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"Set Fier to the Town of Charlestown wich Consumed almost Every House in that Town": An Analysis of Window Leads from the Three Cranes Tavern Site

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A lack of published data on window leads from sites in New England prompted a project analyzing the sample from the Three Cranes Tavern site in Charlestown, Massachusetts. This structure was built ca. 1629 in anticipation of John Winthrop's arrival to settle Massachusetts Bay. For most of its existence it was used as an ordinary. Like the rest of Charlestown, it was destroyed on 17 June 1775 during the Battle of Bunker Hill. Excavated as part of the "Big Dig" in 1985, the recovered sample included 148 items identified as window leads. Within this sample were window leads, window ties, and a small sample of scrap lead. The marked leads are described and an analysis of the physical characteristics of the leads is presented. A study of the window ties describes three types and relates them to historically known manufacturing processes.

Le manque de données publiées sur les cames de fenêtre en plomb trouvées sur des sites de la Nouvelle-Angleterre a incité la création d'un projet visant l'analyse d'un échantillon provenant du site de Three Cranes Tavern à Charlestown, Massachusetts. Ce bâtiment a été construit vers 1629 en prévision de l'arrivée de John Winthrop, venu s'établir dans la baie du Massachusetts. Pour la majeure partie de son existence, il a été utilisé comme une taverne. Comme le reste de Charlestown, il fut détruit le 17 juin 1775 lors de la Bataille de Bunker Hill. Fouillé dans le cadre du projet du « Big Dig » en 1985, l'échantillon récupéré comprenait 148 objets identifiés comme des cames de fenêtres en plomb. Dans cet échantillon se trouvaient des cames de fenêtres, des attaches de fenêtres et quelques fragments de plomb. Les cames de fenêtres sont décrites et une analyse de leurs caractéristiques physiques est présentée. L'étude des attaches de fenêtre permet de les associés à trois types, qui sont reliés à des procédés de fabrication historiquement connus.

Introduction

The study of marked window leads has been an important part of the analysis of colonial period sites for almost three decades. Since Noël Hume (1982: 324) first demonstrated that some 17th-cenutry window leads contain dates and other information hidden within them, much effort has been expended opening leads and recording the examples. A large portion of this work has been done on collections from the mid-Atlantic region, particularly Maryland and Virginia, e.g., Edwards and Harwood (2013), Hanna (1986), Luckenbach and Gibb (1994), Noël Hume and Noël Hume (2001), and Rivers (2004). There has been a noticeable lack of such research in New England, however. In his summary of the known marks on window leads, Egan (2012) listed 154 dated examples. Of these, 45 were reported from Maryland and Virginia, representing 35% of the known examples. In Egan's compilation, there was only one dated example from New England.

There are still very few marked leads reported from New England. In addition to the 1694 dated example on Egan's list, there is one undated example, and both are from the Faneuil Hall site in Boston (Egan 2012: Nos. 63, 172). Goodwin (1999: 92) showed a fragmentary lead from the Turner House in Salem, Massachusetts, marked 1664. A number of leads dated 1664 have been reported from the Humphrey and Lucy Chadbourne site in Berwick, Maine (Baker 2009: 10). There is a 1675 lead from the Aptucxet Trading Post in Bourne, Massachusetts (Chartier 2015). These meager findings have not been published in any detail.

To begin to address this lack of published data, window leads from the Three Cranes Tavern site (1629–1775) in Charlestown, Massachusetts, were processed and recorded (FIG. 1). The excavations on this site were carried out in 1985 as part of the Central Artery/Tunnel Project, known unofficially in Boston as the "Big Dig." Because the analysis of

