How Much Do You Know about Bricks?

Introduction to Earth2Class 10 Mar 2018

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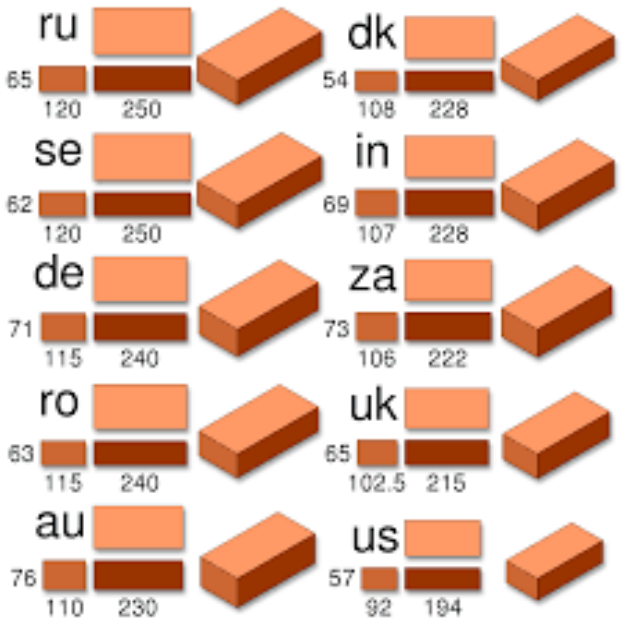
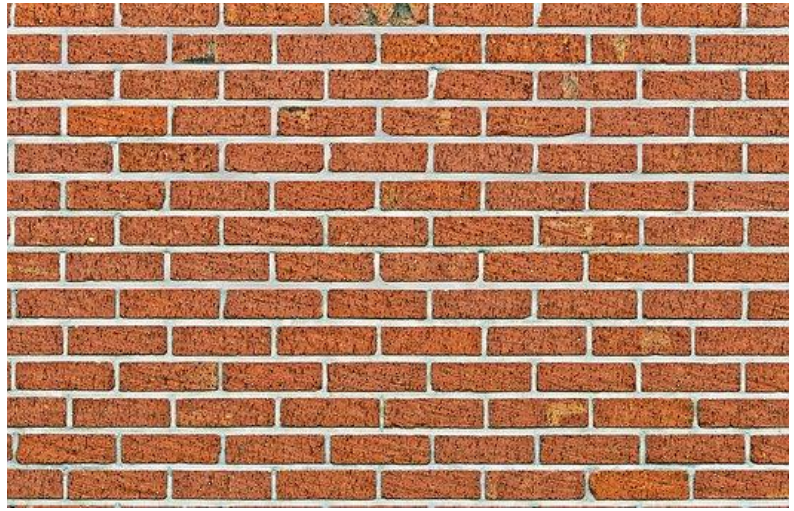


What defines a “brick”?

- Rectangular solid building material used to make walls, pavements, and other masonry construction.
- Traditionally made of clay, but can also be other materials
- Produced in bulk quantities in many sizes and variations
- Two basic types are **fired** and **non-fired**



When were the first bricks used?

- Air-dried bricks (“mudbricks”) earlier than 7,500 BC

  Made with mud, water, and binder such as straw

- Tell Aswad (“Black Hill”) near Damascus may date to 9300 BC (Neolithic)

[Also known for decorated skulls]

https://en.wikipedia.org/wiki/Tell_Aswad

http://www.abovetopsecret.com/forum/thread819706/pg1

Brick-making was invented/spread to all continents very early in human history

- Egyptians used sun-dried bricks made from Nile River mud
  Protected from weathering by external stone facing

- (Think about the tradition of moror in the Jewish Passover seder)

Fired ("ceramic") bricks

- Among earliest are found in ruins from the Western Zhou dynasty in China about 3,000 years ago. Produced on a large scale

  (For those who want to learn more in a scholary article: https://www.arct.cam.ac.uk/Downloads/chs/final-chs-vol.16/chs-vol.16-pp.3-to-11.pdf)

- Fired bricks last longer than air-dried bricks.
  So it is no surprise that the technic was spread and adopted in many Mediterranean, Asian, African, and European civilizations

Many Roman structures were built of bricks

- The Pantheon incorporated brick
- Volcanic ash provided a useful material for making mortar

https://www.romeartlover.it/Costroma.html

Most bricks today contain the following ingredients:

- Silica (sand) – 50% to 60% by weight
- Alumina (clay) – 20% to 30% by weight
- Lime – 2 to 5% by weight
- Iron oxide – ≤ 7% by weight
- Magnesia – less than 1% by weight

Like most trades with a very long history, brickmaking uses many words with special, traditional meanings

Three common methods to produce bricks

- **Molded bricks** – start with raw clay and 25–30% sand to reduce shrinkage. Clay first ground and mixed with water to the desired consistency. Then pressed into steel moulds with a hydraulic press. Fired ("burned") at 900–1000 °C to achieve strength.
- **Dry-pressed bricks** – similar to the soft-mud moulded method, but starts with much thicker clay mix, so forms sharper-edged bricks. Greater force in pressing and longer burn make this more expensive.
- **Extruded bricks** – Mixed with 10–15% water (stiff extrusion) or 20–25% water (soft extrusion) in a pugmill. Mixture forced through a die to create long cable of desired width and depth. Cut into bricks of desired length by wall of wires. Produces hard, dense bricks. Dies can produce perforations which reduce the volume of clay needed. Lighter, easier to handle, different thermal properties . Hardened by drying for 20 to 40 hours at 50 to 150 °C before being fired.

Modern brickworks may use conveyor lines

- Bricks are fired in a continuously tunnel kiln
- Move slowly conveyors, rails, or kiln cars
- Achieves more consistent product
- Often have lime, ash, and organic matter added to speed up burning process

What produces different colors in bricks?

Fired color of clay bricks influenced

- chemical and mineral content of the raw materials
- firing temperature
- and atmosphere in the kiln.

For example, pink bricks are the result of a high iron content, white or yellow bricks have a higher lime content.

Bricks made with materials other than clay

- **Calcium-silicate bricks** (also called sandlime or flintlime bricks)
- Made with lime binding the silicate material.
- Raw materials include lime mixed in a proportion of about 1 to 10 with sand, quartz, crushed flint, or crushed siliceous rock, together with mineral colorants.
- Mixed and left until the lime is completely hydrated, then pressed into moulds and cured in an autoclave for three to fourteen hours to speed the chemical hardening

What the difference between blocks and bricks?

- Bricks formed from concrete are usually termed as blocks
- Typically pale grey
- Made from dry, small-aggregate concrete formed in steel moulds by vibration and compaction
- Finished blocks are cured, rather than fired, using low-pressure steam.
- Concrete blocks manufactured in much wider range of shapes and sizes than clay bricks

What determines the size of bricks?

- For efficient handling and laying, must be small enough and light enough to be picked up using one hand, leaving the other hand free for the trowel.
- Usually laid flat, so effective limit on the width of a brick set by the distance which can conveniently be spanned between the thumb and fingers of one hand
- Normally this is about four in/100 mm
- In most cases, length of a brick is about twice width, about eight in/ 200 mm
- Standardized sizes vary by country

What are some other “brick facts”?

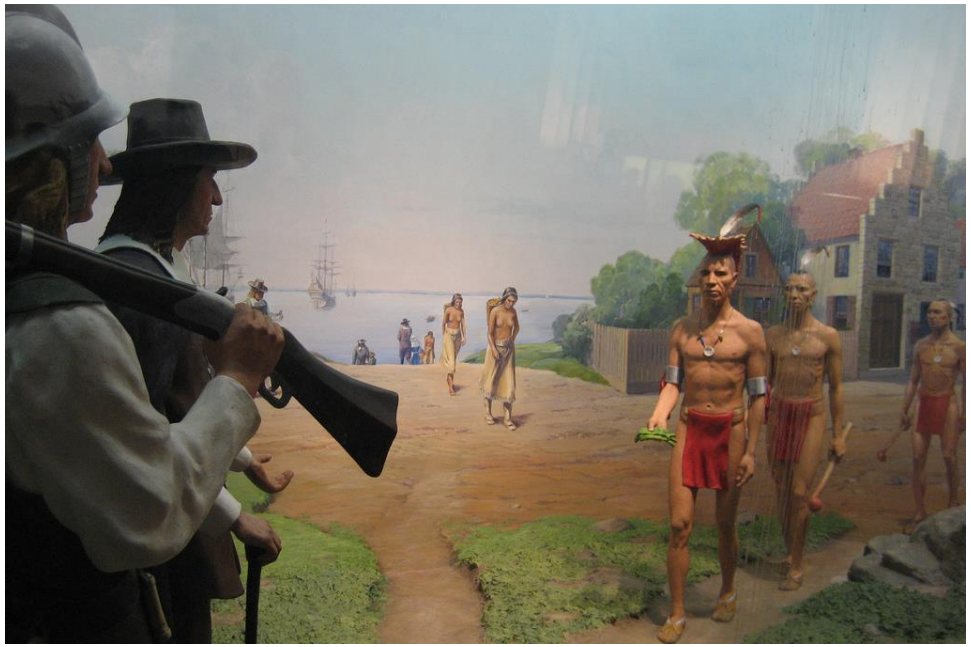
- Bigger brick makes for a thicker (and more insulating) wall Historically, this meant that bigger bricks were common in colder climates, such as Russia
- Smaller bricks adequate and more economical in warmer regions
- Bricks may be solid, indented, perforated, cellular, or hollow
- Use of brick largely restricted to small to medium-sized buildings (steel and concrete superior materials for high-rise construction)

