



The Hudson Armory

Historic Structure Report

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EXECUTIVE SUMMARY

This completed historic structure report (HSR) seeks to provide readers with a comprehensive guide to the history of the armory in Hudson, New York. Structures define the heritage of our built environment; understanding the physical makeup and history of this edifice will empower its stewards to follow a path of best practice where preservation is concerned. It provides:

- A primary planning document for decision-making about preservation, rehabilitation, restoration, or reconstruction treatments
- Documentation to help establish significant dates or periods of construction
- A guide for budget and schedule planning for work on the historic structure
- A basis for design of recommended work
- A compilation of key information on the history, significance, and existing condition of the historic structure
- A summary of information known and conditions observed at the time of the survey
- A readily accessible reference document for owners, managers, staff, committees, and professionals working on or using the historic structure
- A tool for use in interpretation of the structure based on historical and physical evidence
- A bibliography of archival documentation relevant to the structure
- A resource for further research and investigation
- A record of completed work



Brick and stone masonry in need of attention. Source: Author

RECOMMENDATIONS – SUMMARY

The following brief summaries of the findings of the conditions assessment are discussed in greater detail in the ‘Problems of Repair’ section of this historic structure report:

Flat roof on motor vehicle storage addition ... The motor vehicle storage addition was built in 1957 and, at that time, a flat, ballasted roof installed. With the building becoming privately owned approximately twenty years later, it is safe to assume that the State never replaced the flat roof. Given the extensive water damage and poor attempts at repair visible there, coupled with a

general, overall lack of maintenance since, it can be assumed that the original roof is still in place. This roof must be replaced.

Stone restoration ... The blue sandstone used for the foundation, porch, arches, and architectural trim was, at some locations, set by the masons on the vertical side of the bedding plains. As a result, widespread delamination has occurred, as layers have exfoliated from the stones. At the front porch, in particular, massive sections of stone are completely gone. The problem is not new; some very decent stone patches can be seen and are holding up well. The failing layers of stone must be removed and the voids filled with contemporary stone patching compounds such as Cathedral Stone Products' JAHN restoration mortar. In some instances, the stone has deteriorated to the point where replacement is warranted. Replacement materials should be compared to existing units that are adjacent to the new work. A wide range of shades and tones are available for blue sandstone; samples must be provided and a proper match selected to provide an aesthetically pleasing finished product.

Copper flashing and gutter replacement

... The copper flashings and gutters of the roof system are approximately 115 years old and have outlived their service life. It is time for replacement even if leaks are not yet detected. All flashings should be replaced with full weight (20 oz/sq') copper in a manner consistent with assemblies detailed in the SMACNA "Architectural Sheet Metal Manual," Sixth Edition, as well as the National Slate Association's technical manual, "Slate Roofs: Design and Installation Manual" (2010). Little has



Deteriorated mortar joints, inappropriate repairs. Source: Author

changed in the world of slate roofing since the turn of the century when the armory was built; the details illustrated in these manuals, once installed, will constitute replacement in kind.

Brick and stone masonry repointing ... The brick and stone mortar joints should be repointed with a material that is appropriate in composition (natural cement or lime putty) and sympathetic in appearance and tooling. An appropriate recipe will require one part slaked lime mixed with three parts sand. The ratio of granule sizes can also be gleaned from mortar analysis. Sands should be sought at area sand and gravel pits and compared to the samples included with mortar analysis reports first. If satisfactory aggregate cannot be located by this method, a wide range of materials are available through specialty suppliers.

Wooden windows and doors ... We recommend the retention and repair of original windows and doors whenever possible. The repair and weatherization of existing wooden windows is more

practical than most people realize; many windows are unfortunately replaced because of a lack of awareness of techniques for evaluation, repair, and weatherization. Wooden windows and doors which are repaired and properly maintained will have greatly extended service lives while contributing to the historic character of the building. Thus, an important element of the building's significance will have been preserved for the future.

Steel windows ... Rolled steel windows are often mistakenly deemed unworthy of preservation in the conversion of old buildings to new uses. Steel window repair begins with a careful evaluation of the physical condition of each unit. The evaluation of the armory's steel windows included: presence and degree of corrosion; condition of paint; deterioration of the metal sections, including bowing, misalignment of the sash, or bent sections; condition of the glass and glazing compound; presence and condition of all hardware, screws, bolts, and hinges; and condition of the masonry surrounds, including need for caulking or resetting of improperly sloped sills.



The drill shed. Source: Author

Front steps and walkway ... The concrete stairs at the front entrance are in disrepair. Steel plates on the bullnoses, designed to protect the edge of the steps where tread and riser meet, have warped and contorted into tripping hazards. Additionally, the concrete walkway that approaches the main entrance is askew and should be replaced.

Fence and landscaping ... The fence and surrounding landscape have not been maintained. Overgrown trees and shrubs are not part of the historic landscape and should be cut back or removed altogether. The fence is in

disrepair and numerous gaps allow entry, rendering it ineffective as a perimeter security measure. It does not appear in historic photos, does not serve a functional purpose, and should also be removed.

Tile repairs ... The tiled deck of the porch and entry vestibule are missing dozens of original tiles. Replacement tiles should be acquired through salvage or custom ordered to match existing pieces. They should be set, grouted, and finished in a manner sympathetic to the original, adjacent units.

Mechanical systems ... Existing mechanical systems should be regularly inspected and maintained by a qualified HVAC contractor on a semi-annual basis. As plans are developed for the re-purposing of the armory, an upgrade to the mechanical systems and addition of cooling will be considered. This should be done after the work is performed on the envelope as that

work will increase the building's energy efficiency and directly impact the demands placed upon present and future mechanical systems. A mechanical systems engineering firm with a proven track record in historic structures must be consulted as the introduction of new systems in older buildings is not without problems. Historic buildings are not easily adapted to house modern precision mechanical systems. Careful planning must be provided early on to ensure that decisions made during the design and installation phases of a new system are appropriate.

RECOMMENDATIONS – PRIORITIZATION OF TASKS

Using the above list of recommended actions, tasks have been prioritized according to criticality. They are listed in a manner such that issues threatening the health and safety of occupants and visitors to the armory are listed first, followed by issues causing (or allowing) damage to the structure and routine maintenance.

1. Replacement of flat roof on the motor vehicle storage addition
2. Preservation of the blue sandstone masonry
3. Copper gutter and flashing replacement
4. Front steps and walkway
5. Brick and stone masonry repointing
6. Wooden windows and doors
7. Steel windows and doors
8. Tile repairs
9. Mechanical systems maintenance and evaluation
10. Fence and landscaping

RECOMMENDATIONS – ESTIMATES OF COST

Cost estimates for implementation of the recommendations of the conditions assessment report are listed below. In many instances, pricing structure is broken out into further detail, including unit prices. Refer to the 'Engineers Estimate of Cost' section for more information.

• Replacement of flat roof on the motor vehicle storage addition ...	\$26,048
• Preservation of the blue sandstone masonry ...	\$94,875
• Copper gutter, flat roof and flashing replacement ...	\$122,206
• Front steps and walkway ...	\$23,400
• Stairways at side exits ...	\$24,800
• Brick and stone masonry repointing ...	\$127,500
• Wooden windows and doors ...	\$88,800
• Steel windows ...	\$172,000
• Tile repairs ...	\$5,600
• Mechanical systems ...	\$12,400
• Fence and landscaping ...	\$8,400
Total:	\$706,029

RECOMMENDATIONS – TIMELINE FOR IMPLEMENTATION OF A PHASED PLAN

A timeline for implementation of a phased plan to perform necessary preservation and restoration tasks is listed below. As discussed above, any upgrade considerations should be done after the work is performed on the envelope; that work will increase the building's efficiency and directly impact the demands placed upon present and future mechanical systems. Duration of each phase is in calendar days, weeks or months and is an estimate only—actual times may differ. Also, it may not be necessary for one phase of work on the envelope to be completed before another may start. While greater coordination is required, there is no reason why window work cannot take place while the flat roof is replaced, for example. The project management team will be responsible for coordinating the work of the different trades.

Phase I – Roofing	<i>Six to eight weeks</i>	\$148,254
Replacement of flat roof on the motor vehicle storage addition		
Copper gutter, flat roofing and flashing replacement		

Phase II – Masonry	<i>Twelve to fourteen weeks</i>	\$251,375
Preservation of the blue sandstone masonry		
Front steps and walkway		
Brick and stone masonry repointing		
Tile repairs		

Phase III – Fenestration	<i>Four to six months</i>	\$260,800
Wooden windows and doors		
Steel windows and doors		

Phase IV – Mechanical systems	<i>One month</i>	\$12,400
Mechanical systems maintenance		
System evaluation and upgrade recommendations, design		

Phase V – Site work	<i>Five to eight days</i>	\$33,200
Fence removal		
Landscaping		
Steel emergency exit stairs, two locations		

TAX INCENTIVES FOR PRESERVING HISTORIC PROPERTIES

The Federal Historic Preservation Tax Incentives program encourages private sector investment in the rehabilitation and re-use of historic buildings. It creates jobs and is one of the most successful and cost-effective community revitalization programs in the nation. It has leveraged over \$58 billion in private investment to preserve 37,000 historic properties since 1976. The

National Park Service and the Internal Revenue Service administer the program in partnership with State Historic Preservation Offices.

20% TAX CREDIT

A 20% income tax credit is available for the rehabilitation of historic, income-producing buildings that are determined by the Secretary of the Interior, through the National Park Service, to be “certified historic structures.” The State Historic Preservation Offices and the National Park Service review the rehabilitation work to ensure that it complies with the Secretary’s Standards for Rehabilitation. The Internal Revenue Service defines qualified rehabilitation expenses on which the credit may be taken. Owner-occupied residential properties do not qualify for the federal rehabilitation tax credit. Learn more about this credit before you apply. Each year, Technical Preservation Services approves approximately 1000 projects, leveraging nearly \$4 billion annually in private investment in the rehabilitation of historic buildings across the country.

10% TAX CREDIT

The 10% tax credit is available for the rehabilitation of non-historic buildings placed in service before 1936. The building must be rehabilitated for non-residential use. In order to qualify for the tax credit, the rehabilitation must meet three criteria: at least 50% of the existing external walls must remain in place as external walls, at least 75% of the existing external walls must remain in place as either external or internal walls, and at least 75% of the internal structural framework must remain in place. There is no formal review process for rehabilitations of non-historic buildings.



Hudson Armory circa 1955. Source: NYS Military Museum

HISTORIC PRESERVATION EASEMENTS

A historic preservation easement is a voluntary legal agreement, typically in the form of a deed that permanently protects an historic property. Through the easement, a property owner places restrictions on the development of or changes to the historic property, then transfers these restrictions to a preservation or conservation organization. A historic property owner who donates an easement may be eligible for tax benefits, such as a Federal income tax deduction. Easement rules are complex, so property owners interested in the potential tax benefits of an easement donation should consult with their accountant or tax attorney.

INTRODUCTION

The armory in Hudson, New York, like most armory structures erected in New York after 1879, is a masonry fortress that looks like the castles of medieval Europe. The architect, Isaac G. Perry, is often referred to as New York's first State Architect, and was relatively prolific in the design and construction of this new building type. Many of Perry's armories are included on the National Register of Historic Places (NRHP.) The Hudson Armory sits just outside the boundaries of the federal Hudson Historic District, a multiple resource area. While this HSR is being prepared as a degree requirement, it will be presented to the owners of the building, Galvan Partners, LLC. The Hudson Armory was previously determined to be National Register eligible; the owners plan to submit the structure for consideration to the New York State Historic Preservation Office (SHPO) for inclusion on the NRHP.

ABOUT THE AUTHOR

The author, Ward Hamilton, at time of writing (Spring 2012), was in his final semester at the University of Massachusetts at Amherst. The drafting of this historic structure report (HSR) was a requirement of the Preservation Design Studio course in the M.Sc. in Design and Historic Preservation program. Hamilton, the owner of a preservation contracting and consulting firm based in Niskayuna, New York, has previously performed work on other structures for the owners of the armory building.

METHODOLOGY

Access to the structure, original plans, elevations, and drawings, were provided by the owners' representative. Research was conducted at the New York State Military Museum and Veterans Research Center in Saratoga Springs, New York, the Hudson Area Free Library, and through JSTOR resources available online. *How to write a historic structure report*, by David Arbogast, and "Preservation Brief 43: The Preparation and Use of Historic Structure Reports," by Deborah Slaton, were used as reference guides. Additional research was conducted utilizing the New York State Office of Parks and Recreation's SPHINX database.

ACKNOWLEDGMENTS

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Architect Isaac G. Perry. Source: NYU

SCOPE AND ORGANIZATION OF THE HSR

The executive summary at the beginning of the document is a streamlined version of the HSR. Critical information, such as findings and recommendations, are found there allowing for ease of communication to the various stakeholders in the project. Following this introduction, the exterior elevations and interior spaces are described in detail. After a section that addresses the history of the armory as a structure, the Hudson Armory, proper, is discussed as well as its occupants and their exploits, and the architect Isaac G. Perry. The discussion of re-purposing is not an esoteric exercise where the Hudson Armory is concerned; indeed, plans for adaptive

re-use are presently being considered. Alternative uses are discussed after the history of the building is presented.

The investigation of the building systems will provide an overview of the structural component of the armory, based on what is readily discernible from archived plans and sections as well what is visible to the naked eye. Major changes and alterations will also be examined. Since the armory was completed in 1898, a fire destroyed much of the drill shed in 1928 (rebuilt almost two years later), a motor vehicle storage addition was built in 1957, and sanitation facilities were upgraded and expanded in 1962. The building's electrical and mechanical systems, current and historical, are described and discussed to the extent possible.

The materials analyses will look in depth at the fabric that makes up the historic structures. The finishes analysis will discuss the original materials used and contain a discussion of finish materials from the period. The armory is a structural masonry building, and the masonry analysis section will examine the materials and methods of construction. Wood analysis will focus on the fenestration and doors, moldings and trim, and structural members. The metals analysis will look at the copper used for flashings and gutters in the roof system as well as the steel used in casement windows, structural beams, and trusses.

Problems of repair will be addressed in the final section of the HSR. Existing issues and causation will be discussed and steps needed to prevent further deterioration or damage provided. Steps necessary to preserve or restore the building systems will be specified in accordance with the Secretary of the Interior's Standards for the Treatment of Historic Properties with Illustrated Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings and numerous National Park Service Technical Preservation Briefs. The recommended actions will be prioritized by criticality for phased implementation and an engineer's estimate of costs will be presented for budget and planning purposes.

Finally, the several appendices will include photographs, plans and elevations specific to the Hudson Armory. Historical photographic documentation will include pictures acquired in the course of research for the HSR. Contemporary photographic documentation will include captured satellite images, exterior elevations and interior spaces. Plans, elevations and sections are included for: the original 1897-8 construction, the 1957 motor vehicle storage addition, and the modernization of sanitary facilities in 1962.

Contemporary elevations, sections and floor plans, prepared in 2012, comprise the final appendix.

DESCRIPTION

In terms of layout and construction, the Hudson Armory followed the pattern of most post-1879 armories: a forward

section that housed the administration offices and an attached drill shed to the

rear. The architecture and decoration of the Seventh Regiment's armory in Manhattan was most influenced by the architecture of medieval European castles and forts built between the 12th and 15th centuries. The Seventh Regiment provided the form and basic design premise for all armories erected after 1879. The Hudson Armory was designed by architect Isaac G. Perry and is remarkably similar to his other armories, particularly those in Hornell, Whitehall, Tonawanda, and Ogdensburg.



Ogdensburg Armory. Source: NYS Military Museum

SETTING

The Hudson Armory is an enormous, castellated-style structure constructed of blue sandstone, and is located on the northwest corner of the intersection of State and North 5th Streets in Hudson. Warren Street is the primary east-west thoroughfare through the city and contains the primary business district. The armory is on the periphery of the Hudson Historic District, a massive 139-acre district with 756 contributing structures, including the armory. The Hudson Historic District was added to the National Register of Historic Places in 1985. Narrow lanes flank the armory to the north and west while broad lawns lie to the east and south.

STRUCTURE

The armory's administration building is two stories with a hipped roof; a large, gable-roofed drill shed is attached at the rear. Both sections of the armory are built with dark red brick, load-bearing walls built atop a raised, rusticated, blue sandstone foundation; at all locations where the stone walls are battered, the variance is ½" per foot. The administration building and drill shed

are both sheathed with Pennsylvania slate roofing tiles; hips and ridges are covered with a copper, rolled ridge flashing at all locations of the slate roof. The 1897 plans and drawings call for galvanized iron gutters and terra cotta hip and ridge tiles. No documentation has been uncovered to explain the disparity; rehabilitation after the 1921 fire is a possible time frame when a change may have occurred.

EASTERN ELEVATION

The basic form of the administration building is regular and symmetrical, although an overall appearance of asymmetry prevails due to the four- and two-story towers engaged at the front corners of the façade. Windows throughout the administration building contain of one-over-one, double-hung sash with fixed transom lights and roughly hewn blue sandstone lintels and sills; first story windows feature protective iron bars. The sash measure 18" x 30" and transoms are 18" x 12" at all locations of the main block. Sills measure 7.5" in height and project 1" from the



Whitehall Armory. Source: NYS Military Museum

face of the wall, except at the first floor where the 10" corbelled belt course doubles as a sill; lintels measure 13" in height and are flush with the wall. Brick mullions between the window pairs are 16" wide. Cellar windows align symmetrically and consist of 18" x 18" fixed transoms.

The main block of the administration building consists of a symmetrical,

five-bay-wide, center hall façade, the middle three bays of which are distinguished by a two-story, arcaded pavilion with brick piers and rusticated stone voussoirs. A hip-roofed, brick dormer surmounts the pavilion; the tall, narrow, undecorated quintuple single-light window grouping is consistent with Richardsonian Romanesque massing. Each single light measures 10" x 40" and is topped by a 10" x 8" transom and are separated by 8" brick mullions. A continuous 8" stone lintel crosses the window tops; the sill is a continuous 7.5" stone band. A stone balcony with wrought iron railings is sheltered under the second story of the arcade (original plans called for a 4" square stone balustrade which appears to have been removed.) The first- and second-story of the pavilion's façade are defined by three corbeled brick courses and a 5" stone belt course. The central entrance features double massive, paneled oak doors surmounted by a multi-paned transom light.

