BRICK STUDY
AT
FORTRESS LOUISBOURG, NHSC

By
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April 21, 2005

Fortress Louisbourg Brick Study

In order to determine if there are patterns in the brick sizes used in military and domestic context at Louisbourg a study of bricks was undertaken.

There where a total of 68 bricks measured from the active collection in the Archaeology building. Those chosen were complete or almost complete and had datable events associated with them. Of these 68 there were 37 bricks that were dated as pre-1745 in the event sequence with 18 found to be of a military context and 19 of a domestic context.

It should be noted that no brick measured was a true rectangle. Visually it appeared to the eye that the width, thickness and length for most of the bricks were equal but in reality they taper in all 3 measuring distances. Measurement of maximum length, width and thickness were taken. Placement within length ranges of +/- 1/4" were the used to separate bricks into sizes. Clay colour though noted, was not taken into consideration as placement of firing within the kiln changes colours from orange to red to black red or combinations of the same. It should also be noted that the sizes indicated in historical brick measurements include the amount of mortar that would be used in the joint. This could vary from 3/8" to over ½".

This study is in no way complete nor can it be taken as proof of required sizes for reproduction but rather, as a guideline to what sizes can be interpreted from the available materials and measurements.

Military Bricks - all from the Princess Bastion Gunloop Area

7.5" (7.25"-7.75")without mortar

	LENGTH in	LENGTH cm	
65L3E13.1	7.50	19.05	BRICK RED
65L3E13.9	7.66	19.45	BRICK RED
65L3E13.5	7.68	19.5	BRICK RED
65L3E15.1	7.68	19.5	BRICK RED
1B35X1.2	7.72	19.6	BRICK RED
65L3E13.10	7.72	19.6	BRICK RED

The width for this group all fall in the range 3.75 +/- .05
The thickness for this group all fall in the range of 2.0 +/- .1

8.0" (7.75" -8.25") without mortar

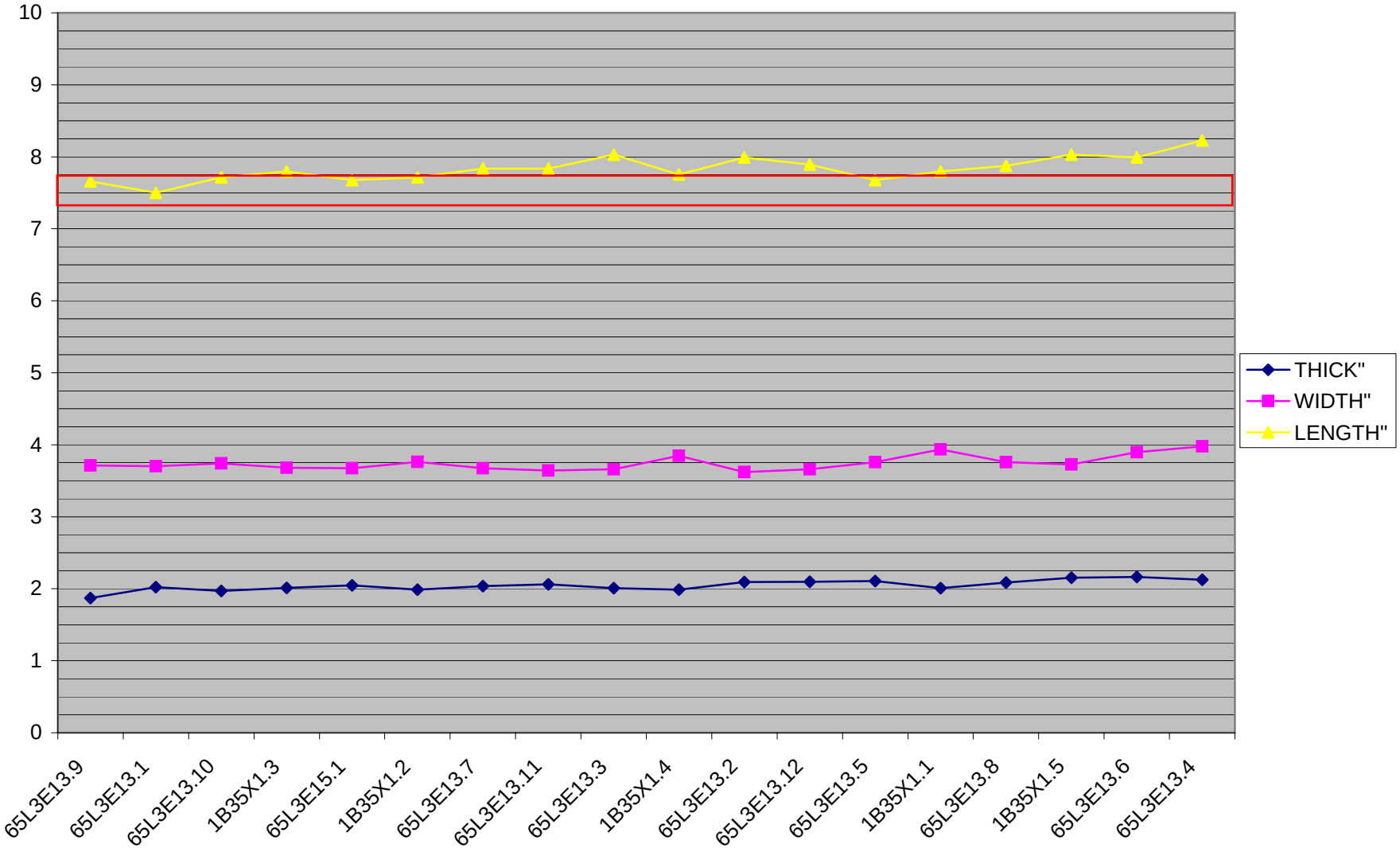
	LENGTH in	LENGTH cm	
1B35X1.4	7.76	19.7	BRICK RED TO BLACK
1B35X1.1	7.80	19.8	BRICK RED
1B35X1.3	7.80	19.8	BRICK RED TO BLACK
65L3E13.7	7.84	19.9	BRICK RED TO BLACK
65L3E13.11	7.84	19.9	BRICK RED
65L3E13.8	7.87	20.0	BRICK RED
65L3E13.12	7.89	20.05	BRICK RED
65L3E13.2	7.99	20.3	BRICK RED
65L3E13.6	7.99	20.3	BRICK RED
1B35X1.5	8.03	20.4	BRICK RED
65L3E13.3	8.03	20.4	BRICK RED TO BLACK
65L3E13.4	8.23	20.9	BRICK RED

