Northeast Historical Archaeology

Volume 45 Article 5

2016

"The science and misteire of glazing": Thoughts on the Use of Marked Window Leads in Archaeological Analysis

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Marked window leads have the potential to add significant insights to the understanding of archaeological sites. One of the few artifacts that commonly bears a date, window leads can provide a terminus post quem *(TPQ) for the feature or level in which they are found. There have been attempts to go beyond their use as a TPQ, and, based on these artifacts, describe architectural sequences, structural changes, and do feature comparisons. While all of these have produced interesting results, their validity remains uncertain because of a lack of basic data on glaziers and vise makers. This study looks at the adoption of the glazier's vise in England, identifies several of the men who made them, and investigates the history of several of the glaziers that used them. Examples of archaeological analysis based on dated window leads are evaluated in light of these biographies.*

Les plombs de fenêtre marqués ont le potentiel d'ajouter des éléments importants à la compréhension des sites archéologiques. Parmi les rares artéfacts qui portent généralement une date, les plombs de fenêtre peuvent fournir un terminus post quem (TPQ) pour la structure ou l'unité stratigraphique dans laquelle ils sont retrouvés. Il y a eu des tentatives de s'en servir au-delà du TPQ, en essayant entre autres d'utiliser ces artéfacts pour décrire des séquences architecturales, des changements structurels, et pour faire des comparaisons entre les structures. Bien que toutes ces recherches aient produit des résultats intéressants, leur validité demeure incertaine en raison d'un manque de données de base sur les vitriers et les fabricants d'étaux. Cette étude porte sur l'adoption de l'étau de vitrier en Angleterre, l'identification de plusieurs hommes qui fabriquaient ces objets, et sur l'histoire de plusieurs vitriers qui les ont utilisés. Des exemples d'analyses archéologiques basées sur des plombs de fenêtre datés sont évaluées à la lumière de ces biographies.

Introduction

When, in the early 1980s, conservator Hans Barlow opened the channel of a window lead from Martin's Hundred, Virginia, and discovered that it contained both a date and biographical information, it was clear that archaeologists had a new dating tool to use in examining colonial period sites (Noël Hume 1982: 324). Archaeologists began scouring previously excavated collections and processing the window leads, hoping for new information. Many of the fragments turned out to have no marks except the milling lines used to grip the lead as it was pressed though the glazier's vise. In 1986, an article listed all 17 of the then-known marks (Egan, Hanna, and Knight 1986). Recently a new catalog of marked leads was published that listed 177 whole or partial marks (Egan 2012).

The most basic question about the window leads remains: Why they were marked at all? The only person who would see the mark, unless the window broke, would be the glazier. Egan, Hanna, and Knight (1986: 307) noted that, throughout the 17th and 18th centuries, the London Glaziers' Company was concerned with the use of overstretched and underweight leads, believing that this would cause a window to fall apart. To combat this, the company undertook regular searches of glaziers' shops and recorded a number of instances where glaziers were fined for using "light leads" (Ashdown 1918: 68–69, 71). The concern over "light leads," that is, leads stretched too long and likely to fail, was shared by glaziers' guilds in Germany, France, and the Low Countries, where repeated attempts were made to ban the use of milled leads (Caen 2009: 295–296).

There is no direct reference in the surviving records to the marking of leads. However, there are two instances (1697 and 1705) where glaziers "struck out their proof pieces" before the glaziers' court (Ashdown 1918: 68, 71). Further, the "Acts and Ordinances" of the company, dated 1749, required that a member of the company show "a design, plot or proof piece of his workmanship, to be by him there struck out, performed and finished" (Ashdown 1918: 137). This may or may not refer to the leads being used, but it does speak to the company's concern over workmanship. Based on this concern and the hidden nature of the marks themselves, it is generally assumed that the marks were used for quality control (Egan 2012: 293).

Despite the great increase in the number of known marks, there is still little understanding of what they represent and how they can be used in analysis. At a minimum, a dated window lead presents a firm TPQ for the feature or layer in which it was found. It has been suggested that the collection of marked leads from a site can be used to assess changes in the building over time (Hanna 1986: 8). However, there has been little discussion or analysis of why window leads were marked, how frequently those marks changed, and the potential problems encountered when using them for dating on 17th- or 18th-century sites. To address these issues fully would require much more historical information on the glaziers themselves, the guilds they belonged to, and the men who made the vises that marked the leads. Research in those areas is still meager. What follows, then, is a preliminary effort to address some of the issues with dated window leads.