The battered walls of the raised basement and first story of the octagonal, four-story southeast corner tower are of rusticated stone construction; the upper two and one half stories are of brick. Each face of the octagon is identical. At the basement, single light 18" x 18" transoms are decorated with 7.5" sills and 13" lintels that blend with the bluestone façade. First- and second-story windows are tall, narrow rectangular openings with stone trim. At each location, the one-over-one, double-hung window sash measure 18" x 30" and transoms are 18" x 12". Sills measure 7.5" in height and project 1" from the face of the wall, except at the second floor where the 10" corbelled belt course doubles as a sill. The lintel of the second-story window measures 13" in height and is recessed 2" within the plane of the wall, along with the brick wall, between second- and third-story windows. The third-story windows consist of tall, narrow round-arched openings and stone sills. As with the windows below, the one-over-one, double-hung window sash measure 18" x 30"; the stone sill measures 7.5" and projects an inch out from the face of the wall. The fixed radial transom lights are 18" x 20" surmounted by narrow, round brick arches; the outermost rowlock course projects ½".

The upper half story consists of a castellated brick parapet with a machicolated cornice and stone belt course. Above the third-story windows on each panel, there is a pair of symmetrical, recessed brick panels, 8" wide x 24" tall x 12" wide, spaced 20" apart. The machicolation starts above; three projections per panel, composed of corbelled brick, 4' tall x 16" wide x 12" total projection, each spaced 12" apart. A 10" tall sandstone belt course tops the projections, and tight brick radial arches above each opening through to the inside face of the wall. Above the tight brick arches, flush to the wall, are single recessed brick panels, each 20" tall x 8" wide x 12" deep. At the crenelated parapet, each panel of the battlements is comprised of a pair of embrasures, each 16" wide divided by a center merlon 2'4" wide and 3' tall. Corner merlons measure 2'4" wide on the face and 3' tall. Sandstone sills extend 2" into brickwork and project 1.5" over the wall, both inside and outside, drip edge on each side. The bottom of each crenel pitches down from outside to inside. At the top of each merlon the brick is corbelled out ¾"; the 4" Indiana limestone coping projects 1.5" over the inside face of the wall and over the projecting brick course outside. At the embrasure, the coping projects 1" over the brickwork of the merlons, and pitches down 2" from outside.



Tonawanda Armory. Source: NYS Military Museum

The round, two story northeast corner tower rests on a battered, rusticated stone foundation. In terms of proportion, the northeast tower is short and slender and in sharp contrast to the tall, beefy southeast tower. One-over-one, double-hung windows with stone sills and lintels are regularly spaced around the first- and second-stories. The sash measure 10" x 30" and transoms are 10" x 12" at all locations of this tower. Sills measure 7.5" in height and project 1" from the face of the wall, except at the first floor where the 10" corbelled belt course doubles as a sill; lintels measure 13" in height and are flush with the wall. Cellar windows align symmetrically and consist of 10" x 18" fixed transoms. The tower is surmounted by a conical roof that returns to the main roof of the administration building.

SOUTHERN ELEVATION

At the first- and second-stories of the administration building, one-over-one, double-hung windows with fixed transoms with stone sills and lintels are asymmetrically spaced across three bays. First floor windows are covered with protective iron bars. At the cellar level, the left and



Hornell Armory. Source: NYS Military Museum

middle bays each have pairs of 18" x 18" fixed transoms with a continuous 13" stone lintel and 4" sill, all flush with the unbattered stone foundation. The right side bay has a single transom of identical dimension and decoration. The top of the water table is a 10" stone belt course. This belt course forms the sill of the first-story windows. The left bay is comprised of the fenestration that serves the inside stairwell. A pair of double-hung,

one-over-one windows with 18" x 20" lights are separated by a 16" brick mullion and 13" continuous stone lintel. At the center bay, there is a pair of double-hung, one-over-one windows with 18" x 30" lights, with fixed 18" x 12" transoms above each, separated by a 16" brick mullion and 13" continuous stone lintel. At the right side bay, there is a single double-hung, one-over-one window with 18" x 30" lights, with fixed 18" x 12" transom and 13" stone lintel.

A hip-roofed, brick dormer surmounts the roof; the tall, narrow, undecorated triple single-light window grouping is consistent with Richardsonian Romanesque massing. Each single light measures 10" x 40" and is topped by a 10" x 8" transom and separated by 8" brick mullions. A continuous 8" stone lintel crosses the window tops; the sill is a continuous 7.5" stone band.

A short, one and one-half-story round tower, similar in proportion to the northeast tower, appears to be engaged in the southwest corner of the administration building but is actually attached to the drill shed. The foundation is sandstone laid in ashlar pattern, battered 1/2" per foot. The cellar

window is a fixed, 10" x 18" transom with 4" sill and 13" lintel. A continuous, 10" sandstone band defines the water table. One-over-one, double-hung windows with single light, 10" x 30" sash and 10" x 12" transoms are spaced evenly around the first-story, divided by 24" brick mullions. The sandstone water table is the sill for these windows and a continuous stone lintel course tops the first-story fenestration. A 7.5" sandstone belt course forms the sills of the fixed 10" x 36" transom windows of the top half story. Brick mullions are 24" wide and the individual, stone lintels are 8". The tower is surmounted by a conical slate roof with radial, copper gutters at the eaves.

The eight-bay-deep drill shed, oriented on an east-west axis, is attached to the rear (western elevation) of the administration building. Each bay is articulated by brick buttresses with limestone caps and features three tall, narrow ten-light steel windows with individual stone sills and bricked over steel lintels. The top and bottom pairs of lights open hopper-style. All windows are covered with protective iron bars. The overall dimensions of these windows are 10" x 60".



Seventh Regiment Armory, NYC. Source: Author

The foundation below the 8" sandstone water table is ashlar laid sandstone.

Each bay has a 10" x 18" fixed transom cellar window with 4" sill and 8" lintel.

The fourth bay from the east was altered to add double doors and steel stairs. The cornice is an incrementally-stepped, brick corbel with copper gutters at the eaves. Pennsylvania slate covers the roof with a copper rolled ridge flashing.

A large, round, one and one-half-story squat tower with a low-pitched conical roof is attached to the southwest corner of the drill shed. The foundation extends

above the first floor level to approximately 12 feet above grade and is composed of ashlar laid sandstone battered 1/2" per foot. Pairs of narrow ten-light steel windows with continuous 10" sandstone sills (which forms the water table) and bricked, steel lintels are regularly spaced around the first-story. The top and bottom pairs of lights open hopper-style. The overall dimensions of these windows are 12" x 84". A 7.5" sandstone belt course forms the sills of the 10" x 36" fixed transom windows of the top half story. The windows are laid out in triple, with 16" brick mullions and continuous, 8" stone lintels. The conical Pennsylvania slate roof has radial, copper gutters at the eaves.

WESTERN ELEVATION

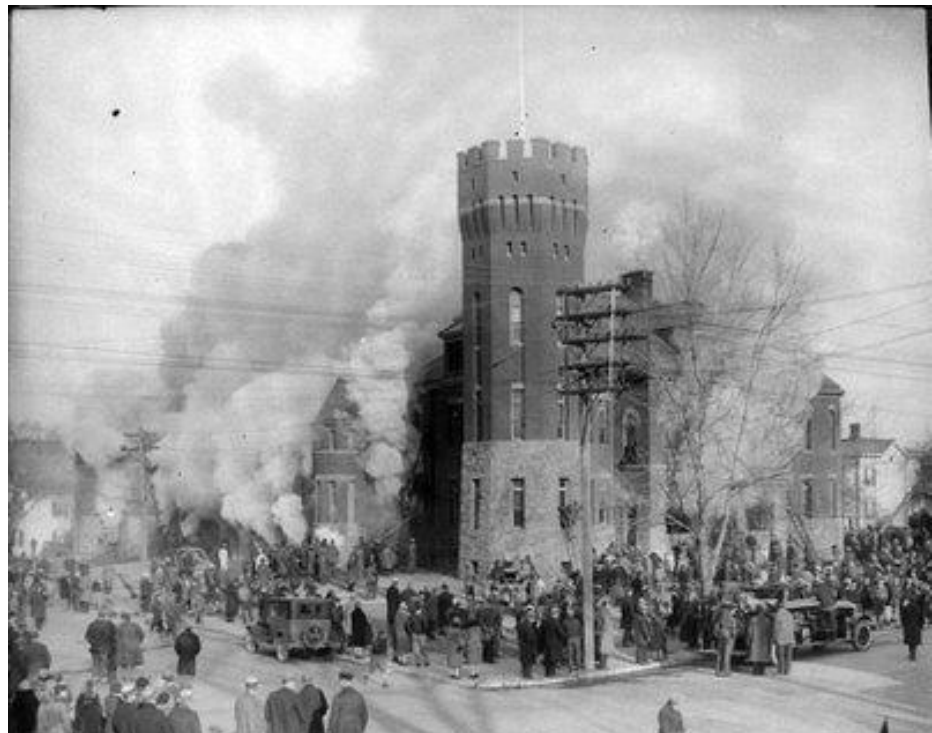
A large, rectangular brick garage addition is located at the western end of the drill shed. It is flat with a ballast roof system. Original, first-story windows were bricked closed in 1957 when this

addition was erected. The western, gable end of the drill shed is seven-bay-wide; limestone-capped buttresses top 24" wide brick buttresses and a copper sheet metal cornice decorates the rakes of the roof. At the second story, two bays have triple sets of tall, narrow, ten-light steel windows with individual 7.5" sandstone sills. The top and bottom pairs of lights open hopper-style. The windows measure 10" x 56" each and are topped by bricked over steel lintels. A massive brick, limestone capped chimney stack dominates the roof line above the apex of the gable end.

NORTHERN ELEVATION

The northern elevation, like the southern elevation, is an eight-bay-deep drill shed, oriented on an east-west axis, attached to the rear (western elevation) of the administration building. Each

bay is articulated by brick buttresses with limestone caps and features three tall, narrow ten-light steel windows with individual stone sills and bricked over steel lintels. The top and bottom pairs of lights open hopper-style. All windows are covered with protective iron bars. The overall dimensions of these windows are 10" x 60". The foundation below the 8" sandstone water table is rubble



The fire of New Year's Eve 1928. Source: Hudson Area Library

laid native limestone. Each bay has a 10" x 18" fixed transom cellar window with 4" sill and 8" sandstone lintel. The fourth bay from the east was altered to add double doors and steel stairs. The cornice is an incrementally-stepped, brick corbel with copper gutters at the eaves. Pennsylvania slate covers the roof with a copper rolled ridge flashing. The bays of the drill shed differ from the rest of the structure in that the foundation is composed of limestone rubble, unlike the ashlar sandstone at other locations.

The foundation of the three bay administration building is ashlar laid sandstone. The easternmost bay has a single cellar window; center and western bays have pairs. The cellar windows are fixed 18" x 18" transoms with 4" sandstone sills and 13" sandstone lintels. 16" brick mullions separate the pairs. At the first- and second-stories of the administration building,

the easternmost bay has a one-over-one, double-hung single light window with transom while the center and western bays have pairs of windows. The sash measure 18" x 30" and transoms are 18" x 12"; sandstone sills and lintels are 10" and 13" respectively. The sill at this level is also the water table belt course. The fenestration of the second-story is identical to the first-story with one exception: the sandstone sills are individual to the window openings and measure 7.5" each. A hip-roofed, brick dormer surmounts the center of the roof line; the dormer fenestration is composed of a pair of one-over-one, double-hung windows, not original to construction. Each single light sash measures 16" x 24". The roof is sheathed with Pennsylvania slate roofing tiles; hips and ridges are covered with a copper, rolled ridge flashing at all locations of the slate roof. At the roofline, just below the ridge on this elevation, are two large, copper globe ventilators.

INTERIOR DESCRIPTION

The interior of the armory is, overall, in remarkably good condition. While maintenance has been deferred in some portions of the administration building, the majority of the space and the massive drill shed have been well-kept. Throughout the administration building, the same molding profiles are repeated in each room. Like the moldings, the doors and transoms above are all golden oak. Like molding profiles, the single-light sash and surrounding casement are also uniform. These details are highlighted in a schedule on the following page.



Armories were often host to grand social events for their members. Source: Will Kimball

The four grand fireplaces were not included in the administration building to provide heat from a conventional standpoint—boilers have heated radiators throughout the structure since its construction. Armories were clubhouses for their members, many of whom were members of the middle- and upper-classes; they were a gathering place for social and recreational

purposes. As the Gilded Age gave way to the Progressive Era institutional structures, such as armories, often enjoyed the grand design, scale and decoration afforded to residential and commercial structures.

Molding Profile Schedule



Picture frame
molding

3.5" x 1.625"



Chair rail
molding

4" x 1"



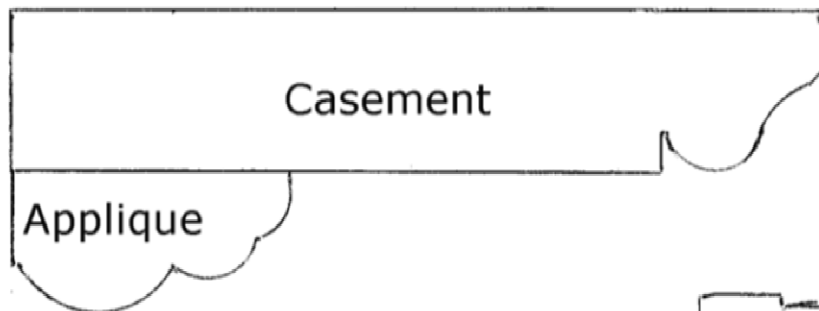
Baseboard
molding

8" x 1.5"

Scale:

1"

Window Schedule

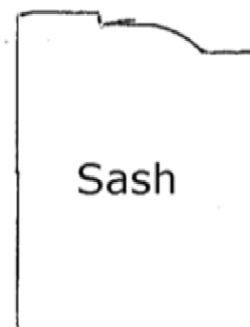


Casement

Applique

Scale:

1"



Sash

INTERIOR DESCRIPTION – BASEMENT

Room B01 Stair hall



Source: Author

The stair hallway in the basement is a largely utilitarian space, dominated by circuit breakers, steel doors and stairs. Several doorways enter adjoining spaces, the alarm room, the ammunition storage area, and the shooting range.



Source: Author

Detail of the terra cotta tile floor system below the drill shed, above.

Room B02 Alarm closet



Source: Author

The alarm closet is located under the stairs and includes a battery backup system.

Room B03 Ammunition storage closet



Source: Author

Munitions were stored behind two sets of steel doors in this forward room, beneath the arcaded pavilion, above.

Room B04 Range



Source: Author

The indoor range has three custom pulleys and a steel backing with sanded base.

Room B05 Kitchen



Source: Author

The former kitchen space is dominated by an 80 gallon water heater. The room has been largely stripped of any appliances or similar culinary equipment.

Room B06 Bathroom



Source: Author

This bathroom was constructed in 1962. See plans in the appendix.

Room B07 Shower area



Source: Author

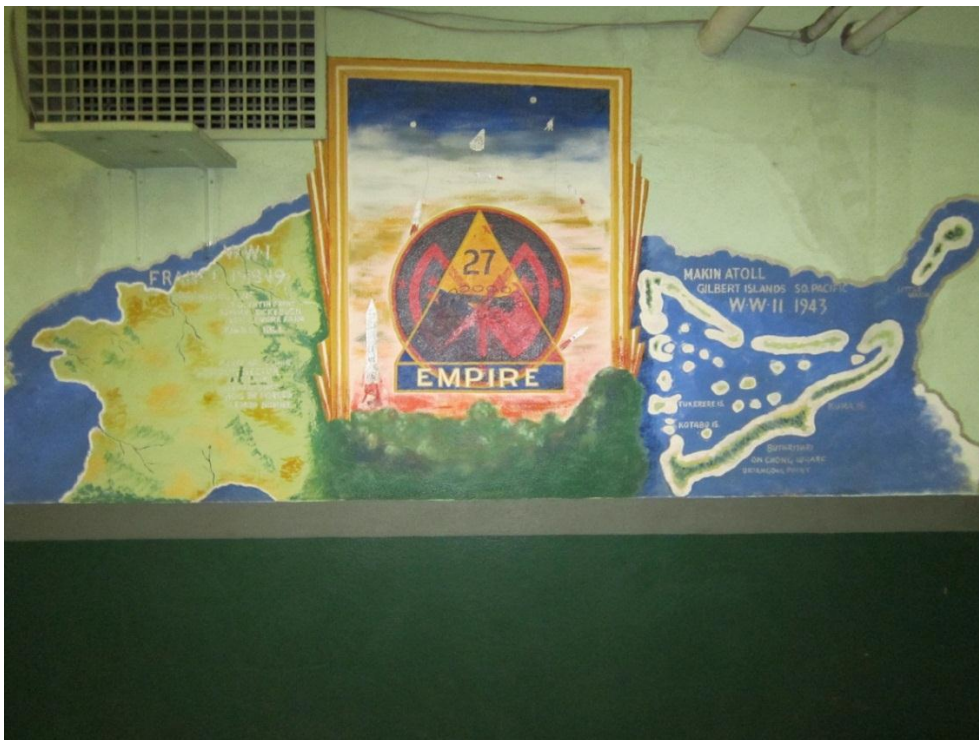
The shower space was updated and constructed in 1962. See plans in the appendix with details specific to updates and mechanical systems.

Room B08 Mess hall



Source: Author

The mess hall also served as the fallout shelter and has hand painted murals on the walls.



Source: Author

On the western wall, a painting depicts the regalia of the 27th Engineers, flanked by campaign maps of France from WW I and the South Pacific during WW II.



Source: Author

'Virgin River, Utah National Park''



Source: Author

The mess hall has three hand painted murals. On the western wall, a painting depicts the regalia of the 27th Engineers, flanked by campaign maps of France from WW I and the South Pacific during WW II. The northern wall has two murals, depicted above. One is titled 'Virgin River, Utah National Park' and the other is 'Mirror Lake Cascade Park, Oregon.'

Room B09 Boiler room



Source: Author



Source: Author

The boiler room is dominated by two massive, Weil-McLain oil burners. During the winter, the furnaces burn seventeen gallons of oil per hour.

Room B10 Hall



Source: Author

The main hall is largely empty, save for some stored materials.

Room B11 Work shop



Source: Author

The former work shop is dominated by a table and custom built cabinetry.

