: remove loose concrete, clean exterior surface, inject epoxy inside the crack which will bond and adhere to both sides of the crack, remove the excess epoxy after seal is properly cured.
- If the crack is active; consultation from a structural engineer is required to determine the cause and recommend repairs.

Note: When the crack passes through the wall, the wall shall be properly reinforced with steel straps and expansion anchor bolts; then the crack shall be filled with a sealant made of epoxy or other appropriate material.

Spalling:

Patches of lost surface material usually occurs from corroded reinforcing bars. A structural engineer should be consulted before repairing.

- Remove the spalled masonry material and expose the reinforcing bars, break away any attached material.
- Remove rust from the bars using a wire brush or sandblasting.
- Place an epoxy coating over the bars to prevent further corrosion.
- A structural engineer may be needed to determine if the bars should be replaced or may be cut away. ONLY a civil engineer can make this determination.
- Any repaired material used should match the existing material composition.
- A cement binder is not suggested as it will shrink while drying.
- To properly cure the patch it should be kept moist for several days.

Deflection:

Manifested in the bending or sagging of concrete.

- Structural members will need to be strengthened or repaired; as recommended by a structural engineer.

Stains

Discoloration of the material may be caused by several factors.

- Alkali-aggregate – white stain on the surface.
- Metals inserted into or corrosive elements dripping on the concrete.
- Efflorescence is a white, powdery stain which is the result of lime leaching from the concrete.
- Stains can be removed with a soft-bristle brush or by using a poultice.

Note: Poultices are clays used for cleaning historic buildings. These clays draw out deep-seated contaminants and staining from the surface of masonry.

Erosion:

This is usually caused by weathering.

- Damaged surface material will need to be replaced. Those methods described above may be applied.
- Source of the erosion (i.e. water) should be eliminated.

4.1.2: Repointing (Brief 2)

Repointing is the process of "*removing deteriorated mortar from the joints of a masonry wall and replacing it with new mortar*". This is to be done when deteriorated mortar is cracked, loose or allows water to infiltrate. (*Brief 2*) Prior to any repairs assess the damage; repointing is not always appropriate.

- The mortar, surrounding masonry and construction process should be examined and/or analyzed to ensure repairs match properly.
- Hand chisels and mash hammers should be used to remove mortar. Although saws and/or grinders may also be used if necessary (these are recommended for hard stones).
- Mortar should be removed (at a minimum) to 2 - 2 ½ times the width of the joint.
- Any loose or disintegrated mortar found at this depth should also be removed.
- Joints should be rinsed to remove dust or other partials and should be damp when mortar is replaced.
- Deep areas should be filled first.
- Fill mortar ¼ of an inch at a time – wait until it is of thumb-print hardness before adding another layer.
- When the final layer is of thumb-print hardness it must be tooled to match the original masonry.
- Curing times vary; refer to manufacturers label for specific instructions regarding dampness.
- Excess mortar can be removed using a stiff natural or nylon brush. This should take place after the mortar is hard but before set.

4.1.3: Stone (Brief 15)

Cracked Stone:

- Remove loose stone chips.
- Using a cementitious material which matches the existing stones' color, fill the fissure to provide water impermeability and prevent further cracking.

Spalled Stone:

- Remove loose chips and wet the damaged area.
- Apply a patch of cementitious material matching the existing stone color.
- Build up in layers until meeting the original profile.

For larger patches, pins might be needed to secure the new material.

Stone Replacement:

This should be considered when safety is a concern. Stone replacement is the most viable solution when repairing large areas of damaged stone is not an option.

- Use a circular saw to cut grooves into the face of the damaged stone (be careful not to hit adjacent stones).
- Insert a chisel in the groove and strike the chisel with a hammer to split the stone in pieces.
- Remove all the stone pieces and clean the cavity.
- When cutting a new stone use a diamond-blade to model the stone to fit the shape and depth of the cavity, leaving a gap of 3/8" for mortar joints.
- Wet the cavity and edges of surrounding stones.
- Set the new stone in the cavity on a mortar bed.
- Insert the new mortar in the joints.
- Let the mortar cure.
- Then brush the excess dried mortar.

Resetting Loose Stones:

- Remove stone and set it aside.
- Remove all of the existing mortar bedding.
- Clean and dampen the top of the lower stone.
- Install a new layer of mortar on the top of the lower stone.
- Reset the loose stone on the new mortar and remove any excess of mortar.
- Even the joints between the stones with a damp sponge.

4.1.4: Plaster (Brief 21)

Generally speaking plaster is designed to be durable; however, this is not always the case as can be evidenced when plaster cracks or becomes detached. Usually this is the result of structural problems, poor workmanship, improper curing or moisture. Repairing plaster is not always necessary; therefore, before starting any repair work a thorough examination of the structure should be made to positively identify the cause and appropriate solution. Consultation with a structural engineer and preservation specialist is recommended.

Causes:

- Structural – overloading, settling or excessive vibrations or movement of the lath (member which holds the plaster in place).
- Poor workmanship – improperly proportioned mix, incompatible base and finish coats, improper application, too much retardant, inadequate thickness.
- Improper curing – ideal curing temperatures are between 55-70 degrees Fahrenheit. If temperatures are not regulated when applied the plaster is subject to dry-outs, freezing and sweat-outs.
- Moisture – interior or roof leaks, gutter or downspout, dampness at the foundation level, splashback.

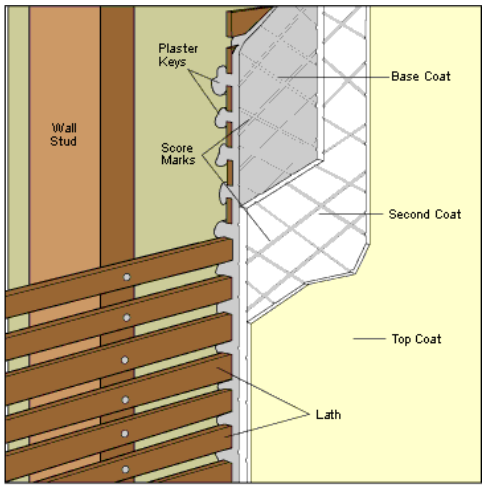


Figure 18: Diagram of a Plaster Wall

Cracks:

- Hairline cracks are generally not considered serious providing they do not widen and the plaster is in good condition. Typically they can be patched.
- Cracks may open seasonally (humidity). They should be widened with a tool such as a crack widener and then filled.
- For structural cracks, remove the plaster on each side of the crack to a width of approximately 6 inches. Clear the debris and apply a metal lath to the existing wood one. Fill the crack with plaster in three successive layers.

Note: Make sure structural problems are solved prior to fixing the larger cracks.

Wall Holes:

- Small – less than 4 inches in diameter. Trowel a base coat into the hole, scrape it back to just below the current plaster level. When set but not dry add more plaster to create a smooth wall.
- Large – where all three coats have been damaged or missing and the lath is visible. Remove all debris and re-nail the lath if loose. Use a water mister to keep the lath damp. Attach a metal lath to the wooden one and apply plaster in three coats. Take care to slightly overlap the new plaster over the old to create an even joint.

Ceiling Holes:

- If patches of plaster are coming down it is likely that the keys which holds the plaster to the ceiling have broken.
- If the areas surrounding the keys are in good condition the loose plaster can be reattached using flathead wood screws and plaster washers.
- If plaster needs to be patched use methods described above.

Replacement:
If replacing the plaster is the only option, consultation with preservation specialists, structural engineers is suggested.

- Safety precautions should be taken when removing plaster due to the potential for coal, lead or asbestos air particles. Consult OSHA safety standards for specifics.
- Before replacing the plaster it must be decided whether to use the existing laths or implement a new system. This decision should consider the condition of the lath and thickness of remaining plaster.

4.2: Wood

Wood is the most common construction material at Fort Monroe. It has been used in the construction of framing, clapboards, shingles, siding and decorative elements.

- Paint should be stripped by hand (scraping or sanding) or with thermal devices; chemicals should only be used as a supplement.
- Do not remove paint which is firmly adhered to the wood.
- Sand or water blasting and use of torches for paint removal are inappropriate.

4.2.1: Structural Systems (Preservation Manual)

Wood restorations, unless confined to decorative elements or minor cosmetic repairs, are extremely serious and generally reflect structural problems. Before conducting repairs on the structural system, "*a careful diagnosis of the causes of failure is necessary*", not all visible problems will be evidence of structural problems. Therefore, it is critical for a structural engineer to assess the situation, offer suggestions and conduct the repairs. If there is a serious problem the situation may require "*monitoring movement over a period of years, examination of the physical condition of the foundation and the surrounding soil and analysis of these results to assess the risks involved in reinforcement the foundation*." (*Army Historic Preservation Maintenance Manual*)

Figure 19: Repaired Sagging Floor

Visible Problems:

- Sagging (generally near the center of the building) or bulging floors.
- Defective structural posts.
- Splitting, under designed or rotting joists.

Causes:

- Improper construction or repairs.
- Settling of the foundation.
- Changes in the grade.
- Moisture build-up or standing water.

- Exposure to the elements.
- Leaks

Figure 20: Repaired Rotted Joist

Possible Repairs:

- Shoring – to prevent total collapse.
- Sistering – attaching additional material to the deteriorated post or beam.
- Replacement – either partial or total.

4.2.2: Windows (Brief 9)

Damage to wooden windows can be due to several factors including insects, vandalism and design failure but is most commonly attributed to moisture problems. Deterioration usually first occurs on the sill, an area where water can collect and seep into the wood.

Preventative Steps:

- Check all joints and seams, if water can enter at the edges they should be caulked.
- Inspect the glazing putty for cracks or any loose/missing pieces.
- The back putty (interior of the pane) should be inspected.
- Ensure the sill slopes away from the building (downward).
- If possible create a dripline on the underside of the sill.
- Check for proper operation: the sill is an area where rainwater and condensation collect; constant opening/closing of the window while in operation; as well as cooling/heating of the season all of which makes this area susceptible for joint failure and separation.

Warning Signs:

- Puddling of water on the sill – if water comes in contact on a regular basis or remains on the wood there is the potential for a serious problem.
- The condition of the paint (cracking, peeling, blistering and flaking) – BE ADVISED: failure of paint does not guarantee there is a moisture problem. Always check the soundness of the wood before starting repairs.

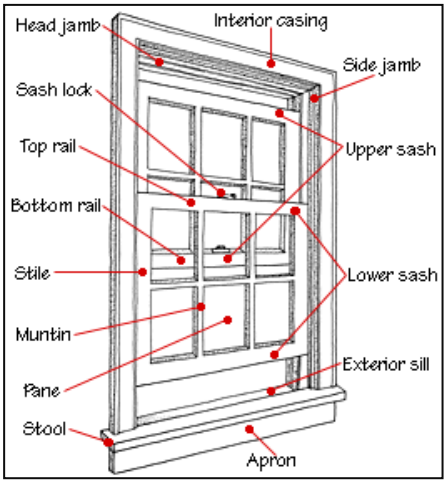


Figure 21: Diagram Showing Parts of a Window

Wood Soundness:
Severe deterioration will be visible. With less severe deterioration the soundness of the wood will need to be tested to determine the extent of the damage. Wood soundness may be checked by two methods:

- Insert a sharp object, such as an ice pick, into the wood and attempt to pry up a small piece. Rotted wood will come up in short irregular pieces.
- Gently push a sharp object into the wood at a perpendicular angle. This is especially helpful when the core is rotted but the exterior appears sound.

Paint Removal:
May be necessary if there is an excessive build-up of paint or if the paint is badly flaking or peeling.

- Removal methods vary depending on the amount of paint to be removed. Before starting research methodology to ensure appropriate method is being used.
- If heat is to be used to remove paint from the sash, either remove or protect the glass to prevent breaking. After removing the paint the sash should be sanded, patched and primed.
- Exterior paint should cover any glazing or putty and slightly cover the edges of the glass to aid in creating a weather-tight seal.

Putty Removal:
Any deteriorated putty should be removed when making repairs.

- In some cases a soldering iron may be required if the putty has hardened in the rabbets (grooves in the sash for the glass).
- If putty is on glass clean the panes in linseed oil to soften it before removal.

Replacing Glass:

- To cushion and seal the glass place glazing putty or linseed oil putty in the rabbets before returning the panes.
- ONLY use a glazing putty after the wood has been treated with linseed oil and primed with oil based primer or paint.

Stabilizing:
In some cases wood may be stabilized rather than being replaced. If the wood is split, checked or shows early signs of rot the following methods may be used:

- Dry the wood.
- Treat affected areas with a fungicide.
- Apply 2-3 coats of boiled linseed oil to waterproof the area.
- Fill with epoxy any cracks or holes.
- Paint over repaired area.

OR

- Build-up affected areas with several layers of a wood epoxy.
- Sand, prime and paint.

Note: In either case the layers should create a small slope to carry water away.

Replacement:

- If damage on the sill and/or sash is too severe to be repaired or stabilized, partial or total replacement will be required. This is a complex, expensive process; consultation with a preservation specialist and/or carpenter is suggested.

Weatherization:

- Use appropriate contemporary weather-stripping. Historic weather-stripping is usually made of felt and may no longer be effective.
- If appropriate install sash locks to aid the weather-stripping.
- Ensure caulking around doors and windows is undamaged.
- Check sealant between the window or door frames and at any openings made of brick or wood.
- Replace sealant if necessary.

4.3: Architectural Metals:

Architectural metals are used in several aspects of building construction. The types of metals in use at Fort Monroe are iron, steel, tin and aluminum. They are seen in roofing materials, porches, windows, siding, stairways and various decorative elements.

- Metals should be positively identified before cleaning to determine the softness of the metal and tested to ensure appropriate cleaning materials are being used.
- Care should be taken to not place incompatible metals together.
- Sandblasting using a low pressure is acceptable ONLY after hand scraping and wire brushes are ineffective in removing corrosion or paint.
- Patina should not be removed.

4.3.1: Steel (Preservation Manual)

Most problems encountered with steel (and iron) come from deterioration. Anything more serious than a simple repair requires the consultation of a preservation specialist and/or structural engineer.

Types of Deterioration:

- Corrosion or abrasion.
- Loose connections.
- Fatigue or impact.

Repairs:

- Methods for corrosion removal will depend on the metal, its location, severity of damage and adjacent materials. Consult a preservation specialist before commencing removal.
- Once the surface is rust free a protective coating may be applied. Historically paint has been the most ideal; tar or bituminous paints should be avoided.
- Abrasion is due to a moving element being in direct contact with the metal; if the source cannot be removed consider solutions such as abrasive resistant paints or placing material between the metal and abrasive element.
- Any loose rivets or bolts should be replaced or tightened.

4.3.2: Cast Iron (Brief 27)

Large-scale repairs can be dangerous and should not be attempted by an inexperienced or unqualified workforce; consultation with a preservation specialist and/or structural engineer is strongly advised.

Types of Deterioration:

- Rust
- Missing elements.
- Impact damage or structural failure.
- Broken joints.
- Connection damage or loss of anchorage.

Repair:

- Most repairs on cast iron require trained specialists.
- Small scale rust may be removed by hand by scraping, chipping or using a wire brush.
- Low pressure grit blasting is very effective at removing paint build-up or corrosion. DO NOT use sharp aggregates or pressure over 100 psi.

- Dirt may be removed using low pressure water or a non-ionic solution. Scraping by hand can effectively remove grease or residue deposits.
- Alkaline paint removers or acidic cleaners are not recommended.
- Remove all deteriorating paint, dirt and any other debris from the surface – if paint adheres to the surface DO NOT try to remove it.

4.3.3: Rust on Metal Roofing:

- If there are large patches of rust an experienced professional is recommended.
- Rust will reappear if the roof remains untreated; therefore it is critical to paint the roof once rust has been removed.
- Clean and thoroughly dry the area to be painted.
- Use a zinc primer and appropriate metal roof paint for the top coat. Acrylic coating is also an option. Apply by brush or roller, spray paint is not recommended.

Note: Apply the same method for rusted window wells.

4.4: Roofs

Roofs provide both a decorative and practical element to building construction. It is essential it remains weather tight at all times. Roofing materials used at Fort Monroe are: asphalt, slate, sheet metal, asbestos, corrugated metal, tin and wood.

- Roofing materials used in repairs should match in color, size and type.
- A leaking roof may be temporarily protected by plastic tarps, plywood or building paper.
- Roofs should be inspected for moisture build up, insect damage, proper anchorage and deteriorated roof fasteners.

4.4.1: Wood Shingles (Brief 19)

Wooden shingles can last anywhere from 15-60 years, although 30 is more common. It is important that when replacing wood shingles to match the size, shape, texture, configuration, craftsmanship and details. Using inappropriate shingles will increase the potential for failure and damage.

Reasons for Deterioration:

- Shingle is too thin.
- Durability of the wood.
- Poor ventilation; build-up of moss or lichen.
- Contact with trees.
- Installation, maintenance or repair methodology.

Repair:

- When damage is fairly localized small amounts of replacement is appropriate.
- Remove damaged shingle, insert new shingle and fasten in place with a metal tab.
- If the singles are cracked or the joint might allow for water seepage, insert metal flashing under the shingle.

Replacement:

- If 20% or more of the shingles in single location are damaged, large scale replacement will be necessary.

4.4.2: Asphalt Shingles

- Remove the damaged shingle(s) starting with the uppermost shingle.
- Check the underlying conditions; if warped or rotten repair the damaged area.
- Remove nails in and above the damaged area.
- Use roofing cement to patch the building paper.
- Starting with the lowest shingle insert new shingles.
- Using $^{7}/_{8}$ – 1 inch nails, nail all shingles into place excluding the top shingle.
- Apply roofing cement to the top shingle then slide it into place and secure it with nails.

4.4.3: Slate Shingles (Brief 29)

Slate shingles can last approximately 60-125 years. Full-scale roof replacement should only be a last resort, repair whenever possible. There are three types of slate roofs: standard, which is the most common, generally being uniform thickness, length and width; textural, generally found on Tudor style buildings the shingles are of different thickness, uneven tails and rough texture; and graduated, usually found on institutional or ecclesiastical structures, the thicker/larger slates are found near the eaves with the smaller/thinner slates near the ridge.

Deterioration of slate is caused by the physical/mineralogical properties, manufacture procedure, installation methods and lack of regular maintenance.

Physical/Mineralogical Properties:

- Mineral impurities speed-up the weatherization process.
- Hot/dry and cold/wet cycles result in gypsum being produced, this causes internal stress on the slate and the layers split.
- Chemical/physical changes resulting from weathering increase absorption abilities while also decreasing strength of the slate.

Manufacturing Problems:

- These can be difficult to identify unless visible before installing on a roof.

Installation Methods:

- Improper nailing or lapping.
- Joints are improperly set – this allows for water seepage.
- Insufficient headlap – distance between the lowest portion of a shingle and highest portion of a shingle on the next row.

Repairs:

- Remove the damaged slate.
- Check the plywood sheathing for damage if several slates are being removed.
- Do not replace with plywood; instead use woods of similar thickness and width. Avoid using pressure treated wood, it shrinks causing the slate to crack.
- Install new slates (working from the bottom of the roof slope upwards), secure with nails, metal hooks, clips or straps.
- Do not use sealants or roofing mastic, over time this causes the shingle to break apart.

4.4.4: Built Up Roofing System

Blisters:

- Usually the result of heat or moisture build-up or insufficient flashing.
- Remove the gravel from the damage area.
- Make a cross-shaped cut using a utility knife through the damaged area.
- Check within the cut to see if the area is still wet. Look for and repair leaks.
- Using a putty knife fill the pocket with plastic roofing cement; spread the cement beyond the damaged area at least 5 inches in all directions.

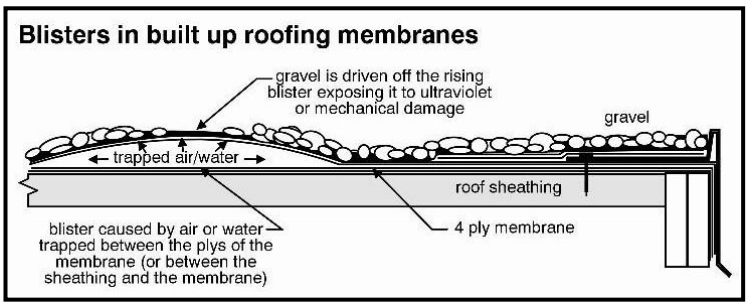


Figure 22: Diagram of a Blister on a Built-Up Roof

- Place an asphalt shingle or a patch made of roll roofing material that is approximately 2 inches larger. Place in the cut and press into the roofing cement.
- Cover the repaired area with a layer of plastic roofing cement, at least three inches beyond the patch.
- When the cement is cured re-install the gravel back over the top of the patch.

Leaks:

- Scrape gravel away from damaged area, at least 4 inches beyond the edge but take care to not damage the roof membrane.
- Make a small cut through the membrane. If possible nail the roofing down on either side of the cut.
- Clean the surface.
- Spread plastic roofing cement over entire damaged area to include the slit made earlier – it needs at least 7 inches in width. Extend the cement in all directions at least 2 -3 inches further than necessary. Thickness of the cement should only be $^1/_4$ - $^1/_8$ of an inch.
- Place reinforcement fabric (at least 7 inches wide) over the damaged area; ensure that is approximately 2-3 inches longer than the damaged area. Press into the cement.
- Place another thin layer of cement over the fabric.
- Once finished recover with gravel.

4.4.5: Flashing

Flashing helps to protect the joints and seams on a roof by moving water away. When repairing flashing it is important to use the same material as the original, if incompatible metals are used the corrosion process speeds up. There are three types of flashing: valley, vent and step.

Figure 23: Flashing Around a Vent Pipe

Valley:

In this case you do not remove the flashing, instead it is patched.

- Make a patch large enough to fit under the shingles on either side of the damaged area – make sure it is tapered at the end.
- Taking care, break the seal around the damaged flashing and the surrounding shingles.

- Clean the damaged flashing with a wire brush and cut a slit into it.
- Place roofing cement around the boarder of the patch, slip the tapered end into the slit and fit the edges of the patch under the shingles.
- Place the square edge atop the damaged flashing, press to create a seal.
- Add additional cement to all seams and joints, ensure there is a smooth seal otherwise water will not flow properly.

Vent:

- Make sure the flashing rests on at least one shingle – install shingles up to vent pipe.
- Apply roofing cement along the edge of the flashing.
- Install a new flashing apron and position the collar so that the long end lies down the roof and overlaps the shingles.
- The flashing apron is secured to the deck with roofing nails.
- Cut shingles to fit around the neck of the flashing. Use cement on the joints and to cover any exposed nails.

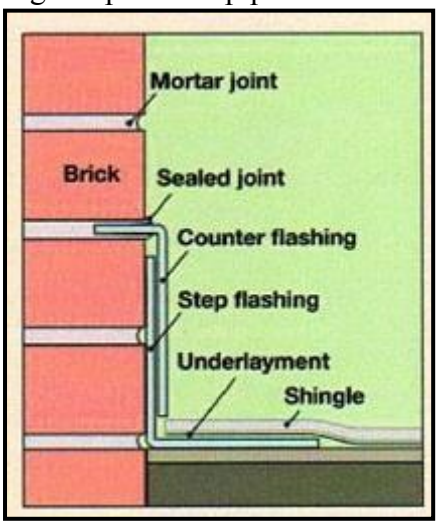


Figure 24: Flashing Around a Chimney

Step:

- To expose the damaged flashing bend back the counterflashing or siding.
- Remove roofing cement and shingles from around the damaged area.
- Remove the damaged flashing.
- Apply roofing cement to all unexposed areas of the new flashing and install it. Make sure it is overlapped by the flashing above and overlaps the flashing/shingles below.
- Do not fasten the flashing to the vertical element – place a nail through the bottom corner.
- Place the counter flashing and singles back over the flashing. Seal all joints with roofing cement.

4.5: Lead Base Paint and Asbestos

The following paragraphs outline the major steps required to carry out an abatement project.

4.5.1: Previous work

Building inspections have identified materials likely to contain lead base paint and asbestos. Investigations included inspections of the exteriors and the interiors of buildings.

- Residential buildings containing lead based paint have been encapsulated in areas of high risk
- Materials containing asbestos required more extensive inspections in the following areas: exterior walls and roof materials (siding, roof underlayment, vent seals); the interior (walls, floors and ceilings); crawl spaces and basements (wrap and fitting on pipes).

Once identified, these materials were submitted to a laboratory certified under the National Voluntary Laboratory Accreditation Program (NVLAP) for analysis.

4.5.2: Regulations

Federal regulations:

- 29 CFR 1910 OSHA General Industry Safety and Health Standards
- 29 CFR 1926 OSHA Construction Safety Standards
- 40 CFR 61 National Emission Standards for Hazardous Air Pollutants
- DA circular 40-843 Policy and Guidelines for asbestos management

- U.S. Environmental Protection Agency regarding Worker Protection Regulation
- Asbestos School Hazard Abatement Reauthorization Act
- Virginia Regulations for asbestos removal and encapsulation
- AR 200-1 Environmental Protection and Enhancement
- Resource Conservation Recovery Act

Work Guidelines:

- Personnel conducting lead base paint/asbestos surveys are required to be an accredited L.B.P and Asbestos Inspectors and/or Management Planners in accordance with the Commonwealth of Virginia.
- Laboratories performing analyses of samples shall be accredited by the National Voluntary Laboratory Accreditation Program operated by the National Institute of Standards and Technology for Sample Analysis.

Contractor Responsibilities:

- Contractor(s) shall be responsible for conducting pre inspection of the site to determine the presence of asbestos or lead base paint. The contractor shall also be responsible for conducting a hazard assessment to determine necessary measures for the protection of his/her site technicians
- Technicians engaged in renovation or repair projects shall be protected from exposure and shall take the necessary precautions to control, contain and clean up hazardous materials. Technicians exposed to hazardous materials shall be subject to medical examinations
- Contractor(s) are required to report any accident or injury

4.5.3: Lead Base Paint

Any corrective action, maintenance or repair work involving lead base paint removal requires precautionary measures to be taken to contain lead dust. As a general rule, plastic sheathing shall be installed on exterior and interior surfaces to prevent lead base paint chips land dust from contaminating grounds and buildings. Exterior surfaces with cracked, peeling, flaking material may be releasing lead paint chips and dust.

Removal:

- "Wet Scraping is recommended for the removal of loose paint. Both painted surfaces and scraping tools shall be kept wet during the scraping process to minimize the lead dust. Scraping tools are to have a soft flexible blade to not damage or gouge the material. The prepared surface is to be free of jagged rough edges which may interfere with the coating's ability to seal any gap.
- Following wet scraping, the surfaces shall be cleaned with a damp sponge to remove any dust. A tri-sodium phosphate followed by a clean water wash is to be used. The surfaces should be dry and thoroughly prepared prior to repainting or resealing.
- Heat guns provide an alternative method for removal. By blowing a stream of hot air on the surface causing a blister which allows the paint to be removed with a patty knife. The heat gun works best on heavy paint build up.

Encapsulation:

- Spraying a chemical solvent-base or caustic on intricate decorative features including details located on chimney lintels, stairway newels or rosette on frame doors etc

Not Recommended:

- Rotary drills, water or sandblasting.

Surface Sealing:

- Apply encapsulating enamel paint - one primer coat and two finishing coats.

Cleanup:

- A HEPA vacuum shall be used to remove all surface dust and small debris.
- At the end of each day, dust and debris shall be misted with water prior to sweeping and then placed in double 4-mil or 6-mil plastic bags and stored in a secure area before being transferred to a designated disposal facility.

Disposal of Debris:

- All lead waste shall be properly characterized and disposed of in accordance with State and local requirements.
- Lead debris shall never be sent to a solid waste incinerator (a disposal method that disperses lead into the air).

4.5.4: Asbestos

Removal, Disposal and Replacement:

- The material shall first be treated with a solution of water and a wetting agent to reduce fiber release. However some types of materials containing amosite will not absorb water a solution, therefore other wetting agents shall be tested on material for absorption. Otherwise, a dry removal shall be undertaken using respiratory protection and following remediation procedures.
- Friable asbestos materials shall be disposed of in leak-tight containers, typically 6-mil polyethylene bags. These bags are placed in 55 gallons drums and the bags shall be labeled as specified by OSHA.
- Water spray operations may leak through polyethylene sheets and damage floors. Sealed double plastic sheets shall protect the floors.
- Do not encapsulate extensive deteriorated material, rather enclose the damaged area and caulk around the perimeter of the enclosure.

Abatement Methods for Pipe and Boiler Insulation:

- When damages are limited apply a non asbestos plastering on the damaged area
- When large portion of pipe insulation shall be removed use containment bags; the bags are wrapped around the pipe insulation and sealed to the pipe with tape.

Conducting Abatement Projects:

Releasing a Contractor:

- An asbestos abatement project is completed when fiber release has been controlled and airborne asbestos has been reduced to a satisfactory condition

Visual Inspection:

- The asbestos inspector shall confirm the completion of the work. When materials containing asbestos have been removed, surfaces shall be checked for any remaining hazardous material. If dust is found the work area shall be cleaned again

Air Testing:

- Collect asbestos fibers by drawing the air through a filter. To accomplish an accurate measurement use a blower or a slow speed fan to keep the fibers (if any) dangled during the sampling

Analysis of Samples - three microscopic methods used for analysis of asbestos include:

- PCM: Phase Contrast Microscopy
- SEM: Scanning Electron Microscopy
- TEM: Transmission Electron Microscopy

Phase Contrast Microscopy application is most frequently used as well as the least expensive. In addition, this method has reliable analytical procedure
Testing with the PCM Method:

- Extract a minimum of 3000 liters minimum of air through each air filter at the rate of 2 to 12 liters per minute
- Collect five samples per work site or room and retain the sample with the most asbestos fiber density for analysis

The PCM analysis consists of measuring the asbestos from the selected filters and determines its presence, type and density. This analysis is performed in three phases:

- A gross examination.
- Examination under polarized light on a stereo microscope.
- Examination by phase-polar illumination on the compound phase microscope.

After the material analysis the contractor can be released when the sample value is approximately 0.01 fibers per cubic centimeter from a sampling base of 3000 liters of air

Figure 25: Vinyl Floor Tiles

<u>Materials Which May Contain Asbestos at Fort Monroe:</u>
Cement Roof /Wall Shingles:

- Asbestos cement wall shingles is a mixture of asbestos fibers and Portland cement (material is durable and fire resistant). This material was in popular use in the U.S. from the 1920's through the 1960's.

Floor Tiles:

- Floor tiles were made using asphalt binder, limestone, vinyl and other pigments combined with asbestos fibers.

Acoustical Ceiling:

- Acoustical ceiling were made using fiber glass or wood combined with asbestos.

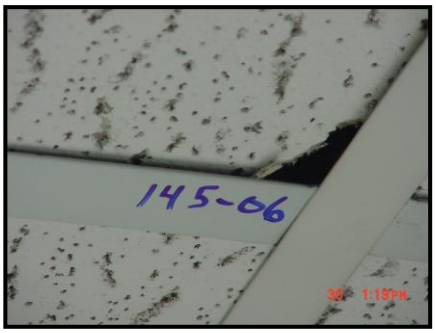


Figure 26: Acoustical Ceiling Tiles

Wrappings/ Fitting on a Pipe:

- Wrap and fitting on pipe were made of chrysotile and amosite.
- These types of asbestos are excellent for thermal insulation.

<u>Recommendations for Removal:</u>

- Removing asbestos using a rotary blade, cutters and other equipment that sand, grind and abrade release consequential amounts of asbestos dust and are subject to the National Emissions Standards for Hazardous Air Pollutants (NESHAP).

- Manual methods using tools such as hatchets, spud bare, pry bar and shovel are recommended. These tools release less dust compared to the devices mentioned earlier and are not subject to regulations if the material is not friable.
- Not all asbestos-containing products are dangerous. A health risk exists only when asbestos fibers are released from a product into the air where they may be inhaled. Products that are friable or made into dust are more dangerous than products in which binders immobilize the asbestos fiber.

Figure 27: Wrapping on a Pipe

Appendix A:
Building Descriptions

The following building descriptions provide some general information about the building, fenestrations, contributing interior features (if applicable), materials and the mechanical/electrical systems. Also provided is the Army designated building number, address, National Historic Landmark status (contributing or not), Virginia State Inventory Record Number and a picture.

All buildings have been grouped into one of four categories: housing, administration, storage and fortifications.

The following information is designed to be brief and to only provide the necessary information to carry-out the caretaker role. The descriptions have come from the: National Historic Landmark District nomination (2010); Historic American Building Survey (HABS)1987 report; Programmatic Agreement; Mariani Report (1988); Historic Architecture Repair and Maintenance Plan (HARAM) from 2001.

RESIDENTIAL

Building #: 1

Built: 1819
Address: 151Bernard Road
Dimensions: 48′ 0″ (five bays) x 32′ 3″
Stories: 3.0
NHL Status: Contributing
Type: Residential
VA State Inventory #: 114-0002-0004

Description: Central block on double piles with two-story flanking wings, an above-ground basement and gabled roof. Porch is full façade, supported by octagonal columns and piers. Basement: Entry has a glazed, paneled wood door. Windows are six-over-six-light double sash. First Floor: The central entry has a glazed, paneled wood door. Windows are two-over-two-light double-hung sash. Second Floor: Six-light casement window, four-light fixed window and two-over-two-light double-hung sash window. Interior: Ornamental plaster dome above stairs; columns and rope molding at doors and windows casings; elliptical staircase; two marble and wood fireplace mantels; vaulted ceiling on the second floor bedrooms; quarter-sawn pine flooring; solarium floor with alternating light and dark stained boards; below-grade cistern; century-old radiators; built-in casework on all floor; paneled reveals.

Materials: Flemish bond brick walls built on a concrete and brick foundation. Asphalt roof shingles. Porch is wood with a tin roof, wood columns and brick piers. Floors are wood, with plaster over the brick walls.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: A gas boiler and three AC window units. Gas-fired water heater.

Building #: 3

Built: 1875
Address: 167 Bernard Road
Dimensions: 51′ 0″ (six bay fronts) x 35′ 0″
Stories: 2.5
NHL Status: Contributing
Type: Residential
VA State Record #: 114-0002-0016

Description: A symmetrical duplex with a front-facing T- floor plan and a full façade porch. The roof is cross gabled with broken pitch on the front elevation. Chimneys have corbelled caps. The building was remodeled in 1934 after being damaged by a fire. The porch is picketed with balustrades, Doric columns and pilasters, dentils and a full entablature. It runs the entire façade on the second story First Floor: Two central entries have paneled wood with twelve lights; three-light transoms. Windows are four-over-four-light double-hung sash with lintels and sills. Second Floor: Two central entries have three-light French doors. Windows are four-over-four-light double-hung sash with lintels and sills. Porch runs the full façade. Interior: Original stairs, flooring, window and door casings.

Materials: Brick walls (bricks painted white) built on a concrete foundation. Roof of main structure has asphalt shingles while the porch has a metal roof. Windows have masonry lintels and sills

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Gas boiler; AC window units. Gas-fired water heater.

Building #: 14

Built: 1880
Address: 14 Ruckman Road
Dimensions: 41′ 0″ (three-bay front) x 25′ 6″
Stories: 2.0
NHL Status: Contributing
Type: Residential
VA State Inventory #: 114-0002-0136

Description: Front facing T-plan with a symmetrical façade and full-façade porch. The roof is crossed-gabled with two (three total) central chimneys with pots; cornice brackets; and chamfered roof supports. First Floor: Central entry with paired glazed wood-panel doors and flanked by pairs two-over-two-light double-hung sash windows. Second Floor: Four-over-four double-hung sash windows; central window is six-over-six-light double-hung sash which are paired with pedimented casing.

Materials: Wood frame with asbestos siding, built on a concrete and brick foundation. Asphalt roof shingles. The porch is a wooden frame with a slightly-pitched metal roof and brick pier foundation (it is currently in poor condition).

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Gas boiler and window AC units. Gas-fired water heater.

Building #: 15

Built: 1878
Location: 34 Ruckman Road
Dimensions: 38′6″ (six bay front) x 48′9″
Stories: 2.0
NHL Status: Contributing
Type: Residential
VA State Record #: 114-0002-0017

Description: A symmetrical duplex with a front-facing T-plan and full façade porch. Cross gabled roof with six chimneys. Windows on both floors are two-over-two-light double-hung sash. First Floor: Two central entries with glazed wood panel doors. Porch is one story with a full façade; its roof is supported by chamfered posts with jigsaw-cut brackets and pilasters at the ends and jigsaw-cut balusters. Interior: Original windows and doors.

Materials: Main structure is a wood frame atop a concrete foundation and has asbestos-shingle siding. The porch is also of a wood frame as are the posts. The roof is asphalt shingle while the porch roof is metal.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Gas boiler; central AC system. Gas-fired water heater.

Building #: 16

Built: 1878
Address: 51 Bernard Road
Dimensions: 51′0″ (six bay front) x 36′ 0″
Stories: 2.5
NHL Status: Contributing
Type: Residential
VA State Record #: 114-0002-0018

Description: A symmetrical duplex with a front-facing T-plan and full façade porch. Cross gabled roof. The six interior chimneys have corbelled caps. The porch is two stories, with picketed balustrades, Doric columns and pilasters. First Floor: Two central entries each having glazed wood paneled doors with transoms. Windows are four-over-four-light double-hung sash. Second Floor: Two glazed French doors. Windows are two-over-two-light double-hung sash. Interior: Original stairs, flooring, window and door casings.

Materials: Five course common brick bond (painted white) walls built on a concrete foundation. The roof has asphalt shingles. The porch has a wooden from and metal roof. Windows have masonry lintels and sills.

Mechanical/Electrical Systems: Electrical: Services from exterior transformer to an exterior disconnect switch and an exterior circuit breaker panel board. Mechanical: Gas furnace; central AC system. Gas-fired water heater.

