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A REVIEW OF PENNSYLVANIAN CLAY MINERAL INDUSTRIES,  
NORTH-CENTRAL TEXAS<sup>1/</sup>

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The clay mineral industry of the Pennsylvanian outcrop belt of north-central Texas has long figured in the economic growth of the region. Coal and clay were among the earliest mineral products of Pennsylvanian strata, pre-dating by many years the "oil-boom days" of Ranger, Desdemona, Breckenridge, and others. Although the ceramic industry does not match the wealth which petroleum brings to the counties of this area, there has been, nevertheless, a steady growth in total volume and variety of products. Future demand for ceramic products is bright, not only for basic brick and tiles but for many new uses in which properties such as heat resistance, strength, and low density may be utilized.

The clay mineral industry in north-central Texas can be divided into two major categories: (1) heavy clay products consisting of traditional brick, tile, and conduit ware and (2) lightweight shale or clay material depending upon expanding properties during intense heating. Heavy clay products dominated the ceramic industry in this area since the late 1800's, but following World War II, the lightweight or expanded-shale and clay industry has become increasingly important and will undoubtedly continue growing as research defines new uses and production techniques.

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<sup>1/</sup>Reprinted, with minor corrections, from "A Guide to the Strawn and Canyon Series of the Pennsylvanian System in Palo Pinto County, Texas", an occasional publication of the North Texas Geological Society, Wichita Falls, Texas, prepared for the Regional Meeting of the American Association of Petroleum Geologists and Southwestern Federation of Geological Societies, October 22-25, 1958, Mineral Wells, Texas.

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## HEAVY CLAY INDUSTRY

The first brick plant in the counties which have surface strata of Pennsylvanian age began operating at Thurber, Erath County, in the 1880's using Mingus shale of the Garner formation (Plummer and Hornberger, 1935, pp. 204-208). The Bennett plant of Acme Brick Company in western Parker County commenced production in 1891, and another plant operated during 1906 and 1907 near East Mountain in Mineral Wells. From these and other early plants, eight modern heavy clay product plants have evolved.

The stratigraphic position of thirteen operating pits is listed in table 1. Other pertinent data relating to heavy clay production are given in table 2, and the locations of plants and pits are shown in figure 1.

Five heavy clay plants use clay and shale of Strawn age, while material for two plants is obtained from the lower Canyon series. Clay from the upper Cisco series is used by two companies as supplementary mix in their heavy clay process. One plant manufactures flower pots from upper Cisco clay.

Brick, tile, and conduit manufacturers rely upon clay and shale of the Strawn series for strong economic as well as geologic reasons. Railroad facilities, marketing outlets in the nearby Fort Worth and Dallas area, and exceptional exposures of deposits early focused the industry in the Mineral Wells vicinity. Corresponding geologic attributes including acceptable iron and lime content make the deposits of Strawn age desirable. Abundant fuel and labor are also significant. A limiting factor which reduces the versatility of these deposits is the color of the fired products, which ranges from the typical oxidized red to reduced gray and black. There is a definite need for a source of light-firing clay or shale in Palo Pinto County.

Many shales of Canyon age are favorably located with respect to railroads, labor, and fuel, but established deposits of Strawn age in eastern Palo Pinto and western Parker counties presently satisfy most of the local demand in heavy clay manufacturing. Certain operators in the area, however, are interested in locating additional deposits with special ceramic properties in order to improve the quality of present products and enter new lines of ceramic goods. Therefore, the shales and clays of the Canyon and Cisco, as well as the Strawn series, are potentially important and warrant chemical and ceramic testing.

A study of clays in the upper Cisco series by the Bureau of Economic Geology (Plummer, Bradley, and Pence, 1949) delineated three clay horizons, the Quinn, Curry, and Craddock clays, which exhibit good plasticity, normal shrinkage, exceptional strength, and satisfactory firing range. Iron and sulfur compounds are often problems, but favorable casting and light-firing properties make these upper Cisco deposits exceptional in this region. These and other similar clays in upper Cisco and lower Wolfcamp strata should receive greater attention in the future.

