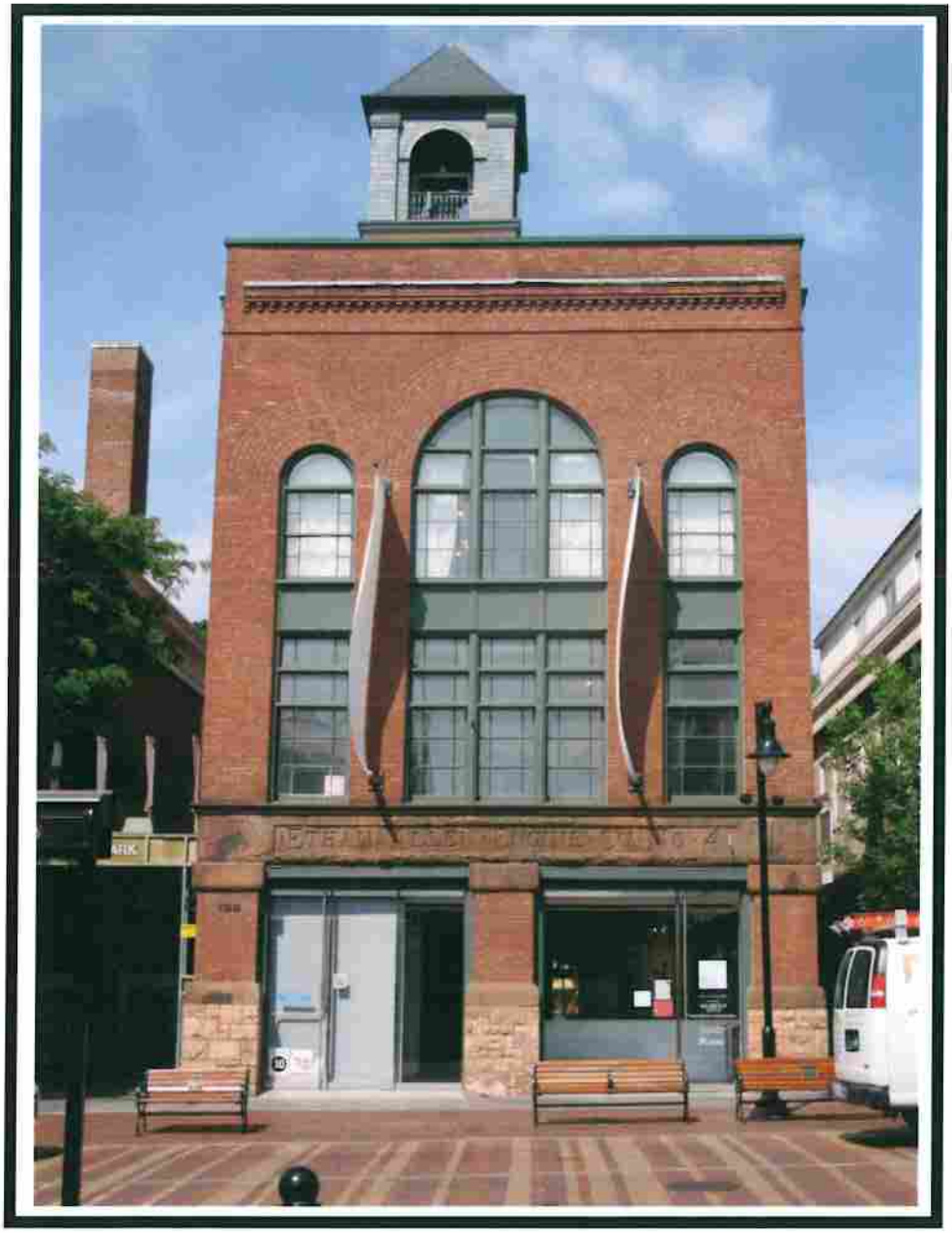
WINDOW CONDITION ASSESSMENT

BCA CENTER
BURLINGTON, VERMONT
AUGUST 2014



PREPARED FOR THE CITY OF BURLINGTON
PUBLIC WORKS DEPARTMENT

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Overview

This report is provided as a tool for planning the continued maintenance and improvement of the windows at the BCA Center (f.k.a. "Firehouse Gallery", "Ethan Allen Engine Co. No. 4") located at 135 Church Street in Burlington, Vermont. The report should be viewed as a "snapshot" in time, capturing the conditions as they were on the date of the site visit. It includes a thorough description and classification of the various windows in place, as well as an assessment of the conditions observed during a site visit conducted on 14 July 2014. Additionally this report makes recommendations for the restoration, improvement and future maintenance of those windows and an estimate (*see **Appendix III***) on the order of magnitude required to carry those measures out.

