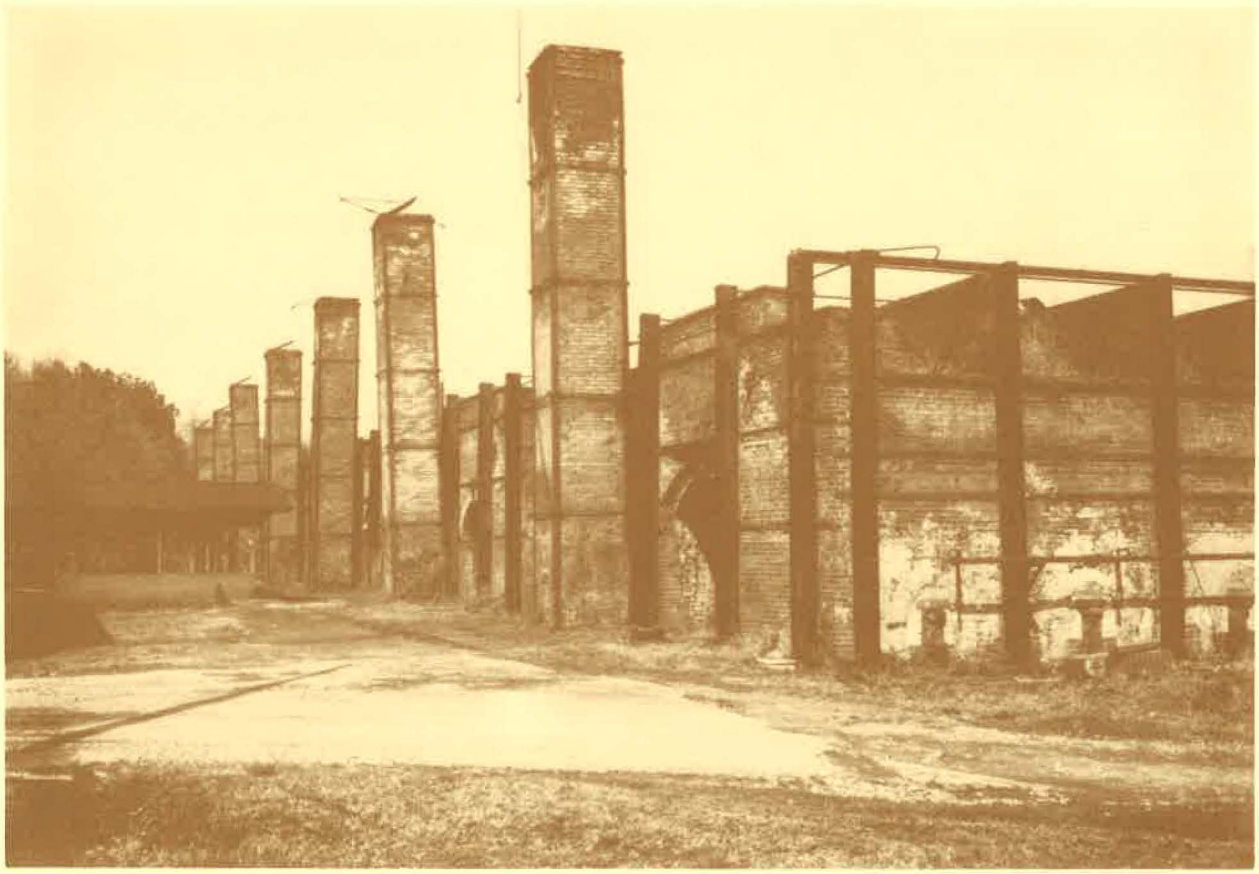
CERAMIC AND STRUCTURAL CLAYS, SHALES AND SLATES OF GORDON COUNTY, GEORGIA

BRUCE J. O'CONNOR



DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL PROTECTION DIVISION
GEORGIA GEOLOGIC SURVEY

INFORMATION CIRCULAR 69

COVER PHOTO: View of the seven rectangular, down-draft, gas-fired kilns at the brick plant of the Plainville Brick Company, built in 1923 - last production reported in 1971 (U.S. Bureau of Mines, 1971, Minerals Yearbook, Area Reports: Domestic). See Map Location No. Gdn. 31S-58 and descriptions in Smith (1931, p. 232-234).