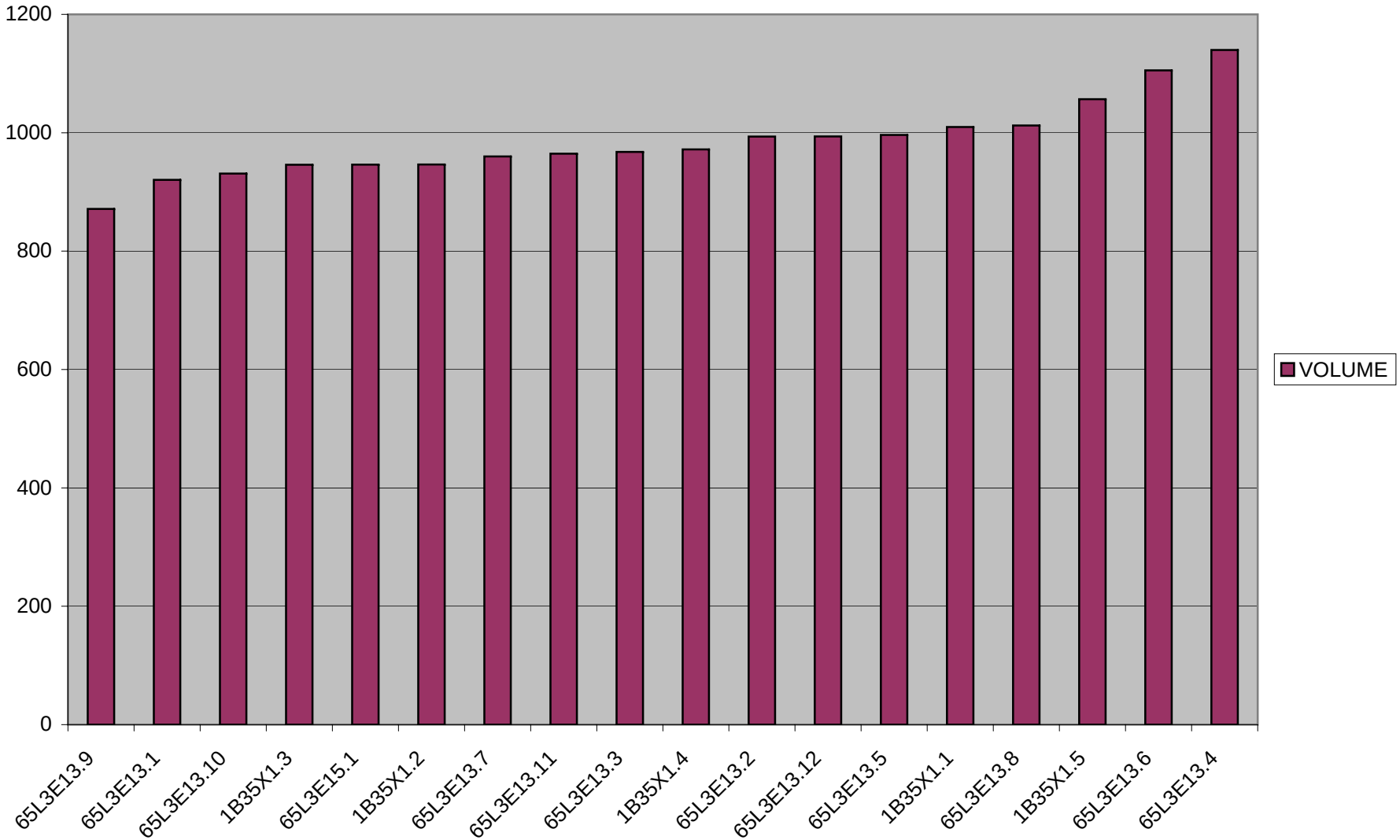
The width for this group all fall in the range of 3.75 +/- .2
The thickness for this group all fall in the range of 2.0 +/- .2

Brick sizes:
7 1/2" x 3 3/4" x 2"
8 x 3 3/4" x 2 brick or closest to“colonial american” standard brick size and majority