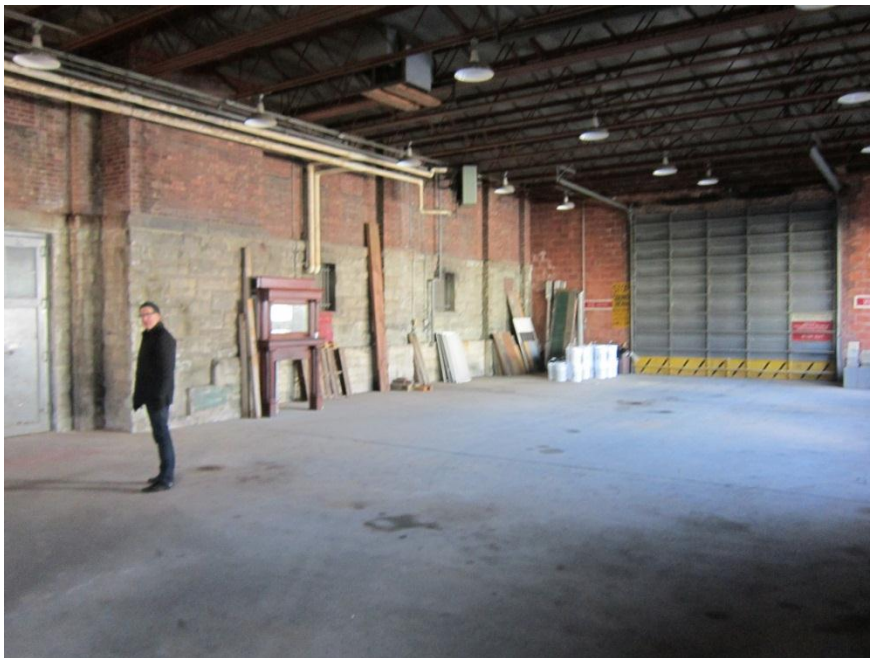
Room B12 Coal bin



Source: Author

The coal bin has been unused since after 1962, when it was identified on plans as such. It can be surmised that the existing, oil-fed burners were installed at some time after.

Room B13 Garage



Source: Author

The motor vehicle storage addition was added at the western elevation (rear of the building) in 1957. See plans in the appendix.

Room B14 Electrical service



Source: Author

The 400 amp electrical service is located in the basement below the northeast tower.

INTERIOR DESCRIPTION – FIRST FLOOR

Room 101 Vestibule



Source: Author



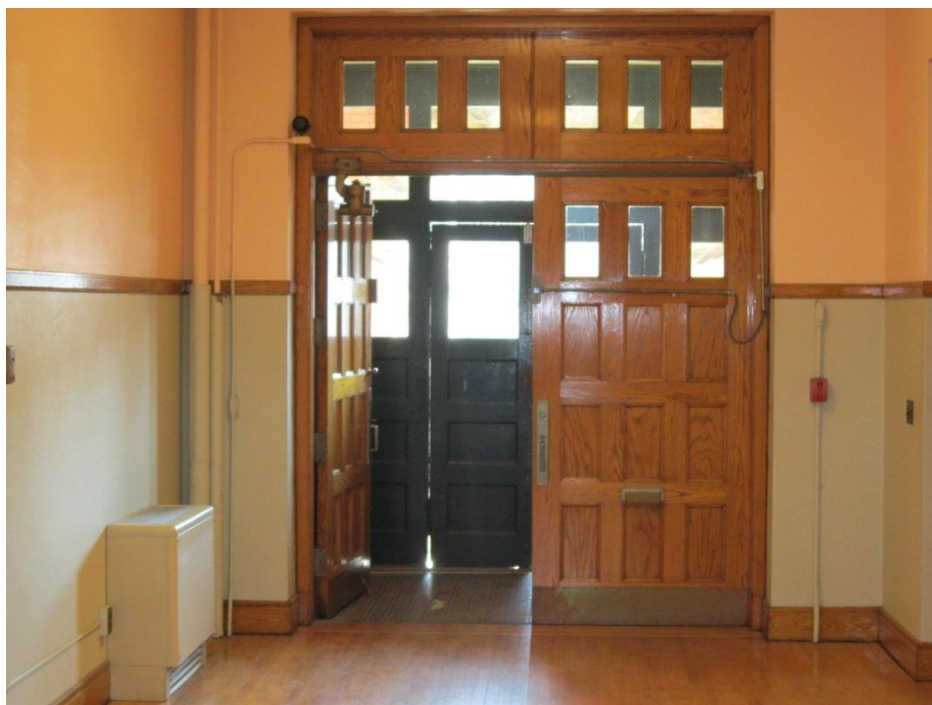
Source: Author

The vestibule is defined by heavy oak, inner doors with fixed transoms, a tiled floor, and a window for weapons pass through to the armorer's post.

Room 102 Hall



Source: Author



Source: Author

The main hall leads straight to the drill shed. The dominant feature is the pair of heavy oak, twelve paneled doors with fixed three light transoms.

Room 103 North office



Source: Author



Source: Author



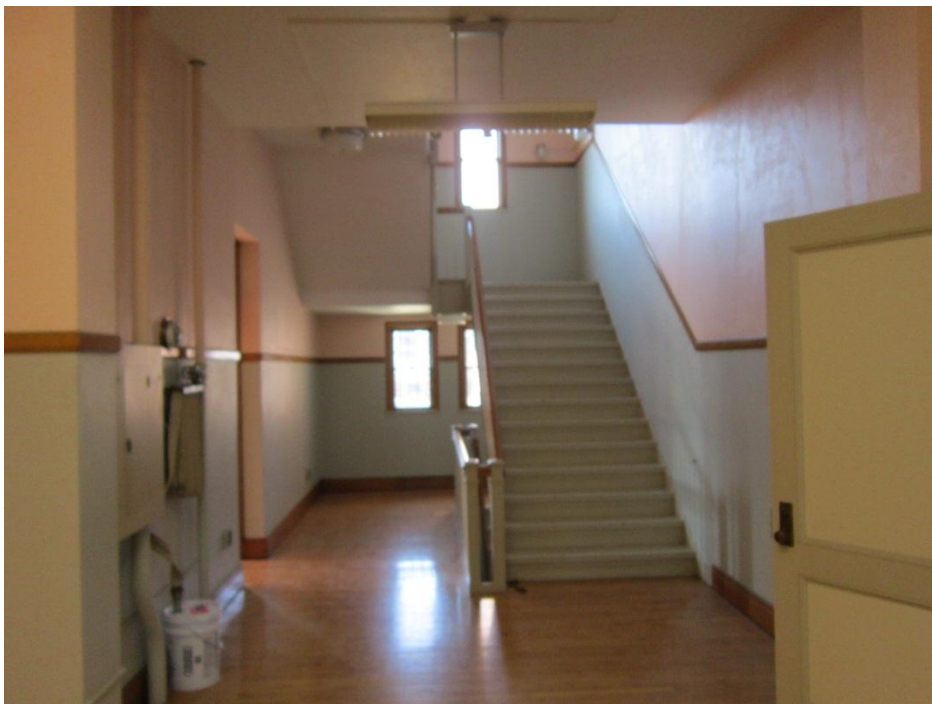
Source: Author



Source: Author

This space is defined by a radial bay that is part of the northeast tower, baseboard, chair rail, and picture moldings, and an ornate fireplace surround, all crafted from oak.

Room 104 Stair hall



Source: Author

Steel stairs lead up to the second floor and down to the basement.

Room 105 Armorer



Source: Author

A split, two paneled oak door and eight light transom define the opening to the armorer's post.

Room 106 South office



Source: Author



Source: Author

This space is defined by a radial bay that is part of the southeast tower, baseboard, chair rail, and picture moldings, and an ornate fireplace surround, all crafted from oak.

Room 107 Locker room



Source: Author

The lockers are gone, but shadows illustrate the dimensions of the now missing lockers.

Room 108 Drill Hall



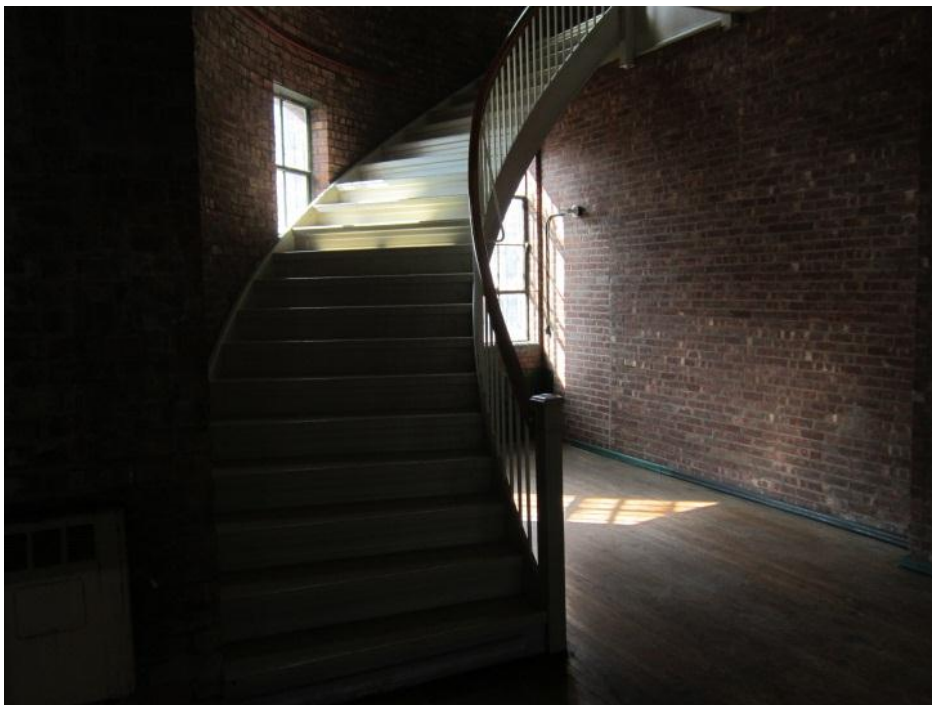
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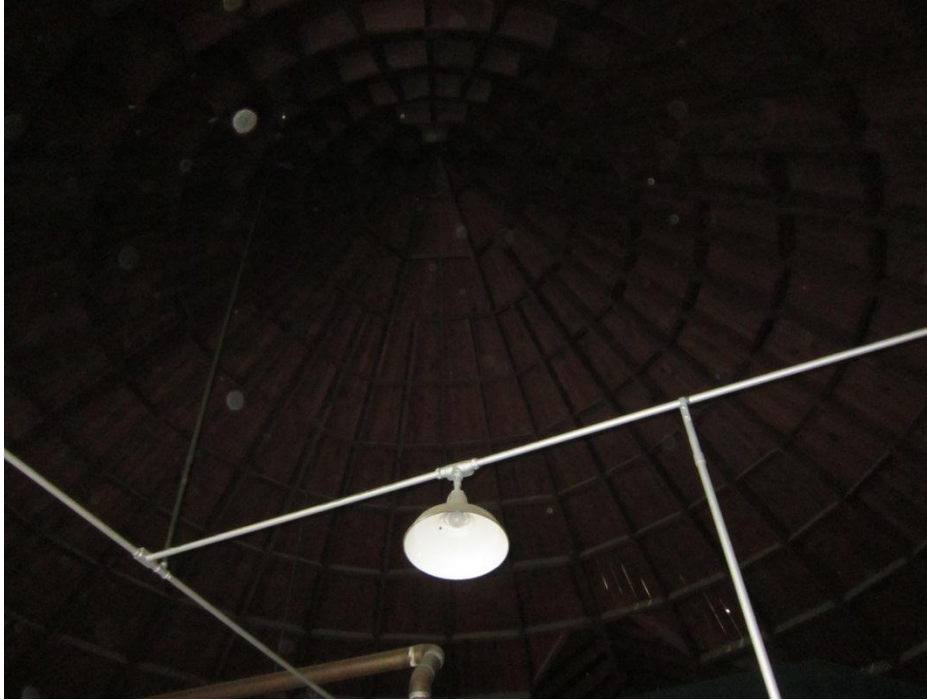
Source: Author



Source: Author



Source: Author



Source: Author

The drill hall is a massive, open space characterized by the steel trusses that make the unobstructed floor plan possible. The balcony at the eastern end is accessed by the stairs in the administration building. Access to the balcony at the western end is gained by the radial, steel staircase in the large turret. The wood floor is painted for a basketball court, a letter H painted at center court. Two sets of double doors provide egress points on either side of the floor.

Room 109 Powder room



Source: Author

Room 110 Ladies room



Source: Author

The powder room and ladies' room were added in 1962 when the sanitation facilities of the Hudson Armory received an overhaul.

INTERIOR DESCRIPTION – SECOND FLOOR

Room 201 Stair hall



Source: Author

The steel stairway has oak handrails. The oak chair rail and baseboard is identical to molding profiles at other locations described.

Room 202 Hall



Source: Author

The second story hall has the same oak chair rail and baseboard trim identical to molding profiles at other locations described. A set of double doors with a segmental transom leads to the balcony.

Room 203 North office



Source: Author



Source: Author



Source: Author



Source: Author

This space is defined by a radial bay that is part of the northeast tower, baseboard, chair rail, and picture moldings, and an ornate fireplace surround, all crafted from oak. The entry to this space differs from others in that entry is gained through a double set of oak, two paneled doors with a fourteen light transom.

Room 204 South office and lockers



Source: Author



Source: Author



Source: Author

This space is defined by a radial bay that is part of the southeast tower, baseboard, chair rail, and picture moldings, and an ornate fireplace surround, all crafted from oak. Handmade, wooden lockers (fine cabinetry) still exist in their original location.

Room 205 Bathroom



Source: Author

The second floor bathroom has marble shower stall and hexagonal tile floor.

Second floor porch



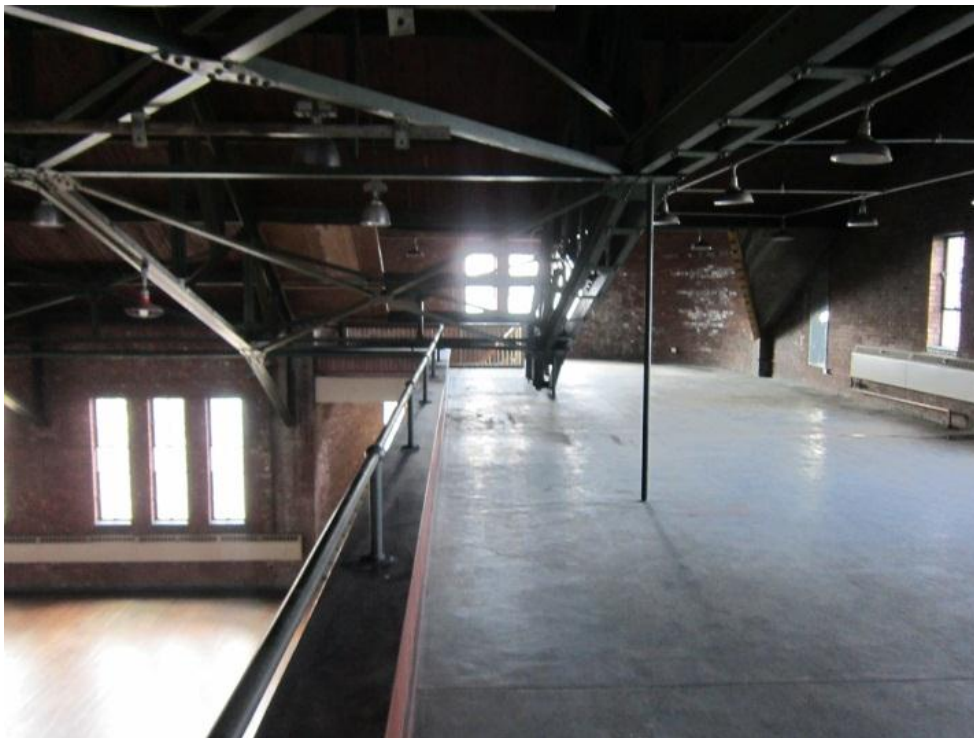
Source: Author



Source: Author

The second floor porch deck is composed of flat-lock soldered sheet metal panels.

Second floor balconies



Source: Author

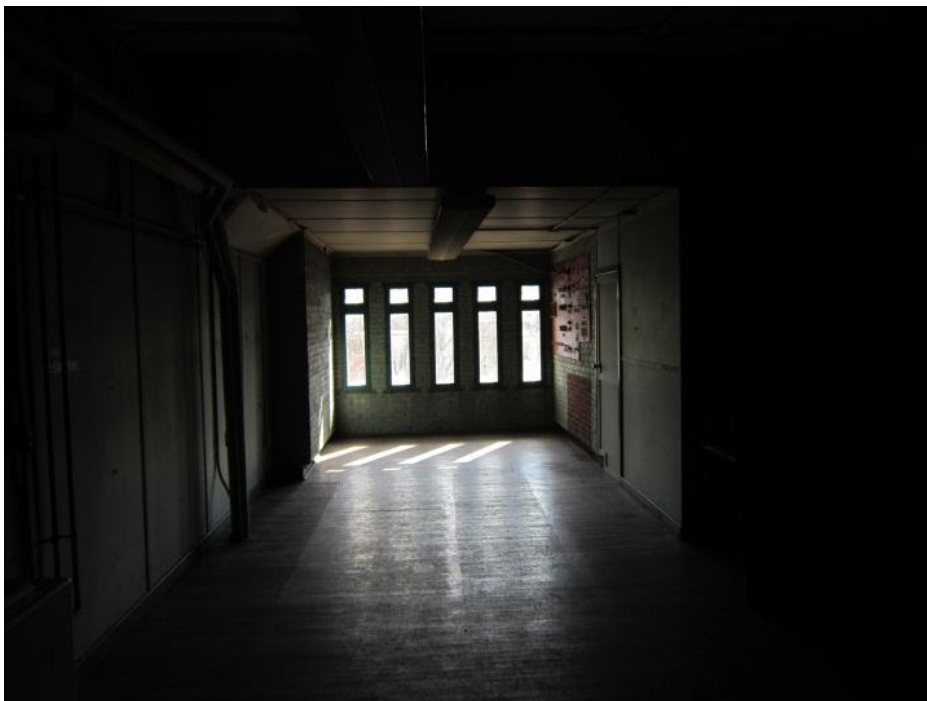


Source: Author

The second floor balconies provide a vantage point from which to view the activities on the floor of the drill hall, below.

INTERIOR DESCRIPTION – ATTIC

Room 301 Main hall



Source: Author



Source: Author

Detail of dormer windows, eastern elevation.



