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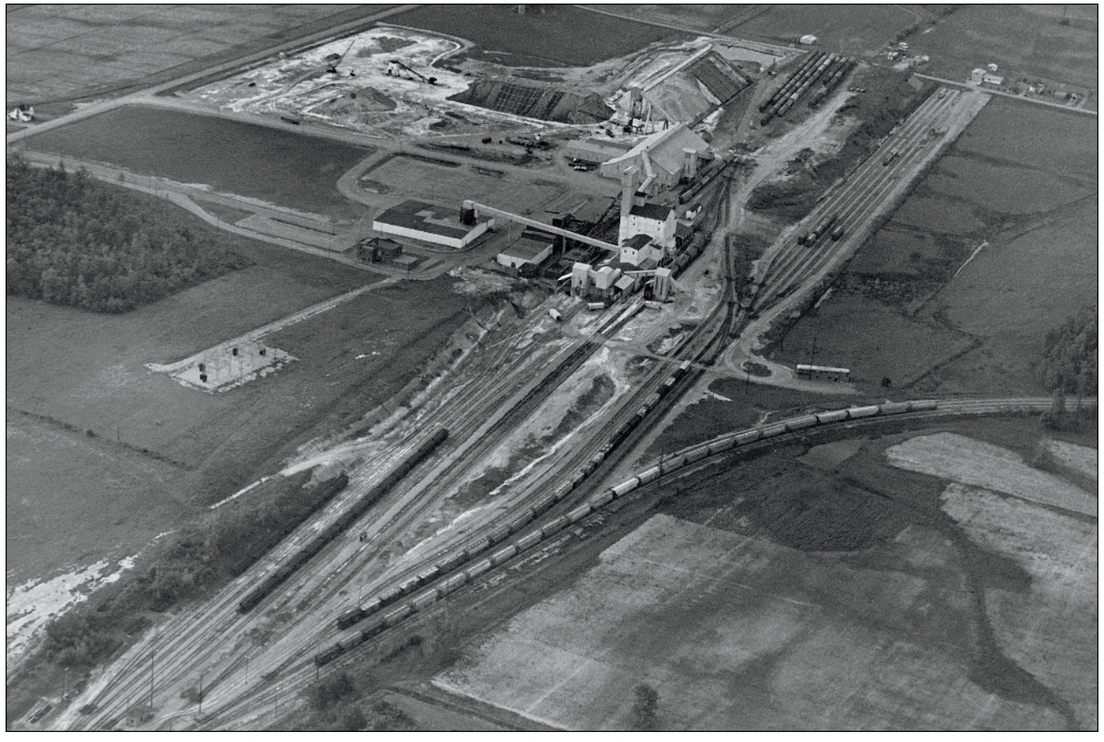
Salt mining

TWO

Covered hoppers are loaded at the International Salt Co. mine at Retsof, N.Y., which was the largest salt mine in North America when this photo was taken in 1975. More than 75 cars were loaded each day. The mine closed after it collapsed and flooded in 1994. The headhouse is the tall structure at the center; the separate loading building at left can fill hopper cars and trucks (far left). *Harold Russell*

You might think of salt in terms of the salt shaker on your kitchen table as a seasoning for food, but salt has many other uses: as an ice control for highways in winter, as a feedstock for chemical production, as an ingredient in many products, and as a key element in manufacturing processes. Salt has long been used in food preparation, and it was especially valuable as a preservative in the days before refrigeration.

Once a staple of the rich, salt has become an affordable, common commodity through the advent of improved mining techniques during the late 1800s. Into the 1900s, salt mining and its processing became major industries, and railroads have played an important role in moving bulk salt, packaged salt, and salt products from mines and processing plants to consumers.



This aerial view shows the Retsof mine with large salt storage piles at the rear and a conveyor going to a covered storage shed at left. Empty covered hoppers in the small yard at the top of the photo are on a grade, allowing them to coast downhill to the breaker as needed. From there, a car puller (winch) moves loads to the yard (at left). *Harold Russell*

The world salt market is huge, with a total production of about 250 million tons annually. The United States produces about 45 million tons of salt per year—second only to China, which is responsible for about 60 million tons—and Canada produces about 6 million tons per year.

