

God is in the Details

RESTORING THE HISTORIC GUTTERS AT THE 1829 NORTH FAMILY BRETHREN'S WORKSHOP

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FIG 1



FIG 2



FIG 3

Introduction

Gutters seem like a fairly prosaic subject. Rain rolls down the roof, is captured in channels along the eaves, and then is diverted away from the building foundation through piping. But in the Shaker world, the details of everyday life and work took on an enhanced spiritual purpose and represented opportunities to tap into both the practical and artistic talents of the brethren and sisters. Water was a precious commodity at Mount Lebanon and other communities, and the North Family Shakers developed an elaborate water management system of interconnected mill ponds, cisterns, and aqueducts to power manufacturing operations, water crops, and maintain the sparkling cleanliness that was so highly valued in the religion.¹ Rainwater, in particular, was valued for its softness in laundering operations and an article in a Shaker publication notes that at Mount Lebanon “all rainwater from roofs in utilized for laundry purposes.”² Both fresh and waste-water were recycled through multiple uses to such a degree that one commentator stated “Shaker water wasn't any good when they were done with it because it was all worn out.”³ Gutter systems, and associated cisterns and catch basins, were then, like everything

else at Mount Lebanon, part of the warp-and-woof of Shaker communal life.

So, when the Shaker Museum | Mount Lebanon undertook a project in 2011 to restore the historic gutters on the Brethren's Workshop, the Museum leadership knew they would need a special team versed in both the historic building technology of the period and the distinctive way it was shaped by “Shaker hands” into larger systems of use and meaning at the North Family community. Fortunately, the Museum had access to both sets of rare skills. Under the leadership of Don Carpentier, who has an unmatched practical knowledge of early American building technology, and Museum Director of Collections and Research Jerry V. Grant, who provided the Shaker perspective, a team of craftsman from David E. Lanoue, Inc. and interns from the North Bennet Street School were able to create an unusually faithful restoration of the historic gutter system.⁴ This work was accomplished using period tools and period materials in a distinctly Shaker way. This essay documents the process with some brief excursions into the history of gutter technology in the early Republic.

1 The remains of this extensive waterworks were recently analyzed and mapped in a 2009 Historic American Landscapes Survey (HALS) conducted by landscape architects from the National Park Service.

2 Charles F. Wingate, “Shaker Sanitation” in *The Manifesto* (Canterbury, NH: by the United Society of Believers), Vol 19, May 1889, 114.

3 June Sprigg, *By Shaker Hands*. (New York: Alfred A. Knopf Inc., 1975.), p. 146.

4 The gutter restoration project was part of a larger restoration campaign of the east elevation of the Brethren's Workshop led by John Mesick of Mesick-Cohen-Wilson-Baker-Architects. The gutter restoration project team also included restoration carpenter Peter Smith and metalworker Mike Fountain from preservation firm David E. Lanoue, Inc., and North Bennet Street School interns William Burns, Frank DiFrancesco and Jared Lodge. Funding for this project was provided by a New York State Environmental Protection Fund (EPF) grant and a private foundation.



FIG 4



FIG 5



FIG 6

The Brethren's Workshop and Laundry

The six-story Brethren's Workshop is the oldest surviving structure at the North Family site and the only one constructed of brick [fig. 1]. It was the heart of manufacturing activities at the North Family and contained a waterwheel in the basement, fed by an above-ground sluiceway or penstock, that powered wood-working tools in the shop.⁵ The Brethren's Workshop also originally housed the Sister's laundry operation.⁶ Soon after the completion of the building, a Shaker journal noted, "1829, November 24 - the Sisters this day for the first time washed in the Brick Shop."⁷ The large new brick shop was sheltered by a relatively steep gabled roof, which provided a large surface area to collect rainwater. A metal gutter system fabricated of tin was installed on the east elevation of the structure, most likely as part of the original construction.⁸ A detail of a historic photo dating to the 1880s shows the original gutter system with its distinctive semi-cylindrical "leader heads [fig. 2]."

Leader heads, also called "conductor heads" or "rain hoppers," were open basins at the top of the downspout or "leader pipe" which served as a kind of temporary expansion tank, preventing excess storm water from a heavy rain storm from spilling over the top of the gutter. The larger diameter of the basin collected more water than the smaller dimension pipe below and maintained a steady flow of air to accelerate the flow of the water down the leader pipe.