Source: Author

A chart of the corps of engineers' bridge sections, in model form, remains on the wall

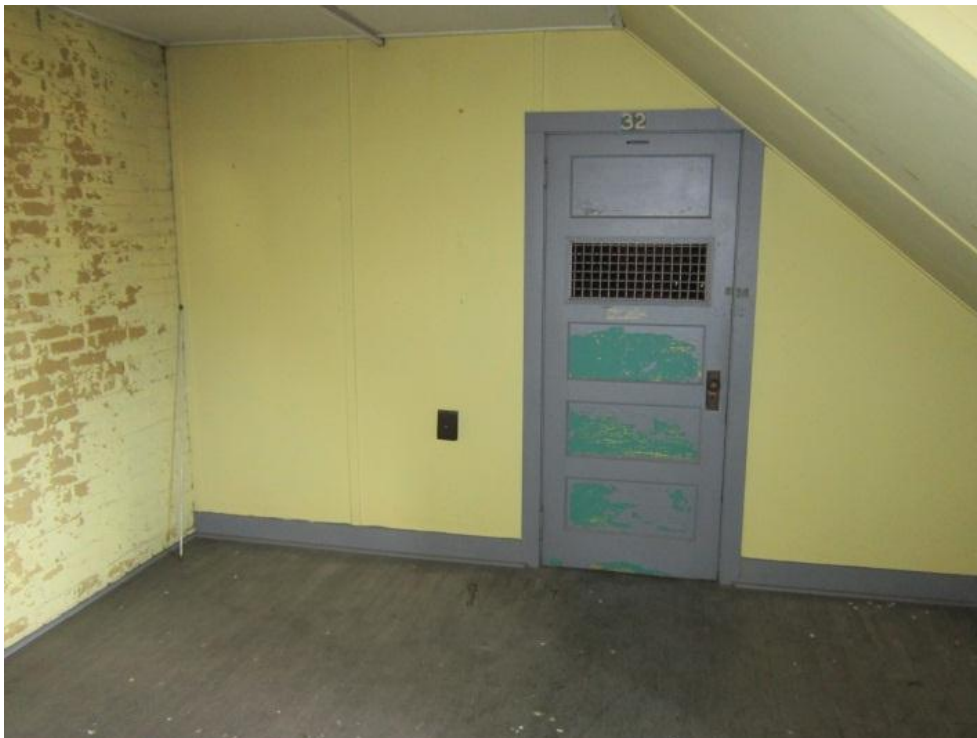
Room 302 Attic space north



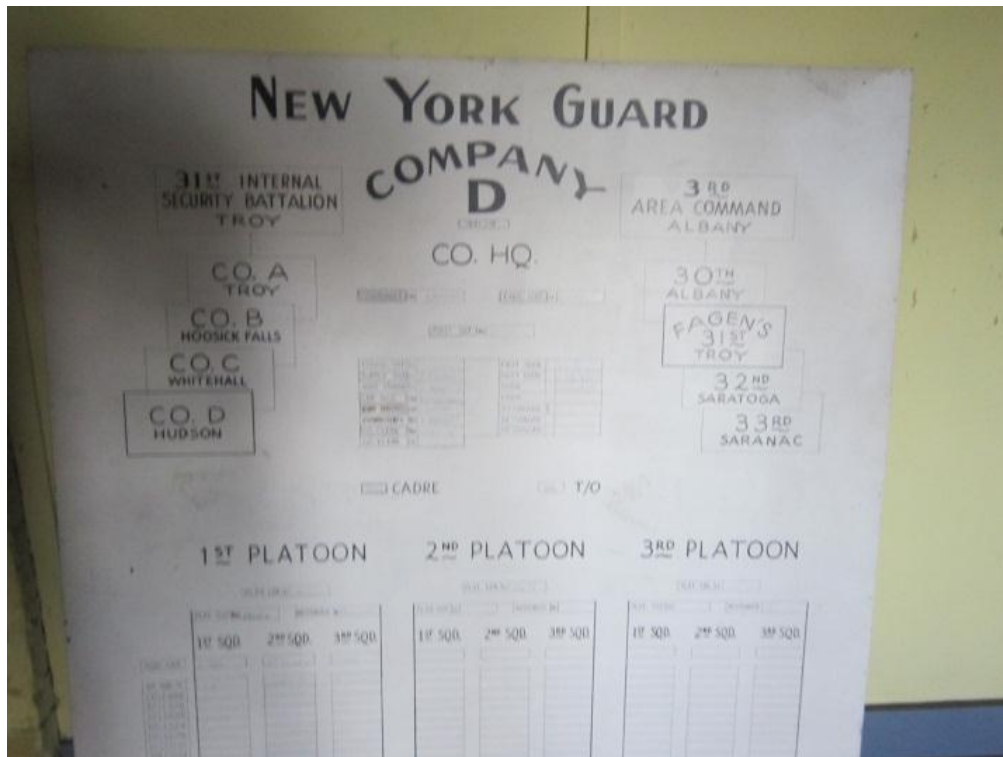
Source: Author

Instead of the Richardsonian Romanesque window massing of the dormers of the eastern and southern elevations, the double hung sash in this space can be removed and derrick used to raise and lower heavy objects.

Room 303 Attic space south



Source: Author



Source: Author

Company D's roster and division chart remains in this attic space.

Room 304 Tower room



Source: Author



Source: Author

This space is characterized by the low, radial door into the room and the radial transoms.



Source: Author

A ladder and hatch lead to the enclosed space, above.

INTERIOR DESCRIPTION – TOWER

Room 401 Interior space



Source: Author

A steep wooden stair leads up to the rooftop of the castellated tower.



Source: Author

THE ARMORY AS A NEW BUILDING TYPE

The term *armory* was introduced in the militia's vocabulary in the 1860's and used almost exclusively after 1870 to describe facilities built or adapted for the sole use of the militia. However, it was not until 1879 when the Seventh Regiment erected its armory in Manhattan's Upper East Side that the term came to define a new, uniquely American building type. Because of its scale, prominence, setting, design and decoration, the Seventh Regiment's armory on Park Avenue was—and still is—regarded as the epitome of the building type.

In general terms, armories built after 1879 were structures that served many purposes, the foremost of which was the headquartering of local militia units. They are all two part buildings: a forward administration structure with attached drill shed to the rear. Many, such as the armory in Hudson, were castellated fortresses whose design was derived from the medieval European, gothic military architecture they sought to emulate. The characteristics of the building type can be divided into four categories:

function; form, layout, and construction; location and setting; and architectural design and decoration.

FUNCTION

Armories served as military facilities, clubhouses and public monuments. As military facilities they served as headquarters for localized units of the state militia. Weapons, munitions, tools and equipment were stored there. The drill sheds afforded a place to train year round, unhampered by weather conditions. And they served as a place to gather in times of emergency. Armories were also clubhouses for their members, many of whom were members of the middle- and upper-classes; they were a gathering place for social and recreational purposes. As public monuments, armories stood as a symbolic (and quite literal) reminder of the government's presence and military might in the community, particularly during the post-Civil War era of labor-capital conflict.



Seventh Regiment. Source: NYS Military Museum

FORM, LAYOUT AND CONSTRUCTION

As far as layout and construction are concerned, armories built after 1879 followed the model and design of the Seventh Regiment: multi-storied forward structures for office and administration with massive drill sheds attached to the rear. All late nineteenth century armories were masonry structures that featured load bearing walls. Aesthetically, the administration

buildings dominated the design and appearance of armories after 1879; functionally, the drill sheds were their reason for being. Practice on the village green was often impeded by weather; the need for a climactically controlled space, year round, was the reason for the advent of the new building type.

The construction of the drill sheds, often tens of thousands of square feet of open space, required the use of state of the art engineering and technology, particularly the use of enormous steel trusses to support the vast roofs of the sheds. The inspiration for the massive open floor spaces was the relatively new train shed building type (Grand Central Depot, New York, 1871) and the exhibition hall (Centennial Exhibition, Philadelphia, 1876.) In the Seventh Regiment's and all extant, subsequent drill sheds, the truss work remained exposed, a hallmark feature of the armory building type.



The 23rd Separate Company, June 1898. Source: Hudson Area Library

LOCATION AND SETTING

Armories were erected as near to the center of their communities as possible. They were a daily reminder of the government's military strength and presence, particularly in times of unrest when they reassured the law

abiding citizens and were a foreboding symbol to those who would create disturbances. And members did not want to travel to the outskirts of town for drill practice or mandatory meetings, or a social event at the armory.

ARCHITECTURAL DESIGN AND DECORATION

The design of the Seventh Regiment and all armories erected after 1879 was most influenced by the architecture of European castles and forts built between the 12th and 15th centuries. Like the structures that influenced their design, armories featured towers with battlements and crenellated parapets, battered masonry walls, tall, narrow windows with steel bars, and gated portcullises and sally ports. But these were not for aesthetic purposes alone. The armory was a fortress in

times of unrest that could withstand a siege, and its militia could fire upon rioters from those towers and through those windows.

HISTORY OF BUILDING, OCCUPANTS AND ARCHITECT

THE BUILDING – THE ARMORY IN HUDSON

Twenty years after the formation of the 23rd Separate Company on the 24th of May of 1878, plans were made to erect a new company-sized armory in the City of Hudson. The new armory was designed by architect Isaac G. Perry and is remarkably similar to his other armories in Whitehall, Tonawanda and Ogdensburg, all of which are listed on the National Register of Historic Places. The armory cost \$6,000 to build and was paid for by Columbia County. Prior to the construction of the new armory, the rear of the courthouse was used for meetings and administrative purposes; the unit drilled on Washington Park. The administration building most closely resembles his armory in Hornell; the drill shed there, however, is perpendicular rather than at the rear. The Hudson armory features a raised and battered stone foundation, a tripartite, arcaded entrance pavilion and a four story tower topped with a crenelated parapet. A shorter tower with a conical roof creates an asymmetrical façade typical of Perry’s armory designs. A major fire on December 31, 1928, destroyed much of the interior; repairs were completed in 1930.

THE OCCUPANTS – MILITARY UNITS STATIONED IN THE ARMORY

The armory in Hudson, New York, was home to several company-sized units in what is today the New York Army National Guard. These units were engaged in conflicts that included the Spanish American War, World War I and World War II. In the wake of the Civil War, the office of the New York State Adjutant General undertook an ambitious reorganization of the state’s militia designed to achieve more centralized control over training, supply and mobilization. Among the new units of the New York National Guard was the 23rd Separate Company at Hudson. This unit replaced a local militia company and was organized in 1878. This unit was named “Cowles Guards” after Colonel David S. Cowles, a native son of Hudson killed in the Civil War.



Colonel David Smith Cowles. Source: Hudson Area Library

David Smith Cowles was born in Hudson in 1817. The son of a Congregationalist preacher and educated at Yale, he entered the practice of law and eventually established his own practice. Cowles served as district attorney in Columbia County for three terms. When war erupted in 1861, he felt compelled to volunteer and served as a Colonel in the 128th Regiment. On May 27, 1863, at the Battle of Port Hudson, he was killed after leading his troops against a rebel surge, preventing the lines from being overrun. His death and subsequent funeral were well documented in the media and he remains a celebrated figure in the history of the City of Hudson.

The 23rd Separate Company retained its unit designation until 1897. The armory was also home to Nucleus Co. I of the 203rd New York Volunteers during the Spanish American War. In 1899, Co. D of the 1st Infantry Regiment was organized and housed at the Hudson Armory. The armory's men received local recognition in 1900 for enforcement of a quarantine order during a smallpox outbreak in nearby Stockport. This unit was reorganized in 1905 as Co. F of the 10th



New York National Guardsmen. Source: NYS Military Museum

Infantry Regiment. The unit was called out during the Mexican Border Crisis of June 1916. In February of 1917, the unit was dispatched to the Catskills to protect the reservoirs that supplied New York City's drinking water after a German plot was uncovered to poison it. In July, the unit was called into federal service and sent to northern France. The unit saw action there and was involved in breaking the Hindenburg Line in 1918. In 1940, the unit was reassigned to the 106th Infantry

Regiment and sent to the South Pacific. On November 20, 1943, the United States Army and 2nd Marine Division landed on Makin and Tarawa, initiating the Battles of Makin and Tarawa, in which the Japanese were defeated. The Gilbert Islands were then used to support the invasion of the Marshall Islands in February 1944. The final unit to call the Hudson Armory home was Co. B of the 152nd Engineers, from 1961 until the late 1970's when the State decommissioned the armory; it has remained in private ownership since.

THE ARCHITECT – ISAAC G. PERRY (1822-1904)

Born in Bennington, Vermont, in 1822, Isaac Gale Perry was raised and educated in Keeseville, New York, where his parents had relocated in 1829. Between 1832 and 1854 he completed an apprenticeship and entered into partnership with his father, Seneca Perry, a shipwright turned carpenter. By 1847, Seneca Perry and Son were advertising locally as carpenter-joiners who

undertook masonry work. The Perrys were well known for their skills at constructing spiral staircases, and the younger Perry, according to one biographer, earned a local reputation as an architect before leaving Keeseville.

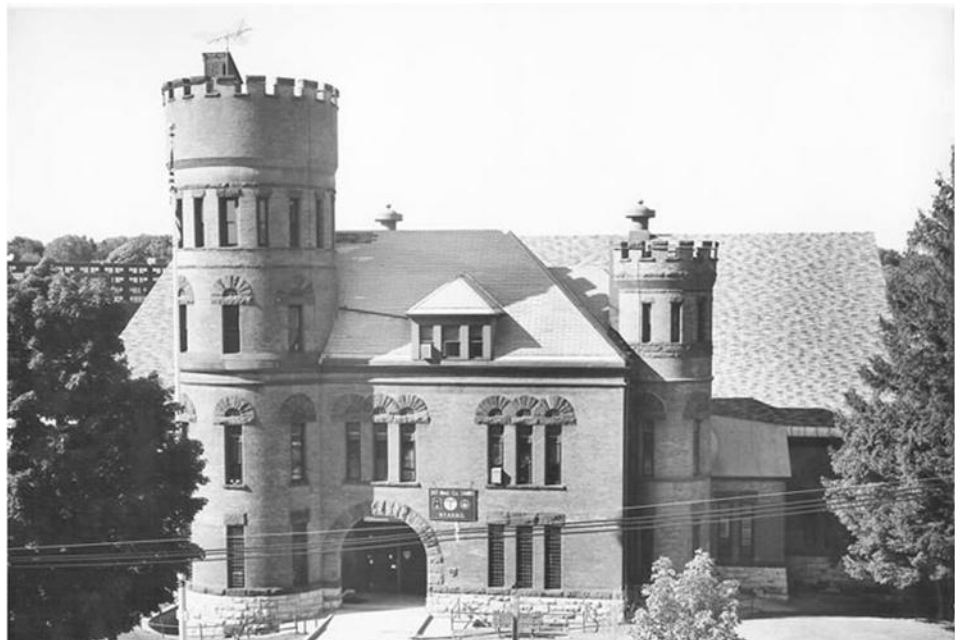
Isaac Perry's architectural work in Keeseville is not well documented, but it is likely that the Emma Peale residence, called "Rembrandt Hall" (1851), a Gothic Revival-style Downingesque cottage that contains a spiral staircase by the Perrys, is an early design. By 1852, Perry relocated to New York to apprentice in the office of architect Thomas R. Jackson (1826-1901). Jackson, who migrated from England as a child, rose to the position of head draftsman in the office of Richard Upjohn (1802-1872). The New York State Inebriate Asylum (1864) was the first major project designed and constructed by Perry, and marked the turning point in his architectural career. Perry's inexperience is evident in Turner's account of the building's design. Perry later recalled that he

penciled the plans with the assistance of his wife, Lucretia Gibson Perry. He also appears to have been assisted by Peter Bonnett Wight (1838-1925), the head draftsman in Jackson's firm, but Wight's role in the project is not well documented.

The First National Bank of Oxford Building, was

constructed in 1894 in the Richardsonian Romanesque style, designed by Perry and built by James M. Wright of Binghamton, New York. The Clerk's Building of the Orleans County Courthouse was constructed in the High Victorian Gothic style in 1882-3. It forms a part of the Orleans County Courthouse Historic District in the Village of Albion. He also designed the Broome County Courthouse, built in 1897-1898. The Monday Afternoon Club, located at 191 Court St., Binghamton, was built by Perry in the Second Empire style. A 21-room, Queen Anne Victorian mansion, was built for Colonel General Edward F. Jones in 1867 and is listed on the National Register of Historical Places in the City of Binghamton. At the same time he designed and built the J. Stuart Wells House, listed on the National Register of Historical Places in 2009.

Perry is credited as the architect of about twenty armories in New York State, but supervised, and should possibly be credited for, as many as forty. Many are listed on the National Register



Saratoga Springs Armory. Source: NYS Military Museum

of Historic Places. Perry is considered to have been the first state architect in New York. Governor Grover Cleveland appointed him to oversee construction activities at the state capitol. Perry was commissioned lead architect for the New York State Capitol and served from 1883 to its completion in 1899. He was the third and last architect of the project and designed a dome for the capitol that was never built. Although his official title was "Capitol Commissioner," by the mid- to late 1880s, Perry had oversight responsibility for all state government building programs and he was commonly referred to as the "State Architect." He retired in 1899, and the state legislature officially created the Office of the State Architect that same year.

ALTERNATIVE USES

ADAPTIVE RE-USE OF STRUCTURES

Adaptive reuse deals with the issues of conservation and heritage policies. While old buildings may become unsuitable for their programmatic requirements, as progress in technology, politics and economics moves faster than the built environment, adaptive reuse comes in as a sustainable option for the reclamation of sites. In many situations, the types of buildings most likely to become subjects of adaptive reuse include; industrial buildings, as cities become gentrified and the process of manufacture moves away from city; political buildings, such as palaces and buildings which cannot support current and future visitors of the site; and community buildings such as churches or schools where the use has changed over time.

Adaptive reuse is seen as an effective way of reducing urban sprawl and environmental impact. By reusing an existing structure within a site, the energy required to create these spaces is lessened, as is the material waste that comes from destroying old sites and rebuilding using new materials. Through adaptive reuse old, unoccupied buildings can become suitable sites for many different types of use.

[Model of Seventh Regiment Armory today. Source: ArmoryonPark.org](https://www.armoryonpark.org/)

reuse old, unoccupied buildings can become suitable sites for many different types of use.

CRITERIA TO CONSIDER

While the process of adaptive reuse is a decision often made purely by companies establishing a particular brand or presence, there are often criteria for deciding whether a building should be



conserved and reused or just demolished for the area of land it occupies. Some of these determining criteria include:

- The societal value of a given site; that is the importance of the use of a site to the community or visitors' use;
- The potential for the reuse of a particular site; the physical damage sustained to the site and its support of future use, the character of the existing site in terms of the proposed reuse;
- The historical importance of the site; in terms of both physicality of the street-scape and the area, as well as the site in the community's understand of the past; and,
- The natural ecological conditions of the site; whether the site is suitable climatically or can support the proposed environmental work needed in the site.