The Development and Use of the Glazier's Vise

An important place to begin is with the machine used to produce the turned window lead. Called a glazier's vise ("vice" in the UK) or lead mill, this device thins and lengthens the lead. The wheels of this machine, while doing their main job, impart the marks found on leads archaeologically. Prior to its introduction, window leads were cast in a mold and, if needed, were hand carved to the right shape and profile. This was time consuming, but produced a superior product (Marks 1993: 36). Use of the glazier's vise still required the casting of the lead, but instead of hand trimming, the cast lead was processed through the vise. Milled leads could be produced more quickly, but, unless carefully processed, could be too thin and cause the window to sag or fail. It is uncertain where or when the glazier's vise was developed, but it was being used in Germany by the middle of the 15th century, and the guilds were already trying to ban them (Caen 2009: 295). Perhaps the earliest surviving glazier's vise is in Gouda at the Church of St. John. It was purchased by the church in 1654 and bears a date of 1652 on the frame (Caen 2009: 304).

The introduction of this device into England was not without controversy. In 1546 the London Glaziers' Company complained about foreign glaziers working in the city, and that they had lately "made a certen thing called a vice to draw out lead with" (Marks 1993: 228). Despite their complaints, the glazier's vise would become a standard piece of equipment. In the 1552 building accounts for Redgrave Hall, Suffolk, Nicholas Livebylove, a joiner from London, was paid 25 s. for a glazier's vise (Sheehan 2013: 25).

The glazier's vise was, for its time, a complex machine that required a maker familiar with forging iron and creating geared mechanisms, skills that glaziers were not required to have. Most often this fell to blacksmiths who specialized in other trades. The mark reported by Noël Hume was from a man who described himself as a "Gonner" or gunner. This was probably a gunsmith who, some years later, was appointed royal handgun maker (Fissel 1990). Another trade combined with vise maker was that of clockmaker, again, someone familiar with geared mechanisms (Matthews 1793: 10). Most often, however, they were described simply as blacksmiths. An advertisement of 1745 described John Hoyland as a "blacksmith and wire-maker," while later advertisements identify him as a "glazier's vice and plumber's tool maker" (*London Daily Advertiser* 1745, 1753). James West was also described as a "glaziers' vice and plumbers' tool maker" when his London shop was sold in 1801. But, the shop itself was described as a "spacious smith's shop" and was advertised to blacksmiths (*Morning Chronicle* 1801). These skills were transferred to North America, as evidenced by an advertisement from Boston for William Bryant, a blacksmith, who "makes and mends Glazier's Vises" (*New England Weekly Herald* 1732). More direct evidence may have been found at the Vansweringen site in St. Mary's City, Maryland, where casting waste from window-lead manufacture was recovered (Hanna 1986). The site was in use from the mid–17th century through the 1740s and indicates that either window manufacture or repair was practiced.

Identifying the men who made glazier's vises is difficult for several reasons. First is the confusion over their profession, as described above. Second, this vise seems to have been a specialized product, and not many men made such devices. Henry Gyles, a glass painter and

glazier of York, wrote to a friend in London in 1668, seeking to purchase a glazier's vise. His friend replied that he "did enquire of the vice maker whereof there is but one in London, his name is Cresswell and lives near More Lane by Cripplegate" (Hake 1921: 60). This number does not seem to have increased greatly by the end of the century. In 1699, the Glaziers' Company printed a paper concerning "Masters, Journeymen and Vicemaker," where only the last class is in the singular (Ashdown 1918: 69).

The makers of glazier's vises are important because, early on, they are the ones mentioned on the marked leads. The "Gonner" found at Martin's Hundred was the maker of the vise, not the glazier (Noël Hume 1982: 324). In 1661, the name Abraham Mountfort appeared on marked leads, and he identified himself as a vise maker (Egan 2012: 294). Of the five marks dated 1661 or before, three seem to represent vise makers, not glaziers. Study of the leads would be much easier if they continued to imprint whole names, but, after 1661 and until the end of the 18th century, most marks consist only of initials with a date. Of the 127 marks dated between 1661 and 1775 (Egan 2012: 294–299), only 9 contain all or most of a name.

Early in the discussion of marked leads, it was noted that the initials usually occur in pairs. As an example, a mark (No. 25 in Egan's catalog) from St. Mary's City, Maryland, is recorded as WM 1674 WC. It was first suggested that this indicated a master glazier and his apprentice (Egan et al. 1986: 307). This was, in part, because some initials occur on many leads with different dates and a variety of other initials. Given the several years that a person remained an apprentice, this explanation does not seem plausible. Perhaps a better suggestion is that the repeated initials represent the vise maker, while the differing initials represent the glazier (Egan 2012: 293). In the above example, WM would be the vise maker and is found on leads marked 1670–1687, while WC would represent the glazier for whom the vise was made. Over the span of 17 years, the initials WM are associated with 11 different sets of initials and 3 marks with the names of the glazier spelled out.