Brief History and Building Description

Located on the western side of Church Street, near the corner of Church and Main, the former Ethan Allen Engine Co. No. 4 building sits adjacent to Burlington's City Hall. Designed and built by Burlington architect A.B. Fisher (1831 – 1911) in 1889, the building, with its associated bell tower, was the tallest in the city at the time of its construction. The building served as a fire station until 1926 when Central Fire Station (later "Fire Station No. 1") was built on Winooski Avenue. Following the move to the new Central Fire Station, the Burlington Police Department occupied the building on Church Street until 1969[1]. In 1973 the building was saved from demolition and eventually stabilized and repaired, reopening as a public art space in 2003. Today the building serves as the BCA Center with galleries, classrooms and studios open to the public.

The design of the structure reflects some of the eclecticism typical of the late 19th century, while retaining a sense of stateliness and formality appropriate to public buildings and fire stations in particular. The narrow and deep three/four-story, flat roofed brick building is capped near the rear by a tall brick and slate, hipped roof bell tower. The building's Church Street elevation formerly contained large wooden vehicle bay doors on the ground level above which a deep redstone lintel still bares the carved inscription "Ethan Allen Engine Co. No. 4". The fenestration is complex, varied and at times asymmetrical. Nearly all windows have modern interior storms. What follows is an elevation-by-elevation description of the various windows at the BCA Center

Detailed Window Description

East Elevation

Above the inscribed lintels on the east elevation, three bays of stacked windows extend from the second to the third floor. These window assemblages consist of a combination of hung sash, transom, fixed light and arch toped windows. Beginning above the first floor lintels on the southerly end of the east elevation, and lighting the second floor, a single-hung sash is capped by two stacked transoms, each separated by a horizontal mullion/sill. A beaded-board spandrel separates the stacked transom from the third floor, which is lighted by a double-hung sash, which in turn is capped with a fixed, arch-topped

[1] Liisa Reimann, *Firefighting in Burlington* (Arcadia Publishing 2006), p. 41

light. This pattern is repeated on the northerly end of this elevation. These two bays flank a larger central bay comprised of a similar assemblage with degrees of variation. Here the bay contains three sets of the window assemblage separated by mullions. A variation in construction occurs on the third floor where double-hung sash are replaced with fixed divided light sash capped with segmental arch transoms with a second row of transoms rising to form a complete arch.

Window Count – East Elevation

Type of Window	Quantity Present	No. of Lights Per Window
Single hung sash	5	9 (horizontal/uneven)
Double hung sash	2	5/5 (uneven)
Transom	10	3 (uneven)
Fixed lights	8	1 (2 arched, 6 segmental)
Total	25 windows	103 lights

