Robison Building Analysis LLC
7358 Sylvan Dr.
Kent, Ohio 44240
(330) 221-1428

April 17, 2021

Subject: **HISTORIC PRESERVATION ASSESSMENT**

Brewster Building
5 Aurora Street
Hudson, Ohio
Robison Building Analysis Project No. 2020.148

Robison Building Analysis, LLC (RBA) is pleased to provide this report on the Brewster Store. This report provides a condition assessment of accessible areas of the structure, a reconstruction of the original configuration of the building, and recommendations on its adaptive reuse as office space.

Figure 1

A view of the west elevation of the Brewster Store prior to its adaptive reuse as a bank.

Project Understanding

The Brewster Store was constructed in 1839 by the builder Leander Starr. The business was financed by Zenas Kent and managed by Anson A. Brewster who eventually became sole owner of the store. It continued operation as a store through the 19th century with the replacement of the storefront windows and a covered porch on the façade (Figure 1). About 1908 the building was renovated as a bank, with the First National Bank of Hudson occupying the structure. A new vault was constructed for the bank, and there was a significant alteration of the interior spaces at this time. It is likely that the internal stairs were removed and replaced about 1942 when the stair addition to the east was constructed. Finally, a single story addition was added on the north in 1955. This report focuses on the original configuration of the Brewster Store.

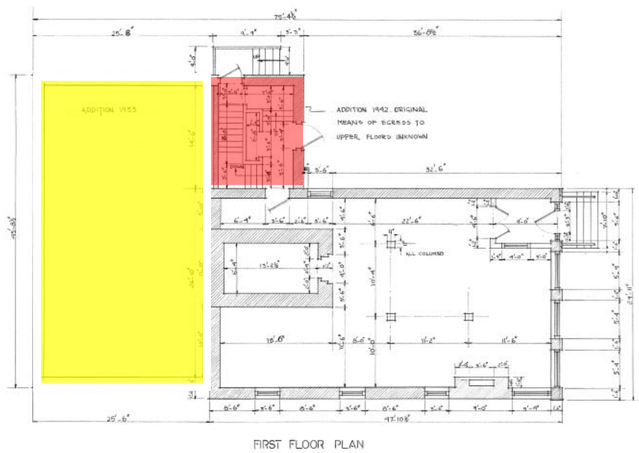

Figure 2

A plan of the first floor of the Brewster Store from the HABS record. The 1942 stair addition is shaded red, and the 1955 addition is shaded yellow.

Condition Assessment

EXTERIOR

The Brewster Store has brick walls, a sandstone foundation, and sandstone pilasters and lintels. A wood entablature and balustrade accents the roof line on the façade, and ornamental wood panels are installed above the second floor windows.

Figure 3

A view of the Brewster Store from the south.

Foundation

The foundation consists of large blocks of sandstone. The upper two courses have a vertical tooling of the stone surface, while the lower courses have a rough-shaped surface. It is likely that only the top two courses were intended to be above grade.

Figure 4

A view of the Brewster Store from the south.

Windows have been cut into the foundation on the west elevation. They appear to have been cut in following the original construction. For example, in Figure 4 the window in the foundation was inserted underneath a window in the brick wall above. This is good practice, as it preserves a 'column' of solid masonry extending from the roof line down to the foundation. However, in this instance there was a joint in the top foundation course over the basement window. Without a single stone spanning the basement window opening, the stones have dropped and the brick coursing above had dipped. Mortar repairs have been installed to the foundation stones and the brick has been repointed above. It is likely that the opening was cut into the foundation to serve as a coal chute.

Figure 5

A view of a basement window on the south elevation of the Brewster Store. Note the mortar repairs to the foundation stones and the dip in the brick coursing above.

Brick

The brick of the Brewster store is typical of brick fired in temporary ‘cramps.’ The manufacturing process consisted of quarrying the clay and then mixing with water, usually in a pug mill with draft animals walking around in a circle pulling an axle around a pivot point with wheels cutting through and mixing the clay. The mixed clay was then packed in molds and dried to remove excess moisture. The cramp was made by stacking the brick with air spaces between the brick and then covering the assembly with an insulating layer of soil. The fire in the cramp heats up the brick closest to the flame more than those more distant, resulting in differences of color, porosity, and compressive strength. The color variation observed across the brick walls of the Brewster Store is consistent with early brick manufacture.

Modern brick are fired to set temperature standards to achieve semi-vitrification of the clay. This results in brick with consistent properties through the cross-section of the brick. However, historic brick fired to lower temperatures often have a harder outer layer (which achieved the highest temperatures during firing) and a softer core. If the outer layer is compromised, bricks can ‘hollow out’ due to weathering. When this occurs, bricks must be replaced.

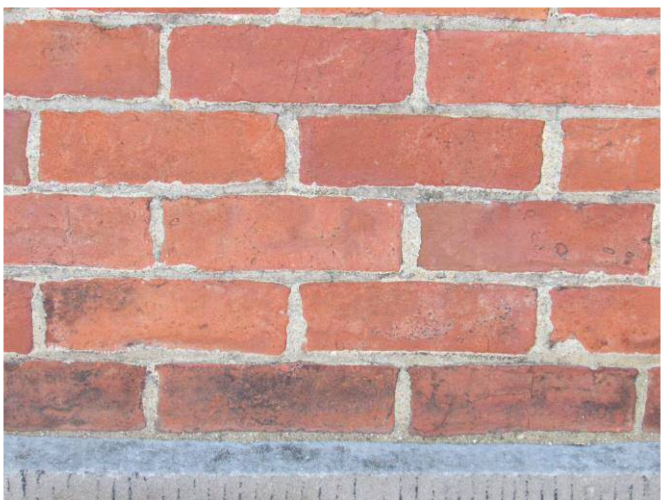

Figure 6

A detail showing a representative area of sound brick.

The present mortar is a later repointing

Most of the exterior brick walls are in good condition. However, there are two primary areas where deterioration has occurred. The first of these is near the south entrance of the building. It is probable that constant use of de-icing salts has contributed to the observed extreme weathering. Salt dissolves into water which is then absorbed into the porous brick. When the water evaporates, the salt crystalizes. As crystals grow, they expand and damage the brick. Switching to calcium magnesium acetate as a deicer avoids this type of damage.