The idea that these repeated initials represent the vise maker is supported by a surviving English glazier's vise that was made by Edward White in 1717 (FIG 1). The initials EW are found on leads dated from 1677–1717 (FIG 2). Unfortunately, while the frame of this vise contains an inscription identifying the maker as Edward White and bears a date: July^{y}e 27 17 EW 17, there is no inscription on the internal wheels that would have marked the leads (Diane Lee 2014, pers. comm.).

An Edward White, blacksmith, died in 1718 in the parish of St. Giles without Cripplegate, where most of the vise makers lived (Prerogative Court of Canterbury 1718). In his will, he left his "trade and occupation" to two of his cousins, John Hoyland and Robert Lacy. I have already mentioned Hoyland advertising as a glazier's-vise maker in 1753. Egan (2012: 291) lists the first year that the repeated initials IH are found on leads as 1718, the same year John Hoyland took up White's "trade and occupation," and they continue in use until 1756. Another set of repeated initials on Egan's list, GD, are found with dates from 1741 to 1760. Advertisements from the 1740s and 1750s identify this vise maker as George Dummer (*London Daily Advertiser* 1753). Like the others, he lived in the parish of St. Giles without Cripplegate (Bayley 2003).

Discussion of Glaziers' Marks

There are three marks, listing the whole name of a glazier, that are associated with the repeated initials. Those of Francis Good, dated 1673 (FIG 3), and Richard Pindar, dated 1676, are associated with the initials WM (Egan 2012: 295). The mark of William Puryour, dated 1678, is associated with the EW initials. If the repeated initials represent the vise maker, and they are found on leads along with the names of known glaziers, it is likely that the second set of initials also represents glaziers. This is where these marks become important archaeologically. A vise maker might make a large number of glazier's vises over his career, but how many of these devices would a glazier need? More importantly, how often would the glazier change the marks on his wheel? More than 30 years after their initial discovery, many marked leads have been examined and, for the most part, each set of glazier's initials occurs on only one dated mark, unlike those repeated for the vise maker. Still, it is possible that the sample size is yet too small to know the range of marks.

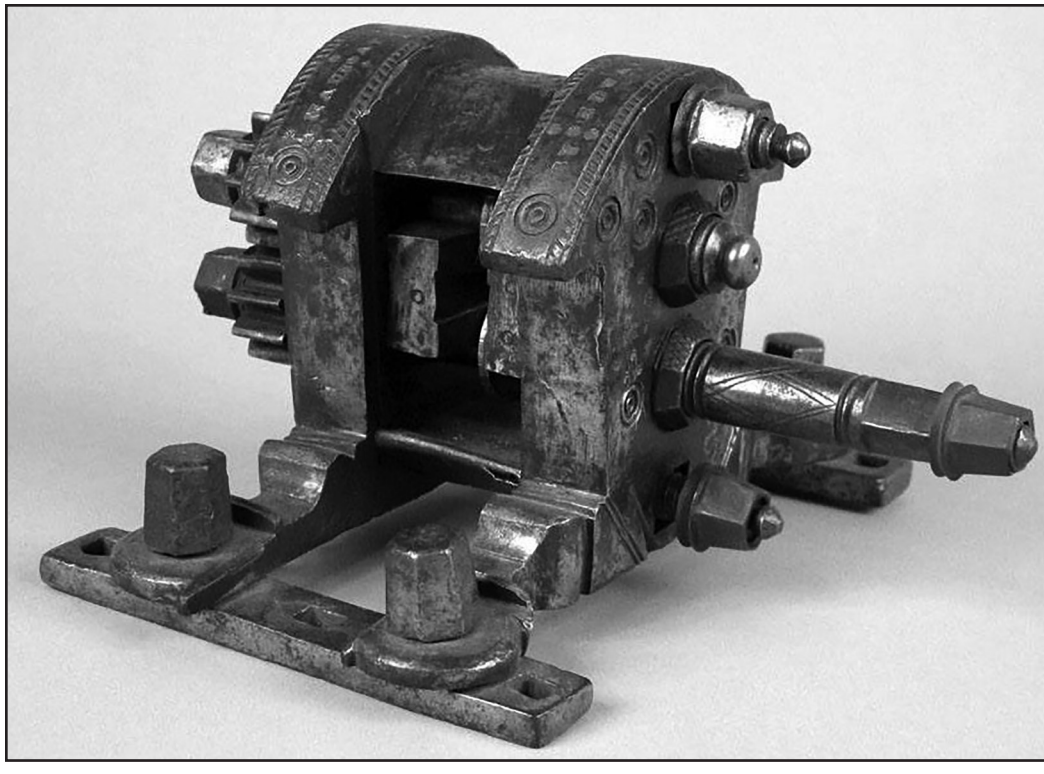

Figure 1. Glazier's vise, probably made by Edward White, in the collection of the Connecticut Historical Society. (Photo courtesy of Connecticut Historical Society, 2013.)