PROVENIENCE	THICKNESS	WIDTH	LENGTH	VOLUME	THICK"	WIDTH"	LENGTH"	VOLUME "
65L3E13.9	4.75	9.43	19.45	871.2141	1.870079	3.712598	7.65748	53.16475
65L3E13.1	5.14	9.4	19.05	920.4198	2.023622	3.700787	7.5	56.16746
65L3E13.10	5	9.5	19.6	931	1.968504	3.740157	7.716535	56.81311
1B35X1.3	5.11	9.35	19.8	946.0143	2.011811	3.681102	7.795276	57.72933
65L3E15.1	5.2	9.33	19.5	946.062	2.047244	3.673228	7.677165	57.73225
1B35X1.2	5.05	9.56	19.6	946.2488	1.988189	3.76378	7.716535	57.74364
65L3E13.7	5.17	9.33	19.9	959.8984	2.035433	3.673228	7.834646	58.57659
65L3E13.11	5.24	9.25	19.9	964.553	2.062992	3.641732	7.834646	58.86064
65L3E13.3	5.1	9.3	20.4	967.572	2.007874	3.661417	8.031496	59.04487
1B35X1.4	5.05	9.77	19.7	971.9685	1.988189	3.846457	7.755906	59.31315
65L3E13.2	5.32	9.2	20.3	993.5632	2.094488	3.622047	7.992126	60.63095
65L3E13.12	5.33	9.3	20.05	993.8585	2.098425	3.661417	7.893701	60.64896
65L3E13.5	5.35	9.55	19.5	996.3038	2.106299	3.759843	7.677165	60.79819
1B35X1.1	5.1	10	19.8	1009.8	2.007874	3.937008	7.795276	61.62178
65L3E13.8	5.3	9.55	20	1012.3	2.086614	3.759843	7.874016	61.77434
1B35X1.5	5.47	9.47	20.4	1056.738	2.153543	3.728346	8.031496	64.48613
65L3E13.6	5.5	9.9	20.3	1105.335	2.165354	3.897638	7.992126	67.45168
65L3E13.4	5.4	10.1	20.9	1139.886	2.125984	3.976378	8.228346	69.56011

Military bricks pre-1745




VOLUME cm3
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800
600
400
200
0
65L3E13.9
65L3E13.1
65L3E13.10
1B35X1.3
65L3E15.1
1B35X1.2
65L3E13.7
65L3E13.11
65L3E13.3
1B35X1.4
65L3E13.2
65L3E13.12
65L3E13.5
1B35X1.1
65L3E13.8
1B35X1.5
65L3E13.6
65L3E13.4
VOLUME

Domestic Bricks

From Blocks 1A, 2E, 2K, 16B, 16C, 16D,16E, 75B

7.0"(6.75" - 7.25") without mortar

	LENGTH in	LENGTH cm	
16L94B9.7	7.17	18.2	BRICK RED TO BLACK
16L94B9.4	7.21	18.3	BRICK RED

The width for this group fall in the range 3.5 +/- .2

The thickness for this group all fall in the range 2.0 +/- .2

7.5"(7.25"-7.75") without mortar

	LENGTH in	LENGTH cm	
16L80E5.1	7.28	18.5	BRICK RED
1L43A2.4	7.28	18.5	BRICK RED TO BLACK
16L89F9.14	7.38	18.75	BRICK RED
16L80A22.4	7.40	18.8	BRICK RED TO BLACK
1L43A99.13	7.44	18.9	LIGHT BRICK RED
16L82H3.16	7.48	19.0	BRICK RED
16L82H4.4	7.52	19.1	BRICK RED
16L92N19.61	7.60	19.3	BRICK RED TO BLACK
16L80A22.2	7.64	19.4	BRICK RED
16L94B9.6	7.68	19.7	BRICK RED

The width for this group fall in the range 3.75 +/- .2 with 1 falling below with 3.4

The thickness for this group all fall in the range 2.0 +/- .2

8.0"(7.75" - 8.25")

	LENGTH in	LENGTH cm	
16L80A22.3	7.80	19.8	BRICK RED TO DARKER RED
16L80A22.1	7.95	20.2	BRICK RED

The width for this group fall in the range 3.75 +/- .05

The thickness for this group all fall in the range 2.0 +/- .1

Over 8.25"
thinner oversized:

	LENGTH in	LENGTH cm	
16L94B9.5	8.27	21	BRICK RED

has a thickness of 1.4 and a width of 4.4

1L6D3.8	9.13	23.2	ORANGE

has a thickness of 1.7 and a width of 4.6 * possible French brick

2L80F34.5	8.27	21	ORANGE RED
16L94B9.3	8.47	21.5	ORANGE

The width for this group fall in the range 4.0 +/- .1
The thickness for this group all fall in the range 2.0 +/- .2