Economic clay deposits with high kaolinite content suitable for fine quality ceramic products are unknown in the general area of Pennsylvanian outcrop, a fact that hinders full exploitation of available clay and shale as well as labor, fuel, and transportation facilities. Horton Ceramics Company of Eastland, for example, must ship kaolinitic or ball clay from another state for manufacture of quality cast items. Suitable local deposits of these light-firing, molding clays would stimulate similar enterprises.

## EXPANDED SHALE INDUSTRY

As early as 1875, a patent was issued covering the use of burned clay aggregate for use in producing artificial stone (Rowen, 1956, p. 1103), but the industry did not develop until about 1920, when Stephen J. Hayde brought the widely known "Haydite" into prominence. Since the end of World War II, the manufactured lightweight aggregate industry has grown enormously because of a decline in by-product aggregates and an increase in use of lightweight aggregate in concrete masonry.

The first expanded-shale plant in Texas and the second west of the Mississippi River started operating with rotary kilns in the Strawn-Mingus area, southwestern Palo Pinto County, in 1945. This operator, H. C. Vandaveer, began experimentally expanding tailings of Mingus shale as early as 1941, in the abandoned Thurher coal-mining area. Vandaveer now specializes in athletic track cinders.

A second lightweight aggregate plant produces from shale in the lower Cisco series at Eastland, and a third operates eight rotary kilns from shale of upper Canyon age at Ranger. The Ranger plant is reportedly the largest single lightweight aggregate plant in the United States. The plants at Ranger and Eastland sell only bulk expanded-shale aggregate. Location, geologic, and production information for the lightweight aggregate industry in this area is recorded in figure 1 and tables 1 and 2, respectively.

Texas Industries, Inc., Dallas (Kenneth F. McLaughlin, geologist, personal communication) has found that in Texas, illitic clays are most successfully used in lightweight aggregates. Mixtures of illitic and chloritic clays and illitic and vermiculitic clays are also satisfactory. Impurities such as limestone and sand are undesirable in deposits used in the expanded shale industry. Limestone hydrates after being calcined, and sand decreases cohesiveness and produces an excess of fine material when burned. Iron content of deposits must be checked to prevent adverse coloring in the finished aggregate. Texas Industries, Inc., emphasizes that availability of a nearby large market is a primary consideration in locating plants, since deposits of suitable shale and clay are relatively plentiful. Exploration for new deposits is not as important an economic factor in the expanded shale industry as in the heavy clay and quality clay industries.

Process of shale expansion. -- The principles involved in shale expansion are not fully understood by investigators. The United States Bureau of Mines (Conley et al., 1949, pp. 9-10) completed a comprehensive study of expanding or "bloating" properties with several generalizations: (1) Type of clay or shale in bloated products is generally the same as used in heavy clay production; (2) basic clay mineral structure has little effect on bloating process; (3) constituents responsible for bloating are minerals and materials associated with the clay mineral, such as carbonaceous material, iron compounds, limestone, dolomite, and gypsum; (4) shales make excellent bloated products, but it cannot be assumed that their higher carbonaceous content is responsible; and (5) non-bloating clays may be made to expand by adding constituents necessary to cause bloating.

The Bureau of Mines report also notes two important requisites for expansion. When the bloating temperature is reached (between 1000 and 1400 degrees C.), the clay mass must be in a "pyroplastic condition, and at the same time gases must be evolving throughout the mass." The pyroplastic consistency is caused by fluxes which begin the fusion that traps evolved gases. A vesicular structure results.

The Missouri Geological Survey (Herold et al., 1958) recently reported that oxidation of carbon in shales and clays is the primary source of gas, and the corresponding oxidation of sulfides and carbonates is negligible. They note that fluidity and glass formation necessary for expanding shales is not a simple relationship between silica and alumina but the result of complex reactions among at least six minor constituents or fluxes. An additive, ferric oxide, was found to produce expansion in many non-bloating clays and shales for the following reasons: (1) assures adequate glass content at bloating temperature, (2) produces moderate fluidity, and (3) reduces to ferrous state at about 1000 degrees C. with liberation of oxygen. Ferric oxide may become important in the expanded-shale industry because it is economically available as hematite.