There are two sets of marks that argue for more frequent changes. One is a mark, found both at Jamestown, Virginia, and St. Mary's City, Maryland, that begins with the vise maker's mark of WM and ends with the glazier's mark of RD. These have reported dates of 1683, 1685, and 1686 (Egan 2012: 295–296). The other, found on six sites in England, Maryland, and Virginia, begins with EW, ends with RA, and is associated with the dates 1693 and 1695 (Egan 2012: 296). Without more specific information on the glaziers, these marks are difficult to interpret.

By looking at the glaziers whose names are fully included on the leads, it is possible to gain some insight on the question. The first of the 17th-century glaziers on which there is

Figure 2. Mark lead with the initials EW and dating to the 1670s. (Photo courtesy of Historic St. Mary's City, 2015.)

Figure 3. Mark of Francis Good, dated 1673, and associated with the initials WM. (Photo courtesy of Historic St. Mary's City, 2015.)

information is Francis Good, who worked in the parish of All Hallows Barking in London near the Tower (Prerogative Court of Canterbury 1687). He is known archaeologically by two dated marks, one from 1661 and the other dated 1673 (Egan 2012: 294–295). The earlier mark has been found on five sites in the Chesapeake, while the later mark is known from only two sites. None of the marks associated with Good have been found in England. The first historical document that mentions Francis Good is the charter granted the London Glaziers' Company by James II in 1685/86, where Good is listed as one of 18 members of the court of assistants of the company (Ashdown 1918: 124). Good died in 1687 and, in his will, bequeathed property to his wife Letitia. The family is mentioned one more time in the daybook of the Company of Glaziers. where, on 29 October 1700, Letitia Good, widow of Francis, is recorded as taking an apprentice (Ashdown 1918: 70).

This biography, woefully inadequate as it is, raises several questions for dating leads marked by Francis Good. There is a gap of 12 years between the known marked leads. Could a lead marked 1661 actually have been produced in 1672, before the new wheel was used? Did Francis Good continue to use the wheel marked 1673 up until his death in 1687? There are no recorded marks for Letitia Good and none with the initials LG. Yet, she seems to have carried on her husband's glazing business for at least 13 years after his death. Taking an apprentice in 1700 certainly suggests that she was active until then. What mill was she using for her leads? None of these questions can be answered, and it is possible that further excavations will reveal additional leads marked with different dates for either Francis or Letitia Good.

While the previous example raised many unanswerable questions, the mark of Edmund Gyles demonstrates the complexities of using marked window leads as dating tools. Gyles lived in York, was a member of the glaziers' guild there as early as 1634, and was active in the city's defense during the English Civil War (Dungworth and Harrison 2011: 4). Through the 1660s, he was actively plying his trade in the north of England. His son Henry, born in York in 1646, was the fifth of 14 children (Pearson 1985: 3). Henry Gyles went on to be an accomplished glass painter and is credited with reviving the skill in much of northern England. A number of surviving painted windows had been attributed to Edmund Gyles because they were made with leads marked with his mark and dated 1665. In fact, Henry Gyles continued to use his father's lead mill at least until 1700. The armorial window from Belsay Castle in Northumberland is a good example of this. The central, painted portion is made with leads bearing the mark: EDMOND GILES OE YORKE 1665 : , while leads with the mark: EW 1697 hold the undecorated panes around the edge. The central portion, on both historical and scientific grounds, is thought to have been created ca. 1699 (Dungworth and Harrison 2011: 12).

There has been speculation on how frequently a glazier might change the inscription on his wheel. Hanna (1986: 1) suggested that the wheels might be changed every two or three years, and this has become an accepted generalization (Luckenback and Gibb 1994: 24). However, the Gyles family represents a case in which the glaziers never changed the wheel. Edmund Gyles died in 1676 and passed the glazier's vise to his son Henry, who continued to use it until ca. 1700. The dates on the leads are as much as 35 years earlier than their use in windows.