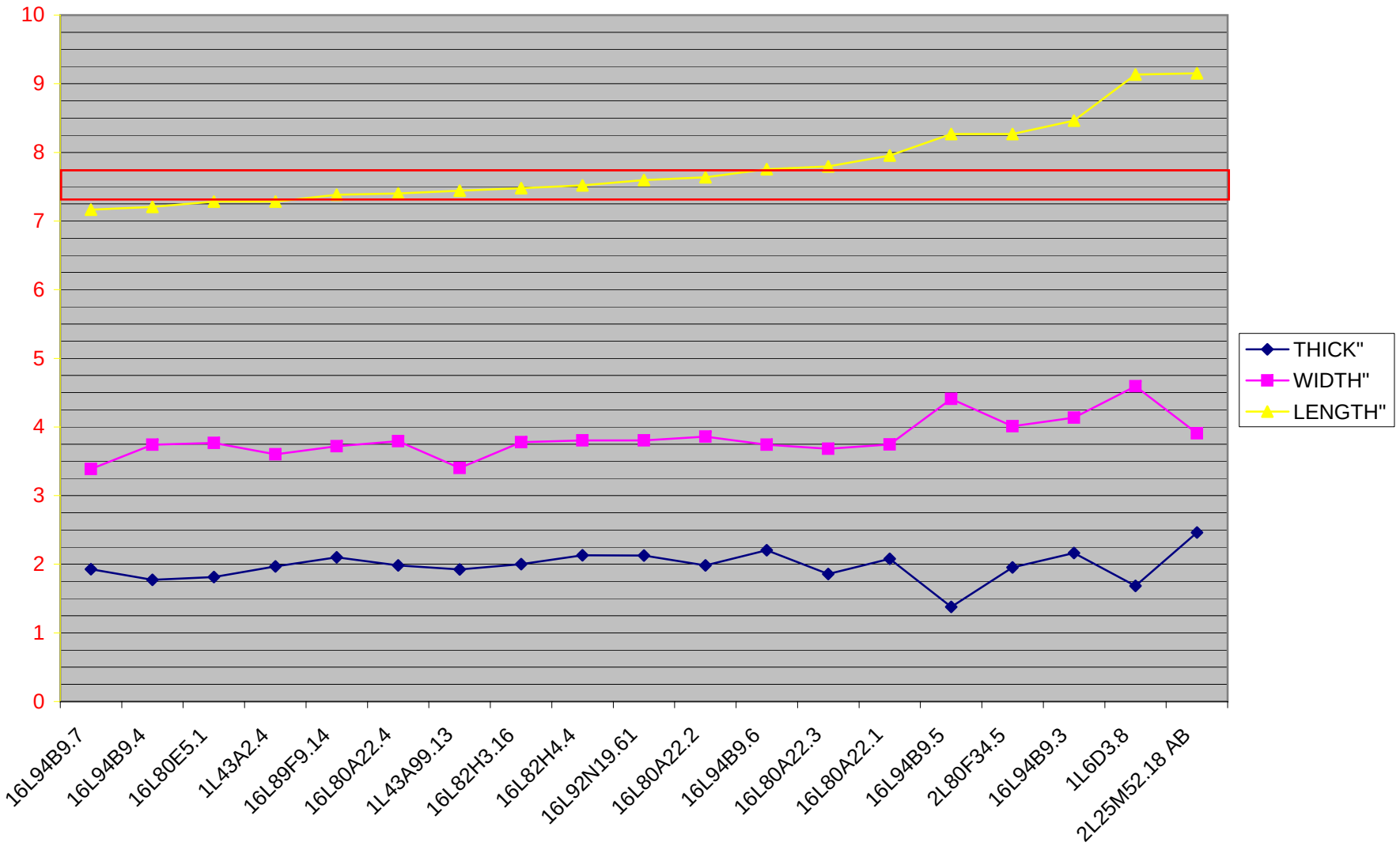
2L25M52.18 AB	9.15	23.25	BRICK RED AND YELLOW

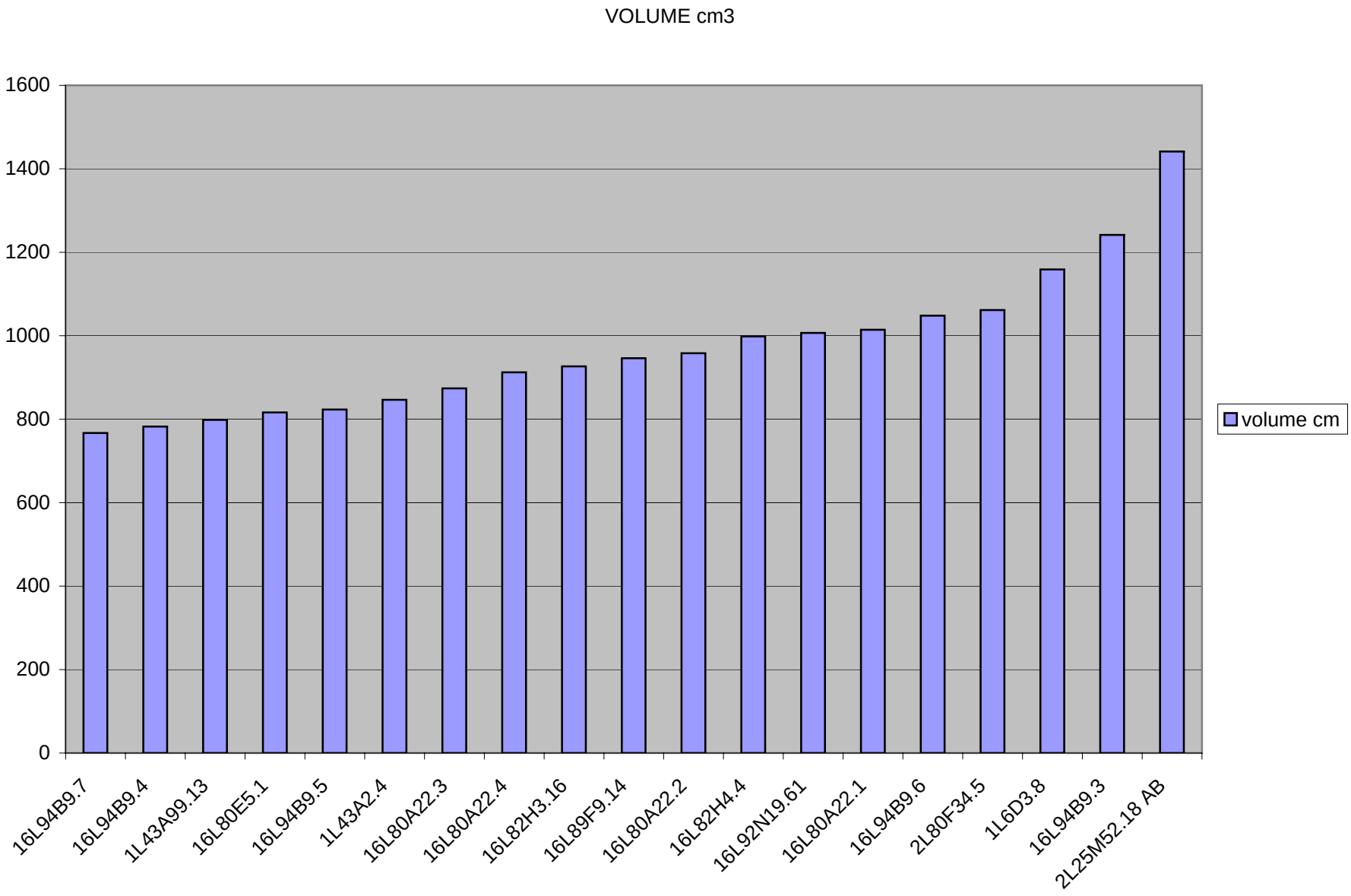
Brick Sizes:

small		7 " x 3 ½" x 2"
standard		7 ½" x 3 3/4" x 2" * majority of bricks
standard (colonial)		8" x 3 3/4" x 2"
large	thin	8 1/4" x 4 ½ x 1 3/8"
		8 ½" x 4 3/8" x 2"
extra large	thin	9" x 4 ½ " x 1 3/4"
		9" x 4" x 2 1/2"

PROVENIENCE	THICKNESS	WIDTH	LENGTH	volume cm	THICK"	WIDTH"	LENGTH"
16L94B9.7	4.9	8.6	18.2	766.948	1.929134	3.385827	7.165354
16L94B9.4	4.5	9.5	18.3	782.325	1.771654	3.740157	7.204724
16L80E5.1	4.61	9.57	18.5	816.17745	1.814961	3.767717	7.283465
1L43A2.4	5	9.15	18.5	846.375	1.968504	3.602362	7.283465
16L89F9.14	5.34	9.45	18.75	946.18125	2.102362	3.720472	7.38189
16L80A22.4	5.04	9.63	18.8	912.46176	1.984252	3.791339	7.401575
1L43A99.13	4.89	8.64	18.9	798.51744	1.925197	3.401575	7.440945
16L82H3.16	5.08	9.6	19	926.592	2	3.779528	7.480315
16L82H4.4	5.41	9.66	19.1	998.17746	2.129921	3.80315	7.519685
16L92N19.61	5.4	9.66	19.3	1006.7652	2.125984	3.80315	7.598425
16L80A22.2	5.04	9.8	19.4	958.2048	1.984252	3.858268	7.637795
16L94B9.6	5.6	9.5	19.7	1048.04	2.204724	3.740157	7.755906
16L80A22.3	4.72	9.35	19.8	873.8136	1.858268	3.681102	7.795276
16L80A22.1	5.28	9.51	20.2	1014.29856	2.07874	3.744094	7.952756
16L94B9.5	3.5	11.2	21	823.2	1.377953	4.409449	8.267717
2L80F34.5	4.96	10.19	21	1061.3904	1.952756	4.011811	8.267717
16L94B9.3	5.5	10.5	21.5	1241.625	2.165354	4.133858	8.464567
1L6D3.8	4.28	11.67	23.2	1158.78432	1.685039	4.594488	9.133858
2L25M52.18 AB	6.25	9.92	23.25	1441.5	2.46063	3.905512	9.153543