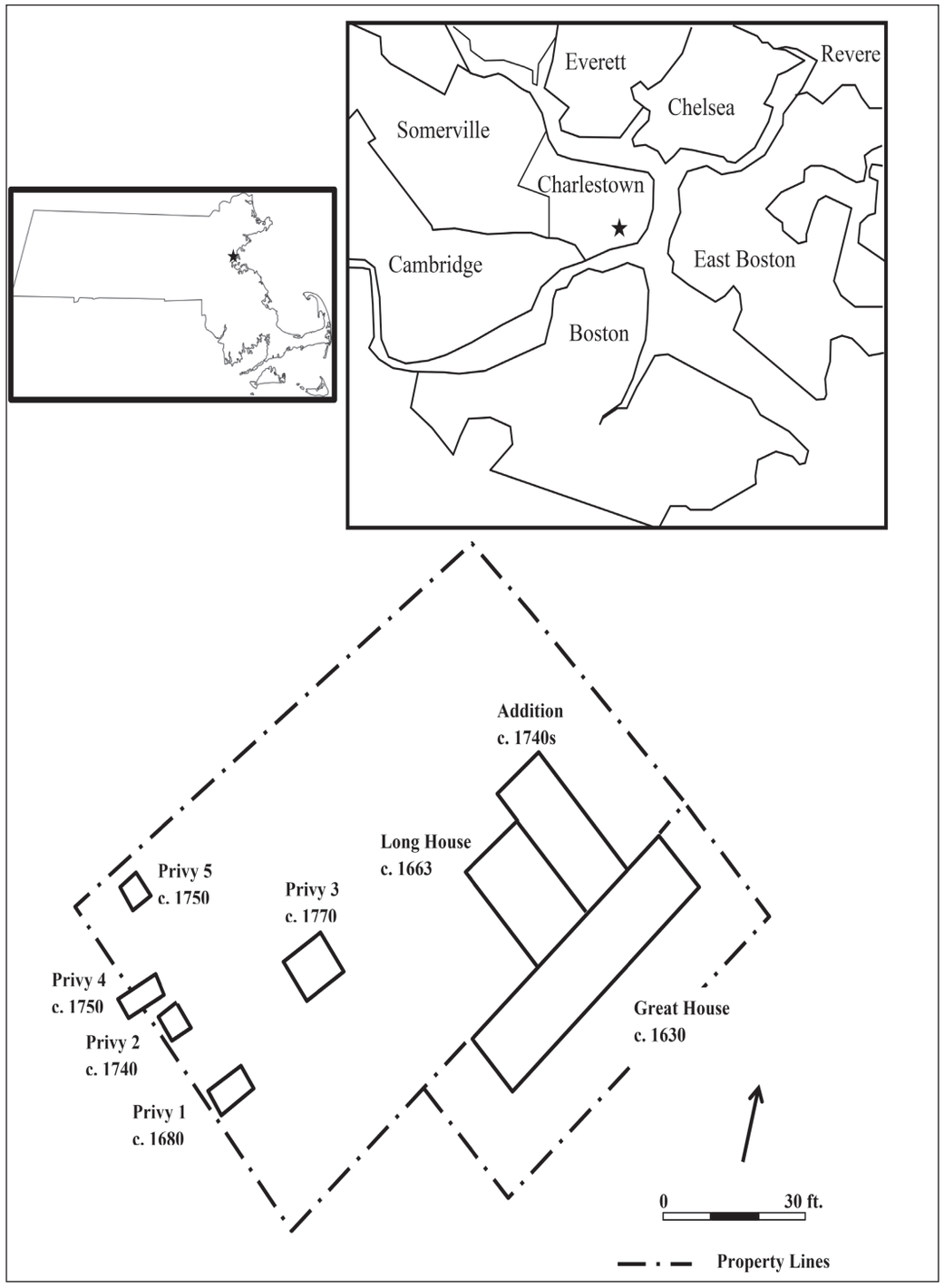

Figure 1. Location map of Three Cranes Tavern site. (State map: Waterproofpaper.com [2018]; town map: Wikipedia [2018]; site map: Gallagher et al. [1994]:194; Figure by Timothy B. Riordan, 2018.)

window leads was new and just beginning to be included among the techniques for understanding colonial sites, no attempt was made to study the leads during the initial analysis. A re-examination of these artifacts provides new insights on the distribution of marked window leads and on the site.

Three Cranes Tavern Site

In 1629, an advance party of the Massachusetts Bay Company constructed a building, known as the Great House, on the Three Cranes Tavern site, in anticipation of the arrival of Governor John Winthrop the following year. Winthrop, who arrived in 1630, did not stay long in this house. Because of perceived problems with the water supply, Winthrop and the majority of the settlers migrated across the Charles River and established their settlement on the Shawmut Peninsula, which later was called Boston.