While it has not yet been possible to provide the same kind of historical background on the other six men identified as 17th-century glaziers based on their marks, it is important to note that each has only a single, dated mark associated with him. A couple of these are known to have continued work for as much as 30 years after the date of the single mark. If the relationship between the marked lead and the historical background is so complex for these men, how much more so must it be for those only identified by initials on the leads, and what does this mean for archaeological analysis of marked leads?

The Archaeological Use of Dated Window Leads

To understand the potential and problems of using dated window leads for archaeological interpretation, it is necessary to look at how common the marks are, and whether that changes through time. In one of the earliest articles on window leads, Hanna (1986) estimated, based on the beginning study of those at St. Mary's City, that about 10% of the leads were marked, and this figure has been cited repeatedly over the years (Egan et al. 1986: 306; Deetz 1995: 108; Egan 2012: 292). However, a fuller study shows that there was a great deal of variability in this figure (Hanna 1986). The leads in the newer study span most of the 17th century and were collected from two sites in St. Mary's City: St. Johns (ca. 1638–1700) and Vansweringen (ca. 1665–1740). In the St. Johns sample, there were 550 leads, with 111 marked, or 20% of the sample. At the Vansweringen site, there were 52 marked leads out of a total of 394, or 13% of the sample. It is hard to compare this with other sites as, most often, the number of marked leads is reported, but there is no estimate of what part of the total sample that represents. An exception is the sample from the John Reading House (ca. 1687–1702) in Gloucester, New Jersey, where out of a sample of 109 H-shaped leads, 69 were marked examples, or 63% of the total (Thomas 1984: IV-8). Not one of these examples has a percentage of marked leads as low as 10% of the sample.

The difference between the two sites in St. Mary's City and the Reading House may be due to a number factors, such as sampling or individual site history. Another possibility is the time period represented. It has already been noted that 1661 is an important date in the history of window leads. Before that date, most leads were not marked, but, after it there were many marked leads. The occupation at St. Johns began in 1638, or 23 years earlier than the significant date. At the Vansweringen site, occupation began in 1665, and it received its initial windows only four years after marking began in earnest. In contrast, the Reading House occupation began in 1687, during the period of greatest frequency for marked leads. Is the high percentage of marked leads at this site typical of the late 17th century, or is some other factor at work? Until there are more, well-reported samples, this question cannot be answered.

Having a set of artifacts, each of which has a specific date marked on it, should be a significant aid to archaeological analysis. However, probably because of the problems mentioned above, window leads have received little attention. Most often in archaeological reports, dated window leads are used solely as TPQs for features or for the site (Thomas 1984: IV–8; Horman et al. 2001: 540). Some have attempted to take this further, looking at the dated leads as evidence of window replacement. Metz et al. (1998: 55) found leads at the Page House site in Williamsburg, Virginia, that bore dates of 1669. The house was built in 1662 and burned in the late 1720s. Metz et al. suggested that the leads marked 1669 were evidence of three sets of windows in the house. The first set was installed when the house was constructed and left no marked leads. Some or all of those windows were replaced in the 1670s by those containing leads marked 1669. Since many of the 1669 leads were found in features contemporary with the building, it was further suggested that at least some of the windows were later replaced.

The analysis of marked leads from the Page House site highlights both the potential and the problems of marked window leads. The lack of marks for the earliest set of windows is understandable, given that leads were seldom marked before 1661. Metz et al. (1995: 71) related the replacement of windows in the 1670s to destruction wrought in Bacon's Rebellion, for which John Page filed a claim after the return of settled government. The argument that leads marked 1669 were in

windows replaced after 1676 is based on an assumption of a 5–7 year time lag. Since the glaziers who can be identified on the marked leads lived, worked, and died in England, researchers have always assumed that the windows were constructed there and shipped as units to North America. Because of this, a certain amount of time lag has been assumed between the making of the leads and windows and their transport to North America, and their use in a building. This lag has been estimated at between 4 and 7 years (Deetz 1995: 110; Goodwin 1999: 92).

Most of the estimates of time lag are based on a study, already mentioned, completed at St. Mary's City, Maryland (Hanna 1986). To assess the validity of the time-lag assumption, it is necessary to review the findings of that study. The analysis of the two sites, St. Johns and Vansweringen, benefited from several factors. Both sites had extensive excavations and there were many window leads that were explored. Secondly, many of the conserved leads had datable marks and presented a detailed corpus of inscriptions. Finally, both sites had been thoroughly researched, so that owners, lessees, and site functions were well documented. At the St. Johns site, there were 82 datable marks ranging from 1661–1685, while at the Vansweringen site, there were 37 datable leads ranging from 1661–1699. Comparing the number of datable leads with the known history of the sites, Hanna (1986: 7, 9) constructed charts showing the number of leads per year with the changes in ownership or known periods of restoration. The charts produced remarkably different results. In the chart for St. Johns, "the window lead dates either exactly match the change of occupation or precede the change by one year" (Hanna 1986: 5). However, the chart from the Vansweringen site showed less of a relationship between the historical changes and the dated leads, reflecting "a three to four year time lag at this site" (Hanna 1986: 8).