Figure 6 shows heavily weathered brick, including units that have hollowed out and weathered. Mortar joints are in need of repointing in this region as well. The current brick steps are a later alteration to the building. It is probable that sandstone slabs were used for the original steps.

Figure 7

A view of deteriorated brick near the south entrance.

The parapets of the building are in poor condition. This is a common condition for brick structures because there is no warm surface to aid in drying out the parapet. While most of the brick wall has a warm interior on the inside face that dries out the wall in winter months, the parapet is surrounded by ambient temperatures. In winter months when freeze-thaw damage is most likely, the brick of the parapet are more likely to have water in their pores. A parapet is likely to experience more cycles of freeze-thaw due to their smaller mass. Finally, if the coping is not waterproof, the parapet will receive more moisture than the vertical walls below. Figure 8 shows missing mortar joints and some hollowed out brick in the parapet of the store.

Figure 8

A view of the west parapet of the Brewster Store. The arrow points to an area of deteriorated mortar joints and brick.

The coping stones on the parapet are sandstone. Sandstone is relatively porous, and will allow water to seep through slowly and wet the parapet. Installing sealant at the joints between coping stones can help, but due to the porous nature of sandstone, sheet metal flashing is best. Flashing can be installed on top of the coping stones economically, or it can be concealed under the coping units without substantially changing the look of the building.

The parapets are thin and may need some stiffening in order to address the code-mandated wind loads on the building. It is likely that the balustrades which run between the free ends of the parapet can be fastened to the brick with sufficient capacity to address wind loads. The wide spacing of the current balusters was probable a cost-saving measure when the wood balustrade was replaced.

Figure 9

A view of the upper south façade, showing the extensions of the parapets and the position of the balustrade..

Different brick colors and patterns indicate some changes to the east elevation over time. The white arrow points to a rectangular opening which may have been a later window. The yellow arrow points a square area of replacement brick that may have been a window or opening. The red arrow points to a line of brick that has been replaced, extending along the east elevation. Most of these brick anomalies likely date to the Italianate structure which abutted the store in the late 19th century. A photograph taken in the early 20th century (note the electric wires in Figure 11) shows the outline of the interior plaster finishes applied to the east elevation during this period.

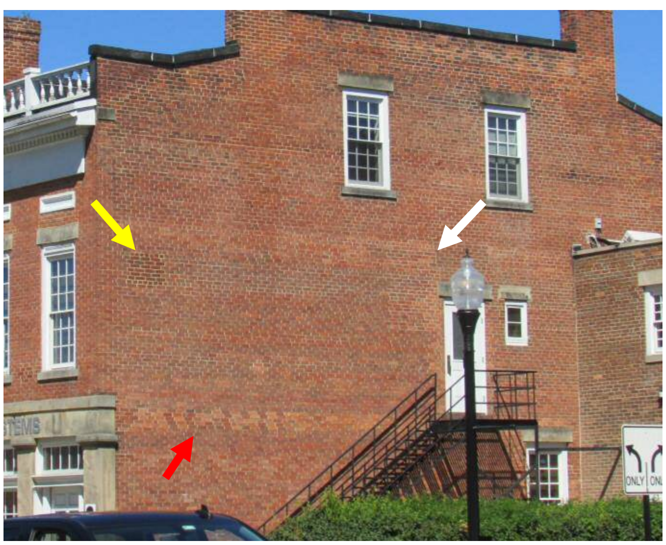

Figure 10

A view of the east elevation showing anomalies in the brick work which likely indicate previous openings or other features.

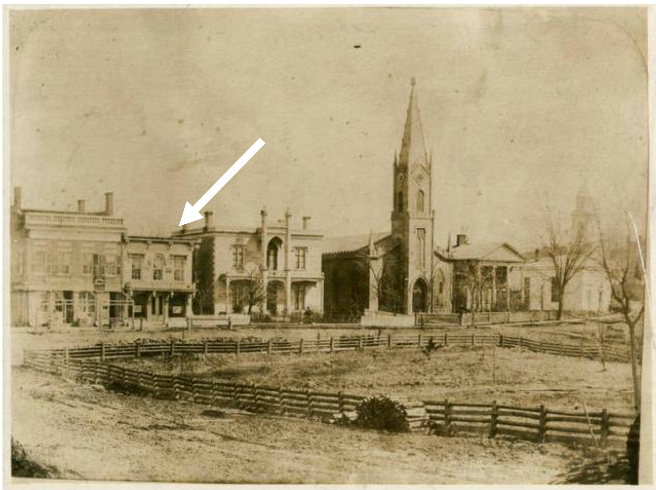

Figure 11

A view of the Brewster Store with an adjacent Italianate building in the late 19th century.

Figure 12

A view of the Brewster Store showing the east elevation following the demolition of the adjacent Italianate structure.

Sandstone

The ground level of the south façade features a sandstone façade with five Doric pilasters framing four openings. The pilasters support an abbreviated entablature with a simple rectangular profile of the cornice and no differentiation between the architrave and frieze. This is typical of early carpenters who would take details from architectural pattern books and simplify them for economy.

Figure 13

A view of the lower south façade with the sandstone pilasters.

The sandstone features a 'combed' surface, with small vertical ridges formed with a toothed chisel. The pilasters are given definition with a border of horizontal combing. The sandstone is in good condition, with minimal weathering visible except where deicing salts were applied near the entrance.

Figure 14

A detail showing the stone tooling on the sandstone pilasters and entablature.

The stonework is well detailed. The window sills of the storefront windows have a lugged profile, meaning that when the wood jambs of the windows rests on the stone, the stone surface is higher. This encourages water the flow away from the wood windows and avoids the pooling of water where the end grain of the wood can take it up and accelerate wood rot. This is a sign of an experienced and careful builder.

Figure 15

A detail of a lugged window sill under a storefront window.

Historic photographs show that the storefront was covered by a porch in the latter part of the 19th century (Figure 1). The south-facing façade with large windows would significantly heat up the space in the summer. Indeed, the earliest photograph of the store shows a light frame that appears to have supported a shade awning (Figure 11). The porch was likely a permanent version of a canvas awning that had been present for many years. There is little damage to the sandstone entablature, suggesting the attachment of the porch to the building was to the brick above the entablature.