ADVANTAGES OF ADAPTIVE REUSE

With the debate of adaptive reuse as a sustainable avenue in the development of key sites, there are many advantages to using certain sites for redevelopment. Some of these advantages include the site's location; in many cases, historical sites are often located in the centers of large cities due to the spatial development of a given area, these buildings can often be heritage-listed and therefore sold as an entity, rather than just for the land that they occupy, which the new tenants then have to retrofit the building for their particular purpose. Older buildings also often have a specific period character through the detailing and joinery of their constructed eras that newer or reconstructed developments lack, in certain cases, such as the hospitality industry; the grand character of a site can influence the feel of their building and are used for maximum potential to enhance the site's physical attractiveness to a client.

BARRIERS TO ADAPTIVE REUSE

As mentioned above, adaptive reuse sometimes isn't the most viable option for all historic sites. For some sites that have been left alone to decay by neglect, the physical damage of the site can render the site unusable both in terms of the cost to repair the damage as well as unsafe by government standards. Sites contaminated by old materials such as asbestos also become unviable for the process of adaptive reuse.

PROVIDING HANDICAP ACCESSIBILITY

Historically, most buildings and landscapes were not designed to be readily accessible for people with disabilities. In recent years, however, emphasis has been placed on preserving historically significant properties, and on making these properties-and the activities within them-more accessible to people with disabilities. With the passage of the Americans with Disabilities Act in 1990, access to properties open to the public is now a civil right. Modifications to historic properties to increase accessibility may be as simple as a small, inexpensive ramp to overcome one entrance step, or may involve changes to exterior and interior features.

A three-step approach is recommended to identify and implement accessibility modifications that will protect the integrity and historic character of historic properties:

- 1) Review the historical significance of the property and identify character-defining features;
- 2) Assess the property's existing and required level of accessibility; and,
- 3) Evaluate accessibility options within a preservation context.



Evaluate accessibility options within a preservation context. Source: AmRamp.com

It is a challenge to evaluate properties thoroughly, to identify the applicable accessibility requirements, to explore alternatives and to implement solutions that provide independent access and are consistent with accepted historic preservation standards. Solutions for accessibility should not destroy a property's significant materials, features and spaces, but should increase accessibility as much as possible.

UPGRADE OF HEATING, VENTILATING AND COOLING SYSTEMS IN HISTORIC BUILDINGS

The successful integration of new systems in historic buildings can be challenging. Meeting modern HVAC requirements for human comfort or installing controlled climates for museum collections or for the operation of complex computer equipment can result in both visual and physical damage to historic resources. Owners of historic buildings must be aware that the final result will involve balancing multiple needs; no perfect heating, ventilating, and air conditioning system exists. In undertaking changes to historic buildings, it is best to have the advice and input of trained professionals who can:

- assess the condition of the historic building,
- evaluate the significant elements that should be preserved or reused,
- prioritize the preservation objectives,
- understand the impact of new interior climate conditions on historic materials
- integrate preservation with mechanical and code requirements,
- maximize the advantages of various new or upgraded mechanical systems,
- understand the visual and physical impact of various installations,
- identify maintenance and monitoring requirements for new or upgraded systems, and,

- plan for the future removal or replacement of the system.

Too often the presumed climate needs of the occupants or collections can be detrimental to the long-term preservation of the building. With a careful balance between the preservation needs of the building and the interior temperature and humidity needs of the occupants, a successful project can result.

EXAMPLES OF RE-PURPOSED ARMORIES

Like many institutional buildings, armories are among the best examples of sustainable structures—brick walls, stone foundations, slate roofs—they were built to last. And the vast, open drill sheds create opportunities not afforded in most interior spaces. Throughout Pennsylvania, armories in Pottstown, Scranton, Wilkes-Barre, Lancaster, Harrisburg, and York have been converted into affordable housing. The arsenal, a close cousin of the armory building type, in Rochester was converted first to a convention hall, then an academy, and is now a thriving theatre. The Seventh Regiment's flagship armory in NYC is now a re-purposed, mixed use structure that houses offices, studios, and galleries. Just as it was a model for armories at the turn of the century, the Seventh Regiment—again—sets the benchmark for armories in the new millennium.

INVESTIGATION OF BUILDING SYSTEMS

CONTEXT

Systems of utility and convenience were closely scrutinized during investigation. All historic buildings inhabited and used by people reveal some association, at the very minimum, with the necessities of lighting, climate control, water, food preparation, and waste removal. Later installations in a building may include communication, hygiene, food storage, security, and lightning protection systems. Although research into the social uses of rooms and their furnishings has inspired many new, parallel research into how people actually carried out the most mundane tasks of everyday life has been fairly neglected. Utility and convenience systems are most prone to alteration and upgrading and, at the same time, less apt to be preserved, documented or re-used. Understanding the history or use of a building, and the history of systems technology, can help predict the physical evidence that might be found, and what it will look like after it is found.

SUMMARY

This HSR evaluates and investigates three internal systems: structural, electrical and mechanical. The structural portion will evaluate the masonry foundation and walls, wood joists, beams and rafters, and the steel beams and trusses. The electrical section will examine original (where possible) and extant components of the electrical system in the armory. Finally, the

mechanical systems investigation will look closely at the heating, ventilating and plumbing components of the building and alterations, improvements and upgrades to each.

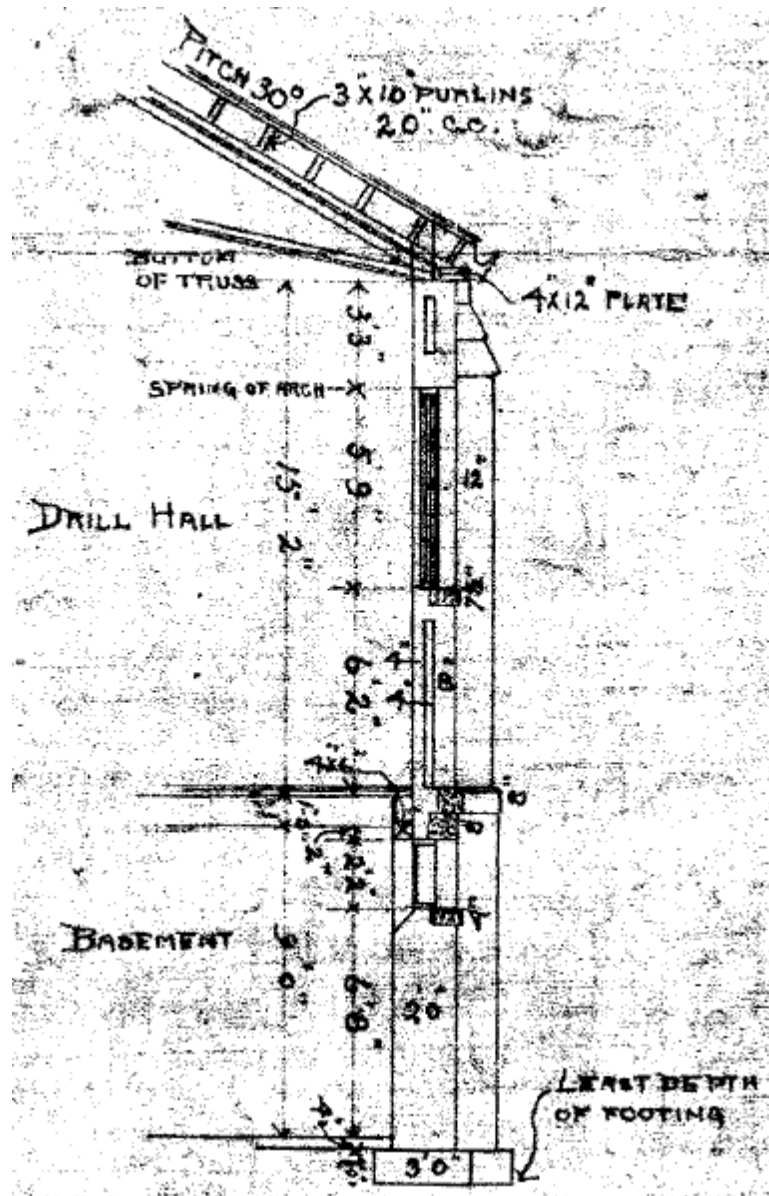
STRUCTURAL SYSTEMS INVESTIGATION

BUILDING STRUCTURE

Like all extant armories in New York State that were erected after 1879, the Hudson armory is comprised of structural masonry. Battered sandstone (native bluestone) walls comprise the foundation up to the water table. According to the original plans, all concrete footings are 12" thick and 36" wide. Foundation walls in the administration building and drill shed sections are 24" thick blue sandstone set in an ashlar pattern and capped with an 8" thick blue sandstone belt course. The brick walls of both sections, at four wythes thick (16"), are load bearing. The dark red bricks that

comprise the armory walls are all relatively uniform $7\frac{5}{8}" \times 3\frac{5}{8}" \times 2\frac{1}{4}"$ in size and laid in "Common" or "American" bond Five courses of stretchers, one course of headers. Mortar joints are generally $\frac{3}{8}"$ thick, as tight as $\frac{1}{4}"$ in some limited locations and as thick as $\frac{1}{2}"$ elsewhere.

In the basement, beneath the tiled front porch and tiled vestibule, 6" – $12\frac{1}{4}"$ # I beams perpendicular to the front façade support cement slabs. Under the administration building, 3" x 12" joists, set 12" on center, run parallel to the front of the building. Under the drill shed, 20" x 20" x 9' tall brick piers support 10" x 12" steel girders that run perpendicular to the front of the armory. Across the top of the girders, 3" x 12" joists, set 12" on center, span the width of the drill shed. At the rear end, beyond the boiler room, 2'8" x 2'8" x 9' tall brick piers support the



Section from 1897 drawings of drill shed.

Source: Galvan Foundation

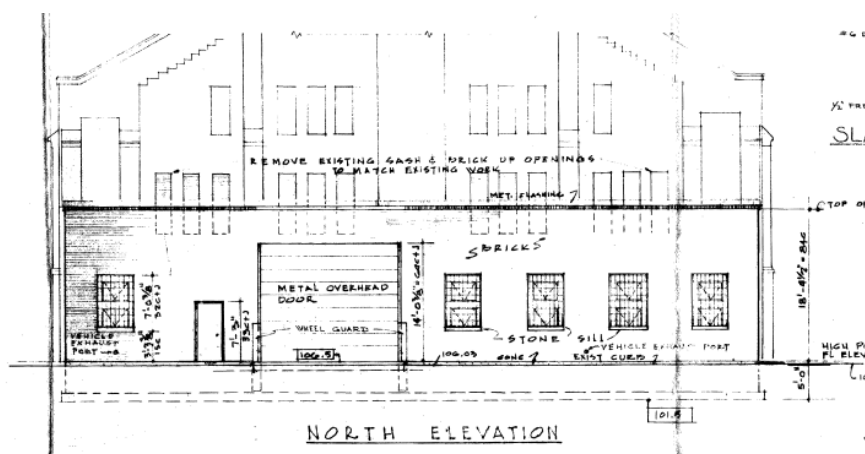
structure, above. According to the original plans in section, the entire basement floor is 4" thick concrete at all locations.

At the first floor, in the administration building area of the structure, the 12'3" ceilings are framed with 3" x 12" joists, set 12" on center, like the floor below. At the stairwell, two I beams, each 9" -21 #, span the opening. In the drill shed, 8" - 18 # I beams cross the tops of the load bearing masonry walls the entire length of the room. The trusses are secured to 4" x 12" plates set atop the I beams. The trusses are crossed by solid decking. 3" x 10" purlins are set atop the decking 20" on center, and two layers of 1" thick roof decking complete the framing, above. In the rear of the drill shed, beneath the turret, the 12'6" ceiling is supported by lally columns. Atop these columns are 8" - 18 # I beams. In the second floor, in the administration building portion of the structure, 13'3" ceilings are supported by 2" x 12" joists set 12" on center. In lieu of the I beams, below, the span at the stairwell is supported by a wood framed wall on this floor at the stairwell. In the attic, above, rafters are 2" x 10" set 20" on center. Wood roof decking is at least 1" thick x 12" wide hardwood planking butted together. Structural members within the tower rooms are not visible.

The arches throughout the administration building portion of the armory; without exception, all are radial arches and, except for the tripartite, arcaded entrance pavilion, all are brick. The first and second story porches at the entrance each have three arches facing the street, and one on each side of the return, for a total of ten. All are uniform: bluestone springers, voussoirs and keystones all identical in size and form.

At the rear of the building, facing Short Street, is the 1957 motor vehicle storage addition. Footings were poured 48" below grade (and below the frost line) and load bearing brick walls were laid up. At grade, an 8" thick reinforced concrete slab was poured atop 6" porous fill. The walls terminate at 18' above the top of the slab. The outside dimensions of the garage are 80'1" x 37'2.5" across the back of the building. Brick pilasters are integrated into the wall plan approximately 20' apart on the long wall, 18' on the sides. According to the construction documents, long span, steel joists, no. 2406, 3'11" on center, span the short length. At each end,

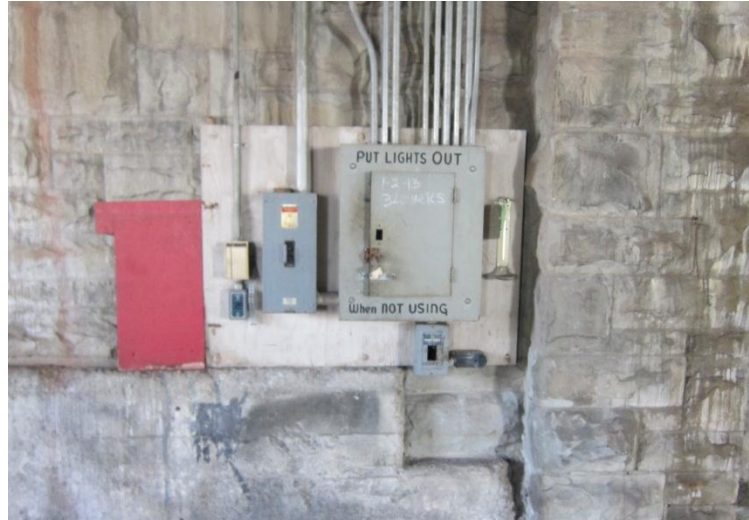
Elevation of the 1957 garage addition. Source: Galvan Foundation



they rest on 3.5" x 3.5" x 5/16" steel angle irons secured to the masonry with 3/4" x 3.75" anchors. Three evenly spaced rows of bridging run between the joists. Roof deck materials could not be discerned.

ELECTRICAL SYSTEMS INVESTIGATION

The Hudson Armory has 400 amp electrical service that enters below grade from the Rope Alley elevation. The main service panel is located in the basement below the northeast tower. Circuit breakers are located throughout the structure on every level. The Hudson Armory was owned and maintained by the State of New York until the 1970s. While



Circuit breakers inside the 1957 garage addition. Source: Author

it may be safe to assume that the electrical service installed well, an electrical contractor experienced with old structures should inspect the system for any non-visible issues.

MECHANICAL SYSTEMS INVESTIGATION

The original furnaces were coal fed (as evidenced by the existence of the coal bin.) These likely existed past 1962, when plans for upgrade of the sanitary facilities show the boilers in an adjacent room, next to the coal bin. Today, oil-fueled, double Weil-McLain boilers heat the radiators in the Hudson Armory. This is done in the winter months at a rate of 17 gallons per hour. An enormous oil tank is beneath the lawn on the southern elevation.

RECOMMENDATIONS

As plans are developed for the re-purposing of the armory, an upgrade to the mechanical systems and addition of cooling will be considered. A mechanical systems engineering firm with a proven track record in historic structures must be consulted as the introduction of new systems in older buildings is not without problems. The attempt to meet and maintain modern climate control standards may in fact be damaging to historic resources. Modern systems are often over-designed to compensate for inherent inefficiencies of some historic buildings materials and plan layouts. Energy retrofit measures, such as installing exterior wall insulation and vapor barriers or the sealing of operable window and vents, ultimately affect the performance and can reduce the life of aging historic materials.

In general, the greater the differential between the interior and exterior temperature and humidity levels, the greater the potential for damage. As natural vapor pressure moves moisture from a warm area to a colder, dryer area, condensation will occur on or in building materials in the colder area. Too little humidity in winter, for example, can dry and crack historic wooden or painted surfaces. Too much humidity in winter causes moisture to collect on cold surfaces, such as windows, or to migrate into walls. As a result, this condensation deteriorates wooden or metal

windows and causes rotting of walls and wooden structural elements, dampening insulation and holding moisture against exterior surfaces. Moisture migration through walls can cause the corrosion of metal anchors, angles, nails or wire lath, can blister and peel exterior paint, or can leave efflorescence and salt deposits on exterior masonry. In cold climates, freeze-thaw damage can result from excessive moisture in external walls.

To avoid causing these types of damages to the armory, it is important to understand how building components work together as a system. Methods for controlling interior temperature and humidity and improving ventilation must be considered in any new or upgraded HVAC or climate control system. While certain energy retrofit measures will have a positive effect on the overall building, installing effective vapor barriers in load-bearing, masonry walls is virtually impossible and often results in destruction of significant historic materials.



The boiler room as it exists in February of 2012. Source: Author

SUMMARY

Existing mechanical systems should be regularly inspected and maintained by a qualified HVAC contractor on a semi-annual basis. As plans are developed for the re-purposing of the armory, an upgrade to the mechanical systems and addition of cooling will be considered. A mechanical systems engineering firm with a proven track record in historic structures must be

consulted as the introduction of new systems in older buildings is not without problems. Historic buildings are not easily adapted to house modern precision mechanical systems. Careful planning must be provided early on to ensure that decisions made during the design and installation phases of a new system are appropriate

MATERIALS ANALYSES

Field examination and testing of building material may include non-destructive (non-intrusive) or, where necessary, destructive (intrusive) examination and/or testing of materials, components, and systems. Examples of non-destructive methods of field examination and testing include field microscopy, the use of a metal detector to locate concealed metal elements, and X-ray techniques to assess concealed conditions. Some examples of destructive methods of field examination and testing include structural testing, strain relief testing, and inspection openings (probes).

Instruments such as a borescope, through which concealed conditions can be viewed through a small hole, permit enhanced examination while limiting damage to the existing building fabric. Depending upon existing conditions and the results of the site inspection, field monitoring may be required. Field monitoring can include humidity and temperature monitoring, documentation of structural movement and vibrations, light level monitoring, and other environmental monitoring.