Kenneth F. McLaughlin of Texas Industries, Inc., reports (personal communication) that there is considerable evidence from experiments and operations to show that water vapor is the most essential gas which provides energy for expansion. These findings hold that molecularly held water plays a part in the expansion process. It is evident from these conflicting theories that further study will be necessary before the expanding process is fully understood.

## CLAY MINERALOGY

The mineral content of representative clay and shale samples from pits in Pennsylvanian strata, north-central Texas, is listed below. Determinations by differential thermal analyses and X-ray diffraction were made by R. L. Stone and E. J. Weiss, of the Department of Ceramic Engineering, The University of Texas. Clay minerals are listed in order of relative abundance.

- (1) Quinn clay, upper Cisco series. A presently abandoned auxiliary pit of Texas Brick Company located near Gallagher Clay Products Company and Texeramics, Inc., pits at Cisco--

Kaolinite, illite, abundant quartz and gypsum.

- (2) Brownwood shale, lower Canyon series. Texas Brick Company pit at Brownwood--

Illite, vermiculite, kaolinite. Abundant quartz, less amounts of organic material, and pyrite.

- (3) Lake Bridgeport shale, lower Canyon series(?). Acme Brick Company pit at Bridgeport--

Illite, kaolinite, trace of montmorillonite. Abundant organic material, quartz, dolomite, gypsum.

- (4) East Mountain shale, Strawn series. Mineral Wells Clay Products Corporation pit at Mineral Wells--

Muscovite, illite, kaolinite, trace of montmorillonite. Abundant iron hydroxide, quartz.

- (5) Grindstone Creek formation, Strawn series. Acme Brick Company pit at Bennett--

Illite, kaolinite, montmorillonite. Abundant quartz, organic material and pyrite.

## ACKNOWLEDGMENT

Cooperation by officials of eleven clay products plants discussed in this review is acknowledged. Interest expressed in geologic aspects of clay indicates a need for continuing cooperative work between ceramic and geologic professions.

Chambers of commerce personnel throughout north-central Texas provided interesting historical facts about the industry. Professors R. L. Stone and E. J. Weiss, Department of Ceramic Engineering, The University of Texas, furnished unpublished clay mineral data from a joint study of Texas clays by the Bureau of Engineering Research and the Bureau of Economic Geology. Kenneth P. McLaughlin of Texas Industries, Inc., contributed information regarding the expanded shale and clay industry.