Domestic bricks pre-1745




VOLUME cm3
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1000
800
600
400
200
0
volume cm
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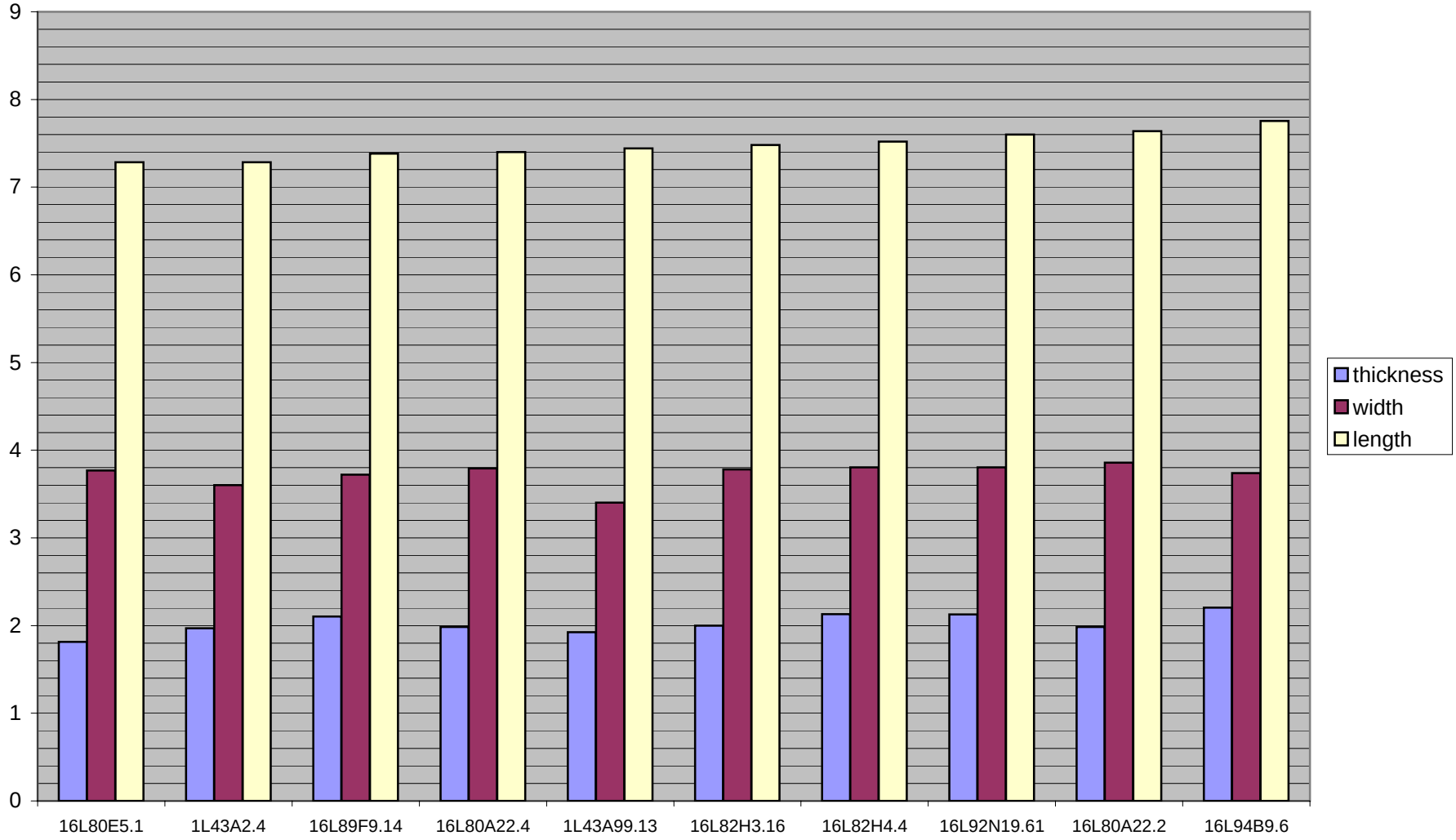
16L94B9.4
1L43A99.13
16L80E5.1
16L94B9.5
1L43A2.4
16L80A22.3
16L80A22.4
16L82H3.16
16L89F9.14
16L80A22.2
16L82H4.4
16L92N19.61
16L80A22.1
16L94B9.6
2L80F34.5
1L6D3.8
16L94B9.3
2L25M52.18 AB

Domestic Context Bricks
7.5 average length



In both domestic and military contexts the majority of the bricks measured fall in the range of 7 ½" x 3 3/4" x 2" and 8" x 3 3/4" x 2"

None of the bricks truly reflect the sizes expressed in the source material even when adding mortar joint amounts. The bricks measured for the military context appear to have a small amount of range variation in the length of brick size with no real variation in the ranges of width and thickness. This makes sense as the brick comes from one structure and possibly one construction event. The domestic context has a larger number of sizes determined by ranges in length, width and thickness. The majority are shorter than those found in the military context. What makes one group different from the other could be a matter of placement of the bricks in the kiln for firing, how clean the mold was and the clay composition of the brick itelf. While colour was not taken into consideration it should be noted that orange coloured occurred in extra large bricks and the largest overall brick was an unusual mottled yellow and red brick.

Sources:

http://www.sizes.com/materls/brickNonM.htm

Brick Sizes at the Fortress of Louisbourg, 1725 through 1744-1745 - *Eric Krause*
http://fortress.uccb.ns.ca/search/BrickSizes.htm

Bricks and Brickmaking: A Handbook for Historical Archaeology, Karl Gurcke,The University of Idaho Press, 1987

non-modular brick sizes

Dimensions given are nominal; *they include the thickness of the mortar joint.* The actual physical dimensions of a brick would be smaller; when the brick is laid the mortar brings it to the size of the module. So for example a “standard” brick intended to be laid with $^{3}/_{8}$ inch mortar joints might have actual dimensions of 3¾ inches × 1 $^{7}/_{8}$ inches by 7 $^{5}/_{8}$ inches, while a standard brick for ½ inch joints might be 3¾ inches × 1¾ inches by 7½ inches.