The Brethren's Workshop gutter system was probably connected to the large brick cistern that still exists in the basement although later building changes have obscured this relationship.⁹ Once installed, the Brethren's Workshop gutters remained in place for nearly one hundred and fifty years. The same gutter system appears in HABS photos taken in 1930s [see fig. 1] and is still intact in a photo from 1972 [fig. 3].¹⁰

- 5 The aboveground aqueduct ran from a millpond to the northwest through an opening in the south end of the Brethren's Workshop. At some point – probably due to problems with freezing in cold weather or the Shakers' desire to build a lumber-storage building just south of the Workshop, the water was run underground in wooden piping. Later this piping, found to be too small, was replaced with cast iron pipe.
- 6 It is also possible that waterpower was used to mechanize some of the laundry operations at an early date. During the 1850s, the Mount Lebanon Shakers had perfected a waterpower driven "wash mill" (an early commercial washing machine), patented under the name of Shaker trustee, Brother Nicholas Bennett. An improved model of that machine was later manufactured and sold by the Canterbury, New Hampshire Shaker community.
- 7 Elder Richard's [Bushnell] journal, North Family, Mount Lebanon, NY. Shaker Museum | Mount Lebanon, Old Chatham, New York (NOC, mss. no. 10346).
- 8 A number of pieces of evidence point to 1829 as the installation date for the gutters. First, the project team found a section of the original tin gutter in the basement constructed using the small 10 x 14 inch tin sheets that were the largest size available prior to 1830. Second, the semi-cylindrical form of the leader head was common in the United States during the first several decades of the nineteenth century but had been supplanted by more box-like forms with scrolled brackets by 1830-1840 (see discussion in next section). Third, remnants of the original strap used to secure the leader pipe to the building were hand-tooled using a "burring machine." By mid-century, this same work would have been done with a "gutter beading machine" which leaves a different quality of marks on the surface of the metal. Lastly, and perhaps most conclusively, is the Shaker's sophisticated water management practices and the initial use of the Brick Shop as a laundry.
- 9 During the 1860s and 1870s, the south side of the Brethren's Workshop was extensively reworked. A shed addition was built along the original exposed basement wall, the openings reconfigured, and the wall itself refaced with sawn stone. These changes eliminated evidence of any original direct gutter connection to the cistern. By 1939, when the workshop was photographed for the HABS project, the south leader pipe was terminated with an elbow section that dumped the storm water directly on the roof of the shed addition (which is no longer extant). It is very unlikely this was the original Shaker configuration.
- 10 It is likely, however, that at least some components of the gutter system were replaced over time.



FIG 7



FIG 8



FIG 9

Historic Gutters: Shaker and Non-Shaker

The earliest gutters and downspouts used in the North American colonies were wholly made of wood.¹¹ By the time of the Revolution, however, public buildings and finer residences in major cities began to be outfitted with imported metal gutter components made of lead. By 1800, lead gutter components were increasingly replaced with more economical tin (tin-coated iron) or terne (lead and tin-coated iron) components built up from sheet metal. In the New York State and other parts of the Northeast, it was common to use a mix of tin and wood elements. A typical early nineteenth century arrangement was to employ a wood “built-in gutter” that had been carved out of a single log [fig. 4] with a tin leader head and downspout on the front of the house, and a simpler “attached” tin “half-round” gutter [fig. 5] and downspout on the less important rear elevation.¹²

Shaker gutters follow the basic forms used in the outside, non-Shaker world. Shaker communities tended to install the more utilitarian half-round gutter systems (rather than built-in gutters) on both the front and rear elevations of the building. This was in keeping with the “plain,” functionalist orientation of the members. Rather than being concealed, Shaker gutters at Mount Lebanon and other communities were rather prominently displayed [fig. 6]. While it was uncommon in Shaker usage, the distinctive semi-cylindrical leader head used

at the Brethren’s Workshop replicates a relatively common early nineteenth century form in New York State.¹³ Fig. 7 shows a circa 1815 example from Eagle Mills, New York in the collection of Don Carpentier that is virtually identical to the Brethren’s Workshop leader head minus the decorative elements. Fig. 8 shows another undecorated example in-situ on a group of commercial structures in Philadelphia.

The size and proportions of the Brethren Workshop and “worldly” gutters were dictated by the available manufacturing technology of the period. In the early decades of the nineteenth century, the largest tin sheets manufactured were 10 x 14 inches. The standard 3-inch diameter of leader pipe was the result of rolling a full sheet into a tubular form. Dimensions of other components such as gutter pans and leader head basins were similarly based on combinations of half and full sheets. By 1830, larger 10 x 20 inch tin sheets began to be available, and gutters and leader heads became correspondingly larger. Leader head styles changed as well becoming more boxy and featuring decorative scrolls.¹⁴ Fig. 9 shows an exuberant example of these later designs in the collection of Don Carpentier. Both stylistically, and in terms of construction, however, the Brethren’s Workshop gutters relate to the earlier Federal period worldly examples.

