NEW HAMPSHIRE DIVISION OF HISTORICAL RESOURCES
State of New Hampshire, Department of Cultural Resources 603-271-3483
19 Pillsbury Street, 2nd floor, Concord NH 03301-3570 603-271-3558
Voice/ TDD ACCESS: RELAY NH 1-800-735-2964 FAX 603-271-3433
http://www.nh.gov/nhdhr preservation@nhdhr.state.nh.us

REPORT ON THE OLD HAVERHILL ACADEMY BUILDING (PEARSON HALL) HAVERHILL CORNER, NEW HAMPSHIRE

JAMES L. GARVIN

NOVEMBER 30, 2008

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EXECUTIVE SUMMARY

The New Hampshire Land and Community Heritage Investment Program (LCHIP) has granted funds to assist with the rehabilitation of the Old Haverhill Academy building, or Pearson Hall, at Haverhill Corner. The granting of LCHIP funds for a historic property requires that the treatment of that property be carried out in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties*, specifically the *Standards for Rehabilitation*.

These *Standards* envision the adaptation of a building for present and future needs rather than its restoration to the period of its construction. The plans for proposed adaptation of Pearson Hall, prepared by in October 2002 by Finegold Alexander & Associates of Boston, were conceived in the spirit of the *Standards for Rehabilitation*.

The *Standards for Rehabilitation* place value on changes to a property that have taken place over time and that embody the history of changing needs and uses of the building. These *Standards* also allow flexibility (but urge sensitivity) in adapting the building to meet contemporary needs.

Particularly relevant to the recommendations of this report is Standard No. 4: **"***Changes to a property that have acquired historic significance in their own right will be retained and preserved.*" Much of this report is devoted to identifying and characterizing the major changes that have been carried out at Pearson Hall over the years so that the alterations "that have acquired historic significance in their own right" can be discerned and addressed in the upcoming rehabilitation.

Although it was built in 1816 as a home for Haverhill Academy and local courts, Pearson Hall as we see it today retains original fabric mostly in its brick walls and roof structure. With the exception of a few original window casings, all visible interior joinery of 1816 was removed in a series of nineteenth-century remodeling campaigns. The most transformative of these occurred in 1897, when the first story was modernized as an auditorium for community use and the second story was remodeled into a dining hall and home for the Haverhill Library. The second story of the building retains much fabric from this remodeling.

A second major transformation occurred in 1927, when the Haverhill School District employed Wells and Hudson, architects of Hanover, to convert the first-story auditorium to classrooms and corridors. Virtually all the detailing seen today on the first story dates from 1927 or later.

It is the assumption of the present report that the building can and will be adapted for future uses under the guidance of the *Standards for Rehabilitation*. At the same time, it is the assumption of thus report that significant spaces and materials from 1897 and 1927 will be preserved whenever possible, enhanced by judicious repair as suggested by the Standards, especially Standard No. 6: "*Deteriorated historic features will be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature will match the old in design, color, texture, and, where possible, materials. Replacement of missing features will be substantiated by documentary and physical evidence*."

Following these principles, the present report makes certain recommendations in response to questions that were raised during the preliminary investigation of the building in April 2008. Among these recommendations are:

- The exterior brickwork will be treated according to recommendations of the National Park Service, using appropriate materials and techniques

- The front doorway will be rehabilitated according to one of several possible designs. Consideration will be given to restoring the entrance with double-leaf doors, as were installed in 1897 and removed recently, and retaining the 1897 fanlight. Life safety codes will govern the ultimate dimensions and configuration of the door.

- Early window sashes of several periods will be retained and protected by storm sashes. Modern sashes will be replaced by true-divided-light sashes that follow the predominant pattern installed throughout most of the building in 1897, and will likewise be protected by storm sashes.

- The building will be searched for architectural fragments that may provide clues regarding window blinds, window sashes, door patterns, and the belfry parapet. An area, perhaps in the attic, will be established for the permanent preservation of architectural evidence that may be discovered through searching or during construction.

- Window blinds will be fabricated for the façade following analysis of any surviving evidence regarding appropriate patterns for various periods.

- The belfry parapet will be replaced according to the evidence offered by available photographs and by any physical remains that may be found.

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JAMES L. GARVIN
APRIL 30, 2008
COMPLETED NOVEMBER 30, 2008

This report is based on an inspection of the old Haverhill Academy Building (built in 1816 and renamed Pearson Hall in 1897) on April 28, 2008. The purpose of the inspection was to address several questions about the design, evolution, and condition of the building, thereby providing a fuller context for the development of a program of rehabilitation for the structure.

This report is intended to supplement Kimberly Alexander Shilland's "Haverhill Academy Reuse Proposal: Historic Structures Report" (c. 1991). The Shilland report provides a good summation of the known history of Pearson Hall. The current report focuses on technical aspects of the building, and on architectural changes that mark its evolution from a combined use as an academy and a county courthouse to full academy use on both stories, then to town hall/library use, and finally back to academic use and adaptation as a public school building. Since a portion of the funding for the proposed rehabilitation of Pearson Hall is in hand, and since the expenditure of this funding will need to comply with the *Secretary of the Interior's Standards for Rehabilitation*, this report also discusses character-defining features of Pearson Hall that will need to be considered carefully as plans for adapting the building are developed further.

Summary history: Pearson Hall is one of the most significant academic structures to survive in New Hampshire. Built for the Haverhill Academy in 1816, reportedly by builder-architect Edmund Stevens, the structure was utilized initially not only by the academy but also by the Grafton County courts, which occupied the second story until a nearby courthouse was constructed in 1846. With a largely intact exterior and with some original features surviving on the interior, the building is one of a small group of New Hampshire academy structures to survive from the early 1800s; others include the Atkinson Academy building (1803), the Portsmouth Academy building (1809), and the Pinkerton Academy building (1814) in Derry. All of these buildings have been altered considerably as their uses have evolved over the years.

As an institution, Haverhill Academy represents the pioneering stage of private secondary education. When Haverhill Academy was incorporated in 1794, the academy movement in New England was in its earliest phases; in that year, the New Hampshire legislature had incorporated only seven other academies: Phillips Exeter (1781), New Ipswich (1789), Chesterfield (1790), Atkinson (1791), Aurean Academy in Amherst (1791), Charlestown (1791), and Gilmanton (1794). The building is unusual among its surviving contemporaries in that it treats a narrow elevation as its façade and has a belfry over the entrance pavilion, almost like a church building. Most other known academy buildings of the period utilized a broad elevation as the façade, sometimes (as in Exeter and Atkinson) articulating that façade with a shallow projecting pavilion. Where belfries were present on these contemporary buildings, they sat astride the ridge of the roof in the center of the structure, not over the entrance.

Front (west) elevation, Haverhill Academy Building (Pearson Hall), built in 1816. Photograph: April 2008.

Chronology of the Haverhill Academy Building (Pearson Hall) derived from Kimberly Alexander Shilland, "Haverhill Academy Reuse Proposal: Historic Structures Report":

Circa 1793	A wooden building was erected for the use of Haverhill Academy.
1794	Haverhill Academy was incorporated.
1816	The wooden academy building burned on February 8, 1816 and was replaced during the ensuing year by the extant brick structure, said to have been built by Edmund Stevens under the supervision of Ephraim Kingsbury. The building was shared with the Grafton County courts, which occupied the entire second story.
1846	A new brick courthouse (now called Alumni Hall) was built on Court Street, and the courts ceased to occupy the second story of the academy building.
1846	The vacating of the academy building by the courts may have stimulated some remodeling of the interiors for expanded academic uses. According to William Frederick Whitcher's *History of the Town of Haverhill, New Hampshire* (1919), the trustees of the academy undertook "thorough repairs with necessary alterations made to the interior of the building." The 1916 *Catalogue of Haverhill Academy and High School* states that the trustees "fitted up the building for the two departments they had so long desired to maintain."
Circa 1865	Possible renovations to the first story, designers unknown. Whitcher's *History of the Town of Haverhill* states that the academy trustees permitted the Town of Haverhill to make changes to the lower story for use as an assembly hall.
1880	According to Whitcher's *History of the Town of Haverhill*, Haverhill Academy merged with the town's public school system, though the academy retained its original name. John Quincy Bittinger's *History of Haverhill, N. H.* (1888) says that "when the school was reorganized in 1880 the Academy was thoroughly repaired at an expense of about one thousand dollars. . . . and the school is now equipped for furnishing a complete academic education in English and classical studies."
1897	Both floors of the old academy building were remodeled under the direction of James Henry Pearson of Chicago, and the building was renamed in honor of its benefactor. The *Weekly News* of May 21, 1897, said that

> . . . the old academy building will contain on the first floor, the hall for public entertainment and assemblies; and on the second floor, a spacious room for the Haverhill Public Library, a kitchen and dining room for social purposes, and two dressing rooms. Double entrance doors have been put in and the lower hall enlarged . . . The stage has been rebuilt, the size being the same as before. At

> either end of the stage, closed stairways lead to the dressing rooms above. On the second floor the Haverhill Public Library will occupy the southwest room which has been made 23 x 34 feet by letting 12 feet of the academic room into it. The dining room will be in the northwest room of the building. . . . The kitchen occupies the space between the two dressing rooms. . . .

These verbal descriptions do not correlate clearly with the first- and second-story floor plans of the building that we see today. Some of the discussion below will therefore attempt to differentiate among the various periods of woodwork seen in various areas of the building with the purpose of trying to define which interior details may be considered significant and character-defining.

Additional chronology of the Haverhill Academy Building (Pearson Hall) derived from a cursory examination of Haverhill School District Reports:

Because it is clear that the floor plan and detailing of the building as seen today, especially on the first story, do not reflect the presence of a community hall as described in the account of the 1897 remodeling, further (but not exhaustive) research into the published town and school reports has been undertaken and has produced the following supplemental chronology:

1925 A private donation of cash permitted the exterior [woodwork] of Pearson Hall to be repainted and a new sign to be placed on the front of the building. This sign is visible in an available photograph that has been estimated to date from circa 1930. The domestic science room (old dining room) and the laboratory were renovated.

1926 An "Expert School Architect" was employed to design three "splendid" new classrooms on the first story, in the space occupied by Pearson Hall, the community meeting hall. This proposal would permit grade school students to be moved from the Haverhill Academy building next door, leaving the latter fully occupied by the high school. Sentiment at Haverhill Corner and elsewhere in town seemed to oppose the loss of the hall, so the proposal was dropped for the moment.

1927 The proposal to subdivide and remodel the first-floor hall for classrooms was again on the school district warrant and was approved. Wells and Hudson, architects of Hanover, were employed to superintend the remodeling. Work began by July, 1927, but the first floor framing was found to be so decayed that it had to be replaced or strengthened at unanticipated additional expense. The completed remodeling, described in the school district report for the period ending in January 1928, provided three new classrooms, toilets, supply closets, and wardrobes. It is clear that the remodeling of 1927 included the enlargement of the westernmost side windows on both the north and south elevations of the building, and probably the provision of some of the exit doors that remain in use. Grade students from the Ladd Street School were moved to Pearson Hall.

1929 Grafton Masonic Lodge was given a lease on the second floor of the building (the former dining room, kitchen, and library). The lodge remodeled this floor for Masonic uses.

It is not clear from this limited chronology whether academic uses of Pearson Hall ceased altogether in 1897, or whether limited educational functions, possibly focusing on use of the second-floor Pearson Hall dining room and kitchen as a “domestic science” classroom, occurred between 1897 and the return of the building to classroom use in 1927.

Brick construction: The Haverhill building is unusual within a statewide context in having been built of brick as early as 1816. Only the fact that Haverhill possesses several other contemporary brick buildings of fine quality disguises the exceptional nature of a brick academy building of such an early date. The brick walls of the Haverhill Academy building are character-defining features of the structure. All future work on the building should be planned to ensure the security and preservation of these walls.