Following Winthrop's removal, the Great House was used as the meetinghouse for those who remained in Charlestown. In 1635, Robert Long purchased the Great House with the provision that it could still be used for services until another meetinghouse was built. By 1638, the property was referred to as "Long's Ordinary," indicating that it was already functioning in the role that it would have until its destruction. Robert Long died in 1663, and his inventory revealed that the Great House was a typical hall-and-parlor house, with a porch and with rooms above all three spaces. John Long, son of Robert, inherited the property. He built a new dwelling house adjacent to the Great House and improved many of the buildings. When he died in 1683, his inventory reveals that the Great House and the Long House were joined by a space simply described as an "entry." It also reveals that he was renting out the Great House to another innkeeper (Gallagher et al. 1994: 32–39).

Members of the Long family continued to own the property well into the 18th century, renting out the tavern, and sometimes, the Long House. The earliest reference to the building as the Three Cranes Tavern was in 1737 (*Boston News-Letter* 1737). In 1743, the tavern passed out of the Long family, and in 1746 was acquired by Nathaniel Brown, who ran it for 27 years. Brown is said to have made significant changes to the site (Gallagher et al. 1994:43). By 1773, John Woart, who was leasing the building, advertised that he wished "to inform the public, that he keeps the noted tavern in Charlestown called the Three Cranes, formerly improved by Mr. Nathaniel Brown,––Where gentlemen, travelers, and others, may depend on the best entertainment, and being treated with the utmost civility" (*Massachusetts Spy* 1773: 4).

As part of the strategy to drive the British forces from Boston, on the night of 16 June 1775 rebels under the command of Colonel William Prescott fortified the crest of Breed's Hill in Charlestown. The next morning the British army attacked the hill, in what would later be called the Battle of Bunker Hill. During this engagement, because the British were suffering from sniper fire from the town, Admiral Samuel Graves directed his fleet to begin bombarding the town with incendiary shells. The main focus of the bombardment was the town marketplace; the location of the Three Cranes Tavern. Charlestown, including the tavern, was almost entirely destroyed as part of the battle.

The town began to rebuild soon after the battle, but in 1788 Charlestown voted that the market square "shall not in the future be encumbered by any building" (Gallagher et al. 1994: 44). In 1794, the Ancient and Honorable Artillery Company of Boston, which held Nathaniel Brown's mortgage on the tavern property, donated the lot to the town as part of the public space. The area continued to be the town marketplace until the mid-19th century, when a park was established. It was renamed as City Square in 1848 to celebrate the town being granted a city charter. Throughout the 19th and 20th centuries, utility lines and other disturbances impacted the area, and, in 1899, the Boston Elevated Railway was constructed with a stop at City Square.

In the late 1970s, plans were developed to replace the Central Artery, a portion of I-93 that ran through Boston as an elevated roadway. The northern approaches to that roadway ran through Charlestown. As part of the Central Artery North Reconstruction Project, testing was completed in the City Square area that resulted in the discovery of four sites eligible for the National Register, including the Great House/Three Cranes

Tavern, and the area was termed the City Square Archaeological District (Pendery et al. 1982). Data recovery was completed between August and December 1985. A total of 34 features were considered significant and excavated, including structural remains of the Great House/Three Cranes Tavern and several privies and trash pits (Gallagher et al. 1994: 72).

The Sample and Marks

A total of 148 pieces of lead were pulled from the collection of the Three Cranes Tavern site for analysis. This represented all the lead, either marked as window lead or considered potentially related to windows, recovered during the excavations in the 1980s. Of these, 15 were not window related. They included lead scrap and a piece of sprue from shot making. The non-window leads will not be considered further. Another 42 pieces of lead were deemed possible window ties, i.e., lead soldered to the leaded window and used to attach it to the saddle-bars.

Saddle-bars were thin rods of iron or wood attached to the inside of a leaded sash to help stiffen the leaded glass. The possible lead ties will be treated separately later.

There were 91 segments of typical H-shaped window leads to be opened, cleaned. and inspected for marks. They ranged in length from 26 mm to an amazing 475 mm. Overall, the sample included 5296 mm of window lead. A total of 24 marks on 19 lead segments were observed in this sample (TAB. 1). The marked leads represent 21% of the sample, which compares well with other samples that ranged from 10% to 63% marked leads, e.g., Hanna (1986) and Thomas (1984: IV-8). In New England, it seems, marked leads are as common as in other areas.

Table 1. Marked leads from the Three Cranes Tavern.