Building #: 17 and 18 (Tuileries)

Built: 1823
Address: 41 and 29 Bernard Rd
Dimensions: 65′ 0″ x 37′9″ and 18′0″ x 23″ 0″
Stories: 3.0 (two stories over an above-ground basement)
NHL Status: Contributing
Type: Residential
VA State Record #: 114-0002-0005 and 114-0002-0019

Description: Rectangular floor plan with a rear ell and three-story full façade porch. The gabled roof is corbelled out and inset with stone to form ornamental quarter-rounds. A single large chimney serves all fireplaces (8 in total). The roof is a broken pitch on the front elevation. Full length porch is supported by piers and topped with Tuscan columns. Third level porches were probably added in 1907. Entrances are at gable ends under the side porches. Windows on the first and second floors are four-over-four-light double hung sash. Entries for all floors are glazed paneled wood doors. Basement: Windows are two -over-two-light double-hung sash. Interior: Original stairs and some flooring. Building 17: closets on either side of the first place may be historic, fireplaces may be original.

Materials: According to the 1987 HABS report the building is a wood frame with Flemish bond brick veneer walls built on full raised brick foundations. Porches are supported by brick columns and have tin roofs. The main roof has asphalt shingles.

Mechanical/Electrical Systems: Electrical: Services from exterior transformer to an exterior disconnect switch and an exterior circuit breaker. Mechanical: AC duct system. Gas-fired water heater.

Building #: 19

Built: 1880
Location: 18 Bernard Rd
Dimensions: 41'3" (three-bay front) x 25'6"
Stories: 2.0
NHL Status: Contributing
Type: Residential
VA State Record #: 114-0002-0020

Description: Symmetrical duplex with a front facing T- plan and a full-façade porch. One story bay on either side, only the northwest bay has windows. The central chimneys have corbelled tops. The porch has jigsaw brackets and balusters. First Floor: Central entry with a pair of glazed wood-panel doors. Windows are four-over-four light double-hung sash and two-over-two-light double-hung sash in the center of the bay window. Second Floor: Windows are four-over-four double hung sash and six-over-six double-hung sash under the center gable. Interior: Original slate fireplace mantels, hardware, moldings, quarter-sawn pine flooring, arched recessed in primary spaces, stair with turned balusters, acorn newels and a hardwood handrail

Materials: Wood frame built on a concrete foundation. Exterior walls are asbestos shingle. The roof has asphalt shingles. The porch is a wooden frame, brick foundation with a metal roof.

Mechanical/Electrical Systems: Electrical: Services from exterior transformer to an exterior disconnect switch and an exterior circuit breaker. Mechanical: Gas boiler; central AC system. Gas-fired water heater.

Buildings #: 25, 26, 30 and 31

Built: 1934
Address:

- 33 and 29 Tidball (25 and 26) 34 and 38 Hampton St (30 and 31)

Dimensions: 42' 0" (four bay front) x 30' 0"
Stories: 2.0
NHL Status: Contributing
Type: Residential
VA State Inventory #: 114-0002-0021 through 114-0002-0024

Description: Rectangular plan with brick end sleeping and rear porches. Buildings 26 and 31 have a hipped roof, while buildings 25 and 30 have a gabled roof. Two interior end chimneys are visible from the exterior. The sleeping porches have tripartite windows. First Floor: Two doorways with pilasters and overlight with wooden tracery. Tripartite windows: six-over-six-light double-hung sash flanked by two-over-two-light double-hung sash. Second Floor: Windows are six-over-six light double-hung sash. Interior: Original windows and doors, including ten light paired French doors; casings and moldings; fireplace mantels; stairs and wood flooring.

Materials: Brick foundation, exterior walls are five course common brick bond and a slate roof. Sleeping porches have brick foundations, clapboarded walls and metal hipped roofs.

Mechanical/Electrical System: Electrical: Services from exterior transformer to an exterior disconnect switch and circuit breaker. Mechanical: Gas furnace; central AC system. Gas-fired water heater.

Building #: 33, 34, 35, 43, 44, 45, 51, 52 and 54

Built: 1930

Address:

- 57 Fenwick Rd (#33) 1 Reeder Cir (#43)
- 94 Ingalls Rd (#34) 102 Ingalls Rd (#44)
- 2 Reeder Cir (#35) 110 Ingalls Rd (#45)
- 118 Ingalls Rd (#51) 134 Ingalls Rd (#54)
- 126 Ingalls Rd (#52)

Dimensions: 100′ 0″ (twelve-bay front) x 29′ 0″

Stories: 2.5

NHL Status: Contributing

Type: Residential

VA State Inventory #:

- 114-0002-0025 114-0002-0028 114-0002-0032 114-0002-0026 114-0002-0029 114-0002-0033
- 114-0002-0027 114-0002-0030 114-0002-0034

Description: Rectangular plan with two projecting two-bay porticos and end sleeping porches. The roof is gabled with a single central chimney. There are two, two-story sleeping porches each with flanking casemates, multi-paned fixed windows and a full entablature. Windows for both floors are six-over-six-light double-hung sash with jack arches and sills. First Floor: There are two, two-bay porticos. Second Floor: Paired four-over-four-light double-hung sash windows with jack arches and sills. There are six hipped dormers with six-over-six double-hung sash windows. Interior: Original windows and doors; casings and moldings; fire place mantels; stairs; wood flooring. Note: Building # 52B had a fire in 1936 which caused significant interior damage.

Materials: The main structure is built on a concrete foundation and has cinder block walls with a five course common bond brick veneer and a slate roof. The porticos have brick foundations with a concrete base and caps; wooden balustrades and a standing seam metal roof. The sleeping porches a standing seam metal roof. Window arches are brick and sills are concrete.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Furnace, central AC system and sprinkler system. Gas-fired water heater.

Building #: 50

Built: 1834
Address: 121Bernard Road
Dimensions: 50′ (eight bays) x 47′6″ and 23′ 7″ (four bays) x 27′ 10″
Stories: 2.0
NHL Status: Contributing
Type: Residential
VA State Inventory #: 114-0002-0031

Description: Irregular T- shape grouping of three quarters (a duplex-50A and B connected to a single family dwelling-50C). A wrap-around porch wraps on the main façade of the duplex with Doric columns. A porch extends the width of the second building with Doric columns on the second floor. Entries for both the duplex and single family dwelling are glazed, paneled wood doors. The duplex has a gabled roof, a central chimney and two end chimneys. Duplex: First and Second Floors: Windows are six-over-six-light double-hung sash with painted brick sills and jack arches. Single Family Unit: First Floor: Windows are nine-over-nine-light double-hung sash. Single Family Unit: Second Floor: Windows are six-over-six-light double-hung sash.

Materials: The duplex is a wooden frame with five course English bond brick veneer walls. The roof has asphalt shingles. The porch is wood, supported by brick piers and a standing metal seam roof with simple wood railings and lattice work between piers. The single family building is a wooden frame constructed on a brick and concrete foundation, with a painted brick veneer and a standing seam metal hipped roof. The porch is wood, with wooden square piers on the first floor and wood Doric columns on the second. The roof is a standing metal seam. Chimneys are made of brick and painted white.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Gas furnace; central AC system. Gas-fired water heater.

Building #: 55

Built: 1886
Address: 42 Ingalls
Dimensions: 41′ 0″ (three-bay front) x 25′6″
Stories: 2.0
NHL Status: Contributing
Type: Residential
VA State Inventory #: 114-0002-0035

Description: Symmetrical duplex with a front-facing L-plan and full façade porch. Cross gable roof with a center gable and three interior chimneys with corbelled tops. Porch is single story with an extended slightly-pitched roof and jigsaw cut brackets and balusters. There are two one story side bays, with the south side having windows. Windows are two-over-two-light double-hung sash. First Floor: Central entry has paired, glazed wood-panel doors with transom. Second Floor: Center windows are paired with pedimented casing. Interior: Original reeded window and door casings; radiators; moldings; oak flooring and arched recesses in primary spaces; stairs with turned balusters; chamfered newels with beveled caps and stained hardwood handrail.

Materials: Wood frame with aluminum siding built on a brick and concrete foundation. Asphalt roof shingles. Wood framed porch with a metal roof and brick piers.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and a circuit breaker. Mechanical: Gas boiler; central AC system. Gas-fired water heater.

Building #: 60

Built: 1890
Address: 67 Fenwick
Dimensions: 29′ 2″ (three-bay front) x 28′ 6″
Stories: 2.0
NHL Status: Contributing
Type: Residential
VA State Inventory #: 114-0002-0036

Description: Irregular block floor plan and façade with a side porch. Cross gables roof with three interior chimneys. First Floor: Main entrance has a glazed wood-panel door; paired twelve-over-two-light double-hung sash windows and small six-over-one light double –hung sash window. The porch is a single story with a hipped roof. Second Floor: Paired twelve-over-two-light double-hung sash windows and nine-over-two double-hung sash windows. The floor is stepped out and bracketed. Gables are extended and bracketed featuring sunbursts and half timbering. Interior: Original fire place with reeded surround; wood fireplace mantel shelf with brackets; raised panel doors with period hardware; and random width pine floors and trim.

Materials: Wood frames built on a brick and concrete foundation. First floor exterior walls are wood clapboards, with wood shingles on the second floor and a clapboard gable. Roof has asphalt shingles.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Gas boiler and gas-fired water heater.

Building # 61

Built: 1889
Address: 43 Ingalls Road
Dimensions: 43′ 0″ (six-bay front) x 16′0″
Stories: 1.5
NHL Status: Contributing
Type: Residential
VA State Inventory #: 114-0002-0037

Description: Rectangular duplex with a symmetrical façade and partial façade porch. Cross gabled roof. There are three interior chimneys have corbelled caps and brick work under the eaves. Porch is a single story with parallel gables and quatrefoil cut-outs, chamfered columns and pilasters, and pointed-arch entranceways. Both floors have four-over-four-light double-hung sash windows with jack arches. First Floor: Two central entries with jack arches, two glazed paneled doors. Second Floor: Two pointed-arch windows in the center wall dormer with four-over-four light double-hung windows and diamond-shaped louvered windows below the cornice of the wall dormer. Interior: Original stairs, windows and doors casings, possibly original wood flooring and built-in china cabinet.

Materials: Seven course common bond brick walls built on a concrete foundation, with asphalt roof shingles. Porch is a wooden frame with asphalt roof shingles. There are exposed rafters.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Gas boiler; central AC system. Gas-fired water heater.

Building #: 62 and 63

Built: 1889
Address: 28 and 24 Ruckman Road
Dimensions: 38′ 6″ (six-bay front) x 48′ 9″
Stories: 2.5
NHL Status: Contributing
Type: Residential
VA State Inventory #: 114-0002-0038 and 114-0002-0039

Description: Symmetrical duplex, front-facing T- plan and wrap-around porch. Cross gabled roof with six chimneys. Paired cornice brackets and verge boards in the side gables. The porch has a hipped roof, jigsaw-cut brackets paired with cornice brackets with pendants. Windows are two-over-two light double-hung sash. First Floor: Two central glazed wood panel doors. Interior: Original reeded window and door casings; period hardware; moldings; built-in casework; wood flooring; front and rear stairs; reeded newel posts . Building 62: faux fainted slate and wood fireplace mantels; double porcelain laundry tubs; main stairs with ball newel caps and drop pendants. Building 63: incised slate fireplace mantels; main stairs with hardwood handrails; main fireplace retains a cast-iron coal grate.

Materials: Asbestos shingle siding built on a concrete foundation. Porch frame is wood with a metal roof. Roof is asphalt shingle.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: One gas boiler; base board heating system; six AC window units. Gas-fired water heater.

Building #: 64

Built: 1934
Address: 71 Fenwick
Dimensions: 29′ 2″ (four-bay front) x 28′ 6″
Stories: 2.0
NHL Status: Contributing
Type: Residential
VA State Inventory #: 114-0002-0040

Description: Rectangular floor plan with a one-story entrance portico and two story side sleeping porches; a hipped roof and two chimneys. The porch is pedimented with Doric piers. There are two tripartite bay windows. Both floors have twelve-over-twelve-light double-hung sash windows and one-over-one light double-hung sash windows in the porches. First Floor: A central entry with a glazed paneled door. Second Floor: Transom window. Interior: Brick fireplace and hearth with a wooden mantel; five paneled doors with period hardware; wood flooring and trim; plain casings and a straight run stair.

Materials: Wood frame built on a brick and concrete foundation. Siding is aluminum with an asphalt shingle roof on both the main structure and entrance portico. Porches are a wooden frame with a shed roof.

Mechanical/Electrical System: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: One gas boiler and four AC window units. Gas-fired water heater.

Building #: 90

Built: 1900
Address: 21 Moat Walk
Dimensions: 20′ 4″ (three-bay front) x 28′ 2″
Stories: 2.0
NHL Status: Contributing
Type: Residential
VA State Inventory #: 114-0002-0041

Description: Rectangular floor plan with a one-story rear ell, front/back porches and a raised basement. Two bay single story porch with three square columns and turned balusters. Windows on both floors are six-over-six-light double-hung sash with segmental arches. First Floor: Segmental arch over doorway made of three rows of header bricks. Interior: Original windows and doors; casing and moldings; stairs; wood flooring.

Materials: Stretcher bond brick walls built on a concrete foundation, with a brick water table. Porch has wooden columns and a metal roof. Asphalt shingles on the roof.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Gas furnace; central AC system. Gas-fired water heater.

Building #: 93

Built: 1884
Address: 75 Ingalls Road
Dimensions: 35′ (two-bay front) x 44′
Stories: 2.0
NHL Status: Contributing
Type: Residential
VA State Inventory #: 114-0002-0042

Description: Rectangular floor plan with a side wing and two-story wrap-around porch, peidmented side dormers and four chimneys and picketed balustrade. Roof is hipped and pyramidal with a side gabled wing. The porch has a hipped roof with Doric columns. Entry on both floors is through wood-paneled paired glazed doors with segmental arches. Windows are one-over-one-light double hung sash with segmental arches and stone stills. Second Floor: Rounded window. Interior: Original pocket doors and staircase; fluted pilaster trim; corner blocks; arched openings into bays on the first and second floors.

Materials: Eight course common-bond brick walls built on a concrete and brick foundation. Asphalt-shingle roof and siding on the side dormers. Porch is a wooden frame on a brick foundation with a tin roof.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Heat pump; central AC system and two AC window units. Gas-fired water heater.

Building #: 101, 102 and 103

Built: 1906
Address: 55, 59 and 63 Ingalls Road
Dimensions: 32'0" (eight-bay front) x 72' 5"
Stories: 2.5
NHL Status: Contributing
Type: Residential
VA State Inventory #: 114-0002-0043, 114-0002-0044, 114-0002-0045

Description: Rectangular plan with two rear wings, a gabled roof with three chimneys and one central chimney. Porches are on three sides with arched openings and sawn balusters. There is a raised basement. First and second floor both have double glazed raised panel doors with segmental arches and curved three-light overlights. Windows are two-over-two-light double-hung sash with arches. First Floor: Windows have jack arches. Second Floor: Windows have segmented arches. There are two large dormers with arched six-over-six-light double-hung sash with segmental arches. Four small dormers, curved with four-light casement windows with wood keystones. Interior: Built-in sideboard; fireplace mantel with mirrors; original windows and doors; original moldings; stairs with bracketed stringers; and original wood flooring. Building 101: Has original window and door casings.

Material: Stretcher bond brick walls built on a concrete and brick foundation, with sting course at the first and second levels and below the eaves. There is also a brick splash course and an asphalt shingle roof. Porches are brick with wood columns; decorate elements include brick pilasters and iron work in the arches. Decorative elements on windows include masonry keystones.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Gas furnaces; central AC duct system. Gas-fired water heater.

Buildings #: 109, 110 - 115, 130, 131, 132, 140, 148, 149, 150 - 156

Built: 1906 and 1911

Address:

- 1-3 Frank Ln (109)
- 34-36 Tidball Rd (111)
- 26-28 Tidball Rd (113)
- 18-20 Harrison St (115)
- 18-20 Tidball Rd (131)
- 17-19 Moat Walk (140)
- 9-11 Moat Walk (149)
- 8-10 Patch Rd (151)
- 13-15 Patch Rd (153)
- 183-185 Bernard Rd (155)
- 38-40 Tidball Rd (110)
- 30-32 Tidball Rd (112)
- 22-24 Harrison St (114)
- 22-24 Tidball Rd (130)
- 13-15 Tidball Rd (132)
- 5-7 Moat Walk (148)
- 13-15 Moat Walk (150)
- 12-14 Patch Rd (152)
- 13-15 Murray St (154)
- 179-181 Bernard Rd (156)

Dimensions: 29′ 6″ (six-bay front) x 39′ 0″

Stories: 2.0

NHL Status: Contributing

Type: Residential

VA State Inventory #:

- 114-0002-0046 (109)
- 114-0002-0047 (110)
- 114-0002-0048 (111)
- 114-0002-0049 (112)
- 114-0002-0050 (113)
- 114-0002-0051 (114)
- 114-0002-0052 (115)
- 114-0002-0064 (130)
- 114-0002-0065 (131)
- 114-0002-0066 (132)
- 114-0002-0069 (140)
- 114-0002-0076 (148)
- 114-0002-0077 (149)
- 114-0002-0078 (150)
- 114-0002-0079 (151)
- 114-0002-0080 (152)
- 114-0002-0081 (153)
- 114-0002-0082 (154)
- 114-0002-0083 (155)
- 114-0002-0084 (156)

Description: Rectangular block duplex with a one-story rear ell, side porches and a gabled roof. Windows on the first and second floor are six-over-six-light double-hung sash with arches; half-rounded windows at the gable end and side porches on the rear ell. The porch is one story with chamfered, square columns. Buildings 148-156 have s one central chimney. Buildings 109-115, 130-132 and 140 have three chimneys. First Floor: Identical doorways at either end with raised panel and brick jack arches. Interior: Original windows and doors; stairs with open stringers; living room mantel; wood flooring. Buildings 148, 150, 151: Have built in casework and historic air registers on the second floor. Building 154 has a historic register. Building 155 might have a historic register.

Building Materials: Stretcher bond brick walls built on a concrete and brick foundation with a brick water table. The roof has asphalt shingles. Windows have limestone sills. The porches have wood columns and standing seam metal roofs. Buildings 140, 148, 149 and 150 have terra cotta tiled roofs.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Central AC duct systems. Gas-fired water heater.

Buildings #: 118, 120 and 125

Built: 1908
Address: 29 and 37 Fenwick Road; 73 Ingalls Road
Dimensions: 28'1" (four-bay front) x 42'
Stories: 2.5
NHL Status: Contributing
Type: Residential
VA State Inventory #: 114-0002-0053, 114-0002-0055 and 114-0002-0059

Description: Front facing and cross gable with a raised basement and four chimneys. Windows on the first and second stories are six-over-two-light double-hung sash with jack arches. There is a single story wraparound porch with columns, turned balusters and stair rail. First Floor: Double glazed, raised panel doors with four-light transom and jack arch. Second Floor: Two, six-over-two-light double-hung sash windows on the front-facing gable. Interior: Original windows and doors; stairs with bracketed stringers; wood flooring; built-in casework in pantry.

Materials: Stretcher brick bond walls built on a brick and concrete foundation, with a slate roof and stone water table. Windows have stone sills. Porch has brick piers with wood columns and concrete steps. The chimneys have corbelled brick and stone caps; brick coursing over the second story windows and a dentiled cornice.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Central AC duct system. Gas-fired water heater.

Buildings #: 119 and 1087 (the gazebo)

Built: 1907
Address: 33 Fenwick Road
Dimensions: 63' 0" (five-bay front) x 28' 0"
Stories: 2.0
NHL Status: Contributing
Type: Residential
VA State Inventory #: 114-0002-0054 and 114-0002-0285 (gazebo)

Description: Rectangular floor plan with a projecting central block, full height porch and side porches. Roof is gabled with a central cross gable; the main porch is paired full-height fluted columns, pedimented with half round window and square balusters. Side porches have engaged columns, glazed doors, transoms and jalousie windows. There are five chimneys with corbelled caps. Windows on the first and second floor are eight-over-two-light double-hung sash with jack arches and voussoirs. First Floor: Double glazed door with sidelights. Second Floor: Large, plate glass window in the center. Interior: Original: fireplace mantels, multi-light French doors and transoms, pockets doors; staircase; and possibly the flooring. Bldg 1087 (gazebo): is located in the formal, landscaped garden behind the house. It is hexagonal in shape with hexagonal columns and embellished with arches, lattice and a balustrade. The roof is bell-shaped with jigsaw trim.

Materials: Stretcher bond brick walls built on a concrete and brick foundation, with a slate roof. First floor door has a limestone arch and leaded fanlight. Windows have limestone keystones; side porches have brick quoins; wrought iron railing on the balcony and concrete steps. The gazebo has a copper roof.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Fire/smoke alarm system. Thirty five motion detectors. Mechanical: A gas boiler; central AC duct system. Gas-fired water heater.

Buildings #: 121, 123, 124, 126, 127 and 128

Built: 1909
Address:

- 41-43 Fenwick Rd (#121) 2-4 Ruckman Rd (#123)
- 67-69 Ingalls Rd (#124) 163-165, 145-147 and 107-108 Bernard Rd

Dimensions: 21'10" (eight-bay front) x 58'10"
Stories: 2.5
NHL Status: Contributing
Type: Residential
VA State Inventory #:

- 114-0002-0056 (#121) 114-0002-0057 (#123) 114-0002-0058 (#124)
- 114-0002-0060 (#126) 114-0002-0061 (#127) 114-0002-0062 (#128)

Description: Rectangular floor plan with a gable roof, six chimneys, two rear ells and two single story wrap-around porches. Porches have columns, turned baluster and stair rails. Windows on the first and second floors are six-over-two-light double-hung sash with jack arches and sills. First Floor: Double glazed, raised panel doors with four-light transom and jack arch. Second Floor: Two gabled dormers with double hung six-over-two light double hung sash windows, cornice and paneled corner boards. Interior: Original window and doors; stairs with bracketed stringers; wood flooring. (*127B has the original wood flooring and stairs with bracketed stringers)

Materials: Five course common brick bond walls built on a concrete and brick foundation with a brick and stone water table. Roof has asphalt shingles. Windows have stone stills; on the second floor there are wood shingles in the gable above the window and projecting brick. Porches have brick piers, wood columns and concrete steps. Chimneys have corbelled bricks and stone caps.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Gas furnaces; central AC system. Gas-fired water heater.

Building # 129

Built: 1909
Address: 101Ingalls Road
Dimensions: 25'0" (seven-bay façade) x 49'2"
Stories: 2.5
NHL Status: Contributing
Type: Residential
VA State Inventory #: 114-0002-0063

Description: Rectangular duplex with a cross gable roof in the front, a hipped roof in the rear and raised basement. Chimneys have corbelled caps. There are two, one story porches. Windows on both floors are six-over-two-light double-hung sash with jack arches and sills. Three windows are in the cross gable, two are four-over-two-light double-hung sash. First Floor: Glazed, raised panel front door with three-light transom and brick jack arch. Interior: Original windows and doors, casings and moldings; stairs with bracketed stringers; wood flooring; historic bathroom fixtures in attic bath; built-in cupboard and radiator with warming oven in dining room.

Materials: Five course common bond brick walls built on a brick and stone foundation. Asphalt roof shingles, a dentilled cornice and projecting brick course. The HABS report lists a brick water table with a stone splash course.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: One gas boiler; six AC window units. Gas-fired water heater.

Building #: 136 and 137

Built: 1909
Address: 17 and 21Hatch Lane
Dimensions: 32′ 3″ (four-bay front) x 52′ 6″
Stories: 1.0
NHL Status: Contributing
Type: Residential
VA State Inventory #: 114-0002-0067 and 114-0002-0068

Description: Rectangular duplex with a double-shotgun floor plan. Roof is hipped with flared eaves and exposed false rafter ends. The porch is two bays wide with square columns and brackets. There are small ells added to each side in the rear, each featuring a brick chimney at the ends and third central chimney. First Floor: Two doorways with six-over two-light double-hung sash windows with segmental arches made of two rows of headers. Interior: Some original windows and doors, casings and moldings; wood flooring.

Material: Five course common bond brick walls built on a stone foundation. Roof has asphalt shingles. Windows have limestone sills. Porch has wood columns.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Central AC system. Gas-fired water heater.

Building #: 141 and 142

Built: 1910
Address: 53 and 51 Fenwick Road
Dimensions: 44′ 0″ (five-bay front) x 56′ 0″
Stories: 2.0
NHP Status: Contributing
Type: Residential
VA State Inventory #: 114-0002-0070 and 114-0002-0071

Description: Rectangular floor plan with a monumental thirteen bay, wraparound porch and built-up roof. There are fourteen full height columns and second floor balustrade. There are four chimneys with corbelled caps. Windows on both floors are six-over-six-light double-hung sash. First Floor: Double glazed doors with sidelights. Second Floor: The windows are in the center flanked by three light casement windows. Interior: Original windows and doors, stairs and wood flooring; large louvered skylight over stairway hall.

Materials: Five course common bond brick walls built on a brick and concrete foundation with wood columns.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Gas furnaces; central AC system. Gas-fired water heater.

Building #: 143 and 144

Built: 1910
Address: 35 and 41 Ingalls Road
Dimensions: 55'3" (eleven-bay front) x 64'5"
Stories: 2.5
NHL Status: Contributing
Type: Residential
VA State Inventory #: 114-0002-0072 and 114-0002-0073

Description: Rectangular bock plan with a rear ell and gabled roof. There is a two story, two level, five-bay porch with six full-height columns and square balustrades. The porch roof has a balustrade and dentil cornice. Four interior end chimneys attached in pairs at the roof ridge and one central chimney. There is a raised basement; exposed, sawn rafter ends on the sides and rear wings and site parapet walls. Both floors have six-over-one-light double-hung sash windows and bay windows. First floor: Double front door with jack arch and five light transoms. Second Floor: Windows have jack arches and there are three hipped dormers with bracketed eaves. Interior: Original windows and some doors, including pocket doors, casings and moldings; original stairs and quarter-sawn wood flooring; built-in casework; bay windows in dining room.

Materials: Five course common bond brick walls built on concrete foundation with a stone water table. The roof has slate shingles. Porch columns are made of wood and there are concrete steps. There is stone coping at the chimney and roof ridge.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: One gas boiler; central AC system. Gas-fired water heater. Buildings equipped with a sprinkler system.

Building #: 146

Built: 1910
Address: 146 Engineer Lane
Dimensions: 16' 0" (three-bay fronts) x 36' 4"
Stories: 2.0
NHL Status: Contributing
Type: Residential
VA State Inventory #: 114-0002-0074

Description: Rectangular plan with side wings and side dormers. Roof is hipped with a cross gable. Both floors have six-over-two-light double-hung sash windows with jack arches and sills. The porch wraps around on three sides, has eleven bays, columns and square balusters. There are two chimneys with corbelled caps and there is a half round window in the gross gable on the façade. First Floor: Double front door with six-light transom. Interior: Original windows and doors, casings and moldings; stairs; wood flooring.

Materials: Five course common brick bond walls built on a brick and concrete foundation. Roof has asphalt shingles; limestone window sills; wood porch columns; and projecting brick below the eaves.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: One gas boiler; central AC system. Gas-fired water heater.

Building #: 147

Built: 1910
Address: 147 Engineer Lane
Dimensions: 39′ 0″ (five-bay front) x 32′ 6″
Stories: 1.0
NHL Status: Contributing
Type: Residential
VA State Inventory #: 114-0002-0075

Description: Rectangular floor plan with a single hipped roof. There are two interior chimneys with corbelled caps and a raised basement with six-over-six-light double-hung windows with jack arches. First Floor: Arched opening with pilasters; inside a recessed doorway has double glazed doors with five-light transom and jack arch. The windows are six-over-two-light double-hung sash with segmental arches made of three rows of header bricks. Interior: Original windows and doors, casings and moldings; stairs; wood flooring.

Materials: Five course common brick bond walls built on a concrete and brick foundation with brick and concrete steps. Roof has asphalt shingles and windows have brick arches.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Gas furnace; central AC system. Gas-fired water heater.

Building #: 157 and 158

Built: 1911
Address: 101 Bernard Road and 32 Ingalls Road
Dimensions: 48′ 4″ (five-bay front) x 33′ 5″
Stories: 2.5
NHL Status: Contributing
Type: Residential
VA State Inventory #: 114-0002-0085 and 114-0002-0086

Description: Rectangular floor plan with a raised basement and rear ell. Roof is hipped with a hipped cross gable at the rear. There is a two story, two level, three-bay porch with square columns and balusters on the first floor and decorative balustrade on the second. First Floor: Double glazed, raised panel door with sidelights. Windows are paired six-over-two-light double-hung sash with jack arches and sills. Second Floor: French doors in center that are flanked by six-over-two-light double-hung sash windows with jack arches. Interior: Fireplace mantels; original windows and doors, including two pairs of pocket doors, casings and moldings; stairs with turned spindles; wood flooring. Building #157: Built-in casework in the pantry. Building #158: Historic bathroom fixtures in the attic bathroom.

Material: Flemish bond brick walls built on a concrete foundation with a limestone splash course. The steps are concrete and brick with limestone trim. Roof has asphalt shingles; windows on the first floor have limestone sills; porch columns are wood. There are exposed jigsawn rafter ends.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Heat pump; central AC system. Gas-fired water heater.

Building #: 167

Built: 1921
Address: 7 Patch Road
Dimensions: 30′ 6″ (four-bay front) x 41′ 0″
Stories: 2.0
NHL Status: Contributing
Type: Residential
VA State Inventory #: 114-0002-0087

Description: Rectangular floor plan with a front vestibule, raised basement and one interior chimney. Roof is gabled. Both floors have six-over-six double-hung sash windows with jack arches and sills. There is an arched window in the rear elevation. First Floor: Two tall, slim four-light fixed sash windows in the projecting vestibule (entries on sides). Second Floor: Half rounded windows on the gable ends. Interior: Original windows and doors, casings and moldings; stairs; wood flooring; varied colored bricks at the corners and the window/door surrounds.

Material: Stretcher bond brick walls built on a concrete foundation. Roof has asphalt shingles. Windows on both floors have limestone sills. Bricks surrounding the windows are red, while others are lighter.

Mechanical/Electrical System: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: One gas boiler; central AC system. Gas-fired water heater.

Buildings #: 186, 187, 188, 191 - 196

Built: 1931 and 1934
Address:

- 17, 21 and 25 Murray Street
- 2, 6, 10, 1, 5 and 9 Pratt Street

Dimensions: 42′ (four-bay front) x 30′
Stories: 2.0
NHL Status: Contributing
Type: Residential
VA State Inventory #: 114-0002-0088 through 114-0002-0096

Description: Rectangular floor plan flanked by sleeping porches on each gable and rear porches. Buildings 186, 187 and 188 have a projecting front vestibule. Roof is hipped on Buildings: 186, 187, 188, 192, 194 and 196. Roof is gabled on Buildings: 191, 193 and 195. There are two interior end chimneys. Sleeping porches have tripartite windows. First Floor: Two doorways with pilasters, a fanlight and tracery, full entablature and a raised panel door. There are tripartite windows which are six-over-six-light double-hung sash and flanked by two-over-two-light double-hung sash. Second Floor: Windows are six-over-six-light double hung sash. Interior: Original windows and doors, casings and moldings; fireplace mantels; stairs; wood flooring. Building 186 also has ten-light paired French doors.

Materials: Five course common bond brick walls built on a concrete foundation. Roof is slate and door tracery is wood. Sleeping porches have brick foundations, clapboard walls and metal hipped roofs.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Gas furnaces; central AC system. Gas-fired water heater.

Wherry Housing (duplex) Buildings: 300, 301 and 306

Built: Circa 1953
Address: 300, 301 and 306 Fenwick Road
Dimensions:
Stories: 1.0
NHL Status: Contributing
Type: Residential
VA State Inventory #: 114-0002-0097 114-0002-0098 114-0002-0103

Description: Rectangular block duplex. The roof has a side gable. Windows are two-light horizontal sliding glass. Entrance is accentuated by a flat-roofed canopy supported on pipe columns.

Materials: Stretcher brick bond veneer walls built on a reinforced concrete and brick pier foundation. The roof is asphalt shingles. Clapboards are under the gable ends. The entrance columns are steel.

Mechanical/Electrical: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical – Buildings 300 and 301 are equipped with two heat pumps, building 306 has four; central AC system. Gas-fired water heater.

Wherry Housing (quad) Buildings: 302-305, 307-309, 311-324, 342-460

Built: Circa 1953
Address:

- 302-305, 307-309, 311-324 Fenwick Road
- 342-460 Gullick Drive

Dimensions:
Stories: 2.0
NHL Status: Contributing
Type: Residential
VA State Inventory #:

- 114-0002-0099 to 114-0002-0102
- 114-0002-0104 to 114-0002-0125 and 114-0002-0127 to 114-0002-0128

Description: Rectangular floor plan. Windows are two-light horizontal sliding glass. Entrances are accentuated by gable roofed canopies supported by pipe columns. Buildings: 304, 307, 311, 316, 324, 344, 350, 356 and 458 have Dutch gable-roofs. Buildings: 303, 305, 309, 318, 346, 348, 354, 452, 456 and 458 have three dormers with side walls and gables. Remaining roofs have side gables. Building 322 and 314 have a projecting center gable roof creating an entrance overhang; it is accentuated by full height columns and a broken triangular piedmont.

Building: Stretcher brick bond veneer walls built on a reinforced concrete and brick pier foundation. Roof has asphalt shingles. Clapboards are under the gable ends. Canopy supports are steel.

Mechanical/Electrical: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Four heat pumps; central AC system. Gas-fired water heater.

ADMINISTRATIVE

Building #: 4

Built: 1934
Address: In Continental Park
Dimensions: 31′ 0″ x 31′ 0″
Stories: 1.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0189

Description: Octagonal gazebo with a raised basement and conical roof. Entrance to the basement is through a wood paneled door. The roof is supported by Doric columns and constructed with I-beams with wood cladding. There is a full entablature; low hedge of clipped ligustrums (shrubs) around the base; and the railing is has a lyre motif.

Materials: Wood and concrete construction built on a concrete foundation with asphalt shingles and wrought iron railing.

Mechanical/Electrical Systems: None

Building #: 5

Built: 1879
Address: 5 North Gate Road
Dimensions: 446′0″ (forty-five bay front) x 60′ 2″
Stories: 3.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0129

Description: Rectangular floor plan, symmetrical façade, side wings and staircases. The center block has a mansard roof, with hipped wings. The porch is three stories with a flat roof covering stairwells. An addition in 1938 and in 1900 the roof was raised. Windows for all floors are six-over-six-light double-hung sash with segmental arches and sills. First Floor: The main entrance includes a vaulted passage with a segmented arch flanked by four-light paneled doors with three-light transoms. The side wings have double paneled doors with transoms and set in segmental arches and sills. Second and Third Floors: Have double paneled doors with transoms set in segmental arches. Details: A large clock below pediment of the wall dormer on the main building and a drip mold.

Materials: Seven course common bond brick walls built on a concrete and brick foundation. Stairwells are brick; roof has asphalt shingles and arches on the main floor are stone. Window and door sills are masonry.

Mechanical/Electrical Systems: Building 5 north and south have both wet and dry fire suppression systems. Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: One gas boiler; central AC system. Gas-fired water heater.

Building # 6

Built: Circa 1900
Address: 6 North Gate Road
Dimensions: 51′ 10″ (five-bay front) x 36′ 3″
Stories: 1.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0130

Description: Rectangular floor plan with a built-up roof. This building has a 5,000 gallon AST. First Floor: Segmental arch over raised panel door and a two-light transom. Windows are six-over-six-light double-hung sash under segmental arches with sills and eight-light casement windows.

Materials: Five course common bond brick walls built on a concrete foundation with two courses of projecting brick near the bottom of the wall. Window sills are limestone.

Mechanical/Electrical: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: The building is a mechanical room equipped with a one 300-ton chiller.

Building #: 7

Built: 1880
Address: 7 Bernard Road
Dimensions: 80′ 4″ (eight-bay front) x 30′ 4″
Stories: 2.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0131

Description: Rectangular, block floor plan. Roof is hipped, with three chimneys. Windows on both floors are six-over-six-light double-hung sash with segmental arches and sills. The current porch was added in 1968; a pedimented two-story, three-bay porch was removed in 1958. The roof was raised to add a second story around 1900. First Floor: Central entry with two paneled glazed doors, a four-light transom door and step. A partially bricked window with three-over-three-light fixed sash, segmental arch and sill. Second Floor: A wood door in segmental archway with transom and step. Interior: Original wooden stairs; hall is lined with original beaded tongue-and-groove wainscoting; cast iron columns on the first and the second floor; original pressed tin ceilings is currently hidden by acoustic tile

Materials: Seven courses common bond brick walls on the first floor; five courses common bond brick walls on the second floor; nine and six courses between floors; built on a concrete foundation. Roof has slate shingles, with a tin ceiling. Step at main entry and window sills are stone. Step at the second floor is concrete. Doorways on both floors are made of brick. The porch is made of metal and there are several cast iron columns. There are bricked doorways on the first and second floors.

Mechanical/Electrical Systems: Electrical: Services from exterior transformer to an exterior disconnect switch and an exterior circuit breaker. Mechanical: Gas package; central AC system.

Building #: 8

Built: 1887
Address: 8 Bernard Road
Dimensions: 25′ 10″ (two-bay front) x 15′ 2″
Stories: 1.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0132

Description: Symmetrical, rectangular block floor plan. The roof is hipped. Entry has two segmental arches with paneled doors, transom and boarded transom. Addition was added in 1904.

Materials: Five course common bond brick walls (painted white) built on a concrete foundation. Entry doors are wood; the roof has asphalt shingles; and there are exposed rafters.