Salt is a chemical compound, sodium chloride (NaCl), which is a blend of about 60 percent sodium (Na) and 40 percent chlorine with some trace minerals and other impurities. It's found below ground in hard mineral form as halite (also known as rock salt), and it also exists naturally in liquid form in oceans and salt-water lakes. Salt is recovered both by mining underground halite deposits and by evaporating salt water to recover the salt crystals.

Salt is sold in many different forms and grades depending upon its intended purpose. For example, food-grade salt must contain at least 97.5 percent sodium chloride, and pharmaceutical-grade salt is processed to be about 99.9 percent pure. The rock salt that's spread on highways for snow removal can have more impurities, and it is not processed other than being crushed to the proper size.

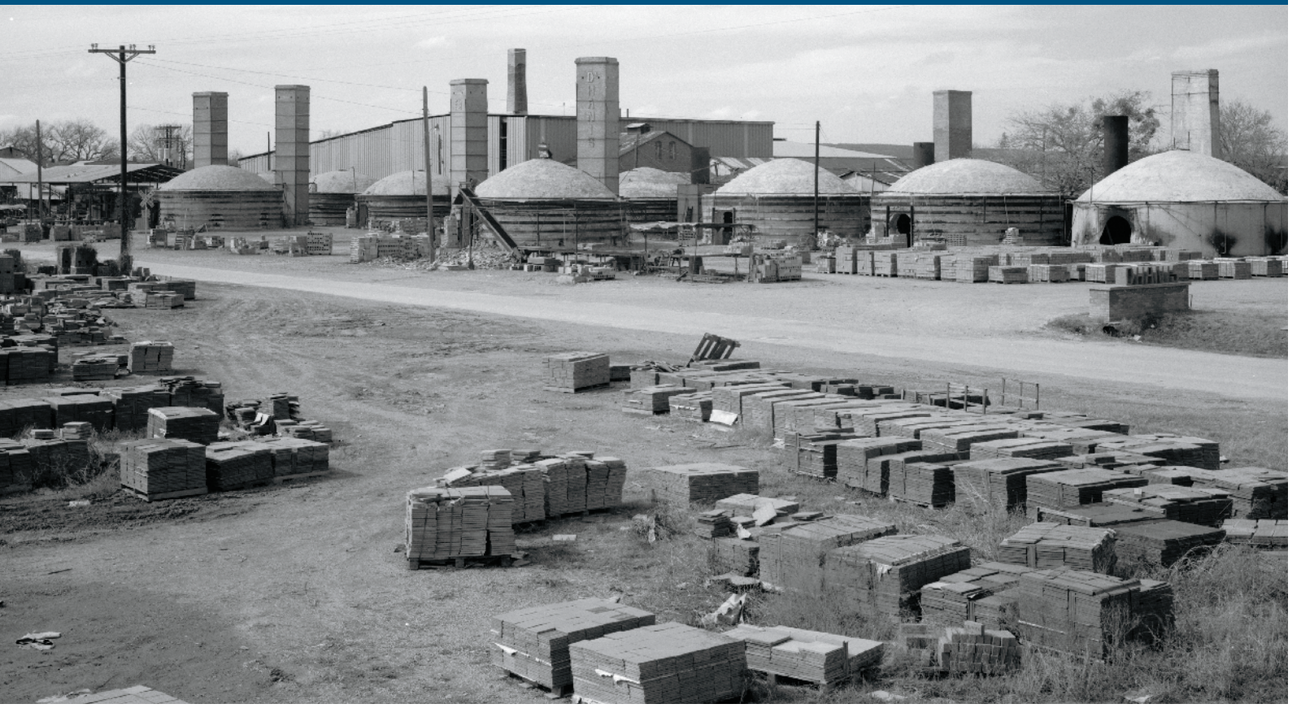
History and uses

Salt has been used by humans for thousands of years. From early history, the typical way of recovering salt was to boil brine and let the water evaporate, leaving behind salt crystals. Sea or salt-lake water (or manmade ponds of salt water) were used for the brine.

As bodies of salt water receded millions of years ago, large beds of halite formed. Layers of salt can be from 50 to 100 feet thick and extend for hundreds of miles. Some salt deposits exist as horizontal layers between stratified layers of rock, much like coal. Other deposits are much thicker. Called salt domes, these tall columns of salt were formed when underlying salt beds were forced upward through rock strata, and they can be hundreds of feet thick.