11 This section is based on a recent conversation with Don Carpentier who provided me with helpful background information on the topic and showed me many period examples in the Eastfield Village collection.

12 This particular example of a wooden gutter relies on the beefiness of its construction alone to withstand the elements. Other period examples were lined with either lead or tin sheeting or tarred or painted to extend their lifespan and prevent water from a failed gutter entering into the wall cavity below.

13 Although historic photos show that attached metal gutters were used on most of the structures at Mount Lebanon (including the Great Stone Barn), none of these examples employed a leader head. Research by Jerry Grant has discovered only one other Shaker example in a historical photograph of the Centre Family Dwelling at the Shaker community at South Union, Kentucky. These leader heads have been removed.

14 These designs correspond to the large scroll brackets veneer on late Empire “Grecian” style furniture.



FIG10



FIG 11



FIG12



FIG 13



FIG 14



FIG15



FIG 16



FIG17



FIG18



FIG 19



FIG 20



FIG 21



FIG 22



FIG 23



FIG 24

Fabricating the Brethren's Workshop Gutter

By the time the Museum acquired the North Family site in 2004, the historic gutters were gone and only a few original gutter hooks survived along the eaves. So, all the components needed to be re-fabricated. The first step in the process reflected probably the only substantial departure from nineteenth century practice. The original Brethren's Workshop gutters were fabricated using 10 x 14 inch sheets of tin-coated wrought iron. While of small size, these sheets were extremely durable due to the properties of the wrought iron used and the multiple layers of tin deposited on the surface during the hot-dipping process. Sheet metal of this type and dimension is no longer manufactured, so Carpentier specified the use of 16-ounce lead-coated copper sheeting which was cut down to the 10 x 14 inch dimensions available during the period [fig. 10].

¹⁵ Most of the tools used in the gutter fabrication project date to the mid-nineteenth century but reflect tin-working technology that was available to the Shakers in 1829 when the Brethren's Workshop was built. This historic tool collection was still in situ in the circa 1830 Clapper Tin Shop from West Sand Lake, New York that Don Carpentier acquired and moved to Eastfield Village during the 1970s.

The gutter pan forms were then built up around wood molds in a series of operations using period tools.¹⁵ First, the inner lip of the gutter was doubled by making a 3/8 inch fold with a "bar folder". Next, the outer lip of the gutter section was created by rolling the edge of the sheet into a tight tube using a "gutter beader" [fig. 11]. This stiffened the gutter section up and provided an anchor to attach the front of the gutter hook. Next, the gutter section was turned over and rounded into the desired half-round profile using a "slip roller" [fig. 12]. The completed sections were then laid on a wood "gutter form" [fig. 13], where they were soldered together [fig. 14]. The 14-inch long sections were built up into two large sections spanning the entire fifty-four foot width of the building.¹⁶

¹⁶ Each of the two sections was carefully pitched down from the middle of the building toward the leader heads to ensure that the rainwater drained properly.

¹⁷ To facilitate fitting the sections together properly, the bottom portion of each leader pipe section was also crimped using a "crimping machine" but this technology dates to the late nineteenth century.



FIG 25

Fabricating the Leader Pipe

The construction of the leader pipe also began with a full sheet laid lengthwise. The edges of sheet were turned up and folded over using a bar folder, in opposite directions, to form a “lock seam.” The sheet was then rounded into a tubular form using the slip roller and the seam locked together [fig. 15]. Next, the leader pipe section was placed on a “conductor stake” and the lock seam was flattened down with a hammer to lock it tight [fig. 16]. The seam was finished with a “grooving tool” and soldered to further reinforce it [fig. 17]. The upper part of each section was then flared outward on a “beak horn stake” to allow the parts to fit together [fig. 18].³⁷ The completed sections of leader pipe were then assembled [fig. 19] and soldered together to form the desired length for the installation.

Fabricating the Leader Head

Like the other gutter components, the leader head was constructed from a series of parts that were soldered together. The back of the unit was formed from a full sheet of lead-coated copper. The first step was to tool a pair of grooves on the long sides of this sheet to receive the sides of the basin using a “square pan swedge” [fig. 20]. The edges of the sheet were then turned back with the bar folder to stiffen them up. The front of basin was formed from a full sheet and rounded using the slip roller. The basin front was then soldered into the grooves on the back. Next, the top of the basin was edged with a “burring machine” to

create a raised edge to receive the top rim which was then cut out and soldered in place [fig. 21]. The bottom funnel was then cut out, and the edges overlapped and soldered together. Next, the funnel was soldered to the bottom of the basin that had also been prepared with the burring machine [fig. 22]. Lastly, a section of leader pipe was soldered onto the end of the funnel [fig. 23]. Fig. 24 shows the completed unit, which represents what is probably the first leader head made for a Shaker building since 1829 when the Brethren’s Workshop was finished.