Starting in the 20th century, use of brickwork declined in areas due to concerns with earthquakes. Earthquakes such as the San Francisco earthquake of 1906 and the 1933 Long Beach earthquake revealed weaknesses of unreinforced brick masonry in earthquake-prone areas. During seismic events, mortar cracks and crumbles, and bricks no longer held together.
Brick masonry with steel reinforcement helps hold the masonry together during earthquakes

Retrofitting older unreinforced masonry structures has been mandated in many jurisdictions.

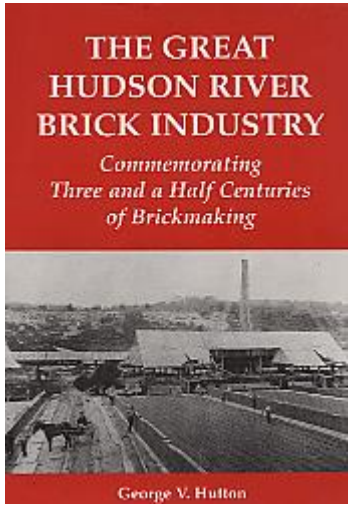
Brick-making in the US

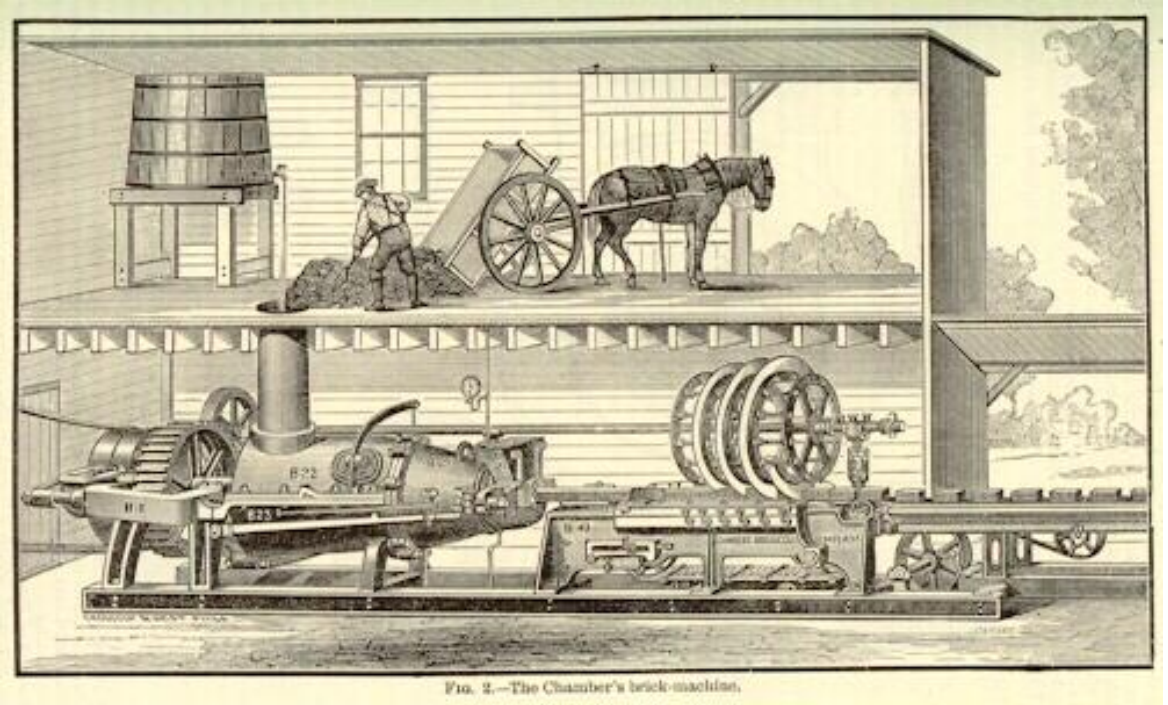
- Probably first made in Virginia as early as 1612
- Salem, MA, kiln established in 1629
- Dutch in New Amsterdam imported yellow bricks from Holland