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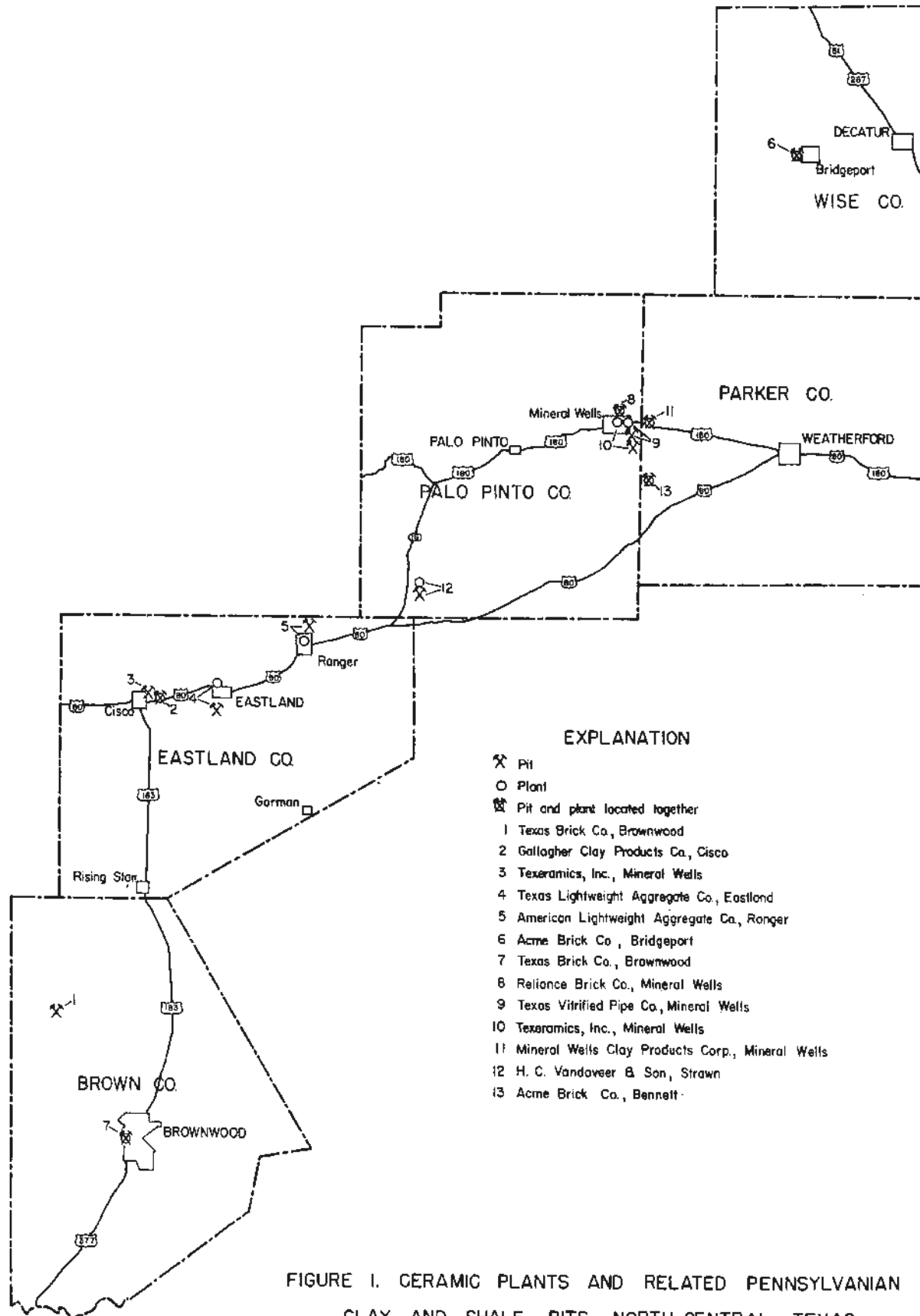


FIGURE 1. CERAMIC PLANTS AND RELATED PENNSYLVANIAN CLAY AND SHALE PITS, NORTH-CENTRAL TEXAS

TABLE 1. STRATIGRAPHIC POSITION OF PRODUCING PENNSYLVANIAN CLAY AND SHALE PITS,  
NORTH-CENTRAL TEXAS.

