

The Availability of Lime and Masonry Construction in New England: 1630-1733

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Between 1630 and 1733 New England witnessed the gradual development of masonry as a significant element in its building tradition. By 1733 structures of brick and stone were common. In the seventeenth century, however, masonry construction was not always practical for a shortage of lime, vital to the making of strong mortars, plagued builders. Wherever the crucial lime was available, masonry quickly became integrated with local building traditions. In locations such as Boston where there was no local abundance of lime, the development of a vernacular masonry style can be directly tied to the introduction of imported sources of mortar lime. This article outlines the seventeenth and eighteenth century methods of producing mortar and the links that connect lime supplies with the emergence of local masonry traditions.

New England's earliest mortars were made of mud. These were satisfactory only for foundations and the interior portions of chimneys. The exterior parts of chimneys and exposed masonry work demanded hard mortar made of lime, or the work stood only until the next rainstorm.¹ This lime was scarce and expensive. In most locations only the wealthy could attempt large masonry projects. The known scarcity of lime, furthermore, augmented the appearance of comfort, status, and authority the powerful sought in their high style brick dwellings.

Seventeenth century lime was obtained

from two sources: mollusk shells and rare deposits of natural limestone. Sea shells by far accounted for most of the early supplies. Natural limestone deposits, discovered at Providence in 1661 and at Newbury in 1697, did not have an important effect on regional availability until the early eighteenth century.

Both shell and limestone have identical chemical properties. Natural limestone is formed by the accumulation of sea shells and other calcium-rich marine debris solidified under great pressure over long periods. It is geologically defined as a class of rock containing at least 80% of carbonates of calcium and magnesium. When calcified by burning, lime rocks and shells yield products that slake upon the addition of water. This calcification process breaks the bonds between the calcium oxide, or lime, and the gaseous, foul-smelling carbon dioxide.

While all lime used for building purposes had to be thoroughly burned, it was not crucial for mortar lime to be pure, and it was commonly known as "lean lime." This was not the case with plaster lime, known as "fat lime," which required a higher calcium content achieved by careful regulation of the calcification process. Thus partially burned shells will be present in a shell lime mortar, but seldom found in a shell lime plaster.²

The methods of gathering and burning lime in the seventeenth century were simple enough, assuming a source could be discovered. The most common source

of shells were kitchen middens, the buried rubbish heaps left by Indians at their ancient camps. It was a kitchen midden, for example, that was the "lyme pitt" of tanner Thomas Batt of Boston. Batt began mining there sometime before 1667, using his lime, for the most part, in tanning. The "lime liquors" opened up the fiber structure of the hides so that hair and protein matter could be easily removed.³ In 1667 the Boston Town Records report, "There is lett out to Thomas Batt the lyme pitts, that he formerly rented, to make vse of them 14 yrs., at 7^s 6^d."⁴ The "pitts" were located on the western side of Beacon Hill. The town records give a clue to their location in 1668, mentioning ". . . on the Town land wherein are lyme pitts . . . on the aforesaid street leading to the spring."⁵ Only one other lime pit is mentioned in the early Boston records, a small "LimeKill" run by the brickmaker Richard Gridley in the "Southerly part of the town."⁶ Apparently Batt and Gridley were the major suppliers of lime for Boston.

These scattered middens were not sufficient to supply the lime needs of New England. With the many uses of lime creating a steady demand, settlers seized opportunities to gather shells swept onto beaches after storms. In 1694 one such storm swept quantities of shellfish onto the beaches of Lynn, producing a lime hysteria in the town. Hoping to reduce the general chaos of the situation the Lynn magistrates voted that townsmen could "dig and gather as many as they wished for their own use, but no more."⁷ A penalty of twenty shillings awaited any who carted the shells out of the town to be burned into lime.