Mechanical/Electrical: Electrical: Services from exterior transformer to an exterior disconnect switch and circuit breaker. Mechanical: No HVAC system

Building #: 9

Built: 1900
Address: 10 Bernard Road
Dimensions: 45′ 4″ (five-bay) x 60′ 4″
Stories: 2.5
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0133

Description: Rectangular building with a rear wing, hyphen and rear ell. Ornaments are on the roof at junctions of slopes. 1902 a rear ell was added and in 1959 the cast iron porch was removed. The roof is hipped with two chimneys. There is a two-story, two-level front porch on piers with a railing. Doors on the first and second floor are similar - a double door with six-light-overlight and segmental arch. Windows on both floors are two-over-two light double-hung with segmental arches and sills. The central dormer is hipped with two twelve-light fixed sash windows; side walls that curve around the front and meet the window jambs.

Material: Stretcher bond brick walls built on a concrete foundation. The roof has slate shingles. Doors are steel. Window sills on both floors are limestone. Dormer side walls are slate. The porch has brick piers, concrete floors, metal stairs and iron pipe railings. There is a low brick water table on the building. Interior: There are cast iron columns and a section of pressed metal ceiling.

Mechanical/Electrical Systems: This building has a dry fire suppression system. Electrical: Services from exterior transformer to an exterior disconnect switch and circuit breaker. Mechanical: A boiler; central AC system; three AC window units. Gas-fired water heater.

Building #: 10

Built: 1902
Address: 11Bernard Road
Dimensions: 153′ 10″ (eighteen-bay front) x 42′ 0″
Stories: 3.5
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0134

Description: U-plan with a three-part façade, where the central block is recessed. The roof is hipped. Windows on all floors are two-over-two light double-hung sash with jack arches and sills. There are four hipped dormers on the main façade with two six-light fixed-sash windows in each. Five stair towers provide access to all floors. A firewall is in the center with corbelling at the eaves, two central chimneys but six total, ornaments on the roof and a dentilled cornice. First and Second Floors: Two double raised panel, glazed doors with jack arches. Third Floor: Two single, raised panel, glazed doors with jack arches.

Materials: Stretcher bond brick walls built on a concrete foundation. The roof has slate shingles. Window jack arches are brick with masonry sills. Third floor door jack arches are brick. Dormers have slate shingles on the sides. There is a low brick water table on the building with a projecting brick course below the eaves. Ornamentation is either wood or metal.

Mechanical/Electrical: This building has a dry fire suppression system and building 10 north has a wet fire suppression system. Electrical: Services from exterior transformer to an exterior disconnect switch and circuit breaker. Mechanical: A gas boiler; central AC system. Gas-fired water heater.

Building # 11

Built: 1934
Address: 3 Fenwick Road
Dimensions: 200′ 5″ (sixteen-bay front) x 30′ 9″
Stories: 1.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0135

Description: Front-facing L - plan with an addition. Roof is cross hipped. There is an end chimney and eyebrow dormers with louvers. First Floor: Two paneled glazed doors, one wood door and jalousie windows with sills.

Building Materials: Five course Flemish-bond brick walls built on a concrete foundation. Roof has asphalt shingles. The addition has a shed roof. Jalousie windows have concrete sills.

Mechanical/Electrical Systems: Electrical: Services from exterior transformer to an exterior disconnect switch and circuit breaker. Mechanical: A gas boiler; central AC system and one AC window unit. Gas-fired water heater.

Building # 24

Built: 1881
Address: 1 Ruckman Road
Dimensions: 46′ 6″ (three-bay front) x 40′ 4″
Stories: 2.0
NHL Status: Contributing
Type: Administration
VA State Inventory #: 114-0002-0137

Description: Rectangular floor plan with an asymmetrical façade. There is a hipped roof with side-gable, one semi-exterior end chimney and a recessed second story wall with brick corners that suggest pilasters with a corbelled capital and cornice. Joist ends are visible over garage doors. First Floor: A paneled door with a fanlight and a glazed, paneled overhead garage door. Second Floor: Windows are two-over-two-light double-hung sash with segmental arches and sills. Interior: Original painted cast iron columns with ornamental caps supporting chamfered wood beams in the garage area.

Materials: Seven course common bond brick walls built on a concrete foundation. The roof has slate shingles. Door on first floor is wood and brick; garage door is wood. Window sills are masonry. Columns are cast iron with wood beams.

Mechanical/Electrical: Electrical: Services from exterior transformer to an exterior disconnect switch and circuit breaker. Mechanical: Gas furnace; central AC duct system. Gas-fired water heater.

Building #: 27 and 27A

Built: 1860
Address: 66 Ingalls Road
Dimensions: 236′ 3″ (twenty-three bays) x 52′ 2″
Stories: 1.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0138 and 114-0002-0139

Description: Building 27A is a rectangular floor plan and a subsidiary to building 27. The entrance is adorned with a masonry jack arch with a keystone. Windows are twelve-over-twelve-light double-hung sash. Building 27 has a T-shaped floor plan. The roof is side gabled, with an octagonal searchlight tower, added in 1904, at the roof ridge joint of the two rectangular blocks. The searchlight tower has eight-light double-hung sash windows. There is a full entablature, parapet and two interior chimneys. First Floor: Three entries with glazed paneled double doors, each with a stoop, painted jack arch and keystone. Windows are twelve-over-twelve-light double-hung sash with painted sills and lintels. Interior: (27) Some historical paneling at the north end on the wall and ceiling; some cast iron heat registers, some historic doors and transoms remain.

Materials: Masonry walls with three course English brick bond veneer built on a stone foundation. All roofs are asphalt shingles. Entry doors are wood, the masonry stoop, jack arch and window sills are all masonry. There is a brick splash course. The searchlight tower has wood clapboard. Building 27A has five course common bond brick walls built on a stone foundation.

Mechanical/Electrical Systems: Building 27 has a dry fire suppression system. Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Building 27: A gas boiler; central AC system and two AC window units. Building 27A: There is a heat pump and central AC system. Gas-fired water heater.

Building #: 28

Built: 1939
Address: 318 Cornog Lane
Dimensions: 33′ (seven-bay front) x 263′ (fifteen-bay front)
Stories: 2.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0140

Description: U-shape floor plan with a projecting central entrance bay with a built-up roof. The east and west facades have regularly spaced buttresses with coping. First Floor: Double door surrounded by five large plate glass windows in protecting bay; four-light and multi-paned jalousie windows. Second Floor: Jalousie windows. Interior: Open original bays and loading area with submarine mine depot on ground floor; original main stairs; original two-story entry vestibule; large metal vault on the second floor; some tracks are still visible.

Materials: Seven course common bond brick walls built on a concrete foundation and a brick water table with a concrete splash course. Roof parapet is aluminum; first floor door is aluminum and glass. Steps and coping are concrete. There are brick machicolations above second floor windows in projecting bays.

Mechanical/Electrical Systems: Electrical: Services from exterior transformer to an exterior disconnect switch and circuit breaker. Mechanical: A gas boiler; chiller; central AC system and sixteen AC window units. Gas-fired water heater.

Building #: 32

Built: 1934
Address: 501 Fenwick Road
Dimensions: 92′ 4″ (three-bay front) x 38′ 3″
Stories: 1.0
NHL Status: Non-contributing
Type: Administrative
VA State Inventory #: 114-0002-0193

Description: Rectangular floor plan with a gabled roof.

Materials: Structural tile with stucco walls built on a concrete foundation, with a corrugated metal roof. There is a concrete loading platform along most of the façade with metal pipe railing; exposed roof rafters. There are two single metal doors and one solid metal door.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Gas-fired water heater.

Building #: 37

Built: 1934
Address: 7 Fenwick Road
Dimensions: 39′ 4″ (five-bay front) x 36′
Stories: 2.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-00141

Description: Rectangular floor plan with a symmetrical façade, a raised basement and built-up flat roof. A canopy (constructed in 1962) extends from the front entrance down to the sidewalk. The pedimented entrance has flanking pilasters and dentils. Windows are three-over-three-light double-hung sash with jack arches and sills. Basement: Recessed three-over-three-light double-hung sash windows. First Floor: A central entry with paired glazed panel doors with one light. Interior: Original stairs and some doors, transoms and casings.

Materials: The walls are a limestone and Flemish bond built on a concrete foundation. Main entry door is wood; window sills are limestone. Exterior stairs are flanked by a solid masonry balustrade. There are limestone entablatures, brick pilasters, a pedimented limestone entrance, limestone panels below the first floor windows and a limestone water table.

Mechanical/Electrical: Electrical: Services from exterior transformer to an exterior disconnect switch and circuit breaker. Mechanical: A chiller and central AC system. Gas-fired water heater.

Building #: 38

Built: 1934
Address: 505 Fenwick Road
Dimensions: 56′ 6″ (one-bay front) x 38′ 3″
Stories: 1.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0142

Description: Rectangular floor plan with a gabled roof and loading platform along most of the façade.

Materials: Exterior walls are constructed of structural tile on a concrete foundation, the roof has asphalt shingles, the loading platform is concrete and the door is metal.

Mechanical/Electrical Systems: Electrical: – Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Gas furnace, no AC.

Building #: 42

Built: 1938
Address: 41Tidball Road
Dimensions: 114′ 5″ (three-bay front) x 72′ 11″
Stories: 2.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0143

Description: Rectangular floor plan with a symmetrical façade, front extension and hipped roof. There is a one story extended porch with a flat roof. The front extension has entablature and gable returns, a three-light oval window in the gable, three round arches in the center of the façade with keystones, brick quoins and quoined buttresses on the sides. Decorative trim is at the top of the ticket booth. First Floor: Two central entries with paired doors on both side of ticket booth; glazed paneled doors flank the vestibules; the ticket booth has four-light fixed windows. Interior: Many original architectural features remain.

Materials: Six course common bond brick walls built on a concrete foundation and water table. Roof has slate shingles. Entry doors are glass, the porch is a wooden frame with a paired wooden pier to support the roof.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Gas boiler, chiller and central AC system. Gas-fired water heater.

Building #: 46

Built: 1901
Address: 5 Bernard Road
Dimensions: 53′ 2″ (three-bay front) x 16′ 2″
Stories: 1.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0145

Description: Rectangular floor plan with a hipped roof. First Floor: Raised panel door with a jack arch and transom. Six light sash windows with jack arches and sills. There is a chimney flue and overhanging eaves.

Materials: Five course common bond brick walls built on a concrete foundation. Asphalt roof shingles. Window sills are concrete; there is a brick water table and one course of projecting brick at the cornice.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: No HVAC system.

Building #: 47

Built: 1901
Address: 3B Bernard Road
Dimensions: 16′ 1″ (three-bay front) x 68′ 5″
Stories: 1.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0144

Description: Rectangular floor plan with a hipped roof and two chimneys. The main façade originally faced south, the main entrance is now on the west side. First Floor: Main entrance has a jack arch and fixed one-light overlight. There are six-light fixed windows with jack arches and sills.

Materials: Five course common bond brick walls built on a concrete foundation. Asphalt roof shingles. The main door is of modern steel and there is a low brick water table.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Heat pump, central AC system. Gas-fired water heater.

Building # 49

Built: 1909
Address: 184 Bernard Road
Dimensions: 31′ 9″ (three-bay façade) x 17′ 2″
Stories: 1.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0146

Description: Rectangular floor plan with a side ell; hipped roof and central chimney with a wide soffit. First Floor: Raised panel, six-light door with a door hood and sawn brackets. Windows are six-over-six light double-hung sash with jack arches. Interior: Historic light fixtures; beaded tongue-and-groove trim in wing.

Material: Five course common bond brick walls built on a concrete foundation. The roof has asphalt shingles and a small square brick chimney flue with a corbelled cap.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Electrical base board and window AC units. Gas-fired water heater.

Building # 53

Built: 1904
Address: 188 Bernard Road
Dimensions: 84′ 1″ (eleven-bay front) x 38′ 4″
Stories: 1.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0147

Description: Three-part façade with a real ell, an off-center central block and a hipped roof. First Floor: A contemporary raised panel double door with two fixed, one-light overlights and segmental arch. Windows are nine-over-nine light double-hung sash with segmental arches and sills.

Material: Stretcher bond brick walls built on a concrete foundation. The roof has asphalt shingles. Window sills are limestone. There is a low brick water table, a small brick central chimney flue with a corbelled cap and one row of brick headers at the cornice.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: A gas boiler, AC window units and a central AC system. Gas-fired water heater.

Building #: 56

Built: 1939
Address: 55 Patch Road
Dimensions: 78′ (seventeen-bay front) x 36′
Stories: 2.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0148

Description: Rectangular floor plan with a symmetrical façade, raised basement, cross gabled roof and a pedimented entranceway with flanking pilasters. The front gabled roof dormers are pedimented with arch louvers. First and second floor windows are one-over-one light double-hung sash with sills. Basement: Windows are one-over-one light double-hung sash with sills. First Floor: A central entry with paired glazed doors. Interior: Original stair with steel pipe railing.

Materials: Five course common bond brick walls built on a concrete foundation. Roof has slate shingles. Window sills, a belt course and entrances are limestone. Stair railing is steel.

Mechanical/Electrical Systems: Electrical: Services from exterior transformer to an exterior disconnect switch and circuit breaker. Mechanical: A chiller, gas furnace and central AC system. Gas-fired water heater.

Building #: 57

Built: 1934
Address: 57 Patch Road
Dimensions: 154′ 0″ (eleven-bay front) x 283′ 0″
Stories: 2.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0149

Description: Rectangular floor plan with a symmetrical façade. It is a two story front with a one story garage. There is an end chimney, a front center pylon extension, pylons at the corner of the building and buttresses that flank the garage doors. Both floors have jalousie windows with sills and lintels. First Floor: Central entry with glazed wood-paneled door and two overhead garage doors.

Materials: Five course common bond brick walls built on a concrete foundation. Asphalt roof shingles. Windows have metal frames with concrete sills and brick lintels. There is decorative concrete tile set in the walls.

Mechanical/Electrical Systems: This building has a wet fire suppression system. Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Gas boiler and radiator; central AC system. Gas-fired water heater.

Building #: 59

Built: 1934
Address: 59 Patch Road
Dimensions: 35′ 4″ (two-bay front) x 85′ 4″
Stories: 3.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0150

Description: The building raised two or three stories depending on the section. The roof is a built-up system. First Floor: Glazed door. Third Floor: Jalousie windows.

Materials: Five course common bond brick walls built on a concrete foundation. The first floor door is metal and the jalousie windows have metal frames. There are brick stringcourses and buttresses; concrete decorative panels and water table.

Mechanical/Electrical Systems: This building has a dry fire suppression system. Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: A gas boiler, chiller and central AC system. Six internal condensers installed for computer systems. Gas-fired water heater.

Building #: 73

Built: 1893
Address: 1 Fenwick Road
Dimensions: 77′ 9″ (seven-bay front) x 22′ 4″
Stories: 1.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0151

Description: Rectangular floor plan with a hipped roof. There is one interior chimney. First Floor: Glazed paneled doors with segmental arches; 6 painted transoms; a bricked doorway with segmental arch. There are several bricked windows and one bricked doorway, the remaining windows are two-over-two light double-hung with jack arches and sills.

Materials: Five course common bond brick walls built on a concrete foundation. The roof has asphalt shingles. Window sills are concrete.

Mechanical/Electrical: Electrical: Services from exterior transformer to an exterior disconnect switch and circuit breaker. Mechanical: A gas furnace and central AC duct system. Gas-fired water heater.

Building #: 74, 75, 162, 206, 246, 259-270

Built: 2005
Address:

- 106 Pratt Rd 110 Pratt Rd 84 Patch Rd 96 Stillwell Dr
- 347 Fenwick 351 Fenwick 355 Fenwick 363 Fenwick
- 367 Fenwick 359 Fenwick 88 Patch Rd 378 Fenwick
- 19 Tidball Rd 23 Tidball Rd 102 Pratt St 92 Patch Rd

Dimensions:
Stories: 1.0
NHL Status: Non-contributing
Type: Administrative
VA State Inventory #:

- 114-0002-0198 114-0002-0199 114-0002-0213 114-0002-0224 114-0002-0248
- 114-0002-0251 to 114-0002-0261

Description: Rectangular plan with a gable roof and a protruding center front gable portico. Explosion proof windows and doors which comply with post September 11, 2001 Army construction requirements.

Materials: Brick veneer walls built on a concrete foundation with a standing seam metal roof.

Mechanical/Electrical Systems: Building 246 has a wet fire suppression system. Needs to be verified.

Building # 77

Built: 1894
Address: 3 Ruckman Road
Dimensions: 89′ 5″ (nine-bay front) x 44′ 2″
Stories: 2.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0152

Description: Rectangular floor plan with an asymmetrical façade, partial-façade front porch and hipped roof. The porch has chamfered supports. There is a hipped wall dormer that extends out in the front, louvered eyebrow dormers and wide soffits. Both floors have four-over-four light double-hung sash windows with segmental arches and sills. First Floor: Paired, paneled glazed doors with a lintel and step. Interior: Original stair with handrail, turned balusters and molded newels; historic triangle; original floor plan is intact.

Material: Five course common bond brick walls built on a concrete foundation with a brick and concrete water table. The roof has asphalt shingles, brick dentils under the main roof cornice and a metal ridge with end knobs. First floor doors have a stone lintel and step. Window sills are concrete. The porch is a wooden frame with metal railing, a metal hipped roof and a concrete foundation. The interior stair handrails are oak with a steel triangle bolted to the stair stringer. The doorway, fanlight and some windows are bricked. There is a single brick chimney.

Mechanical/Electrical Systems: Electrical: Services from exterior transformer to an exterior disconnect switch and circuit breaker. Mechanical: A gas boiler; central AC system. Gas-fired water heater.

Building # 80

Built: 1897
Address: 80 Ingalls Road
Dimensions: 87′ 4″ (ten-bay front) x 32′ 7″
Stories: 2.5
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0153

Description: Two, five-bay buildings sharing a common roof and wall. A rectangular floor plan, symmetrical façade and full façade front porch. A side gabled roof, each dormer has three-over-three-light double-hung sash windows. There are four chimneys (two interior, two central); two gabled dormers each with a rounded arch louvered window. Windows on the first and second floor are two-over-two-light double-hung sash with segmental arches. Both floors have two paneled glazed doors with one light transom. There are rosettes under the porch cornice. Interior: The north end of the building features original stairs with square balusters, fireplace mantel, doors and trim. South end features fireplace mantels with mottled brown and white ceramic tile, mantel shelves and beveled mirrors; stairs have turned balusters and chamfered newel posts.

Material: Stretcher bond brick walls built on a concrete foundation. The roof has asphalt shingles. The porch has a wooden frame with cast iron supports, a hipped tin roof (no pitch) and a brick foundation. The dentils under the cornices are break headers.

Mechanical/Electrical System: This building has a wet fire suppression system. Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: A gas boiler, chiller and central AC system. Gas-fired water heater.

Building #: 82

Built: 1898
Address: 60 Ingalls Road
Dimensions: 176′ 5″ (twenty-one bay front) x 31′ 5″
Stories: 3.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0154

Description: Front facing H-plan with two story side wings, a raised basement and side gabled roof. There is an octagonal, louvered copula; pilasters and entablature at each entrance extending upwards to encompass a second floor window. Each wing has a four window gable dormers, flanked by one-window gable dormers. Windows are six-over-six-light double-hung sash with segmental arches and sills. The south side has two-over-two light casement windows. The gabled dormers have six-over-six light double hung sash windows. The north wing was extended in 1904, Building 162 was connected in 1912, enlarged on the south side in 1913, and 1941 the roof was raised and extended. Basement: Three-over-three light casement windows. First Floor: Paired doors with four-light transom set in casing. Interior: Historic vestibule in main entry; two sets of stairs at each end of the building.

Materials: Stretcher bond brick walls with red mortar built on concrete foundations and asphalt shingled roof. Door casings are limestone; window sills are stone and window dormers have asphalt siding. The second floor has limestone casing around the window over main entrance. The copula has a metal roof. Two sets of steel stairs.

Mechanical/Electrical System: The rear has a dry, while the front has a wet fire suppression system. Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: A gas boiler, two chillers and central AC system. Gas-fired water heater.

Building #: 83

Built: 1898
Address: 20 Ingalls Road
Dimensions: 45′ 0″ (eight bay front) x 37′ 0″
Stories: 2.0 (clock tower is 3 stories)
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0155

Description: Rectangular floor plan with an asymmetrical façade, a raised basement, three chimneys and a cross-gabled roof. The clock tower is in a recessed arch; the porch has an entry vestibule with doors on either side; dentilled cornices. The south side extends frontally with a parapeted gable, moldings and louvered windows. In 1953 the interior was remodeled, loading docks were added in 1959, fire escapes 1970 and mail room enlarged. Basement: Four-over-four-light double-hung sash windows. First Floor: Central entry with telescoping archway and one-over-one-light double-hung sash windows with jack arches and sills. Second Floor: One-over-one-light double-hung sash windows with round arches. Interior: Some original door casings and transoms.

Materials: Stretcher bond brick walls with red mortar built on a concrete foundation; slate roofs; brick water table. Second floor windows have stone sills with brick hoodmolds. The clock is set in concrete and brick belt courses. Moldings are terra cotta, decorative terra cotta disks/trim extend around the entranceway. Interior: Original oak trimmed vestibule with bronze boxes and grilles, and pressed tin ceiling. Flooring is original wood.

Mechanical/Electrical Systems: Electrical: Exterior transformers to exterior disconnect switch and circuit breaker. Mechanical: A gas boiler, chiller, and central AC system. Gas-fired water heater.

Building #: 84

Built: 1898
Address: 1 Bernard Road
Dimensions: 112′ 9″ (twenty-two bay front) x 23′ 7″
Stories: 1.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0156

Description: Rectangular floor plan with three rear wings, an extended front and a hipped roof (with a center extension). First Floor: Paneled glazed doors with jack arches. There are two-over-two-light double-hung sash windows and two-over-two-light casement windows with jack arches and sills. Converted 1842, rear wings were added 1901 and remodeled in 1970.

Building: Five course common bond brick walls built on a concrete foundation. Roof has asphalt shingles. Windows have concrete sills. There are raised brick friezes and a brick water table.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: A gas boiler; central AC system. Gas-fired water heater

Building #: 85

Built: 1898
Address: 5 Bernard Road
Dimensions: 56′ 1″ (five-bay front) x 16′ 0″
Stories: 1.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0157

Description: Rectangular floor plan with symmetrical façade and a hipped roof. First Floor: Paneled doors with jack arches. Windows have been bricked or otherwise filled and have jack arches.

Materials: Five course common brick walls built on a concrete foundation. The roof has asphalt shingles. Doors are wood, windows have concrete sills and there are bricked windows with jack arches.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: The building is equipped with a 2-ton condenser to provide heat and air conditioning to Building 5. Gas-fired water heater.

Building #: 86

Built: 1898
Address: 2 North Gate Road
Dimensions: 46′ 1″ (four-bay front) x 16′ 0″
Stories: 1.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0158

Description: Rectangular floor plan with symmetrical façade with a hipped roof. First Floor: Glazed panel doors with jack arches, there are single paned casement windows with jack arches and sills.

Materials: Five course common brick walls built on a concrete foundation with a raised brick friezes and brick water table. Asphalt shingle roof; concrete window sills; and wood doors.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: No HVAC system, only one AC window unit. Gas-fired water heater.

Building #: 87

Built: 1932
Address: 150 Ingalls Road
Dimensions: 104′ 0″ (fifteen-bay front) x 42′ 0″
Stories: 3.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0159

Description: Rectangular floor plan with symmetrical façade, raised basement and two chimneys. The roof is cross-hipped; windows are nine-over-nine-light double-hung sash. There are pedimented dormers with six-over-six-light double-hung sash windows. The porch is one story and a partial façade. It has nine bays and a flat roof. First Floor: Three central entries; paired glazed paneled doors with sidelights and transoms. Interior: Original stairs with railing and original terrazzo flooring on ground floor corridors.

Materials: Five course common brick walls built on a concrete foundation. The roof and dormers have asphalt shingles; there is a concrete water table; and the porch has a wood entablature, brick pilasters with concrete capitals and bases. The stair railing is steel.

Mechanical/Electrical Systems: This building has a wet fire suppression system. Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: A gas boiler, chiller and central AC system. Gas-fired water heater.

Building #: 92

Built: 1897
Address: 15 Whistler Lane
Dimensions: 38′ 3″ (six-bay front) x 31′ 9″
Stories: 1.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0160

Description: Rectangular plan with a built-up flat roof. There is a central chimney with a corbelled cap and cornice. First Floor: Paneled glazed doors, one-over-one-light double-hung sash windows.

Materials: Five course common bond brick walls built on a concrete foundation. The doors are wood; window sills are concrete with stone lintels. There is a brick string course and corbelled cornice.

Mechanical/Electrical Systems:

Building #: 96

Built: 1958
Address: 380 Fenwick Road
Dimensions:
Stories: 1.0
NHL Status: Non-contributing
Type: Administrative
VA State Inventory #: 114-0002-0207

Description: Asymmetrical façade with a built-up flat roof and one chimney. First Floor: Four central doors with two lights; ribbon widows; sixteen-over-one-light casement windows, upper part has sixteen opaque glass panels; and one-over-one-light double-hung sash windows.

Materials: Five course common bond brick walls built on a concrete foundation. There is a wooden door frame.

Mechanical/Electrical System: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Gas-fired water heater.

Building #: 100

Built: 1897
Address: 90 Ingalls Road
Dimensions: 225′ 2″ (ten-bay front) x 34′ 3″
Stories: 3.5
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0161

Description: Rectangular floor plan; eight chimneys; a raised basement; front stair towers and rear ells. Roof is gabled with three large dormers: each with six-over-six-light double hung sash windows, segmental arches and decorative keystones; flanked by two recessed two-over-two-light double-hung sash windows, segmental arches, decorative keystones; a round window with a keystone in tympanum. Two smaller gable-roof dormers have six-over-six-light double hung sash windows with decorative keystones. At the pedimented gable ends there are half rounded windows with segmental arches above the windows on the side and rear elevations. Remaining windows are two-over-two-light double hung sash with jack arches and sills. There are three two-story, two level porch/stair towers with arched opening, decorative keystones and sills. The central porch has five bays, the reaming have three bays. First Floor: Five doorways with raised panel doors and three light transoms. Second and Third Floor: Single raised panel doors.

Materials: Stretcher bond brick walls built on a concrete foundation. There is a brick water table; string course at the second floor and below the cornice on the gable ends; double string course at the third; asphalt shingles on roof; masonry window sills. Porch/stair towers have low brick walls, masonry sills and coping. The infill stair towers have brick piers, concrete slab floors and metal pipe railing.

Mechanical/Electrical Systems: This building has both a wet and dry fire suppression system. Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: One heat pump, chiller and central AC system. Gas-fired water heater.

Building #: 105

Built: 1905
Address: 3 Bernard Road
Dimensions: 93′ 0″ (five-bay front) x 43′ 0″ plus 19′ 0″x 45′ 0″
Stories: 2.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0162

Description: T-shape floor plan with a projecting central block and a hipped roof with a cross gable. The building has a raised basement, full entablature, raking cornice and arched opening on stair landing. Windows are one-over-one-light double-hung sash with jack arches, keystones and sills. There are two chimneys and a half round window at the cross gable. First Floor: Pedimented doorway supported by consoles, a glazed one-light double door and a fixed one-light overlight. End windows are paired. Interior: Broad entry hall featuring a double stair with turned oak balusters and a molded handrail. The ceiling has pressed tin plates featuring large central medallions. There are original: pipe railings on the second floor mezzanine; wood base, chair moldings, picture moldings, window and doors casings; five paneled doors and transoms. The vestibule paneling and one-over-one wood double-hung window sash appears to be original.

Materials: Stretcher bond brick walls built on a concrete foundation. The roof has asphalt shingles. Window arches, keystones and sills are limestone. The building has a concrete splash course, brick pilasters with concrete caps on the façade, brick panels in the walls between the floors, pink mortar and a brick tympanum. The chimneys have decorative brickwork in the caps; there are granite steps with limestone coping. The interior ceiling has pressed tin plates; there are wooden columns and pilasters, and original pipe railings.

Mechanical/Electrical System: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: A gas boiler, chiller and central AC system. Gas-fired water heater.

Building #: 105A

Built: 1909
Address: 3 Bernard Road
Dimensions: 28′ 0″ (three-bay front) x 71′ 4″
Stories: 1.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0163

Description: Rectangular floor plan attached to Building # 105 by a small transitional block. The roof is hipped with wide overhanging eaves and a central chimney. First Floor: Double doors with six-light overlight and three-over-three-light double-hung sash windows with sills.

Materials: Five course common bond walls built on a concrete and brick foundation. The roof has slate shingles. Window sills are limestone; doors are aluminum.

Mechanical/Electrical System: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Gas boiler, chiller and central AC system. Gas-fired water heater.

Building #: 116

Built: 1906
Address: 30 Harrison Street
Dimensions: 38′ 0″ (three-bay front) x 45′ 6″
Stories: 2.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0164

Description: Rectangular floor plan, hipped roof, raised basement and a central chimney. Windows on both floors are four-over-four-light double-hung sash with jack arches, keystones, voussoirs and sills. First Floor: Double raised panel doors with three-light overlight, jack arch and keystone.

Materials: Stretcher bond brick walls built on a concrete and brick foundation. Roof has asphalt shingles. First floor door has a brick arch with a limestone keystone. Windows have brick arches and limestone sills. There are granite steps with brick and granite trim. The chimney has limestone coping, there is a brick water table and a belt course above each floor.

Mechanical/Electrical System: This building has a dry fire suppression system. Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: HVAC supplied from Building 134. Gas-fired water heater.

Building #: 117

Built: 1906
Address: 190 Bernard Street
Dimensions: 36′ 0″ (five-bay front) x 152′ 3″
Stories: 2.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0165

Description: Rectangular floor plan with a front facing gable. There are three chimneys with a large exterior flue to the rear, returns at the eaves and a louvered opening in the front-facing gable. Windows are six-over-six-light double-hung sash windows with segmental arches. Exterior stairs and elevator were added in 1957, wooden porches were replaced in 1959. Some windows have been bricked up and there was a fire in 1930. First Floor: Two paneled doors with segmental arches. Window arches are made of three rows of headers.

Materials: Stretcher bond brick walls built on a brick and concrete foundation. The roof has asphalt shingles. There is a brick water table. Segmental arches are made of three rows of brick headers.

Mechanical/Electrical System: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Gas boiler, chiller and central AC system. Gas-fired water heater.

Building #: 133

Built: 1909
Address: 33 Ingalls Road
Dimensions: 164′ 0″ (thirteen-bay front) x 118′ 0″
Stories: 2.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0166

Description: U-shaped floor plan with a recessed central block, a built-up roof, raised basement, pilasters and a dentilled cornice. Windows on both floors are three-over-three light double-hung sash. First Floor: Double doorway with a pediment supported by consoles and a coat-of-arms. Windows have jack arches. Interior: Two sets of original staircases; skylight over the stairs; ornamented columns.

Materials: Steel structural system with Flemish bond brick walls built on a cement foundation. First floor door pediment is limestone. First floor windows have limestone sills and brick arches. There are two sets of granite steps with limestone coping and a cast iron porch on the central block. Stone panels are under windows on the first floor. The columns are cast iron columns and there is some plaster ornamentation.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Heat supplied from Building 134; central AC system. Gas-fired water heater.

Building #: 134

Built: 1909
Address: 20 Whistler Lane
Dimensions: 50′ 0″ (eleven-bay front) x 58′ 6″
Stories: 2.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0167

Description: T-plan with a central block that projects slightly and a raised basement. Flat roof covered with a built up system. There are pilasters on the central block along with a dentilled cornice. Windows on both floors are three-over-three-light double-hung with jack arches and sills. First Floor: A door with an egg and dart trim and pediment. There are double doors with recessed panels. Interior: Original stairs; some original doors, casings and transoms.

Materials: Flemish bond brick walls built on a concrete and brick foundation. The first floor has both a limestone and double wooden doors. Windows have limestone sills. The basement has a brick water table. The pilasters have limestone capitals and there are limestone panels between the floors and cornice.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Oil/gas boiler, two chillers and central AC system. Gas-fired water heater.

Building #: 135

Built: 1908
Address: 61 Patch Road
Dimensions: 165′ 0″ (fifteen bay front) x 40′ 9″
Stories: 2.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0168

Description: Rectangular floor plan with a gabled roof. Windows are one-over-one-light double-hung sash with segmental arches made of three rows of headers. The pent roof has I-beams. First Floor: Three double doors with diagonal car siding; three single doors with diagonal car sliding and two solid modern doors. Interior: Historic fright elevator and some ornamental heating grills.

Materials: Five course common bond brick walls built on a stone foundation; a brick water table and concrete splash course. Asphalt roof shingles with the pent roof having corrugated metal. There are iron tie rods.

Mechanical/Electrical System: This building has a dry fire suppression system. Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Oil boiler and central AC systems. Gas-fired water heater.

Building #: 138

Built: 1909
Address: 30 Ingalls Road
Dimensions: 102′ 5″ (five-bay front) x 35′ 0″
Stories: 2.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0169

Description: T-plan shape with projecting central blocks, a raised basement and full entablatures. Flat roof covered with a built up system. Windows on both floors are one-over-one-light double-hung sash windows with jack arches and sills. First Floor: Double door with overlight; egg and dart molding, sculpted pediment and. Second Floor: Half-round windows with arches and decorative keystones, supported by pilasters. Interior: Original vestibule and molded plaster ornamentation in principle interior space.

Materials: Common bond brick walls with limestone trim built on a stone foundation. First floor has a limestone door. Windows have limestone sills. Windows on the second floor also have limestone arches and keystones. Exterior stairs are limestone and granite with case iron street lamps. The basement has a brick water table, brick pilasters with limestone caps, limestone panels in the wall between floors.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Gas boiler, chiller and central AC duct system. Gas-fired water heater.

Building #: 139

Built: 1909
Address: 173 Bernard Road
Dimensions: 60′ 0″ (eleven-bay front) x 40′ 2″
Stories: 3.5
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0170

Description: U-shaped floor plan with a recessed central block, a hipped roof and six chimneys. There are two hipped dormers with three two-light fixed sash windows and a three story, three bay porch/stair tower across the main façade with columns and spandrels. There is a modillioned cornice and a soldier course near the cornice on the side elevations. Windows for the entire building are two-over-two-light double-hung sash with jack arches and sills. First Floor: Two; glazed, four light, paneled doors with jack arches.

Materials: Fiver course common bond brick walls built on a stone foundation with a slate roof. Window sills are limestone. The porch columns and spandrels are brick with concrete slab floors and original steel stairs.

Mechanical/Electrical Systems: This building has a dry fire suppression system. Systems need to be verified.

Building #: 159

Built: 1911
Address: 193 Bernard Road
Dimensions: 32′ 2″ (five-bay front) x 85′ 2″ and 42′ 0″x 46′ 0″
Stories: 1.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0171

Description: Rectangular floor plan with a rear wing and raised basement. Roof is gabled with a cross gable and an interior end chimney. First Floor: Solid double doors with transom (boarded up) and segmental arch made of three rows of headers. Windows are six-over-six-light double-hung sash with segmental arches, two rows of headers and sills.

Materials: Five course common bond brick walls built on a concrete foundation. Roof has asphalt shingles. Window sills are limestone. There are concrete steps, a brick water table and a limestone splash course.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: A heat pump and central AC system. Gas-fired water heater.

Building #: 161

Built: 1912
Address: 5 Fenwick Road
Dimensions:
NHL Status: Contributing
Stories: 2.0
Type: Administrative
VA State Inventory #: 114-0002-0172

Description: Five part plan with a raised basement and two chimneys. U-plan shape with two wings perpendicularly attached to a main volume. Windows are one-over-one-light double hung sash with jack arches and sills. Building size was doubled in 1938. First Floor: Two main doorways with double raised panel doors surrounded by a decorative door frame. Interior: Two original stairs.

Materials: Flemish bond brick walls built on a masonry foundation. Roof is a low pitched gable and a flat built up system. First Floor door frame is decorative limestone; window sills are limestone. There are granite steps with limestone coping, a limestone water table, brick pilasters with limestone caps and limestone panels near the cornice line.

Mechanical/Electrical Systems: This building has both a wet and dry fire suppression system. Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Gas boiler, chiller; part of heating and AC systems are supplied from Building 134 and central AC system. Gas-fired water heater.

Building #: 163

Built: 1940
Address: 10 Whistler Lane
Dimensions: 90′ 7″ (seven-bay front) x 55′ 7″
Stories: 2.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0173

Description: Rectangular floor plan with a flat built-up roof. Windows are three-over-three-light double-hung sash; there is a central window and a rounded pediment over the entrance. First Floor: Central entry with paired wood-paneled gazed doors. Interior: Original stair; some original doors, casings and transoms.

Materials: Flemish bond brick and stone walls built on a concrete and brick foundation. Window sills are stone. There is a stone entablature supported by full height brick pilasters with stone capitals and bases. The center window has stone casing. There are stone door casings and a metal grade over the transom.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and an exterior circuit breaker. Mechanical: Gas boiler and central AC system. Gas-fired water heater.

Building #: 166

Built: 1857
Address: 135 Bernard Road
Dimensions: 30′ 3″ (three bays) x 68′ 10″
Stories: 1.0
NHL Status: Contributing
Type: Administrative (chapel)

Description: Rectangular floor plan with projecting vestibule, chancel and gabled roof. Crosses are mounted at each end of the roof ridge. First Floor: Central, double entry doors. Second Floor: There are a central group of three gothic-arched windows made of stained glass on the gabled end. Interior: Exposed roof trusses; a dominate aisle with two lesser aisles. Several memorial stained glass windows, some of which were prepared by the Tiffany Studios in New York City; original windows include the triple lancet windows over the vestibule and vestry.

Material: Wood frame with board and batten, built on a cement and brick foundation (which was added in 1968). The roof has slate shingles. Entry doors and crosses are wood. A wood ceiling is supported by pointed wood arches, plaster interior walls and a wood organ loft over the entry.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Gas-fired water heater.