It is noted that the nearby Ellsworth store, currently a dental office, was constructed by Leander Starr as well and shares many details. Similar pilasters and entablature are found on the Ellsworth Store, although they have been painted over. Painting stone is not recommended because although paint is permeable to water vapor, it does retard its transmission. If moisture builds up behind the paint layer, freeze-thaw damage can occur in the stone during cold weather.

Figure 16

A view of the Ellsworth Store, constructed by the same builder as the Brewster Store.

Sandstone lintels are used to bridge over window openings, with sandstone sills below each window. These sandstone elements are uncracked, indicating that there has been little settlement or movement in the foundation. Sandstone coping stones are placed above the parapets (discussed above). Many of these sandstone elements are stained a dark color, especially where they run horizontally and wetted by rains (see Figure 8). The pattern of staining is characteristic of lichen growth, common to limestones and calcareous sandstones. If lichen is the cause of the staining, its removal is best done with a biocide rather than with harsh chemical cleaners. The biocide will not strip paint and is not toxic to workers as some chemical cleaners can be.

Windows and Wood Ornament

All original windows in the store, including the storefront windows, have been replaced. The current windows are 9 over 9 double hung sash windows. Historic photographs show 6 over 6 double hung sash windows, with slightly larger window pane (lite) sizes. The increase in lite size is commonly observed in the 1840s.

The two windows noted by arrows in Figure 16 were not present in historic photographs. Perhaps it was anticipated that a single story building would be built adjacent to the store on the small lot, or shelving occupied the wall to the west. It is presumed that the window openings were created when the building was adaptively reused as a bank.

Figure 17

A view of the west elevation of the store showing the sandstone lintels and sills at each window.

All windows originally had wood shutters. This was common with the thin and fragile mullions used to divide the glass lites, as shutters would reduce both wind forces and protect against wind-borne objects.

The current balustrade above the south elevation is a later addition. Historic photographs show a much closer spacing of the balusters. The new balustrade should seek to match the original. Figures 18 & 19 show examples of pattern book designs that may have been available to the builder, Leander Starr. Asher Benjamin was a popular writer of architectural pattern books, and his influence was strong in Northeast Ohio due to the migration of so many New Englanders who carried Benjamin's books with them. It is likely that the original balusters were similar to those illustrated in Figures 18 & 19.

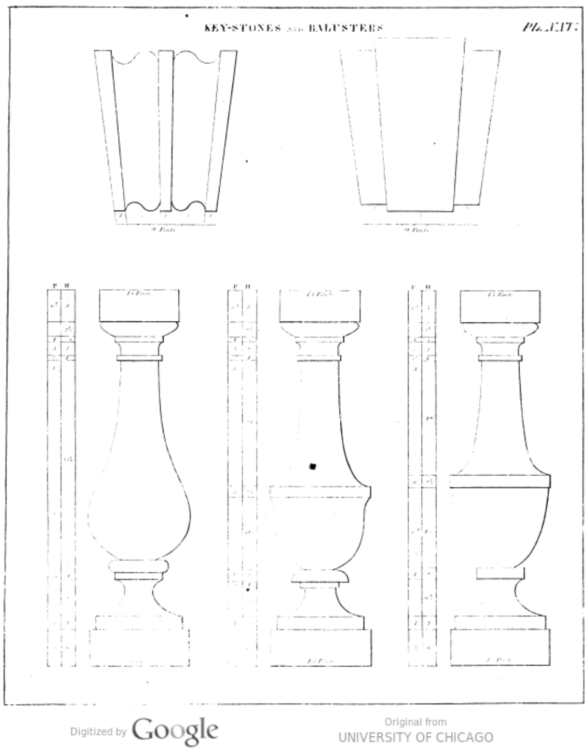

Figure 18

Baluster designs from Asher Benjamin's Practical House Carpenter *(1830).*

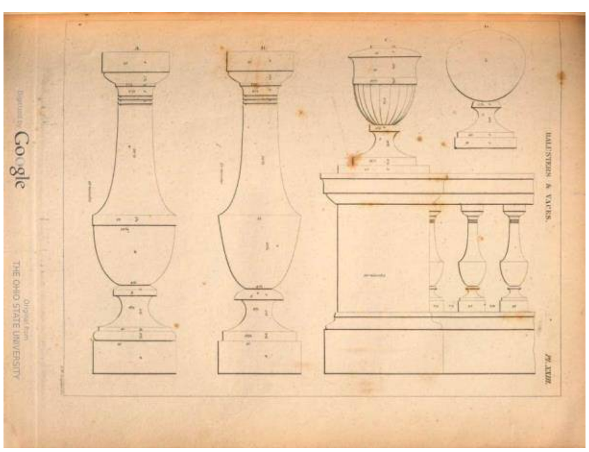

Figure 19

Baluster designs from Asher Benjamin's The Builder's Guide *(1839).*

The wood cornice at the roofline on the south elevation is likely a replacement of the original. The cornice consists of a boxed-out projection, then a bead-and-lozenge molding, then a series of dentils (wood blocks), and then a frieze board below. Details of this cornice are more typical of a date well after 1839. The frieze board below the projecting cornice is built up from two planks, something that would be less likely to be done in 1839 when old-growth lumber was still available. Also, the dentil blocks are connected by a low relief block, and that level of detail and sophistication that was less likely to be found in the 1830s. The current cornice and frieze board may date to the establishment of the First National Bank of Hudson.

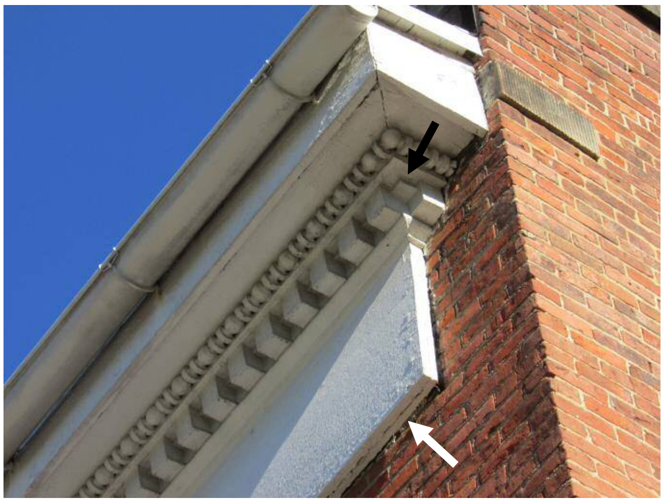

Figure 20

A detail showing the cornice above the south façade. Note the two-ply frieze board (white arrow) and the low relief block between the dentils (black arrow).