| SERIES | GROUP OR FORMATION | FORMATION OR MEMBER                                                                                                               | STRATIGRAPHIC POSITION AND LOCATION OF CLAY AND SHALE PITS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------|--------------------|-----------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CISCO  | THRIFTY            | Obregon sh<br>Crystal Falls ls<br>Breckenridge ls<br>Blach Ranch ls<br>Ivan ls<br>Avis ss                                         | 1. Texas Brick Co., Brownwood. Clay for heavy clay products. E. of State Hwy. 279, 8.5 miles S. of Cross Cut, Brown County. Quinn clay 1/2/ about 15 feet below Crystal Falls limestone.<br>2. Gallagher Clay Products Co., Cisco. Clay for flower pots. N. of U.S. Hwy. 80, 2 miles E. of Cisco, Eastland County. Quinn clay 1/ between Breckenridge limestone and a sandstone which occurs at horizon of Crystal Falls limestone.<br>3. Texeramics, Inc., Mineral Wells. Clay for floor and wall tile. N. of U.S. Hwy. 80, 2 miles E. of Cisco, Eastland County. Quinn clay 1/ between Breckenridge limestone and a sandstone which occurs at horizon of Crystal Falls limestone.<br>4. Texas Lightweight Aggregate Co. ("Haydite"), Eastland. Shale for expanded aggregate. N. of county road, 0.5 mile W. of State Hwy. 6, about 1.2 miles S. of Eastland, Eastland County. Finis shale 1/3/ above Home Creek limestone and below Gonzales limestone. Eastland sandstone 4/ overlies Finis shale. |
|        | GRAHAM             | Wayland sh<br>Post-Bunger cycles<br>Bunger ls<br>North Leon ls<br>Gonzales ls                                                     | 5. American Lightweight Aggregate Co. ("Featherlite"), Ranger. Shale for expanded aggregate. About 1.7 miles S. of Stephens-Eastland County line W. of T. P. R.R., Eastland County. Shales below Ranger limestone 3/ called "Seaman Ranch beds" 4/5/.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| CANYON | CADDO CREEK        | Home Creek ls<br>Colony Creek sh                                                                                                  | 6. Acme Brick Co., Bridgeport. Shale for heavy clay products. 0.1 mile N. of FM 920, about 0.9 mile W. of the Chicago-Rock Island depot in Bridgeport, Wise County. Lake Bridgeport shale 6/ between Willow Point limestone and Rock Hill limestone.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|        | BRAD               | Ranger ls<br>5-Placid sh                                                                                                          | 7. Texas Brick Co., Brownwood. Shale for heavy clay products. S. of U.S. Hwys. 84 and 64, near W. city limits of Brownwood, Brown County. Brownwood shale 2/.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|        | GRAFORD            | Winchell ls<br>Cedarton sh<br>Staff ls<br>(Adams Branch ls)<br>Wolf Mountain sh<br>6- (Lake Bridgeport sh?)<br>7- (Brownwood sh?) | 8. Reliance Brick Co., Mineral Wells. Shale for heavy clay products. E. side of East Mountain, Mineral Wells, Palo Pinto County. Upper part of East Mountain shale 4/ above Hog Mountain sandstone.<br>9. Texas Vitrified Pipe Co. ("Tex-Vit"), Mineral Wells. Shale for heavy clay products. About 0.2 mile E. of FM 1195, 0.7 mile S. of junction with U.S. Hwy. 180, E. of Mineral Wells, Palo Pinto County. Middle part of East Mountain shale 4/ immediately below Hog Mountain sandstone.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|        | WHITT              | Palo Pinto ls<br>Keechi Creek sh<br>Salesville sh                                                                                 | 10. Texeramics, Inc., Mineral Wells. Shale for floor and wall tile. 0.1 mile N. of FM 1195, about 1.5 miles SE. of junction with U.S. Hwy. 180, E. of Mineral Wells, Palo Pinto County. Similar stratigraphically to Texas Vitrified Pipe Co. pit (No. 9).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| STRAWN | LONE CAMP          | East Mountain sh<br>12-Garner fm                                                                                                  | 11. Mineral Wells Clay Products Corp., Mineral Wells. Shale for heavy clay products. S. side of U.S. Hwy. 180 about 0.3 mile E. of Palo Pinto--Parker County line, Parker County. Lower part of East Mountain shale 7/ just above Brazos River sandstone.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|        | MILLSAP LAKE       | 13-Grindstone Creek fm<br>Lazy Bend fm                                                                                            | 12. H. C. Vandaveer & Son ("Vancrete"), Strawn. Shale for expanded aggregates from coal mine tailings. N. and S. of State Hwy. 108, about 2 miles E. of Strawn, Palo Pinto County. Tailings from mines that produced Thurber coal 4/. Mingus shale.<br>13. Acme Brick Co., Bennett. Clay-shale from about 0.6 mile W. of T. P. R.R. crossing, Bennett, Parker County. Grindstone Cr. formation 7/ immediately above the Santo limestone.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