In addition, materials samples may be removed for laboratory studies. A wide range of laboratory testing may be appropriate to establish the composition of various construction materials, determine causes of deterioration, and identify and assess appropriate conservation and repair measures. Materials analysis may also be helpful in dating changes to the structure and in developing a chronology of construction. For example, mortar analysis may be performed to determine the composition of original and repointing mortars and to provide information for use in designing a mortar mix for repointing. As another example, paint and other coatings may be analyzed to determine finish types and composition, and original and subsequent color schemes, using special analysis techniques and comparison with color standard systems. Samples should generally be returned to the owner and retained in case future testing is required. In some cases, it may be appropriate to reinstall the samples after materials studies have been completed.



Mortar analysis is a critical step in specifying materials for preservation work. Source: Clemson.edu

Sample removal and analysis may also be required to identify hazardous materials, which are present in many historic buildings. For example, lead and other heavy metals are components of many older paints and coatings, and asbestos is a constituent of some roofing materials, claddings, sealants, and insulation. Mold and mildew may be present and require special treatment; in this case a consulting industrial hygienist may need to be included in the project team. Analysis may be performed to confirm the materials present, determine the nature of the hazard, and help identify methods of remediation or management.

As buildings constructed during recent decades become "historic," newer materials require study and analysis as part of historic structure reports. For example, curtain wall components and joint sealants may require analysis to determine their composition, identify causes of deterioration, and select appropriate replacement sealants. Composite materials and plastics, present in post-

World War II buildings, may also require special effort to determine repair techniques or appropriate materials for replacement.

FINISHES ANALYSIS

The finishes on the exterior of the Hudson Armory are limited to the paint on the fenestration. Coatings on the wood sash failed decades ago, as evidenced by the widespread rot found in and around the windows. The steel windows have also experienced paint failures and subsequent rusting. The color scheme of each appears to be readily discernible. Interior finishes are largely limited to paint on three coat stucco walls. Fortunately, the inside of the windows, doors, casements and trim—all golden oak—were never painted and retain their original appearance.

OVERVIEW

Historic paint analysis is the scientific analysis of architectural finishes, including not only paints but also metallic finishes and clear and translucent finishes used on historic buildings. The primary purpose of such analysis is to determine the color of the finish used at a particular time in the building's history, usually the original construction, but not always. Secondary purposes include determination of ingredients such as media (water, oil, latex, etc.) and pigments (organic pigments, inorganic pigments, dyes, etc.). Paint analysis is also used at times as a dating technique for various building elements. Typical problems encountered in historic paint analysis include such things as paint loss, surface deterioration, newer materials, substrates, delamination, media and pigment deterioration, and alligatoring.

Because finishes analysis is performed under laboratory conditions samples are collected in the field for later analysis and can be collected by the analyst or by his client who then ships them to him. They are typically collected in one of two types of packages. Manila coin envelopes are highly recommended. They have large flaps which should remain unsealed. There is virtually no possibility of the sample migrating from such an envelope. The other possibility is plastic resealable bags which can be opened and reclosed at will. The only drawback to this type of package is that labeling can be difficult. Under no circumstances should paper letter envelopes, sealed or unsealed, be used. If they are sent in a sealed state they have no further value once they are opened. If they are sent in an unsealed state the sample readily migrates from the envelope as the flap is inadequate to contain the contents.

There are two methodologies in practice at present in the preparation of paint samples for microscopic analysis. The first, which is derived from the medical world, is to treat the sample as a specimen and set it into a fixed position in a permanent medium such as paraffin. The specimen is then ground to a flat finish, providing a horizontal surface for viewing under a microscope. The second is to leave the samples in a loose condition with their broken surfaces which then can be manipulated under the microscope to permit a variety of views of the layers. The primary disadvantage to the first method is that the grinding process tends to blur layers together,

especially layers of similar or identical colors. It also provides only a single, fixed point of viewing. The second method lacks these disadvantages, although skill and experience is required to manipulate the samples effectively.

Following the microscopic investigation a report is written. There are a variety of report types. Some analysts simply summarize their findings and provide little or no discussion of the individual samples and provide only their conclusions regarding historic finishes. At the other end of the spectrum are those who provide not only a discussion of each, individual sample, but also Munsell colors for each layer of each sample. This enables the clients to reach their own conclusions. In many cases the clients have access to additional information such as the history of the building and its maintenance which is not available to the finishes analyst.

Some analysts also provide photomicroscopy as part of their reports. Photomicroscopy is the photography of the samples through the microscope. Its advantage is to illustrate the findings of the report. Disadvantages include color distortions created by the light source and photographic dyes and also the tendency for some clients to match the colors observed in the photographs, rather than those provided in the report itself.

Following the basic report, further research may be required. Typical research includes:

- Provision of color sheets of selected colors from the Munsell Color System.
- Matching of the Munsell colors to a paint manufacturer's system.
- Pigment testing, such as for lead content.
- Media testing, such as for linseed oil or latex.
- Testing of clear or translucent finishes such as varnishes and shellacs.
- Further investigation of decorative painting such as graining (imitating wood), marbelizing (imitating marble), stenciling, or murals.
- Consultation in the replication of historic finishes.

RECOMMENDATIONS

Identify, retain and preserve interior features and finishes that are important in defining the overall historic character of the building, including columns, cornices, baseboards, fireplaces and mantels, paneling, light fixtures, hardware, and flooring; and wallpaper, plaster, paint, and finishes such as stenciling, marbling, and graining; and other decorative materials that accent interior features and provide color, texture, and patterning to walls, floors, and ceilings.

Protect and maintain 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 coatings systems. Protect 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. Protect 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.

Install protective coverings in areas of heavy pedestrian traffic to protect historic features such as wall coverings, parquet flooring and paneling. Remove damaged or deteriorated paints and finishes to the next sound layer using the gentlest method possible, then repaint or refinish using compatible paint or other coating systems. Repaint with colors that are appropriate to the historic building.

Limit abrasive cleaning methods to 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. Evaluate the existing condition of materials to determine whether more than protection and maintenance are required. Repair 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.

Replace in kind extensively deteriorated or missing parts of repeated interior features when there are surviving prototypes such as stairs, balustrades, wood paneling, 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.

MASONRY ANALYSIS

The Hudson Armory is a load-bearing masonry structure. Below grade (and above on the Rope Alley side) the foundation is composed of locally quarried, native limestone, laid up as rubble walls with a very hard portland cement mortar. Above grade, the foundation is made up of blue sandstone similar to that quarried throughout the region, including at the foot of the nearby Catskills. The stone was laid in ashlar pattern, with faces rusticated and set perpendicular to their bedding planes. As a result, widespread delamination is occurring; miraculously, the structural integrity is not compromised at any locations. The trim, sills, and lintels throughout the structure are

The frog indicates manufacture by the Newton Hook Brick Company, an outfit that operated several miles north of the armory. Source: Author



the same sandstone with rusticated faces. The sandstone is set in the same mortar as the limestone. The walls of the Hudson Armory are composed of a relatively uniform, red sanded brick. At the turn of the century, the Hudson River Valley was flush with prolific brick making companies. The brick units sampled indicated NHBCo. The Newton Hook Brick Company was in operation for many years about eight miles north of the City of Hudson. The brick are laid in American bond, and the mortar is very hard with crushed red brick as a component of the aggregate. The brick buttresses are capped with a fine-grained limestone; radial saw marks are visible on the sides of each. While not typically discussed under masonry analysis, the slate roofing tiles appear to be a thick, Pennsylvania black. The field slate measure 10" x 20" and are 1/4" to 3/8" in thickness. While in generally good condition, a fair degree of hazing is evident, typical of the gypsum deposits that frequently leach out of Pennsylvania slate.



Sandstone is sugaring and delaminating. Source: Author

OVERVIEW

Methods for analyzing mortars can be divided into two broad categories: wet chemical and instrumental. Many laboratories that analyze historic mortars use a simple wet-chemical method called acid digestion, whereby a sample of the mortar is crushed and then mixed with a dilute acid. The acid dissolves all the carbonate-containing minerals not only in the binder, but also in the aggregate (such as oyster shells, coral sands,

or other carbonate-based materials), as well as any other acid-soluble materials. The sand and fine-grained acid-insoluble material is left behind. There are several variations on the simple acid digestion test. One involves collecting the carbon dioxide gas given off as the carbonate is digested by the acid; based on the gas volume the carbonate content of the mortar can be accurately determined. Simple acid digestion methods are rapid, inexpensive, and easy to perform, but the information they provide about the original composition of a mortar is limited to the color and texture of the sand. The gas collection method provides more information about the binder than a simple acid digestion test.

Instrumental analysis methods that have been used to evaluate mortars include polarized light or thin-section microscopy, scanning electron microscopy, atomic absorption spectroscopy, X-ray

diffraction, and differential thermal analysis. All instrumental methods require not only expensive, specialized equipment, but also highly-trained experienced analysts. However, instrumental methods can provide much more information about a mortar. Thin-section microscopy is probably the most commonly used instrumental method. Examination of thin slices of a mortar in transmitted light is often used to supplement acid digestion methods, particularly to look for carbonate-based aggregate. For example, the new ASTM test method, ASTM C 1324-96 "Test Method for Examination and Analysis of Hardened Mortars" which was designed specifically for the analysis of modern lime-cement and masonry cement mortars, combines a complex series of wet chemical analyses with thin-section microscopy.

The drawback of most mortar analysis methods is that mortar samples of known composition have not been analyzed in order to evaluate the method. Historic mortars were not prepared to narrowly defined specifications from materials of uniform quality; they contain a wide array of locally derived materials

combined at the discretion of the mason. While a particular method might be able to accurately determine the original proportions of a lime-cement-sand mortar prepared from modern materials, the usefulness of that method for evaluating historic mortars is questionable unless it has been tested against mortars prepared from materials more commonly used in the past.



Detail of brick masonry. Source: Author

RECOMMENDATIONS

Identify, retain and preserve 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. Protect and maintain masonry by providing proper drainage so that water does not stand on flat, horizontal surfaces or accumulate in curved decorative features.

Clean masonry only when necessary to halt deterioration or remove heavy soiling. Carry 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. Clean masonry surfaces with the gentlest method possible, such as low pressure water and detergents, using natural bristle brushes.

Inspect painted masonry surfaces to determine whether repainting is necessary. Remove damaged or deteriorated paint only to the next sound layer using the gentlest method possible (e.g., hand scraping) prior to repainting. Apply compatible paint coating systems following proper surface preparation. Repaint with colors that are historically appropriate to the building and district. Evaluate 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.

Repair, stabilize, and conserve fragile masonry by using well-tested consolidants, when appropriate. Repairs should be physically and visually compatible and identifiable upon close inspection for future research. Repair 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. Remove deteriorated mortar by carefully hand-raking the joints to avoid damaging the masonry. Duplicate old mortar in strength, composition, color, texture, and in width and joint profile.

Repair stone 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. Apply 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. Replace in kind extensively deteriorated or missing parts of masonry features when there are surviving prototypes such as brick or stone. The new work should match the old in material, design, color, and texture; and be unobtrusively dated to guide future research and treatment.

WOOD ANALYSIS

While the wood of the fenestration is in very poor condition, the wood work inside the Hudson Armory is in pristine condition. Golden oak trim, moldings, doors, casements, and fireplace surrounds are ornately detailed and well cared for. The built environment of the Progressive Era was marked by the construction of utilitarian and institutional structures of high design. During this “gilded age” the armory’s members include middle- and upper-class citizens of the community. Interior style and design complemented the militia’s members’ status. The exterior is a different story. The armory is a masonry structure and, as such, has limited wood members and elements. Those that exist are limited to the fenestration of the administration building. A victim of neglect and poor maintenance practices, the sash and members of the jambs are rotted at most locations. A very aggressive treatment approach will be necessary to save any of the original fabric of the windows.



Paint coatings have failed and wood sash are directly exposed to the elements. Source: Author

OVERVIEW

While the analysis of the wood in the armory could be extended to include finish and trim details inside the structure, focus here is on the fenestration. The interior moldings and other wood details are in pristine condition; the windows are not. The key to successful planning for window treatments is a careful evaluation of existing physical conditions on a unit-by-unit basis. A graphic or photographic system may be devised to record existing conditions and illustrate the scope of any

necessary repairs. Another effective tool is a window schedule which lists all of the parts of each window unit. Spaces by each part allow notes on existing conditions and repair instructions. When such a schedule is completed, it indicates the precise tasks to be performed in the repair of each unit and becomes a part of the specifications. In any evaluation, one should note at a minimum:

- window location
- condition of the paint
- condition of the frame and sill
- condition of the sash (rails, stiles and muntins)
- glazing problems
- hardware, and
- the overall condition of the window

Following the inspection and analysis of the results, the scope of the necessary repairs will be evident and a plan for the rehabilitation can be formulated. Generally the actions necessary to return a window to "like new" condition will fall into three broad categories: 1) routine maintenance procedures, 2) structural stabilization, and 3) parts replacement. Each successive repair class represents an increasing level of difficulty, expense, and work time. Note that most of the points mentioned in Repair Class I are routine maintenance items and should be provided in a regular maintenance program for any building. The neglect of these routine items can contribute to many common window problems.

RECOMMENDATIONS

Identify, retain, and preserve 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. Stabilize deteriorated or damaged wood as a preliminary measure prior to undertaking appropriate preservation work. Protect and maintain wood features by providing proper drainage so that water is not allowed to stand on flat, horizontal surfaces or accumulate in decorative features.

Apply chemical preservatives to wood features such as beam ends or outriggers that are exposed to decay hazards. Retain 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.

Inspect painted wood surfaces to determine whether repainting is necessary or if cleaning is all that is required. Remove damaged or deteriorated paint to the next sound layer using the gentlest method possible (hand scraping and hand sanding), then repaint. Use 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.



The exquisite detail of interior mill work is in pristine condition. Source: Author

Repair, stabilize, and conserve fragile wood using well-tested consolidants, when appropriate. Repairs should be physically and visually compatible and identifiable upon close inspection for future research. Repair 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. Replace 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.

METAL ANALYSIS

The metals used in the Hudson Armory's construction have issues as varied as the types used and applications. Copper sheet metal, used for gutters and flashing details on the slate roof, have outlived their service life and are ready for in kind replacement. This type and degree of maintenance is typical and anticipated in large, institutional structures. The steel windows in the drill shed have rusted and expanded, causing damage to over thirty sandstone sills. The steel windows must be treated in the manner described at length, below. The deck of the second-story porch and the roof of the castellated tower are flat-lock seamed and soldered sheet metal. Silver coatings make determination of the type of metal impossible.

OVERVIEW

Metal roofing in America is principally a 19th-century phenomenon. Before then the only metals commonly used were lead and copper. For example, a lead roof covered "Rosewell," one of the grandest mansions in 18th century Virginia. But more often, lead was used for protective flashing. Lead, as well as copper, covered roof surfaces where wood, tile, or slate shingles were inappropriate because of the roof's pitch or shape. Copper with standing seams covered some of the more notable early American roofs including that of Christ Church (1727-1744) in Philadelphia. Flat-seamed copper was used on many domes and cupolas. The copper sheets were imported from England until the end of the 18th century when facilities for rolling sheet metal were developed in America.

Of the inorganic roofing materials used on historic buildings, the most common are perhaps the sheet metals: lead, copper, zinc, tin plate, terne plate, and galvanized iron. In varying degrees



Copper sheet metal cornice decorates the rakes of the roof. Source: Author

each of these sheet metals are likely to deteriorate from chemical action by pitting or streaking. This can be caused by airborne pollutants; acid rainwater; acids from lichen or moss; alkalis found in lime mortars or portland cement, which might be on adjoining features and washes down on the roof surface; or tannic acids from adjacent wood sheathings or shingles made of red cedar or oak. Corrosion from "galvanic action" occurs when dissimilar metals, such as copper

and iron, are used in direct contact. Corrosion may also occur even though the metals are physically separated; one of the metals will react chemically against the other in the presence of an electrolyte such as rainwater. In roofing, this situation might occur when either a copper roof is decorated with iron cresting, or when steel nails are used in copper sheets. In some instances the corrosion can be prevented by inserting a plastic insulator between the dissimilar materials. Ideally, the fasteners should be a metal sympathetic to those involved.

Steel rusts unless it is well-painted or plated. Historically this problem was avoided by use of tin plating or galvanizing. But this method is durable only as long as the coating remains intact. Once the plating is worn or damaged, the exposed iron will rust. Therefore, any iron-based roofing material needs to be undercoated, and its surface needs to be kept well-painted to prevent corrosion. One cause of sheet metal deterioration is fatigue. Depending upon the size and the gauge of the metal sheets, wear and metal failure can occur at the joints or at any protrusions in

the sheathing as a result from the metal's alternating movement to thermal changes. Lead will tear because of "creep," or the gravitational stress that causes the material to move down the roof slope.

RECOMMENDATIONS

Identify, retain, and preserve 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. Stabilize deteriorated or damaged architectural metals as a preliminary measure prior to undertaking appropriate preservation work.

Protect and maintain architectural metals from corrosion by providing proper drainage so that water does not stand on flat, horizontal surfaces or accumulate in curved, decorative features.

Clean architectural metals, when appropriate, to remove corrosion prior to repainting or applying appropriate protective coatings. Identify 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.

Clean soft metals such as lead, tin, copper, terneplate, and zinc with appropriate chemical methods; their finishes can be easily abraded by blasting methods. Use the gentlest cleaning methods for cast iron, wrought iron, and steel--hard metals--in order to remove paint buildup and corrosion. If hand scraping and wire brushing have proven ineffective, low pressure grit blasting may be used as long as it does not abrade or damage the surface. Apply appropriate paint or other coating systems after cleaning in order to decrease the corrosion rate of metals or alloys. Repaint with colors that are appropriate to the historic building or district.

Repair 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. Replace in kind extensively deteriorated or missing parts of architectural metal features when there are surviving prototypes such as porch balusters, column



Steel windows have rusted and expanded. Source: Author

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.

With respect to the steel windows, the following steps are recommended: 1) removal of light rust, flaking and excessive paint; 2) priming of exposed metal with a rust-inhibiting primer; 3) replacement of cracked or broken glass and glazing compound; 4) replacement of missing screws or fasteners; 5) cleaning and lubrication of hinges; 6) repainting of all steel sections with two coats of finish paint compatible with the primer; and 7) caulking the masonry surrounds with a high quality elastomeric caulk.

PROBLEMS OF REPAIR

The Secretary of the Interior provides four distinct but interrelated approaches to the treatment of historic properties. Each is defined, below, so that the recommendations of this HSR can be weighed and considered in context:

- *Preservation* focuses on the maintenance and repair of existing historic materials and retention of a property's form as it has evolved over time;
- *Rehabilitation* acknowledges the need to alter or add to a historic property to meet continuing or changing uses while retaining the property's historic character,
- *Restoration* is undertaken to depict a property at a particular period of time in its history, while removing evidence of other periods; and,
- *Reconstruction* re-creates vanished or non-surviving portions of a property for interpretive purposes.