INTERIOR

Stair

Selective demolition of interior 20th century finishes determined that a stair originally led from the south entrance up to the second floor. Ghost lines of the stair are visible against the east wall of the store.

Figure 21

A view of the ghost lines showing the location of the original stair leading to the second floor. The wood furring strips date to a later period.

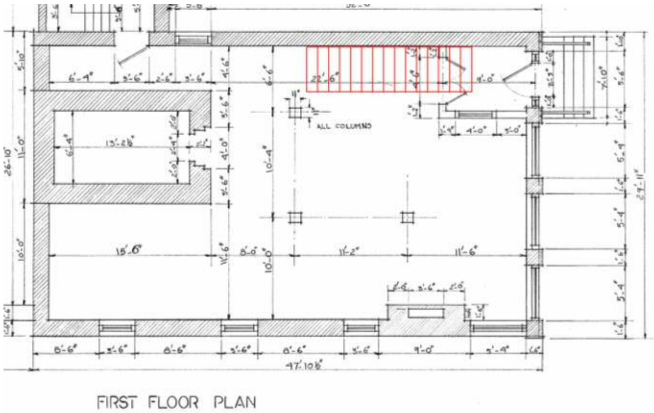

Figure 22

A diagram showing the location of the original first to second floor stair

Wood inserts are present in the 'ghost' area of the stair. Such inserts were placed in the head joints of brick to provide a nailing substrate for moldings. In this case, it is probable that a base molding was installed above the stair treads and that these were fastened to the wood block shown in Figure 23.

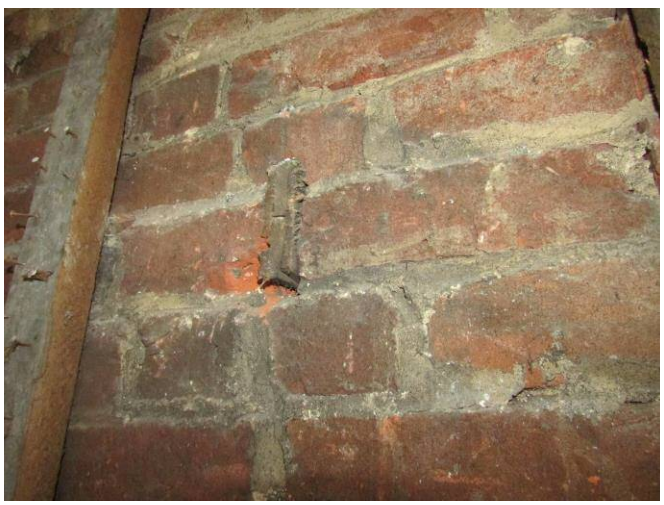

Figure 23

A detail showing a wood insert where moldings were attached to the brick wall.

The second floor stair was originally located in line with the first floor stair, installed adjacent to the east perimeter wall. The seams between the original flooring and later flooring are visible in the northeast corner on the third floor, where the original stair made a 90 degree turn towards the west as it encountered an internal wall.

Figure 24

A detail showing where the original stair existed onto the third floor.

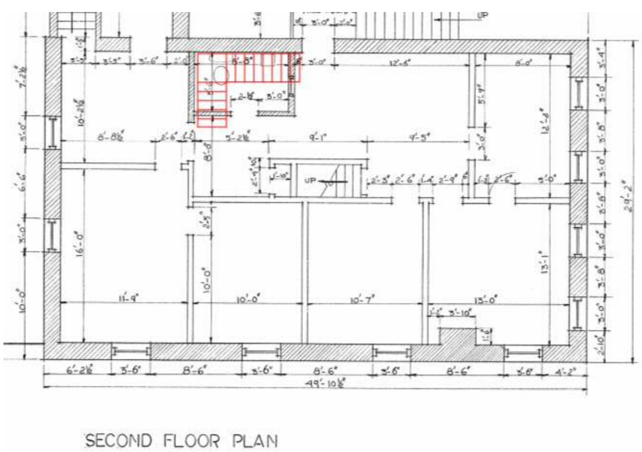

Figure 25

A diagram showing the location of the original second to third floor stair.

The junction between the original and in-fill flooring is distinguished by the bull-nose profile of the original flooring Note that the in-fill flooring is narrower than the original flooring.

Figure 26

A detail the bull-nose profile of the original third floor flooring adjacent to the in-fill flooring installed when the stair was moved.

Basement

The area of the original basement has a perimeter of sandstone foundation walls and brick piers which support the hewn beams supporting the first floor. A substantial foundation for the bank vault is located in the north section of the basement. This was likely installed in 1908 when the First National Bank of Hudson was created. Later coal bins are located against the west foundation wall.

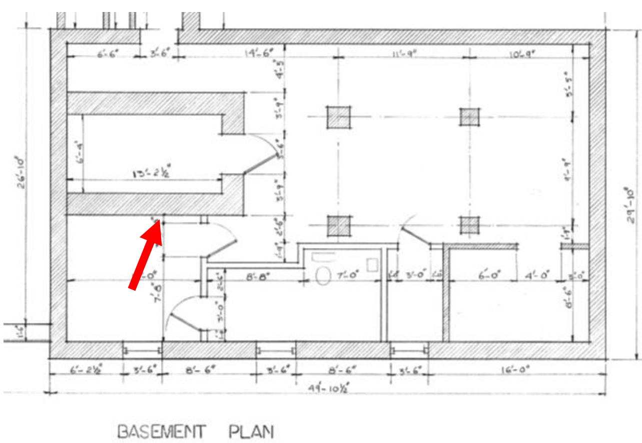

Figure 27

A drawing of the basement from the HABS drawing set. The arrow points to the bank vault foundation. North is to the left.

The brick piers directly support the hewn beams which support the first floor. The joists have reciprocating saw marks and are original to the building.