Building #: 171

Built: 1907
Address: 8 Ruckman Road
Dimensions:
Stories: 2.5
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0174

Description: Rectangular floor plan built on a raised basement and two exterior chimneys with corbelled caps. The monumental central porch has six bays with full-height columns and square balusters. The roof is framed by a cornice-line balustrade. On the south side of the building there is a one-story exterior mezzanine with a decorative balustrade; while on the north there is a two and one half story masonry wing. Despite extensive renovations in 2002 the building retains many original architectural features. There are a variety of windows: one-over-one-light double-hung sash; four-over-four double-hung sash; four-light fixed; three-over-one-light double-hung sash; and union jack fixed. First Floor: Double glazed door with sidelights, elliptical fanlight and decorative keystone. Second Floor: A central two-bay cantilevered porch with decorative square balustrade.

Materials: Flemish Bond Brick walls built on a concrete foundation. Windows have limestone lintels and sills.

Mechanical/Electrical Systems: This building has a wet fire suppression system. Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: A gas boiler, chiller and central AC system. Gas-fired water heater.

Building #: 180

Built: 1942
Address: Harrison Street
Dimensions: 14′ 2″ (one-bay front) x 25′ 9″
Stories: 1.0
NHL Status: Non-contributing
Type: Administrative (Pump house)
VA State Inventory #: 114-0002-0218

Description: Rectangular plan with a built-up roof and exterior end chimney. Entrance is through a glazed door.

Materials: Five course common bond brick walls built on a concrete foundation; concrete steps and a metal door.

Mechanical/Electrical Systems: Needs to be verified.

Building #: 182

Built: 1945
Address: 3 Moat Walk
Dimensions: 46′ 4″ (five-bay front) x 43′ 2″
Stories: 1.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0175

Description: Rectangular floor plan with a hipped roof and chimney. There are nine-light wood paneled doors; louvered eyebrow and two-over-two-light double-hung sash windows with segmental arches and concrete sills.

Building Materials: Five course common bond brick walls built on a concrete foundation. Slate shingled roof.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Gas boiler and central AC duct system. Gas-fired water heater.

Building #: 183

Built: 1945
Address: 102 McNair
Dimensions: 120′ 2″ (seven-bay front) x 43′ 2″
Stories: 1.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0176

Description: Rectangular floor plan, with a side gabled roof. First Floor: Paneled door and overhead garage door and twelve-light casement windows.

Materials: Five course common bond brick walls built on a concrete foundation. Roof has asphalt shingles. Main door is wood, garage door is metal.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Gas boiler and central AC system. Gas-fired water heater.

Building #: 184

Built: 1942
Address: 184 Fenwick Road
Dimensions: 14′ 6″ (one-bay front) 26′ 3″
Stories: 1.0
NHL Status: Non-contributing
Type: Administrative (Pump house)
VA State Inventory #: 114-0002-0219

Description: Rectangular plan with a hipped roof, one main door and an exterior end chimney.

Materials: Five course common bond brick walls built on a concrete foundation, asphalt roof and a metal door.

Mechanical/Electrical Systems: Needs to be verified.

Building #: 185

Built: 1945
Address: 490 Fenwick Road
Dimensions: 209′ 0″ (ten-bay front) x 83′ 6″
Stories: 1.0
NHL Status: Non-contributing
Type: Administrative
VA State Inventory: 114-0002-0220

Description: Rectangular floor plan with a gabled and hipped roof. In 1986 a Porte Cochere was replaced by an arched canopy. There is a large exterior chimney on the front façade. The addition has three single pane fixed sash windows. First Floor: Six multi-paned, fixed-sash windows.

Materials: Five course common bond brick walls built on a concrete foundation. Asphalt shingles on the roof. The arched canopy is wood on brick piers. Window sashes are aluminum and there are brick quoins around the front doorway. The addition has concrete coping at the roof line and a built up roof.

Mechanical/Electrical Systems: This building has a dry fire suppression system. Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Gas-fired water heater.

Building #: 201

Built: 1969
Address: 383 Fenwick Road
Dimensions:
Stories: 1.0
NHL Status: Non-contributing
Type: Administrative (bowling alley)
VA State Inventory: 114-0002-0278

Description: Prefabricated with a flat roof, no windows and a decorative segmental arch over the doorway.

Materials: Brick veneer walls and decorative brick.

Mechanical/Electrical Systems: This building has a wet fire suppression system. Systems need to be site verified.

Building #: 204

Built: 1910
Address: 104 McNair Drive
Dimensions: 33′ 2″ x 138′ 3″
Stories: 2.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0177

Description: Rectangular floor plan with a front facing gabled roof and a small gabled roof addition. Windows on both floors are six-over-six-light double-hung sash windows with lintels and sills. There are two central chimneys with corbelled caps, a round window at the gable end and a ranking cornice. Interior: Original stairs with railing; the upper floor has corridor with beaded wainscoting and chair rail molding.

Materials: Four course common bond brick walls; a concrete foundation and asphalt roof. Windows have granite lintels and stone sills. There are brick quoins and window surrounds; original wood stairs with steel pipe railings.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Gas boiler and central AC system. Gas-fired water heater.

Building #: 205

Built: 1910
Address: 205 McNair Drive
Dimensions: 148′ 3″ x 25′ 11″
Stories: 1.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0178

Description: Rectangular plan with a gabled roof, four-over-four light double hung sash windows and three six-light fixed windows.

Materials: Exterior walls are brick and corrugated metal exterior walls and roof, built on a concrete foundation.

Mechanical/Electrical Systems:

Building #: 207

Built: 1943
Address: 100 McNair Drive
Dimensions: 75′1″ (seven-bay front) x 83′ 5″
Stories: 2.0
NHL Status: Non-contributing
Type: Administrative
VA State Inventory #: 114-0002-0225

Description: Rectangular floor plan with a built-up side gabled roof. First Floor: Wood panel doors and two-over-two light windows. Second Floor: One-over-one light double-hung sash windows and three-light windows with middle hopper window.

Materials: Wood frame with clapboard walls built on a wood pier foundation.

Mechanical/Electrical Systems: This building has a dry fire suppression system. Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Possibly a heat pump.

Building # 209

Built: 1943
Address: 148 Bernard Road
Dimensions: N/A
Stories: 3.0
NHL Status: Contributing
Type: Administrative
VA State Inventory #: 114-0002-0179

Description: Irregular hexagon with a roof deck and flat tarpaper roof with an antenna mount. There is an exterior circular stairway on the northern façade providing access to the second and third floors. An engaged ladder gives access to the roof deck and there is railing surrounding the roof deck and third floor ledge. First Floor: Entry on northwest façade. There are four, six-light Hopper windows and three, three-light single transom windows. Second Floor: Entry identical to first floor; ribbon windows on five sides (eight windows in total). Third Floor: Entry on the southwest façade; ribbon windows on five sides.

Materials: Walls are poured concrete on a concrete foundation. Entries have glazed metal doors. The exterior stairway is steel, railings are metal.

Mechanical/Electrical Systems: Electrical: Unknown**.** Mechanical: One AC window unit.

Building #: 210

Built: 1985
Address: 102 Griffith Street
Dimensions:
Stories: 2.0
NHL Status: Non-contributing
Type: Administration
VA State Inventory #: 114-0002-0279

Description: Rectangular floor plan with a side gabled roof and a loading dock on the west elevation.

Materials: Brick stretcher bond veneer walls built on a concrete foundation. The roof is flat with a standing seam metal roof at the south and west elevations supported by brick columns. There are no windows, only glass entrance doors.

Mechanical/Electrical Systems: This building has both a wet and dry fire suppression system. Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Gas-fired water heater.

Building #: 217

Built: 1921
Address: 146 Bernard Road
Dimensions: 52′ 4″x 22′ 9″
Stories: 1.0
NHL Status: Non-contributing
Type: Administrative
VA State Inventory #: 114-0002-0226

Description: Rectangular floor plan with a side ell, hipped roof, chimney stack and wide overhanging eaves. First Floor: Paneled door in side ell and nine-over-nine-light double-hung sash windows.

Materials: Wood frame, clapboards, a concrete foundation, an asphalt roof and exposed rafters.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Oil boiler and central AC system. Gas-fired water heater.

Building #: 221

Built: 1998
Address: 100 Stillwell Drive
Dimensions:
Stories: 1.0
NHL Status: Non-contributing
Type: Administrative
VA State Inventory #: 114-0002-0280

Description: Rectangular plan with an attached ell in the shape of a trapezoid with a stepped entrance. The main roof is flat with a hood roof over the main entrance. Windows are multi-light.

Materials: Stretcher bond brick walls with decorative brick at every half story, built on a concrete foundation. The hooded roof is standing metal seam and windows are metal.

Mechanical/Electrical Systems: This building has a dry fire suppression system. Needs to be site verified

Building #: 225

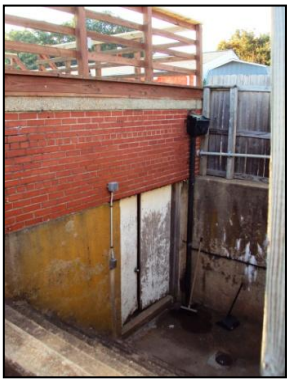
Built: 2003
Address: McNair
Dimensions:
Stories: 1.0
NHL Status: Non-contributing
Type: Administrative
VA State Inventory #: 114-0002-0235

Description: Rectangular plan with a cross gable roof that extends beyond the structure to create a full story entry porch. The porch is supported by Doric columns and windows are two-over-two double-hung sash.

Materials: Running bond brick walls, a concrete foundation with an asphalt roof and wood shingles at the gables.

Mechanical/Electrical Systems: Needs to be site verified.

Building #: 235



Built: 1951
Address: Rose Circle
Dimensions: 37′2″ (one-bay front) x 18′4″
Stories: 1.0
NHL Status: Non-contributing
Type: Administrative
VA State Inventory #: 114-0002-0242

Description: Rectangular plan, the building is partially underground.

Materials: Five course common bond brick walls built on a concrete foundation with a flat concrete roof and wood roof deck. There is a double wood door.

Mechanical/Electrical Systems: Needs to be site verified.

Building #: 243

Built: 1952
Address: 16 Murray Street
Dimensions: 199′ 6″ (ten-bay front) x 54′ 9″
Stories: 1.0
NHL Status: Non-contributing
Type: Administrative
VA State Inventory #: 114-0002-0246

Description: Rectangular floor plan, built-up roof and loading area along the façade. First Floor: Three glazed doors; two tractor-trailer loading doors; two large solid door and eighteen-light fixed sash windows with lintels.

Materials: Five course common bond brick walls. The foundation, loading area and lintels are concrete.

Mechanical/Electrical Systems: This building has a wet fire suppression system. Exterior transformers to an exterior disconnect switch and circuit breaker.

Building # 245

Built: 1992
Address: 370 Fenwick Road
Dimensions:
Stories: 1.0
NHL Status: Non-contributing
Type: Administrative
VA State Inventory #: 114-0002-0281

Description: Rectangular floor plan with a side ell on the south side, a Dutch gabled roof and overhanging eaves. The entrance has an overhanging gabled pediment supported by piers. Windows are two-light fixed.

Materials: Brick walls built on a concrete foundation, asphalt shingle roof and brick piers.

Mechanical/Electrical Systems: This building has a wet fire suppression system. Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker; fire alarm. Mechanical: Gas boiler and central AC system. A sprinkler system and gas fired water heater.

Building #: 560

Built: 1968
Address: Ingalls Road
Dimensions: 13′5″ x 10′0″
Stories: 1.0
NHL Status: Non-contributing
Type: Administrative (Guard House)
VA State Inventory #: 114-0002-0293

Description: A rectangular plan that is one story, a hipped roof that is pedimented on the north end with slate shingles. There are nine single paned windows and three glass doors.

Materials: A concrete foundation, with concrete steps, stretcher bond brick veneer walls and slate roof shingles.
Mechanical/Electrical:

STORAGE

Building #: 8A

Built: 2002
Address: 12 Bernard Road
Dimensions: 26′ 0″x 77′ 0″
Stories: 1.0
NHL Status: Non-contributing
Type: Storage
VA State Inventory #: 114-0002-0289

Description: Rectangular plan, gabled roof, loading area with two stairways, windows are one-over-one fixed.

Materials: Concrete walls, foundation, loading area and stairways. The roof is metal and doors are wood.

Mechanical/Electrical Systems:

Building #: 12

Built: 1915
Address: 81 Patch Road
Dimensions: 98′ 0″ (three-bay front) x 109′ 5″
Stories: 2.0
NHL Status: Non-contributing
Type: Storage
VA State Inventory #: 114-0002-0190

Description: Rectangular plan with projecting front vestibule; side and rear additions; a side gable, a shed roof and overhanging eaves with projecting boards. There is a detached chimney flue connected two feet above ground level. The addition has eight bays with buttresses, two garage sized openings and eight windows (seven have been filled in with cinder blocks). First Floor: Doorway in the projecting vestibule with automatic sliding doors. Two six-light fixed sash windows in the front-facing gable; double windows on the south side and six-over-six-light double-hung sash windows.

Materials: Poured concrete walls and foundation. The roof has asphalt shingles with a shed roof on the extension. The door in the vestibule is glass and aluminum. The addition is cinder block and has cinder block buttresses between the bays. The vestibule is also cinder block. There is concrete coping at the top of the first level

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Boiler, chiller and central AC system. Gas-fired water heater.

Building #: 13, 40, 41, 71, 76, 78, 89, 94, 107, 108, 122, 170, 177, 202, 220, 222, 223, 226-231, 238, 240, 478, 479

Built: 1987 and 1988

Address:

- 93 Pratt St
- 40 Ingalls Rd
- 114 Pratt St
- 102 Ingalls Rd
- 65 Frank Ln
- 75 Fenwick
- 15 Bernard Rd
- 47 Fenwick Rd
- 160 Bernard
- 97 Pratt St
- 74 Pratt St
- 17 Frank Ln
- 31 Frank Ln
- 162 Bernard Rd
- Eustis Ln
- 31 Fenwick
- 3 Pratt St
- 21 Frank Ln
- 33 Frank Ln
- 44 Ingalls Rd
- 32 Ingalls Rd
- Reeder Cir
- Darby Rd
- 23 Frank Ln
- 77 Fenwick
- 100 Bernard
- 1 Mathews Ln

Dimensions: N/A

Stories: 1.0

NHL Status: Non-contributing

Type: Storage (garage)

VA State Inventory #:

- 114-0002-0191
- 114-0002-0194
- 114-0002-0195
- 114-0002-0196
- 114-0002-0200
- 114-0002-0201
- 114-0002-0204
- 114-0002-0290
- 114-0002-0210
- 114-0002-0211
- 114-0002-0212
- 114-0002-0215
- 114-0002-0217
- 114-0002-0222
- 114-0002-0229
- 114-0002-0231
- 114-0002-0232
- 144-0002-0234
- 114-0002-0236
- 114-0002-0237
- 114-0002-0238
- 114-0002-0239
- 114-0002-0240
- 114-0002-0241
- 114-0002-0239
- 114-0002-0244
- 114-0002-0262
- 114-0002-0263

Description: Rectangular floor plan with a gabled roof and overhanging doors.

Materials: Wood frame with wood siding, a concrete foundation and asphalt roof shingles. Building 223,228, 230, 231 and 240 have corrugated metal doors. Building 89, 238, 478 and 479 have corrugated metal siding.

Mechanical/Electrical Systems: There are none.

Building #: 39

Built: 1910

Address: 77 Frank Lane

Dimensions: 12′ 0″x 29′ 0″

Stories: 2.0

NHL Status: Contributing

Type: Storage (support building)

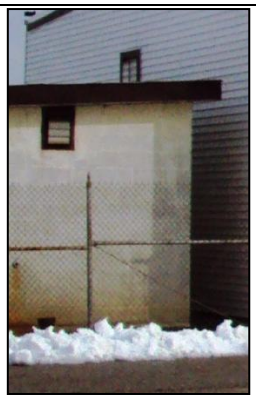
VA State Inventory #: 114-0002-0187

Description: Rectangular floor plan with a hipped roof and a belt course between floors. First Floor: Garage door. Second Floor: Two-over-two light windows with jack arches.

Materials: Five course common bond brick walls built on a concrete foundation. Asphalt roof.

Mechanical/Electrical Systems: No HVAC system.

Building #: 72



Built: 1982
Address: 102 Eustis Road
Dimensions:
Stories: 1.0
NHL Status: Non-Contributing
Type: Storage (workshop)
VA State Inventory #: 114-0002-0197

Description: Rectangular floor plan with a shed roof. This building is on the north side of T-99.

Materials: Frame construction with vinyl siding built on a concrete foundation and rolled roofing.

Mechanical/Electrical Systems:

Building #: 81

Built: 1943
Address: 100 Eustis Lane
Dimensions:
Stories: 1.0
NHL Status: Non-contributing
Type: Storage (warehouse)
VA State Inventory #: 114-0002-0202

Description: Rectangular floor plan.

Material: Frame construction with vinyl siding built on a concrete foundation, with rolled roofing.

Mechanical/Electrical Systems: Electric heat and one AC unit in the office.

Building #: 88

Built: 1934
Address: 310 Fenwick Road
Dimensions: 181′ 0″ (eight-bay front) x 57′ 2″
Stories: 1.0
NHL Status: Non-contributing
Type: Storage
VA State Inventory #: 114-0002-0203

Description: Rectangular floor plan with a side gabled roof. First Floor: Overhead garage door with six garage bays closed with concrete till and fourteen-light fixed windows.

Materials: Steel frame with corrugated asbestos and metal siding built on a concrete foundation. The roof is corrugated-asbestos and doors are made of metal.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Gas-fired water heater.

Building #: 91

Built: 1934
Address: 186 New Garden Street
Dimensions: 14′ 6″ (one-bay front) x 14′ 6″
Stories: 1.0
NHL Status: Non-contributing
Type: Storage
VA State Inventory #: 114-0002-0205

Description: Prefabricated with a rectangular floor plan. The main door has a one-light.

Materials: Stretcher bond brick veneer walls built on a concrete foundation with an asphalt shingle pyramidal roof. The door is metal; there is a concrete water table and concrete steps.

Mechanical/Electrical Systems:

Building #: 104

Built: 1949
Address: Patch Road
Dimensions: 16′ 0″ (one-bay front) x 40′ 7″
Stories: 1.0
NHL Status: Non-contributing
Type: Storage (energy)
VA State Inventory #: 114-0002-0208

Description: Rectangular plan with a built-up roof. First Floor: Glazed door with louvers.

Materials: Five course common bond brick walls built on a concrete foundation. Main door is metal.

Mechanical/Electrical Systems:

Building #: 168

Built: After 1990
Address: 12 Murray Street
Dimensions:
Stories: 1.0
NHL Status: Non-contributing
Type: Storage (warehouse)
VA State Inventory #: 114-0002-0214

Description: Rectangular floor plan with two additions (north and west elevations) and a gabled roof. There is a concrete loading area, two large garage doors and a standard doo and a 500 gallon heating oil tank.

Building: Five course common bond brick walls built on a concrete foundation. Asphalt shingles.

Mechanical/Electrical Systems: This building has a dry fire suppression system. Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Oil boiler, heat pump and central AC system. Gas-fired water heater.

Building #: 172

Built: 1934
Address: 10 Stillwell Drive
Dimensions:
Stories: 1.0
NHL Status: Non-Contributing
Type: Storage
VA State Inventory #: 114-0002-0216

Description: Square floor plan with a hipped roof and one door. This building houses the main water valve for the fort.

Materials: Stretcher bond brick veneer walls built on a concrete foundation, asphalt roof and a metal door.

Mechanical/Electrical Systems: Needs to be verified.

Building #: 190

Built: 1988
Address: 190 Rose Circle
Dimensions:
Stories: 1.0
NHL Status: Non-contributing
Type: Storage (garage)
VA State Inventory #: 114-0002-0277

Description: Rectangular floor plan, side gabled roof and two sliding concession widows.

Materials: Concrete block building built on a concrete foundation with asphalt roof shingles.

Mechanical/Electrical Systems: Electrical: Exterior transformers to an exterior disconnect switch and circuit breaker. Mechanical: Central AC system and one AC window unit. Gas-fired water heater.

Building #: 197

Built: 1996
Address: 12 Stilwell Drive
Dimensions: 12'0" x 20'0"
Stories: 1
NHL Status: Non-contributing
Type: Storage
VA State Inventory #: 114-0002-0291

Description: A small square plan that is one story, with a hipped roof and two side by side metal doors.

Materials: Concrete foundation with brick veneer walls, asphalt roof shingles.

Mechanical/Electrical:

Building #198

Built: 1942
Address: Bernard Road
Dimensions: 81′0″ by 9′0″
Stories: 1
NHL Status: Non-contributing
Type: Storage (transformer vault)
VA State Inventory #: 114-0002-0292

Description: A small rectangular plan that is one story with a single metal door.

Materials: A concrete foundation with stretcher bond brick walls and a concrete shed roof.

Electrical/Mechanical Systems:

Building #: 203

Built: 1946
Address: Ingalls Road
Dimensions: 13′ 6″ (one-bay front) x 22′ 8″
Stories: 1.0
NHL Status: Non-contributing
Type: Storage
VA State Inventory #: 114-0002-0223

Description: Rectangular floor plan with a built-up roof. First Floor: Central entry with paired louvered doors.

Materials: Five course common bond brick walls built on a concrete foundation. Louvered doors are metal with a concrete sill and concrete coping.

Mechanical/Electrical Systems: Needs to be verified.

Building #: 218

Built: 1960
Address: 381 Fenwick Road
Dimensions: 30′ 0″ (one-bay front) x 15′ 0″
Stories: 1.0
NHL Status: Non-contributing
Type: Storage (auto craft shop)
VA State Inventory #: 114-0002-0227

Description: Rectangular plan with a shed roof and louvered door.

Materials: Cinder block walls built on a concrete foundation; the louvered door is metal.

Mechanical/Electrical Systems: This building has a dry fire suppression system. Needs to be verified.

Building #: 219

Built: 1961
Address: 219 Fenwick Road
Dimensions: 15′ 0″ (one-bay front) by 20′ 0″
Stories: 1.0
NHL Status: Non-contributing
Types: Storage
VA State Inventory #: 114-0002-0228

Description: Rectangular floor plan with a shed roof and main door.

Materials: Cinder block walls built on a concrete foundation with asphalt roof and solid metal door.

Mechanical/Electrical Systems: Needs to be verified

Building #: 242

Built: 1952
Address: 242 Stillwell Drive
Dimensions: 13′ 4″ (one-bay front) x 26′ 8″
Stories: 1.0
NHL Status: Non-contributing
Types: Storage
VA State Inventory #: 114-0002-0245

Description: Rectangular floor plan with a hipped roof, main entrance door and fixed sash window.

Materials: Stretcher bond brick walls built on a concrete foundation, asphalt shingle roof and a metal door.

Mechanical/Electrical Systems: Needs to be verified.

Building #: 247

Built: 1958
Address: 1 Walker Court
Dimensions: 98′ 7″ (eleven-bay front) x 27′ 5″
Stories: 1.0
NHL Status: Non-contributing
Type: Storage
VA State Inventory #: 114-0002-0249

Description: Rectangular floor plan with a gable roof. First Floor: Three double glazed louvered doors; two single glazed doors; four small single pane fixed sash windows, two large single pane fixed sash windows and two, two-over-two-light double-hung sash windows.

Materials: Stretcher bond brick walls built on a concrete foundation with an asphalt roof.

Mechanical/Electrical Systems: Needs to be verified.

Building #: 250

Built: 1960
Address: Patch Road
Dimensions:
Stories: 1.0
NHL Status: Non-contributing
Type: Storage (shed)
VA State Inventory #: 114-0002-0282

Description: Square plan, painted white with an elevated shed roof.

Materials: Concrete block building with wooden doors and asphalt roof shingles.

Mechanical/Electrical Systems: Needs to be verified

Building #: 257

Built: 1995
Address: Stillwell Drive
Dimensions:
Stories: 1.0
NHL Status: Non-contributing
Type: Storage (shed)
VA State Inventory #: 114-0002-0283

Description: Rectangular plan, side gabled with two skylights on the east side of the roof and a door on both the east and west sides of the building.

Materials: Painted plywood siding and an asphalt single roof.

Mechanical/Electrical Systems: Needs to be verified.

Building #: T- 28

Built: 1875
Address: 18 Bernard Road
Dimensions: 30′ 6″x 11′ 0″
Stories: 1.0
NHL Status: Contributing
Type: Storage (support building)

Description: Rectangular floor plan with a side gabled roof, entablature and rear shed addition. First Floor: Panel doors with two-light transoms and two-over-two-light double-hung sash windows.

Materials: Wood frame construction with German siding built on a pier foundation; asphalt roof shingles and wood doors.

Mechanical/Electrical Systems: Needs to be verified.

Building #: T-99

Built: 1943
Address: 102 Eustis Ln
Dimensions: 106′ 6″ (two-bay front) x 48′ 3″
Stories: 1.0
NHL Status: Non-contributing
Type: Storage (warehouse)
VA State Inventory #: 114-0002-0269

Description: Rectangular floor plan with a gabled roof, an entry door and overhead garage doors.

Materials: Wood frame, vinyl siding, concrete foundation, asphalt roof shingles and metal doors.

Mechanical/Electrical Systems: Gas furnace and no AC system.

Building #: T-100, T-101 and T-104

Built: 1941 and 1943
Address: 110, 108, 104 Eustis Ln
Dimensions: 153′ 8″ (nine-bay front) x 61′ 0″
Stories: 1.0
NHL Status: Non-contributing
Type: Storage (warehouse)
VA State Inventory #:

- 114-0002-0270 114-0002-0271 114-0002-0273

Description: Rectangular floor plan with a gabled roof.

Materials: Building T-104 has a wet fire suppression system. Wood frame with vinyl siding, a concrete foundation and asphalt roof shingles. The building has an aluminum frame glass doors; metal and wood doors; overhead garage doors and six-over-six-light double-hung sash windows.

Mechanical/Electrical Systems: Needs to be verified.

Building #: T-102

Built: 1963
Address: 106 Eustis Ln
Dimensions: 92′ 9″x 25′ 0″
Stories: 1.0
NHL Status: Non-contributing
Type: Storage (open shed)
VA State Inventory #: 114-0002-0272

Description: Rectangular floor plan and standing roof.

Building: Wood frame and siding built on a concrete foundation with a standing-seam metal roof.

Mechanical/Electrical Systems: There are none.

Building #: T-216, T-457 and T-468

Built: 1954 and 1957
Address: Fenwick Road
Dimensions: 49′ 2″ (two-bay front) x 14′ 4″ (T-216) **and** 23′ 4″ (two-bay front) x 22′ 7″
Stories: 1.0
NHL Status: Non-contributing
Type: Storage (workshop)
VA State Inventory #:

- 114-0002-0274 114-0002-0275 114-0002-0276

Description: Rectangular floor plan with a hipped roof. All buildings have an overhang garage door. T-216: Glazed door and six-over-six-light double-hung sash windows.

Building: Wood frame and siding built on a concrete foundation with an asphalt roof and metal garage doors. T-216: Wood door.

Mechanical/Electrical Systems: Needs to be verified.

FORTIFICATIONS

Stone Fort (Building: 2, 20-23. Does not include free-standing buildings)
Built: 1819 through the 1840s
Address: Bernard Road
Dimensions: Irregular fortification covering approximately 63 acres
Stories: 1.0
NHL Status: Contributing
Type: Fortification (casemates)
VA State Inventory #: 114-0002-0015

Description: Irregular fortification with seven fronts, five-foot thick walls approximately sixteen feet wide with an embrasure opening for cannons. Three main ranges of casemates with three smaller sections built into the ramparts. Main construction ended by 1836; construction of gun emplacements, repairs and modifications continued through the 1840s. Buildings 20, 21 and 22 have nine-over-nine double-hung sash windows. Building 2: Seven upper level vents and original gun emplacements are on the roof. Building 20(Casemate Museum): Sixteen bays (356' x 50') and fourteen interior chimneys. Interior casemates are two rooms deep with a central fireplace and original floors. Entry has a six-light fan light. Building 21: Fourteen interior casemates and two magazines; central entry is a glazed paneled door and four light fanlights. There are sixteen central chimneys. Building 22: Fourteen casemates flanked by two magazines; central entry is through glazed paneled doors with six-light fanlight. Building 23: Seven casemates and gun emplacements are still on the roof.

Materials: All roofs are brick and earth. Buildings 20, 21, 22 and 2: Flemish bond brick and stone veneer walls built on a stone foundation; concrete stoops and large brick segmental arches on granite supports. Buildings 20, 21 and 22: wooden main entry doors, sandstone window sills and lintels. Building 2: Three course English bond brick veneer and stone walls built on a brick and stone reversed arch on rock rubble infill. There is concrete coping; granite rustication around the entrance; granite sills and lintels. Building 20: Brick arches and inner parapets; outer parapets are granite, olivine, sandstone and schist. Brick herringbone pattern floors, granite walls and a sandstone arch over the entry. Three-course English bond brick parapet wall with concrete coping. Building 21: Concrete and carpeting covers the original brick floors, wood paneling covers the original granite walls and plaster covers most of the original arched-brick ceilings. Building 22: Sandstone arch over entry. Building 23: Metal central entry door with a brick jack arch.

Mechanical/Electrical Systems: Buildings 2 and 22: No HVAC; Building 20: Gas furnace and central AC; Building 21: None; Building 23: Electrical transformers.

Buildings #: 212, 213, 214, 216, 232, 233 and 234
Built: 1819 through 1901
Location: Fenwick Road
Dimensions:
Stories: 1.0
NHL Status: Contributing
Type: Fortifications (batteries)
VA State Inventory #: 114-0002-0180 114-0002-0181 114-0002-0182 114-0002-0183
114-0002-0184 114-0002-0185 114-0002-0186

Materials: Concrete foundations and walls.

Electrical/Mechanical Systems: There are none.
(Bldg 556 and 557 are the magazines to Bldg 214; Bldg 558 and 559 are the magazines to Bldg 213)

Appendix B:
Sample Inspection Forms

Samples of an Initial Assessment Survey, monthly, 6-month and 12-month inspection forms may be found in this section. The forms included here are suggestions; forms will should to be changed to be structure specific.

Preliminary Condition Assessment

Building Number:____

*This inspection requires a complete walk around and walk-through of the structure; this includes the attic and basement. Be sure to take note of any warping, leaks, moisture build-up, peeling paint, etc. Return **signed and completed form** to DPW. Include pictures with this form.

Name of Inspectors: Phone Number:

Date:_____

Is the building clear of furniture?
Yes ☐ No ☐

Have utilities – with the exception HVAC and necessary electrical systems – been shut off?
Yes ☐ No ☐

Are there AC window units?
Yes ☐ No ☐
Number:

Have water pipes been drained?
Yes ☐ No ☐

Has the building been broom swept?
Yes ☐ No ☐

Please describe the mechanical system in use:

General Notes (use extra paper if necessary)

Inspect the following for Damage or Failure. Do any of the Following in Need Repair?

Gutters: Yes ☐ No ☐
Describe: _____

Roofing: Yes ☐ No ☐
Describe: _____

Architectural Metals: Yes ☐ No ☐
Describe: _____

Exterior Masonry: Yes ☐ No ☐
Describe: _____

Foundation: Yes ☐ No ☐
Describe: _____

Porch: Yes ☐ No ☐
Describe: _____

Flooring: Yes ☐ No ☐
Describe: _____

Structural Supports: Yes ☐ No ☐
Describe: _____

Lights: Yes ☐ No ☐
Describe: _____

Windows: Yes ☐ No ☐
Describe: _____

Doors: Yes ☐ No ☐
Describe: _____

Check when Complete:

Secure and Lock Windows: ☐

Ensure Doors Shut Properly: ☐

Open Interior Doors: ☐

Lock Exterior Doors: ☐

Close/Screen Vents: ☐

Close/Screen Chimney Flues: ☐

Close/Screen Grills: ☐

Close/Screen Louvers: ☐

Set Thermostat to Appropriate Levels: ☐

Remove Vegetation from Utility Areas: ☐

Pictures of the Exterior: ☐

Pictures of Walls/Ceiling/Floor of EACH Room ☐

Are there Distinguishing/Historic Features Present? Yes ☐ No ☐

Pictures of Features: ☐

Pictures of Previous Damage: ☐

Inspect Building for Insect/Pest Intrusion or Damage: ☐

Insect/Pest Damage? Yes ☐ No ☐
Description:

Water Damage? Yes ☐ No ☐
Description:

Standing Water? Yes ☐ No ☐
Description:

Signature:

Monthly Inspection

Building Number:____

*This inspection requires a complete walk around and walk-through of the structure, to include the basement and attic. Be sure to take note of any warping, leaks, moisture build-up, peeling paint, etc. Return **completed and signed** form to DPW

Name of Inspectors:

Phone Number:

Date: _____

Notes:

Any Exterior Damage?

Yes ☐ No ☐

Location:_____

Extent: _____

Standing/Pooling Water?

Yes ☐ No ☐

Location:_____

Extent: _____

Damage to Windows or Doors?

Yes ☐ No ☐

Location:_____

Extent: _____

Check if the following are Operational:

Humidifiers ☐

Fire Alarms ☐

Fire Extinguisher ☐

Utilities ☐

Sump Pump ☐

Check after Vegetation has been trimmed from:

Drip line ☐

Foundation ☐

Utility areas ☐

Signature:

Name of Inspectors:

Phone Number:

Date: _____

Notes:

Any Exterior Damage?

Yes ☐ No ☐

Location:_____

Extent: _____

Standing/Pooling Water?

Yes ☐ No ☐

Location:_____

Extent: _____

Damage to Windows or Doors?

Yes ☐ No ☐

Location:_____

Extent: _____

Check if the Following are Operational:

Humidifiers ☐

Fire Alarms ☐

Fire Extinguisher ☐

Utilities ☐

Sump Pump ☐

Check after Vegetation has been trimmed from:

Drip line ☐

Foundation ☐

Utility areas ☐

Signature:

6 Month Inspection

Building Number:_____

*This inspection requires a complete walk around and walk-through of the structure, to include the basement and attic. Be sure to take note of any warping, leaks, moisture build-up, peeling paint, etc. Return **completed and signed** form to DPW.

Name of Inspectors: Phone Number:

Date:_____

Any Exterior Damage?

Yes ☐ No ☐

Location: _____

Extent:_____

Standing/Pooling water?

Yes ☐ No ☐

Location: _____

Extent:_____

Any Damage to Windows or Doors?

Yes ☐ No ☐

Location: _____

Extent:_____

Check when Complete:

Clean Gutters: ☐

Clear Storm Drains: ☐

Remove Downed Branches: ☐

Remove any Vegetation in Direct Contact with the Structure: ☐

Replace Fire Alarm Batteries: ☐

Adjust Heat or AC (seasonally): ☐

Ventilate Building: ☐

Inspect for Pests in:

Crawl Space: ☐

Windows: ☐

Doors: ☐

Chimneys: ☐

Vents: ☐

Attic: ☐

Notes:

The Fall Start-Up for Heating System Requires a Full Check on the Following:

Boilers: ☐

Central and Fan Systems: ☐

Radiators: ☐

The Fall Shut-Down for Cooling Systems Requires a Full Check on the Following:

Compressors and Motors: ☐

Air Handling Coils: ☐

The Spring Start-Up for Cooling Systems Requires a Full Check on the Following:

Air Compressor: ☐

Refrigerated Air Dryer: ☐

Filer and Pressure Reducing Station: ☐

Boiler, Chiller, Convertor Pumps and Zone Controls: ☐

Fan Systems and HVAC Unit Controls: ☐

Room-Terminal Unit Controls: ☐

Coolers: ☐

The Spring Shut-Down for Heating Systems Requires a Full Check on the Following:

Boilers: ☐

Pumps: ☐

Notes:

Signature:

12 Month Inspection

Building Number:_____

*This inspection requires a complete walk around and walk-through of the structure; this includes the attic and basement. Be sure to take note of any warping, leaks, moisture build-up, peeling paint, etc. Return **signed and completed form** to DPW.

Name of Inspectors: Phone Number:

Date: _____

Standing/Pooling water?

Yes ☐ No ☐

Location: _____

Extent: _____

Any Damage to Windows or Doors?

Yes ☐ No ☐

Location: _____

Extent: _____

Check When Completed:

Remove Stains from Exterior: ☐

Touch-up Painting (if appropriate): ☐

Spot Repair (if appropriate): ☐

Ventilate Building: ☐

Inspect and Treat Building for Pests: ☐

Notes:

Inspect the following for Damage or Failure. Do any of the Following in Need Repair?

Gutters: Yes ☐ No ☐

Describe: _____

Roofing: Yes ☐ No ☐

Describe: _____

Architectural Metals: Yes ☐ No ☐

Describe: _____

Exterior Masonry: Yes ☐ No ☐

Describe: _____

Foundation: Yes ☐ No ☐

Describe: _____

Porch: Yes ☐ No ☐

Describe: _____

Flooring: Yes ☐ No ☐

Describe: _____

Structural Supports: Yes ☐ No ☐

Describe: _____

Lights: Yes ☐ No ☐

Describe: _____

The Spring Start-Up for Cooling Systems Requires a Full Check on the Following:

Air Compressor: ☐

Refrigerated Air Dryer: ☐

Filer and Pressure Reducing Station: ☐

Boiler, Chiller, Convertor Pumps and Zone Controls: ☐

Fan Systems and HVAC Unit Controls: ☐

Room-Terminal Unit Controls: ☐

Coolers: ☐

The Spring Shut-Down for Heating Systems Requires a Full Check on the Following:

Boilers: ☐

Pumps: ☐

The Fall Start-Up for Heating System Requires a Full Check on the Following:

Boilers: ☐

Central and Fan Systems: ☐

Radiators: ☐

The Fall Shut-Down for Cooling Systems Requires a Full Check on the Following:

Compressors and Motors: ☐

Air Handling Coils: ☐

Signature:

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Appendix C
Detailed Utility Inspection
Check-List

The point-by-point utility inspection check-lists presented here are the same as those used previously by the Department of Public Works at Fort Monroe. This appendix starts with a systems and equipment list. The remainder of the document is divided into fall start-up and shut-down; spring start-up and shut-down; and annual inspections.