It is clear that Haverhill had excellent brick manufacturers who met the need for the thousands of bricks that were used in these local buildings. These brick manufacturers of 1800 and later were, of course, preceded by others who had been active from the eighteenth century. Yet these earlier brick makers did not have to meet the challenge of producing the several hundred thousand bricks that typically were needed for a sizeable structure built entirely of brick; the production of early brickyards was mostly destined for chimney construction in wooden houses. Nor did the early brick makers have to produce many of the harder bricks that were needed for exterior use and exposure to the elements in brick walls; only the uppermost bricks in a chimney needed to be hard-burned enough to withstand wetting, freezing, and thawing. The remainder of a chimney could be, and usually was, built of softer bricks that were laid in weak mortar composed of clay, sand, and dung rather than in more enduring lime-sand mortar used in brick walls.

The production of bricks even in the clay-rich regions of New Hampshire was also limited in scale well into the nineteenth century because of the difficulty of transporting large quantities of heavy bricks from the point of manufacture to distant markets or places of consumption. Of all brick making regions in New Hampshire and adjacent Maine, the seacoast region was clearly the most favored in terms of transportation. In that area, the best clay beds lie alongside or near tidewater, permitting the easy loading and moving of great quantities of brick by water. Inland areas like Haverhill might see bricks transported some distance down the nearby Connecticut River, but it is safe to assume that the bricks used in the Haverhill Academy building and other local brick structures were made close to Haverhill Corner.

In the eighteenth and early nineteenth centuries, bricks were made by simple processes that depended largely on the muscular power of men, boys, and animals. Clay as taken from the ground is not suitable for molding. Such clay is stiff and sticky, and must be tempered or rendered more plastic. This was traditionally accomplished by digging the clay from the clay bank in the fall and allowing it to freeze and thaw, with repeated turnings, over the winter. This tempering process was followed by re-wetting and mechanical kneading, with the addition of sand to make the clay more workable. This was carried out in early brickyards by driving cattle or horses over the lumps of clay; the pug mill, an animal-powered device for mixing sand with the clay, was probably adopted later in the nineteenth century. Tempering was a slow process, inviting hasty or inconsistent work. Writing in 1792, New Hampshire historian Jeremy Belknap complained that much of the clay used in making bricks in coastal yards was “not sufficiently mellowed by the frost of winter, or by the labour of the artificer.”

After the clay had been tempered to the consistency of a stiff mortar, it could be molded. This was accomplished by taking a lump of clay and throwing it into a wooden mold with rectangular cells slightly larger than the dimensions of the fired brick, then striking off the surplus clay with a straightedge. The molding operation required considerable strength and a degree of skill that developed over the course of molding thousands of bricks. To enable the prism of sticky clay to drop out of the mold as a “green” brick, the mold was wetted with water or dusted with dry sand. Physical evidence provided by the smooth surface of bricks in most Haverhill-area buildings of the early 1800s suggests that local brick makers usually used water without sand to lubricate their molds. Most local face (exterior) bricks from the early nineteenth century exhibit some surface irregularities as a result of their having been dropped out of the mold and handled during air-drying. When seen in a raking light, most also display flat, shallow indentations on their faces. These impressions result from the weight of superincumbent bricks when the still compressible green bricks were stacked in the kiln for firing.

After being dropped from the mold, the “green” bricks were laid flat on the ground to begin to dry and stiffen. After a few days, they were tipped up on their edges to dry further. After this initial drying, the bricks were carefully stacked in rows, often under the makeshift shelter of boards placed over the rows to protect the unburned bricks from rain, the brick maker’s enemy.

Once molded and air-dried, green bricks were ready for firing or “burning.” The green bricks were carefully stacked in a “clamp”—a rectangular structure with corbelled tunnels running at intervals through its base and with innumerable gaps or interstices throughout the entire construction to allow heat from the fires in the arches to pass upward through the entire pile. The outer faces of the clamp were “scoved” or covered with an un-mortared veneer of hardened refuse bricks from earlier firings, and were carefully parged or plastered with mortar made of clay and sand to contain the heat of the fires.

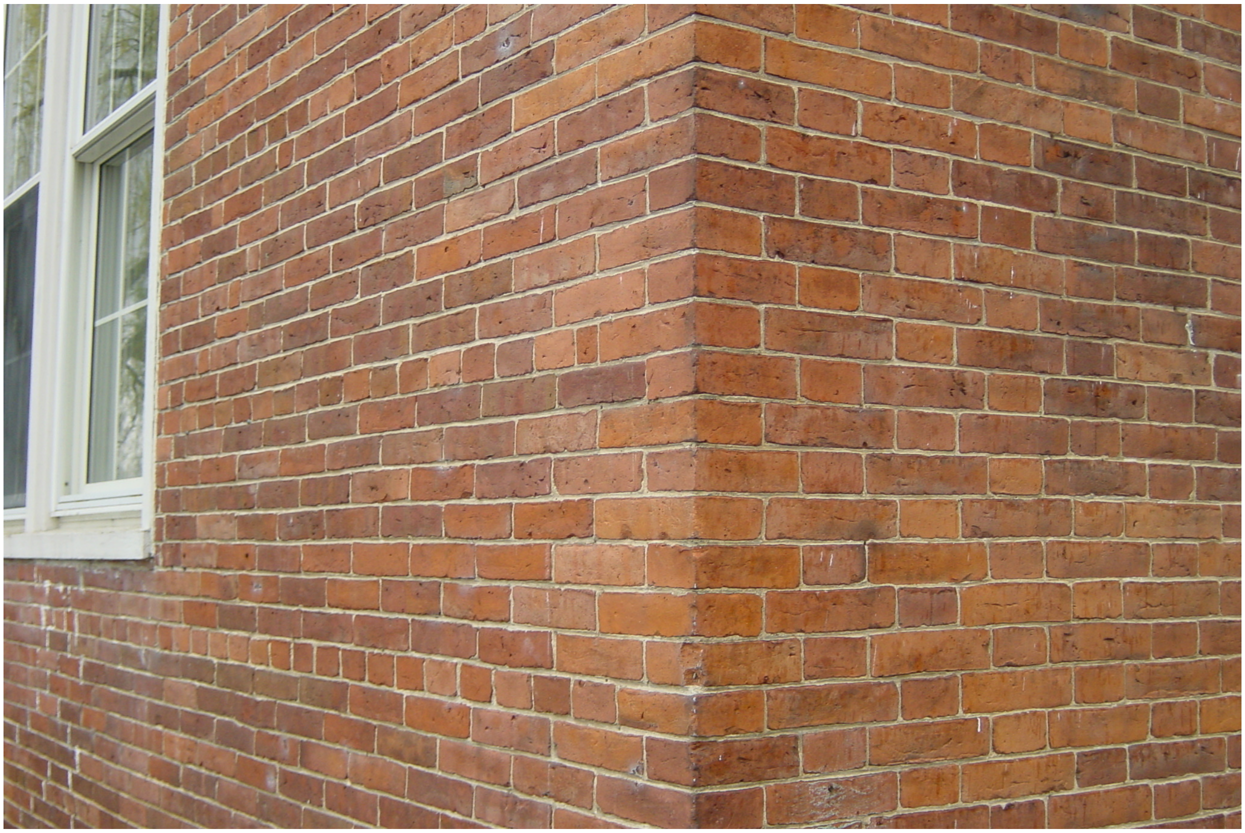
The bricks in a clamp were vitrified by the heat of wood fires made in each of the arches at the base of the pile. By feeding and adjusting these fires and regulating the draft, the temperature at the bottom of the clamp was gradually raised to a point between 1,500 and 2,000 degrees Fahrenheit, transforming the prisms of blue clay into red ceramics. Firing and cooling a clamp of bricks could take well over a week. After the firing was complete and the kiln was slowly cooled over a period of several days, the entire pile was taken apart and the bricks sorted for various uses. Despite the best skill of the brick maker, the bricks near the fires would inevitably be more vitrified than those at the top of the kiln. Usually, the bricks from the mid-region of the clamp would be the characteristic bricks of the burning, displaying a color, size, and hardness that reflected the properties of their clay and their method of firing.

Because of the labor-intensive method of their manufacture, the bricks that compose the walls of the Haverhill Academy building should be regarded as hand-made objects that embody the impressive skill of local craftsmen.

The bricks in this building were also laid with great care. The exterior walls of virtually all New Hampshire buildings of the first decade of the nineteenth century were laid in Flemish bond, a complex but strong brick bond that utilizes alternating headers and stretchers in each course and requires considerable precision in laying the bricks. Yet it was not uncommon for bricklayers to use the more easily-laid common or "American" bond for the side or rear walls of early nineteenth-century structures. Common bond is a stretcher bond that employs a row of headers at intervals to tie the inner and outer wythes of the wall together. In the case of the academy building, the row of headers occurs every eight to ten courses. American bond was seldom employed for the more public elevations of buildings until the late 1820s. This transition is seen in the First Congregational Church building of 1827-28, which stands close to the academy building and has a façade laid in common bond.

In the case of the Haverhill Academy building, the masons employed Flemish bond for the façade, but only to the height of the keystone of the arched opening on the second story. Above that elevation, well above eye level, they switched to common bond, as seen in the photograph below.

Similarly, the bricklayers used common bond for the side and rear elevations of the building, a transition that is not unusual in buildings of the early 1800s.



Front (right) and north side elevations of Haverhill Academy building, showing the transition from Flemish bond on the façade to common bond on the side walls.

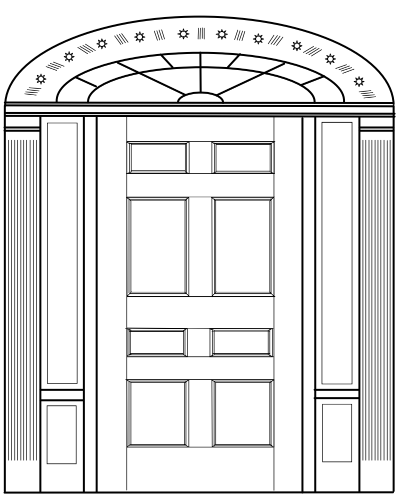
The brick tower was constructed in an unusual fashion. The front wall of the tower, rising flush with the front wall of the pavilion below it, is well supported by that wall. The brick side walls, however, rise from the roof of the projecting pavilion. These walls are not supported by masonry that extends to the ground. Rather, the bottoms of the side walls rest on massive timbers that extend inward from the front wall of the pavilion, above the second story level. The practice of supporting heavy eight-inch-thick brick walls on timber is daring, and in this case has survived for almost two centuries with less trouble than might be expected. Both side walls reveal step cracking, probably mostly due to shrinkage of the supporting timbers across the grain of the wood. This cracking has been repaired with mortar in the past, yet predictably has re-opened sufficiently to allow daylight to be seen from within the tower. Still, the cracks are thin and do not appear to pose a real threat to the integrity of the tower walls.

The rear wall of the tower is filled with wood rather than being built of brick. It is not visible from most vantage points. The side walls are tied together near their tops by iron "S" plates that probably are connected to a cross timber near the top of the tower at the rear wall.

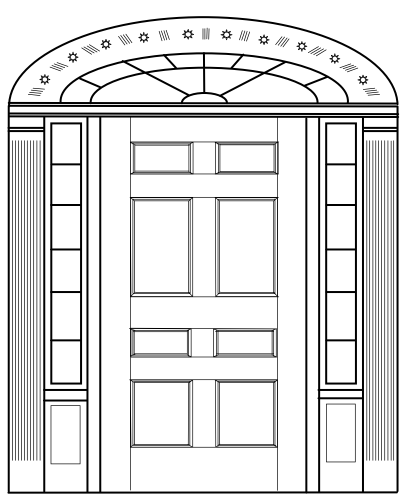
The masonry of the academy building incorporates several other noteworthy features. Among these are the splayed stone lintels above each of the original window openings of the facade. While such lintels are seen on other Haverhill-area buildings, including the somewhat later First Congregational Church building nearby, most brick buildings of circa 1816 utilized invisible wrought iron lintels above wall openings, as does the academy building on its side and rear elevations. The splayed lintels clearly derive from a good local supply of stone and the presence of masons with the skill to split and hammer that stone into precise shapes. These stone elements are important to the visual and technological character of the academy building.