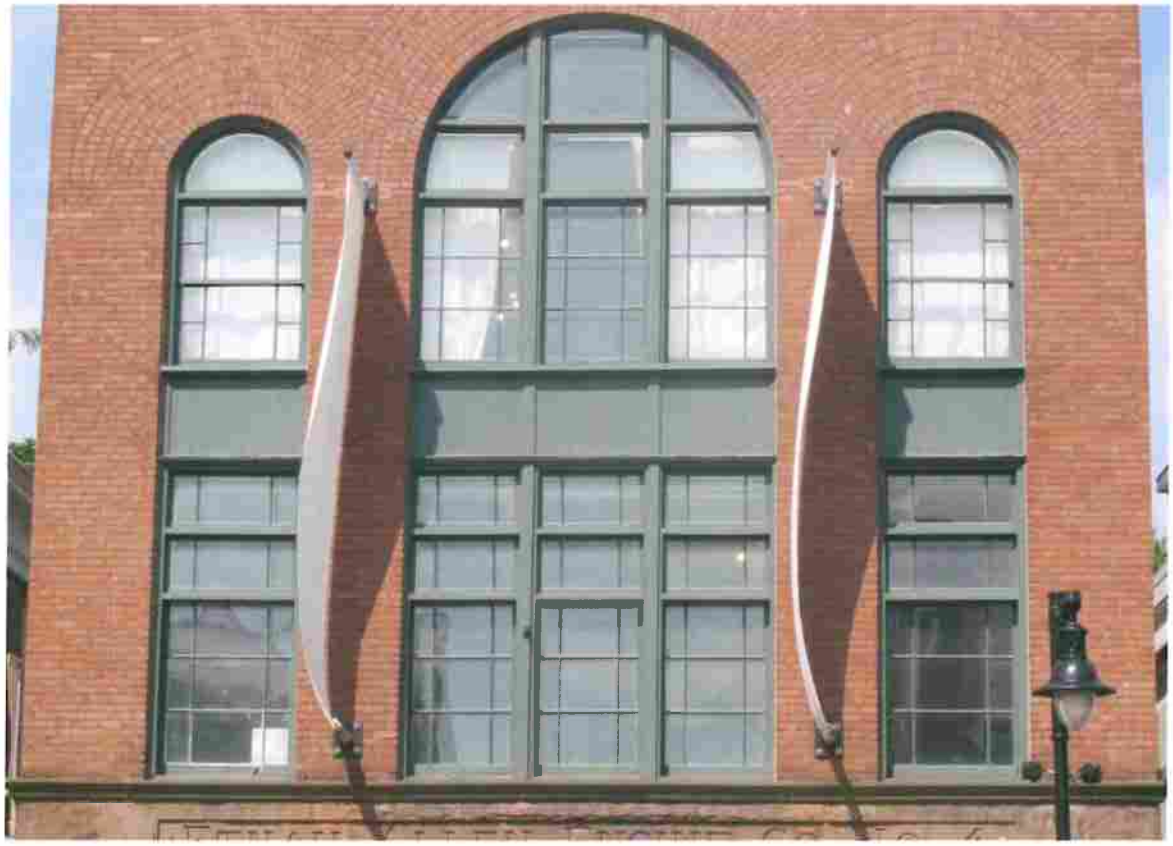


Figure 1 East Elevation Fenestration Assemblage

South Elevation

The south elevation along the walkthrough leading to City Hall Park bears another unique fenestration pattern. Beginning on the ground floor of the easterly end with a former personnel door capped with a modernized elliptical arch window set over a steel I-beam and continuing on to a bank of four, six-light casement windows, a modern glass entry

door, a pair of narrow two-light casement windows and ending with another bank of four, six-light casement windows.

The second floor of the south elevation, beginning at the easterly end, contains a similar window assemblage as described for the east elevation. Here the assemblage begins with three sets of vertically stacked windows consisting of a single-hung sash with three horizontal lights with two stacked transoms above which a spandrel delineates the start of the third floor. The portion of the assemblage lighting the third floor consists of a fixed three light sash above which two transoms with a segmental arched side begin to form the arched top of the assemblage. A mullion separates this first vertical bay from the second bay, which is comprised of similar windows with the exception of a double hung sash that replaces a fixed window on the third floor. Another mullion divides the second bay from the third bay, which is a mirror image of the first bay. The south elevation contains five sets of these assemblages – three on the easterly end and two on the westerly end.