The recommendation of this HSR is to preserve and maintain the structure as it appears. This means replacement of elements of the various systems that have outlived their useful life. For example, the copper roof flashings are approximately 115 years old and should be replaced. But they must be replaced in kind, with new copper sheet metal that is installed in the same form and dimension as the details it replaces. Individual preservation tasks are identified in the section below and are accompanied by an engineered estimate of cost. Prior to producing a request for quotes, drawings should be detailed to identify the locations and extent of work to be performed.

ASSESSMENT OF CONDITIONS

Overall, the condition of the armory in Hudson is good. This is a testament to the manner in which it was built, as little has been done to maintain the structure since it passed from state to private ownership some thirty-five years ago. The replacement of aged copper flashing details in the roof system and repointing of failed masonry joints are typical maintenance tasks in a structure of this type. The primary concerns of the envelope are the roof over the motor vehicle storage addition and the bluestone deterioration, particularly at the front entrance. The issues identified and recommendations for each are listed below by degree of criticality.

RECOMMENDATIONS – CRITICAL ISSUES

The *motor vehicle storage addition* was built in 1957 and, at that time, a flat, ballasted roof installed. With the building becoming privately owned approximately twenty years later, it is safe to assume that the State never replaced the flat roof. Given the extensive water damage and poor attempts at repair visible there, coupled with a general, overall lack of maintenance since, it can be assumed that the original roof is still in place. This roof must be replaced.

The *blue sandstone used for the foundation, porch, arches, and architectural trim* was, at some locations, set by the masons on the vertical side of the bedding plains. As a result, widespread delamination has occurred, as layers have quite literally exfoliated from the stones. At the front porch, in particular, massive sections of stone are completely gone. The problem is not new; some very decent stone patches can be seen and are holding up well. The failing layers of stone must be removed and the voids filled with contemporary stone patching compounds such as Cathedral Stone Products' JAHN restoration mortar.

RECOMMENDATIONS – IMPORTANT ISSUES

The *copper flashings and gutters of the roof system* are approximately 115 years old and have outlived their service life. It is time for replacement even if leaks are not yet detected. All flashings should be replaced with full weight (20 oz/sq') copper in a manner consistent with assemblies detailed in the SMACNA "Architectural Sheet Metal Manual," Sixth Edition, as well as the National Slate Association's technical manual, "Slate Roofs: Design and Installation Manual" (2010). Little has changed in the world of slate roofing since the turn of the century when the armory was built; the details illustrated in these manuals, once installed, will constitute replacement *in kind*.

Replacement slates should be salvaged, Pennsylvania slate so as to blend with adjacent fabric in an aesthetically pleasing manner. There are two acceptable techniques for fastening replacement slates: the "nail and bib" method or the "slate hook". The nail and bib method is the most widely used. The broken slate is removed with a slate ripper and the replacement slate is anchored with a nail in the slot between the two, overlying slates. A small square of flashing is slid under the two, overlying slates on the next course, above, and over the new nail head. The bib is bent a little so friction keeps it in place. Bibs can be aluminum, copper, or other non-corrodible metal; reflective metals that are visible from the ground should never be used.

Aged, brown copper blends nicely into the roof. A slate hook is a hard wire hook made of galvanized steel, copper or stainless steel, approximately three inches long. A small exposed loop hooks the replacement slate in place. This is one instance when an exposed repair device is acceptable because the tiny hook is almost invisible from the ground. Stainless steel hooks are stronger than copper hooks. Slate hooks are preferable to the nail and bib on new slate roofs, especially for repairs in the field of the roof. Using straphangers to repair the roof should be avoided; they're unsightly and they deface the roof.

The *brick and stone mortar joints should be repointed* with a material that is appropriate in composition (natural cement or lime putty) and sympathetic in appearance and tooling. An appropriate recipe will require one part slaked lime mixed with three parts sand. The ratio of granule sizes can also be gleaned from mortar analysis. Sands should be sought at area sand and gravel pits and compared to the samples included with mortar analysis reports first. If satisfactory aggregate cannot be located by this method, a wide range of materials are available through specialty suppliers.

Prior to wholesale use of the new replacement mortar, a mock-up sample should be installed by a qualified craftsperson who understands the curing and application details of traditional lime mortars. Once the mock-up sample is installed, appropriate precautions should be taken to ensure that the mortar is protected from wind, sun, rain and frost to enable slow curing (i.e. carbonation) to take place. The sample should be allowed to cure in the wall for a minimum of seven but preferably fourteen days before final color match is approved.

The failing and deteriorated mortar joints should be cleared by skilled masons with hand tools—NOT grinders and powered chisels. Joints should be cleared to a depth of roughly twice the height or width of the opening (i.e., a 3/8" joint should be 3/4" deep before repointing takes place.) The mortar should be tooled into the joints in 1/4" lifts and allowed to set up until pressing with force is required to leave a fingerprint. Joints should be struck flat, revealing slightly the edge of the facing masonry. Any mortar or residue left behind should be cleaned with a brush or sponge and clean, warm water. The new work should be protected from direct sunlight as it cures. Dampened burlap works well to shade the surfaces, and should be wetted regularly to prevent drying out.

RECOMMENDATIONS – LOW PRIORITY AND GENERAL MAINTENANCE

Wooden Windows and Doors ... We recommend the retention and repair of original windows and doors whenever possible. The repair and weatherization of existing wooden windows is more practical than most people realize; many windows are unfortunately replaced because of a lack of awareness of techniques for evaluation, repair, and weatherization. To further complicate matters (and drive up price), many of the windows are behind the protective iron bars. These grilles cannot be easily removed and they must be retained as they represent a significant historical detail of the armory. Wooden windows and doors which are repaired and properly maintained will have greatly extended service lives while contributing to the historic character of the building. Thus, an important element of the building's significance will have been preserved for the future.

Steel Windows ... Rolled steel windows are often mistakenly deemed unworthy of preservation in the conversion of old buildings to new uses. Steel window repair begins with a careful evaluation of the physical condition of each unit. The evaluation of the armory's steel windows included: presence and degree of corrosion; condition of paint; deterioration of the metal

sections, including bowing, misalignment of the sash, or bent sections; condition of the glass and glazing compound; presence and condition of all hardware, screws, bolts, and hinges; and condition of the masonry surrounds, including need for caulking or resetting of improperly sloped sills.

Front steps and walkway ... The concrete stairs at the front entrance are in disrepair. Steel plates on the bullnoses, designed to protect the edge of the steps where tread and riser meet, have warped and contorted into tripping hazards. Additionally, the concrete walkway that approaches the main entrance is askew and should be replaced.

Fence and landscaping ... The fence and surrounding landscape have not been maintained. Overgrown trees and shrubs are not part of the historic landscape and should be cut back or removed altogether. The fence is in disrepair and numerous gaps allow entry, rendering it ineffective as a perimeter security measure. It does not appear in historic photos, does not serve a functional purpose, and should also be removed.

Tile repairs ... The tiled deck of the porch and entry vestibule are missing dozens of original tiles. Replacement tiles should be acquired through salvage or custom ordered to match existing pieces. They should be set, grouted, and finished in a manner sympathetic to the original, adjacent units.

Mechanical systems ... Existing mechanical systems should be regularly inspected and maintained by a qualified HVAC contractor on a semi-annual basis. As plans are developed for the re-purposing of the armory, an upgrade to the mechanical systems and addition of cooling will be considered. A mechanical systems engineering firm with a proven track record in historic structures must be consulted as the introduction of new systems in older buildings is not without problems. Historic buildings are not easily adapted to house modern precision mechanical systems. Careful planning must be provided early on to ensure that decisions made during the design and installation phases of a new system are appropriate. Since new mechanical and other related systems, such as electrical and fire suppression, can use up to 10% of a building's square footage and 30%-40% of an overall rehabilitation budget, decisions must be made in a systematic and coordinated manner.

The installation of inappropriate mechanical systems may result in any or all of the following:

- large sections of historic materials are removed to install or house new systems,
- historic structural systems are weakened by carrying the weight of, and sustaining vibrations from, large equipment,
- moisture introduced into the building as part of a new system migrates into historic materials and causes damage, including biodegradation, freeze/thaw action, and surface staining,

- exterior cladding or interior finishes are stripped to install new vapor barriers and insulation,
- historic finishes, features, and spaces are altered by dropped ceilings and boxed chases or by poorly located grilles, registers, and equipment,
- systems that are too large or too small are installed before there is a clearly planned use or a new tenant,

For historic properties such as the armory, it is critical to understand what spaces, features, and finishes are historic in the building, what should be retained, and what the realistic heating, ventilating, and cooling needs are for the building, its occupants, and its contents. A systematic approach, involving preservation planning, preservation design, and a follow-up program of monitoring and maintenance, can ensure that new systems are successfully added--or existing systems are suitably upgraded--while preserving the historic integrity of the building.

No set formula exists for determining what type of mechanical system is best for a specific building. Each building and its needs must be evaluated separately. Some buildings will be so significant that every effort must be made to protect the historic materials and systems in place with minimal intrusion from new systems. Some buildings will have museum collections that need special climate control. In such cases, curatorial needs must be considered--but not to the ultimate detriment of the historic building resource. Other buildings will be rehabilitated for commercial use. For them, a variety of systems might be acceptable, as long as significant spaces, features, and finishes are retained. Most mechanical systems require upgrading or replacement within 15-30 years due to wear and tear or the availability of improved technology. Therefore, historic buildings should not be greatly altered or otherwise sacrificed in an effort to meet short-term systems objectives.

ESTIMATE OF COSTS

Roofing | Scope of work and unit pricing

Hip/ridge detail replacement, in kind, with 20 oz/sq' copper, 473 LF @ \$28/LF = \$13,244

Valley flashing replacements, in kind, with 20 oz/sq' copper, 264 LF @ \$146/LF = \$38,544

Chimney flashing details, replaced in kind, two locations, with 20 oz/sq' copper, \$3200/each

Step flashing replacement, in kind, with 20 oz/sq' copper, 174 LF @ \$112/LF = \$19,488

Slate repairs, with matching slate tiles, assume 600 @ \$22/EA = \$13,200

Gutter replacement, approximately 240 LF @ \$87/LF = \$20,880

Flat roof on crenellated tower, flat roofing 216 SF @ \$18.80/SF = \$4060

Arcaded pavilion, second-floor porch, flat roofing 340 SF @ \$18.80/SF = \$6390

Flat roofing replacement, over motor vehicle storage addition, 2960 SF @ \$8.80/SF = \$26,048

Masonry | Scope of work and unit pricing

Mortar repointing – Stone masonry, as needed, approximately 1200 SF @ \$14/SF = \$16,800

Mortar repointing – Brick masonry, as needed, approximately 4450 SF @ \$22/SF = \$97,900
Stone replacement, numerous locations, approximately 150 SF @ \$60/SF = \$9000
Bluestone patching, JAHN restoration mortar, approximately 825 SF @ \$75/SF = \$61,875
Concrete stairs, front entrance, replacement ... \$12,800
Front walkway, replacement ... \$10,600
Stone sill replacements, blue sandstone, approximately 30 units @ \$800/EA = \$24,000
Tile repairs, in kind, front porch and entry vestibule locations ... \$5600
Chimney repairs and repointing, as needed, at two locations ... \$12,800

Fenestration | Pricing estimate for restoring existing windows

Wooden windows and doors, estimated at \$88,800
Steel windows, estimated at \$172,000

Mechanical systems | Scope of work and pricing

Maintenance of existing systems ... \$2200
Evaluation and design of new mechanical systems for structure ... \$10,200

Site work | Scope of work and pricing

Fence removal ... \$3200
Landscaping ... \$5200
Steel stairways at emergency exits, two locations ... \$24,800

BIBLIOGRAPHY AND ADDITIONAL READING

Bradbury, Anna R. *History of the City of Hudson, New York: With Biographical Sketches of Henry Hudson and Robert Fulton*. New York: Record Printing and Publishing Co., 1908.

Butler, L. E. *Presentation of flags of New York Volunteer Regiments*. Albany, NY: Weed, Parsons and Company, Printers, 1865.

Fitch, James Marston. *American Building: The Environmental Forces That Shape It*. Boston: Houghton-Mifflin Co., 1972.

Fogelson, Robert M. *America's armories: Architecture, society and public order*. Boston: President and Fellows of Harvard College, 1989.

Fone, Byrne. *Historic Hudson: An architectural portrait*. Hensonville, NY: Black Dome Press Corp., 2005.

Friedman, Donald. *Historical building construction*. New York: W.W. Norton & Co., Inc., 1995.

Gayle, Margot; David W. Look, AIA; John G. Waite. *Metals in America's Historic Buildings: Uses and Preservation Treatments*. Technical Preservation Services, U.S. Department of the Interior. Washington, D.C.: U.S. Government Printing Office, 1980.

Haynes, Wesley. Isaac G. Perry, architect, builder and craftsman. New York: M.Sc. thesis, Columbia University, 1983.

Hudson Catskill Newspapers. *A pictorial history of Columbia County*. Hudson, NY: The Register Star Co, 1995.

Martin, Maj. Clarence S. *Three Quarters of a Century with the Tenth Infantry*, New York National Guard: 1860 to 1935. Albany, NY: State Printing Office, 1935.

National Slate Association. *Slate Roofs: Design and Installation Manual*, 2010.

Phillips, Morgan, and Selwyn, Judith. *Epoxies for Wood Repairs in Historic Buildings*. Washington, DC: Technical Preservation Services, U.S. Department of the Interior (Government Printing Office, Stock No. 024016000951), 1978.

Secretary of the Interior's Standards for the Treatment of Historic Properties. Washington, D.C.: Preservation Assistance Division, National Park Service, U.S. Department of the Interior, 1993.

SMACNA. *Architectural Sheet Metal Manual*. Sixth Edition.

Smith, William D. and Tara Goodwin Frier. *Access to History: A Guide to Providing Access to Historic Buildings for People with Disabilities*. Boston: Massachusetts Historical Commission, 1989.

Speweik, John P. *The History of Masonry Mortar in America, 1720-1995*. Arlington, VA: National Lime Association, 1995.

Todd, Nancy L. *New York's historic armories: An illustrated history on armories in New York State*. New York: SUNY Press, 2006.

Turberg, Edward. *A History of American Building Technology*. Durham: Durham Technical Institute, 1981.

Unknown author, "Souvenir Edition Dedicated to the 23rd Separate Company: Cowles Guards," *Hudson Register* (June 1898): 1-8.

Weeks, Kay D. and David W. Look. *Preservation Briefs 10: Exterior Paint Problems on Historic Woodwork*. Washington, DC: Technical Preservation Services, U.S. Department of the Interior, 1982.

Wright, Capt. Robert K., and Hylton-Greene, Renee. *A brief history of the militia and the national guard*. Washington, DC: US Government Printing Office, 1986.

Appendix A: Historical photographic documentation



Source: New York State Military Museum and Veterans Research Center (Saratoga Springs, NY)



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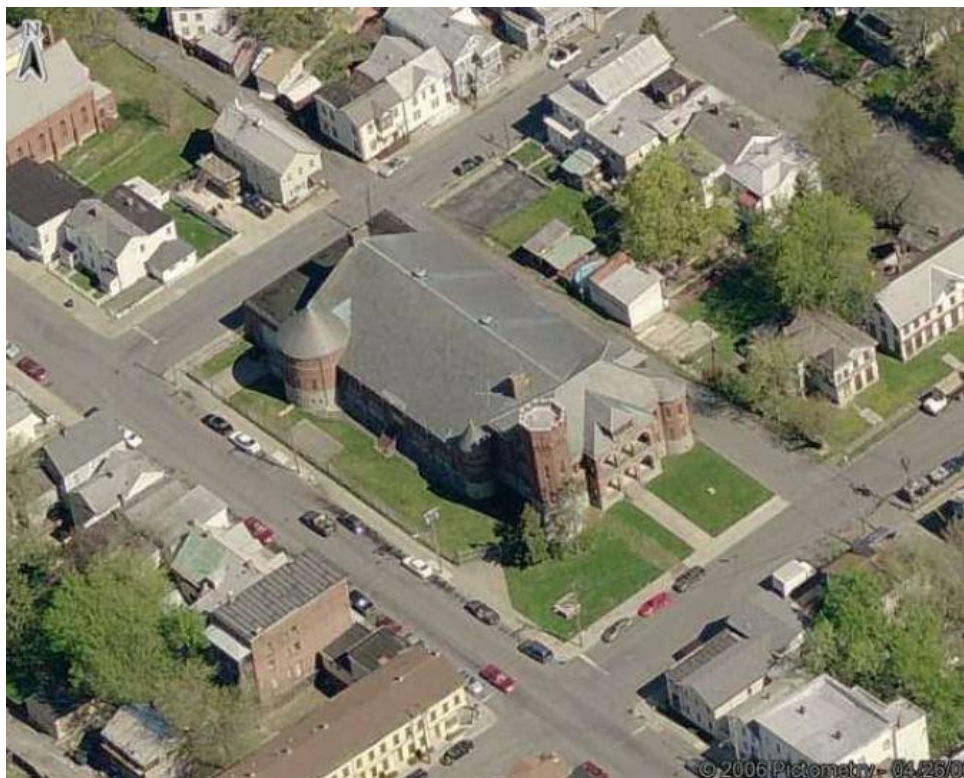


Source: New York State Military Museum and Veterans Research Center (Saratoga Springs, NY)