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TABLE 2. HISTORIC, GEOLOGIC, AND PRODUCTION DATA,  
CERAMIC INDUSTRY, NORTH-CENTRAL TEXAS.

| COMPANY<br>(Present<br>Operator)                          | APPROXIMATE<br>DATE OPER-<br>ATIONS BEGAN | PLANT<br>LOCATION                                                                                                                | PIT(S)<br>LOCATION                            | PRODUCTS                                                      | APPROXIMATE<br>VOLUME OF<br>FINISHED<br>PRODUCTS <sup>1/</sup> | AVERAGE<br>NUMBER OF<br>EMPLOYEES | STRATIGRAPHIC POSITION<br>OF CLAY OR SHALE AND<br>ESTIMATED THICKNESS                                                                                                             | REMARKS                                                                                                                                                                                                                                                                                                                                  |
|-----------------------------------------------------------|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|---------------------------------------------------------------|----------------------------------------------------------------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Acme Brick Co.<br>Bennett plant                           | 1891                                      | Parker County--<br>0.2 mile W. of T. P.<br>R. R. crossing in<br>Bennett                                                          | Plant site. Use<br>shale planer               | Facing brick<br>Structural tile<br>Chemical brick<br>and tile | 2 million brick-<br>equivalents <sup>2/</sup><br>per month     | 145                               | Grindstone Cr. formation above<br>Santo limestone. Company<br>estimates 80 feet of workable<br>shale                                                                              | Organized as Acme Pressed Brick Co.;<br>became Acme Brick Co., 1912. One<br>of earliest plants in area; has been in<br>continuous operation.                                                                                                                                                                                             |
| Acme Brick Co.<br>Bridgeport<br>plant                     | 1921                                      | Wise County--<br>0.1 mile N. of FM<br>920, about 0.9 mile<br>W. of Chicago-Rock<br>Island R.R. depot in<br>Bridgeport            | Plant site. Use<br>shale planer               | Facing brick<br>Structural tile<br>Conduit pipe               | 2 million brick-<br>equivalents per<br>month                   | 70                                | Lake Bridgeport shale, be-<br>tween Willow Point limestone<br>and Rock Hill limestone.<br>Company estimates 80 feet<br>of workable shale.                                         | Began operations, 1921, as Wise County<br>Brick Co.; became Acme Brick Co.<br>about 1935. Used mine tailings until<br>1953. Lignite from Marshall, Texas,<br>mixed with pit shale to produce prod-<br>uct similar to tailing shales.                                                                                                     |
| American<br>Lightweight<br>Aggregate Co.<br>"Featherlite" | 1950                                      | Eastland County--<br>N. of T. P. R.R. spur,<br>N. side of Ranger.<br>8 rotary kilns                                              | 0.4 mile NE. of<br>plant, W. of<br>T. P. R.R. | Expanded shale<br>aggregate                                   | 15 carloads per<br>day                                         | 50                                | "Seaman Ranch beds" below<br>Ranger limestone. Company<br>estimates 150 feet of work-<br>able shale.                                                                              | Plant built early, 1950, by Charles Gline,<br>former manager of Eastland plant.<br>Plant sold to American Lightweight<br>Aggregate before production began.<br>Featherlite Corp., Strawn, moved to<br>Ranger and combined with American<br>Lightweight Aggregate plant, 1956.<br>Reportedly largest aggregate plant in<br>United States. |
| Gallagher Clay<br>Products Co.                            | 1948                                      | Eastland County--<br>N. side of U.S. Hwy.<br>80, 2 miles E. of<br>town of Cisco                                                  | Plant site                                    | Flower pots<br>(2- to 12-inch<br>diameter)                    | 4 to 5 million<br>flower pots per<br>year                      | 13                                | Quinn clay, between Brecken-<br>ridge limestone and a sand-<br>stone ("Cisco Lake sandstone")<br>which occurs at Crystal<br>Falls limestone horizon. 27<br>feet of workable clay. | Norclara Pottery Co., organized, 1941;<br>used Quinn clay for gift-pottery, novelt-<br>ies, etc. Company became Gallagher<br>Clay Products Co. Cisco Clay Products<br>Co. produced brick from Quinn clay<br>but sold and moved to Teague, 1948.<br>Texas Brick Co., Brownwood, owns<br>option to old brick company site.                 |
| Mineral Walls<br>Clay Products<br>Corp.                   | 1929                                      | Parker County--<br>S. side of U.S. Hwy.<br>180, 0.3 mile E. of<br>Palo Pinto--Parker<br>County line, E. side<br>of Mineral Walls | Plant site                                    | Roof tile<br>Facing brick<br>Structural tile                  | 1-1/4 million<br>brick-equiva-<br>lents per month              | 65                                | Lower East Mountain shale,<br>near base of formation.<br>Company estimates 30 feet<br>of workable shale in present<br>pit                                                         | Plant established by A. Eaton. Only<br>plant in area producing roof tile.                                                                                                                                                                                                                                                                |