Doorway treatments: The photograph of circa 1890, mentioned above, shows that the entry fanlight at that date differed from the existing light. Since the fanlight shown in the 1890 photograph closely matches the surviving light in the nearby Grafton Hotel (circa 1815), it may be presumed that the academy building retained its original fanlight until (as noted in the chronology above) it was re-fitted with double front doors in the remodeling of 1897. Before the installation of the double doors, the academy building had an unusual eight-panel single-leaf door, framed on each side by door frame posts. The spaces between these posts and the surviving pilasters that abut the sides of the opening in the brick wall would normally have been filled with sidelights set above panels, as seen in the doorway of the nearby Grafton Hotel. The photograph seems to show that by circa 1890 (and perhaps originally), painted boards had been substituted for the usual sidelights. This photograph, and another that has been dated circa 1895, show that the original fanlight above the door was a near duplicate of the one that survives at the Grafton Hotel.

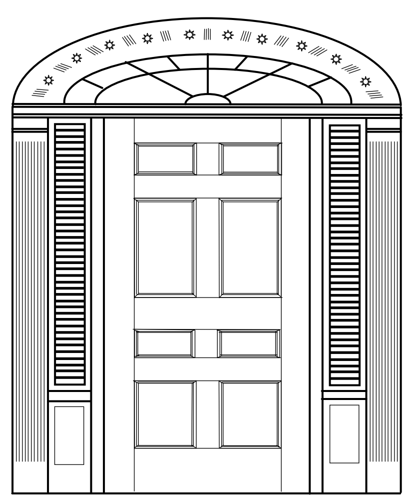
Several original treatments to the doorway of the academy building could have been employed. The earliest available photographs date from circa 1890 or later. These pictures appear to show the original eight-panel door (simulated in the drawings below), but do not necessarily depict the original treatment at the sides of the door. The earliest photographs appear to show the unorthodox treatment at the left (below), consisting of solid board infill on each side of the door. A more commonplace treatment, at least for a private home, would have been the treatments shown in the center drawing, with glazed sidelights, possibly protected by louvered blinds (right, below). Louvered blinds could also have been applied over solid wooden infill to suggest the presence of glazed sidelights even when no sidelights were installed.



Solid board infill
on sides of door



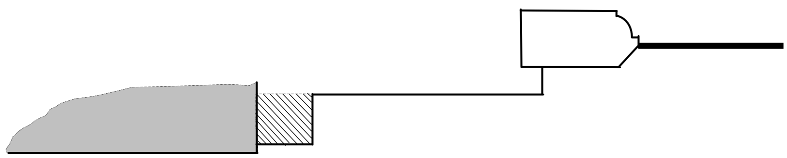
Sidelights



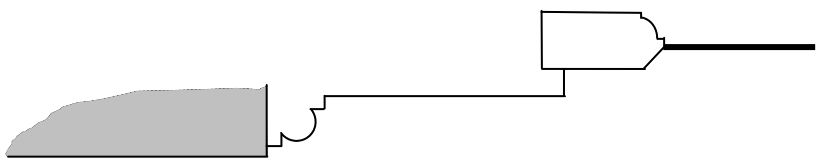
Louvered blinds covering either
solid board infill or sidelights

It is clear from later photographs that the original door was replaced in the remodeling of 1897 by a pair of five-panel doors of the type discussed later in this report; see the drawings on page 17. At the same time, the original fanlight shown in the sketches above was replaced by the somewhat simpler fan seen in the photograph on page 2. Later, by the 1980s, all wooden door elements had been removed and replaced by the glass and aluminum entrance shown on page 2.

Window treatments: The exterior window detailing of the building is not typical of the 1816 period, and appears to reflect a later change. The staff moldings that seal the transition between the brick openings and the wooden window frames are simple, square fillets, as shown below (hatched for clarity).



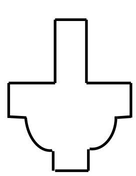
More typically, an early nineteenth-century brick building would have a staff molding in the form of an ogee profile, a half-circle, or a rod, as suggested below:



It seems likely that original staff moldings were replaced by the square stock during a program of sash replacement. The sashes in the building have been replaced several times, leaving the upper twelve-light sash to the south of the front entrance, in a window opening that has long been sealed beneath a stairway (and hidden behind closed blinds until recent removal of all blinds), as the only surviving original sash in the building; the lower sash in this opening is a later twelve-light unit.

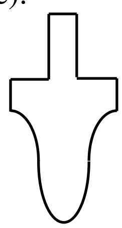
Right: Twelve-over-twelve window in the front pavilion, to the south (right) of the front door.

Below: the muntin profile of the upper sash in this opening (not to scale). This is the only surviving original window sash in the building.



One photograph of circa 1890, showing the façade and part of the south elevation of the building before a major remodeling of 1897 (described below), suggests that all the first-story windows retained their original twelve-over-twelve sashes until 1897, but that most or all second-story windows has been fitted with six-over-six sashes before that date in an earlier remodeling.

The remaining window sashes of Pearson Hall vary greatly in their current configurations. While the only identifiable original sash in the building is the one described above, the structure retains several other sashes of a design that could date anywhere from about 1845 to about 1900. These sashes could have been installed when the courts vacated the second story of the building in 1846. More likely, they date from 1880, when Haverhill Academy merged with the town's public school system and "the Academy [building] was thoroughly remodeled at an expense of about one thousand dollars," as noted in the chronology above. These windows exhibit the muntin profile shown below (not to scale):

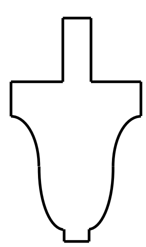


One such sash accompanies the original sash in the window opening to the right of the front door, where it has a twelve-light configuration and is used as the lower unit in the opening. Two other pairs of sashes with the same or a very similar muntin profile fill the two window openings on the second story of the pavilion, on each side of the central "Palladian" window. These sashes have a six-over-six pane arrangement.

A photograph of circa 1890, mentioned above, shows that at that date, all visible sashes on the second story, both in the pavilion and the main building, had been changed to a six-over-six configuration. These second-story sashes presumably displayed the muntin profile that is shown above and survives in the two second-story windows on each side of the Palladian window of the pavilion.

Today, the building exhibits a variety of sashes. Some of these apparently date from the thorough remodeling of the building under the direction of James Henry Pearson in 1897. Others are of more recent vintage. The most recent have snap-in grids that are intended to mimic muntins.

The sashes that appear to date from the 1897 remodeling have a characteristic profile that was introduced in the very late 1800s and persists in use to the present day (not to scale):



Sashes of this general muntin profile remain in the building on most of the second story. The same profile characterizes the fanlight over the front entrance which, as noted below, dates from 1897. The awning windows of the south elevation on the first story, which date from 1927, employ essentially the same profile.

Not all the window sashes that share the muntin pattern shown above are as early as 1897 or 1927. The similar sashes in the "Palladian" window opening at the center of the pavilion are evidently new replacements, hung with spring balances. Given the confusing range of window treatments throughout the building, each surviving sash should be studied carefully in order to develop a more precise window chronology than we currently have.

Special interest centers on the "Palladian" window above the front door, as well as the original treatment of the semi-elliptical arched opening above this window (see photograph on page 7).

As we see it today, the "Palladian" window is not a true three-part unit, although it is treated to appear from the exterior as if the central sash were flanked by narrower sashes and topped by a fanlight. Today, with the louvered blinds removed from all the building's windows, including this central one, the intended effect is greatly diminished. Older photographs, one dating to about 1890, show that for many years the central sash was flanked by louvered blinds, for which the pintles remain in place. When opened, these blinds framed the central sashes and strengthened the suggestion of a three-part Palladian window. When closed (which may have been seldom, since this window lights a stair hall), the blinds revealed the flat boards that are exposed today. In most of the older pictures of the building, these boards, when exposed, were painted a dark color (probably green), although the frames around the boards appear white.

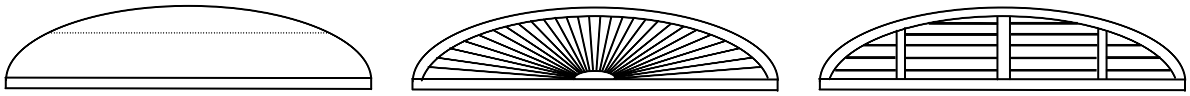
The original or intended treatment of the fan above the window remains unclear. In most false Palladian windows of this type, the fan is filled with a louvered blind to suggest that a glazed fanlight lies beneath. No available photograph of the academy building shows a louvered blind in this position; rather, all show that the boards above the window were painted a dark color (again, probably green), with the curved top board painted white. A white half ellipse appears above the center of the window to suggest the center of a radially louvered blind. The white semi-ellipse is faintly visible today under a thin coat of white paint. Examination of the paint layers around the central window would clearly reveal the sequence of paint treatments over time. Possibly the painted treatment, suggesting an always absent louvered blind, is original.

The rough finish of the curved board or plank that follows the soffit of the brick arch suggests, however, that the semi-elliptical recess above the window was intended to be filled with a louvered blind. The fact that no available photograph shows such a blind suggests either that such an intention was never fulfilled, or that an original louvered blind deteriorated quickly and was never replaced.

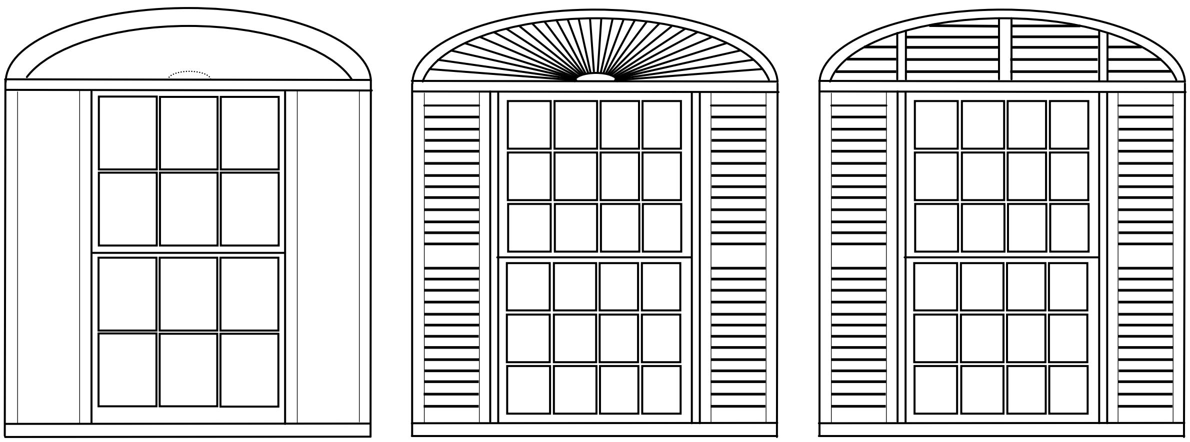
In the inspection of April 30, 2008, some attempt was made inside the building to determine whether evidence is present for sidelights that might have flanked the central window. As may be seen readily on the exterior of the building (photograph on page 7), the wooden framework within the opening in the brick wall could have supported two sidelights as well as the solid board infill that exists today. Yet the gap between the brick jambs and the central window is filled inside the building with split-board lath (the original type of lathing employed in the building), suggesting that no sidelight sashes ever flanked the central window. On the other hand, it appeared that the brick jambs to the south of the window, where damaged plaster permits limited inspection, may have been laid with splayed sides. If so, there may originally have been sidelight sashes with splayed reveals, or the bricklayers may at least have left such an option available to the joiners. This feature should be investigated further.

The two openings in the tower above the second story present additional puzzles. The circular aperture is treated as one might expect, with a louvered blind placed over a backing of green-painted boards. A similar treatment might be expected in the semielliptical opening. All available photographs of the building, however, show only board infill in this opening. Although these photographs are indistinct, they seem to record a full board or plank frame within this opening, having a sill, a curved to rail that follows the brick arch, and three vertical stiles. The two outer stiles appear to have been placed in vertical alignment with the window frames of the "Palladian" window below. The voids in this structure appear to be filled with boards. The current crudely-made board construction is evidently a makeshift of the twentieth century.

Possible (but conjectural) treatments of the "Palladian" window and the semi-elliptical arch above it are suggested in the sketches below:



[current treatment]



Given the inconclusive evidence provided by available photographs, it will be important to search the attic of the building thoroughly for fragments of blinds or other pieces of evidence that may supplement the incomplete photographic record of the treatment of the façade over time.