Clays—many from glacial lake beds—made it unnecessary to import bricks

- Albany (Fort Orange)
- Philadelphia
- Trenton and Burlington
- Raritan River
- Haverstraw





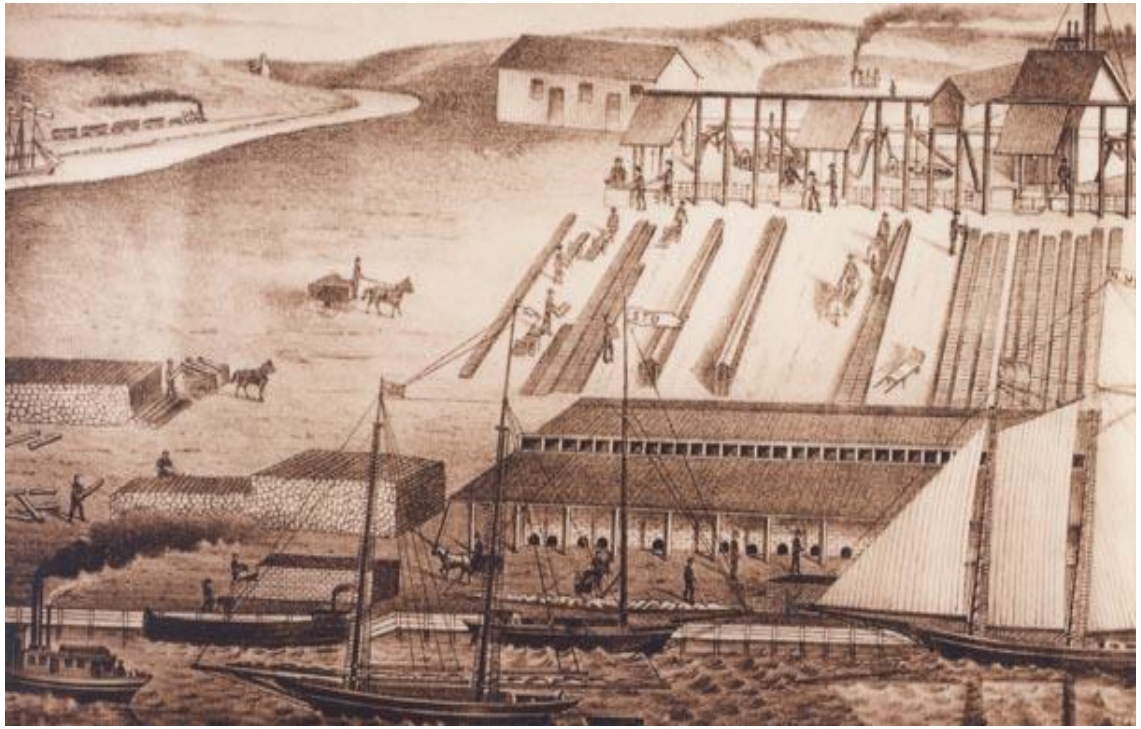
http://brickcollecting.com/history.htm

http://brickcollecting.com/hudson.htm

Brick-making in our local area

- “Glacial Lake Hackensack” provided the clay at Little Ferry
- AMNH geologist counted the annual layers (“varves”) and showed lake lasted 2,500+ yrs

- More info: “Bricks, Stones, and Traprocks”
- Also: “Little Ferry’s Brick Yards”



http://www.njmeadowlands.gov/njmc/about/district/history.html)

St, Croix, US Virgin Islands (Sint-Kruis/Sankt Croix/Santa Cruz/Ay Ay)