Both of these charts were based on the assumption that glaziers changed their dated inscriptions on a regular basis (Hanna 1986: 8), but the historical background of known glaziers suggested this is not true. Marked leads made by Francis Good and dated 1673 are present on both sites. At St. Johns, they make up 12% of the sample, while at the Vansweringen site, they represent 36% of the sample. Based on the known history of Francis Good, there is no way to demonstrate that the leads marked 1673 were not produced as late as 1700. While there had to be some time lag between the English glazier making the window and the colonial builder adding it to the structure, any estimate of how long that interval might be remains speculative.

One way around this problem is a consideration of the context in which the leads were found. A window lead in the plowzone does not yield the same information as one from a sealed feature. It is the relationship between the date on the lead and the date of the sealed context that allows a fuller understanding of that window in the history of the site. Lumping together all of the marks from a site, without a consideration of their respective contexts, masks important aspects of the structural history of the building.

The importance of this approach can be seen in the analysis of another group of window leads from a site known as the Print House, conserved and analyzed at St. Mary's City (Rivers 2004; Riordan and Hurry 2015: 103–106). The sample analyzed in this case represented only one feature from the site, but it yielded a large number of window leads from a sealed context. Understanding this sealed context yields significant insights on the analysis of the window leads.

The Print House site in St. Mary's City, Maryland, is located on a 3 ac. tract known as Smith's Townland, leased to William Smith in 1666 for 31 years. By 1668, when Smith died, he had built two buildings on the property, one of which was known as Smith's Ordinary. After his death, the property lease passed through several hands until it was acquired, in 1672, by Garret Vansweringen, a Dutch immigrant. He ran the ordinary or leased the building to others until 1678, when the structure burned to the ground. Vansweringen petitioned the governor, promising to rebuild the ordinary if his property lease were extended for 21 years. The building, known as the Print House, was built ca. 1680 and probably served as an ordinary for a few years. The function of the structure seems to have changed in 1684 with the arrival of William Nuthead, the first printer in the English colonies south of New England. A

significant concentration of 17th-century, lead printing type has been found associated with this structure. Sometime in the 1680s, Nuthead moved his operation to another building, and the "Print House" probably became an ordinary once again. After the capital moved from St. Mary's City to Annapolis in 1694, there was no further mention of this building. The occupation of this structure dates to ca. 1680–1700 (Riordan and Hurry 2015: 7).

The Print House had an interesting structural history (FIG 4). The main part of the structure was of earthfast construction and measured 25 ft. east–west and 20 ft. north–south. It was divided into two irregular bays, with the western bay 15 ft. long. On the west side, in the southwest corner, was the footprint of a well-preserved, wattle-and-daub chimney with a brick fireback. The main part of the structure did not appear to have been modified during its lifetime.

On the south side of the building was a shed that had a complex history in three phases. Originally, the shed was 22 ft. long and 9.5 ft. wide, centered on the main structure. There were three posts supporting the shed, and they were large, with an average diameter of 10 in., and deep, buried an average 3.25 ft. below the surface. At this point, there was no evidence of a floor in the shed. In phase 2, the entire shed was removed and rebuilt as a 24 ft. long, 9 ft. wide shed. Again there were three posts supporting the shed, but these were much smaller and shallower. The post molds were only 6 in. wide and the holes averaged less than a foot deep. The most important part of the phase 2 renovation was the creation of a wooden floor in the shed. Evidence for this floor consisted of two trenches, each about 11 ft. long, set between the posts and slightly toward the interior of the shed. When excavated, these trenches were round bottomed, suggesting that split logs had been placed there, with the upper edges flattened, to support a floor. The third phase of the shed began with the removal of the logs and the filling of the features with trash. Subsequently, much narrower trenches were dug, and bricks, placed on their edges, were used to line the sides of the mortar bed that was laid in the shed. Flooring tiles were placed in the mortar bed, forming a much more substantial floor.