Belfry parapet: One of the puzzling attributes of the academy building was a former wooden parapet that surrounded and enclosed the bell deck. This feature remained in place at least as late as circa 1930. Almost every available photograph seems to show the enclosure to have relatively heavy posts at each corner, a top rail with a slightly projecting cap, and solidly enclosed sides composed of horizontal boards. This feature is uncharacteristic of belfry balustrades on most federal-era buildings, which tend to be open balustrades composed of turned balusters. In some church buildings, a sawn guilloche or lattice substituted for the balustrade.

It appears that the solid parapet may have been preferred to a more open enclosure because of one feature of the bell deck of the academy building. Instead of having a nearly flat roof covered with soldered sheet copper, as is common in many church belfries, the academy building has a low-pitched roof below the bell cradle. In the absence of the enclosing parapet, the gable ends of this roof are visible. The solidly boarded enclosure masked these triangular gables.

Most available photographs show indistinct horizontal shadows running across the face of these parapets. It is impossible to be certain what these are, but it appears likely that they are lines at the joints of the horizontal boards where the lead-and-oil paint has "chalked" or eroded to a thinner coverage than elsewhere on the boards.

One photograph, tentatively dated circa 1895 (and certainly predating the 1897 remodeling of the building) shows a horizontal flagpole projecting from the front of the belfry—the only available picture that shows a flagpole. This picture shows other anomalies: a shaft or stick projecting diagonally upward from the belfry, behind the wooden parapet, and what appears to be a wooden bracket projecting from the northwestern corner of the parapet. The purposes of these two objects are unclear, but neither appears to have been an original or permanent component of the belfry or the surrounding wooden parapet.

Interior woodwork: As noted above, the interiors of the academy building have undergone much remodeling over the years. The second story largely reflects changes of 1897, which gave the building the name "Pearson Hall" in recognition of the donor who funded and superintended the transformation and furnishing of the building. Today's first floor plan was substantially created during extensive alterations in 1927, intended to transform the auditorium of Pearson Hall into classroom space.

As noted above and in the Shilland report, Pearson's philanthropy was directed toward converting the old academy building into a meeting hall, library, and social meeting place with a kitchen and dining room in the pattern that was familiar in Grange halls. According to the description of the proposed changes that appeared in the *Weekly News* of May 21, 1897 (see pages 3-4, above), the first floor of the building was then remodeled as a single auditorium with a stage at its western wall, and was furnished with folding chair settees. Earlier descriptions suggest that this room had been used as an assembly hall at least as early as circa 1865, and that it had a stage prior to 1897. The 1897 remodeling may have focused on decorating and refurnishing an already familiar auditorium. The 1897 remodeling provided enclosed staircases at each end of the stage, leading upward to dressing rooms on the northeast and southeast corners of the second floor.

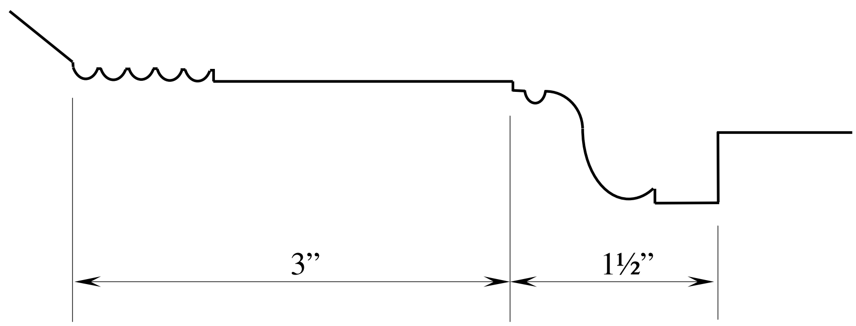
The stage and enclosed staircases no longer exist. A staircase rises from the first floor to the second in the northeastern corner of the building, but this is built largely of second-hand material and probably represents a 1927 adaptation of the stairway of 1897.

The second floor of the building was given a dual use in 1897: that of dining hall and public library. The library occupied roughly the same space as the existing room on the southern side of the second floor, used until recently as a science classroom. The dining hall occupied the room in the northwestern corner of the second story. A kitchen reportedly occupied the space between the two dressing rooms that existed in the northeastern and southwestern corners of the second floor. (More recently, a space adjacent to the existing staircase in the northeastern corner of the building reportedly functioned as a kitchen for domestic arts classes.)

In the absence of drawings that accurately depict the current floor plan of the building, it is difficult to assess all of the post-1897 changes. As noted above, the first story was substantially altered from its 1897 appearance when it was returned to academic use in 1927 and readapted for that purpose. Lease of the second story for Masonic use occurred in 1929, when the Haverhill

Library Association vacated its space on the second floor and moved its collections to a former county office building (1840) nearby, where the Haverhill Corner library collections remain to this day. No obvious remnants of the Masonic remodeling of the second story are evident today.

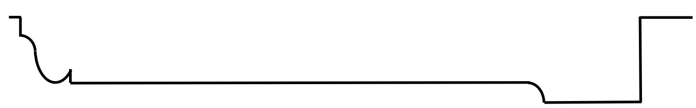
The inspection of April 28, 2008 indicated that some of the windows on the second story retain their original casings of 1816, while all the window and door openings of the first story were altered at the return of the building to academic use in 1927. The original casings of 1816 have the following profile:



Virtually identical door and window casings appear in the nearby Grafton Hotel, a contemporaneous brick building.

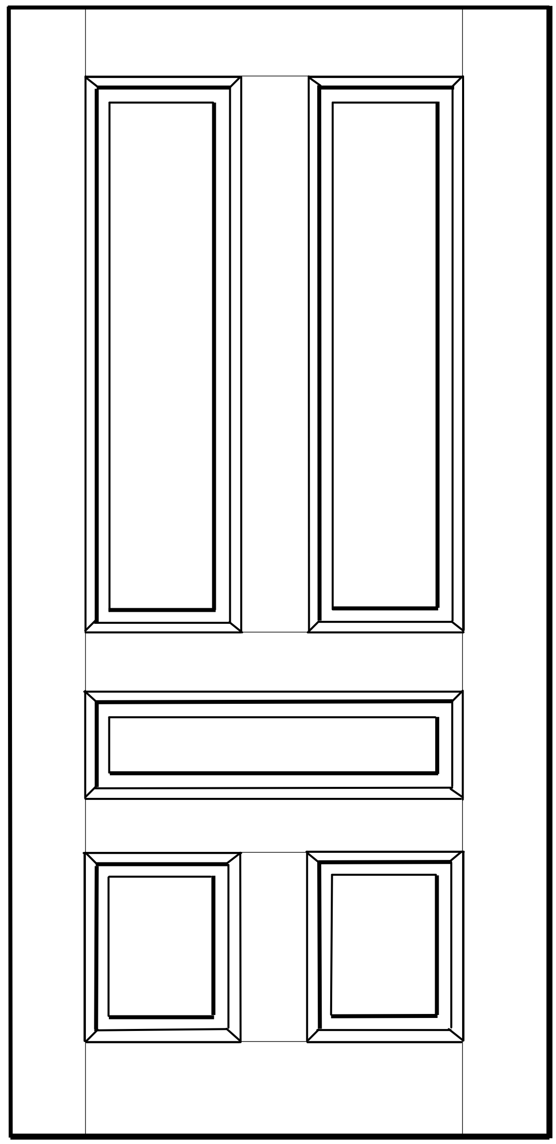
The original window sashes that would have accompanied these casings had twelve-over-twelve lights, with the muntin profile shown on page 10. Available photographs show that the second-story sashes had been changed to a six-over-six configuration before the remodeling of 1927.

On the first floor of the building, virtually all the door, window and blackboard casings were altered when the auditorium created in 1897 was subdivided and converted to classrooms in 1927. The casings that were installed during that conversion have the following profile:



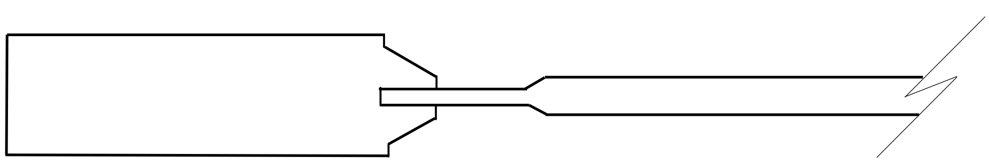
The juxtaposition of these casings with the widened classroom windows in the front classrooms on both the north and south sides of the first story demonstrates that this widening of the openings, together with the installation of the awning sashes that now fill the openings on the south side (and formerly filled those on the north), occurred in the 1927 remodeling.

Most of the surviving doors within the building today date from two periods: the later nineteenth century and the 1927 remodeling for school uses. Most of the surviving doors date from the 1927 remodeling. A few—the most prominent being the pair of doors that open from the top of the front staircase to the former second-story dining room and the corridor that led to the library—almost certainly date from 1897 since they provide access to rooms or spaces that were created in the 1897 remodeling of the second floor.



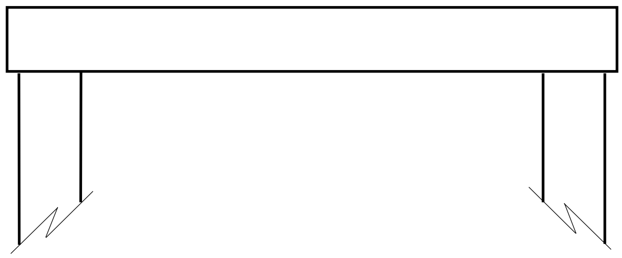
Five-panel doors dating from 1897

Most of these doors are five-panel doors with a single wide panel below the latch rail. They have the cross-section shown below.

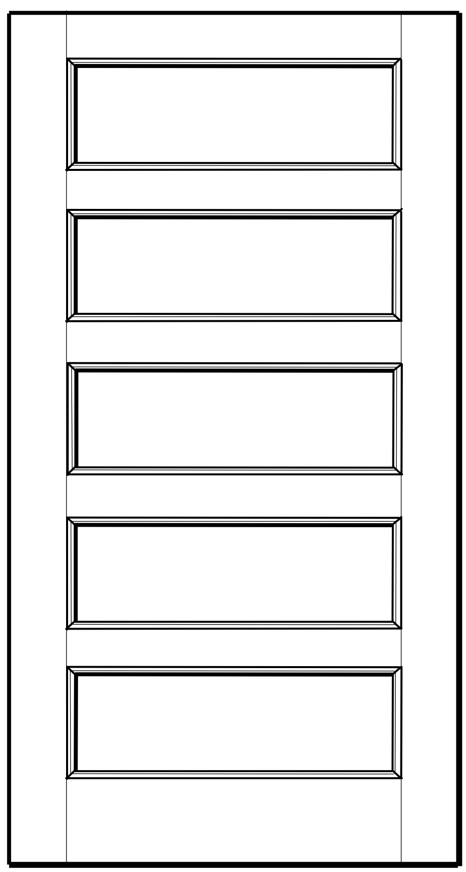


Photographs indicate that a pair of identical five-panel doors was installed in the building's front doorway opening in 1897, at the same time that the fanlight was replaced, to replace the original eight-panel front door of the building. These doors of 1897 were replaced by glass and aluminum double doors, filling the entire width of the opening in the brick wall, by the 1980s.

The casings that frame these doors on the building's interior are of the simplest three-part design:



The doors that characterize the 1927 remodeling are mostly seen on the first story, where the former auditorium was subdivided into classrooms flanking a central corridor. Two of them also open into the former library on the second floor, a room that was apparently remodeled as a lodge room for Grafton Lodge, F&AM, in 1929 and was more recently was used as a science laboratory. These are five-cross-panel doors, a type that was common during much of the twentieth century:



Five-cross-panel doors, presumed to date from 1927

Further and more detailed examination will be necessary to determine or approximate the dates of other interior features of the building. In general, however, it appears that there is very little 1816 joinery exposed to view except for a few widow casings; that the second story is predominantly characterized by changes and materials of 1897; and that the first story exhibits mostly features installed in 1927.

It is clear that the original coved ceiling of the second story was changed to a flat ceiling on the south side of the building in 1897 in order to more easily accommodate the pressed metal ceiling and wall coverings that were installed in the library room and in the corridor that provided access to this room. On the north side of the building, by contrast, the coved ceiling was left in place on the north wall of the dining room, although the entire ceiling of this room was covered with pressed metal.