Mark	Number
1664 • ICEW •	19
EW • 1700	3
◎ EW ◎	1
...16...	1
Total	24

By far the most common mark was dated 1664 and was followed by the initials: ICEW (FIG. 2). This mark accounted for 79% of all the observed marks. It was found on 14 lead segments, mostly as a single mark, but with two examples on 1 segment and five on another. This mark has not been reported outside New England but appears to be common in this area. The 1664-dated lead found at the Turner House in Salem, Massachusetts, illustrated by Goodwin (1999: 92), is broken off and missing the initials, but appears to be in the same font as the marks from the Three Cranes Tavern site. Baker (2009: 10) reported two 1664 marks with the initials. In total, there are 22 examples of this mark from New England. Given the small number of leads examined in other areas, no 1664 marks nor any similar combination of initials have been reported. This raises several possibilities, none of which can be verified at this point. It is possible that the leads were made by a glazier working in New England. While there is evidence that glaziers were practicing in Massachusetts by 1650 (Cummings 1979: 42), no one has yet found a glazier's vice[1] listed in a 17th-century inventory. However, as early as 1725 a blacksmith in Boston advertised that he not only repaired glaziers' vices but made them as well (*New England Weekly Herald* 1732). Certainly, by the early 18th century, New England glaziers were capable of turning their own leads. Another possibility is that the vice was used by a glazier in England whose overseas trade was with merchants who dealt exclusively with New England.

The initials on these leads do not offer much explanation either. Frequently, leads are marked with two pairs of initials, one set indicating the blacksmith who made the vice and the other pair for the glazier who commissioned it (Egan 2012: 293). The vice makers are known because their initials are associated with multiple years, while glaziers are usually only associated with the year their vice was made. One of the most important of the London vice makers was Edward White,

1. The period, old English spelling for vise (vice) is used throughout this article.

Figure 2. Lead marked: 1664 • ICEW •. (Photo by Timothy B. Riordan, 2018.)

whose initials show up on leads dated 1677–1717. While it is possible that the Three Cranes Tavern mark might be associated with Edward White, it would be 13 years earlier than any of his known marks and seems too early for him. Another possibility is a vice maker who was mentioned in a 1668 letter to Henry Gyles, a glazier in York, written by a friend of his in London, who reported "there is only one vice-maker in London and his name is Cresswell" (Hake 1921: 60). Until more research is done on vice makers in London or more marks are found, the origin of this mark must remain uncertain.

Of the remaining marks, four of them are, in fact, associated with Edward White. Frequently, White's marks have his initials first, then the date, and then the initials of the glazier. In two of the three examples from this sample there are no glazier's initials. The final example is broken in the middle of the 1700 date, so this is not certain. This type of mark resembles White's later marks, which show only his initials and a date, the earliest recorded being 1710 (Egan 2012: No. 81). The final White mark has his initials flanked by rosettes but is broken off after that. White began marking his vices in this manner in 1677 and continued to do so until at least 1694 (Egan 2012: No. 64). The last mark consists of the number 16, which does not seem to be preceded by anything and is broken off after the number. This may be part of another 1664 mark, but that is not certain.

The sample of marks from the Three Cranes Tavern is relatively abundant, but heavily weighted to one source. It presents a new mark but raises questions about the trade and manufacture of glass windows that cannot be answered until more data are available. The concentration of this mark on New England sites is intriguing but needs more research. The small number of other marks shows that, at least by the later part of the 17th century and into the early 18th century, New England participated in the London trade in either windows or glaziers' vices.

The distribution of leads in the features of this site offer a unique perspective on the use of leaded windows in New England (TAB. 2). Because of the British bombardment and burning of Charlestown on 17 June 1775, a majority of the features excavated at the Three Cranes Tavern site were termed destruction

Table 2. Distribution of leads by feature.

Description	Date	Total Leads	Marked Leads	Marks (No.)
Non-feature		7	0	
Paving	ca. 1670	1	0	
Soil stain	ca. 1680	4	1	1664 ICEW
Fill	late 17th cent.	1	0	
Privy	ca. 1740	2	2	1664 ICEW (7)
Trash pit	ca. 1750	1	1	1664 ICEW
Demolition	ca. 1775	70	15	1664 ICEW (10); EW 1700 (3); EW; 16...
Utility	ca. 1775–1780	1	0	
Modern	19th & 20th cent.	3	0	
Disturbed	Unknown	1	0	
Totals		91	19	

debris by the excavators. Presumably, they represent things deposited on that day or soon thereafter. Along with other artifact categories, most of the leads recovered came from these deposits. There were 68 lead segments recovered from destruction-related features, or 75% of the sample. All of the non-1664, marked leads and 50% of the 1664 leads came from these deposits. This suggests that the windows marked with the earlier mark were in the building for over 100 years. Even if part of that range is discounted because the vice that made them would have been in use for a certain time, it still indicates a long period without window replacement.