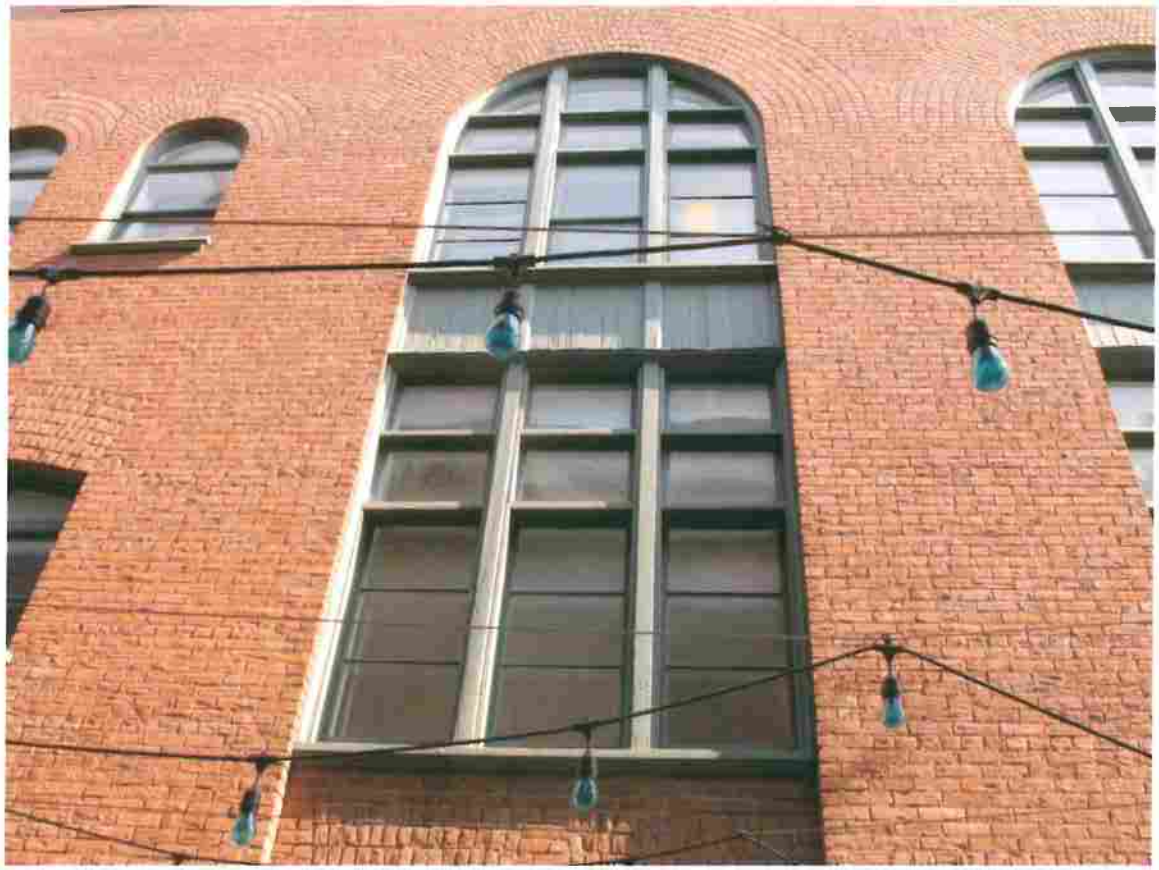


Figure 2 South Elevation Fenestration Assemblage

Between the three easterly sets and the two westerly sets are a bank of three double-hung single light sash separated by mullions and capped with segmental arched transoms forming an elliptical arch. Adjacent to this bank are three two-light casements. Lighting the third floor are two, one-over-one double-hung sash capped with arched-top fixed lights.

Window Count – South Elevation

Type of Window	Quantity Present	No. of Lights Per Window
narrow six-light casement	8	6
narrow two-light casement	5	2
wide two-light casement	2	2
Single-hung sash	15	3 (horizontal)
Transom	30	1
Fixed light	35	34 (1 light), 1 (2 light)
Double hung	10	7 (1/1), 3 (2/2)
Total	115 windows	196 lights

The westerly end of this elevation includes a fourth floor, which contains four, two-light casements capped with arched top fixed transoms.

West Elevation

The first floor of the west elevation contains a wide segmental brick-arch façade with modern floor to ceiling plate glass windows flanking a modern entry door.

The structure's motif of large assembled banks of windows continues on the west elevation's second and third floor. Here three sets of assemblages consist of paired horizontal, three-light casement windows capped with two stacked transoms below a beaded-board spandrel above which a one-over-one, double hung sash is capped by a segmental arch fixed transom.

This end of the building includes a fourth floor, which has six, two-light casement windows capped with arched top fixed transoms.

Figure 3 West Elevation Fenestration

Window Count – West Elevation

Type of Window	Quantity Present	No. of Lights Per Window
3-light casement	6	3
Transom	12	1
Double-hung sash	6	1/1
Fixed segmental arch	6	1
2-light casement	6	2
Fixed arched top	6	1
Total	42	66

North

The north elevation contains sparse windows with none on the first floor. Beginning at the easterly end of the elevation, the second floor fenestration consists of a single double-hung arched top window, a bank of three double-hung three light windows and bank of three double-hung, single-light windows (center window is boarded over), capped by a segmental arch made up of three fixed transoms.

The third floor fenestration consists of two widely spaced double-hung, two-over-two sash, the top sash of which is arched.