As noted above, the first story is largely the product of the 1927 remodeling. The relative newness of some of the spaces on this floor is disguised by the use of pressed metal ceilings that appear similar to the ceilings of the rooms above.

Double awning classroom windows were inserted in both north and south walls in 1927 to light the front classrooms. These survive on the south elevation of the building; on the north, these units have been replaced by paired six-over-six sashes, separated by mullions. Examination of the awning units on the south side may provide further information about their patent date or manufacturer.

SUGGESTIONS FOR REHABILITATION OF EXTERIOR FEATURES

Recommended treatments: Budgetary constraints will probably limit work in the immediate future to exterior repairs. Some exterior treatments will interrelate with future interior work, especially in the area of window redesign. It will therefore be important to settle upon a rehabilitation philosophy for treatment of the entire building before any further work is undertaken.

Tentative proposals, reflected in proposed floor plans for rehabilitation drawn in October 2002 by Finegold Alexander & Associates of Boston, call for removal of the building that connects Pearson Hall with the former Haverhill Academy building, retention of some existing interior partitions and removal of others, widening of certain interior door openings, reinstallation of toilet facilities, reconfiguration of the front staircases, and provision of new access to the building through a small rear addition that would include a second staircase and an elevator.

The commitment in 2008 of funds from the New Hampshire Land and Community Heritage Investment Program (LCHIP) will require that treatment of Pearson Hall be carried out in keeping with the *Secretary of the Interior's Standards for Rehabilitation*. "Rehabilitation" is defined by the National Park Service as "the act or process of making possible a compatible use for a property through repair, alterations, and additions while preserving those portions or features which convey its historical, cultural, or architectural values." While these *Standards* envision some adaptation of a building to adapt the structure to contemporary uses, and thus to preserve the value of the structure to the community, the *Standards* also require caution regarding large-scale removal of elements that may have attained significance in their own right.

The *Secretary of the Interior's Standards for Rehabilitation* are:

1. A property will be used as it was historically or be given a new use that requires minimal change to its distinctive materials, features, spaces, and spatial relationships.
2. The historic character of a property will be retained and preserved. The removal of distinctive materials or alteration of features, spaces, and spatial relationships that characterize a property will be avoided.
3. Each property will be recognized as a physical record of its time, place, and use. Changes that create a false sense of historical development, such as adding conjectural features or elements from other historic properties, will not be undertaken.
4. Changes to a property that have acquired historic significance in their own right will be retained and preserved.
5. Distinctive materials, features, finishes, and construction techniques or examples of craftsmanship that characterize a property will be preserved.
6. Deteriorated historic features will be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature will match the old in design, color, texture, and, where possible, materials. Replacement of missing features will be substantiated by documentary and physical evidence.
7. Chemical or physical treatments, if appropriate, will be undertaken using the gentlest means possible. Treatments that cause damage to historic materials will not be used.
8. Archaeological resources will be protected and preserved in place. If such resources must be disturbed, mitigation measures will be undertaken.
9. New additions, exterior alterations, or related new construction will not destroy historic materials, features, and spatial relationships that characterize the property. The new work shall be differentiated from the old and will be compatible with the historic materials, features, size, scale and proportion, and massing to protect the integrity of the property and its environment.
10. New additions and adjacent or related new construction will be undertaken in such a manner that, if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.

In evaluating the significance of features that represent later changes to a structure, especially with regard to Standard 4 (pertaining to changes to a property that have acquired historical significance in their own right), it is usual to apply criteria developed by the National Register of Historic Places for evaluating significance and integrity. National Register evaluations commonly regard changes that are older than fifty years as potentially significant and character-defining. In the case of a building like Pearson Hall, which has had an educational function from its date of construction (possibly broken for up to thirty years between 1897 and 1927), all adaptations resulting from educational uses must be regarded as important. Thus, for example, the removal of the first-floor classroom spaces and features dating from 1927 would need to be considered carefully, and justified if undertaken.

Fortunately, the schematic plans that have been developed by Finegold Alexander & Associates appear to respect the essential integrity of the two main classroom spaces at the front of the first story and the corridor between them. The area behind (to the east of) these classrooms appears to have been compromised by recent changes, possibly associated with construction of the connecting link between Pearson Hall and the Haverhill Academy building, and to have lost internal coherence and integrity. As noted above, the existing staircase in the northeast corner of the building appears to be built of second-hand materials, although the adjacent partitions and spaces should be examined closely for potential significance.

Similarly, the proposed adaptive plan for the second floor appears to respect the essential nature of the former dining room and the former Haverhill Public Library room on the south side of this story.

Because it will be important to measure the proposed interior adaptation against the *Secretary's Standards*, it would be prudent to carry out a more detailed examination of all internal fabric on both floors, using the general chronology and architectural details described previously in this report as a means of gaining a more detailed understanding of the evolution of the interiors over time. With this deepened understanding, the Finegold Alexander & Associates schematic plans can perhaps be modified slightly in order to avoid unnecessary changes to significant materials and spaces.

In general, the *Secretary's Standards* would best be observed by retaining most changes that were carried out through the 1927 remodeling. Such retention would respect changes that adapted the building for continued educational uses, and thus are changes that have attained significance in their own right. This course of action would also be less expensive than trying to restore the building to some earlier condition that, due to the extent of change on the first story in 1927, can hardly be known at this time. Later changes, including interior alterations at the rear of the building on the first story and the replacement of the earlier front doorway with a glass and aluminum unit, could certainly be reversed to the aesthetic and functional benefit of the building.

As shown by available twentieth-century photographs, Pearson Hall remained an attractive building following the 1927 remodeling. Its façade was largely unchanged from 1897, having the current fanlight above the front door, a double-leaf entrance doorway, and window blinds on all of the windows on the western elevation. At the same time, the classroom window enlargements on the north and south elevations presumably caused all window blinds to be removed from these sides of the building, which now had windows of mismatched sizes, some of them not adapted to the use of blinds.

Exterior masonry: Because the program for reuse of the building is not complete or definite, it cannot presently be known whether modern door openings on the north first-story elevation and the east (rear) second-story elevation are to be retained or filled. It is to be expected that repairs to the historic brick walls of the building will be required after the modern connecting link at the rear is removed. This report is therefore based on an assumption that most required masonry work will entail re-pointing and repairs to original brickwork that was damaged by new construction. It would be prudent to retain the larger double windows that were installed in the north and south front classrooms in 1927, since the installation of these windows improved interior illumination by creating enlarged openings that would be expensive and difficult to return to their original sizes.

In 2008, the Advisory Council on Historic Preservation, a federal agency, issued a draft "Standard Treatment [Specifications] for Historic Exterior Masonry." Sections of these specifications, covering removal of mortar joints from historic brickwork and re-pointing, preparation of lime-based and cement-amended mortars are added to this report as an appendix. While the use of these specifications is not mandatory for a rehabilitation project that does not use federal funding, and while not every provision of these specifications will be applicable to Pearson Hall, a general reliance on these guidelines will ensure compliance with the *Secretary of the Interior's Standards for Rehabilitation.*

Further guidance is available through Preservation Brief No. 2, *Repointing Masonry Joints in Historic Masonry Buildings*. This publication of the National Park Service is available as a paper publication from the New Hampshire Division of Historical Resources, and on-line at http://www.nps.gov/history/hps/tps/briefs/brief02.htm.

The bricks in early nineteenth-century buildings like Pearson Hall are generally of lower strength than bricks made at the end of the century or during the twentieth century. Such bricks were laid in a mortar that is composed of slaked quicklime and sand. This is a low-strength mortar, often having a compressive strength of 75 pounds per square inch (psi). To prevent cracking or spalling through differential expansion, it is important that mortar not equal or exceed the strength of the adjoining bricks. Thus, when re-setting originals bricks in Pearson Hall, it will be important to use a low-strength lime-sand mortar, referred to as "Type K" mortar in the "Tech Notes" of the Brick Industry Association.

Many older brick buildings have been re-pointed at some time in their history; that is, the outer portions of the mortar joints have been raked out and the mortar replaced. The replacement mortar may be identical in formulation to the original, or may differ from the original mixture. If re-pointing was performed after the late 1800s, a proportion of Portland cement, not available until that time, was often added to the lime-sand mix to improve the workability of the mortar and to increase its strength.

The old Haverhill Academy building does not appear to have been re-pointed except where minor repairs have been carried out in limited areas, or where changes to the original masonry were made for installation of egress doors or larger windows. Areas of the building's walls appear, in fact, to retain the original concave mortar jointing that is commonplace in brick buildings of the early 1800s. Therefore, it is not to be expected that extensive amounts of re-pointing will be required during rehabilitation.

It is important that re-pointing of a historic brick building not be performed with too hard or strong a mortar. Where re-pointing may be required, or where sections of exterior masonry require rebuilding due to damage, the most appropriate modern mortar will be a duplicate of the original formula. This is a lime-sand mixture, classified today as a Type K mortar. Because lime-sand mortar is stiff and sticky, masons often prefer to add a proportion of Portland cement to improve workability and to make it easier to replicate the very thin joints that characterize early nineteenth-century bricklaying. Where large areas of rebuilding are necessary, the architect may choose to permit this.

In no case, however, should extensive re-pointing or rebuilding employ a mortar harder that what is defined as a Type O mortar as defined in the "Tech Notes" of the Brick Industry Association. This mortar will have a composition of approximately one part Portland cement to two parts mason's hydrated lime to 6¾-9 parts clean, sharp sand. As shown in the specifications in the Appendix, this formula should yield a compressive strength of approximately 350 pounds per square inch (psi) at 28 days. Gray or white Portland cement is acceptable, depending on the color that must be achieved to match the surrounding original mortar.

The joints of new work should replicate those of original work. This will require that masons take care to use a thinner mortar bed than is common in modern work, and may also require the fabrication of a custom-made jointing tool to achieve the narrow concave joint that is seen on undisturbed areas of the building's walls.

Front doorway: As noted above, the front doorway of the building underwent a change in 1897. This altered design included installation of the present fanlight above the door, and the addition of double-leaf five-panel exterior doors of the pattern shown on page 17. Available photographs do not reveal clearly whether the original doorway opening was widened during the installation of the double-leaf doors, but it seems possible that the doorway opening was widened, thereby altering and narrowing whatever treatment (solid boards, sidelights) flanked the doorway opening, as discussed on page 9.

Present-day codes governing egress may determine whether a two-leaf replication of the 1897 doorway treatment is possible, or whether it will be necessary to install a single door. In any case, the new door[s] will be required to swing out, in contrast to the historical treatment.

A selection will need to be made among the various possible treatments of the areas flanking the new doorway, shown on page 9. Since available evidence of the original design, and even the redesign of 1897, is scanty, the committee should be free to choose whatever design best suits their needs and budget. It is possible that further evidence of the original design, and of possible changes to that design in 1897, will be revealed by a more careful examination of the doorway opening after the modern door frame is removed.

Window treatments: As shown previously, Pearson Hall now exhibits a variety of window sashes. These include the single original sash to the right of the front doorway (long covered by closed blinds to hide its contrasting appearance with respect to other sashes in the building); several sashes with thin nineteenth-century muntins; several two-over-two sashes on the side elevations toward the rear of the building, with the muntin profile shown at the bottom of page 11, probably dating from 1897; the sets of awning sashes that remain in the former southwest classroom on the first story, apparently dating from 1927; modern six-over-six sashes that share the muntin profile shown at the bottom of page 11; and modern sashes with snap-in muntins to suggest the six-over-six layout of older units. Further information on these varying styles of sashes is given in Appendix B to this report.

In the interest of coherence and energy efficiency, it will probably be desirable to choose a predominant sash pattern and to replace some of the newer sashes, and perhaps some of the older ones as well. The predominant sash configuration is now six-over-six. The predominant muntin profile is the one shown at the bottom of page 11. It would seem prudent to replace mismatched sashes with modern units of this style. Such units are still available as Brosco (Brockway-Smith Company) "Boston pattern" sashes, but the recent sale of the Brockway-Smith Company may limit the future availability of this pattern, which has remained popular since the 1890s. Sashes of this pattern can, of course, be custom-made by others.