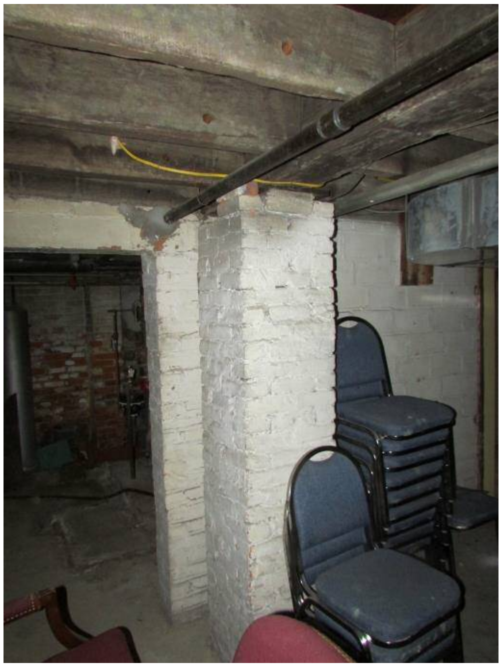

Figure 28

A detail of a brick pier which supports the hewn beams framing the first floor.

In addition to the foundation supporting the bank vault, there is a newer foundation which supports the fireplace in the southwest quadrant of the building. This foundation is not on the HABS basement plan, so it was either not included in the plan or it dates from after 1977 creation of the HABS drawing.

Figure 29

A view of the brick foundation supporting a later fireplace.

There is a wood column in the basement that has the same profile as the wood porch columns of the adjacent Brewster Residence constructed in 1853. It is likely that the wood column dates from after that time, perhaps used to shore up the floor where there was an especially heavy storage of goods.

Figure 30

A view of a wood column in the basement.

Figure 31

A detail of a porch column on the Brewster Residence which is similar to the wood column in the preceding figure.

Second Floor Framing

The original store configuration had no internal posts or columns in the main first floor store space in the southern three bays. The hewn beams which bridged between the east and west brick walls are of insufficient depth to span the approximately 28 feet wide room. Accordingly, the builder inserted a queenpost truss on the second floor to support the hewn beams at mid-span from above. Only remnants of the queenpost truss survive, and the later insertion of doorways and closets have cut or removed portions of the queenpost truss. Figure 33 shows surviving elements of the queenpost truss, and Figure 34 shows an axonometric sketch of the relationship between the hewn beams and the queenpost truss.

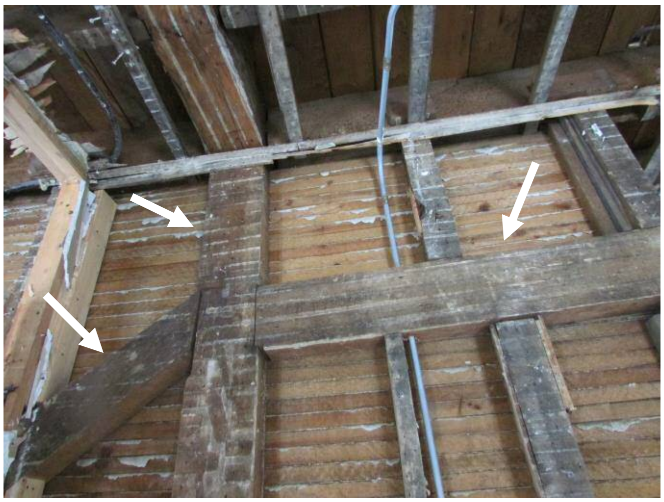

Figure 32

A photograph showing remnants of the queenpost truss that originally supported the second floor.

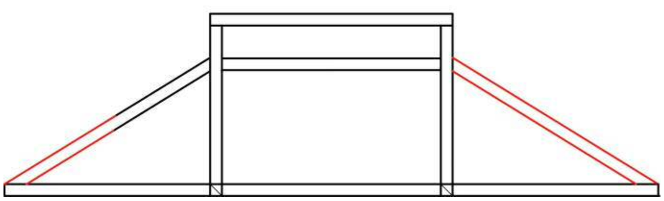

Figure 33

A diagram showing surviving members of the queenpost truss in black, and missing portions in red.

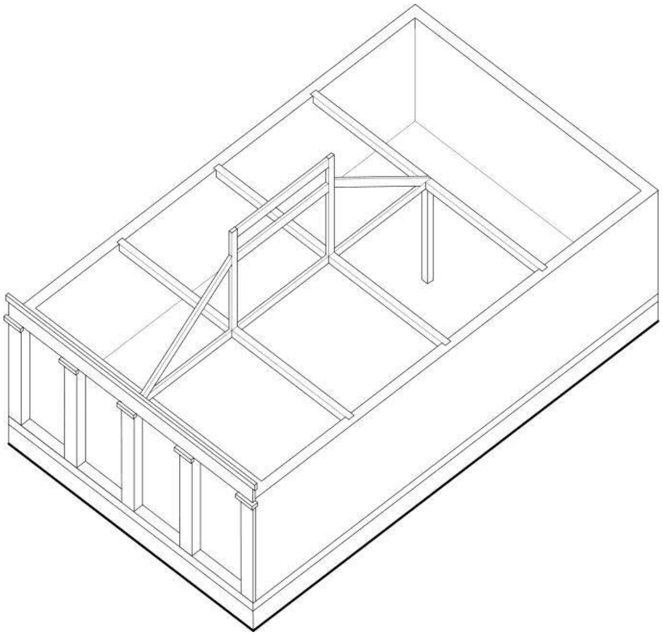

Figure 34

An axonometric diagram showing the relationship between the queenpost truss and the hewn beams it was intended to support. Note that for clarity joists and flooring have been eliminated.

The north extent of the queenpost truss originally had a substantial post underneath the end of the truss. Currently, the bank vault is located below the north extent of the truss, but a double mortise is visible above the entrance to the vault, under the queenpost truss end.

Figure 35

A photograph showing double mortises under the north extent of the queenpost truss.

The horizontal members at the bottom of the queenpost truss (the bottom chord) are distinguished from the regular floor joists by their greater thickness. These members are in tension, and an iron strap was installed where the bottom chord members were interrupted by the hewn beam. The iron tension straps were installed by bending the strap into a U-shape and inserting the ends of the U into slots cut into the bottom face of the bottom chord. Large spikes were then used to fasten the strap to the bottom chord.