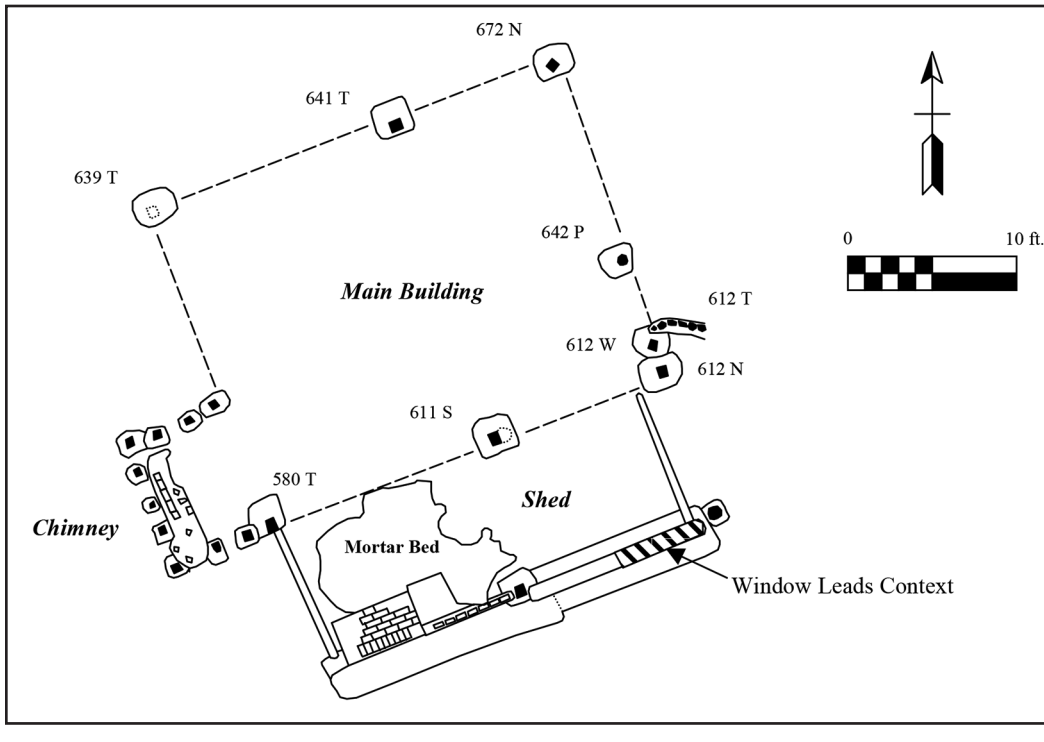

Figure 4. Plan view of features at the Print House site, St. Mary's City, Maryland. (Drawing by author, 2014.)

The window leads considered here come from the mold left by the removal of one of the timber joists and its subsequent filling with debris. The context was sealed by the creation of the mortar bed for the tile floor. Artifacts found in the features are not diagnostic beyond a general dating to the last quarter of the 17th century. Historically, the tile floor most likely represents one of the efforts, made by landholders in St. Mary's City in 1694, to keep the capital from moving to Annapolis. Zacharias Vansweringen, son of Garret, was one of the signers of a petition to the governor that argued for retaining St. Mary's as the capital (Archives of Maryland 1899: 75). The signers pledged to establish a coach service between St. Mary's and the Patuxent River to the north, and to maintain post horses at their own expense. The argument for the tile floor being associated with the controversy of 1694 is supported by the window leads from the timber mold. The sample includes a number of marked leads with the date of 1689, and these provide a TPQ for the filling of the timber mold. It seems unlikely that a major improvement would have been made to this building after the capital moved in 1694. Vansweringen's lease on the property ran out in 1697, and, when he died the next year, there was no mention of this property in his estate (Carr [1975]). The likely date of the tile floor is ca. 1689–1694.

From the timber mold and associated strata, there were 168 pieces of lead conserved (Rivers 2004: 3). Of these, 162 were H-shaped window leads, and 29 of that group had marks, representing 18% of the sample. One of the marks was illegible, but the other 28 had readable inscriptions of three different types, listed in Egan's catalog as Nos. 17, 32, and 54 (Egan 2012: 294–296). These leads are highly fragmented, so they are presented as both number of fragments and as minimum number of inscriptions. The earliest mark was: *WM*II*1671* and is represented by nine fragments and an MNI of seven (Figure 5). A second mark, also very fragmentary, reads: EW16778B MH20. There were six examples of this inscription and these represent an MNI of two. Finally, the most numerous example, found on 13 fragments (MNI=8), is: EW1689HA. It was not possible to identify any of the glaziers based on their initials.

Looking at the context of these leads, in a specific feature, provides some important insights on their meaning. First, it points out an obvious fact, often forgotten, that windows are often not all replaced at the same time. The leads from the timber mold reflect a renovation that took place sometime between 1689–1694 and show that window leads in the Print House had multiple dates, many as much as 23 years earlier than their deposition in the feature. The natural assumption would be that these represent windows that were added to the building at different times.