<sup>1/</sup> Volume of finished products given by local plant officials is only approximate. Figures are recorded in units used by respective company.

<sup>2/</sup> Brick-equivalent = 7-5/8" x 3-5/8" x 2-1/4". Weight of brick-equivalent varies with density of finished clay product. At Acme Brick Co. plant, Bennett,

1 brick-equivalent = approximately 4.5 pounds.

TABLE 2. HISTORIC, GEOLOGIC, AND PRODUCTION DATA, CERAMIC INDUSTRY.

NORTH-CENTRAL TEXAS (CONTINUED).

| COMPANY<br>(Present<br>Operator)                                     | APPROXIMATE<br>DATE OPER-<br>ATIONS BEGAN | PLANT<br>LOCATION                                                                                                  | PIT(S)<br>LOCATION                                                                                                                                                                                               | PRODUCTS                                                                            | APPROXIMATE<br>VOLUME OF<br>FINISHED<br>PRODUCTS | AVERAGE<br>NUMBER OF<br>EMPLOYEES | STRATIGRAPHIC POSITION<br>OF CLAY OR SHALE AND<br>ESTIMATED THICKNESS                                                                                                                                                            | REMARKS                                                                                                                                                                                                                                                                                                                |
|----------------------------------------------------------------------|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Reliance Brick<br>Co.                                                | 1920                                      | Palo Pinto County--<br>E. side of East<br>Mountain, in Mineral<br>Wells                                            | Plant site                                                                                                                                                                                                       | Structural tile<br>Facing brick<br>Paving brick                                     | 3,000 to 4,000<br>tons per month                 | 75                                | Upper East Mountain shale, below<br>Lake Pinto sandstone. Unnamed,<br>lenticular limestones affect<br>amount of workable shale. Thirty-<br>five feet of estimated 90 feet of<br>workable shale being removed.                    | Originally promoted and built by A.<br>Eaton, Mineral Wells. Plant sold<br>about 1927 to Reliance Brick Co.<br>One of first large, modern brick<br>plants in area and in Texas.                                                                                                                                        |
| Texas Brick Co.<br>Co.                                               | 1927                                      | Brown County--<br>S. of U.S. Hwy. 84<br>and 64, W. edge of<br>Brownwood                                            | (A) Plant site<br>(B) E. of State<br>Hwy. 279, about<br>8.5 miles S. of<br>Cross Cut,<br>Brown County                                                                                                            | Facing brick<br>Structural tile<br>Drainage tile                                    | 4,000 tons per<br>month                          | 100                               | (A) Brownwood shale; workable<br>thickness unknown.<br>(B) Quinn clay, below a thin silt-<br>stone, about 15 feet below Crystal<br>Falls limestone. Ten to 15 feet<br>of workable clay below siltstone.                          | Before opening pit south of Cross Cut,<br>clay was hauled from Quinn clay pit,<br>Clasco.                                                                                                                                                                                                                              |