Of equal importance is that the building still had leaded-glass windows at the time of its destruction in 1775. Cummings (1983: 49) states that "up-and-down, counter-balanced sash" windows with crown glass were introduced to Boston as early as the 1690s, but that leaded windows continued to be made well into the 18th century. Indeed, advertisements for the sale of glaziers' vices appeared in Boston newspapers into the 1750s, with the last appearing in 1757 (*Boston Gazette* 1757). Similarly, crown glass and common glass were advertised together through the early 18th century, both being available in diamond and oblong shapes. While crown glass continued to be advertised, the last noted advertisement mentioning common glass was from 1745 (*Boston Evening-Post* 1745). By the time of its destruction on 17 June 1775, the windows of the Three Cranes Tavern would have been seen as out of date and old fashioned. This is interesting in light of the fact that Nathaniel Brown was said to have recently "improved" the tavern and John Woart was advertising it as a place of gentlemanly entertainment (*Massachusetts Spy* 1773).

Physical Characteristics of the Leads

With any sample of window leads there is much more information available than just the marks. Each lead carries data concerning the glazier's vice that made it. By studying these leads in more detail in association with their marks, it is possible to discover information about individual glaziers, the vices that they used, and the windows they made. The purpose of the glazier's vice is to give final form to the cast lead, stretching it and smoothing it as it passes through the machine. The lead is made to pass between two steel wheels that grip the lead and thin it, imparting both the mark and milling lines to the interior channel. The milling marks result from grooves cut into the steel wheels that help grip the lead and pull it through the vice.

By the mid to late 17th century, these vices were able to produce different sizes of lead, to be used on different kinds of windows, by adjusting the side pieces or cheeks. Neve (1703: 193–194) reports that window leads were commonly made in sizes ranging from 4/16 in. (6.3 mm) up to 8/64 in. (12.7 mm). The larger sizes, 7/16 in. (11.1 mm) and above, were used for large squares of glass, not square quarrels, but actual square pieces of glass. He reported the 5/16 in. (7.9 mm) size was used for quarrel glass of all types. Finally, the 4/16 in. (6.3 mm) size was used for fretwork, mostly putting together complex patterns of stained glass. He also reports that "[t]heir Turn'd-lead for Quarries is commonly about 3/10, ... of an Inch broad," which would be 7.6 mm.

While these measurements might have been easy to distinguish when the windows were first made, archaeologically, after the leads have been crushed, twisted, and mashed, they are harder to determine. Many of the poorly preserved leads do not retain their full sides. Only 57 of the 91 leads from the Three Cranes Tavern site were sufficiently preserved to allow a rough measure of their height. These ranged from a low of 6.0 mm to 9.8 mm, with an average of 7.4 mm. To evaluate the sample, leads were grouped by width in 0.5 mm categories and plotted by frequency (FIG. 3). The most common lead size, by far, was between 7.0 and 7.4 mm, representing 40% of the sample. This range does not exactly match either of Neve's measurements of 3/10 in. (7.6 mm) or 5/16 in. (7.9 mm) for leading quarrel glass, but it is very close. Of the leads marked with the 1664 mark, only 11 could be measured for size. These marked leads ranged from 7 to 9.1 mm, with an average of 7.6 mm. The window leads from the Three Cranes Tavern site were in the range for quarrel glass and not crown glass. Even the three largest leads, over 9 mm wide, do not come close to Neve's description of the type used for square glass.