Another interesting observation involves the leads marked with a date of 1689, which were the most numerous in the feature, and applies directly to the question of time lag. The window to which these leads belonged was made in England and shipped to St. Mary's City. The 1689 leads, at most, represented a time lag of five years, but probably less than that. Without looking at the context in which

Figure 5. Marked window lead, dated 1671, from the Print House site. (Photo courtesy of Historic St. Mary's City, 2015.)

the leads were found, there would be no way to determine that fact. It may be that the leads marked 1689 were deposited from a window that broke in transport from England.

From the other end of the site history, the earliest leads found in the feature raise more questions than they answer. If it is assumed that the leads marked 1671 represent the original windows of the Print House, then the time between manufacture and use in a building would be about nine years. However, there are other possible explanations. The Print House was built to replace Smith's Ordinary, which burned in 1678. There is no evidence either way, but it is possible that windows from that building were salvaged as the structure was burning and reused when the new building was constructed. Further, there is the problem of how often, or whether, glaziers changed the dates on their devices. The wheel that marked these leads was made in 1671, but the leads may have been made as late as their deposition in 1689.

Finally, there is no way to estimate how many windows are represented by these leads. Do the leads marked with a date of 1689 represent multiple windows, a single window that broke, or repairs to a partially broken window? The quantity of lead found in the feature would make up only a small portion of the total lead in a single window. It is assumed that leads of different dates would be from separate windows, in this case representing a minimum of three windows. Ultimately, this question is unanswerable, but it is important to keep in mind how small a percentage of the total leads in a building are actually recovered.

Summary

When James Deetz discussed a dated window lead from a site at Flowerdew Hundred in relation to the construction of the building, he mentioned the uncertainty about the amount of time between its manufacture and transport, and use in the New World. Further, he suggested that it could have been from a replacement window. In the end he concluded: "We are left then with a fascinating bit of information with no direct bearing on the question of the dates of occupation" (Deetz 1995: 110). After reviewing the historical and archaeological evidence on the dating of window leads, it appears research is no farther along than when Deetz made that statement.

A dated window lead can certainly be used as a TPQ for the feature or level in which it occurs, like other dated objects. Any attempt to go beyond this, to discuss construction dates, replacement of windows, or changes in the structural history of a building, is fraught with uncertainty. What the date represents is still uncertain. The biographical review of known 17th-century glaziers suggested that they infrequently, if ever, changed the dates on their vises. For example, leads marked by Francis Good with the date of 1661 could have been produced as late as 1672, a span of 11 years. Henry Gyles was still using his father's vise, marked 1665, as late as 1700, a span of 35 years. The only reason these figures are known is because their marks have a complete name and allow for historical research. How much more difficult would it be if the only information on the glazier were the two initials at the end of the mark? A mark from the Reading House in New Jersey bears the glazier's initials, IS, and the date 1684 (Thomas et al. 1985: IV 8–9). In various records there are at least eight glaziers with these initials working in London in the late 17th century. Even supposing that these are the only London glaziers using these initials, how could any of them be specifically associated with a particular dated lead?

Using dated window leads from sealed contexts in association with the known history of a site can produce some useful insights. The context in which the window leads from the Print House in St. Mary's City were recovered occurred at the transition from phase 2 to phase 3 of the building's life. The leads marked with the date of 1689 demonstrated that the filling of the timber-mold feature occurred after this date. Stratigraphically, the mortar bed was placed after the filling of the timber mold, and the history showed that this must have been in 1694 or before. It is the context of the deposition that allows an estimate of 4–5 years for the transport of marked leads to the Chesapeake. However, this must be considered a maximum, as it is possible that the wheel marked 1689 was still being used in the 1690s.

Currently, dated window leads are of limited use in archaeological analysis. Their potential is not only untapped, but it is also unproven. To change this will require much more historical research on glaziers and vise makers. Until the trade and those who practiced it are better understood, it will not be possible to answer

the questions raised about the meaning of these dates. Also, more detailed analyses of window-lead samples from sealed and well-dated contexts are needed. The range of use of specific marks can help to answer questions about the reliability of the dating.

Acknowledgments

I would like to heartily acknowledge Silas D. Hurry and Donald Winter of Historic St. Mary's City for the photographs of window leads used in the article. Also thanks to the Connecticut Historical Society for the photograph of the Edward White rolling mill.

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Author Information

Timothy B. Riordan
timbriordan@gmail.com