SYSTEMS AND EQUIPMENT

- Air conditioners
- Air curtains
- Air dryers
- Air handling units
- Blowers
- Chilled water coils
- Chillers and associated components
- Cold storage facilities (walk-in and reach-in)
- Combination units (cooling or gas fired heating)
- Commercial or Residential Refrigerators and Freezers
- Compressed air and compressed gas equipment
- Compressors
- Condensate pumps and tanks
- Condensers
- Controls (electrical, mechanical, and pneumatic)
- Cooling towers and associated components
- Dust collection equipment
- Evaporative condensers (open or closed-tube)
- Evaporators
- Exhaust fans
- Expansion tanks
- Fan coil units
- Filters (air and coolant)
- Guards, casings, hangers, supports, platforms, and mounting belts
- Heat Pumps
- Heat recovery equipment
- Heaters
- Heating coils
- Hot water boilers and associated components
- Humidifiers
- Ice Machines
- Induction units
- Instruments
- Mechanical ventilation and exhaust equipment
- Mixing boxes
- Motors and drive assemblies
- Oil tanks

FALL

START-UP CHECKLIST FOR HEATING SYSTEMS

Boilers - General

- Check safety relief valve.
- Check combustion controls.
- Check piping and connections.
- Check low-water cutoff.
- Check water make-up system.
- Check room air intake system.
- Check valves.
- Check water level gauge glass and controls.
- Disassemble low-water cutoff.
- Check contacts.
- Check mercury bulbs.
- Check wiring.
- Clean internal surfaces (as required).
- Clean external surfaces (as required).
- Clean burner assembly.
- Clean make-up water.
- Clean fireside.
- Clean flues.
- Inspect refractory.
- Slowdown mud legs.
- Slowdown gauge glass.
- Slowdown feeder cutoff switch (steam).
- Prepare machine for winter conditions.

Oil Boilers

- Check burner operation.
- Check burner control system.
- Check fuel pump.
- Check fuel valves (for tight seating).
- Check oil heater(s).
- Check tank heater.
- Check fluid system.
- Check fuel leaks.
- Check linkage.
- Check flame detection.
- Check flue gas temperature and content.

Gas Boilers

- Check burner operation.
- Check gas booster.
- Check gas regulator.
- Check linkage.
- Check gas leaks.
- Check gas safety switch.
- Check gas valves (for tight seating).
- Check flue gas temperature and content.

Steam Boilers

- Check condensate float valve.
- Check condensate return pumps.
- Check condensate tank.
- Check pumps.
- Check gas safety switches.
- Check pressure controls.
- Check draft fans/switches.

Hot Water Boilers

- Check circulating pump system.
- Check water cutoff.
- Check water feeder.
- Check shutoff valves.
- Check temperature controls.
- Check draft system.

Automatic Temperature Controls

Air Compressor

- Drain tank and check traps.
- Change oil and check oil pressure.
- Check belt and sheaves; change as required.
- Change suction filter as required.
- Check unloader and check valve.
- Check high pressure safety valve.
- Check motor operating conditions and lubricate.

Refrigerated Air Dryer

- Check refrigerant pressure
- Check refrigerant temperature
- Clean condenser and cover grills.
- Check drain trap and bypass valves.

Filter and Pressure Reducing Station

- Check particle filters (change as required).
- Check oil filter (change as required).
- Check pressure reducing valve settings.
- Check low pressure safety valve.

Boiler

- Calibrate all controllers.
- Calibrate all transmitter and receiver gauges.
- Check all **PE** switches.
- Check all control valves.
- Check all pilot positioners.
- Check all auxiliary control devices.

Fan Systems and HVAC Unit Control

- Review sequence of operation.
- Check all dampers and lubricate.
- Check pilot positioners.
- Check all control valves.
- Calibrate all controllers.
- Calibrate all transmitters and receiver gauges.
- Check all solenoid air valves, **PE** switches, and air valves.
- Check all auxiliary control devices.

Room-Terminal Unit Controls

- Check all room stats.

Fans and Central Fan Systems

- Check and clean fan assembly.
- Lubricate fan bearings per manufacturer's recommendations.
- Lubricate motor bearings per manufacturer's recommendations
- Check belts and sheaves. Adjust as required.
- Tighten all nuts and bolts.
- Check motor mounts and vibration pads. Adjust as required.
- Check motor operating conditions.
- Inspect electrical connections and contactors.
- Lubricate and adjust associated dampers and linkage.
- Check fan operation.
- Check and clean drains and drain pans.
- Check and clean strainers.
- Check steam traps and hand valves.
- Check filter advancing mechanism. Lubricate and adjust as required.
- Inspect filters.
- Check heating coils.
- Inspect humidifier.

Radiation

- Visually inspect fins/cast iron. Clean as required.
- Check and clean drains and drain pans.
- Check steam traps and hand valves.

SHUT-DOWN CHECKLIST FOR COOLING SYSTEMS

Compressors and Motors

- Check oil filters.
- Clean strainers.
- Check oil heaters and controls.
- Clean all sight glasses.
- Check open drive motor couplings for wear and alignment.

Air Handling Coils

- Drain and flush coils with anti-freeze solution.
- Clean coil face.
- Clean condensate traps.
- Clean and drain pans.
- Check and calibrate freeze stat controls in air ducts.
- Install freeze alarms in ducts.

SPRING

START-UP CHECKLIST FOR COOLING SYSTEMS

Automatic Temperature Controls

Air Compressor

- Drain tank and check traps.
- Change oil and check oil pressure.
- Check belt and sheaves.
- Change suction filter as required.
- Check unloader and check valve.
- Check high pressure safety valve.
- Check motor operating conditions and lubricate.

Refrigerated Air Dryer

- Check refrigerant pressure
- Check refrigerant temperature
- Clean condenser and cover grills.

Filter and Pressure Reducing Station

- Check particle filters (change as required).
- Check oil filter (change as required).
- Check pressure reducing valve settings.
- Check low pressure safety valve.

Boiler, Chiller, Convertor Pumps, and Zone Controls

- Calibrate all controllers.
- Calibrate all transmitter and receiver gauges.
- Check all PE switches.
- Check all control valves.
- Check all pilot positioners.
- Check all auxiliary control devices.
- Fan Systems and HVAC Unit Controls
- Review sequence of operation.
- Check all dampers and lubricate.
- Check pilot positioners.
- Check all control valves.
- Calibrate all controllers.
- Calibrate all transmitters and receiver gauges.
- Check all solenoid air valves, PE switches, and air valves.
- Check all auxiliary control devices.
- Room-Terminal Unit Controls
- Check all room thermostats.
- Check all control valves.
- Check operation of all dampers and lubricate.
- Check all PE switches, solenoid air valves, and limit controls.
- Check operation of all auxiliary devices.

Chilled Water Coil Cooling

- Lubricate fan bearings per manufacturer's recommendation.

- Lubricate motor bearings per manufacturer's recommendation.
- Check belts and sheaves. Adjust as required.
- Lubricate and adjust dampers and linkage.
- Inspect filters.
- Check motor operating conditions.
- Inspect electrical connections, contactors, relays, and operating/safety controls.
- Check and clean strainers and humidifier. Check hand valves and steam traps.
- Check and clean drains and drain pans.
- Check heating coils.
- Secure unit panels and inspect roof curb flashing.

Cooling Tower

- Remove all debris from within and around unit then flush as required.
- Check and clean strainers, bleed, overflow, and drain.
- Lubricate fan and motor bearings per manufacturer's recommendation.
- Check belts, motor pulley, and motor mounts. Adjust as required.
- Inspect electrical connections, contactors, relays, and operating/safety controls.
- Check motor operating conditions.
- Clean float valve assembly and check for proper operation.
- Check operating conditions. Adjust as required.

Reciprocating Chillers

- Inspect for leaks.
- Check belts, sheaves, and coupling alignment. Adjust as required.
- Check compressor oil level.
- Change oil and refrigerant filter dryer as required.
- Check compressor crankcase heater operation.
- Check vibration eliminators. Adjust as required.
- Inspect electrical connections, contactors, relays, and operating/safety controls.
- Clean external surfaces as required.
- Review manufacturer's recommendations for start-up.
- Check auxiliary equipment operation.
- Energize crankcase heater per manufacturer's recommendation for crankcase warmup.
- Check and test all operating and safety controls.
- Start chilled water pump, condenser water pump, and cooling tower.
- Check refrigerant charge, oil, and oil pressure.
- Inspect chiller and make adjustments as required.
- Cycle operating controls and check unloaders.

Direct Expansion Cooling

- Lubricate fan bearings per manufacturer's recommendation.
- Lubricate motor bearings per manufacturer's recommendation.
- Check belts and sheaves. Adjust as required.
- Check and clean coils. Straighten fins as required.
- Lubricate and adjust dampers and linkages.
- Check and clean drain pan and drains.
- Inspect filters.
- Check motor operating conditions.
- Inspect electrical connections, contactors, relays, and operating/safety controls.
- Check compressor oil level. Check crankcase heater operation.

- Start compressor, check operating conditions, and adjust as required.
- Secure unit panels and inspect roof curb flashing.
- Inspect for refrigerant leaks.
- Check operating conditions and adjust as required.

Humidifiers

- Check and clean strainers. Check steam traps and hand valves.
- Clean and check float assembly.
- Check and clean drains and drain pan.
- Clean heating element.
- Inspect electrical connections, relays, contactors, and operating and safety controls.
- Clean plugged spray nozzles.
- Check unit operating conditions.
- Clean exterior surfaces as required.

Fans and Central Fan Systems

- Check and clean fan assembly.
- Lubricate fan bearings per manufacturer's recommendations.
- Lubricate motor bearings per manufacturer's recommendations
- Check belts and sheaves. Adjust as required.
- Tighten all nuts and bolts.
- Check motor mounts and vibration pads. Adjust as required.
- Check motor operating conditions.
- Inspect electrical connections and contactors.
- Lubricate and adjust associated dampers and linkage.
- Check fan operation.
- Clean outside air intake screen.
- Check and clean drains and drain pans.
- Check and clean strainers.
- Check steam traps and hand valves.
- Check filter advancing mechanism. Lubricate and adjust as required.
- Inspect filters.
- Check heating and cooling coils.
- Inspect humidifier.
- Clean external surfaces as required.

Condensers· Air Cooled

- Remove all debris from within and around unit.
- Inspect for leaks.
- Check belts, pulleys, and mounts. Adjust as required.
- Lubricate fan and motor bearings per manufacturer's recommendations.
- Inspect electrical connections, contactors, relays, and operating and safety controls.
- Check motor operating conditions.
- Check and clean fan blades as required.
- Check and clean coil. Straighten fins as required.
- Check operating conditions. Adjust as required.

Radiation

- Visually inspect fins/cast iron. Clean as required.
- Check and clean strainers. Check traps and hand valves.

Induction Units

- Visually inspect coil. Clean as required.
- Check and clean drains and drain pans.
- Clean discharge grill.
- Check and clean strainers.

Fan Coils

- Brush and vacuum grills, coil, fan, and unit interior.
- Lubricate fan and motor bearings per manufacturer's recommendations.
- Check belts and sheaves. Adjust as required.
- Inspect mechanical seals. Replace as required. - OR - Inspect pump packing. Replace and
- adjust as required.
- Verify gauges for accuracy.
- Clean external surfaces as required.
- Check suction and discharge pressures.

Air Handling and Fan Coil Units

- Check motor amperage
- Check and clean coils
- Check electrical connections
- Check for vibration
- Check motor mounts and supports
- Change air filters
- Check belts and change as required
- Check and clean drain pans and lines and chemically treat as required.
- Lubricate motors and bearings as required

SHUT-DOWN CHECKLIST FOR HEATING SYSTEMS

Hot Water Boilers

- Inspect fireside of boiler and record condition.
- Brush and vacuum soot and dirt from flues and combustion chamber.
- Inspect firebrick and refractory for defects. Patch and coat as required.
- Visually inspect boiler pressure vessel for possible leaks and record condition.
- Disassemble, inspect, and clean low-water cutoff.
- Check hand valves and automatic feed equipment. Repack and adjust as required.
- Inspect, clean, and lubricate the burner and combustion control equipment.
- Check burner sequence of operation and combustion air equipment.
- Check fuel piping for leaks and proper support.
- Clean external surfaces as required.
- Clean boiler room.
- Review log. Log all operating conditions.
- Test low water cut-off and pressure relief valve.
- Check operating and safety controls.
- Fill boiler with chemically treated water to prevent corrosion.

Steam Boilers

- Inspect boiler and burner; then make adjustments as required.
- Test low water cut-off and pressure relief valve.
- Check operating and safety controls.

- Log all operating conditions.
- Shut off burner and open electrical disconnect.
- Close fuel supply valves.
- Thoroughly blow down boiler.

Pumps

- Lubricate pump bearings per manufacturer's recommendations.
- Lubricate motor bearings per manufacturer's recommendations.
- Tighten all nuts and bolts. Check motor mounts and vibration pads. (Replace and adjust as required.)
- Visually check pump alignment and coupling.
- Check motor operating conditions.
- Inspect electrical connections and contactors.
- Inspect mechanical seals. Replace as required - OR - Inspect pump packing. Replace and adjust as required.
- Verify gauges for accuracy.
- Clean external surfaces as required.
- Check suction and discharge pressures.

ANNUAL

Maintenance to Heating Systems:

- Remove boiler from service.
- Cool down boiler.
- Open, inspect, and clean each boiler on water side.
- Open, inspect, and clean each boiler both on fire side.
- Clean tubes, fire box, and tube sheets.
- Remove manhole covers.
- Dismantle low water cutoffs and clean.
- Remove piping to operating and safety controls.
- Remove plugs from cross connections.
- Check safety and operating controls.
- Perform a hydrostatic test.
- Observe and control condition of fire to carry highest possible carbon dioxide with the lowest possible stack temperature without smoke pollution to the atmosphere.
- Clean and inspect boilers internally for cracks, deformities, and corrosion.
- Clean and inspect for eroded or spalled brickwork.
- Clean and inspect the interior of the boiler (shell, drums, and tubes) to remove mud, loose scale, and similar deposits.
- Clean and inspect the boilers interior for grease or oil and remove excess grease or oil to improve heat transfer and operation efficiency.
- Clean and inspect staybolts for corrosion and leaks; shell and tubes for corrosion and scale; tube ends for corrosion and leakage; boiler-feed piping for weakness; baffles; safety connections for leaks, chattering, or simmering; uptake damper and escape pipe.
- Clean and inspect water column, feed water regulator, drain, water alarms high and low and gauge glass to ensure water levels are maintained.
- Clean and inspect connect piping between boiler and water column for corrosion and strains.
- Clean and inspect boiler pressure gauge for operation within boiler limits and blow-off valves for presence of foreign matter.
- Clean and inspect for strains due to settling in steam piping, boiler feed-water piping, and any exterior cracks or openings.
- Clean, inspect, and check combustion for shifting walls.
- Clean and inspect oil burner strainers; disassemble, clean, and inspect all parts of burners for signs of overheating and burning away of metal.
- Clean and inspect all oil valves for wear and carbon build up. Clean burner nozzle openings to remove carbon build up.
- Clean and inspect oil burner hose and flexible connections for cracks and deterioration. Inspect pumps and heater for mechanical and electrical and shut off or disconnect the draft gauge operation.
- Clean, inspect, and remove dirt and dust from forced-draft and induced-draft fans. Apply corrosion protection and inspect motors and bearings for overheating.

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Appendix D:
Heating and AC Units

This document presents the HVAC and AC systems in each building. Included are the make, model, serial numbers, use BTU and voltage.

Heating and A/C Survey as Preformed by the DPW for 2011

Bldg Number	Make	Model Number	Serial Number	Use (heat, A/C, window, etc)	BTU	Voltage
5A 1ST FLR	CARRIER	39ED19	1192T35965	AIR HANDLER 1		208/220
2ND FLR	CARRIER	39ED29	1192T3596	AIR HANDLER 3		208/220
3RD FLR	CARRIER	28CU1136MK 1084--K	2110347008	AIR HANDLER 2		208/230
5C 3RD FLR	MITSUBISHI	? - COMPUTER RM		HEAT PUMP		
5 B/C REAR	EMI	SHC6DF 0000AA01	1-03-M-6739-50	Heat Pump		208/230
5D FRNT	CARRIER (NOT ACTIVE)	52CQDA309301AA	2502X67820	HEAT PUMP	8900 COOL/7800 HEAT	208/230
5E 2ND FLR	EMI			WALL HUNG 2EA		
5E REAR	COMFORT AIR	MIODELENO		WINDOW A/C	11000	208/220
5 E-F REAR	TRANE	2TWB0042A1000AB	5363KK24E	CONDENSOR		200/230
5G 1ST FLR	TRANE	NCCA021CAE0B0E0A 00000000	K94M94127	AIR HANDLER 5		208/220
5G 2ND FLR	TRANE	DW0B18066A0EB103BABA0AB00000	K94M94150	AIR HANDLER 4		208/220
5G 3RD FLR	TRANE	MCCA0214CC0V0AC00	K94M94169	AIR HANDLER 6		208/220
5	EMI	SHC36DF0000AA0A	1-03-M,-6738-50	CONDENSOR		208/230
5 3RD FLR	MITSUBISHI	PU36EK	36300413D	Heat Pump		208/230
5 1ST FLR	TRANE	2TWB20300A1000AA	3134L754F	Heat Pump		208/230
6	KEWANEE	L3W-100-GD	9467420	#1 OIL/GAS	4,200 MBTU	230
	KEWANEE	L3W-100-GD	94105230	#2 OIL/GAS	4,200 MBTU	
	MCQUAY	PEH0789	5YG81033-00	CHILLER 300 TON		480
	EVAPCO	LSTA1012A	5-289456	COOLING TOWER 300 TON		208/230
7	TRANE	YCD240B3L0JB	340100710D	HEAT PUMP GAS	250,000	220/208 GAS
8A	LENNOX	H526-048-5P	5804H0478	COMPRESSOR		208/230 ELEL
	LENNOX	C33-50/60C-2F-1	6005A37016	Furnace		GAS
9	TRANE	CGAFC30EAHD10000E …… 000	C04B01281	COOLING TOWER		208/230

Heating and A/C Survey as Preformed by the DPW for 2011						
Bldg Number	**Make**	**Model Number**	**Serial Number**	**Use (heat, A/C, window, etc)**	**BTU**	**Voltage**
	WEIL MCLAIN	80SE12CS	CP4728784	BOILER GAS	108,200 MBH	
10	MITSUBISHI	PUH24EK	33E004830	HEAT PUMP		208/230
	MITSUBISHI	PUH24EK	33E0049B	HEAT PUMP		208/230
	MITSUBISHI	PUH24EK	33E005C	HEAT PUMP		208/230
	MITSUBISHI	PUH24EK	31E00113B	HEAT PUMP		208/230
	CARRIER	39FD190	3184121941	AIR HANDLER		208/230
	CARRIER	39EF19	3184T21942	AIR HANDLER		208/230
	CARRIER	39EF19	3194T29936	AIR HANDLER		208/230
	CARRIER	39ED19	3184T21927	AIR HANDLER		208/230
11	TRANE	2TWB0036A1000B	4073WM04F	Air Handler	3 TON	200/230
	SAMSUNG	AW25EC88	PEHQ404618	Heat Pump	24000	208/230
	SANYO	C30328	27432	In Door Unit		230
12	BUDERUS	GE 3125/9	05178849-003101	HEAT BOILER	768 MBTU	110/220 GAS
(2ND FLR)	DUNHAM-BUSH	HAH032	70627702AB4G	AIR HANDLER		
	MAJIC AIRE	36-BHW-4	981067299	AIR HANDLER		110/230
	TRANE	CGA18013300EA	4105KDBDD	CHILLER A/C	15 TON	208/230
	TRANE	2TWB0024D1000AB	40737794F	ROOF UNIT		208/230
	CARRIER	38YRA060320	2104303059	ROOF UNIT		208/230
CM 20	TRANE	2TTA0048A3000AA	5305WXN3F	(TOP) A/C COMPR		200/230
	TRANE	2TTA3060A3000AA	8502X6R4F	(TOP) A/C COMPR		200/230
	CARRIER	53STA136-22	0503A31141	HEAT GAS	132,000	110
	YORK	5G2FD0905305A	56002K70052	A/C HEAT	175,000	200/230
	LENNOX	CRS-51-1F	5181M16898	GAS	175,000	200/230

Heating and A/C Survey as Preformed by the DPW for 2011						
Bldg Number	**Make**	**Model Number**	**Serial Number**	**Use (heat, A/C, window, etc)**	**BTU**	**Voltage**
CM 21	MODINE	PA75AD	30011050286	UNIT HEAT GAS	57,000	110
	STERLING	8733664	N/A	UNIT HEAT GAS	100,000	110
	KENMORE	N/A	N/A	WINDOW A/C	8,000	110
	FRIGIDARE	N/A	N/A	WINDOW A/C	8,000	110
	FRIGIDARE	N/A	N/A	WINDOW A/C	12,000	220
	AMER STAND	18CD19D7-14	UD100C-K	HEAT GAS	75,000	110
	HEAT CONTROLLER	D-HMH12AS	99404	(TOP)		208/230
	MITSUBISHI	MUZ-A24NA	8002021	(TOP)		208/230
	HEAT CONTROLLER	A-HMH12AS	99404	(TOP) 15 EA		208/230
	FUVITSU	A0U12RL	HQN005321	(TOP) 9 EA		208/230
24	TRANE	TTB024C100A2	4072W7G5F	EXT		208/230
	TRANE	2TTB042A1000AA	40546G	EXT		208/230
	CARRIER	58MXAD6012	4194A11615	GAS	60,000	200/230
	CARRIER	58MXA100-20	295A05873	GAS	100,000	200/230
27	AMERICAN STANDARD	2A6H2030B1000-AA	3464L4Y4F208230	HEAT PUMP		208/230
	MCQUAY	LML128E1	3YB0150700			208/230
	AMERICAN STANDARD	TWE030P130B0	4021U5H1V			200/230
	TRANE	TTA180C300GA	41510UFAD	A/C		200/230
	TRANE	TTA180C300GA	4123TK2AD	A/C		200/230
28	WEIL MCLANE	788		PACKAGE BOILER	1,632,000	
	WEIL MCLANE	88		PACKAGE BOILER		
	TRANE	TWA090A300FB	8493KAYAD			208/230
	TRANE	2TWB0030A1000AB	30884TYH4F			200/230
	TRANE	2TWB0036A1000AB	3355TK94F			200/230
	AMERICAN STANDARD	247C2048A3000AA	3282XHK3F			200/230

Heating and A/C Survey as Preformed by the DPW for 2011						
Bldg Number	**Make**	**Model Number**	**Serial Number**	**Use (heat, A/C, window, etc)**	**BTU**	**Voltage**
	MITSUBISHI ELEC	PUH36EK				208/230
	AMERICAN STANDARD	TTA120A300FA	4351KHMAD			208/230
	TRANE	CGAFC40EAHA10000E	C03G06775	A/H		200/208
	AMERICAN STANDARD	TWE120A300EL	4352PV4BD	A/H 2ND FLR	5 TON	208/230/460
	YORK	CS156SHFC18X13	CNCM-005650	A/H 2ND FLR		
	AMERICAN STANDARD	AUD100C948K9	4261L531G	FURNACE 2ND FLR	100,000	115
32	CARRIER	38CKC060370	603E24060	CONDENSOR		200/230
	CARRIER	58STA135-10122	3103A31403	FURNICE		200/230
37	TRANE	CCAD040G6F0AT100F00	U92H01240	A/C		200/230
38	CARRIER	5855C110-LC	4891A12778	GAS	100,000	120/208
42	TRANE	AUCC40EBX0300DF00029	C04ED4411	A/C		200/230
	BURNHAM AMERICAN	PF508	7575325	GAS BOILER		115/120
	TRANE	2TTA0048A3000AA	3383P243F	A/C		200/230
47	SANYO	CH2442	14732	SPLIT PACK	11.5/12.1 2TON	208/230
	SANYO	CH2442	15132	SPLIT PACK	11.5/12.1 2TON	208
	SANYO	KH2442	1632	SPLIT PACK		208/230
	SANYO	KH2442	2833	SPLIT PACK		208/230
53	TRANE	TTA120A300FA	404150MA0	CONDENSOR		208/230
	BURHAM	209NIL-TEIZ	64570829	BOILER (GAS)	206,000	120
	HEAT CONTROL INC	A-HMN 24AS	N/A	HEAT PUMP		230/208

Heating and A/C Survey as Preformed by the DPW for 2011						
Bldg Number	**Make**	**Model Number**	**Serial Number**	**Use (heat, A/C, window, etc)**	**BTU**	**Voltage**
	COMFORT AIR	RAH-123	205103449	WINDOW A/C	12,200	230/28
	FRIDFIGARE	LRA074AT7	KK00943082	WINDOW A/C	4500	110
56	WEIL MCLAIN	L9B	H7268.51234679T	Boiler		200/230
	TRANE	CGADC9DEAHA	CD4801397	A/C		208/230
	TRANE	2TWA0060A3000AB	4062NLE2F	HEAT PUMP		200/230
	TRANE	2TWA0048A3000AB	4064SBJ4F	HEAT PUMP		200/230
57			2050022	HEAT GAS		
		ANSZ836-19931CAN1		Boiler		
			2050024			
			2050025			
			2050026			
			2050027			
			2050028			
	COPPER FIN 11		J03H00159284			
	TRANE	2TTA0036A3000AA	402147J3F			200/230
	TRANE ODDYSSEY	TTA090A300FA	40320F4AD			200/230
	FRIGIDAIR			WINDOW A/C 4EA	12,000	
	TRANE	2TWB0024A1000AB	4044T5T4F			200/230
	GOODMAN	CPKE24-1AB	12444259	HEAT PUMP ROOF		208/230
	MITSUBISHI	PUGH36CKB	2282013	HEAT PUMP ROOF		230
	MITSUBISHI	PUH24BK		HEAT PUMP ROOF		230
	AMERICAMN STANDARD	2A7A2060A1000AA	3085NXY3F	HEAT PUMP ROOF		208/230
	ALLEGANCE	247A2048A1000AA	237453G3F	HEAT PUMP ROOF		208/230
	ALLEGANCE	2A7A2024A1000AA	23358YNF	HEAT PUMP ROOF		200/230
	SANYO	CH1822	10111	ROOF		208/230
59	LIEBERT	CDF415Y	921C2073	A/C		208/230

Heating and A/C Survey as Preformed by the DPW for 2011						
Bldg Number	**Make**	**Model Number**	**Serial Number**	**Use (heat, A/C, window, etc)**	**BTU**	**Voltage**
	LIEBERT	CDF415Y	920CS0760	A/C		208/230
	LIEBERT	DCSF083P	738C03718	A/C		2085/230
	TRANE	RAUCC30EBX1300D000020	C04B01398	A/C		200/230
	WEILMCLAIN	80	1	GAS HEAT		
	CHANDLER	WSS105	T04C02549	A/C		208/230
	CHANDLER	WSS105	T04C02550-	A/C		208/230
	LIEBERT	DCSF083P	0551C82891	A/C		208/230
	TRANE	TT8120A300FA	4034MAAAD	A/C		200/230
	EC0SII HI ROSS			A/C	(2EA)	
	EMERSON			A/C	(4EA)	
	DATAC			A/C		
	LIEBERT			A/C	(2EA)	
73	TRANE	2TTB0060A1000AA	40634DN3F	HEAT PUMP		200/230
	CARRIER	58MXA12020	3794A15311	CONDENSOR	120000 GAS	200/230
74	TRANE VOYAGER	YCH240B3L0JB	412100196D	SPLIT PACK	250000 GAS	208/230
75	TRANE VOYAGER	YCH240BELFJB	446100404D	SPLIT PACK	250000 GAS	208/230
	DURATIC EMI	SHC12DA0000AA0B	104M533749	CONDENSOR		208/230
77	CARRIER	30RAP0305FA02100	3510Q40434	Condensor		208/230
	WEIL MCLANE	PFG-6-PIN	6	Boiler	247,000	208/230
80	TRANE	CGAFC25EAHA1000E000N0 … W00	CV04B01280	Condensor		200/208
	BURNHAM	V904	8M2965R1	Boiler		120

Heating and A/C Survey as Preformed by the DPW for 2011						
Bldg Number	**Make**	**Model Number**	**Serial Number**	**Use (heat, A/C, window, etc)**	**BTU**	**Voltage**
82	BRYAN	R69003	201L	GAS BOILER		120
	TRANE	RTUA090AY001R3D0VAU	990099033	A/C		200
	AJAX	WFG1500	52553	BOILER	1,500,000	208/230
	TRANE	MCCA021GAT2ABC000H0CCA00 ……	K98C22341	AIR HANDLER		200/230
	BRYAN	R69G003	201L	GAS BOILER		
	TRANE	R78A1004XM01A300BG	1L02395	A/C		460
	TRANE	MCCA014KAF0CA	K98F56807	AIR HANDLER		208/230
	TRANE	MCCA014BAV0ABC000F0ECA ……	K98F6812	AIR HANDLER		208/230
	MITSUBISHI			HEAT PUMP ON ROOF		
	MITSUBISHI	PUG24AYB	WLMM022890	HEAT PUMP ON ROOF		208/230
	TRANE	RTCA090G0D00A300K	U98008889	A/C		200/230
83	BURNHAM	210NILIFIT2	64560163	PACKAGE BOILER	299,000	120,60
	CARRIER			GAS EXT (2 EA)		
	HEAT CONTROLER	AHMC18AS	305K00169	CONDENSOR		230/208
84	CARRIER	40RR-012-550	1490F10477	A/H		230/460
	BURHAM	210NIL-TEI2	64585787	BOILER GAS	299,000 BTU	120
	TRANE	TTA120C300GB	408309UAD	CONDENSOR 10 TON		208/230
	TRANE	TTB024C100-A2	4072W905F	ABOVE CEILING		200/230
87	LOCHINER	CFN501PM	L016686	BASMNT	500,000	120
	LOCHINER	CFN501PM	L016685	BASMNT	500,000	120
	LOCHINER	PBN0750	Boiler	Boiler	750,000	120
	LOCHINER	PBN0750	27444	Boiler	750,000	120
	MITSUBISHI	PU18EK	96D01436C	CONDENSOR		208/230
	TRANE	R1AQA100AYM01B3D0BP	U02003900	EXT		208/230

Heating and A/C Survey as Preformed by the DPW for 2011						
Bldg Number	**Make**	**Model Number**	**Serial Number**	**Use (heat, A/C, window, etc)**	**BTU**	**Voltage**
96 REAR	MITSUBISHI	MUH12TN				198/253
	EMI	SCC30DF0000ADA	1-03-J-0778-37	HEAT PUMP		208/230
	BUDERUS	GE315/9	05178848-00-3101-0003	BOILER GAS	768,000	208
	BUDERUS	GE315/9	05178848-00-3101-0004	BOILER GAS	768,000	208
	SANYO	C1852	171132	HEAT PUMP ELEC		208
	SANYO	C1852	177532	HEAT PUMP ELEC		208
	SANYO	CL3032A	11324	HEAT PUMP ELEC		208
	CARRIER	38AR2008-501	3506040083	C OOLING TOWER		208/230
(ROOF)	TRANE	TCD3240840AJB	443100725D	#5 CONDENSOR		208/230
(ROOF)	TRANE	TCD150D40ABA	443100718D	#6 CONDENSOR		208/230
(ROOF)	TRANE	TSC036A3RDA1BF002000000AD	4431005772	#7 CONDENSOR		208/230
(ROOF)	TRANE	TSC90A4DA1GF002000000A0	4431006772	#2 CONDENSOR		208/230
(ROOF)	TRANE	TCD300B4DAHB	4-43100731D	#3 C ONDEDNSOR		208/230
(ROOF)	TRANE	TCD150D40DAD	C431007760	#1 CONDENSOR		208/230
(ROOF)	TRANE	TSC090A4120A1GF002000000A0	44310073902	# ? CONDENSOR		208/230
(ROOF)	YORK	4M240C00C4ADD1C	NFNM081899	#9 C ONDEDNSOR		208/230
(ROOF)	TRANE	TCD180B40AHB	443100722D	8 CONDEDNSOR		208/230
(ROOF)	TRANE	TSC060A3R8A1GF002000000A(		4431005276		208/230
100	TRANE	CGAF60BAHA10000E0000N … W00	C04B01283	EXT		200/208
	TRANE	2TTB0048A1000AA	54950DAJF	EXT		200/2330
	LG	LWHD800RY6	612TABM05797	A/C WINDOW	9.8	115
	WEIL MCLANE	LGB SERIES 2 BOILER		BOILER	400,000-910,000	120
	TRANE	MCCB017UA0B0UB	K03K43433A	A/H BASMNT		200
	TRANE	MCCB017UA0B0UB	E5L576BBIMA	A/H BASMNT		200
105	TRANE	CGAFC40FAHA10000E …. 000	C03-09860	CHILLER		208/230
	BRYANT	F450-W-G1	91110	Boiler Gas	450,000	208/230
	TRANE	BCVC090E1A0C4NA6P00000B	T03270787	AH BOILER RM #1		208/230

Heating and A/C Survey as Preformed by the DPW for 2011						
Bldg Number	**Make**	**Model Number**	**Serial Number**	**Use (heat, A/C, window, etc)**	**BTU**	**Voltage**
	TRANE	BCHC036E1A3NA4G00000B	T03L70795	AH ATTIC #6		208/230
	TRANE	BCHC036E1A3NA4G00000B	N/A	AH ATTIC #3		208/230
	TRANE	BCHC036E1A3NA4G00000B	T03L70789	AH ATTIC #4		208/230
	TRANE	BCHC036E1A3NA4G00000B	T03L70794	AH ATTIC #5		208/230
	TRANE	BCHC036E1A3NA4G00000B	TO3L70789	AH ATTIC #2		208/230
	WHIRLPOOL	ACM122XK0	QL1030731	AC WINDOW	11,600	110/120
	FEDDERS	A3T12F2AG-AR	GM1968182090	AC WINDOW	12,000	110/115
	WHIRLPOOL	ACM122XKO	QL1030728	AC WINDOW	11,600	110
	FEDDERS	A3212F2AG-AR	GM1968232090	AC WINDOW	12,000	115
	WHIRLPOOL	ACM122XK0	QL030388	AC WINDOW	11,600	115
	CARRIER	N/A	N/A	AC WINDOW	12,000	115
105A	EMO	S1JC36DF000AA0A	N/A	Heat Pump		208/230
	TRANE	CGA180B300EA	N/A	Condensor		208/230
	DUNKIRK	DBF0-9W	4401300603	FURNACE GAS	309MBH	208/230
117	COLUMBIA BOILER	WL60	N/A	GAS BOILER	833,000	
	TRANE	CGAFCV40EAHA10000E00000000000W09	CD4802826	CONDENSOR		222/208
	HEAT CONTROLLER	MSS-024A	N/A	HEAT PUMP		230/208
	CARRIER	40RMQ012--B600NC	2499F26680	A/H		208/230
134	JACKSON&CHURCH	AH50FHWMB	C98215	AIR HANDLER	(ROOF TOP)	200/230
	TRANE	CAUGC	J92H83072B032		(ROOF TOP)	200/230
	EMI	SHC18DF00000AA0A	104D924-19			208/3230
	TRANE	TTA090A300FA	347429LAD	A/C		208/230
	CLEAVER BROOKS	CB600200	L77789		8369000	460
	CLEAVER BROOKS	CB600200	L77790		836900	460
	WEIL MCLAIN	LGB	2	GAS HEAT	400000	120
	BACS ACB BATTIMORE	324-8-2	U065036801	COOLING TOWER		

Heating and A/C Survey as Preformed by the DPW for 2011						
Bldg Number	**Make**	**Model Number**	**Serial Number**	**Use (heat, A/C, window, etc)**	**BTU**	**Voltage**
	SNYDER GENERAL	PEH0063	52D8102200			2400
	SNYDER GENERAL	PEH0063	52D8101900			2400
135	(OUTSIDE)	GSCC241	GSCC2410321070600			200/230
	HEAT CONTROLLER	AHMH24A2	312KA0081			208/230
	HEAT CONTROLLER	AHMH24A2	312KA00158			200/230
	YORK	DM240E36A2AAA1B	N8MM083343			208/230
	CLIMATE CONTROL	WSS105	T04B03030			208/230
	TRANE	TW8090300FA	413504GAD			208/230
	BURDERUS	G2157	5.17846E+16	GAS HEAT		115/120
	TRANE	TCH240B300JB	4421008560	A/C		208/230
	TRANE	2TWB0036A1000AB	42946CW4F	HEAT PUMP		200/230
	CLIMATE CONTROL	WSS105	T04B03031			
	TRANE	TTA120A300FA	4063KBGAD	A/C		208/230
	AMERICAN STANDARD	TWE09DA300EA	3315YJ85H	AIR HANDLER		208/230/460
138	TRANE	CG8FC40EAHA10000E000-W00	C04B01282	A/C		200/230
	TRANE	CCDB03BE0F	K86K14617	AIR HANDLER		115
139	TRANE	RTAA1104XQ01A3DD0BGKN	U04B04643	AIR HANDLER	110 TON	460
(3EA)	TRANE	MCCB0500A0A00B	K03K47716A	AIR HANDLER		460
	WELL MCLEAN	MODEL 88	N/A	BOILER (GAS)		
(3EA)	TRANE	MCCB040UD0D0UA	K03K47711A	AIR HANDLER		460
	AMERICAN STANDARD	2A7B0036A1000DA	3343NKD3F	CONDENSOR		200/230
	LENOX	CB18-41-3P	5191F64711	COOLING TOWER		208/230
159	YORK	EA120C00AAA-1A	NGNM097100	COOLING TOWER	10 Ton	208/230
	YORK	FA120C00A6AAA-1B	NHNM105672	HEAT PUMP		208/230