Historical sizes

For readers hoping to date a building by its bricks, a word of warning from the archeologist Ivor Noël Hume:

> [Bricks] have also served as a kind of Rosetta Stone for architects and archeologists attempting to date old foundations and buildings. The sad truth of the matter, however, is that individual bricks are not nearly as informative as we are often led to believe, though when seen in their original coursing they can offer us a few general guidelines. ... The fallacy of trying to date a building by its brick sizes is exhibited time and again

when one measures numerous examples from one foundation and finds half a dozen different sizes used in its construction. These variations may be all of the same date, but they may also be derived from the long-established practice of robbing abandoned buildings of their bricks and re-using them in later walls. Such loot can often be identified by the presence of more than one type of mortar on a single brick.1

A statute of Elizabeth I (*1571*)		9	4¼	2¼
A statute of George I (*1725*)	place brick	9	4¼	2½
	stock brick	9	4¼	2 5/8
Neve (*1736*)2	statute, small, or common brick	9	4½	2¼
	Great brick	12	6	3
Tabert (*1804*)3		9	4	2½

18th century colonial American 8¾ by 4 by 2 5/8

Type	Depth × height × length
standard	3¾ inches by 2¼ inches by 8 inches
jumbo	3¾ inches by 2¾ inches by 8 inches
3-inch	3 inches by 2¾ inches by 9 inches

The following are considered oversize bricks.

8 inch square	3 5/8 inches by 8 inches by 8 inches
12 inch square	3 5/8 inches by 12 inches by 12 inches
high brick	4 inches by 8 inches by 16 inches

1.
Ivor Noël Hume.
A Guide to Artifacts of Colonial America.
New York: Alfred A. Knopf, *1970*.
Pages 80, 82.

2
Richard Neve.
The City and Country Purchaser's and Builder's Dictionary: or, The Complete Builder's Guide. 3rd ed.
London, *1736*.

3
Benjamin Tabert.
The Book of Trades, or the Library of Useful Arts. Part II.
London (*1804 or 1805*).
Reprinted Philadelphia, *1807*. That edition was reprinted as *Early Nineteenth-Century Crafts and Trades* by Dover Publications in *1992*. The quotation is from page 4.

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Brick Sizes at the Fortress of Louisbourg, 1725 through 1744-1745

By

Eric Krause

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March 6, 2005

The common brick in use at the the Fortress of Louisbourg, beginning at least as early as 1725, and in particular, from 1731 through 1744-1745 was one that had been imported through Boston, Massachusetts.

> ***Les briques que l'on fait icy estant fort petites, et tres mauvaises, et qui tombent en poussise mont fait prendre le parti den faire venir de baston, affin de faire de beaux en bons ouvrages ...*** *[SOURCE] C11B, Volume 7, November 10, 1725, f. 345v [SOURCE]*

During the Louisbourg period (1713-1758), French builders chose hand made bricks either produced on Isle Royale or imported from New England (though in 1722, 8,000 bricks of [8] pouces long may have been ordered from France. *[Source] 1E99, March 18, 1722, p. 284 [Source]* ***In the early years, the only available bricks came from a kiln at Port Toulouse (St. Peter's), set up circa 1716.*** *[SOURCE] Bibliotheque Genie, Manuscript 125, 1717, p. 110; See also C11B, Volume 3, 30 December 1718, folio 120; C11C, Volume 15, item 69, 22 December 1716. [SOURCE]*

However, its product was of an inferior quality, being dry and mixed with small stones, and, in 1723, declared too soft. *[SOURCE] C11B, Volume 27, 1727, folio 315v; Archives Genie, Article 14, no. 43, 20 November 1751; C11B, Volume. 06, 1723, ff. 310-319. [SOURCE]* ***This brick appeared to be 8 pouces* thick [... les briques du Port Toulouse estaient payee il y en avoit plus de 20000 mil et 8000 dans le magazin du Roy ce qui fait 4 tois et 1.3 cube et 37 quarree sur 8 pouces d'epaisseur ...*** *[SOURCE] C11B, Volume 3, December 30, 1718, f. 123v [SOURCE]*

To fill the gap, a New England imported brick came to dominate the building scene from the 1730's to the final fall of Louisbourg in 1758. Meanwhile, in the early 1750's, with mixed results, kilns were set up at Spanish Bay (Sydney), and then, more successfully, in the Mira area. *[SOURCE] Dilys Francis, "The Mines and Quarries of Cape Breton Island During the French Period, 1713 - 1760", (Fortress of Louisbourg, November 15 1965), pp. 20 - 21 [SOURCE]*

In 1737, the "Devis pour la maison Duperrier-Rodrigue" provided the following specifications:

> ***... 8e***
>
> ***... Tous les cheminé Seront fait de Bonne brique bien quitte de huit pouce de long Sur quatre de Large le tout maçonné de mortier de chaux et de Sable fin bien endhuit par dedans de mesme mortier le plus proprement que faire Se pouras ...*** *[SOURCE] G2, Volume 184, 1737, ff. 392-394 [SOURCE]*

According to Louis Franquet, Director of Fortifications for the whole of New France, the Isle Royale brick of 1753 from Spanish Bay measured 8 pouces 3 lignes by 4 pouces 2 lignes by 2 pouces l/2 ligne [8.7944 x 4.4416 x 2.1764 inches or i.e 8 51/64 x 4 29/64 x 2 5 1/2/32 inches]. However, at this time, the imported New England brick measured only 7 pouces long by 3 pouces 6 lignes wide, by 1 pouce 8 lignes thick [7.462 x 3.7308 x 1.7760 inches or i.e 7 15/32 x

3 47/64 x 1 25/32 inches). *[SOURCE] C11B, Volume 33, October 9, 1753, ff. 464 - 465 [SOURCE]*

Normally, when one sees a brick dimension, it is considered nominal in that it includes the thickness of the mortar joint. Thus, physically, the actual brick is a usually smaller. For example, a brick described as being 8 inches long but laid with a 3/8 inch joint would actually have measured only 7 5/8 inches in length when in hand.