Window Count – North Elevation

Type of Window	Quantity Present	No. of Light Per Window
Double-hung arch top sash	1	1/1
Double-Hung 3/3 sash	3	3/3
Double-hung 1/1 sash	2	1/1
Double-hung arch top	2	2/2
Segmental arch Fixed light	3	3
Total	12	26

Tower

The south elevation of the tower contains three, two-light casements. There are likely more windows contained in the tower, however access to the tower was not available at the time of the site visit and not all elevations are visible from the ground.

Total Window Count for BCA (excluding Tower)

Total Window Quantity	**Total Lights**
194	**391**

Condition Assessment
Obvious work was done to the windows throughout the building during the previous decade's major restoration, including some reglazing, patching of rotted /cracked sills and sash members, and installation of interior storm panels. Many of these repairs have now failed and the windows, windowsills, and mullions at the BCA Center have reached a point of being in **mostly poor condition and will require a varying amount of restoration work**.

There are a number of challenges to completing window restoration work at the BCA Center that are unique to this facility. Generally speaking, most historic windows were designed to be removed and accessed from the interior of a building. The windows at the BCA Center are no different. However, due to the presence of a number of obstructions, both permanent and semi-permanent, removing windows from the interior will be nearly impossible. In almost all cases, semi-permanent storm panels cover the wood window. Removing these panels will require partial dissemble in order to access the historic window. In other cases, modern stairways have been built against exterior walls, covering over the windows and making their removal from the interior impossible. And in still other cases, interior walls have been constructed against the exterior walls, covering entire banks of windows. For this reason, it's likely that the majority of any window restoration work will need to be carried out from the exterior, via scaffolding or a personnel lift.

An additional item of note that directly affects the course of action taken with the windows at the BCA Center relates to the fact that the Preservation Trust of Vermont in partnership with the Vermont Housing & Conservation Board holds a preservation easement on the building. This easement prioritizes the preservation of the existing historic windows. Prior to any work being completed it is recommended that the Preservation Trust of Vermont be consulted to ensure that the work plan meets the stipulations of the easement.

In considering the condition of the windows, it is helpful to think of each window as a system made up of various parts that function together. One or perhaps two of these parts can fail without the entire system failing. However, when multiple failures occur they compound, resulting in an overall failure of the system.

In the case of the windows at BCA Center, many deficiencies were identified within the window system resulting in their current condition.

Deficiencies Identified

The following is a listing of deficiencies common to many windows at BCA Center (*refer to **Appendix I** for photographs of various deficiencies*):

- Failed exterior glazing putty
- Heavily built-up and flaking exterior paint layers
- interior storm panels missing or no longer properly sealed
- Moderate amount of cracked/broken glass throughout

- Moderate to significant rot identified on south elevation windowsills and sash members
- Moderate to significant rot identified on some casements and sills on fourth floor of the west elevation
- A number of windowsills weathered and checked from lack of paint
- Failed or missing caulking between wooden brick molding and exterior brick wall

General Recommendations for Restoration of Wood Windows at Fire Station No. 1
It is recommended that a qualified window restoration specialist be selected to carry out a thorough restoration of the historic windows at BCA Center. Given that in most cases, these windows do not need to operate, their functionality is a low priority in this restoration.

Most window restoration work involves removing the sash in order to carry out bench repairs, either on or off site. In the case of the BCA Center, this will not be possible for many of the windows. **For this reason, most windows will need to be restored in place.** This can be accomplished either through the erection of scaffolding or the use of a personnel lift or a combination of the two.

The exact procedures and materials used to carry out this restoration may vary between professionals, however they should generally follow the *Secretary of the Interior's Standards for Rehabilitation.* One such approach is outlined below.

For additional reference on the repair and maintenance of wood windows, see Preservation Brief No. 9 at the National Park Service's Preservation Brief website: http://www.nps.gov/tps/how-to-preserve/briefs/9-wooden-windows.htm

1) *Removal of limited Sash and On-Site Work*
   a) Those window sash that can be removed will be taken off-site for bench repairs. The sash, any interior stops or any other parts of the frame removed will be labeled for reinstallation in their original location. Window openings will then be secured with plywood.
   b) All exterior window trim, casing and sills, as well as mullions and spandrels will be inspected and any needed repairs will be made. Repairs will consist of epoxy or Dutchman-type wood patches. Exterior brick mold caulking, where failing, will be removed, the cracks cleaned and new non-sag elastomeric sealant installed and tooled to a smooth and uniform surface.
   c) Those sash that cannot be removed for bench repairs will be restored in place as part of the exterior restoration work listed above. Sash restoration in place will involve removal of loose flaking paint on the sash frames, repairs to the frames as needed, sanding of paint shoulders, removal of all failed putty, scraping back of paint lines along sound putty, oiling and sealing of exposed glazing rabbets and spot-glazing where needed.
   d) Once the glazing has cured, all exterior surfaces of the window trim and sash will be sanded as needed, primed, caulked with a non-sag elastomeric sealant and painted with two topcoats of high quality exterior paint.