Heating and A/C Survey as Preformed by the DPW for 2011						
Bldg Number	**Make**	**Model Number**	**Serial Number**	**Use (heat, A/C, window, etc)**	**BTU**	**Voltage**
161	TRANE	2TTA0060A3000AA	5331LJL3F	CONDENSOR		200/230
	AIRSTACK	ASP10A	JD0213	EXT		208
	TRANE	LPCAD03D	T03M81152	MECH RM		208
	TRANE	LPCAD03D1D0LCM020008AC4CAUBOI	T03M81151	A/H		208
	CENTRALAIRE	L0309	29963015	A/H		
	CENTRALAIRE	L0309	299630L6	A/H		
	AMER STANDARD	TA2024A100A3	2212NL94F	CONDENSOR		200/230
	TRANE	2TTA0060A3000AA	52035EE3F	CONDENSOR		200/230
		7A2018A100A1	P1336GVCF	CONDENSOR		200/230
	AMERICAN STANDARD	2A6H2042A1000AB	4063T962F	CONDENSOR		208/230
162	AMERICAN STANDARD	YCH240B328L0JB	348100405D	HEAT A/C GAS	250,000	208/230
166	TRANE	YC0180B3L868	207100492D	GAS	250,000	208/230
	MITSUBISHI	SERVICEREFPUYA36NWI	52000948A	HEAT PUMP		208/230
163	SANYO	CL2432A	83933	A/C		208/230
168	TRANE	WCC024F100BH	4055LAD2H	EXT		208/230
	TRANE	2TWB0048A1000AB	3092T2LIF	EXT		200/230
	WEIL MCLANE	CP2072993		BOILER OIL	250MBH	
171	TRANE	RTAA0B0AYM01A3D0BG	U01K02038	EXT		200
	TRANE	MCCA014GAY0AACA00-C0AC0…	K01H15085C	MECH RM		200

Heating and A/C Survey as Preformed by the DPW for 2011						
Bldg Number	**Make**	**Model Number**	**Serial Number**	**Use (heat, A/C, window, etc)**	**BTU**	**Voltage**
	BRYAN	AB120-W-FDG	87296	A/H		120
	TRANE	MCCA035MAM0C0B0DD0AC … AE	K01H15116C	A/H		
	PVI	4000P600ATP	30113469	MECH RM	3,200,000	230
182	BURNHAM	PV85WC-TBWN	64562888	GAS		208/230
	DATA AIR	DTAU-0532 #1	2001-1604-A			208/230
	DATA AIR	DTAU-0532 #2	2001-1603-A			208/230
	DATA AIR	DTAU-0532 #3	20012-1602-A			208/230
	DATA AIR	DTAU-0532 #4	2001-1601-A			208/230
	DATA AIRE	DARC0532	2001-1606A			208/230
	DATA AIRE	DARC0532	2001-1605-A			208/230
	KEEP RITE	KCM010-T3AA11V0220	102400509			208/230
	KEEP RITE	KCM010-T3AA11V0220	102404510			208/230
	MITSUBISHI	PU936AYB1	W0K5991024			208/230
183	TRANE	TTA180C300GA	33140G2AD	CONDENSOR		200/230
	TRANE	TTA180C00GA	4052PYLAW	CONDENSOR		200/230
	CARRIER	40RM028B511GC	2107U15452			208/230
185	TRANE	RTAA100AY601A300AB	U00A04998	A/C C OMPRESSOR	100 TON	208/
	WEIL MCLAIN	LGB	CP4699892	BOILER GAS		
(PENTHOUSE)	THERMAC	CPE-300-H	07-213519-03	AHU		208/2330
(PENTHOUSE)	THERMAC	CPE-300-H	07-213519-4	AHU		208/230
(PENTHOUSE)	THERMAC	CLP-171-H	01-213519-02	AHU		208/230
(STORE RM.)	REZNOR	F125-E	BCF66M4NA9819X	GAS HEATOR	125,000	110/120
(STORE RM.)	LG			WINDOW A/C	14000	220
(STORE RM.)	LG			WINDOW A/C	14000	220
(STORE RM.)	LG			WINDOW A/C	14000	220
(STORE RM.)	LG			WINDOW A/C	14000	220

Heating and A/C Survey as Preformed by the DPW for 2011						
Bldg Number	**Make**	**Model Number**	**Serial Number**	**Use (heat, A/C, window, etc)**	**BTU**	**Voltage**
201	RITE BOILER	225	8419247	BOILER GAS		208/220
	TRANE	CGAFC604A2A1000DE0000000000000	C06K10369	COOLING TOWER	60 TON	460
	TRANE	GGAEC664ABAJ01R	S96E815Y5	COOLING TOWER	60 TON	460
	CARRIER			AH2		208/220
	CARRIER	6336FA108A	298A	AH1		208/220
	TRANE	CGAFC30EAHA10000E00J 0	A/C			120/240
	?	33-FB0750NE2ACPS	10033516	HEAT PIMP		120/240
	TRANE	2TWB0036A1000AB	3355UHX4F	A/C		200/230
204	BURNHAM	BCJR50A-15	120253333	PACKAGE BOILER	299,000	115/60
206	TRANE	YCH210C3HBEA	453100546D	H/P GAS		208/230
207	CAPTIVE AIR SYSTEM	NRTPAAID250G10NCAS18FA	637009		18,337	208
	AMER STANDARD	WCD130B300HA	427100235D	HEAT PUMP ROOF		208/230
	TRANE	2TWB0060A1000AB	351130UC2F	HEAT PUMP GROUND		200/230
	BURNHA,M	805	64570311	MECH RM	594,000	120
209	3 WINDOW A/C					
217	TRANE	2TTB0036A10008A	41120AL5F	CONDENSOR OIL		200/230
	ARMSTRONG AIR	LUF80C84195016-1A	8402M15291	FURNACE OIL	85,000	120/240
218	TRANE	TTB018C100A2	4043W4X5F	A/C		200/230

Heating and A/C Survey as Preformed by the DPW for 2011						
Bldg Number	**Make**	**Model Number**	**Serial Number**	**Use (heat, A/C, window, etc)**	**BTU**	**Voltage**
	?	144906	144904	HEATER COIL 5EA		200/230
221	MCQUAY	ALR050E	57B8130501	COOL TOWER		208/230
	WITT	RC5024VE	233880C97	CHILLER		208/230
	BRYAN	F850-W-G1	79868	BOILER GAS	850/425 MBH	208/230
	AAF	218510N04	97-2200	A/H		208/230
	MCQUAY	LSL128DH	97C0080700	A/H		208/230
		SWHP100-10A	970404	SWIM/POOL COMPRES		208/230
(ROOF)	WEATHER MASTER	48HJE006--541CA	1304G30148	HEAT GAS	115000	208/230
(ROOF)	CARRIER	48HJE006--541CA	1304G30077	HEAT GAS	72,000	208/230
(ROOF)	CARRIER	48HJE008---541C	1304G40522	HEAT GAS	180,000	208/230
243	MITSUBISHI	PUG36CKB	2032215	EXT		208/230
	FRIGIDARE	F8C107P1A	1K64738318	WINDOW UNIT	10,000	115
	GE	ASW118DAS1	GD709520	WINDOW UNIT	17,900	208/230
	TRANE	YFD180B3LAHB	405100205D	ROOF	250,000	208/230
	TRANE	YSC120A3RLA1CH00000000000D	404101015L	ROOF	150,000	208/230
	TRANE	YFD210C3LAEA	405100217D	ROOF	250,000	208/230
	MITSUBISHI	PUH18EK		HEAT PUMP ROOF		208/230
245	TRANE	CGAFC30EAC21000 … T009	C99K20594M	COOL TOWER		208/230
	UL	HABAT060SLT	W0C5709969	AIR COMP		208/230
	AMER STAND	2A7C2060A3000AB	4125J4C3F	AIR		208/230
	DURATEC			AIR COMP		
	WELL MCLEAN	EG75-PIN	3	BOILER GAS	300,000	
246	LENNOX	HS26-048-5P	5804K29798	A/C		208/230
	LENNOX	HS26-048-5P	5804S07000764	A/C		208/230

Heating and A/C Survey as Preformed by the DPW for 2011						
Bldg Number	**Make**	**Model Number**	**Serial Number**	**Use (heat, A/C, window, etc)**	**BTU**	**Voltage**
	LENNOX	HS26-048-5P	5804P26306	A/C		208/230
	LENNOX	C33-50160CV-2F-1	6005A37015	HEAT 3 GAS		208/230
	LENNOX	C-33-50160C-2F-1	6004M05476	HEAT 2 GAS		208/230
247	YORK	H5CE090A25A		A/C		200/230
	HEAT CONTROLLER	AHMC09AS	306KA0056	BOILER	9K	200/230
259	CARRIER	38CKC060570	4303E12203	COMP A/C		208/230
	CARRIER	38CKC060570	2503E22502	COMP A/C		208/230
	CARRIER	38CKC060570	4603E09278	COMP A/C		208/230
	CARRIER	586TA136-22	1603A28790	HEAT 3 GAS		208/230
	CARRIER	685TA136-22	1503A26610	HEAT 2 GAS		208/230
	CARRIER	685TA136-22	1603A28786	HEAT 1 GAS		208/230
	CARRIER	38NDC024-341L2	4203X74044	COMPUTER A/C		208/230
260	CARRIER	38HDC024-3412A	4203X74443	COMPU A/C		208/230
	CARRIER	38CKC060570	2503E22504	A/C		208/230
	CARRIER	38CKC060570	2503E22500	A/C		208/230
	CARRIER	38CKC060570	2503E02498	A/C		208/230
	CARRIER	68ASTA136-22	1603A28798	HEAT 1 GAS		208/230
	CARRIER	68ASTA136-22	19038028425	HEAT 2 GAS		208/230
	CARRIER	586ASTA135-22	1903A28430	HEAT 3 GAS		208/230
261	TRANE	YST120A3RCAINA000000000	430101242L	HEAT A/C GAS	150,000	208/230
	TRANE	YST120A3RCAINA000000000	43010649L	HEAT A/C GAS	150,000	208/230
	MITSUBISHI	PUGH18AYB	WENM016684			208/230
	MITSUBISHI	PUG18AYB	WENM0016687			

Heating and A/C Survey as Preformed by the DPW for 2011						
Bldg Number	**Make**	**Model Number**	**Serial Number**	**Use (heat, A/C, window, etc)**	**BTU**	**Voltage**
262	AMERICAN	YCH210C3L0ED	346101298D	HEAT A/C GAS	250,000	208/230
263	HEAT CONTROLLER	A-HMH12AS		COMPUTER RM		208/230
	AMERICAN STAND	YCH210C3L0EG	407100395P	HEAT PUMP		208/230
264	LENNOX	HS26-060-6P	5805D21870	COMPRESSOR		208/230
	LENNOX	HS26-048-6P	5805D53121	COMPRESSOR		208/230
	LENNOX	HS26-060-6P	5805D21688	COMPRESSOR		208/230
	LENNOX	C33-50160C-2F-1	6005C69847	HEAT 2 GAS		208/230
	LENNOX	C33-63D-2F-1	6005C55729	HEAT 1 GAS		208/230
265	LENNOX	HS26-048-5P	5805A32445	A/C		208/230
	LENNOX	H526-048-5P	5804A0776	A/C		208/230
	LENNOX	H526-060-4P	5805A07423	A/C		208/230
	LENNOX	C33-50160C 2F-1	6005A37013	GAS		208/230
266	CARRIER	48HJE008541	0405G40414	CONDENSOR	180	208/230
	CARRIER	38TXA024340	3804E07694	CONDENSOR		208/230
	CARRIER	38TXA036331	0205E78409	CONDENSOR		208/230
267	CARRIER	380R018C341	4504X98551	CONDENSOR		208/230
	EMI	SICA6000D00	108H541531	CONDENSOR		208/230
	CARRIER DURON	38TXA060350	4204E33994	CONDENSOR		208/230
	EMI	SCC24DF0000AA0B	105E818919	CONDENSOR		208/230
	CARRIER DURON	38TXA048330	7704E34719	CONDENSOR		208/230
	EMI	SCC24DF0000AA0B	105E8129219	CONDENSOR		208/230

Heating and A/C Survey as Preformed by the DPW for 2011						
Bldg Number	**Make**	**Model Number**	**Serial Number**	**Use (heat, A/C, window, etc)**	**BTU**	**Voltage**
	CARRIER DURON	38TXA060350	3904E26560	CONDENSOR		208/230
	TRANE	2TWB0043A1000AB	3453L2A4F	HEAT PUMP		200/230
	CARRIER PERFORMANCE 93	58MTA120F11120	2404A11587	HEAT PUMP	120 T	115/60 1PH
	CARRIER	58MTA100F12116	4704A13869	GAS FURNACE	100,000	1154/60 1PH
268	AMERICAN SATANDARD	YCH300D3L0HB	447100404D	HEAT PUMP	250	208/230
	HEAT CONTROLLER	8HMC12AS	3250820312G	CONDENSOR	12000	115
270	LENNOX	HS26-068-6P	5805D19240	COMPRESSOR		208/230
	LENNOX	HS26-048-6P	5805D53119	COMPRESSOR		208/230
	LENNOX	HS26-060-6P	5805D21869	COMPRESSOR		208/230
	LENNOX	C33-50160C-2F-1	6005C89846	HEAT 1		208/230
	LENNOX	C33-620-2F-1	6005C55728	HEAT 2		208/230
T-100	YORK	D7CG036N07925A	NCLM026430	HEAT PUMP (GAS)	100,000	
	HIGH EFFICIENCY 5000	CA5036VKB1	L9308116854	CONDENSOR		
T-101	COMFORT AIRE	RAD-123A000201	711TA	WINDOW UNIT	12,000	230/208
	KENMORE	255.7015101	KK01542494	WINDOW UNIT	15,000	120/208
	TRANE	GPNC004AEC1000	A86K08308	WINDOW UNIT	45,000	115
	TRANE	GPNC004AEC1000	A86K08307	WINDOW UNIT	45,000	115

Appendix E:
Secretary of Interior Standards for the Treatment of Historic Buildings

The Secretary of Interior Standards for the Treatment of Historic Properties with attention to preservation is provided in this section. The Secretary of Interior Standards for Rehabilitation, Restoration and Reconstruction may be found at the National Park Service website.

Standards for Preservation & Guidelines for Preserving Historic Buildings

Preservation *is defined as the act or process of applying measures necessary to sustain the existing form, integrity, and materials of an historic property. Work, including preliminary measures to protect and stabilize the property, generally focuses upon the ongoing maintenance and repair of historic materials and features rather than extensive replacement and new construction. New exterior additions are not within the scope of this treatment; however, the limited and sensitive upgrading of mechanical, electrical, and plumbing systems and other code-required work to make properties functional is appropriate within a preservation project.*

Standards for Preservation

1. A property will be used as it was historically, or be given a new use that maximizes the retention of distinctive materials, features, spaces, and spatial relationships. Where a treatment and use have not been identified, a property will be protected and, if necessary, stabilized until additional work may be undertaken.

2. The historic character of a property will be retained and preserved. The replacement of intact or repairable historic materials or alteration of features, spaces, and spatial relationships that characterize a property will be avoided.

3. Each property will be recognized as a physical record of its time, place, and use. Work needed to stabilize, consolidate, and conserve existing historic materials and features will be physically and visually compatible, identifiable upon close inspection, and properly documented for future research.

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

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

6. The existing condition of historic features will be evaluated to determine the appropriate level of intervention needed. Where the severity of deterioration requires repair or limited replacement of a distinctive feature, the new material will match the old in composition, design, color, and texture.

7. 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.

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

Guidelines for Preserving Historic Buildings

Introduction

In **Preservation**, the options for replacement are less extensive than in the treatment, Rehabilitation. This is because it is assumed at the outset that building materials and character-defining features are essentially intact, i.e, that more historic fabric has survived, unchanged over time. The expressed goal of the **Standards for Preservation and Guidelines for Preserving Historic Buildings** is retention of the building's existing form, features and detailing. This may be as simple as basic maintenance of existing materials and features or may involve preparing a historic structure report, undertaking laboratory testing such as paint and mortar analysis, and hiring conservators to perform sensitive work such as reconstituting interior finishes. Protection, maintenance, and repair are emphasized while replacement is minimized.

Identify, Retain, and Preserve Historic Materials and Features

The guidance for the treatment **Preservation** begins with recommendations to identify the form and detailing of those architectural materials and features that are important in defining the building's historic character and which must be retained in order to preserve that character. Therefore, guidance on ***identifying, retaining, and preserving*** character-defining features is always given first. The character of a historic building may be defined by the form and detailing of exterior materials, such as masonry, wood, and metal; exterior features, such as roofs, porches, and windows; interior materials, such as plaster and paint; and interior features, such as moldings and stairways, room configuration and spatial relationships, as well as structural and mechanical systems; and the building's site and setting.

Stabilize Deteriorated Historic Materials and Features as a Preliminary Measure

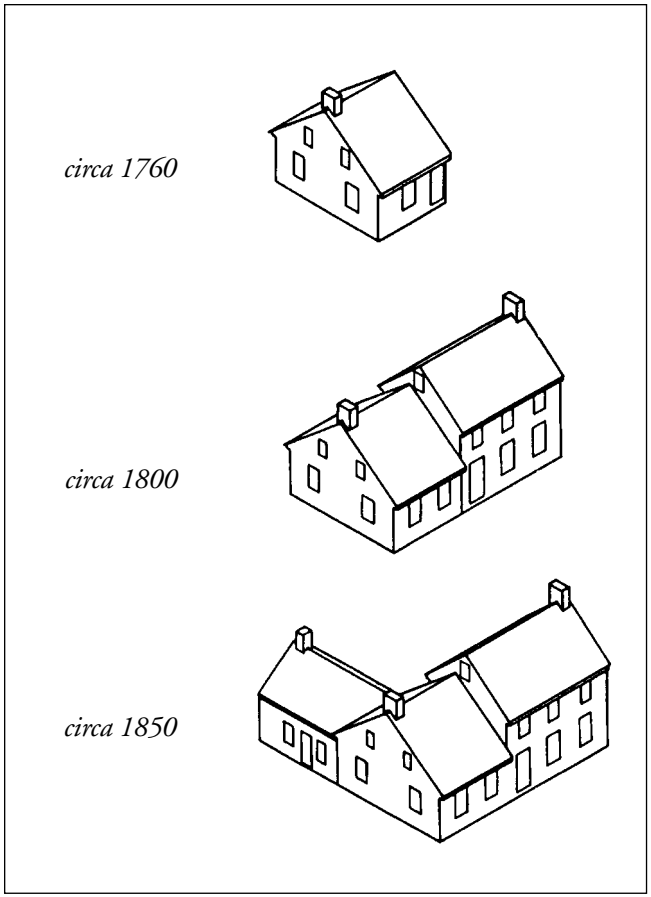
Deteriorated portions of a historic building may need to be protected thorough preliminary stabilization measures until additional work can be undertaken. ***Stabilizing*** may include structural reinforcement, weatherization, or correcting unsafe conditions. Temporary stabilization should always be carried out in such a manner that it detracts as little as possible from the historic building's appearance. Although it may not be necessary in every preservation project, stabilization is nonetheless an integral part of the treatment **Preservation;** it is equally applicable, if circumstances warrant, for the other treatments.

Protect and Maintain Historic Materials and Features

After identifying those materials and features that are important and must be retained in the process of **Preservation** work, then ***protecting and maintaining*** them are addressed. Protection generally involves the least degree of intervention and is preparatory to other work. For example, protection includes the maintenance of historic materials through treatments such as rust removal, caulking, limited paint removal, and re-application of protective coatings; the cyclical cleaning of roof gutter systems; or installation of fencing, alarm systems and other temporary protective measures. Although a historic building will usually require more extensive work, an overall evaluation of its physical condition should always begin at this level.

Repair (Stabilize, Consolidate, and Conserve) Historic Materials and Features

Next, when the physical condition of character-defining materials and features requires additional work, ***repairing*** by ***stabilizing, consolidating, and***



This three-part drawing shows the evolution of a farm house over time. Such change is part of the history of the place and is respected within the treatment, Preservation. Drawing: Center for Historic Architecture and Engineering, University of Delaware (adapted from Preservation Brief 35: Understanding Old Buildings).

conserving is recommended. **Preservation** strives to retain existing materials and features while employing as little new material as possible. Consequently, guidance for repairing a historic material, such as masonry, again begins with the least degree of intervention possible such as strengthening fragile materials through consolidation, when appropriate, and repointing with mortar of an appropriate strength. Repairing masonry as well as wood and architectural metal features may also include patching, splicing, or otherwise reinforcing them using recognized preservation methods. Similarly, within the treatment **Preservation**, portions of a historic structural system could be reinforced using contemporary materials such as steel rods. All work should be physically and visually compatible, identifiable upon close inspection and documented for future research.

Limited Replacement In Kind of Extensively Deteriorated Portions of Historic Features

If repair by stabilization, consolidation, and conservation proves inadequate, the next level of intervention involves the ***limited replacement in kind*** of extensively deteriorated or missing *parts* of features when there are surviving prototypes (for example, brackets, dentils, steps, plaster, or portions of slate or tile roofing). The replacement material needs to match the old both physically and visually, i.e., wood with wood, etc. Thus, with the exception of hidden structural reinforcement and new mechanical system components, substitute materials are not appropriate in the treatment **Preservation**. Again, it is important that all new material be identified and properly documented for future research.

If prominent features are missing, such as an interior staircase, exterior cornice, or a roof dormer, then a Rehabilitation or Restoration treatment may be more appropriate.

Energy Efficiency/Accessibility Considerations/Health and Safety Code Considerations

These sections of the **Preservation** guidance address work done to meet accessibility requirements and health and safety code requirements; or limited retrofitting measures to improve energy efficiency. Although this work is quite often an important aspect of preservation projects, it is usually not part of the overall process of protecting, stabilizing, conserving, or repairing character-defining features; rather, such work is assessed for its potential negative impact on the building's character. For this reason, particular care must be taken not to obscure, damage, or destroy character-defining materials or features in the process of undertaking work to meet code and energy requirements.

Preservation as a Treatment. *When the property's distinctive materials, features, and spaces are essentially intact and thus convey the historic significance without extensive repair or replacement; when depiction at a particular period of time is not appropriate; and when a continuing or new use does not require additions or extensive alterations, Preservation may be considered as a treatment. Prior to undertaking work, a documentation plan for Preservation should be developed.*

Building Exterior

Masonry: Brick, stone, terra cotta, concrete, adobe, stucco, and mortar

Recommended	*Not Recommended*
Identifying, retaining, and preserving masonry features that are important in defining the overall historic character of the building such as walls, brackets, railings, cornices, window architraves, door pediments, steps, and columns; and details such as tooling and bonding patterns, coatings, and color.	Altering masonry features which are important in defining the overall historic character of the building so that, as a result, the character is diminished.
	Replacing historic masonry features instead of repairing or replacing only the deteriorated masonry.
	Applying paint or other coatings such as stucco to masonry that has been historically unpainted or uncoated.
	Removing paint from historically painted masonry.
	Changing the type of paint or coating or its color.
Stabilizing deteriorated or damaged masonry as a preliminary measure, when necessary, prior to undertaking appropriate preservation work.	Failing to stabilize deteriorated or damaged masonry until additional work is undertaken, thus allowing further damage to occur to the historic building.
Protecting and maintaining masonry by providing proper drainage so that water does not stand on flat, horizontal surfaces or accumulate in curved decorative features.	Failing to evaluate and treat the various causes of mortar joint deterioration such as leaking roofs or gutters, differential settlement of the building, capillary action, or extreme weather exposure.
Cleaning masonry only when necessary to halt deterioration or remove heavy soiling.	Cleaning masonry surfaces when they are not heavily soiled, thus needlessly introducing chemicals or moisture into historic materials.
Carrying out masonry surface cleaning tests after it has been determined that such cleaning is appropriate. Tests should be observed over a sufficient period of time so that both the immediate and the long range effects are known to enable selection of the gentlest method possible.	Cleaning masonry surfaces without testing or without sufficient time for the testing results to be of value.

Recommended	*Not Recommended*
Cleaning masonry surfaces with the gentlest method possible, such as low pressure water and detergents, using natural bristle brushes.	Sandblasting brick or stone surfaces using dry or wet grit or other abrasives. These methods of cleaning permanently erode the surface of the material and accelerate deterioration.
	Using a cleaning method that involves water or liquid chemical solutions when there is any possibility of freezing temperatures.
	Cleaning with chemical products that will damage masonry, such as using acid on limestone or marble, or leaving chemicals on masonry surfaces.
	Applying high pressure water cleaning methods that will damage historic masonry and the mortar joints.
Inspecting painted masonry surfaces to determine whether repainting is necessary.	Removing paint that is firmly adhering to, and thus protecting, masonry surfaces.
Removing damaged or deteriorated paint only to the next sound layer using the gentlest method possible (e.g., hand-scraping) prior to repainting.	Using methods of removing paint which are destructive to masonry, such as sandblasting, application of caustic solutions, or high pressure waterblasting.
Applying compatible paint coating systems following proper surface preparation.	Failing to follow manufacturers' product and application instructions when repainting masonry.
Repainting with colors that are historically appropriate to the building and district.	Using new paint colors that are inappropriate to the historic building and district.
Evaluating the existing condition of the masonry to determine whether more than protection and maintenance are required, that is, if repairs to masonry features will be necessary.	Failing to undertake adequate measures to assure the protection of masonry features.
Repairing, stabilizing, and conserving fragile masonry by using well-tested consolidants, when appropriate. Repairs should be physically and visually compatible and identifiable upon close inspection for future research.	Removing masonry that could be stabilized, repaired and conserved; or using untested consolidants and untrained personnel, thus causing further damage to fragile materials.

Adequate protection and maintenance of a historic building is an ongoing commitment. Here, two workers are priming and repainting exterior stone and wood trim. If surface treatments are neglected, more extensive repair and replacement will be required. Each loss further undermines a building's historic integrity.

Recommended	*Not Recommended*
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, damp walls, or damaged plasterwork.	Removing nondeteriorated mortar from sound joints, then repointing the entire building to achieve a uniform appearance.
Removing deteriorated mortar by carefully hand-raking the joints to avoid damaging the masonry.	Using electric saws and hammers rather than hand tools to remove deteriorated mortar from joints prior to repointing.
Duplicating old mortar in strength, composition, color, and texture.	Repointing with mortar of high portland cement content (unless it is the content of the historic mortar). This can often create a bond that is stronger than the historic material and can cause damage as a result of the differing coefficient of expansion and the differing porosity of the material and the mortar.
	Repointing with a synthetic caulking compound.
	Using a "scrub" coating technique to repoint instead of traditional repointing methods.
Duplicating old mortar joints in width and in joint profile.	Changing the width or joint profile when repointing.

Recommended	*Not Recommended*
Repairing stucco by removing the damaged material and patching with new stucco that duplicates the old in strength, composition, color, and texture.	Removing sound stucco; or repairing with new stucco that is stronger than the historic material or does not convey the same visual appearance.
Using mud plaster as a surface coating over unfired, unstabilized adobe because the mud plaster will bond to the adobe.	Applying cement stucco to unfired, unstabilized adobe. Because the cement stucco will not bond properly, moisture can become entrapped between materials, resulting in accelerated deterioration of the adobe.
Cutting damaged concrete back to remove the source of deterioration (often corrosion on metal reinforcement bars). The new patch must be applied carefully so it will bond satisfactorily with, and match, the historic concrete.	Patching concrete without removing the source of deterioration.
Repairing masonry features by patching, piecing-in, or otherwise reinforcing the masonry using recognized preservation methods. The new work should be unobtrusively dated to guide future research and treatment.	Removing masonry that could be repaired, using improper repair techniques, or failing to document the new work.
Applying new or 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 waterproof, water repellent, or non-historic coatings such as stucco to masonry as a substitute for repointing and masonry repairs. Coatings are frequently unnecessary, expensive, and may change the appearance of historic masonry as well as accelerate its deterioration.

The following work is highlighted to indicate that it represents the greatest degree of intervention generally recommended within the treatment **Preservation***, and should only be considered after protection, stabilization, and repair concerns have been addressed.*

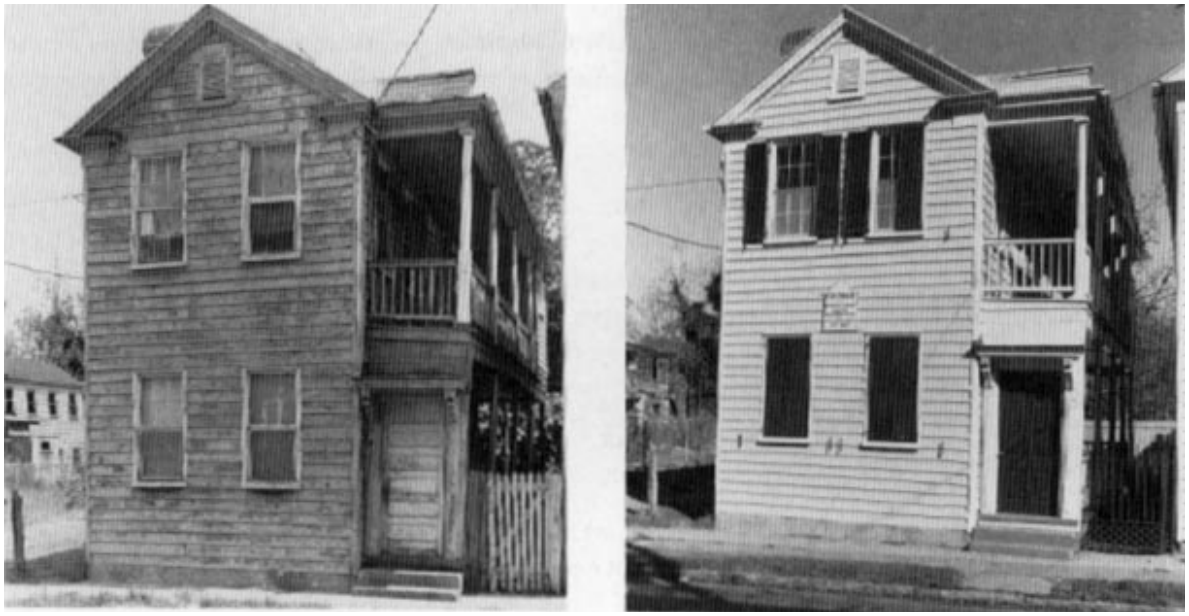
Recommended	*Not Recommended*
Limited Replacement in Kind	
Replacing in kind extensively deteriorated or missing parts of masonry features when there are surviving prototypes such as terra-cotta brackets or stone balusters. The new work should match the old in material, design, color, and texture; and be unobtrusively dated to guide future research and treatment.	Replacing an entire masonry feature such as a column or stairway when limited replacement of deteriorated and missing parts is appropriate. Using replacement material that does not match the historic masonry feature; or failing to properly document the new work.

Building Exterior

Wood: Clapboard, weatherboard, shingles, and other wooden siding and decorative elements

Recommended	*Not Recommended*
Identifying, retaining, and preserving wood features that are important in defining the overall historic character of the building such as siding, cornices, brackets, window architraves, and doorway pediments; and their paints, finishes, and colors.	Altering wood features which are important in defining the overall historic character of the building so that, as a result, the character is diminished.
	Replacing historic wood features instead of repairing or replacing only the deteriorated wood.
	Changing the type of paint or finish and its color.
Stabilizing deteriorated or damaged wood as a preliminary measure, when necessary, prior to undertaking appropriate preservation work.	Failing to stabilize deteriorated or damaged wood until additional work is undertaken, thus allowing further damage to occur to the historic building.
Protecting and maintaining wood features by providing proper drainage so that water is not allowed to stand on flat, horizontal surfaces or accumulate in decorative features.	Failing to identify, evaluate, and treat the causes of wood deterioration, including faulty flashing, leaking gutters, cracks and holes in siding, deteriorated caulking in joints and seams, plant material growing too close to wood surfaces, or insect or fungus infestation.
Applying chemical preservatives to wood features such as beam ends or outriggers that are exposed to decay hazards and are traditionally unpainted.	Using chemical preservatives such as creosote which, unless they were used historically, can change the appearance of wood features.
Retaining coatings such as paint that help protect the wood from moisture and ultraviolet light. Paint removal should be considered only where there is paint surface deterioration and as part of an overall maintenance program which involves repainting or applying other appropriate protective coatings.	Stripping paint or other coatings to reveal bare wood, thus exposing historically coated surfaces to the effects of accelerated weathering.
Inspecting painted wood surfaces to determine whether repainting is necessary or if cleaning is all that is required.	Removing paint that is firmly adhering to, and thus, protecting wood surfaces.
Removing damaged or deteriorated paint to the next sound layer using the gentlest method possible (handscraping and handsanding), then repainting.	Using destructive paint removal methods such as propane or butane torches, sandblasting or waterblasting. These methods can irreversibly damage historic woodwork.

Recommended	*Not Recommended*
Using with care electric hot-air guns on decorative wood features and electric heat plates on flat wood surfaces when paint is so deteriorated that total removal is necessary prior to repainting.	Using thermal devices improperly so that the historic woodwork is scorched.
Using chemical strippers primarily to supplement other methods such as handscraping, handsanding and the above-recommended thermal devices. Detachable wooden elements such as shutters, doors, and columns may—with the proper safeguards—be chemically dip-stripped.	Failing to neutralize the wood thoroughly after using chemicals so that new paint does not adhere. Allowing detachable wood features to soak too long in a caustic solution so that the wood grain is raised and the surface roughened.
Applying compatible paint coating systems following proper surface preparation.	Failing to follow manufacturers' product and application instructions when repainting exterior woodwork.



Maximizing retention of historic materials and features is the primary goal of Preservation as demonstrated here in these "before" and "after" photographs. Aside from some minor repairs and limited replacement of deteriorated material, work on this house consisted primarily of repainting the wood exterior. Photos: Historic Charleston Foundation.

Recommended	*Not Recommended*
Repainting with colors that are appropriate to the historic building and district.	Using new colors that are inappropriate to the historic building or district.
Evaluating the existing condition of the wood to determine whether more than protection and maintenance are required, that is, if repairs to wood features will be necessary.	Failing to undertake adequate measures to assure the protection of wood features.
Repairing, stabilizing, and conserving fragile wood using well-tested consolidants, when appropriate. Repairs should be physically and visually compatible and identifiable upon close inspection for future research.	Removing wood that could be stabilized and conserved; or using untested consolidants and untrained personnel, thus causing further damage to fragile historic materials.
Repairing wood features by patching, piecing-in, or otherwise reinforcing the wood using recognized preservation methods. The new work should be unobtrusively dated to guide future research and treatment.	Removing wood that could be repaired, using improper repair techniques, or failing to document the new work.

The following work is highlighted to indicate that it represents the greatest degree of intervention that is generally recommended within the treatment **Preservation***, and should only be considered after protection, stabilization, and repair concerns have been addressed.*

Recommended	*Not Recommended*
Limited Replacement in Kind	
Replacing in kind extensively deteriorated or missing parts of wood features when there are surviving prototypes such as brackets, molding, or sections of siding. New work should match the old in material, design, color, and texture; and be unobtrusively dated to guide future research and treatment.	Replacing an entire wood feature such as a column or stairway when limited replacement of deteriorated and missing parts is appropriate. Using replacement material that does not match the historic wood feature; or failing to properly document the new work.

Building Exterior

Architectural Metals: Cast iron, steel, pressed tin, copper, aluminum, and zinc

Recommended	*Not Recommended*
Identifying, retaining, and preserving architectural metal features such as columns, capitals, window hoods, or stairways that are important in defining the overall historic character of the building; and their finishes and colors. Identification is also critical to differentiate between metals prior to work. Each metal has unique properties and thus requires different treatments.	Altering architectural metal features which are important in defining the overall historic character of the building so that, as a result, the character is diminished.
	Replacing historic metal features instead of repairing or replacing only the deteriorated metal.
	Changing the type of finish or its historic color or accent scheme.
Stabilizing deteriorated or damaged architectural metals as a preliminary measure, when necessary, prior to undertaking appropriate preservation work.	Failing to stabilize deteriorated or damaged architectural metals until additional work is undertaken, thus allowing further damage to occur to the historic building.
Protecting and maintaining architectural metals from corrosion by providing proper drainage so that water does not stand on flat, horizontal surfaces or accumulate in curved, decorative features.	Failing to identify, evaluate, and treat the causes of corrosion, such as moisture from leaking roofs or gutters.
	Placing incompatible metals together without providing a reliable separation material. Such incompatibility can result in galvanic corrosion of the less noble metal, e.g., copper will corrode cast iron, steel, tin, and aluminum.
Cleaning architectural metals, when appropriate, to remove corrosion prior to repainting or applying other appropriate protective coatings.	Exposing metals which were intended to be protected from the environment.
	Applying paint or other coatings to metals such as copper, bronze, or stainless steel that were meant to be exposed.
Identifying the particular type of metal prior to any cleaning procedure and then testing to assure that the gentlest cleaning method possible is selected or determining that cleaning is inappropriate for the particular metal.	Using cleaning methods which alter or damage the historic color, texture, and finish of the metal; or cleaning when it is inappropriate for the metal.
	Removing the patina of historic metal. The patina may be a protective coating on some metals, such as bronze or copper, as well as a significant historic finish.