Geography and Climate

- St. Croix lies at 17°45’N 64°45’W, making it the easternmost point in the United States of America (ignoring westernmost Aleutian Islands just west of the 180th meridian)
- Trade wind blows more or less along the length of the island. Hills of the western part of the island receive a good deal more rain than the east end; annual rainfall is on the whole extremely variable, averaging perhaps 40 inches (1,000 mm) a year.
- East end of the island is a dry desert range with a substantial amount of cactus; west end has lush vegetation and palm trees.
- Multiple ecosystems in a small geographic area.
- Fairly severe and extended drought has always been a problem

History of St Croix – 15th/16th Century

- Inhabited by various indigenous groups during its prehistory.
- Christopher Columbus landed on Santa Cruz, as he called it, on November 14, 1493
- Immediately was attacked by the Kalinago, who lived at Salt River on the north shore (first recorded fight between the Spanish and a New World native population)
- Columbus named battle site *Cabo de la Flecha* (Cape of the Arrow)
- Most or all of the native population eventually dispersed or killed
- By the end of the 16th century, the islands were uninhabited[

17th Century

- Dutch and English settlers landed St. Croix in 1625, joined by some French refugees from St. Kitts
- English expelled others before they were evicted by Spanish invasion in 1650
- Spanish occupation short lived since a French force attacked and established a colony
- From 1651 until 1664, Knights of Malta ruled in the name of Louis XIV
- Island then passed to French West India Company
- Colony evacuated to San Domingo in 1695 when France battled the English and Dutch in the War of the Grand Alliance
- Uninhabited and abandoned for another 38 years

18th Century

- In 1725, St. Thomas Governor Frederick Moth encouraged Danish West Indies Company to purchasing *Santa Cruz'* (St. Croix).
- In 1733, France and Denmark-Norway concluded a treaty by which the Danish West India Company bought St. Croix for 750,000 livres.
- Moth named the first Danish governor of St. Croix
- 1742 census lists 120 sugar plantations, 122 cotton plantations, and 1906 slaves, with about 300 Englishmen and 60 Danes on the island
- By 1754, the number of slaves had grown to 7,566

18th – 20th Century

- For nearly 200 years, St. Croix, St. Thomas and St. John were known as the Danish West Indies.
- By late 18th century, at peak of the plantation economy, enslaved population of St. Croix numbered between 18,000 and 20,000, and the white population ranging between 1,500 and 2,000

  (Are you beginning to see why the question of where the bricks came from is not easy to answer?)

Alexander Hamilton

- Alexander Hamilton and his brother lived with their mother Rachel "Faucette" on St. Croix, after she returned to the island in 1765
- Within two years, Hamilton lost his father, James Hamilton, by abandonment, and his mother to death. Official documents from 1768 probate court testimony from his uncle established Alexander's age at thirteen
- By 1769, Hamilton's cousin, aunt, uncle, and grandmother had also died
- His brother James became an apprentice carpenter, and Alexander became the ward of Thomas Stevens, a merchant on King Street
- Hamilton was soon clerking in the export-import business of Beekman and Cruger
- In 1772, local businessmen funded Hamilton's further education at King's College in New York (The rest is history, to coin a phrase.)[1]

Back to the early 19th Century

- British invasion (not the Beatles) and occupation of the Danish West Indies took place at the end of March 1801. Denmark-Norway accepted the Articles of Capitulation and the Britain took control without a shot being fired. Occupation lasted only until April 1802, when Britain returned the islands to Denmark-Norway
- A second British invasion of the Danish West Indies in December 1807, when a British fleet captured St Thomas and St. Croix. Denmark-Norway did not resist and the invasion again was bloodless. Lasted until 20 November 1815.
- Both invasions due to Denmark's alliance with France during Napoleonic Wars. On the conclusion of peace with France, islands returned to Denmark

20th – 21st Century

- In 1916, Denmark sold St. Croix, St. Thomas, and St. John to the United States under the Treaty of the Danish West Indies. Formal transfer of the islands to the U.S. took place on April 1, 1917.
- Island's inhabitants were granted United States citizenship in 1927. Industrialization of the island and its move away from an agrarian society took place in the 1960s
- 2012 shutdown of the Hovensa refinery resulted in the loss of many jobs. Agriculture has seen a slow resurgence, due to rise in demand for local produce and agricultural products
- Tourism and rum are important sources of income today.

No discussion of bricks can end without a tip of the hat to George Herriman, creator of Krazy Kat and Ignatz (and one of the most influential cartoonists in history)