The statement that "mismatched" sashes might be replaced is not intended to suggest replacement of significant historical units that help to trace the evolution of the building. In particular, the surviving original sash, the sashes with sharp, thin muntins discussed near the top of page 11, and the awning sashes on the first story of the south elevation are significant and ought to be retained. If they cannot be retained in place for any reason, these sashes should be marked with their known history and stored permanently in the building, probably in an attic area to be reserved the permanent preservation of architectural evidence.

In the interest of energy conservation, some form of storm sashes will be needed where they do not already exist. The flatness of the exterior window frames, discussed on page 10, will facilitate the installation of exterior storm window units. Even in combination with some of the older sashes that survive in the building, exterior storm windows should produce energy efficiency comparable to that of modern double-glazed units. A study of the energy efficiency of historic windows in combination with various types of storm sashes was completed by the University of Vermont in 1997 and has been made available by the National Park Service at http://www.ncptt.nps.gov/Product-Catalog/Product.aspx?ProductID=1997-16.

The only sashes now in the building that do not lend themselves to the installation of exterior storm windows are the awning units in the southwest classroom. Because the meeting rails and bottom rails of these units tilt outward beyond the plane of the exterior window frame when the windows are opened, these sashes operate in a fashion that conflicts with the installation of exterior storm units.

Window blinds: As noted above, Pearson Hall relied on exterior louvered blinds for architectural effect. This was particularly true on the front of the building, where virtually all historic photographs show various combinations of open and closed blinds. As shown on pages 9 and 14, the use of blinds for architectural effect around the front doorway and in the openings directly above the doorway remains puzzling and deserves careful investigation. But blinds were used historically on all window openings that flank this central axis. Some photographs suggest that these window blinds may have been covered with window screening on one side in order to exclude both light and insects when closed.

Evidence of the use of blinds on the side windows is less clear. No historical photograph shows such blinds. A careful search for the former existence of pintles on the north and south windows may settle the question of whether the side windows were originally fitted with blinds. In any case, the alterations made in 1927 to the first-floor front classrooms will preclude the installation of blinds here.

A careful search should be made throughout the building for evidence of the patterns of blinds, both for ordinary windows and for the special openings at the center of the façade. Blinds of the early nineteenth century had fixed, heavy louvers, not the lighter or movable louvers often encountered on later blinds. If blinds are found within the building, it will be important to try to determine their date[s] of fabrication.

Following investigation, consideration ought to be given to replacing blinds on the façade of the building. The installation of blinds on this elevation would be historically correct and would greatly improve the appearance of the building.

Belfry parapet: As noted above, photographic evidence is inconclusive with regard to the precise design of the wooden parapet that surrounded the belfry. This feature appears to have been made from solid, horizontal boards, perhaps with the intention of hiding the now-visible gable of the pitched bell deck.

Although the use of a solid wooden belfry parapet is apparently unique within the region, photographic evidence shows that this parapet was in place by circa 1890. As noted above, such a parapet had the advantage of hiding the low-pitched gable of the bell deck roof, which would have remained visible behind a balustrade.

While it might be assumed that the known parapet was installed during a remodeling that took place before 1897 (possibly that of 1880), there is reason to suppose that the solid treatment was original to the building. Asher Benjamin illustrated a partly solid eaves parapet for a dwelling house in his *American Builder's Companion* of 1806 (Plate 35), breaking the solid wooden enclosure with openings, filled with guilloches, above each window of the façade. The idea was adopted, in simpler form, by the builders of two of the "Ridge" houses at nearby Orford village.

Other possibly original features of Haverhill Academy point to a deliberately plain treatment of parts of the building. These features include the possible use of solid boards in place of sidelights at the original entrance, and the simple, square staff moldings used around each exterior window frame. While it cannot be known whether these features were original or the products of later alterations, they do suggest the possibility that certain features of the Academy building were deliberately fashioned in a plain and rugged manner during the original construction.

Having no other evidence than that offered by a series of photographs (unless pieces of the parapet appear during a search of the building), the most defensible course of action would be to reproduce the parapet, as shown in the photographs, as accurately as possible. This would be entirely in keeping with Standard 3 of the *Secretary of the Interior's Standards for Rehabilitation*: **"***Each property will be recognized as a physical record of its time, place, and use. Changes that create a false sense of historical development, such as adding conjectural features or elements from other historic properties, will not be undertaken*."

It should be noted that wooden features attached to belfries and steeples are notoriously prone to rapid deterioration because of their exposure to the weather. The reproduced parapet should be fabricated solidly from heavy stock and attached firmly to the roof to resist the forces of wind and weather.

APPENDIX A

STANDARD TREATMENT FOR HISTORIC EXTERIOR MASONRY

APPENDIX A:

EXCERPTS FROM: ADVISORY COUNCIL ON HISTORIC PRESERVATION, "STANDARD TREATMENT FOR HISTORIC EXTERIOR MASONRY"

SECTION 04100.01 REMOVAL OF MORTAR JOINTS AND REPOINTING
PART 1 – GENERAL

1.01 DESCRIPTION

A. This specification has been developed for use on historic properties (defined as any district, site, building, structure, or object that is listed in or eligible for listing in the National Register of Historic Places) and provides an overview of accepted practices. Site-specific specifications, when appropriate, will be provided by the Architect.

B. All work described herein and related work must conform to the Secretary of the Interior's Standards for the Treatment of Historic Properties.

C. The Contractor shall provide all labor, materials, equipment, and operations required to complete the rehabilitation work indicated herein.

D. All work described herein and related work must have the approval of a Cultural Resources Manager, Conservator, Historic Architect, or other professional who meets the standards outlined in the Secretary of the Interior's Standards – Professional Qualifications Standards pursuant to 36 CFR 61. Such person is referred to in this document as the ***Architect***.

1.02 SECTION INCLUDES

A. Removal of mortar joints

B. Repointing

1.03 RELATED SECTIONS

A. Section – 04100.02 Preparation of Lime and Cement-Amended Mortars

B. Section – 04211 Historic Brick

C. Section – 04214 Terra Cotta and Ceramics

D. Section – 04500 Masonry Restoration

E. Section – 04720 Historic Cast Stone

1.04 REFERENCES

A. Repointing shall conform to *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring & Reconstructing Historic Buildings*, available at the National Park Service (NPS) website at <http://www.nps.gov/history/hps/tps/standards_guidelines.htm>.

B. Techniques employed for repointing shall be as outlined in *Preservation Brief No. 2: Repointing Masonry Joints in Historic Masonry Buildings*, available online at the NPS website at <http://www.nps.gov/history/hps/tps/briefs/brief02.htm>.

C. U.S. General Services Administration Historic Preservation Technical Procedures for mortar, available online at <http://www.gsa.gov/gsa/cm_attachments/GSA_DOCUMENT/Preservation_Note_01_R2RQ4-y_0Z5RDZ-i34K-pR.doc>; <http://w3.gsa.gov/web/p/hptp.nsf/a533f1f859737bc9852565cc0058d0b6/7de342045d4c63

f6852565c50054b3a7?OpenDocument>; and
<http://w3.gsa.gov/web/p/hptp.nsf/a533f1f859737bc9852565cc0058d0b6/e7518da3d776f026852565c50054b3c5?OpenDocument>.

D. Masonry restoration work shall comply with ACI / ASCE 530.1-88. Contractor shall maintain at least one copy of ACI / ASCE 530.1-88 on site.

1.05 SUBMITTALS

The Contractor will submit a detailed schedule of the areas to be repointed, including an assessment of the problem areas and a detailed procedure for repointing, to the Architect for approval.

1.06 QUALITY ASSURANCE

A. Work Experience: The Contractor to perform the work in this section shall have a minimum of five (5) years experience in the repointing of historic masonry. He/she shall demonstrate a working knowledge of the Secretary of the Interior's Standards for Guidelines for Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings.

B. Mortar removal will be undertaken by an experienced mason. The mason operating power or mechanical tools shall have demonstrated proficiency with the tools prior to approved use by the Architect. The Mason/operator using the equipment must have a minimum of five (5) years experience and demonstrated expertise in their proper use on historic structures.

1.07 MOCK-UPS

A. The Contractor shall prepare mock-up installations prepared with each of the removal methods and tools that will be used for this Work at locations selected by the Architect. Test panels should not be undertaken in areas that are highly visible. Use of power and mechanical tools shall be approved by the Architect.

B. The Contractor shall prepare two mock-up installations of each type of masonry joint style and mortar color to be installed at locations selected by the Architect. If cleaning tests are also to take place, test panels should be placed in the same area. Test panels should not be undertaken in areas that are highly visible. Each test panel shall be executed in the same manner as the final installation. Mock-ups will be reviewed after the mortar removal and again after completion of repointing. Test panels shall be a minimum area 3x3 feet for brick facades, and larger for stone facades. Test panels will be inspected for color, texture, and installation technique.

C. The Contractor shall prepare up to three additional mock-ups of each mortar, joint type, and mortar color without further compensation. Approved test area(s) shall become part of the work and shall serve as the quality standard for all subsequent work.

Removal of Mortar Joints and Repointing
04100.01 - 3

1.08 DELIVERY, STORAGE, AND HANDLING

A. Materials shall be delivered to the site in original packaging, unopened, with manufacturer's name and product identification thereon. Cementitious materials shall be protected from contamination by foreign matter and deterioration by moisture or temperature. Contaminated or deteriorated material shall not be used. Products stored longer than six (6) months shall not be used.

B. Masonry materials shall be stored in such a manner as not to interfere with the operation and daily maintenance of the facility. Proposed storage locations shall be approved by the

Owner prior to the delivery of materials. Masonry materials shall not be stored inside the building.

1.09 PROJECT / SITE CONDITIONS

A. The normal temperature range for the work of this Section shall be when the air and surface temperatures are 40 degrees F and rising, or less than 90 degrees F and falling. When temperatures are expected to fall outside this range, the Contractor shall employ hot and cold weather procedures as published by the Masonry Institute of America.

B. The Contractor is responsible for protecting existing adjacent materials and surfaces during the execution of the work, and shall provide all necessary protection and follow all necessary work procedures to avoid damage to existing material assemblies not a part of the work in the Section.

C. The Contractor shall provide visible barriers and / or warning tape around the perimeter of the work area for visitor protection and shall also provide that nearby vehicles and adjacent structures will be protected from damage during the course of the work.

D. The Contractor shall coordinate masonry repointing with the other trades involved in exterior and interior restoration work, including but not limited to masonry cleaning, sealing, and painting.

PART 2 – PRODUCTS

2.01 EQUIPMENT FOR RAKING AND REPOINTING

A. Equipment for raking joints:

1. Traditional Method: Hand chisels and mash hammers
2. Modern Method: Power tools including small pneumatically-powered chisels, scaler (power chipper), and thin diamond-bladed grinders. Power saws are not recommended.

B. Equipment for repointing:

1. Mortar pan mill or equipment for mortar mixing
2. Plastic buckets, hoe, wooden mallet or ax handle

Removal of Mortar Joints and Repointing

04100.01 - 4

3. Mortar board, hawk, trowels, pointing rod
4. Natural bristle or nylon brushes (metal bristle brushes are NOT to be used)

2.02 MORTAR SELECTION CRITERIA: See Sections 04100.02 and 04400.01.

A. Repair mortar shall match the color, texture, and tooling of the existing pointing.

B. Sand shall match the sand of the historic mortar.

C. Mortar shall have greater vapor permeability and be softer, measured in compressive strength, than the masonry units.

D. Mortar shall be as vapor permeable and be as soft or softer, measured in compressive strength, than the existing historic mortar.

PART 3 - EXECUTION

3.01 GENERAL

A. The restoration methods and materials selected for a specific structure shall take into account the total construction system of the building to be worked upon, including different masonry and mortar materials, as well as non-masonry elements that may be affected by the work.