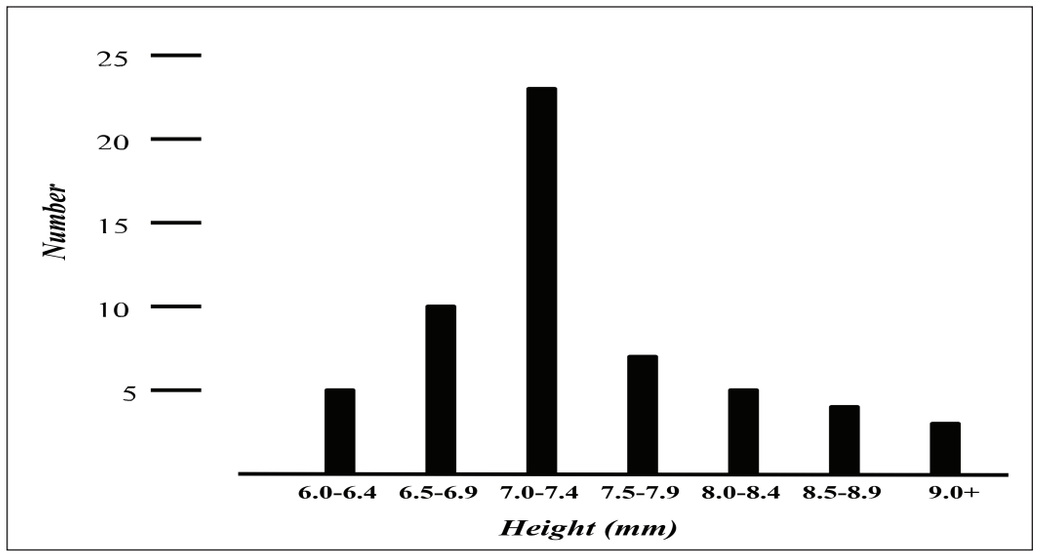

Figure 3. Graph of the side height of the lead sample. (Figure by Timothy B. Riordan, 2018.)

Milling Marks

Another characteristic of turned window leads often cited as a possible means of dating them is the number of milling marks on the lead. All glaziers' vices were handmade products, and the smith who made them could determine how many cuts in the steel wheel were needed to grip and pull the lead through. Milling marks can also be used to determine the diameter of the steel wheel that made the mark when more than one mark is noted on a lead segment. The sample of leads from the Three Cranes Tavern site provides information on both of these attributes.

The possibility of dating window leads based on the frequency of milling marks was hypothesized as soon as researchers began to look at the leads. Knight (1983: 50) suggested that earlier 17th-century leads had 20 milling marks per 20 mm, but that the number was decreasing to 4 or 5 per 20 mm by the middle of the century. This observation was partially

supported by an analysis of dated leads from Coombe Abbey, Warwickshire, where the dated leads ranged from 1723–1808 and were found to have five milling marks per 20 mm (Hilton and Baker 2006: 157). In an analysis of marked leads from the Print House site in St. Mary's City, Maryland, it was reported that leads marked with dates of 1671 and 1677 had ten or more milling marks per 20 mm, while those dated 1689 had only eight to ten milling marks per 20 mm (Rivers 2004: 7). However, Rivers (2004) cautioned that no dating would be reliable unless the entire circumference of the vice wheel could be seen.

Leads from the Three Cranes Tavern site support Rivers's caution about the use of milling marks for dating. On the lead segments bearing the 1664 mark, milling marks were 16 or 18 per 20 mm. However, on the one segment that was 475 mm long, it was possible to measure the milling between four marker's marks. These measured 18, 16, and 16 milling marks per 20 mm. Thus, the same wheel, on the same piece of lead, produced different frequencies of milling marks. This variation probably resulted from the differential pressure the glazier exerted on the lead as he pulled it through the vice. Despite the variation, the vice marked these leads relatively consistently as, in all 15 cases where it was possible to measure this characteristic, the milling was between 16 and 18 marks per 20 mm.

The frequency of milling was very different on the leads associated with vices made by Edward White. Of these four leads, the milling frequency varied from 6 to 14 marks per 20 mm. These dated 36 years later than those marked with the 1664 date and tend to support the idea that the number of milling marks decreases over time. However, there is still much uncertainty about milling marks. The window lead bearing the mark of Edward White flanked by rosettes, mentioned above, was noted to have ten milling marks per 20 mm on the side that bore the mark. On the reverse side, there were only six milling marks per 20 mm. As a general rule, fewer milling marks might indicate a date in the late 17th or early 18th century, but much more research is necessary to demonstrate this relationship.