| Texas<br>Lightweight<br>Aggregate Co.<br>"Haydite"                   | 1946                                      | Eastland County--<br>N. of T. P. RR. on<br>road to Lake Breas-<br>ford, NW. edge of<br>Eastland. 2 rotary<br>kilns | 0.5 mile W. of<br>State Hwy. 6,<br>1.2 miles S. of<br>Eastland, East-<br>land County                                                                                                                             | Expanded shale<br>aggregate                                                         | 350 yards per<br>day                             | 20                                | Fine shale, above Home Creek<br>limestone and below Gonzales<br>limestone (?). Sandstone (East-<br>land sandstone?) occurs at top<br>of pit. Company estimates 60<br>feet of workable shale.                                     | Plant built by Charles Cline but sold<br>to Texas Lightweight Aggregate Co.<br>Cline held "Haydite" rights for Texas<br>in mid-forties.                                                                                                                                                                                |
| Texas Vitriified<br>Pipe Co.<br>"Tex-Vit"                            | 1947                                      | Palo Pinto County--<br>S. of East Hubbard<br>Street, E. side of<br>Mineral Wells                                   | 0.2 mile E. of<br>FM 1195, 0.7<br>mile S. of<br>junction with<br>U.S. Hwy. 180,<br>SE. of Mineral<br>Wells, Palo<br>Pinto County                                                                                 | Flue linings<br>Sewer pipe and<br>connections<br>Structural tile<br>Drainage tile   | 4,000 tons per<br>month                          | 125                               | Middle East Mountain shale,<br>below Hog Mountain sandstone.                                                                                                                                                                     | Established by Clements Brothers of<br>Indiana after considering Eastland<br>for site. Rail facilities considered<br>better in Mineral Wells. Several<br>East Mountain shale pits used since<br>1947.                                                                                                                  |
| Texceramics,<br>Inc.                                                 | 1949                                      | Palo Pinto County--<br>S. of East Hubbard<br>Street, E. side of<br>Mineral Wells                                   | (A) 0.1 mile N. of<br>FM 1195, 1.5<br>miles SE. of<br>junction with<br>U.S. Hwy. 180,<br>SE. of Mineral<br>Wells, Palo<br>Pinto County<br>(B) N. of U.S.<br>Hwy. 80, 2 miles<br>E. of Clasco,<br>Eastland County | (A) Floor and<br>wall tile--red<br>(B) Floor and<br>wall tile--buff                 | 50,000 square<br>feet per month                  | 25                                | (A) Middle East Mountain shale,<br>below Hog Mountain sandstone.<br>(B) Quinn clay, between Breck-<br>enridge limestone and a sand-<br>stone ("Clasco Lake sandstone")<br>which occurs at horizon of<br>Crystal Falls limestone. | Plant originally located at Camp<br>Walters.<br>Only plant in area that produces floor<br>and wall tile.                                                                                                                                                                                                               |
| H. C. Vandaveer<br>& Son<br>"Vancrete"<br>and "Skipper's<br>Red Dog" | 1945                                      | Palo Pinto County--<br>S. of State Hwy. 108,<br>2 miles E. of Strawn                                               | Mine tailings<br>located within<br>8-mile radius<br>of plant site                                                                                                                                                | Roofing cherts<br>Driveway cherts<br>Track cinders<br>Curb tile<br>Aggregate blocks | 25 carloads per<br>month                         | 15                                | Mingus shale from mine tail-<br>ings from Thurber coal<br>production.                                                                                                                                                            | First expanded-shale plant in Texas;<br>second west of Mississippi River.<br>Started experimental operations 1941,<br>and actual production 1945. Sold<br>trade name and plant to Featherlite<br>Corp. 1947; began operating under<br>present name, 1948. Supplied mater-<br>ial for 200 athletic tracks in Southwest. |