2) *Shop Work For those Sash That Can Be Removed*
   a) Sash and Glass
      i) Once removed to an off-site shop location, restoration work will begin with the careful removal of all glass. All panes will be labeled for reinstallation prior to removal. Glazing putty will be removed using steam, chisels, scrapers and other physical means. The greatest possible care will be taken to protect the panes.
      ii) Following de-glazing, the interior and exterior paint surfaces will be hand scraped to a point of refusal or to bare wood depending on the condition of existing paint. Any paint transitions or "shoulders" will be sanded smooth.
      iii) Once scraped/stripped, any needed repairs will be made to the sash frames. These repairs will consist of epoxy or Dutchman-type wood patches. If repairs to the joints are required, the joint will be carefully disassembled, repaired and reassembled without the use to glue. (Typically mortise and tenon joints were not fixed with glue. For this reason, and to facilitate any future repairs, no glue is used when repairing joints.)
      iv) After repairs are made, the glazing rabbets will be brushed with a coat of shellac and the glass will be re-glazed with an oil-based glazing compound. The glass will be set into the glazing rabbet on a bed of glazing putty. The glass will be held in place with appropriate, non-ferrous glazing points. Broken panes will be replaced with new double-strength glass.
      v) Once the glazing putty has skinned over, the interior and exterior of the sash will be primed with a high quality primer and finished with two coats of a high quality paint. Paint coatings will over-lap the glazing onto the glass no more than $1/16^{th}$ of an inch to create a weather seal. Neither putty nor exterior paint will be visible from the interior, creating a crisp and aesthetically pleasing line.
      vi) Following painting, the glass will be carefully cleaned and the sash prepared for safe transit back to the site for reinstallation.
      vii) Existing metal hardware will be stripped of built up paint, cleaned and reserved for reinstallation. Where missing or broken, new hardware will be provided to closely existing.

   b) Interior Sash Stops
      i) Where present, interior stops (narrow trim pieces that hold the bottom sash in place) will be scraped to a point of refusal and sanded smooth. Any needed repairs will be made with epoxy or Dutchman-type wood patches. Once repaired, the stops will be spot primed and painted with two topcoats. In situations where sash stops are missing, new ones will be milled to closely match existing.

   c) Parting Beads
      i) When present, the parting beads (narrow strips of wood that separate the top and bottom sash) will be replaced with new stock milled to match existing.

3) Return to Site for Installation

a) Re-installation of the Sash
   i) Prior to installing the restored sash, the metal weatherstripping will be repaired or replaced as needed.
   ii) With the sash installed, both top and bottom sash will be checked for proper operation and stop adjustors tuned as needed. Sash locks will be installed followed by any needed touch-ups and clean up.

Storm Windows

The existing interior acrylic storm panels are in varying states of quality. While some are still functional and maintain good seals against the movement of air and moisture, others have failed and require attention. Those that are either missing entirely or no longer achieve a secure seal should be repaired. Where needed, new acrylic panels should be purchased from a glass shop and installed with appropriate gaskets, seals and/or caulking. Some panels need simply to be re-seated on new gaskets in order to achieve a seal. The ultimate success of interior storm panels such as these rely on sealing the interior against the movement of interior air past the storm onto the historic window. Care should be taken to ensure the storm is sealed correctly.

Conclusion

The windows at BCA Center are a significant piece of the unique architectural design of an important city building. The window related work completed during the building's restoration in previous decades preserved these features. The ensuing years have taken their toll and the windows are now in need of attention. A careful restoration will allow them to serve well into the next phase of this building's long and interesting story.