Now, how does the 1753 Isle Royal descriptions fit with this rule?

Significantly, Franquet's initial cost calculations were based entirely on the price per imported brick (e.g. 21 livres 10 sols per 1000 English bricks), thus clearly indicating that the above dimensions were their actual physical size. When he then further stated that experience indicated that it took 7938 (at a cost of 170 livres 13 sols 4 deniers 2/25) of the smaller English brick to occupy the same 1 toise cube of space that 4860 of the larger local brick took, only then was he taking into account the mortar joint. Moreover, he was to later observe, that within that same cubic space, the local brick would have required 2/7th less mortar than the English brick, thus increasing entrepreneurial profits. Of interest, in 1753, the charge-back, which would have included both the bricks and the required mortar, in a construction Devis with Claude Coeuret for maintaining the King's works, was 120 livres per cubic toise. ([ASQ, Surlaville Papers, October 1, 1753]

Although brick imports from New England were to continue in the 1750's, there was clearly a renewed interest at this time in local bricks, and that, in 1753, when they cost 27 livres per 1000 (notwithstanding Coeuret's even cheaper arrangement), the price was most competitive. According to Franquet, a charge of as much as 35 livres per 1000 would have returned the same price as those from New England. *[C11B, Volume 33, October 12, 1753, f. 237; C11B, Volume 33, October 9, 1753, ff. 464 - 465.]*

In England, government statutes in force during the Louisbourg period set the size of the common brick in inches at 9 in length by 4 1/2 in width by 2 1/4 in thickness. *[SOURCE] John Muller, A Treatise Containing The Practical Part of Fortification, (London, 1755), p. 102.; See also, Calder Loth, "Notes on the Evolution of Virginia Brickwork from the Seventeenth Century to the Late Nineteenth Century," in APT Bulletin, 6:2 (1974), pp. 82 - 83. Loth suggested that the width was 4 1/4 (4.25) inches. [SOURCE]*

In the American colonies, its bricks often measured this English "statute" size as well. *[SOURCE] Harley J. Mckee, Introduction to Early American Masonry, Stone, Brick, Mortar and Plaster, National Trust/Columbia University Series on the Technology of Early American Building, p. 48 [SOURCE]*

However, ordinary French bricks measured 8 (sometimes 9) pouces in length by 4 (sometimes 4 1/2) pouces in width by either 1 or 1 1/2 (often for laying in the place of pavé) or 2 pouces in thickness. *[SOURCE] C.E. Briseux, L'Art de Bâtir des Maisons de Campagne, (Paris, 1743), p. 46; Belidor, La Science des Ingenieurs dans la Conduite des travaux de Fortification et D'Architecture Civile, (Paris, 1729), p. 7; Architecture Moderne ou L'Art de Bien Bâtir, (Paris, 1728), p. 23; J. F. Monroy, Trait d'Architecture Pratique (Paris: 1789), p. 15. In France, a cubic toise of mortared brickwork equalled 4600 bricks (8x4x2 pouces) or 520 when used in one toise quarre'e of work of one brick thickness (i.e. 8 pouces). At this time, French bricks weighed about 4 livres each - Belidor, p. 27; See also J.F. Blondel, Cours d'Architecture, (Paris, 1777), p. 169. He stated that they weighed only 1 1/2 livres. [SOURCE]*

In Massachusetts, in 1711, according to the consolidated act, some things were to change, including brick size:

> *That Clay for the making of Bricks shall be digged before the tenth of December yearly; and shall be turned over in the Month of February or March next ensuing, at least twenty Days before it be wrought; and then well and thoroughly wrought. And no*

Person shall temper his Clay with salt or brackish Water; nor digg any Clay in any Place where the salt Water comes in. ... That the Size of Bricks shan't be less than nine Inches long, four Inches and a Quarter of an Inch Broad, and two Inches and an Half Inch thick. And all Moulds to be used for the making of Bricks, shall be made agreable to these Sizes: That is to say, not less than nine Inches and a Quarter of an Inch long, four Inches a Quarter and a Half Quarter of an Inch broad, and two Inches and Half an Inch deep, within Side; being well shod with Iron, and sealed by the Sealer to be appointed, as is herein directed: so that the Bricks may hold out the Dimensions prescribed as aforesaid, as near as may be when burned ... [SOURCE] Acts and Laws of His Majesty's Province of the Massachusetts-Bay in New-England (Boston, 1759), 1711, pp. 172-173 [SOURCE]

In Boston, in the 1760"s at least, some bricks measured in inches 8 long by 4 wide by 2 thick. Those placed on the outward face of the building were to be struck in sand. [SOURCE] George Francis Dow, The Arts and Crafts in New England, (Topsfield, 1927), pp. 219 -220 [SOURCE]

As late as 1772:

WANTED, for building a New Meeting-House ...

... 800 Thousand Bricks eight Inches long four wide and two thick, to be made of tough well-tempered Clay, and well burnt, one quarter Part of them to be stuck in Sand for the outward Face of the Building. Four Thousand Sand Bricks for outside Arches, nine Inches long four & half wide and two & half thick. One Thousand Water-table Bricks made in Proportion to the Others. One & half Thousand O G Bricks for Facias, 8, 4 & 2. ... [SOURCE] Boston News-Letter, February 20, 1772 [SOURCE]

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*

1 French Ligne = .0888 English Inches [3/32] with 12 ligne to a pouce
1 French Pouce = 1.0656 English Inches [1 1/16]