B. The extent of the repointing, whether partial or sectional repointing, complete facades or features, or total structure or building, shall be reviewed by the Architect on site prior to

beginning operations. The Contractor shall submit a repointing schedule, including methods and materials to be used for approval before work starts.
C. The Contractor shall complete a survey of the condition of the mortar and masonry:
1. Existing general masonry failures that contribute mortar losses shall be noted and should be scheduled for repair prior to repointing.
2. Analysis of mortar type and color shall be conducted, the extent and type of analysis to be determined by the Architect.
D. The Contractor shall protect adjacent materials, installed non-masonry materials, and openings.
E. Manufacture's instructions for mixing and installation of masonry and equipment shall be followed. Masonry shall conform to ASTM C 270.
F. Masonry cleaning shall be completed prior to beginning raking and repointing work.
3.02 SYSTEM FOR JOINT REMOVAL
A. The areas selected for repointing, if partial or selective repointing is to be done, shall be designated and marked off.
Removal of Mortar Joints and Repointing
04100.01 - 5
B. Removal Methods:
1. Traditional Method: removal of mortar by hand with a hand chisel and mash hammer. This method produces the least damage and is preferred for masonry with thin joints and brick.
2. Modern Method: removal with power tools such as pneumatic chisels and grinders. Power saws are not recommended for use on most brick walls or thin joints. Small pneumatically powered chisels are generally effective for use on historic buildings, providing the operator is skilled. Grinders with thin diamond blades can be used for horizontal joints on hard portland cement mortars.
3. Combined Methods: combined use of power tools and hand chiseling methods are generally recommended and achieve the highest degree of success when properly executed.
C. Specifications for Removal:
1. Mortar shall be removed to a minimum depth of 2 to 2 ½ times the width of the joint but not less than ¾ inch.
2. Chisels and power tools are to be the appropriate size to fit cleanly into mortar joints without damage to surrounding surfaces.
3. Loose or disintegrated mortar beyond the minimum depth shall be removed.
4. Removal of the mortar shall be done in a manner that does not score, chip, or otherwise damage masonry units or adjacent elements.
5. Mortar should be removed cleanly from the masonry units, leaving square corners at the back of the cut.
6. If using a grinder to rake head joints, the Contractor shall switch to the smallest diameter blade possible to make the deepest cut without overrunning the ends of the joint and cutting into the bricks above or below. Top and bottom of the head joints shall be finished with a chisel.
7. Use a hand chisel to finish joints adjacent to door and window openings to avoid damage to frames and trim.
8. If work is found unacceptable, all raking shall cease without additional cost to the

Owner until deficiencies in tools, workmanship, or methodology have been corrected to the Architect's satisfaction.

3.03 SYSTEM FOR REPOINTING

A. The Contractor shall inspect all joints to receive mortar prior to commencing work:

1. After removal of the old mortar, joints shall be blown clean with compressed air (40-60 psi) to remove all loose particles and dust.

2. Prior to repointing, joints shall be dampened with low pressure water (100-150 psi). Joints shall be damp with no visible standing water.

3. A continual mist of water shall be applied for a few hours prior to repointing walls of absorbent masonry units such as limestone, sandstone, and common brick.

B. Filling Joints:

1. Fill the deeper areas first, compacting the new mortar in several successive layers.

2. Apply successive amounts of mortar in ¼-inch layers.

3. Allow each layer to harden before application of the next layer.

4. Apply the final layer flush with masonry units, except where old bricks or stones have worn, rounded edges, the final mortar layer should be recessed slightly from the face of the masonry. Do not feather-edge mortar over chipped or damaged edges.

C. Finishing:

1. Allow the final layer to set until "thumb-print hard" and tool to match the historic joint. Proper timing is important for uniform color and appearance of the mortar.

2. Remove excess mortar from the edges of the joints with a natural bristle or nylon brush after mortar has dried but before the mortar is initially set (1-2 hours).

D. Curing:

1. Periodically wet mortar joints after the mortar joints are thumb-print hard and have been tooled (especially important with high-lime content mortars, such as Type O, Type K, and especially Type L). Misting with a hand sprayer with a fine nozzle for one to two days is recommended.

2. Where ambient temperatures exceed 80 degrees F or where wind speeds exceed 20 mph, cover walls with burlap after repointing to keep walls damp and protected from direct sunlight. If plastic is used, it must be tented out and not placed directly against the wall.

3. Allow new mortar to cure for at least 30 days prior to exposure to other repairs, such as masonry cleaning.

3.04 FINAL REPORT

The Contractor shall:

A. Revisit the site after the new mortar has cured at least 30 days to compare the finish and color of the repair to see if the desired affect has been achieved.

B. Document the work and finished product with photographs.

C. Provide a written summary of the project and results upon final inspection and approval. The summary shall outline steps taken or new findings not specified in the initial documentation.

END OF SECTION

SECTION 04100.02 PREPARATION OF LIME AND CEMENT-AMENDED MORTARS
PART 1 - GENERAL
1.01 DESCRIPTION
A. This specification has been developed for use on historic properties (defined as any district, site, building, structure, or object that is listed in or is eligible for listing in the National Register of Historic Places) and provides an overview of accepted practices. Site-specific specifications, when appropriate, will be provided by the Architect.
B. All work described herein and related work must conform to the Secretary of the Interior's Standards for the Treatment of Historic Properties.
C. The Contractor shall provide all labor, materials, equipment, and operations required to complete the rehabilitation work indicated herein.
D. All work described herein and related work must have the approval of a Cultural Resources Manager, Conservator, Historic Architect, or other professional who meets the standards outlined in the Secretary of the Interior's Standards – Professional Qualifications Standards pursuant to 36 CFR 61. Such person is referred to in this document as the ***Architect***.
1.02 SECTION INCLUDES
A. Mortar selection
B. Preparation of lime mortar
C. Preparation of cement-amended mortar
1.03 RELATED SECTIONS
A. Section 04100.01 – Removal of Mortar Joints and Repointing
B. Section 04211 – Historic Brick
C. Section 04214 – Terra Cotta and Ceramics
D. Section 04400.01 – Identifying Masonry Types and Failures
E. Section 04500 – Masonry Restoration
1.04 REFERENCES
A. *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring & Reconstructing Historic Buildings*, available at the National Park Service (NPS) website at <http://www.nps.gov/history/hps/tps/standards_guidelines.htm>.
B. Use and types of mortar are found in *Preservation Brief No. 2: Repointing Masonry Joints in Historic Masonry Building*, available online at the NPS website at <http://www.nps.gov/history/hps/tps/briefs/brief02.htm>.

C. U.S. General Services Administration Historic Preservation Technical Procedures for Mortar, available online at <http://w3.gsa.gov/web/p/hptp.nsf/a533f1f859737bc9852565cc0058d0b6/7de342045d4c63f6852565c50054b3a7?OpenDocument> and <http://w3.gsa.gov/web/p/hptp.nsf/a533f1f859737bc9852565cc0058d0b6/e7518da3d776f026852565c50054b3c5?OpenDocument>.
D. Weaver, Martin E. *Conserving Buildings: A Manual of Techniques and Materials*. Revised edition. New York: John Wiley & Sons and the Preservation Press, 1997.

E. ASTM C207, *Standard Specification for Hydrated Lime for Masonry Purposes*.
F. ASTM C206, *Standard Specification for Finishing Hydrated Lime*.
G. ASTM C144, *Standard Specification for Aggregate for Masonry Mortar*.
H. ASTM C150, Type II, *Standard Specification for Portland Cement*.
I. ASTM C979, *Specification for Pigments for Integrally Pigmented Concrete*.

1.05 SUBMITTALS

A. The Contractor shall submit a detailed schedule of the areas to be repointed, including an assessment of the problem areas, a historic mortar analysis, and a detailed procedure for repointing, to the Architect for approval:

1. Submit data indicating proportion or property specifications used for mortar.
2. Submit test reports for mortar materials and report proportions resulting from laboratory testing used to select mortar mix.

B. Product Literature: The Contractor shall submit the manufacturer's product literature to the Architect for all proprietary products specified for repointing. Product literature shall include specification data, Material Safety Data Sheets, and instructions for storage, handling, and use.

C. Historic Mortar Analysis: The Contractor shall submit the laboratory report from completed mortar analysis. Mortar analysis shall be completed prior to beginning testpanel preparation. Analysis shall be limited to wet chemical and microscopic analysis to characterize the insoluble aggregate, determine binder-aggregate ratio, prepare a mix design for replacement mortar, and identify appropriate sources for sand aggregate.

D. Samples: No masonry restoration work shall proceed until all samples are approved. The Contractor shall submit samples of the following masonry repair and replacement materials for approval of color and texture match:

Cured pointing mortar. Portable samples shall be prepared using drywall channel or similar material the approximate width of a mortar joint. Once a matching mortar color is achieved, placement of on-site mock-ups may begin.

Preparation of Lime and Cement-Amended Mortars

04100.02 - 3

1.06 QUALITY ASSURANCE

A. Work Experience: The Contractor to perform the work in this section shall have a minimum of ten (10) years experience with historic mortars and masonry repairs and repointing. He/she shall demonstrate a working knowledge of the Secretary of the Interior's Standards for Guidelines for Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings.

B. The Contractor shall not change sources or manufacturers of mortar materials during the course of the work.

1.07 MOCK-UPS

A. The Contractor shall prepare two mock-up installations of each type of masonry and mortar color to be installed at locations selected by the Architect. If cleaning tests are also to take place, test panels should be in the same area. Test panels should not be undertaken in areas that are highly visible.

B. Each test panel shall be executed in the same manner as the final installation. Test panels shall be a minimum area of 3x3 feet for brick facades, and larger for stone facades.

C. After the test panels have cured for a period of two to three weeks (or otherwise specified by the Architect), the test panels will be inspected for color, texture, and installation

technique.
D. The Contractor shall prepare up to three additional mock-ups of each mortar and mortar color without further compensation. Approved test area(s) shall become part of the work and shall serve as the quality standard for all subsequent work.
1.08 DELIVERY, STORAGE, AND HANDLING
A. The Contractor shall deliver all products to the site in original packaging, unopened and undamaged, with manufacturer's name and product identification visible thereon and manufacturer's instructions and Material Safety Data Sheets.
B. The Contractor shall store products in a dry location and protected from dampness and freezing following manufacturer's instructions.
C. The Contractor shall stockpile and handle aggregates in a manner to prevent contamination from foreign materials.
1.09 PROJECT / SITE CONDITIONS
A. Mortar installation shall executed only when the air and surface temperatures are 40 degrees F and rising or less than 80 degrees F and falling. Minimum temperature for masonry repointing shall be 50 degrees F and above for at least 2 hours after completion and above freezing for at least 24 hours after completion. Work shall not commence when rain, snow, or below-freezing temperatures are expected within the next 24 hours. All surfaces shall be free of standing water, frost, and ice.
B. The Contractor is responsible for protecting existing adjacent materials and surfaces during the execution of the work., and will provide all necessary protection and follow all

necessary work procedures to avoid damage to existing material assemblies not a part of the work in the Section.
C. The Contractor shall provide visible barriers and / or warning tape around the perimeter of the work area for visitor protection, and shall also provide that nearby vehicles and adjacent structures are protected from damage during the course of the work.
D. Contractor shall coordinate masonry repointing with the other trades involved in exterior and interior restoration work, including but not limited to masonry cleaning, sealing, and painting.
PART 2 - PRODUCTS
2.01 MORTAR SELECTION CRITERIA: See Sections 04100.02 and 04400.01.
A. Repair mortar shall be compatible with the material, quality, color, and texture of the existing mortar.
B. Sand shall match the gradation of the historic mortar and be free from impurities. The color, size, and texture of the sand should be similar to the original sand.
C. Mortar shall have greater vapor permeability and be softer, measured in compressive strength, than the masonry units.
D. Mortar shall be as vapor permeable and be as soft or softer, measured in compressive strength, than the existing historic mortar.
E. Testing and Mortar Selection for Masonry Units:
1. Selection of Mortar for Brick Units:
a. Identify type and strength of brick.
b. Identify the composition, strength, and hardness of the historic mortar.
c. Lime and Sand mortars are preferred for historic brick masonry.

d. Portland Cement generally should not be used for historic brick.
e. Mortar should have a lower compressive (psi) strength than brick.
f. Mortar should be harder than the historic mortar.
2. Selection of Mortar for Terra Cotta and Ceramic Units:
a. Mortar should have a lower compressive (psi) strength than the terra cotta and ceramic units.
b. Hard, portland cements or coarsely screened mortars shall not be used.
3. Selection of Mortar for Adobe Units: Requires special considerations. See Section 04290.