Recommended	*Not Recommended*
Cleaning soft metals such as lead, tin, copper, terneplate, and zinc with appropriate chemical methods because their finishes can be easily abraded by blasting methods.	Cleaning soft metals such as lead, tin, copper, terneplate, and zinc with grit blasting which will abrade the surface of the metal.
Using the gentlest cleaning methods for cast iron, wrought iron, and steel—hard metals—in order to remove paint buildup and corrosion. If handscraping and wire brushing have proven ineffective, low pressure grit blasting may be used as long as it does not abrade or damage the surface.	Failing to employ gentler methods prior to abrasively cleaning cast iron, wrought iron or steel; or using high pressure grit blasting.
Applying appropriate paint or other coating systems after cleaning in order to decrease the corrosion rate of metals or alloys.	Failing to re-apply protective coating systems to metals or alloys that require them after cleaning so that accelerated corrosion occurs.
Repainting with colors that are appropriate to the historic building or district.	Using new colors that are inappropriate to the historic building or district.
Applying an appropriate protective coating such as lacquer to an architectural metal feature such as a bronze door which is subject to heavy pedestrian use.	Failing to assess pedestrian use or new access patterns so that architectural metal features are subject to damage by use or inappropriate maintenance such as salting adjacent sidewalks.
Evaluating the existing condition of the architectural metals to determine whether more than protection and maintenance are required, that is, if repairs to features will be necessary.	Failing to undertake adequate measures to assure the protection of architectural metal features.

Recommended

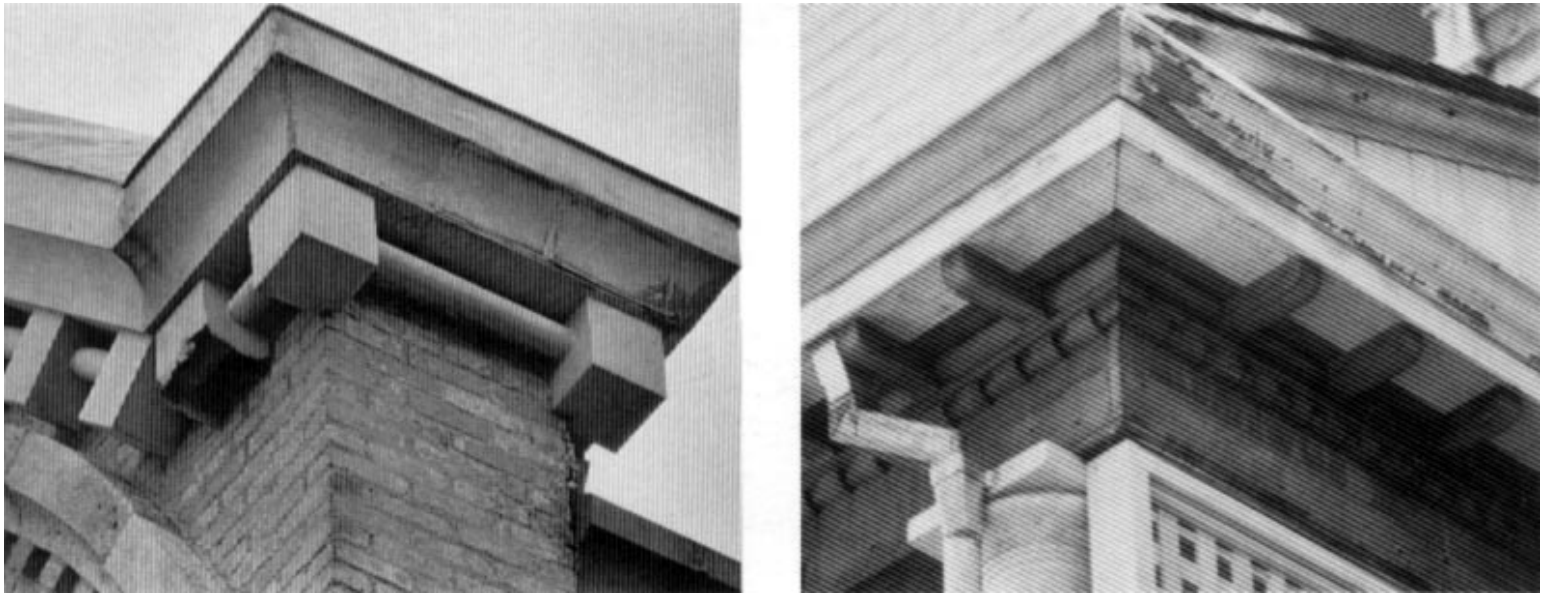
Repairing, stabilizing, and conserving fragile architectural metals using well-tested consolidants, when appropriate. Repairs should be physically and visually compatible and identifiable upon close inspection for future research.

Repairing architectural metal features by patching, piecing-in, or otherwise reinforcing the metal using recognized preservation methods. The new work should be unobtrusively dated to guide future research and treatment.

Not Recommended

Removing architectural metals that could be stabilized and conserved; or using untested consolidants and untrained personnel, thus causing further damage to fragile historic materials.

Removing architectural metals that could be repaired, using improper repair techniques, or failing to document the new work.



Two examples of "limited replacement in kind" point out an appropriate scope of work within the treatment, Preservation. (a) One metal modillion that has sustained damage from a faulty gutter will need to be replaced; and (b) targeted repairs to deteriorated wood cornice elements (fascia board and modillions) meant that most of the historic materials were retained in the work.

The following work is highlighted to indicate that it represents the greatest degree of intervention generally recommended within the treatment **Preservation***, and should only be considered after protection, stabilization, and repair concerns have been addressed.*

Recommended	*Not Recommended*
Limited Replacement in Kind Replacing in kind extensively deteriorated or missing parts of architectural metal features when there are surviving prototypes such as porch balusters, column capitals or bases, or porch cresting. The new work should match the old in material, design, and texture; and be unobtrusively dated to guide future research and treatment.	Replacing an entire architectural metal feature such as a column or balustrade when limited replacement of deteriorated and missing parts is appropriate. Using replacement material that does not match the historic metal feature; or failing to properly document the new work.

Building Exterior

Roofs

Recommended

Identifying, retaining, and preserving roofs—and their functional and decorative features—that are important in defining the overall historic character of the building. This includes the roof's shape, such as hipped, gambrel, and mansard; decorative features such as cupolas, cresting, chimneys, and weathervanes; and roofing material such as slate, wood, clay tile, and metal, as well as its size, color, and patterning.

Stabilizing deteriorated or damaged roofs as a preliminary measure, when necessary, prior to undertaking appropriate preservation work.

Not Recommended

Altering the roof and roofing materials which are important in defining the overall historic character of the building so that, as a result, the character is diminished.

Replacing historic roofing material instead of repairing or replacing only the deteriorated material.

Changing the type or color of roofing materials.

Failing to stabilize a deteriorated or damaged roof until additional work is undertaken, thus allowing further damage to occur to the historic building.

It is particularly important to preserve materials that contribute to a building's historic character, such as this highly visible slate roof. In the event that repair and limited replacement are necessary, all new slate would need to match the old exactly. Photo: Jeffrey S. Levine.

Recommended	*Not Recommended*
Protecting and maintaining a roof by cleaning the gutters and downspouts and replacing deteriorated flashing. Roof sheathing should also be checked for proper venting to prevent moisture condensation and water penetration; and to insure that materials are free from insect infestation.	Failing to clean and maintain gutters and downspouts properly so that water and debris collect and cause damage to roof fasteners, sheathing, and the underlying structure.
Providing adequate anchorage for roofing material to guard against wind damage and moisture penetration.	Allowing roof fasteners, such as nails and clips to corrode so that roofing material is subject to accelerated deterioration.
Protecting a leaking roof with plywood and building paper until it can be properly repaired.	Permitting a leaking roof to remain unprotected so that accelerated deterioration of historic building materials—masonry, wood, plaster, paint and structural members—occurs.
Repairing a roof by reinforcing the historic materials which comprise roof features using recognized preservation methods. The new work should be unobtrusively dated to guide future research and treatment.	Removing materials that could be repaired, using improper repair techniques, or failing to document the new work. Failing to reuse intact slate or tile when only the roofing substrate needs replacement.

The following work is highlighted to indicate that it represents the greatest degree of intervention generally recommended within the treatment **Preservation***, and should only be considered after protection, stabilization, and repair concerns have been addressed.*

Recommended	*Not Recommended*
Limited Replacement in Kind	
Replacing in kind extensively deteriorated or missing parts of roof features or roof coverings when there are surviving prototypes such as cupola louvers, dentils, dormer roofing; or slates, tiles, or wood shingles on a main roof. the new work should match the old in material, design, color, and texture; and be unobtrusively dated to guide future research and treatment.	Replacing an entire roof feature such as a cupola or dormer when limited replacement of deteriorated and missing parts is appropriate. Using replacement material that does not match the historic roof feature; or failing to properly document the new work.

Building Exterior

Windows

Recommended

Identifying, retaining, and preserving windows—and their functional and decorative features—that are important in defining the overall historic character of the building. Such features can include frames, sash, muntins, glazing, sills, heads, hoodmolds, panelled or decorated jambs and moldings, and interior and exterior shutters and blinds.

Not Recommended

Altering windows or window features which are important in defining the historic character of the building so that, as a result, the character is diminished.

Changing the historic appearance of windows by replacing materials, finishes, or colors which noticeably change the sash, depth of reveal, and muntin configuration; the reflectivity and color of the glazing; or the appearance of the frame.

Obscuring historic window trim with metal or other material.

Preserving a building's historic windows generally involves scraping, sanding, and re-painting. While some repair work will most likely be undertaken within the scope of work on this institutional building, replacement of the window units is usually not an appropriate Preservation treatment. Photo: Chuck Fisher.

Recommended	*Not Recommended*
Conducting an indepth survey of the condition of existing windows early in preservation planning so that repair and upgrading methods and possible replacement options can be fully explored.	Replacing windows solely because of peeling paint, broken glass, stuck sash, and high air infiltration. These conditions, in themselves, are no indication that windows are beyond repair.
Stabilizing deteriorated or damaged windows as a preliminary measure, when necessary, prior to undertaking appropriate preservation work.	Failing to stabilize a deteriorated or damaged window until additional work is undertaken, thus allowing further damage to occur to the historic building.
Protecting and maintaining the wood and architectural metals which comprise the window frame, sash, muntins, and surrounds through appropriate surface treatments such as cleaning, rust removal, limited paint removal, and re-application of protective coating systems.	Failing to provide adequate protection of materials on a cyclical basis so that deterioration of the window results.
Making windows weathertight by re-caulking and replacing or installing weatherstripping. These actions also improve thermal efficiency.	Retrofitting or replacing windows rather than maintaining the sash, frame, and glazing.
Evaluating the existing condition of materials to determine whether more than protection and maintenance are required, i.e. if repairs to windows and window features will be required.	Failing to undertake adequate measures to assure the protection of historic windows.
Repairing window frames and sash by patching, piecing-in, consolidating or otherwise reinforcing them using recognized preservation methods. The new work should be unobtrusively dated to guide future research and treatment.	Failing to protect the historic glazing when repairing windows. Removing material that could be repaired, using improper repair techniques, or failing to document the new work. Failing to reuse serviceable window hardware such as brass sash lifts and sash locks.

The following work is highlighted to indicate that it represents the greatest degree of intervention generally recommended within the treatment **Preservation,** *and should only be considered after protection, stabilization, and repair concerns have been addressed.*

Recommended	*Not Recommended*
Limited Replacement in Kind	
Replacing in kind extensively deteriorated or missing parts of windows when there are surviving prototypes such as frames, sash, sills, glazing, and hoodmolds. The new work should match the old in material, design, color, and texture; and be unobtrusively dated to guide future research and treatment.	Replacing an entire window when limited replacement of deteriorated and missing parts is appropriate. Using replacement material that does not match the historic window; or failing to properly document the new work.

Building Exterior

Entrances and Porches

Recommended	*Not Recommended*
Identifying, retaining, and preserving entrances and porches—and their functional and decorative features—that are important in defining the overall historic character of the building such as doors, fanlights, sidelights, pilasters, entablatures, columns, balustrades, and stairs.	Altering entrances and porches which are important in defining the overall historic character of the building so that, as a result, the character is diminished.
	Replacing historic entrance and porch features instead of repairing or replacing only the deteriorated material.
Stabilizing deteriorated or damaged entrances and porches as a preliminary measure, when necessary, prior to undertaking appropriate preservation work.	Failing to stabilize a deteriorated or damaged entrance or porch until additional work is undertaken, thus allowing further damage to occur to the historic building.
Protecting and maintaining the masonry, wood, and architectural metals that comprise entrances and porches through appropriate surface treatments such as cleaning, rust removal, limited paint removal, and re-application of protective coating systems.	Failing to provide adequate protection to materials on a cyclical basis so that deterioration of entrances and porches results.
Evaluating the existing condition of materials to determine whether more than protection and maintenance are required, that is, repairs to entrance and porch features will be necessary.	Failing to undertake adequate measures to assure the protection of historic entrances and porches.
Repairing entrances and porches by reinforcing the historic materials using recognized preservation methods. The new work should be unobtrusively dated to guide future research and treatment.	Removing material that could be repaired, using improper repair techniques, or failing to document the new work.

The following work is highlighted to indicate that it represents the greatest degree of intervention generally recommended within the treatment **Preservation,** *and should only be considered after protection, stabilization, and repair concerns have been addressed.*

Limited Replacement in Kind

Recommended	*Not Recommended*
Replacing in kind extensively deteriorated or missing parts of repeated entrance and porch features when there are surviving prototypes such as balustrades, cornices, entablatures, columns, sidelights, and stairs. The new work should match the old in material, design, color, and texture; and be unobtrusively dated to guide future research and treatment.	Replacing an entire entrance or porch feature when limited replacement of deteriorated and missing parts is appropriate. Using replacement material that does not match the historic entrance or porch feature; or failing to properly document the new work.

Building Exterior

Storefronts

Recommended

Identifying, retaining, and preserving storefronts—and their functional and decorative features—that are important in defining the overall historic character of the building such as display windows, signs, doors, transoms, kick plates, corner posts, and entablatures.

Stabilizing deteriorated or damaged storefronts as a preliminary measure, when necessary, prior to undertaking appropriate preservation work.

Not Recommended

Altering storefronts—and their features—which are important in defining the overall historic character of the building so that, as a result, the character is diminished.

Replacing historic storefront features instead of repairing or replacing only the deteriorated material.

Failing to stabilize a deteriorated or damaged storefront until additional work is undertaken, thus allowing further damage to occur to the historic building.

The original form and features of this 1920s storefront have been retained through Preservation. Photo: David W. Look, AIA.

Recommended	*Not Recommended*
Protecting and maintaining masonry, wood, and architectural metals which comprise storefronts through appropriate treatments such as cleaning, rust removal, limited paint removal, and reapplication of protective coating systems.	Failing to provide adequate protection of materials on a cyclical basis so that deterioration of storefront features results.
Protecting storefronts against arson and vandalism before work begins by boarding up windows and doors and installing alarm systems that are keyed into local protection agencies.	Permitting entry into the building through unsecured or broken windows and doors so that interior features and finishes are damaged by exposure to weather or vandalism. Stripping storefronts of historic material such as wood, cast iron, terra cotta, carrara glass, and brick.
Evaluating the existing condition of storefront materials to determine whether more than protection and maintenance are required, that is, if repairs to features will be necessary.	Failing to undertake adequate measures to assure the preservation of the historic storefront.
Repairing storefronts by reinforcing the historic materials using recognized preservation methods. The new work should be unobtrusively dated to guide future research and treatment.	Removing material that could be repaired, using improper repair techniques, or failing to document the new work.

The following work is highlighted to indicate that it represents the greatest degree of intervention generally recommended within the treatment **Preservation,** *and should only be considered after protection, stabilization, and repair concerns have been addressed.*

Recommended	*Not Recommended*
Limited Replacement in Kind	
Replacing in kind extensively deteriorated or missing parts of storefronts where there are surviving prototypes such as transoms, kick plates, pilasters, or signs. The new work should match the old in materials, design, color, and texture; and be unobtrusively dated to guide future research and treatment.	Replacing an entire storefront when limited replacement of deteriorated and missing parts is appropriate. Using replacement material that does not match the historic storefront feature; or failing to properly document the new work.

Building Interior

Structural Systems

Recommended	*Not Recommended*
Identifying, retaining, and preserving structural systems—and individual features of systems—that are important in defining the overall historic character of the building, such as post and beam systems, trusses, summer beams, vigas, cast iron columns, above-grade stone foundation walls, or load-bearing brick or stone walls.	Altering visible features of historic structural systems which are important in defining the overall historic character of the building so that, as a result, the character is diminished.
	Overloading the existing structural system; or installing equipment or mechanical systems which could damage the structure.
	Replacing a loadbearing masonry wall that could be augmented and retained.
	Leaving known structural problems untreated such as deflection of beams, cracking and bowing of walls, or racking of structural members.
	Utilizing treatments or products that accelerate the deterioration of structural material such as introducing urea-formaldehyde foam insulation into frame walls.
Stabilizing deteriorated or damaged structural systems as a preliminary measure, when necessary, prior to undertaking appropriate preservation work.	Failing to stabilize a deteriorated or damaged structural system until additional work is undertaken, thus allowing further damage to occur to the historic building.
Protecting and maintaining the structural system by cleaning the roof gutters and downspouts; replacing roof flashing; keeping masonry, wood, and architectural metals in a sound condition; and ensuring that structural members are free from insect infestation.	Failing to provide proper building maintenance so that deterioration of the structural system results. Causes of deterioration include subsurface ground movement, vegetation growing too close to foundation walls, improper grading, fungal rot, and poor interior ventilation that results in condensation.
Examining and evaluating the existing condition of the structural system and its individual features using non-destructive techniques such as X-ray photography.	Utilizing destructive probing techniques that will damage or destroy structural material.

Recommended	*Not Recommended*
Repairing the structural system by augmenting or upgrading individual parts or features using recognized preservation methods. For example, weakened structural members such as floor framing can be paired with a new member, braced, or otherwise supplemented and reinforced.	Upgrading the building structurally in a manner that diminishes the historic character of the exterior, such as installing strapping channels or removing a decorative cornice; or damages interior features or spaces. Replacing a structural member or other feature of the structural system when it could be augmented and retained.

The following work is highlighted to indicate that it represents the greatest degree of intervention generally recommended within the treatment **Preservation** *and should be only be considered after protection, stabilization, and repair concerns have been addressed.*

Recommended	*Not Recommended*
Limited Replacement in Kind	
Replacing in kind those visible portions or features of the structural system that are either extensively deteriorated or missing when there are surviving prototypes such as cast iron columns and sections of loadbearing walls. The new work should match the old in materials, design, color, and texture; and be unobtrusively dated to guide future research and treatment.	Replacing an entire visible feature of the structural system when limited replacement of deteriorated and missing portions is appropriate. Using material for a portion of an exposed structural feature that does not match the historic feature; or failing to properly document the new work.
Considering the use of substitute material for unexposed structural replacements, such as roof rafters or trusses. Substitute material should, at a minimum, have equal loadbearing capabilities, and be unobtrusively dated to guide future research and treatment.	Using substitute material that does not equal the loadbearing capabilities of the historic material or design or is otherwise physically or chemically incompatible.

Building Interior

Spaces, Features, and Finishes

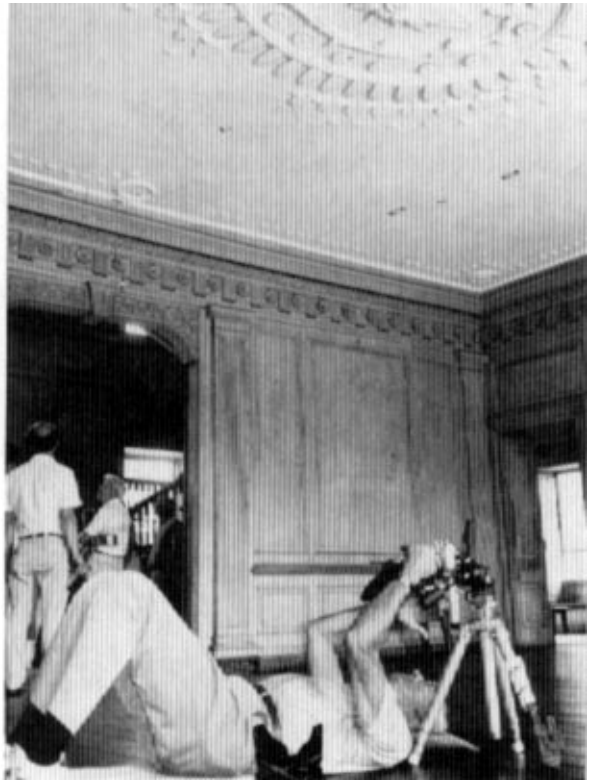
Recommended

Not Recommended

Interior Spaces

Identifying, retaining, and preserving a floor plan or interior spaces that are important in defining the overall historic character of the building. This includes the size, configuration, proportion, and relationship of rooms and corridors; the relationship of features to spaces; and the spaces themselves such as lobbies, reception halls, entrance halls, double parlors, theaters, auditoriums, and important industrial or commercial spaces.

Altering a floor plan or interior spaces—including individual rooms—which are important in defining the overall historic character of the building so that, as a result, the character is diminished.



Careful documentation of a building's physical condition is the critical first step in determining an appropriate level of intervention. (a) This may include relating the historical research to existing materials and features; or (b) documenting a particular problem such as this cracked ceiling. Photo (a): Jean E. Travers; Photo (b): Lee H. Nelson, FAIA.

Recommended	*Not Recommended*
Interior Features and Finishes	
Identifying, retaining, and preserving interior features and finishes that are important in defining the overall historic character of the building, including columns, cornices, baseboards, fireplaces and mantels, panelling, light fixtures, hardware, and flooring; and wallpaper, plaster, paint, and finishes such as stencilling, marbling, and graining; and other decorative materials that accent interior features and provide color, texture, and patterning to walls, floors, and ceilings.	Altering features and finishes which are important in defining the overall historic character of the building so that, as a result, the character is diminished. Replacing historic interior features and finishes instead of repairing or replacing only the deteriorated masonry. Installing new decorative material that obscures or damages character-defining interior features or finishes. Removing historic finishes, such as paint and plaster, or historic wall coverings, such as wallpaper. Applying paint, plaster, or other finishes to surfaces that have been historically unfinished. Stripping paint to bare wood rather than repairing or reapplying grained or marbled finishes to features such as doors and paneling. Changing the type of finish or its color, such as painting a previously varnished wood feature.
Stabilizing deteriorated or damaged interior features and finishes as a preliminary measure, when necessary, prior to undertaking appropriate preservation work.	Failing to stabilize a deteriorated or damaged interior feature or finish until additional work is undertaken, thus allowing further damage to occur to the historic building.
Protecting and maintaining masonry, wood, and architectural metals that comprise interior features through appropriate surface treatments such as cleaning, rust removal, limited paint removal, and reapplication of protective coating systems.	Failing to provide adequate protection to materials on a cyclical basis so that deterioration of interior features results.

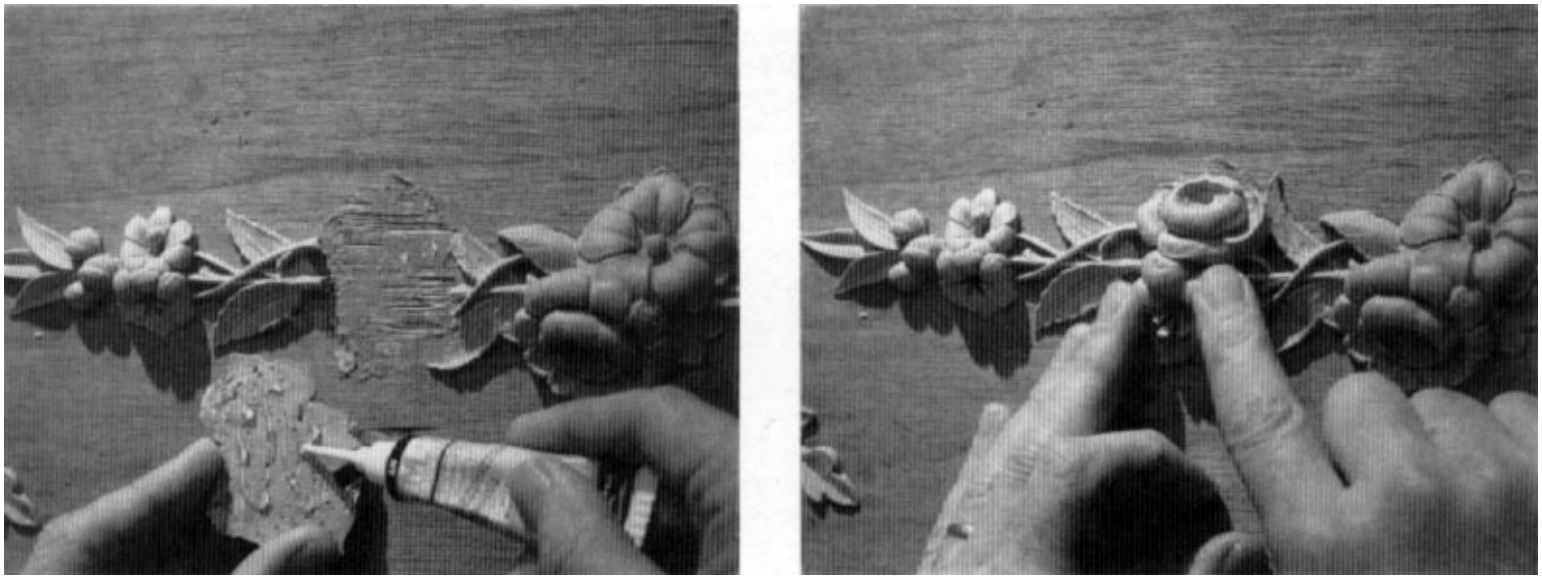
Recommended	*Not Recommended*
Protecting interior features and finishes against arson and vandalism before project work begins, boarding-up windows, and installing fire alarm systems that are keyed to local protection agencies.	Permitting entry into historic buildings through unsecured or broken windows and doors so that the interior features and finishes are damaged by exposure to weather or vandalism. Stripping interiors of features such as woodwork, doors, windows, light fixtures, copper piping, radiators; or of decorative materials.
Protecting interior features such as a staircase, mantel, or decorative finishes and wall coverings against damage during project work by covering them with heavy canvas or plastic sheets.	Failing to provide proper protection of interior features and finishes during work so that they are gouged, scratched, dented, or otherwise damaged.
Installing protective coverings in areas of heavy pedestrian traffic to protect historic features such as wall coverings, parquet flooring and panelling.	Failing to take new use patterns into consideration so that interior features and finishes are damaged.
Removing damaged or deteriorated paints and finishes to the next sound layer using the gentlest method possible, then repainting or refinishing using compatible paint or other coating systems.	Using destructive methods such as propane or butane torches or sandblasting to remove paint or other coatings. These methods can irreversibly damage the historic materials that comprise interior features.
Repainting with colors that are appropriate to the historic building.	Using new paint colors that are inappropriate to the historic building.
Limiting abrasive cleaning methods to certain industrial warehouse buildings where the interior masonry or plaster features do not have distinguishing design, detailing, tooling, or finishes; and where wood features are not finished, molded, beaded, or worked by hand. Abrasive cleaning should only be considered after other, gentler methods have been proven ineffective.	Changing the texture and patina of character-defining features through sandblasting or use of abrasive methods to remove paint, discoloration or plaster. This includes both exposed wood (including structural members) and masonry.
Evaluating the existing condition of materials to determine whether more than protection and maintenance are required, that is, if repairs to interior features and finishes will be necessary.	Failing to undertake adequate measures to assure the protection of interior features and finishes.

Recommended

Repairing historic interior features and finishes by reinforcing the materials using recognized preservation methods. The new work should match the old in material, design, color, and texture; and be unobtrusively dated to guide future research and treatment.

Not Recommended

Removing materials that could be repaired, using improper techniques, or failing to document the new work.



In Preservation, an appropriate level of intervention is established prior to work in order to maximize retention of historic materials.
(a) A conservator is applying adhesive to 19th century composition ornament that has delaminated from its wood substrate.
(b) The compo fragment is carefully held in place until the quick-setting adhesive takes hold. Photos: Jonathan Thornton.

The following work is highlighted to indicate that it represents the greatest degree of intervention generally recommended within the treatment **Preservation,** *and should only be considered after protection, stabilization, and repair concerns have been addressed.*

Recommended	*Not Recommended*
Limited Replacement in Kind	
Replacing in kind extensively deteriorated or missing parts of repeated interior features when there are surviving prototypes such as stairs, balustrades, wood panelling, columns; or decorative wall coverings or ornamental tin or plaster ceilings. New work should match the old in material, design, color, and texture; and be unobtrusively dated to guide future research and treatment.	Replacing an entire interior feature when limited replacement of deteriorated and missing parts is appropriate. Using replacement material that does not match the interior feature; or failing to properly document the new work.

Building Interior

Mechanical Systems: Heating, Air Conditioning, Electrical, and Plumbing

Recommended	*Not Recommended*
Identifying, retaining, and preserving visible features of early mechanical systems that are important in defining the overall historic character of the building, such as radiators, vents, fans, grilles, plumbing fixtures, switchplates, and lights.	Removing or altering visible features of mechanical systems that are important in defining the overall historic character of the building so that, as a result, the character is diminished.
Stabilizing deteriorated or damaged mechanical systems as a preliminary measure, when necessary, prior to undertaking appropriate preservation work.	Failing to stabilize a deteriorated or damaged mechanical system until additional work is undertaken, thus allowing further damage to occur to the historic building.
Protecting and maintaining mechanical, plumbing, and electrical systems and their features through cyclical cleaning and other appropriate measures.	Failing to provide adequate protection of materials on a cyclical basis so that deterioration of mechanical systems and their visible features results.
Preventing accelerated deterioration of mechanical systems by providing adequate ventilation of attics, crawlspaces, and cellars so that moisture problems are avoided.	Enclosing mechanical systems in areas that are not adequately ventilated so that deterioration of the systems results.
Improving the energy efficiency of existing mechanical systems to help reduce the need for elaborate new equipment.	Installing unnecessary climate control systems which can add excessive moisture to the building. This additional moisture can either condense inside, damaging interior surfaces, or pass through interior walls to the exterior, potentially damaging adjacent materials as it migrates.
Repairing mechanical systems by augmenting or upgrading system parts, such as installing new pipes and ducts; rewiring; or adding new compressors or boilers.	Replacing a mechanical system or its functional parts when it could be upgraded and retained.
Replacing in kind those visible features of mechanical systems that are either extensively deteriorated or are prototypes such as ceiling fans, switchplates, radiators, grilles, or plumbing fixtures.	Installing a visible replacement feature that does not convey the same visual appearance.

The following should be considered in a **Preservation** *project when the installation of new mechanical equipment or system is required to make the building functional.*

Recommended	*Not Recommended*
Installing a new mechanical system if required, so that it causes the least alteration possible to the building.	Installing a new mechanical system so that character-defining structural or interior features are radically changed, damaged, or destroyed.
Providing adequate structural support for new mechanical equipment.	Failing to consider the weight and design of new mechanical equipment so that, as a result, historic structural members or finished surfaces are weakened or cracked.
Installing the vertical runs of ducts, pipes, and cables in closets, service rooms, and wall cavities.	Installing vertical runs of ducts, pipes, and cables in places where they will obscure character-defining features.
	Concealing mechanical equipment in walls or ceilings in a manner that requires excessive removal of historic building material.
Installing air conditioning in such a manner that historic features are not damaged or obscured and excessive moisture is not generated that will accelerate deterioration of historic materials.	Cutting through features such as masonry walls in order to install air conditioning units.

Building Site

Recommended

Identifying, retaining, and preserving buildings and their features as well as features of the site that are important in defining its overall historic character. Site features may include circulation systems such as walks, paths, roads, or parking; vegetation such as trees, shrubs, fields, or herbaceous plant material; landforms such as terracing, berms or grading; furnishings such as lights, fences, or benches; decorative elements such as sculpture, statuary or monuments; water features including fountains, streams, pools, or lakes; and subsurface archeological features which are important in defining the history of the site.

Not Recommended

Altering buildings and their features or site features which are important in defining the overall historic character of the property so that, as a result, the character is diminished.

Retaining the historic relationship between buildings and the landscape.

Removing or relocating buildings or landscape features, thus destroying the historic relationship between buildings and the landscape.

Stabilizing deteriorated or damaged building and site features as a preliminary measure, when necessary, prior to undertaking appropriate preservation work.

Failing to stabilize a deteriorated or damaged building or site feature until additional work is undertaken, thus allowing further damage to occur to the building site.

Drayton Hall, near Charleston, South Carolina, is an excellent example of an evolved 18th century plantation. Of particular note in this photograph are the landscape features added in the late 19th century—a reflecting pond and rose mound. With an overall Preservation treatment plan, these later features have been retained and protected. If a Restoration treatment had been selected, later features of the landscape as well as changes to the house would have been removed. Photo: Courtesy, National Trust for Historic Preservation.

Recommended	*Not Recommended*
Protecting and maintaining buildings and sites by providing proper drainage to assure that water does not erode foundation walls; drain toward the building; or damage or erode the landscape.	Failing to maintain adequate site drainage so that buildings and site features are damaged or destroyed; or alternatively, changing the site grading so that water no longer drains properly.
Minimizing disturbance of terrain around buildings or elsewhere on the site, thus reducing the possibility of destroying or damaging important landscape features or archeological resources.	Introducing heavy machinery into areas where it may disturb or damage important landscape features or archeological resources.
Surveying and documenting areas where the terrain will be altered to determine the potential impact to important landscape features or archeological resources.	Failing to survey the building site prior to beginning work which results in damage to, or destruction of, important landscape features or archeological resources.
Protecting, e.g., preserving in place, important archeological resources.	Leaving known archeological material unprotected so that it is damaged during preservation work.
Planning and carrying out any necessary investigation using professional archeologists and modern archeological methods when preservation in place is not feasible.	Permitting unqualified personnel to perform data recovery on archeological resources so that improper methodology results in the loss of important archeological material.
Preserving important landscape features, including ongoing maintenance of historic plant material.	Allowing important landscape features to be lost or damaged due to a lack of maintenance.
Protecting building and landscape features against arson and vandalism before preservation work begins, i.e., erecting protective fencing and installing alarm systems that are keyed into local protection agencies.	Permitting the property to remain unprotected so that the building and landscape features or archeological resources are damaged or destroyed.
	Removing or destroying features from the buildings or site such as wood siding, iron fencing, masonry balustrades, or plant material.
Providing continued protection of historic building materials and plant features through appropriate cleaning, rust removal, limited paint removal, and re-application of protective coating systems; and pruning and vegetation management.	Failing to provide adequate protection of materials on a cyclical basis so that deterioration of building and site feature results.

Recommended	*Not Recommended*
Evaluating the existing condition of materials and features to determine whether more than protection and maintenance are required, that is, if repairs to building and site features will be necessary.	Failing to undertake adequate measures to assure the protection of building and site features.
Repairing features of the building and site by reinforcing historic materials using recognized preservation methods. The new work should be unobtrusively dated to guide future research and treatment.	Removing materials that could be repaired, using improper repair techniques, or failing to document the new work.

The following work is highlighted to indicate that it represents the greatest degree of intervention generally recommended within the treatment **Preservation,** *and should only be considered after protection, stabilization, and repair concerns have been addressed.*

Recommended	*Not Recommended*
Limited Replacement in Kind	
Replacing in kind extensively deteriorated or missing parts of the building or site where there are surviving prototypes such as part of a fountain, or portions of a walkway. New work should match the old in materials, design, color, and texture; and be unobtrusively dated to guide future research and treatment.	Replacing an entire feature of the building or site when limited replacement of deteriorated and missing parts is appropriate. Using replacement material that does not match the building site feature; or failing to properly document the new work.

Setting (District/Neighborhood)

Recommended	*Not Recommended*
Identifying retaining, and preserving building and landscape features which are important in defining the historic character of the setting. Such features can include roads and streets, furnishings such as lights or benches, vegetation, gardens and yards, adjacent open space such as fields, parks, commons or woodlands, and important views or visual relationships.	Altering those features of the setting which are important in defining the historic character.
Retaining the historic relationship between buildings and landscape features of the setting. For example, preserving the relationship between a town common and its adjacent historic houses, municipal buildings, historic roads, and landscape features.	Altering the relationship between the buildings and landscape features within the setting by widening existing streets, changing landscape materials, or constructing inappropriately located new streets or parking. Removing or relocating historic buildings or landscape features, thus destroying their historic relationship within the setting.
Stabilizing deteriorated or damaged building and landscape features of the setting as a preliminary measure, when necessary, prior to undertaking appropriate preservation work.	Failing to stabilize a deteriorated or damaged building or landscape feature of the setting until additional work is undertaken, thus allowing further damage to the setting to occur.
Protecting and maintaining historic building materials and plant features through appropriate cleaning, rust removal, limited paint removal, and reapplication of protective coating systems; and pruning and vegetation management.	Failing to provide adequate protection of materials on a cyclical basis which results in the deterioration of building and landscape features.
Protecting building and landscape features against arson and vandalism before preservation work begins by erecting protective fencing and installing alarm systems that are keyed into local preservation agencies.	Permitting the building and setting to remain unprotected so that interior or exterior features are damaged. Stripping or removing features from buildings or the setting such as wood siding, iron fencing, terra cotta balusters, or plant material.
Evaluating the existing condition of the building and landscape features to determine whether more than protection and maintenance are required, that is, if repairs to features will be necessary.	Failing to undertake adequate measures to assure the protection of building and landscape features.

Recommended	*Not Recommended*
Repairing features of the building and landscape using recognized preservation methods. The new work should be unobtrusively dated to guide future research and treatment.	Removing material that could be repaired, using improper repair techniques, or failing to document the new work.