Such storms were infrequent bonanzas. Impatient individuals often did not wait for a beaching and pillaged live oyster beds. This practice occurred in Provi-

dence as late as 1728, although Providence, curiously, had large deposits of natural limestone. Quite understandably the practice was frowned upon by the town:

Upon complaint made to this councill that the Long oyster bed that hath bin the principal supply of oysters for the inhabitants and poore of our several Neighboring Precincts now likely to be wholly destroyed by those that take and have took up the trade of Lime burning . . . if any person or persons shall be taken and convicted of getting and gathering oysters and shells upon sd oyster bed in order for the makeing of Lime: shall forfeit all such shells or Lime that shall be so made . . . and procicuted as in Actions of Trespass in forty shillings.⁸

Once the limestone or the shells had been gathered the limeburner placed the material in a "field kiln." The kiln, in the shape of a "truncated cone inverted," was packed with a "charge consisting of limestone and fuel alternately stratified." The limestone or shell, soon glowing white from the heat, burned for eighteen hours or longer until it was completely calcined.⁹ Throughout the process steady currents of air were forced through the kiln to maintain the high temperatures required for a "good marble," as lime was then called.

Nathaniel Hawthorne pictured the crude kilns and the men who tended them in the short story *Ethan Brand*. The "insufferable glare," the "curling and riotous flames," and the "athletic and coal begrimed figure of the limeburner" of Hawthorne's nineteenth century New England would not have been different two hundred years before.¹⁰

Often a large masonry project required supplies of lime beyond the production capacity of local limeburners. Lime-short Boston offers a good example of this problem in the construction of the Peter

Sargeant House, completed in 1679. Sargeant purchased the land for his future home, in later years known as the Province House, on July 30, 1677. On September 25, 1677 the town records report that "liberty was granted to Mr. Peter Sargeant, to set up a limekiln upon Clay Hill near Fox Hill, if it be done with the advice and approbation of Deacon Elliot."¹¹

Sargeant's wealth permitted such a costly undertaking. The majority of Boston's citizens, however, could not dream of such a project. Although the General Court had ordered on October 15, 1679 "... that henceforth no dwelling house in Boston shalbe erected & sett up except of stone or brick . . .," in response to the awful destruction of the sweeping fire of August 1679, the townsmen refused to comply. The opposition to the masonry law, rooted in the high cost of compliance, was so intense that on May 19, 1680 the Court suspended "the executing and prosecution of the late law . . . for the space of three years."¹² The "three years" provision became meaningless as Boston authorities never again attempted to enforce the law. While Boston was never without brick structures — as early as 1652 there is mention of "Edw: Bendalls brick house"¹³ — masonry was the exception and remained rare until the turn of the eighteenth century.

The question of the importation of lime from outside of New England arises whenever early masonry is discussed. There is little evidence that lime was imported from outside the region for building purposes. Some "minor quantities" of imported lime and coral were discovered at the Saugus Iron Works archeological exploration¹⁴ and English vessels are known to have delivered lime to the West Indies. However, no seventeenth century document has been found

recording the arrival of lime shipments to New England ports.¹⁵

While Boston was short of lime for mortar, a few areas of New England possessed ample natural deposits. These locations developed unique masonry traditions in the seventeenth and eighteenth centuries. The gradual export of natural limestone from these areas influenced the development of masonry architecture in lime-short locations, such as Boston.

Rhode Island was the first New England area to discover a natural deposit of limestone. In 1661 Robert Hackleton was "... to have liberty to burn lime upon the common meer about and to take stones and wood for the same purpose."¹⁶ During 1665 the town of Providence proclaimed "... those lime rocks around Hackleton's lime kiln shall perpetually be common and that no land shall be laid out on the north east or south east of said kiln ... said kiln being at or near a place called Soakequoissett."¹⁷ By 1669 there were two limestone quarries in the vicinity of Providence — Dexter's Lime Rocks ten miles north of Providence and the Manton deposit four miles west of Providence. The Manton kiln stood until 1904 and was described in that year as "twelve feet deep and ten feet in diameter," a very large kiln.¹⁸

The excitement of the Rhode Island discovery prompted Roger Williams to write Governor John Winthrop, Jr. of Connecticut, who was visiting Boston. Williams wrote that he had "... encouraged Mr. [Gregory] Dexter to send you a limestone, and to salute you with this enclosed." If there was "... any occasion of yourself (or others) to use any of this stone . . .," Williams wrote, a shipment was possible for "... Mr. Dexter hath lusty teams and lusty sons, and a very willing heart."¹⁹