Figure 36

A photograph showing iron straps which provided continuity past the hewn beam for the queenpost truss lower chord. The iron column is a later addition. The arrow points to the large spike fastening the strap to the bottom chord.

At the base of each queenpost, iron straps were used to suspend the hewn beams, enabling a column-free interior. The straps were bent into an L-shape, with the horizontal L set into a slot in the side of the queenpost and the vertical leg of the L was hammered into a round shape with threads cut into vertical leg. A large nut was then threaded on to the strap and tightened up to the bottom face of the hewn beam. An additional plate was installed with a through-bolt at the base of the queenposts, but the existing structure obscures how these plates were fastened to the hewn beam below.

Figure 37

A photograph showing an iron strap and plate used to suspend the hewn beam from the base of a queenpost.

Figure 38

A photograph showing the bolt threaded on to the end of the iron strap shown in the preceding figure. The red-painted steel beam installed in later years is visible in the base of the photograph.

At the south extent of the queenpost truss an iron strap was used to fasten the diagonal to the bottom chord. Slots were cut into the sides of the bottom chord, and it is assumed that a U-shaped strap was installed over the now-missing diagonal. Cut nails were installed to each side of the slot and then bent over to retain the strap in the slot.

Figure 39

A photograph the iron strap installed at the south extent of the queenpost truss. The arrow points to a cut nail bent over the strap to retain it in the slot.

The broken end of the iron strap in the figure above was examined. It has the fibrous structure typical of hand forged iron. Slag inclusions tended to form thin planes in the metal when hammered, and break surfaces tear along these planes, forming the fibrous surface.

Figure 40

A photograph showing the break surface on the iron strap in the preceding figure where it was broken when the queenpost diagonal was removed.

This queenpost truss would have been highly loaded, and it appears that later props were installed under the hewn beams to carry the load. Mortises have been cut into the bottom of several of the hewn beams. Theoretically, additional posts would not have been required had the queenpost arrangement functioned satisfactorily. These mortises suggest that the structure was adjusted and reconfigured to address deflections and distortions. Logically, iron hangers at the base of each queenpost would have been the weak link in the system.

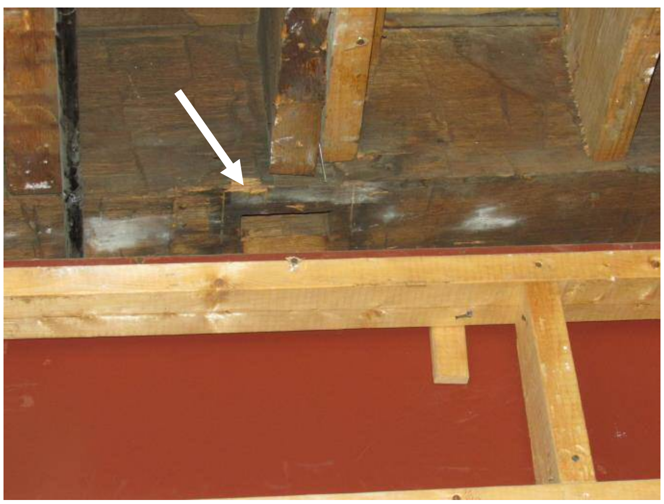

Figure 41

A photograph showing an existing mortise cut into the bottom of a hewn beam.

Roof and Third Floor Framing

The roof and two of the bays are supported by a system of queenpost and simple triangular trusses. Since the ground floor had a column-free main store area, the roof loads had to be shifted to the masonry walls rather than be carried down through the lower floors. The Leander Starr installed two queenpost trusses running east-west and bearing on the exterior brick walls. These queenpost trusses support the third floor, but they also support the two triangular roof trusses. This roof system has supported the roof and third floor for about 180 years with little repair or additional bracing.

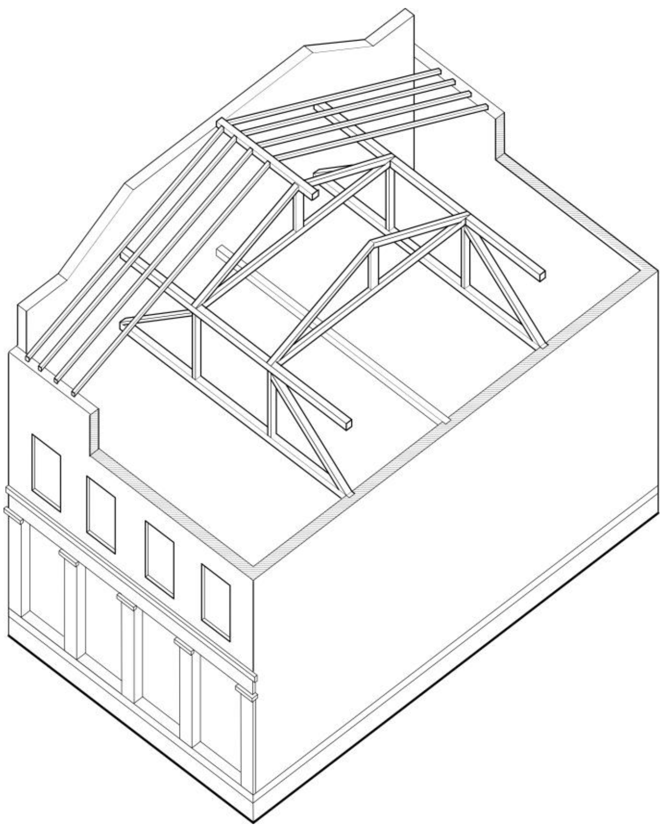

Figure 42

An axonometric diagram showing two triangular roof trusses supported by two queenpost trusses at the third floor level. Note that lower framing has been eliminated for clarity, and only a few roof rafters have been shown so as not to obscure truss configuration.

The triangular roof trusses show characteristic details from the 1830s, with mortise and tenon connections fixed by 'treenails,' or wooden pegs, driven into the connections. Large dimension timbers are hewn, while thinner planks have reciprocating saw marks characteristic of early water-powered saw mills.