4. Stone:
a. Identify type of stone.
b. Identify geological and mineralogical nature of stone.
c. Identify the Compressive or Crushing Strength of stone both wet and dry: ASTM C170-87.
d. Mortar should have a lower compressive (psi) strength than stone: general about 1/3 the compressive or crushing strength of the stone units.
e. Hard, portland cements are generally not appropriate for historic mortars.
5. Concrete Block and Cast Stone Units:
a. Mortar should have a lower compressive (psi) strength than the masonry units.
b. Use of concrete amended mortars.
2.02 MORTAR TYPE AND MIX
A. Depending on the desired strength and consistency, lime mortars should conform to ASTM C207 and ASTM C206, Mortar for Masonry, such as:
1. Type M (2,500 PSI): 3:1:12
2. Type S (1,800 psi): 2:1:9
3. Type N (750 psi): 1:1:6
4. Type O (350 psi): 1:2:9
5. Type K (75 psi): 1:3:11
6. Type L: 0:1:3
OR
B. Equivalent mortar that meets comparable federal specifications.
2.03 POINTING MATERIALS AND MIXES (JOB-MIXED MORTAR)
A. Portland Cement: ASTM C150, Type I, non-staining and without air entrainment. Gray and white Portland Cement may be combined as required to match the desired color.
1. Non-staining white cement, preferred for historic applications, unless grey cement was used in the original mortar.
2. Standard grey cement is generally not used for historic masonry.

B. Hydrated Lime: ASTM C207, Type S.
C. Lime Putty (slaked lime): should conform to ASTM C5.
D. Sand: ASTM C144, free of clay, silt, soluble salts, and organic matter; shall match the color and texture of the original mortar sand. The Contractor may request from the Architect a sample of the original mortar sand for use in color and texture matching.

E. Water: Potable, free from injurious amounts of oil, soluble salts, alkali, acids, organic impurities and other deleterious substances which impair mortar strength or bonding.
F. Masonry Cement (premixed, bagged mortar): shall NOT be used.
2.04 PRE-MIXED MORTARS: Pre-mixed mortars may be used for repointing. All mortars must be
approved by the Architect.
2.05 ACCESSORY MATERIALS
A. Historic Materials include other components that enhance the color and texture matching and may include materials such as crushed oyster shells and animal hair, and historic pigments such as brick dust and lamp black.
B. Colorants (if required for exact color match): Non-fading, mineral oxide masonry pigment as approved by the Architect.
1. Pigments should not exceed 10% by weight of the portland cement in the mix.
2. Carbon black should not exceed 2% of the Portland cement in the mix.
2.06 ADMIXTURES
A. No air-entraining admixtures or material containing air-entraining admixtures.
B. No antifreeze compounds shall be added to mortar.
C. No admixtures containing chlorides shall be added to mortar.
2.07 EQUIPMENT FOR MORTAR PREPARATION
A. Equipment:
1. Trough, plastic buckets, hoe, wooden mallet or ax handle, or similar implements
2. Mortar pan mill
3. Paddle or drum type mixers
4. Undyed, unprinted burlap
Preparation of Lime and Cement-Amended Mortars
04100.02 - 7

PART 3 – EXECUTION

3.01 GENERAL
A. Testing and Mortar Selection shall be reviewed by the Architect. The Contractor shall submit testing schedule, mortar schedule, and schedule of related repairs, including methods and materials to be used:
1. Identify masonry units: Type and composition.
2. Identify the crushing or compressive strength (psi) of masonry units.
3. Identify properties, composition, and strength of historic mortar.
4. Select mortars that match the existing in color, texture, quality, and materials.
5. Select mortars that are softer than the existing mortar and the masonry units.
B. Mortar components should be measured and mixed carefully (in a consistent manner) to assure uniformity of visual and physical characteristics.
C. Pre-mixed mortar should be mixed and handled following manufacturer’s specifications.
3.02 FIELD MORTAR MIXING LIME MORTARS
A. Measure dry ingredients by volume.
B. In a clean trough, wheelbarrow, or mixer (depending on quantities needed) combine and mix all dry ingredients thoroughly (before adding water).
C. Add just enough clean water to “hold together,” thus allowing the mixture to stand for a period prior to the addition of the remaining water.
D. Prior to use, add half of the water and mix thoroughly for five (5) minutes.

E. Add the remaining water in small portions until the desired consistency is reached. Keep the amount of water added to a minimum.
F. Mortar should be used within approximately 30 minutes of final mixing. Do not retemper or add more water after final mixing.
3.03 FIELD MIXING FOR MORTAR USING LIME PUTTY
A. Materials are measured by volume.
B. Do not add additional water.
C. Proportion sand first, and then add the lime putty.
D. Mix in a clean trough for five (5) minutes or until all the sand is thoroughly coated with the lime putty by beating with a wood mallet or ax handle, interspersed by chopping with a hoe to achieve the maximum workability and performance.

OR
E. Mix in a mortar pan mill when large quantities are needed, following the sequence above. Modern paddle and drum mixers do not achieve the desired results.
F. Protect the mixture from the air by covering with wet burlap or seal in a large plastic bag.
G. The sand/lime putty mix (which resembles brown sugar) can be stored indefinitely if placed in a sealed bag or container. Recombine mixture as specified in D above into a workable plastic state. *Do not add water.*
3.04 FIELD MIXING FOR PORTLAND CEMENT –LIME PUTTY-SAND MORTARS (Type O or Type K)
A. Materials are measured by volume.
B. Combine sand and lime putty as described above and mix. Do not add water at this point.
C. Mix the portland cement in to a slurry paste using clean water.
D. Combine the portland cement slurry with the sand/lime putty mixture.
E. Add color pigments, if any.
F. Mix for five (5) minutes.
D. Mixture should be used within 30 minutes to 1 ½ hours. Do not retemper mixture. Once portland cement is added, the mortar can no longer be stored.
3.05 FINAL REPORT
The Contractor shall:
A. Document the work, testing, and mortar mixes used, and finished product, including photographs and final mortar schedules.
B. Provide a written summary of the project and results upon final inspection and approval. The summary shall outline steps taken or new findings not specified in the initial documentation.
END OF SECTION

APPENDIX B:

THE EVOLUTION OF WINDOW SASHES

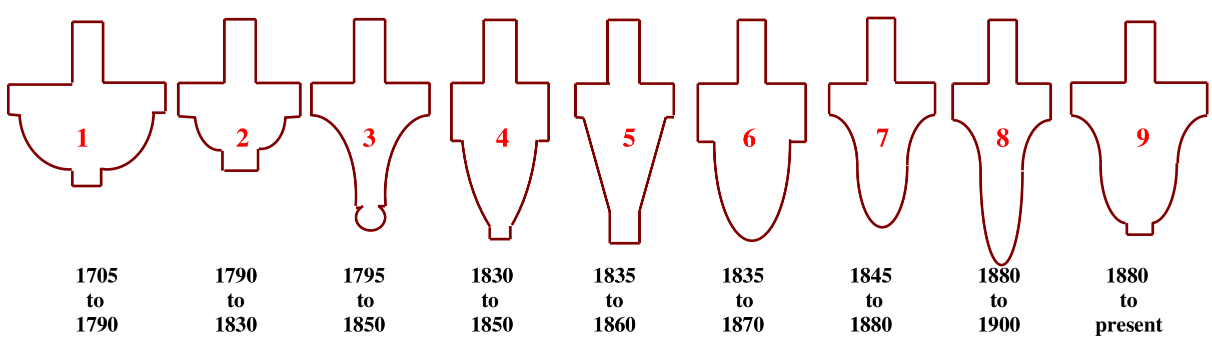
NEW HAMPSHIRE DIVISION OF HISTORICAL RESOURCES
State of New Hampshire, Department of Cultural Resources 603-271-3483
19 Pillsbury Street, 2nd floor, Concord NH 03301-3570 603-271-3558
Voice/ TDD ACCESS: RELAY NH 1-800-735-2964 FAX 603-271-3433
http://www.nh.gov/nhdhr preservation@nhdhr.state.nh.us

THE EVOLUTION OF WINDOW SASHES

Few elements of a building contribute more to its architectural character than do the window sashes. There is a great difference between a window opening filled with twelve-over-eight sashes and one filled with two-over-two sashes. The character of the sash is even stronger from within the building, where the grid of muntins interposes itself between the eye and the view from the window. The inner faces of the muntins are molded, and the profiles of these moldings evolved over time, contributing much to the expression of style or period in a structure. As shown in the chart below, new sash designs appeared every ten or fifteen years during the nineteenth century, lending their character to succeeding architectural styles. The muntin profile therefore provides a useful means of dating a building as well as helping to define the aesthetics of the window and the room.

WINDOW MUNTIN PROFILES IN NEW ENGLAND, 1705 TO THE PRESENT

(The profiles shown below are derived from dated buildings. Some profiles may occasionally persist beyond the end of the usual date range as shown in the chart.)



Yet sashes are meant to be looked through. It is easy to look past the grid of muntins and to ignore their beauty and the size and character of the glass. Perhaps because sashes are largely transparent, they are often undervalued as a contributing element to the style and character of a building. People often assume that all old windows are much alike, or that the character of the sash is unimportant. Coupled with the common idea that old sashes are loose, fragile and drafty, the assumption that they are insignificant makes the sash the most vulnerable and often-replaced element of a historic building. Any historic building with its original sashes and glazing retains a higher degree of architectural integrity than a comparable structure in which the sashes have been replaced. Where original or early sashes survive, their preservation should be a paramount concern of the building's owner.

The earliest sliding sashes, introduced to North America shortly after 1700, had heavy muntins that were often over an inch in width (**1**). The considerable width of the muntins, however, combined with the tendency to use small lights of glass in these early windows, gave eighteenth-century sashes a heavy appearance that is quite noticeable from inside or outside a building.

The evolution of the muntin profile after the end of the eighteenth century was generally one of increasing delicacy. At the same time, production of window glass in the United States reduced the cost of glazing and permitted sashes to have fewer but larger lights. Thus, window openings tended to become larger, sashes became lighter and held larger panes, and interiors generally became brighter.

The advent of the federal style in the late 1700s and early 1800s was accompanied by several patterns of window muntin. The most common type, popular until about 1830, was nearly identical in profile to the heavy muntin of the 1700s, but was smaller in dimensions (**2**). Its profile consists of quarter-round moldings and flat fillets. Another muntin type first seen just before 1800 had a cove-and-bead profile (**3**). Generally restricted to more expensive buildings or urban areas, this profile is much less common than the traditional quarter-round-and-fillet pattern.

The quarter-round-and-fillet pattern did not disappear with the advent of the Greek Revival style in the 1830s. Instead, it evolved, adopting an elliptical molding in place of the quarter-round (**4**).

The Greek Revival style was, however, accompanied by alternate muntin profiles that were noticeably different from those seen earlier. Perhaps the most distinctive was the flat, angular profile (**5**). Like some moldings seen in Greek Revival joinery, this muntin relies on its faceted surfaces rather than on curves for its character. This type of muntin is often seen in conjunction with woodwork that is similarly decorated with flat surfaces rather than with curved moldings.

Also popular during the Greek Revival period, as well as in buildings of a Gothic character, is the Gothic muntin (**6**). Often assuming the profile of a rounded or pointed arch, this simple muntin appeared in the late 1830s and persisted from the 1840s through the 1860s.

A profile that enjoyed nearly the longevity of some of the older quarter-round-and-fillet shapes was the sharp ogee muntin (**7 & 8**). Composed of S-curved moldings that meet in a knife edge, this was the sharpest and thinnest profile ever used in American windows. First seen in the late Greek Revival buildings of the 1850s, the sharp ogee muntin persisted up to the turn of the twentieth century, appearing in six-light sashes in the earlier years and in two-light sashes at the end of the century.

Another muntin profile that has enjoyed a popularity rivaling that of the earliest quarter-round-and-fillet muntins is still in use today. This is the ogee-and-fillet profile, first seen in early colonial revival buildings (**9**). The profile is often seen in modern windows with true divided lights, and is most commonly encountered in the ever-popular Brosco "Boston" sashes, available in configurations ranging from two lights to multiple lights.