It is unknown whether Rhode Island

lime reached Boston or anywhere else in New England during the years immediately following the discovery. Within Rhode Island the limestone deposits played an important role in the development of a regional masonry style. Early Rhode Island masonry depended initially on the abundant shell supplies along Narragansett Bay. Up and down the shores of the bay the first settlers constructed dwellings of rubble stone and shell lime mortar. Many of these structures, including the demolished "Stone Castle" of the Greene Family, c. 1640, in Potowomut and the Samuel Cranston House, c. 1640, in Newport, were built entirely of stone.²⁰ Sometime during this early settlement period the stone-ender dwelling emerged as the dominant style. This form combined a timber frame structure with an end wall made of stone. Even with the discovery of natural limestone in 1661 stone-enders constructed near the bay often used shell lime. One example of a shell lime stone-end is the Bliss House, c. 1680, in Newport. The availability of natural lime at Providence, however, permitted the stone-end form to flourish in growing areas distant from shell supplies.

An examination and chemical analysis of mortar samples from eight remaining stone-end houses in Rhode Island and southeastern Massachusetts provides conclusive evidence that natural limestone was used in the mortars, with the single exception of the Bliss House. There are shell fragments in the mortars of all stone-enders, and this evidence has led to a belief that all Rhode Island masonry used shell lime. However the shell fragments in the mortar are not, in fact, calcined and were added to the aggregate much as broken glass was added to eighteenth century mortars. If shell lime had been used, fragments of partially

calcined shells would have been present.²¹

The use of natural limestone for mortar was more economical than production of shell lime, for the limestone deposits were less expensive to mine than shells. The most humble of stone-end dwellings, such as the Clement Weaver House, c. 1680, in East Greenwich, and the Richard Searle House, c. 1677, in Oaklawn, used lime burned from limestone, even though the Clement Weaver House stands less than a mile from shell-strewn Narragansett Bay. The availability of natural limestone fostered the early stone masonry tradition of Rhode Island. Without the lime deposits, Rhode Island vernacular dwellings would have been quite different.

When limestone deposits were discovered in Newbury, Massachusetts in 1697, the Rhode Island experience was repeated. The availability of lime in Newbury influenced local building. Samuel Sewall dutifully reported the "... account of the body of Lime-Stone discover'd at Newbury . . ." in his *Diary*, declaring it to be "good marble." According to Sewall, the discovery had produced great excitement in Newbury, so that soon men "... began to come with Teams by 30 in a day . . ." to carry off the limestone to kilns.²² After the discovery brick end houses like the Short House, c. 1732, appeared in and about Newbury. For many years, lime burned from Newbury limestone was used in mortars throughout eastern Massachusetts. The Newbury historian Joshua Coffin remarked that "... vast quantities of lime of the best quality were annually made in Newbury for nearly a century for export as well as home use."²³

After the Newbury discovery lime mortar was readily available in Boston. This new supply eliminated the need for the smelly shell lime kilns along the Charles,²⁴ with cleaner air and cheaper masonry

construction as a result. When in 1733 the Newbury lime was augmented by lime produced by William MacIntyre, "the father of limeburners" in Thomaston, Maine and shipped to Boston on the two lime sloops of Samuel Waldo, the era of lime shortage was over. Now Boston architecture made the final transformation from wood to masonry; Boston, from this time forward, was a city of red brick.²⁵

In the course of one century New

England passed from a region short in lime to an area with adequate supplies. Where abundant lime supplies existed, as in Rhode Island and Newbury, early masonry traditions thrived. Masonry building patterns expanded throughout the region after the discovery of limestone sources. Only with the transport of lime to Boston and other lime-poor sections could masonry become an important part of the entire region's architectural tradition.

NOTES

¹ Rain was a problem when mud mortars were used. John Winthrop, for example, constructed a "building of stone at Mistick" that "(... not being finished, and laid with clay for want of lime) two sides were washed down to the ground..." *Journal, "History of New England,"* ed. James Kendall Hosmer (New York: Charles Scribner's Sons, 1908), pp. 69-70.

² Roger Lee Grindle, *Quarry and Kiln: The Story of Maine Limestone* (Rockland, Me.: Courier-Gazette, 1971), p. 20.

³ Fred O'Flaherty, ed., *The Chemistry and Technology of Leather* (New York: Reinhold Publishing, n.d.), p. 229. Lime had many uses in the seventeenth century. Besides tanning and its use in mortar, it was necessary in sugar making, soap boiling, and sanitation.