Figure 43

A detail showing the bottom chord of a roof truss showing the hewn surface, the tenon from a vertical member in the center of the truss, and the ends of the treenails which secure the tenon in the mortise.

Leander Starr was a clever carpenter and devised a complex framing system for the floors. The queenpost truss on the second floor carried load from the center hewn beam on the third floor, and most of the load on the second floor. The magnitude of loading was likely too much for the iron straps which held the queenpost truss together. However, it shows intelligence and three-dimensional thinking of Leander Starr in designing the structure. There are few failures of existing framing members. Only a single joist supporting the 2^{nd} floor was observed to have a shear failure.

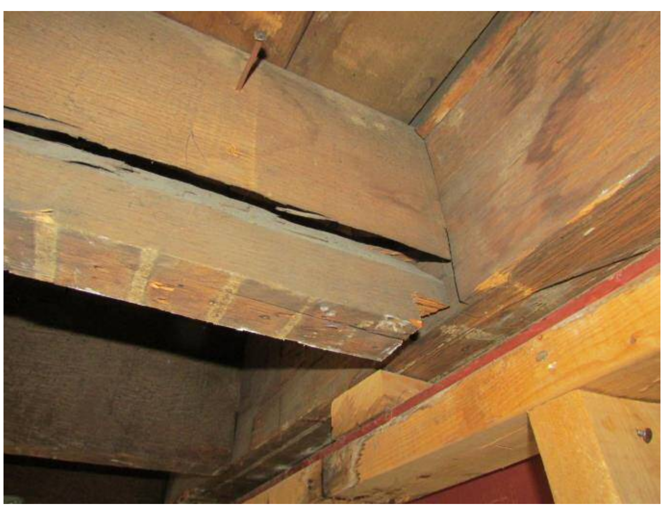

Figure 44

A detail showing a 2^{nd} floor joist with a shear failure at the tenon.

Flooring

The first floor flooring is a later replacement. The subflooring runs diagonally to the supporting joists, a technique that was only used after the Civil War when balloon framing became common.

The subflooring appears to have been reused from another structure, as some of the subflooring planks have ghost marks from an earlier installation.

Figure 45

A photograph showing the subfloor on the first floor level.

Figure 46

A photograph showing a subfloor plank with ghost marks from a previous installation.

It is probable that the wood furring strips installed in the second floor to which the lath and plaster ceiling were attached were cut from the original flooring. Tongue and groove edges are visible on many of the furring strips, indicating that their first used was as flooring.

Figure 47

A detail of a furring strip on the second floor ceiling which was reused and cut down from flooring. Note the tongue cut into the side.

A fragment of flooring was recovered from the first floor ceiling which had been used to reinforce one of the queenpost straps. This, too, may be a piece of the original flooring on the first floor. The fragment is 5/4 inch thick, has a rough sawn bottom, and a hand-planed top. The parallel, shallow grooves in the top surface just visible in the photograph can be easily felt by running a finger across the board. Given the deterioration on one end of the fragment, it is speculated that it came from the floor near a doorway where it was occasionally wetted. Since there is no perceptible wear on the surface, it likely was in a corner behind the hinge side of a door where there was no foot traffic.

Figure 48

A detail of a flooring fragment recovered from the 1st floor ceiling. Note the parallel shallow grooves on the surface.

The flooring on the 2nd and 3rd floors is largely original. The supporting joists have reciprocating saw marks, characteristic of early water-powered saw mills. The flooring is tongue and groove of random width and the bottom surface shares the reciprocating saw marks. The floor boards also have been hand-planed fit the profile of the joists. Early sawmills were unable to produce planks with a consistent thickness. Accordingly, carpenters often had to hand-plane the bottom of the floor boards to ensure a good fit. This was observed in the upper two floors of the Brewster Store.

Figure 49

A photograph showing reciprocating saw marks on a floor joist and on the bottom surface of the flooring. The arrow points to where the bottom of the flooring planks were hand-planed to fit the profile of the joists.

In the northwest quadrant of the building an opening is framed out in the floor structure. New joists, painted white, have been installed to fill the opening. This appears to have been an open hatch to facilitate hoisting up items to the upper floors. Framed openings are present at both the 2nd and 3rd floors.

Figure 50

A photograph showing an opening framed out on the second floor framing.

Finishes

Original finishes have been removed from the entire 1st and 2nd floors. The only decorative feature on the first floor is the fireplace in the southwest quadrant, whose foundation was discussed above. As was noted, if the HABS drawings are accurate, the feature dates from after 1977.

Figure 51

A photograph showing the existing fireplace on the first floor.

The center bays of the 3rd floor show characteristic finishes from the first half of the 19th century, and are likely original. There are two four-panel doors which show characteristic hand-planed marks, mortise and tenon connections between the styles and rails, and pegs holding the doors together.

Figure 52

A photograph showing one of the two doors on the third floor with visible hand-planed marks on the back side.

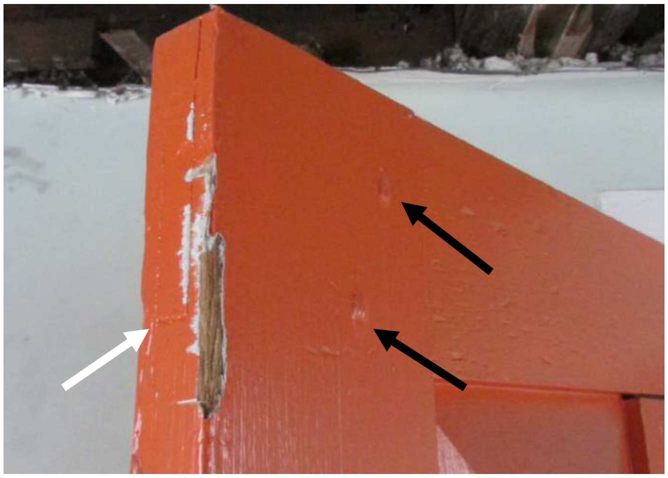

Figure 53

A detail showing the tenon (white arrow) and pegs (black arrows) used to assemble the door.

The two doors have thumb latch hardware which is typical of the 1830s in Ohio.

Figure 54

A photograph showing one of the two doors on the third floor with visible hand-planed marks on the back side.