Gutter Hooks

Several of the original wrought iron gutter hooks were still in place below the roof eave allowing them to be replicated by Michael J. Saari, a blacksmith from Woodstock, Connecticut [fig. 25]. The design of these gutter hooks is, according to Don Carpentier, “very unique” and represents the practical Shaker aesthetic at work. Rather than the typical worldly design which required an additional cross piece or “gutter strap” connecting the outer edge of the gutter lip with the adjoining roof eave to prevent the gutter being knocked out of place by high winds, the North Family Shakers invented a simpler and more elegant solution. The Shakers added a spur to back edge of the gutter hook to hold the rear of the gutter pan and curved the front inward to form a spring that snugly locked the gutter in place. The resulting gutter hook is both more sculptural and more effective than worldly designs of the period.



FIG 26

Conclusions

Figs. 26 and 27 show the completed Brethren's Workshop gutter installation. Before being attached to the building, all of the gutter components were primed and then painted with a handmade linseed oil paint ground in a paint mill replicating the period treatment. Following historic photos, the gutter was painted white to match the restored plaster cove molding and the leader head

and leader pipe painted red to match the main body of the building which paint analysis had showed to have been originally painted a similar color. The restoration of the gutters at the Brethren's Workshop amply demonstrates that for the Shakers, and committed museums and historic sites that seek to interpret and honor this heritage, "God is in the details."



FIG 27

- FIG 1 Brethren's Workshop, east elevation, Historic American Building Survey (HABS, NY, II-Neleb. V, 31-1), (1939)
- FIG 2 Detail of circa 1888 photo showing Brethren's Workshop gutter and leader head. Collection of Shaker Museum | Mount Lebanon.
- FIG 3 East elevation of Brethren's Workshop showing intact leader heads, circa 1972. Photo: James Baker, Architect of Record for the Darrow School.
- FIG 4 Built-in gutter carved from a single log, circa 1799, New York State, collection of Don Carpentier, Eastfield Village. Photo: Peter Watson.
- FIG 5 Section of tin gutter, circa early 1800s, New York State, collection of Don Carpentier, Eastfield Village. Photo: Peter Watson.
- FIG 6 South elevation of North Family Sisters Second Dwelling, Historic American Buildings Survey (HABS NY,11-NELEB.V,25-3), circa 1930.
- FIG 7 Tin leader head, circa 1815, from Eagle Mills, New York. Collection of Don Carpentier, Eastfield Village. Photo: Peter Watson.
- FIG 8 Circa 1868 photo showing tin leader heads on a row of commercial structures, Front Street, South of Dock, Philadelphia. Collection Free Library of Philadelphia.
- FIG 9 Painted scroll form tin leader head, circa 1840, collection of Don Carpentier, Eastfield Village. Photo: Peter Watson.
- FIG 10 Jared Lodge cutting down lead-coated copper sheeting to period 10 x 14 inch dimensions. Photo: Peter Smith.
- FIG 11 William Burns watches Don Carpentier rolling the lip of the gutter section using a gutter beader. Photo: Peter Smith.
- FIG 12 Using a slip roller to round the gutter section. Photo: Peter Smith.
- FIG 13 Laying the gutter sections on the gutter form in preparation for soldering. Photo: Peter Smith.
- FIG 14 Mike Fountain soldering the gutter sections together. Photo: Peter Smith.
- FIG 15 Locking the seam on the leader pipe section. Photo: Peter Smith.
- FIG 16 Don Carpentier flattening the lock seam with a hammer. Photo: Peter Smith.
- FIG 17 Frank DiFrancesco using a grooving tool to finish the seam. Photo: Peter Smith.
- FIG 18 Jared Lodge flaring the top of the leader pipe section on the conductor stake. Photo: Peter Smith.
- FIG 19 Assembling the leader pipe sections in preparation for soldering. Photo: Peter Smith.
- FIG 20 Don Carpentier using a square pan swedge to crease the back of the leader head. Photo: Peter Smith.
- FIG 21 Soldering the top rim onto the basin of the leader head. Photo: Peter Smith.
- FIG 22 Don Carpentier forming the bottom funnel. Photo: Peter Smith.
- FIG 23 Soldering a section of leader pipe onto the leader head. Photo: Peter Smith.
- FIG 24 The completed leader head, ready to be primed and painted. Photo: Peter Smith.
- FIG 25 Original (top) and reproduction (bottom) Shaker gutter hooks. Photo: Jerry Grant.
- FIG 26 Restored gutters on the east elevation of the Brethren's Workshop. Photo: Peter Watson.
- FIG 27 Detail of restored gutters. Photo: Peter Watson.