⁴ *A Report of the Record Commissioners of the City of Boston, Boston Town Records 1660-1701* (Boston: Rockwell and Churchill, 1881), p. 35.

⁵ Suffolk County (Massachusetts) Deeds, V, p. 494. See also Suffolk County Deeds, V, p. 495; XIII, p. 387; *Boston Town Records, 1660-1701*, p. 1.

⁶ Suffolk County Deeds, VIII, p. 352. Also see *Boston Town Records, 1660-1701*, p. 1.

⁷ Alonzo Lewis, *History of Lynn* (Boston: Samuel Dickenson, 1844), pp. 185-186.

⁸ *The Early Records of the Town of Providence* (Providence: Remington, 1897), XII, p. 89.

⁹ Bryan Higgins, *Experiments and Observations of ... Cements and Quick Limes* (London: T. Cadell, 1780), p. 280.

¹⁰ Nathaniel Hawthorne, *Hawthorne's Short Stories*, ed. Newton Arvin (New York: Alfred A. Knopf, 1975), pp. 375-390.

¹¹ *Boston Town Records, 1660-1701*, p. 113 and Suffolk County Deeds, X, p. 144.

¹² Nathaniel B. Shurtleff, ed. *Records of the Governor and Company of the Massachusetts Bay in New England (1628-86)*, 5 vols. (Boston: W. White, 1853-54), V, p. 240. See Abbott L. Cummings, "The Domestic Architecture of Boston, 1660-1725," *Archives of American Art Quarterly Journal*, vol. 9, no. 4, 1971, pp. 1-16.

¹³ *Ibid.*, V, pp. 266-267; Suffolk County Deeds, I, p. 117.

¹⁴ Neal E. Hartley, *Ironworks on the Saugus* (Norman, Okla.: Univ. of Oklahoma Press, 1957), p. 169.

¹⁵ See Higgins, p. 211.

¹⁶ Providence Records, III, p. 8.

¹⁷ Providence Records, III, p. 66.

¹⁸ D. H. Harris, "Nautaconkanut Evening," *Providence Journal*, April 3, 1904, p. 24. For a discussion of the location of Rhode Island limestone deposits see Sidney S. Rider, *The Lands of Rhode Island as they were known to Canoncius and Miantunnomi when Roger Williams came in 1636* (Providence, n.d.), p. 270.

¹⁹ Williams to Winthrop, August 19, 1669, *Publications of the Narragansett Club* (Providence: 1874), VI, p. 332.

²⁰ Little is known of these houses. See Oliver Payson Fuller, *The History of Warwick* (Provi-

dence: Angell, Burlingame & Co., 1875), p. 76 for a drawing of the "Stone Castle."

²¹ The examination and chemical analysis of the mortar samples was conducted by the writer with the generous assistance of Mr. Morgan Phillips S.P.N.E.A. and Dr. Malcolm Gauri of the University of Louisville, Louisville, Ky. Houses tested: The Eleazer Arnold House, c. 1687; Bliss House, c. 1680; Clemence-Irons House, c. 1680; Thomas Fenner House, c. 1677; Greene-Bowen House, c. 1715; Richard Searle House, c. 1680; Waite-Potter House, c. 1677; Clement Weaver House, c. 1676. Numerous other masonry dwellings were examined, but due to extensive repointing of exposed masonry they could not be included in this study. Laboratory tests, with controls, were conducted on limestone and shells by the writer to recreate limeburning methods of the seventeenth century.

For a comparative discussion of stone-end structures and mortar see Norman M. Isham and Albert F. Brown, *Early Rhode Island Houses* (Providence: Preston and Rounds, 1895), esp. pp. 73-75. Isham and Brown also offer a comprehensive list of Rhode Island dwellings pp. 90-97.

²² Samuel Sewall, *Diary of Samuel Sewall*, ed. Mark Van Doren (New York: Macy-Masius, 1927), p. 144.

²³ Joshua Coffin, *An Historical Sketch of Newbury, Newburyport, and West Newbury* (Boston: Samuel G. Drake, 1845), p. 165. For a discussion of the location of the Newbury lime quarry see John J. Currier, *Old Newbury* (Boston: Damrell and Upham, 1896), p. 95.

²⁴ After 1697 references to lime burning in Boston are rare. See *Boston Town Records, 1701-1715*, p. 17 and p. 92.

²⁵ Grindle, p. 2.