To further assess the variation caused by pulling the lead through the vice, the distance between repeated marks was measured. This was possible on two segments of lead both showing the 1664 mark. The first segment was the long piece, 475 mm, and it had four of the marks on it. The distance between those marks was 110, 105.6, and 113 mm, respectively. The other segment, which had two marks, was 152 mm long, and the distance between the marks was 99.8 mm. Presumably all of these segments came from the same vice, but there was 13.2 mm difference in the spacing of the marks. The shorter segment, with the lesser distance, was much heavier and thicker than the other segment. Where the long segment was 8.1 mm wide with a side thickness of 0.4 mm, the shorter segment was 9.1 mm wide with a side thickness of 0.75 mm. While these differences were relatively small, they made a big difference in the appearance and feel of the leads. Either intentionally or because of pulling pressure as the lead moved though the vice, the shorter segment was much less distorted. Thus, the calculated diameter of the wheel based on the long segment varied from 1.32 to 1.41 in. in diameter. The calculated wheel diameter based on the shorter, less distorted, segment was 1.25 in. A dated 1755 glazier's vice, made by John London and curated in the collections of Colonial Williamsburg, has a wheel measured at 1.25 in. in diameter (Kelly Ladd-Kostro 2017, pers. comm.). The vice used by the glazier who made the 1664 leads probably had a wheel of the same size, but only one of the four measured distances reflected that. While both the milling marks and calculated wheel size might have some use in dating window leads, the information available at present is too equivocal to positively demonstrate such use.

Window Ties

Another class of lead artifacts associated with leaded windows are the ties that were used to attach the leaded sash to the saddle-bars (FIG. 4). The saddle-bars, or stay bars, can be of either wood or iron. According to Cummings, a "typical casement ... is fitted with three horizontal stay bars that stiffen and support the glass. Narrow strips of lead are bent around these stay bars and are soldered to the lead 'cames' or dividers that hold the individual diamond-shaped panes of glass" (Cummings 1979: 155).

Figure 4. Window tie showing shape of a saddle bar. (Photo by Timothy B. Riordan, 2018.)

Such leads have been noted in other studies. At the John Reading House in Gloucester City, New Jersey, Thomas (1985: IV-9) reported finding small leads with a convex exterior and a medial line in the interior that appeared to be a cut window lead. Rivers (2004: 7–9) reported the same type of leads from the Print House site in St. Mary's City, Maryland.

In the sample of lead from the Three Cranes Tavern site, there were 42 pieces that were considered to be window ties. These occurred in three varieties (FIG. 5) (TAB. 3) based on their physical characteristics. The most common type was strips of flat lead with a width ranging from 2.1 to 5.8 mm and a thickness ranging from 0.5 to 3.9 mm. Of these, two had lumps of solder, showing where they had been attached to the window, two had twisted ends from the process of tying them to the saddle-bar, and one had a curved section that had been around the saddle-bar (FIG. 6). The diameter of the curve, reflecting the bar, was 10.5 mm. There was no iron staining on the lead, so the saddle-bar may have been of wood.

The second type, represented by ten examples, looked like a small window lead that had been cut in half (FIG. 7). The exterior of the lead was convex, and the interior had a medial line that had been the channel of an H-shaped lead. This type had been previously reported from sites in New Jersey and Maryland. It had a range of width from 3.6 to 5.5 mm and a thickness ranging from 1.0 to 2.1 mm. Within this group there were three that had solder and one that was tied. There was also one curved section with a diameter of 14.9 mm.

Table 3. Window ties by type.

Type	Number	Thickness	Width	Notes
Convex	10	1.5 mm	4.6 mm	3 soldered, 1 tied, 1 curved
Straight	10	1.7 mm	4.6 mm	2 soldered, 1 tied, 3 curved
Non-Turned	22	1.5 mm	4.1 mm	2 soldered, 2 tied, 1 curved
Total	42			

This piece did not show any iron staining. On the curved segment, the medial line of the lead was on the interior of the curve.

The final variety also had ten examples. It consisted of cut window leads with a flat exterior and the interior medial line (FIG. 8). They ranged in width from 3.3 to 5.4 mm and in thickness from 1.2 to 2.3 mm. There were two pieces with solder and one tied piece. There were three curved pieces, one of which retained a portion of an iron saddle-bar with a diameter of 10.8 mm. The other two curved segments, which showed no iron staining, had diameters of 7.7 and 11 mm, respectively. All three curved segments had the medial line on the interior of the curve.

These leads were an important part of the window assembly and could be made in a number of ways. In the same passage where he describes making different size window leads with the same glazier's vice, Neve (1703: 189) reports that:

> with another pair of spindles, whose nuts almost meet or touch, they turn lead for tyers, which when it comes out of the vice, is almost cut asunder. These tyers are very tough but they are commonly made too slight, and therefore some use to cast tyers, which are stouter, but not so tough, being more apt to break in winding.