Mining of these underground salt deposits became a more practical salt-recovery method in the 19th century. Manufacturers use three methods to recover or make salt. The one I'll concentrate on is conventional mining, which employs processes similar to coal mining. Shafts are sunk underground to the solid rock salt seams or domes. The salt is broken up and brought to the surface, where breakers grind the salt into various grades.

Classic brickyards



THREE

Beehive kilns were an icon of brickyards from the 1800s through the 1950s, and some remained in operation into the 1970s or later. This is the D'Hanis Brick & Tile Co. in D'Hanis, Texas. The process building is at the rear, and a rail spur enters the facility near the left-most kiln, where a crossbuck is visible. *Historic American Engineering Record (HAER)*

Throughout the 1800s, the country was expanding rapidly as new areas were being settled. Cities were growing, and older wood structures needed replacement. After several major fires in large cities, brick became the standard construction material for city and industrial structures. There was a great need for bricks for building homes, storefront buildings, and industrial structures as well as for paving sidewalks and streets. Thousands of small, local brickyards operated throughout the country, tapping into local clay deposits as raw material.

As mechanization came to the industry, most less-efficient brick manufacturers closed; however, others grew in size, increased production, and shipped their finished products longer distances. Railroads became a primary method of moving finished bricks.

This aerial view shows a typical medium-sized brickyard from the beehive kiln era, the United Clay Products plant in Washington, D.C. The process buildings are to the left, and the drying shed (with 38 drying tunnels) is in the middle. The plant closed in 1972, and this view is from 1983. *HAER*

The distinctive look of classic brickyards, with their beehive kilns, tall smokestacks, numerous open storage areas, and other interesting details make them appealing subjects for modeling.

History

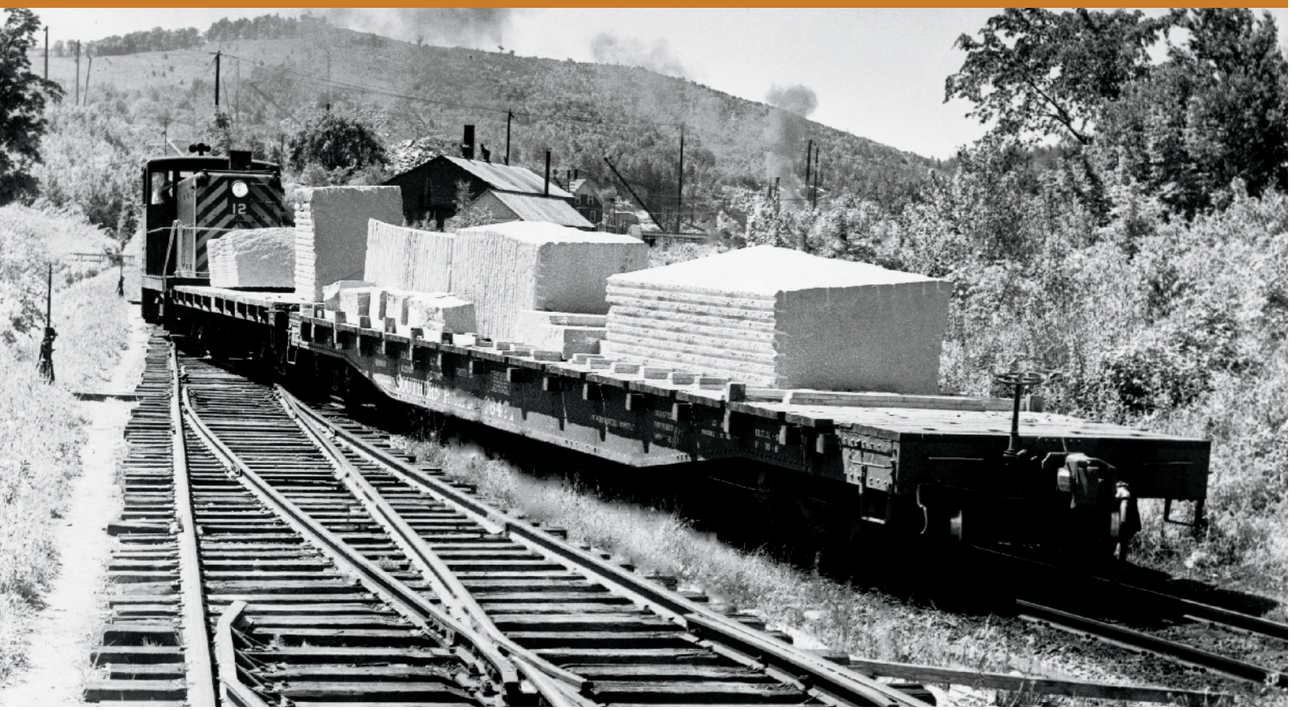
Fired bricks have been around since 2000 B.C., and sun-dried mud bricks were used for thousands of years before that. In the United States, brick kilns were being erected in the colonies in the early 1600s.