The following work is highlighted because it represents the greatest degree of intervention generally recommended within the treatment **Preservation***, and should only be considered after protection, stabilization, and repair concerns have been addressed.*

Recommended	*Not Recommended*
Limited Replacement in Kind	
Replacing in kind extensively deteriorated or missing parts of building and landscape features where there are surviving prototypes such as porch balustrades or paving materials.	Replacing an entire feature of the building or landscape when limited replacement of deteriorated and missing parts is appropriate. Using replacement material that does not match the building or landscape feature; or failing to properly document the new work.

The goal of Preservation is to retain the historic form, materials, and features of the building and its site as they have changed—or evolved—over time. This bank barn was built in the 1820s, then enlarged in 1898 and again in 1914. Today, it continues its role as a working farm structure as a result of sensitive preservation work. This included foundation re-grading; a new gutter system; structural strengthening; and replacement of a severely deteriorated metal roof. Photo: Jack E. Boucher, HABS.

Although the work in the following sections is quite often an important aspect of preservation projects, it is usually not part of the overall process of preserving character-defining features (maintenance, repair, and limited replacement); rather, such work is assessed for its potential negative impact on the building's historic character. For this reason, particular care must be taken not to obscure, alter, or damage character-defining features in the process of preservation work.

Energy Efficiency

Recommended	*Not Recommended*
Masonry/Wood/Architectural Metals	
Installing thermal insulation in attics and in unheated cellars and crawlspaces to increase the efficiency of the existing mechanical systems.	Applying thermal insulation with a high moisture content in wall cavities which may damage historic fabric.
Installing insulating material on the inside of masonry walls to increase energy efficiency where there is no character-defining interior molding around the windows or other interior architectural detailing.	Installing wall insulation without considering its effect on interior molding or other architectural detailing.
Windows	
Utilizing the inherent energy conserving features of a building by maintaining windows and louvered blinds in good operable condition for natural ventilation.	Removing historic shading devices rather than keeping them in an operable condition.
Improving thermal efficiency with weatherstripping, storm windows, caulking, interior shades, and if historically appropriate, blinds and awnings.	Replacing historic multi-paned sash with new thermal sash utilizing false muntins.
Installing interior storm windows with air-tight gaskets, ventilating holes, and/or removable clips to insure proper maintenance and to avoid condensation damage to historic windows.	Installing interior storm windows that allow moisture to accumulate and damage the window.
Installing exterior storm windows which do not damage or obscure the windows and frames.	Installing new exterior storm windows which are inappropriate in size or color.
	Replacing windows or transoms with fixed thermal glazing or permitting windows and transoms to remain inoperable rather than utilizing them for their energy conserving potential.

Recommended	*Not Recommended*
Entrances and Porches	
Maintaining porches and double vestibule entrances so that they can retain heat or block the sun and provide natural ventilation.	Changing the historic appearance of the building by enclosing porches.
Interior Features	
Retaining historic interior shutters and transoms for their inherent energy conserving features.	Removing historic interior features which play an energy conserving role.
Mechanical Systems	
Improving energy efficiency of existing mechanical systems by installing insulation in attics and basements.	Replacing existing mechanical systems that could be repaired for continued use.
Building Site	
Retaining plant materials, trees, and landscape features which perform passive solar energy functions such as sun shading and wind breaks.	Removing plant materials, trees, and landscape features that perform passive solar energy functions.
Setting (District/Neighborhood)	
Maintaining those existing landscape features which moderate the effects of the climate on the setting such as deciduous trees, evergreen wind-blocks, and lakes or ponds.	Stripping the setting of landscape features and landforms so that the effects of wind, rain, and sun result in accelerated deterioration of the historic building.

Accessibility Considerations

Recommended	*Not Recommended*
Identifying the historic building's character-defining spaces, features, and finishes so that accessibility code-required work will not result in their damage or loss.	Undertaking code-required alterations before identifying those spaces, features, or finishes which are character-defining and must therefore be preserved.
Complying with barrier-free access requirements, in such a manner that character-defining spaces, features, and finishes are preserved.	Altering, damaging, or destroying character-defining features in attempting to comply with accessibility requirements.
Working with local disability groups, access specialists, and historic preservation specialists to determine the most appropriate solution to access problems.	Making changes to buildings without first seeking expert advice from access specialists and historic preservationists to determine solutions.
Providing barrier-free access that promotes independence for the disabled person to the highest degree practicable, while preserving significant historic features.	Making access modifications that do not provide a reasonable balance between independent, safe access and preservation of historic features.
Finding solutions to meet accessibility requirements that minimize the impact on the historic building and its site, such as compatible ramps, paths, and lifts.	Making modifications for accessibility without considering the impact on the historic building and its site.

Health and Safety Considerations

Recommended	*Not Recommended*
Identifying the historic building's character-defining spaces, features, and finishes so that code-required work will not result in their damage or loss.	Undertaking code-required alterations to a building or site before identifying those spaces, features, or finishes which are character-defining and must therefore be preserved.
Complying with health and safety codes, including seismic code requirements, in such a manner that character-defining spaces, features, and finishes are preserved.	Altering, damaging, or destroying character-defining spaces, features, and finishes while making modifications to a building or site to comply with safety codes.
Removing toxic building materials only after thorough testing has been conducted and only after less invasive abatement methods have been shown to be inadequate.	Destroying historic interior features and finishes without careful testing and without considering less invasive abatement methods.
Providing workers with appropriate personal protective equipment for hazards found in the worksite.	Removing unhealthful building materials without regard to personal and environmental safety.
Working with local code officials to investigate systems, methods, or devices of equivalent or superior effectiveness and safety to those prescribed by code so that unnecessary alterations can be avoided.	Making changes to historic buildings without first exploring equivalent health and safety systems, methods, or devices that may be less damaging to historic spaces, features, and finishes.
Upgrading historic stairways and elevators to meet health and safety codes in a manner that assures their preservation, i.e., so that they are not damaged or obscured.	Damaging or obscuring historic stairways and elevators or altering adjacent spaces in the process of doing work to meet code requirements.
Installing sensitively designed fire suppression systems, such as sprinkler systems that result in retention of historic features and finishes.	Covering character-defining wood features with fire-resistant sheathing which results in altering their visual appearance.
Applying fire-retardant coatings, such as intumescent paints, which expand during fire to add thermal protection to steel.	Using fire-retardant coatings if they damage or obscure character-defining features.
Adding a new stairway or elevator to meet health and safety codes in a manner that preserves adjacent character-defining features and spaces.	Radically changing, damaging, or destroying character-defining spaces, features, or finishes when adding a new code-required stairway or elevator.

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Appendix F:
Preservation Brief 31

Preservation Brief 31 is the mothballing procedure and standards designated by the National Park Service. The additional Preservation Briefs used for the mothballing report can be found on the National Park Service website.

31 Preservation Briefs
Technical Preservation Services
National Park Service
U.S. Department of the Interior

Mothballing Historic Buildings

Sharon C. Park, AIA

A NOTE TO OUR USERS: The web versions of the **Preservation Briefs** differ somewhat from the printed versions. Many illustrations are new, captions are simplified, illustrations are typically in color rather than black and white, and some complex charts have been omitted.

When all means of finding a productive use for a historic building have been exhausted or when funds are not currently available to put a deteriorating structure into a useable condition, it may be necessary to close up the building temporarily to protect it from the weather as well as to secure it from vandalism. This process, known as mothballing, can be a necessary and effective means of protecting the building while planning the property's future, or raising money for a preservation, rehabilitation or restoration project. If a vacant property has been declared unsafe by building officials, stabilization and mothballing may be the only way to protect it from demolition.

This building has been successfully mothballed for 10 years because the roof and walls were repaired and structurally stabilized, ventilation louvers added, and the property maintained. Photo: NPS files.

This Preservation Brief focuses on the steps needed to "de-activate" a property for an extended period of time. The project team will usually consist of an architect, historian, preservation specialist, sometimes a structural engineer, and a contractor. Mothballing should not be done without careful planning to ensure that needed physical repairs are made prior to securing the building. The steps discussed in this Brief can protect buildings for periods of up to ten years; long-term success will also depend on continued, although somewhat limited, monitoring and maintenance. For all but the simplest projects, hiring a team of preservation specialists is recommended to assess the specific needs of the structure and to develop an

effective mothballing program.

A vacant historic building cannot survive indefinitely in a boarded-up condition, and so even marginal interim uses where there is regular activity and monitoring, such as a caretaker residence or non-flammable storage, are generally preferable to mothballing. In a few limited cases when the vacant building is in good condition and in a location where it can be watched and checked regularly, closing and locking the door, setting heat levels at just above freezing, and securing the windows may provide sufficient protection for a period of a few years.

But if long-term mothballing is the only remaining option, it must be done properly. This will require stabilization of the exterior, properly designed security protection, generally some form of interior ventilation--either through mechanical or natural air exchange systems--and continued maintenance and surveillance monitoring.

Boarding up without adequate ventilation and maintenance has accelerated deterioration of this property. Photo: NPS files.

Comprehensive mothballing programs are generally expensive and may cost 10% or more of a modest rehabilitation budget. However, the money spent on well-planned protective measures will seem small when amortized over the life of the resource. Regardless of the location and condition of the property or the funding available, the following 9 steps are involved in properly mothballing a building:

Documentation

1. Document the architectural and historical significance of the building.
2. Prepare a condition assessment of the building.

Stabilization

3. Structurally stabilize the building, based on a professional condition assessment.
4. Exterminate or control pests, including termites and rodents.
5. Protect the exterior from moisture penetration.

Mothballing

6. Secure the building and its component features to reduce vandalism or break-ins. 7. Provide adequate ventilation to the interior.
8. Secure or modify utilities and mechanical systems.
9. Develop and implement a maintenance and monitoring plan for protection.

These steps will be discussed in sequence below. Documentation and stabilization are critical components of the process and should not be skipped over. Mothballing measures should not result in permanent damage, and so each treatment should be

weighed in terms of its reversibility and its overall benefit.

Documentation

Documenting the historical significance and physical condition of the property will provide information necessary for setting priorities and allocating funds. The project team should be cautious when first entering the structure if it has been vacant or is deteriorated. It may be advisable to shore temporarily areas appearing to be structurally unsound until the condition of the structure can be fully assessed. If pigeon or bat droppings, friable asbestos or other health hazards are present, precautions must be taken to wear the appropriate safety equipment when first inspecting the building. Consideration should be given to hiring a firm specializing in hazardous waste removal if these highly toxic elements are found in the building.

Documenting and recording the building

Documenting a building's history is important because evidence of its true age and architectural significance may not be readily evident. The owner should check with the State Historic Preservation Office or local preservation commission for assistance in researching the building. If the building has never been researched for listing in the National Register of Historic Places or other historic registers, then, at a minimum, the following should be determined:

The overall historical significance of the property and dates of construction;

The chronology of alterations or additions and their approximate dates; and,

Types of building materials, construction techniques, and any unusual detailing or regional variations of craftsmanship.

Old photographs can be helpful in identifying early or original features that might be hidden under modern materials. On a walk-through, the architect, historian, or preservation specialist should identify the architecturally significant elements of the building, both inside and out.

Documenting a building's history and assessing its condition provide information to set priorities for stabilization and repair, prior to mothballing. Photo: NPS files.

By understanding the history of the resource, significant elements, even though deteriorated, may be spared the trash pile. For that reason alone, any materials removed from the building or site as part of the stabilization effort should be carefully scrutinized and, if appearing historic, should be photographed, tagged with a number, inventoried, and safely stored, preferably in the building, for later retrieval.

A site plan and schematic building floor plans can be used to note important information for use when the building is eventually preserved, restored, or rehabilitated. Each room should be given a number and notations added to the plans regarding the removal of important features to storage or recording physical treatments undertaken as part of the stabilization or repair.

Because a mothballing project may extend over a long period of time, with many different people involved, clear records should be kept and a building file established. Copies of all important data, plans, photographs, and lists of consultants or contractors who have worked on the property should be added to the file as the job progresses. Recording actions taken on the building and identifying where elements that have been removed are stored will be helpful in the future.

The project coordinator should keep the building file updated and give duplicate copies to the owner. A list of emergency numbers, including the number of the key holder, should be kept at the entrance to the building or on a security gate, in a transparent vinyl sleeve.

Preparing a condition assessment of the building

A condition assessment can provide the owner with an accurate overview of the current condition of the property. If the building is deteriorated or if there are significant interior architectural elements that will need special protection during the mothballing years, undertaking a condition assessment is highly recommended, but it need not be exhaustive.

A modified condition assessment, prepared by an architect or preservation specialist, and in some case a structural engineer, will help set priorities for repairs necessary to stabilize the property for both the short and long-term. It will evaluate the age and condition of the following major elements: foundations; structural systems; exterior materials; roofs and gutters; exterior porches and steps; interior finishes; staircases; plumbing, electrical, mechanical systems; special features such as chimneys; and site drainage.

To record existing conditions of the building and site, it will be necessary to clean debris from the building and to remove unwanted or overgrown vegetation to expose foundations. The interior should be emptied of its furnishing (unless provisions are made for mothballing these as well), all debris removed, and the interior swept with a broom. Building materials too deteriorated to repair, or which have come detached, such as moldings, balusters, and decorative plaster, and which can be used to guide later preservation work, should be tagged, labeled and saved.

Buildings seriously damaged by storms or deterioration may need to be braced before architectural evaluations can be made. Photo: John Milner Architects. Photo: NPS files

Photographs or a videotape of the exterior and all interior spaces of the resource will provide an invaluable record of "as is" conditions. If a videotape is made, oral commentary can be provided on the significance of each space and architectural feature. If 35mm photographic prints or slides are made, they should be numbered, dated, and appropriately identified. Photographs should be cross-referenced with the room numbers on the schematic plans. A systematic method for photographing should be developed; for example, photograph each wall in a room and then take a corner shot to get floor and ceiling portions in the picture. Photograph any unusual details as well as examples of each window and door type.

Loose or detached elements should be identified, tagged and stored, preferably on site. Photo: NPS files

For historic buildings, the great advantage of a condition assessment is that architectural features, both on the exterior as well as the interior, can be rated on a scale of their importance to the integrity and significance of the building. Those features of the highest priority should receive preference when repairs or protection measures are outlined as part of the mothballing process. Potential problems with protecting these features should be identified so that appropriate interim solutions can be selected. For example, if a building has always been heated and if murals, decorative plaster walls, or examples of patterned wall paper are identified as highly significant, then special care should be taken to regulate the interior climate and to monitor it adequately during the mothballing years. This might require retaining electrical service to provide minimal heat in winter, fan exhaust in summer, and humidity controls for the interior.

Stabilization

Stabilization as part of a mothballing project involves correcting deficiencies to slow down the deterioration of the building while it is vacant. Weakened structural members that might fail altogether in the forthcoming years must be braced or reinforced; insects and other pests removed and discouraged from returning; and the building protected from moisture damage both by weatherizing the exterior envelope and by handling water run-off on the site. Even if a modified use or caretaker services can eventually be found for the building, the following steps should be addressed.

Structurally stabilizing the building

While bracing may have been required to make the building temporarily safe for inspection, the condition assessment may reveal areas of hidden structural damage. Roofs, foundations, walls, interior framing, porches and dormers all have structural components that may need added reinforcement.

Interior bracing which will last the duration of the mothballing will protect weakened structural members. Photo: John Milner Architects.

Structural stabilization by a qualified contractor should be done under the direction of a structural engineer or a preservation specialist to ensure that the added weight of the reinforcement can be sustained by the building and that the new members do not harm historic finishes. Any major vertical post added during the stabilization should be properly supported and, if necessary, taken to the ground and underpinned.

If the building is in a northern climate, then the roof framing must be able to hold substantial snow loads. Bracing the roof at the ridge and mid-points should be considered if sagging is apparent. Likewise, interior framing around stair openings or under long ceiling spans should be investigated. Underpinning or bracing structural piers weakened by poor drainage patterns may be a good precaution as well. Damage caused by insects,

moisture, or from other causes should be repaired or reinforced and, if possible, the source of the damage removed. If features such as porches and dormers are so severely deteriorated that they must be removed, they should be documented, photographed, and portions salvaged for storage prior to removal.

If the building is in a southern or humid climate and termites or other insects are a particular problem, the foundation and floor framing should be inspected to ensure that there are no major structural weaknesses. This can usually be done by observation from the crawl space or basement. For those structures where this is not possible, it may be advisable to lift selective floor boards to expose the floor framing. If there is evidence of pest damage, particularly termites, active colonies should be treated and the structural members reinforced or replaced, if necessary.

Controlling pests

Pests can be numerous and include squirrels, raccoons, bats, mice, rats, snakes, termites, moths, beetles, ants, bees and wasps, pigeons, and other birds. Termites, beetles, and carpenter ants destroy wood. Mice, too, gnaw wood as well as plaster, insulation, and electrical wires. Pigeon and bat droppings not only damage wood finishes but create a serious and sometimes deadly health hazard.

If the property is infested with animals or insects, it is important to get them out and to seal off their access to the building. If necessary, exterminate and remove any nests or hatching colonies. Chimney flues may be closed off with exterior grade plywood caps, properly ventilated, or protected with framed wire screens. Existing vents, grills, and louvers in attics and crawl spaces should be screened with bug mesh or heavy duty wire, depending on the type of pest being controlled. It may be advantageous to have damp or infected wood treated with insecticides (as permitted by each state) or preservatives, such as borate, to slow the rate of deterioration during the time that the building is not in use.

Securing the exterior envelope from moisture penetration

It is important to protect the exterior envelope from moisture penetration before securing the building. Leaks from deteriorated or damaged roofing, from around windows and doors, or through deteriorated materials, as well as ground moisture from improper site run-off or rising damp at foundations, can cause long-term damage to interior finishes and structural systems. Any serious deficiencies on the exterior, identified in the condition assessment, should be addressed.

Regrading has protected this masonry foundation wall from excessive damp during its 10-year mothballing. Note the attic and basement vents, temporary stairs, and interpretive sign. Photo: NPS files.

To the greatest extent possible, these weatherization efforts should not harm historic materials. The project budget may not allow deteriorated features to be fully repaired or replaced in-kind. Non-historic or modern materials may be used to cover historic surfaces temporarily, but these treatments should not destroy valuable evidence necessary for future preservation work. Temporary modifications should be as visually compatible as possible with the historic building.

Roofs are often the most vulnerable elements on the building exterior and yet in some ways they are the easiest element to stabilize for the long term, if done correctly. "Quick fix" solutions, such as tar patches on slate roofs, should be avoided as they will generally fail within a year or so and may accelerate damage by trapping moisture. They are difficult to undo later when more permanent repairs are undertaken. Use of a tarpaulin over a leaking roof should be thought of only as a very temporary emergency repair because it is often blown off by the wind in a subsequent storm.

If the existing historic roof needs moderate repairs to make it last an additional ten years, then these repairs should be undertaken as a first priority. Replacing cracked or missing shingles and tiles, securing loose flashing, and reanchoring gutters and downspouts can often be done by a local roofing contractor. If the roof is in poor condition, but the historic materials and configuration are important, a new temporary roof, such as a lightweight aluminum channel system over the existing, might be considered. If the roofing is so deteriorated that it must be replaced and a lightweight aluminum system is not affordable, various inexpensive options might be considered. These include covering the existing deteriorated roof with galvanized corrugated metal roofing panels, or 90 lb. rolled roofing, or a rubberized membrane (refer back to cover photo). These alternatives should leave as much of the historic sheathing and roofing in place as evidence for later preservation treatments.

Urban buildings often need additional protection from unwanted entry and graffiti. This commercial building uses painted plywood panels to cover its glass storefronts. The upper windows on the street sides have been painted to resemble 19th century sash. Photo: NPS files.

For masonry repairs, appropriate preservation approaches are essential. For example, if repointing deteriorated brick chimneys or walls is necessary to prevent serious moisture penetration while the building is mothballed, the mortar should match the historic mortar in composition, color, and tooling. The use of hard portland cement mortars or vapor-impermeable waterproof coatings are not appropriate solutions as they can cause extensive damage and are not reversible treatments.

For wood siding that is deteriorated, repairs necessary to keep out moisture should be made; repainting is generally warranted. Cracks around windows and doors can be beneficial in providing ventilation to the interior and so should only be caulked if needed to keep out bugs and moisture. For very deteriorated wall surfaces on wooden frame structures, it may be necessary to sheathe in plywood panels, but care should be taken to minimize installation damage by planning the location of the nailing or screw patterns or by installing panels over a frame of battens. Generally, however, it is better to repair deteriorated features than to cover them over.

Foundation damage may occur if water does not drain away from the building. Run-off from gutters and downspouts should be directed far away from the foundation wall by using long flexible extender pipes equal in length to twice the depth of the basement or crawl space. If underground drains are susceptible to clogging, it is recommended that the downspouts be disconnected from the drain boot and attached to flexible piping. If gutters and downspouts are in bad condition, replace them with inexpensive aluminum units.

If there are no significant landscape or exposed archeological elements around the foundation, consideration should be given to regrading the site if there is a documented drainage problem. If building up the grade, use a fiber mesh membrane to separate the new soil from the old and slope the new soil 6 to 8 feet (200 cm-266 cm) away from the foundation making sure not to cover up the dampcourse layer or come into contact with skirting boards. To keep vegetation under control, put down a layer of 6 mil black polyethylene sheeting or fiber mesh matting covered with a 2"-4" (5-10 cm.) of washed gravel. If the building suffers a serious rising damp problem, it may be advisable to eliminate the plastic sheeting to avoid trapping ground moisture against foundations.

Mothballing

The actual mothballing effort involves controlling the long-term deterioration of the building while it is unoccupied as well as finding methods to protect it from sudden loss by fire or vandalism. This requires securing the building from unwanted entry, providing adequate ventilation to the interior, and shutting down or modifying existing utilities. Once the building is de-activated or secured, the long-term success will depend on periodic maintenance and surveillance monitoring.

Securing the building from vandals, break-ins, and natural disasters

Securing the building from sudden loss is a critical aspect of mothballing. Because historic buildings are irreplaceable, it is vital that vulnerable entry points are sealed. If the building is located where fire and security service is available then it is highly recommended that some form of monitoring or alarm devices be used.

To protect decorative features, such as mantels, lighting fixtures, copper downspouts, iron roof cresting, or stained glass windows from theft or vandalism, it may be advisable to temporarily remove them to a more secure location if they cannot be adequately protected within the structure.

The first floor openings of this historic building have been filled with cinder blocks and the doors, window sash, and frames removed for safe keeping. The security metal door features heavy duty locks. Photo: NPS files.

Mothballed buildings are usually boarded up, particularly on the first floor and basement, to protect fragile glass windows from breaking and to reinforce entry points. Infill materials for closing door and window openings include plywood, corrugated panels, metal grates, chain fencing, metal grills, and cinder or cement blocks. The method of installation should not result in the destruction of the opening and all associated sash, doors, and frames should be protected or stored for future reuse.

Generally exterior doors are reinforced and provided with strong locks, but if weak historic doors would be damaged or disfigured by adding reinforcement or new locks, they may be removed temporarily and replaced with secure modern doors. Alternatively, security gates in an new metal frame can be installed within existing door

openings, much like a storm door, leaving the historic door in place. If plywood panels are installed over door openings, they should be screwed in place, as opposed to nailed, to avoid crowbar damage each time the panel is removed. This also reduces pounding vibrations from hammers and eliminates new nail holes each time the panel is replaced.

For windows, the most common security feature is the closure of the openings; this may be achieved with wooden or pre-formed panels or, as needed, with metal sheets or concrete blocks. Plywood panels, properly installed to protect wooden frames and properly ventilated, are the preferred treatment from a preservation standpoint.

This painted trompe l'eoil scene on plywood panels is a neighborhood-friendly device. Photo: NPS files.

There are a number of ways to set insert plywood panels into windows openings to avoid damage to frame and sash. One common method is to bring the upper and lower sash of a double hung unit to the mid-point of the opening and then to install pre-cut plywood panels using long carriage bolts anchored into horizontal wooden bracing, or strong backs, on the inside face of the window. Another means is to build new wooden blocking frames set into deeply recessed openings, for example in an industrial mill or warehouse, and then to affix the plywood panel to the blocking frame. If sash must be removed prior to installing panels, they should be labeled and stored safely within the building.

Plywood panels are usually 1/2"-3/4" (1.25-1.875 cm.) thick and made of exterior grade stock, such as CDX, or marine grade plywood. They should be painted to protect them from delamination and to provide a neater appearance.

These panels may be painted to resemble operable windows or treated decoratively. With extra attention to detail, the plywood panels can be trimmed out with muntin strips to give a shadow line simulating multi-lite windows. This level of detail is a good indication that the building is protected and valued by the community.

If the building has shutters simply close the shutters and secure them from the interior. If the building had shutters historically, but they are missing, it may be appropriate to install new shutters, even in a modern material, and secure them in the closed position. Louvered shutters will help with interior ventilation if the sash are propped open behind the shutters.

There is some benefit from keeping windows unboarded if security is not a problem. The building will appear to be occupied, and the natural air leakage around the windows will assist in ventilating the interior. The presence of natural light will also help when periodic inspections are made. Rigid polycarbonate clear storm glazing panels may be placed on the window exterior to protect against glass breakage. Because the sun's ultraviolet rays can cause fading of floor finishes and wall surfaces, filtering pull shades or inexpensive curtains may be options for reducing this type of deterioration for significant interiors. Some acrylic sheeting comes with built-in ultraviolet filters.

A view showing the exterior of the Brearley House, New Jersey, in its mothballed condition Photo: Michael Mills, Ford Farewell Mills Gatsch, Architects.

Securing the building from catastrophic destruction from fire, lightning, or arson will require additional security devices. Lightning rods properly grounded should be a first consideration if the building is in an area susceptible to lightning storms. A high security fence should also be installed if the property cannot be monitored closely. These interventions do not require a power source for operation. Since many buildings will not maintain electrical power, there are some devices available using battery packs, such as intrusion alarms, security lighting, and smoke detectors which through audible horn alarms can alert nearby neighbors. These battery packs must be replaced every 3 months to 2 years, depending on type and use. In combination with a cellular phone, they can also provide some level of direct communication with police and fire departments.

If at all possible, new temporary electric service should be provided to the building. Generally a telephone line is needed as well. A hard wired security system for intrusion and a combination rate-of-rise and smoke detector can send an immediate signal for help directly to the fire department and security service. Depending on whether or not heat will be maintained in the building, the security system should be designed accordingly. Some systems cannot work below 32°F (0°C). Exterior lighting set on a timer, photo electric sensor, or a motion/infra-red detection device provides additional security.

Providing adequate ventilation to the interior

Once the exterior has been made weathertight and secure, it is essential to provide adequate air exchange throughout the building. Without adequate air exchange, humidity may rise to unsafe levels, and mold, rot, and insect infestation are likely to thrive. The needs of each historic resource must be individually evaluated because there are so many variables that affect the performance of each interior space once the building has been secured.

A mechanical engineer or a specialist in interior climates should be consulted, particularly for buildings with intact and significant interiors. In some circumstances, providing heat during the winter, even at a minimal 45° F (7°C), and utilizing forced-fan ventilation in summer will be recommended and will require retaining electrical service. For masonry buildings it is often helpful to keep the interior temperature above the spring dew point to avoid damaging condensation. In most buildings it is the need for summer ventilation that outweighs the winter requirements.

This exhaust fan has tamper-proof housing. Photo: Michael Mills, Ford Farewell Mills Gatsch, Architects.

Many old buildings are inherently leaky due to loose-fitting windows and floorboards and the lack of insulation. The level of air exchange needed for each building, however, will vary according to geographic location, the building's construction, and its general size and configuration.

There are four critical climate zones when looking at the type and amount of interior ventilation needed for a closed up building: hot and dry (southwestern states); cold and damp (Pacific northwest and northeastern states); temperate and humid (Mid-Atlantic states, coastal areas); and hot and humid (southern states and the tropics).

Once closed up, a building interior will still be affected by the temperature and humidity of the exterior. Without proper ventilation, moisture from condensation may occur and cause damage by wetting plaster, peeling paint, staining woodwork, warping floors, and in some cases even causing freeze thaw damage to plaster. If moist conditions persist in a property, structural damage can result from rot or returning insects attracted to moist conditions. Poorly mothballed masonry buildings, particularly in damp and humid zones have been so damaged on the interior with just one year of unventilated closure that none of the interior finishes were salvageable when the buildings were rehabilitated.

Portable monitors are used to record temperature and humidity conditions in historic buildings during mothballing. Photo: NPS files.

The absolute minimum air exchange for most mothballed buildings consists of one to four air exchanges every hour; one or two air exchanges per hour in winter and twice that amount in summer. Even this minimal exchange may foster mold and mildew in damp climates, and so monitoring the property during the stabilization period and after the building has been secured will provide useful information on the effectiveness of the ventilation solution.

There is no exact science for how much ventilation should be provided for each building. There are, however, some general rules of thumb. Buildings, such as adobe structures, located in hot and arid climates may need no additional ventilation if they have been well weatherized and no moisture is penetrating the interior. Also frame buildings with natural cracks and fissures for air infiltration may have a natural air exchange rate of 3 or 4 per hour, and so in arid as well as temperate climates may need no additional ventilation once secured. The most difficult buildings to adequately ventilate without resorting to extensive louvering and/or mechanical exhaust fan systems are masonry buildings in humid climates. Even with basement and attic vent grills, a masonry building many not have more than one air exchange an hour. This is generally unacceptable for summer conditions. For these buildings, almost every window opening will need to be fitted out with some type of passive, louvered ventilation.

Depending on the size, plan configuration, and ceiling heights of a building, it is often necessary to have louvered opening equivalent to 5%-10% of the square footage of each floor. For example, in a hot humid climate, a typical 20'x30' (6.1m x 9.1m) brick residence with 600 sq. ft.(55.5 sq.m) of floor space and a typical number of windows, may need 30-60 sq. ft.(2.75sq.m-5.5 sq. m) of louvered openings per floor. With each window measuring 3'x5'(.9m x 1.5 m) or 15 sq. ft. (1.3 sq.m), the equivalent of 2 to 4 windows per floor will need full window louvers.

Small pre-formed louvers set into a plywood panel or small slit-type registers at the base of inset panels generally cannot provide enough ventilation in most moist climates to offset condensation, but this approach is certainly better than no louvers at all. Louvers should be located to give cross ventilation, interior doors should be fixed ajar at least 4" (10cm) to allow air to circulate, and hatches to the attic should be left open.

Monitoring devices which can record internal temperature and humidity levels can be invaluable in determining if the internal climate is remaining stable. These units can be powered by portable battery packs or can be wired into electric service with data downloaded into laptop computers periodically. This can also give long-term information throughout the mothballing years. If it is determined that there are inadequate air exchanges to keep interior moisture levels under control, additional passive ventilation can be increased, or, if there is electric service, mechanical exhaust fans can be installed. One fan in a small to medium sized building can reduce the amount of louvering substantially.

If electric fans are used, study the environmental conditions of each property and determine if the fans should be controlled by thermostats or automatic timers. Humidistats, designed for enclosed climate control systems, generally are difficult to adapt for open mothballing conditions. How the system will draw in or exhaust air is also important. It may be determined that it is best to bring dry air in from the attic or upper levels and force it out through lower basement windows. If the basement is damp, it may be best to zone it from the rest of the building and exhaust its air separately. Additionally, less humid day air is preferred over damper night air, and this can be controlled with a timer switch mounted to the fan.

The type of ventilation should not undermine the security of the building. The most secure installations use custom-made grills well anchored to the window frame, often set in plywood security panels. Some vents are formed using heavy millwork louvers set into existing window openings. For buildings where security is not a primary issue, where the interior is modest, and where there has been no heat for a long time, it may be possible to use lightweight galvanized metal grills in the window openings. A cost effective grill can be made from the expanded metal mesh lath used by plasterers and installed so that the mesh fins shed rainwater to the exterior.

Securing mechanical systems and utilities

At the outset, it is important to determine which utilities and services, such as electrical or telephone lines, are kept and which are cut off. As long as these services will not constitute a fire hazard, it is advisable to retain those which will help protect the property. Since the electrical needs will be limited in a vacant building, it is best to install a new temporary electric line and panel (100 amp) so that all the wiring is new and exposed. This will be much safer for the building, and allows easy access for reading the meter.

Most heating systems are shut down in long term mothballing. For furnaces fueled by oil, there are two choices for dealing with the tank. Either it must be filled to the top with oil to eliminate condensation or it should be drained. If it remains empty for more than a year, it will likely rust and not be reusable. Most tanks are drained if a newer type of system is envisioned when the building is put back into service. Gas systems with open flames should be turned off unless there is regular maintenance and frequent surveillance of the property. Gas lines are shut off by the utility company.

If a hot water radiator system is retained for low levels of heat, it generally must be modified to be a self-contained system and the water supply is capped at the meter. This recirculating system protects the property from extensive damage from burst pipes. Water is replaced with a water/glycol mix and the reserve tank must also be filled with this mixture. This keeps the modified system from freezing, if there is a power failure. If water service is cut off, pipes should be drained. Sewerage systems will require special

care as sewer gas is explosive. Either the traps must be filled with glycol or the sewer line should be capped off at the building line.

Developing a maintenance and monitoring plan

While every effort may have been made to stabilize the property and to slow the deterioration of materials, natural disasters, storms, undetected leaks, and unwanted intrusion can still occur. A regular schedule for surveillance, maintenance, and monitoring should be established. The fire and police departments should be notified that the property will be vacant. A walk-through visit to familiarize these officials with the building's location, construction materials, and overall plan may be invaluable if they are called on in the future.

The optimum schedule for surveillance visits to the property will depend on the location of the property and the number of people who can assist with these activities. The more frequent the visits to check the property, the sooner that water leaks or break-ins will be noticed. Also, the more frequently the building is entered, the better the air exchange. By keeping the site clear and the building in good repair, the community will know that the building has not been abandoned. The involvement of neighbors and community groups in caring for the property can ensure its protection from a variety of catastrophic circumstances.

The owner may utilize volunteers and service companies to undertake the work outlined in the maintenance chart. Service companies on a maintenance contract can provide yard, maintenance, and inspection services, and their reports or itemized bills reflecting work undertaken should be added to update the building file.

Sidebar

Mothballing Checklist

In reviewing mothballing plans, the following checklist may help to ensure that work items are not inadvertently omitted.

Moisture

- Is the roof watertight?
- Do the gutters retain their proper pitch and are they clean?
- Are downspout joints intact?
- Are drains unobstructed?
- Are windows and doors and their frames in good condition?
- Are masonry walls in good condition to seal out moisture?
- Is wood siding in good condition?
- Is site properly graded for water run-off?
- Is vegetation cleared from around the building foundation to avoid trapping moisture?

Pests

- Have nests/pests been removed from the building's interior and eaves?
- Are adequate screens in place to guard against pests?
- Has the building been inspected and treated for termites, carpenter ants,

rodents, etc.?
- If toxic droppings from bats and pigeons are present, has a special company been brought in for its disposal?

Housekeeping

- Have the following been removed from the interior: trash, hazardous materials such as inflammable liquids, poisons, and paints and canned goods that could freeze and burst?
- Is the interior broom-clean?
- Have furnishings been removed to a safe location?
- If furnishings are remaining in the building, are they properly protected from dust, pests, ultraviolet light, and other potentially harmful problems?
- Have significant architectural elements that have become detached from the building been labeled and stored in a safe place?
- Is there a building file?

Security

- Have fire and police departments been notified that the building will be mothballed?
- Are smoke and fire detectors in working order?
- Are the exterior doors and windows securely fastened?
- Are plans in place to monitor the building on a regular basis?
- Are the keys to the building in a secure but accessible location?
- Are the grounds being kept from becoming overgrown?

Utilities

- Have utility companies disconnected/shut off or fully inspected water, gas, and electric lines?
- If the building will not remain heated, have water pipes been drained and glycol added?
- If the electricity is to be left on, is the wiring in safe condition?

Ventilation

- Have steps been taken to ensure proper ventilation of the building?
- Have interior doors been left open for ventilation purposes?
- Has the secured building been checked within the last 3 months for interior dampness or excessive humidity?

Maintenance Chart

1-3 months; periodic

- regular drive by surveillance
- check attic during storms if possible
- monthly walk arounds
- check entrances

- check window panes for breakage
- mowing as required
- check for graffiti or vandalism

- enter every 3 months to air out
- check for musty air
- check for moisture damage
- check battery packs and monitoring equipment
- check light bulbs
- check for evidence of pest intrusion

every 6 months; spring and fall

- site clean-up; pruning and trimming
- gutter and downspout check
- check crawlspace for pests
- clean out storm drains

every 12 months

- maintenance contract inspections for equipment/utilities
- check roof for loose or missing shingles
- termite and pest inspection/treatment
- exterior materials spot repair and touch up painting
- remove bird droppings or other stains from exterior
- check and update building file

Conclusion

Providing temporary protection and stabilization for vacant historic buildings can arrest deterioration and buy the owner valuable time to raise money for preservation or to find a compatible use for the property. A well planned mothballing project involves documenting the history and condition of the building, stabilizing the structure to slow down its deterioration, and finally, mothballing the structure to secure it. The three highest priorities for a mothballed building are 1) to protect the building from sudden loss, 2) to weatherize and maintain the property to stop moisture penetration, and 3) to control the humidity levels inside once the building has been secured.

While issues regarding mothballing may seem simple, the variables and intricacies of possible solutions make the decision-making process very important. Each building must be individually evaluated prior to mothballing. In addition, a variety of professional services as well as volunteer assistance is needed for careful planning and repair, sensitively designed protection measures, follow-up security surveillance, and cyclical maintenance.

In planning for the future of the building, complete and systematic records must be kept and generous funds allocated for mothballing. This will ensure that the historic property will be in stable condition for its eventual preservation, rehabilitation, or restoration.

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Home page logo: Appropriately mothballed historic building. Photo: NPS files.

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nd other educational materials on responsible historic preservation treatments to a broad public.

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