Paint analysis of the doors shows that the earliest finish color remaining was a warm gray (see Appendix A). However, underneath the primer coat for the light gray finish coat was a residue of a varnish. It is possible that the paint was stripped from the doors and repainted with the warm gray color. There were between 3 and 5 paint layers on the doors (excluding the primer coat). This is a small number of paint layers for a building dating to 1839—more commonly one would expect 10-15 paint layers for a building of this age. This makes is more likely that the residue on the wood observed in the paint analysis was due to paint stripping.

A portion of a thumb latch was removed to see if any paint residue might remain under the hardware. Unfortunately, no colors other than those present in the paint analysis were observed.

Figure 55

A photograph showing the bare wood underneath the door latch.

Unfortunately, the observed residue under the paint layers examined in the paint analysis provides no clue as to what the original paint color was. Experience with other Northeast Ohio buildings from the 1820s and 1830s shows that red lead paints were commonly used for utilitarian buildings, such as stores.

The third floor retains the flues leading to the chimneys. It seems most likely that stoves were used to heat the building, as there is no evidence remaining in the framing of any hearths.

Figure 56

A photograph showing the projection in the exterior wall which houses a flue leading the chimney above.

Summary of Recommendations

The following recommendations are summarized from the report:

1. Repoint brick in the parapet and near the south entrance.
2. Replace deteriorated brick, primarily found in the parapet and near the south entrance.
3. Flash the parapet coping, either above or underneath the existing coping stones.
4. Test the sandstone stains to determine if they are due to lichen growth, and clean as described.

Closing

It has been our pleasure to assist you with a better understanding of the Brewster Store prior to its adaptive reuse. Please call if you have any questions relative to this report and its associated drawings.

Sincerely,

Elwin C. Robison

Elwin C. Robison
Principal

Appendix A—Paint Analysis

Paint Analysis

1839 Brewster Store

Hudson, Ohio

March 9, 2021

On Monday, March 8, 2021, David Arbogast, architectural conservator, of Davenport, Iowa, received a set of three paint samples from Elwin Robison, Principal, of Robison Building Analysis LLC in Kent, Ohio. The samples were taken on February 8 by Mr. Robison from the interior of the 1839 Brewster Store in Hudson, Ohio and were sent for analysis to determine their historic finishes.

The analysis utilized an optical Amscope microscope with magnification between 7 and 90 power. Each layer observed was color matched to the Munsell System of Color using natural north light. Only opaque, pigmented layers (i.e. paint layers) were matched. It is impossible to determine colors for finishes such as metallic paints and leafs and shellacs and varnishes because their color varies according to their translucency and reflectance.

The Munsell System of Color is a scientific system in which colors have been ranged into a color fan based upon three attributes: hue or color, the chroma or color saturation, and the value or neutral lightness or darkness. Unlike color systems developed by paint manufacturers, the Munsell system provides an unchanging standard of reference which is unaffected by the marketplace and changing tastes in colors.

The hue notation, the color, indicates the relation of the sample to a visually equally spaced scale of 100 hues. There are 10 major hues, five principal and five intermediate within this scale. The hues are identified by initials indicating the central member of the group: red R, yellow-red YR, yellow Y, yellow-green YG, green G, blue-green BG, blue B, purple-blue PB, purple P, and red-purple RP. The hues in each group are identified by the numbers 1 to 10. The most purplish of the red hues, 1 on the scale of 100, is designated as 1R, the most yellowish as 10R, and the central hue as 5R. The hue 10R can also be expressed as 10, 5Y as 25, etc. if a notation of the hue as a number is desired.

Chroma indicates the degree of departure of a given hue from the neutral gray axis of the same value. It is the strength of saturation of color from neutral gray, written /0 to /14 or further for maximum color saturation.

Value, or lightness, makes up the neutral gray axis of the color wheel, ranging from black, number 1, to white at the top of the axis, number 10.

A visual value can be approximated by the help of the neutral gray chips of the Rock or Soil Color chart with ten intervals. The color parameters can be expressed with figures semi-quantitatively as: hue, value/chroma (H, V/C). The color "medium red" should serve as an example for presentation with the three color attributes, 5R 5.5/6. This means that 5R is located in the middle of the red hue, 5.5 is the lightness of Munsell value near the middle between light and dark, and 6 is the degree of the Munsell chroma, or the color saturation, which is about in the middle of the saturation scale. The discussion of the samples lists the layers from the most recent at the top to the oldest at the bottom. In cases where the actual color was between two Munsell colors, an intermediate number is listed. For example, 10YR 6/5 actually falls between the standard colors of 10YR 6/4 and 10YR 6/6. The results obtained, are as follow:

Sample 1	Munsell
White	N 9.5/
Light gray	N 7.75/
Dark gray	N 4.5/
Light gray	N 7.75/
Golden varnish	----------

The first sample was collected from the base molding of the third floor. It revealed five finish layers. The top layer was stark white. Beneath it was a light gray layer. Below that layer was a very thin layer of dark gray. Underneath that layer was another light gray layer. On the wood surface itself was a very thin layer of golden varnish which might have been the original finish coat.

Sample 2	Munsell
Burnt orange	2.5YR 4.5/10
White	5Y 9/1
Warm gray	5Y 6/2
White	5Y 9/1

The second sample was removed from the south door of the third floor. Its top coat was a thin layer of intense burnt orange. Beneath it was a white layer. Beneath that layer was a warm gray layer. On the wood substrate was a thin layer of white paint matching that of the previous white layer.

Sample 3	Munsell
Burnt orange	10R 5/10
White	5Y 9/1
Warm gray	5Y 6/1
Dark gray	N 4.5/
Warm gray	5Y 6/1
Pale light gray	N 8.0/
Golden varnish	----------

The third sample was from the north door of the third floor. Seven finish layers were observed on this sample. It was similar to the second sample and revealed three additional layers. Beneath the warm gray layer was a dark gray layer matching that of the first sample. Beneath that layer was another warm gray layer matching the earlier warm gray layer. This is a similar sequence as observed on the first sample. Underneath the older warm gray layer was a layer of pale light gray which was comparable to the oldest white layer of the second sample. Here, as in the first sample, there were traces of golden varnish on the wood substrate.