This indicates that ties could be produced by the glazier's vice or cast. The two types in

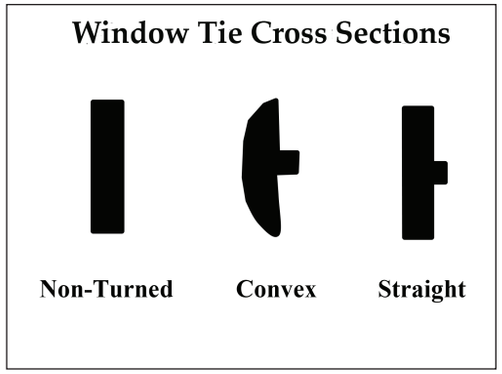

Figure 5. Window tie cross sections. (Figure by Timothy B. Riordan, 2018.)

the sample that appear to be cut window leads conform to Neve's description of those made with the vice. The non-turned variety may be the cast leads that he mentioned. All three varieties have an average thickness and width that are very similar (TAB. 3). However, the range of variation is much different. The two types that were made on the vice have much narrower ranges and look more like a standardized product. Both the convex and straight types vary in thickness a maximum of 1.1 mm, and the variation of width for the convex type is 2.7 mm, while it is 2.1 mm for the straight-sided type. This is in contrast to the non-turned type that varies in thickness a maximum of 3.4 mm and has a variation of

Figure 6. Cast window tie with a twisted end. (Photo by the Timothy B. Riordan, 2018.)

Figure 7. Vice-made, convex-sided window tie with a twisted end. (Photo by Timothy B. Riordan, 2018.)

width of 3.7 mm. It cannot be demonstrated that the non-turned type is a cast product, but the range of variation is suggestive of it.

The 42 pieces of lead that are identified as window ties represent a significant class of artifacts. In the sample from the Print Shop at St. Mary's City, Maryland, there were only six artifacts that could have been window ties, despite having twice the number of window leads as were found at the Three Cranes Tavern. As these artifacts have not been generally recognized archaeologically, there could many explanations for this difference. It is possible that the destruction of the tavern by bombardment may have led to the greater deposition of these window ties. Of the total sample, 11 were found in modern disturbances and 1 was found in a feature the date of which could not be determined. The remaining 30 artifacts were all from demolition contexts created by

Figure 8. Vice-made, straight-sided window tie with a twisted end. (Photo by Timothy B. Riordan, 2018.)

the destruction of the tavern in 1775. While 75% of the window leads were recovered from demolition contexts, 96.7% of the window ties came from such features. Such a high association of window ties with demolition features is suggestive of the violent destruction of the building.

Summary

There has been little published about marked window leads from the New England area, and this project was completed in order to begin addressing that lack of knowledge. The marked window leads from the Three Cranes Tavern site represent the first full sample from the area, and a number of conclusions can be drawn from it. The most basic of these is that window leads found in New England seem to be marked in proportions comparable to those found in other areas. It is likely that New England participated in the same trade in prepared windows as did the rest of the colonies. What makes New England different is that glaziers in the area were already making their own leads as early as the beginning of the 18th century. How that might affect samples of marks is yet unknown. The discovery of the ICEW mark, common in New England but not found elsewhere, raises the possibility that this was an even earlier phenomenon.

Going beyond the simple marking of leads, this study has looked at the process of lead making with a glazier's vice and suggests that variability in the physical characteristics of the leads may be due to differential pressure applied by the glazier as he pulled the lead through the vice. This affected not only the thickness and size of the lead, but also the frequency of milling marks inside the channel. It has been suggested that the frequency of milling could be used as a dating tool. While this is true in a general way—there appears to be less milling over time—any more specific dating is uncertain. On examining an exceptionally long lead with multiple marks, it was noted that the number of milling marks, from the same vice, varied over the length of the piece. Further, a lead was observed to have distinctly different milling on different sides. The question of milling marks for dating needs more research.

A type of artifact often confused with window leads is the tie used to attach the leaded sash to the frame. The confusion is easy to understand, as many of these ties look like cut window leads and were produced on the same vice. Unless one is specifically looking for them, these will often be cataloged simply as lead scrap. Identifying these artifacts will add to the understanding of the building architecture on a site.

Analysis of window leads can yield many insights on both the site being investigated and on the process of creating windows in the colonial period. It should be more than simply recording the presence or absence of marks. Thorough reporting of excavated samples will lead to further insights and provide a body of data that can be used by future researchers.

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