Appendix I – Examples of Window Failure/Deficiencies Found at BCA Center

Figure 4 Failed glazing putty

Figure 5 Flaking failed paint

Figure 6 Broken glass

Figure 7 Stairway built over existing window

Figure 8 Rotted bottom rail

Figure 9 deterioration and likely rot at joint

Figure 10 Failing older repairs to 4th floor casement

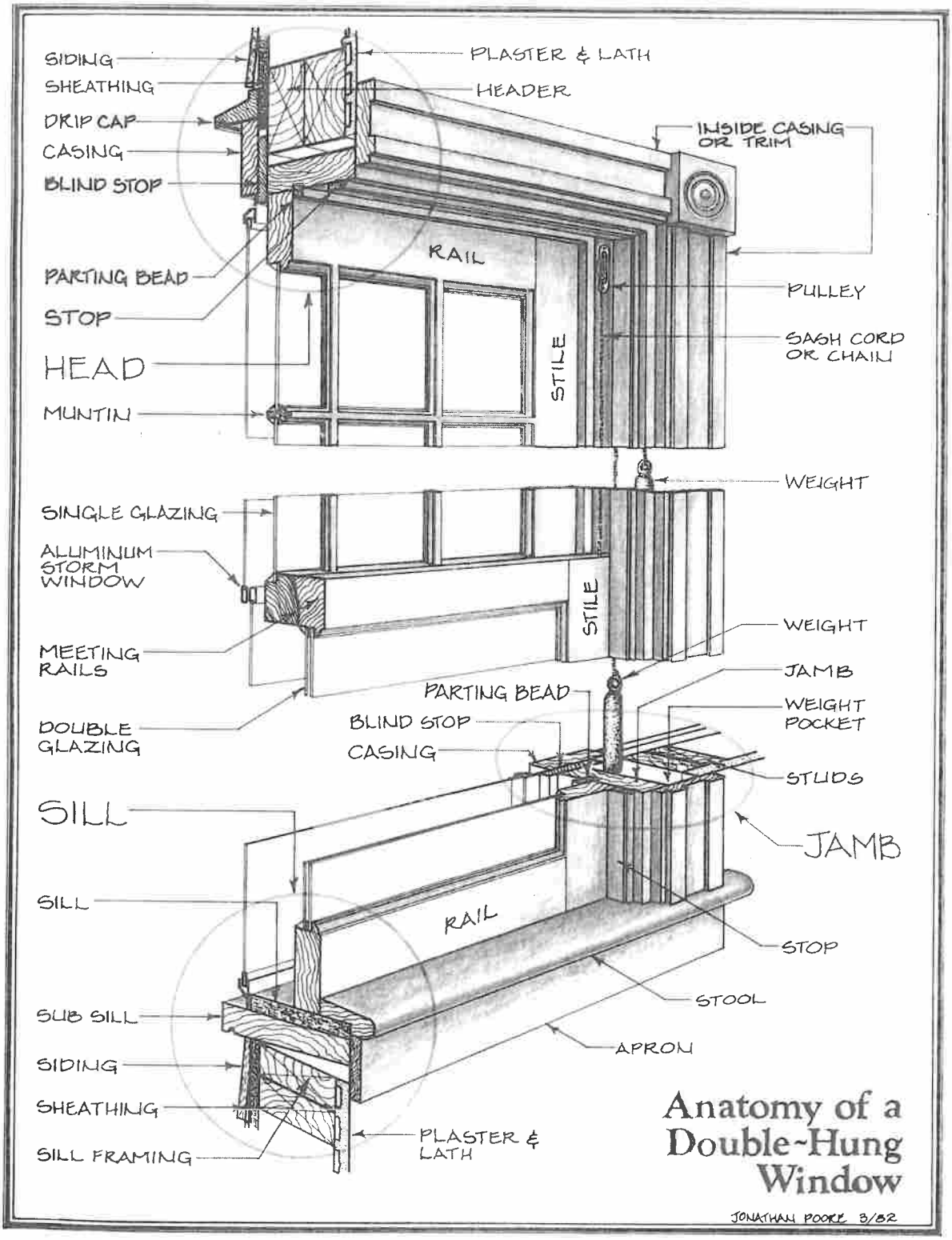
Figure 11 temporary repairs with L bracket

Figure 12 Failed paint on sill – South Elev.

Figure 13 cracked and damaged sill

Appendix II

"Anatomy of a Double Hung-Window" (from *Old House Journal*)



The Old-House Journal 19