Brick resulted in long-lasting, durable structures that, most importantly, were far more resistant to fire than traditional wood-sheathed buildings. In the late 1800s, as towns and cities grew rapidly in the East and spread with expansion to the West, brick became the preferred building material for downtown storefront and office structures (where fire would be devastating since buildings abutted each other). Brick also became the material of choice for large industrial buildings, warehouses, and factories, as well as houses of the well-to-do.

The rails in this scene at the United Clay brickyard were for dryer carts that carried green bricks from the drying shed (in the background) to the kilns. *HAER*

Transporting bricks long distances wasn't very cost effective, so thousands of brickyards sprang up across the country, following the settlement of new areas. Nineteenth-century brickyards relied on a lot of manual labor and a nearby source of clay and other raw materials. The

Quarries



FOUR

A Barre & Chelsea locomotive pulls two flatcars of granite blocks from a Vermont quarry. The wood planks on the deck of the car keep the blocks from shifting. *Jim Shaughnessy*

Quarries play a major role in the construction industry, producing various aggregates such as sand, gravel, and crushed rock as well as large slabs of stone including granite and marble. Modern quarry pits can be huge—resembling open mines—and the loading and crushing areas feature lots of interesting heavy construction equipment. Railroads have long been involved in serving quarries and hauling aggregates in open hoppers or gondolas, with flatcars and gondolas used for dimensional stone. Since quarries are located throughout the country, most modelers would be able to realistically add one to their layouts.

Rock, in various forms, is one of the world's greatest, and most abundant, natural resources. Rock and rock products have been used for construction projects since primitive man.

Some quarries resemble coal mines, with the crushing equipment in tall structures. Two loading bays for railcars pass under the structure, with a large stockpile and conveyors at the side. *Jim Hediger*

A complex system of covered and open conveyors carry materials around the Canada Crushed & Cut Stone Co. in Dundas, Ontario. The raw stone comes in from atop the hill at right and is screened and processed by the structures at left and center. *Bob Chambers*

Along with using solid blocks of rock to make walls, buildings, roads, walkways, dams, bridges, and other structures, various types of aggregates are key ingredients in many products. They are used by themselves for landscaping, road and railroad subroadbed, railroad ballast, and other construction projects.

All rock is not created equal—the many types of rock have significantly varying characteristics, making each suitable for different uses. Rock falls into three broad classes. Sedimentary rocks, such as limestone and sandstone, are formed by fine particles of sediment that build up over time in places such as an ocean floor. Time and pressure bond the materials into distinctive layers, or beds. Igneous rock, such as granite, is formed when molten rock cools and hardens. Metamorphic rock starts out as igneous or sedimentary rock, but heat and pressure transform it and alter its qualities. One example is marble, which is formed from limestone that has recrystallized. There are many types of rock in each category, and each has different qualities in appearance, grain, strength, and durability.

This limestone quarry near Birmingham, Ala., is about 400 feet deep. It has been worked in several levels. Historic American Engineering Record (*HAER*)

Rock facilities fall into two basic categories: pits and quarries. A pit recovers naturally occurring material such as sand and gravel (hence the terms *gravel pit* and *sand pit*). Operations at pits are limited to excavating materials, screening and sizing them, and loading.

A quarry deals with solid rock and stone and processes it into dimensional stone or aggregates. Along with excavating, quarries crush rock and often process it further into worked or dressed material. Quarries are generally much larger operations than pits and are more likely to be served by rail.

Dimensional stone and aggregate

Quarries produce rock in two forms: solid slabs or blocks (dimensional stone) and aggregate in crushed and other particulate forms.

The most common types of dimensional stones are limestone