Appendix B: Contemporary photographic documentation



Source: EagleView Measurements



Source: EagleView Measurements



Source: EagleView Measurements



Source: EagleView Measurements



Source: EagleView Measurements



Front elevation. Source: Author



Dormer and top of the pavilion. Source: Author



View looking north. Source: Author



View of administration building, looking south. Source: Author



View of entrance. Source: Author



Detail of machicolated crenellation. Source: Author



Deterioration of sandstone belt course. Source: Author



Front doors. Source: Author



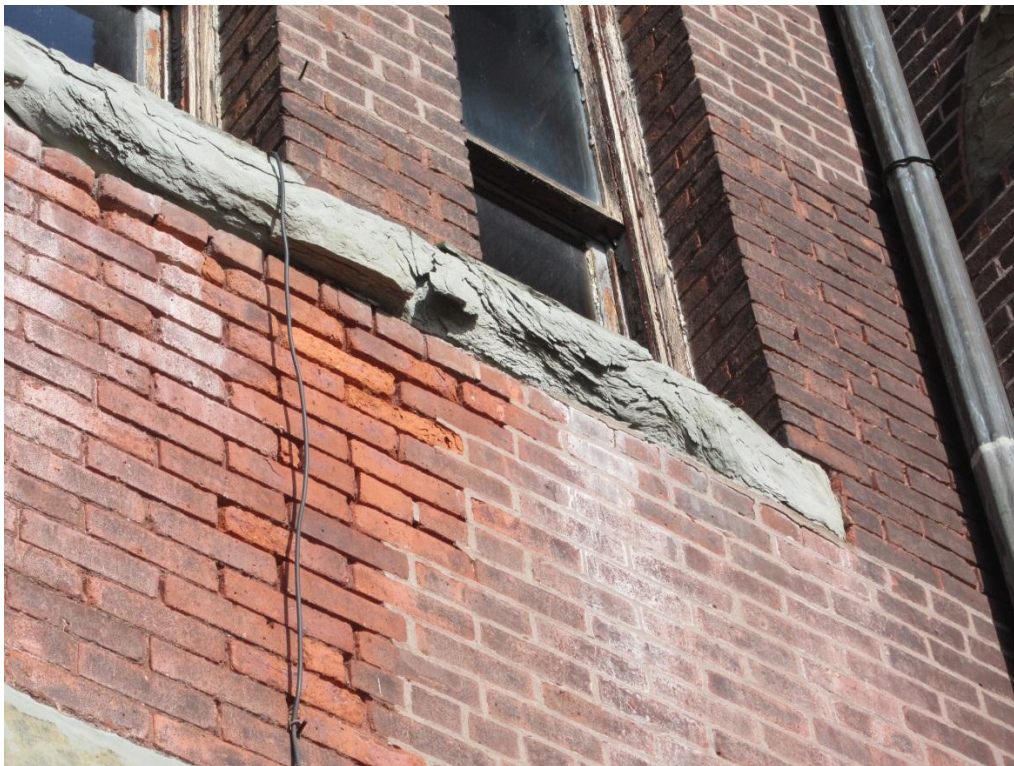
Detail of sandstone voussoirs and brick spandrels. Source: Author



Missing tiles, font porch. Source: Author



Delaminating sandstone, laid vertically on bedding planes. Source: Author



Deteriorating sandstone sill and mortar joints. Source: Author



Evidence of the original stone balustrade. Source: Author



Capillary action has pitted brick on the front porch. Source: Author



Cornerstone and inscription. Source: Author



View of southern elevation. Source: Author



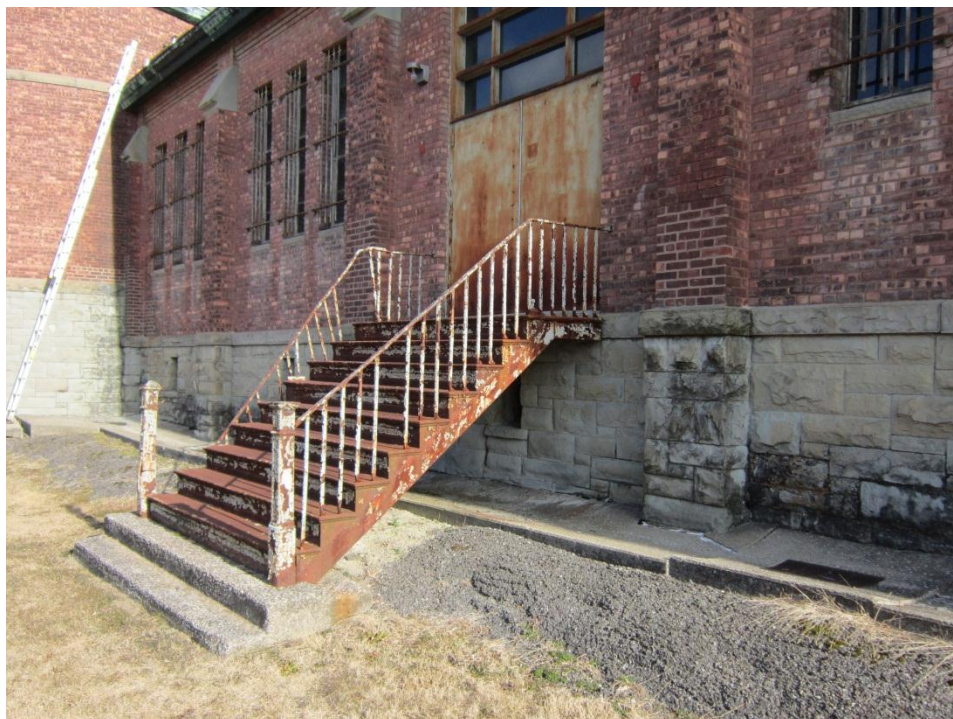
Foundation below grade is native limestone. Source: Author



Inappropriate repointing work. Source: Author



Northwesterly view of elevation. Source: Author



Steel staircase. Source: Author



Large turret. Source: Author



Motor vehicle storage addition (1957). Source: Author



Motor vehicle storage addition rooftop. Source: Author



Large chimney at western elevation. Source: Author



Large chimney stack at western end of building. Source: Author



Detail of copper cornice. Source: Author



Steel windows have rusted and expanded, causing sills to delaminate. Source: Author



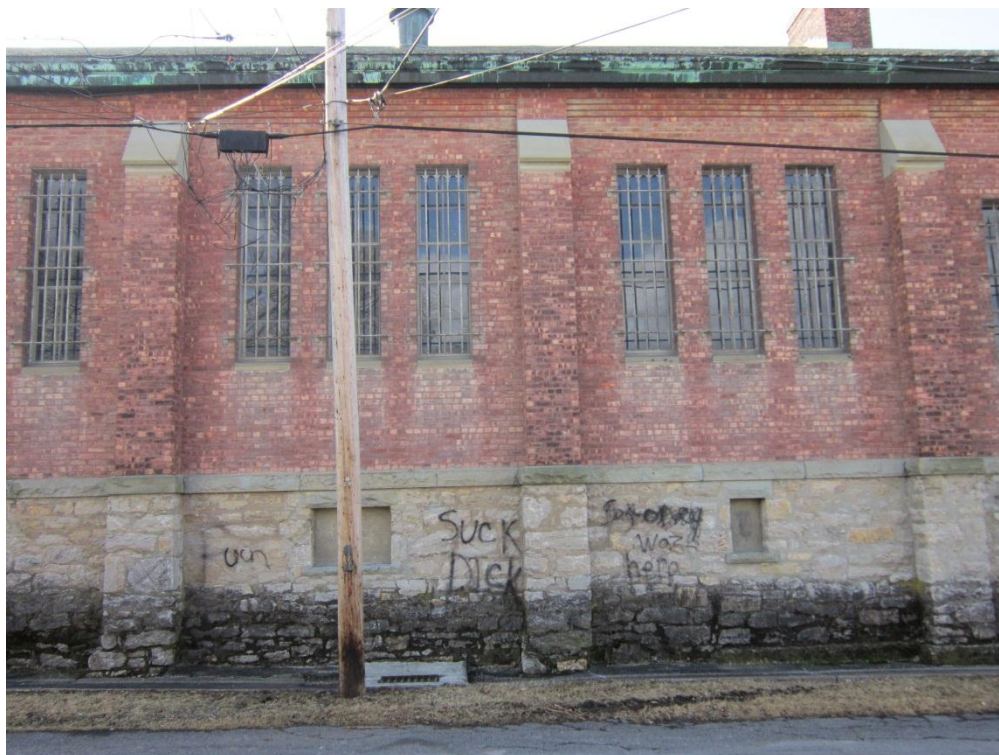
Rear of the 1957 motor vehicle storage addition. Source: Author



Rope Alley entrance. Source: Author



Rope Alley entrance. Source: Author



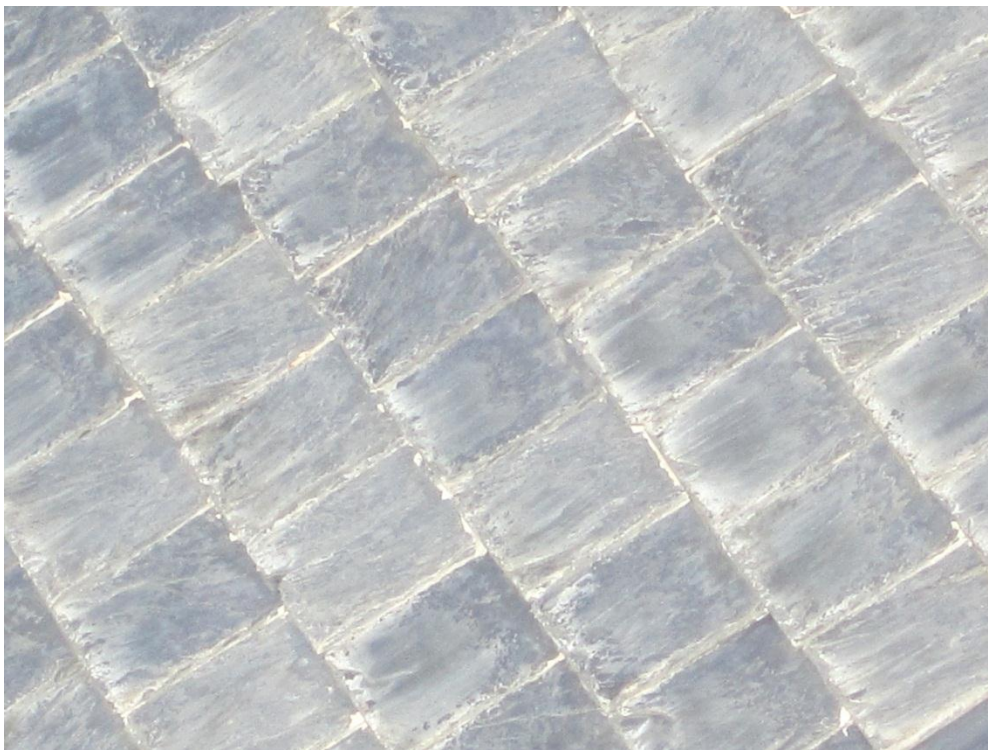
View of drill shed bays, northern elevation. Source: Author



Administration building, northern elevation. Source: Author



Administration building roof. Note missing chimney. Source: Author



Close-up view of slate materials. Source: Author



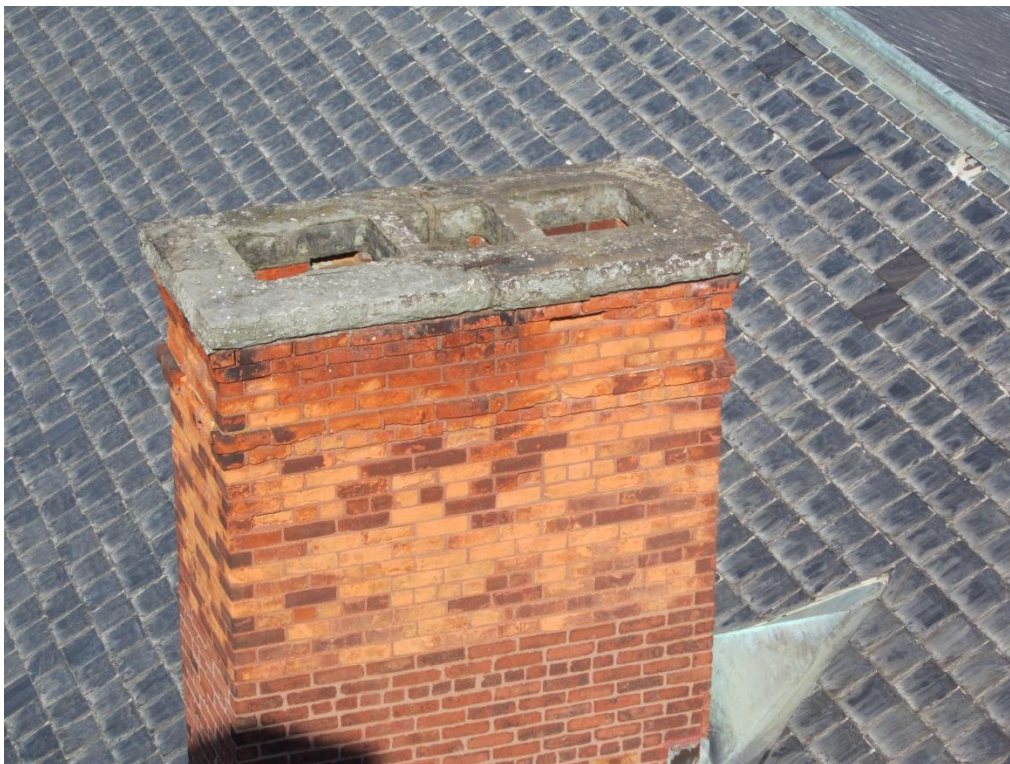
Northwesterly view, from tower. Source: Author



Sheet metal vents at ridge. Source: Author



Crenellation and tower roof. Source: Author



Chimney stack with native limestone cap. Source: Author

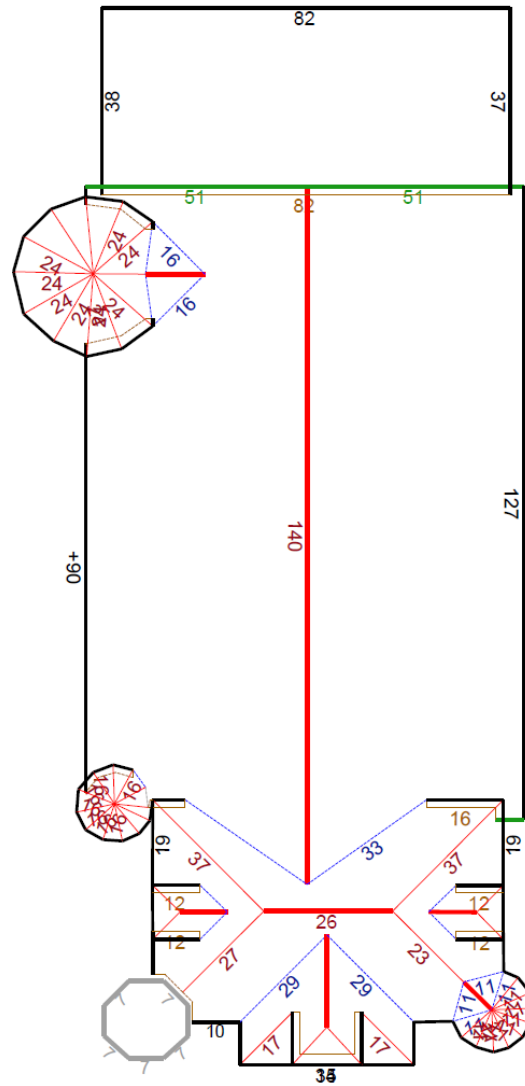
Appendix G: 2011 Measured roof report

Length Diagram

Total Line Lengths:
Ridges = 224 ft
Hips = 778 ft

Valleys = 264 ft
Rakes = 109 ft
Eaves = 772 ft

Flashing = 109 ft
Step flashing = 164 ft
Parapets = 54 ft



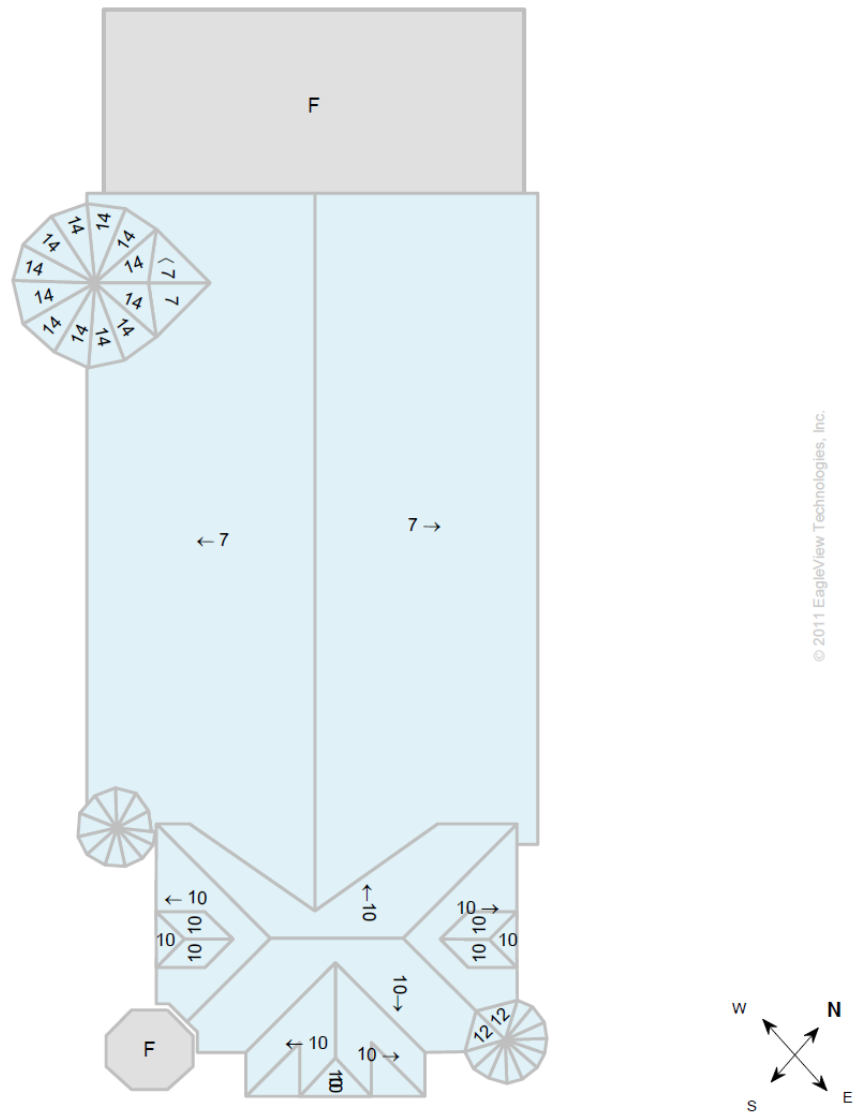
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Note: This diagram contains segment lengths (rounded to the nearest whole number) over 5 feet. In some cases, segment labels have been removed for readability. Plus signs preface some numbers to avoid confusion when rotated (e.g. +6 and +9).

Source: EagleView Measurements

Pitch Diagram

Pitch values are shown in inches per foot, and arrows indicate slope direction. The predominant pitch on this roof is 7/12.



Note: This diagram contains labeled pitches for facet areas larger than 20 square feet. In some cases, pitch labels have been removed for readability. Blue shading indicates a pitch of 3/12 and greater. Gray shading indicates flat, 1/12 or 2/12 pitches. If present, a value of "F" indicates a flat facet (no pitch).

Source: EagleView Measurements

Total Area = 21536 sq ft, with 56 facets.