CERAMIC AND STRUCTURAL CLAYS, SHALES AND SLATES OF GORDON COUNTY, GEORGIA

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Information Circular 69

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INTRODUCTION

This report presents a compilation of all available published and unpublished ceramic firing tests and related analytical data on samples from Gordon County, Georgia. It provides information on mined and/or undeveloped clays, shales and related materials; and is intended for use by geologists, engineers and members of the general public. The report should aid in the exploration for deposits of ceramic raw material with economic potential for future development. This information may also be of use to those who wish to obtain information on the potential use of particular deposits at specific locations.

Tests by the U.S. Bureau of Mines, subsequently referred to as USBM, were performed by the Norris Metallurgy Research Laboratory, Norris, Tennessee and the Tuscaloosa Research Center, Tuscaloosa, Alabama under cooperative agreements with the Georgia Geologic Survey and its predecessors (i.e., the Earth and Water Division of the Ga. Department of Natural Resources; the Department of Mines, Mining and Geology; and the Geological Survey of Georgia). Many of the firing tests were performed on samples collected by former staff members of the Georgia Geologic Survey (and its predecessors) during several uncompleted and unpublished studies. These include work by Bentley (1964), Smith (1968?) and Tadkod (1980). Additional unpublished data presented in this compilation include work by TVA (see Butts and Gildersleeve, 1948, p. 124 and 125). Published data include studies by the following authors: Veatch (1909, p. 395 to 397), Smith (1931, p. 211 to 241), Butts and Gildersleeve (1948, p. 124 and 125), and Hollenbeck and Tyrrell (1969, p. 18 to 20).

Regardless of the source, all of the ceramic firing testing data presented in this report are based on laboratory tests that are preliminary in nature and will not suffice for plant or process design. They do not preclude the use of the materials in mixes (Liles and Heystek, 1977, p. 5).

ACKNOWLEDGEMENTS

The author gratefully acknowledges the help of many individuals during the preparation of this report and the work of many who contributed to the earlier, unpublished studies included here. The cooperative work of the U.S. Bureau of Mines forms the main data base of this study. During the last several years Robert D. Thomson, Chief of the Eastern Field Operations Center, Pittsburgh, Pennsylvania, was responsible for administering the funding of costs incurred by the USBM. Others in that office who helped coordinate the program were Charles T. Chislaghi and Bradford B. Williams. Since 1966 M.E. Tyrrell, H. Heystek, and A.V. Petty, Ceramic Engineers, and Kenneth J. Liles, Research Chemist, planned and supervised the test work done at the USBM Tuscaloosa Research Center in Tuscaloosa, Alabama. Prior to 1966 this test work was supervised by ceramists H. Wilson, G.S. Skinner, T.A. Klinefelter, H.P. Hamlin and M.V. Denny at the former Norris Metallurgy Research Laboratory in Norris, Tennessee. Tests by the Tennessee Valley Authority were conducted under the supervision of H.S. Rankin and M.K. Banks at the Mineral Research Laboratory on the campus of North Carolina State College, Asheville, North Carolina, using samples collected by S.D. Broadhurst. Additional tests were conducted by professor J.F. Benzel, Department of Ceramic Engineering, Georgia Institute of Technology, Atlanta, Georgia, and by Merazzi Ceramiche, Sassuolo, Italy. The majority of the unpublished tests were performed on samples collected by former staff geologists of the Georgia Geologic Survey, predominantly by J.W. Smith, A.S. Furcron, R.D. Bentley, N.K. Olsen, D. Ray, M.A. Tadkod, and G. Peyton, assisted by C.W. Cressler of the U.S. Geological Survey. N.K. Olsen and C.W. Cressler also have

provided the author with valuable advice and suggestions regarding sample locations and past studies. K.J. Liles and J. Smith reviewed a preliminary draft of this report. The advice and encouragement of my colleagues on the staff of the Georgia Geologic Survey are greatly appreciated. However, the contents of this report and any errors of omission or commission therein are the sole responsibility of the author.

LOCATION OF STUDY AREA

Gordon County is located on the eastern side of the Valley and Ridge province of northwest Georgia (Fig. 1). No companies are currently mining clay or shale in the county, and only a few operations have been active here in the past (Table 1). The most abundant ceramic raw materials in the county are the shales and residual clays derived from the Conasauga Group; however, other units such as the Floyd Shale, Rome Formation and Red Mountain Formation, as well as residual clays of the Knox Group, are locally well developed. The general nature of these and other geologic units which occur in the county are summarized on Table 2.

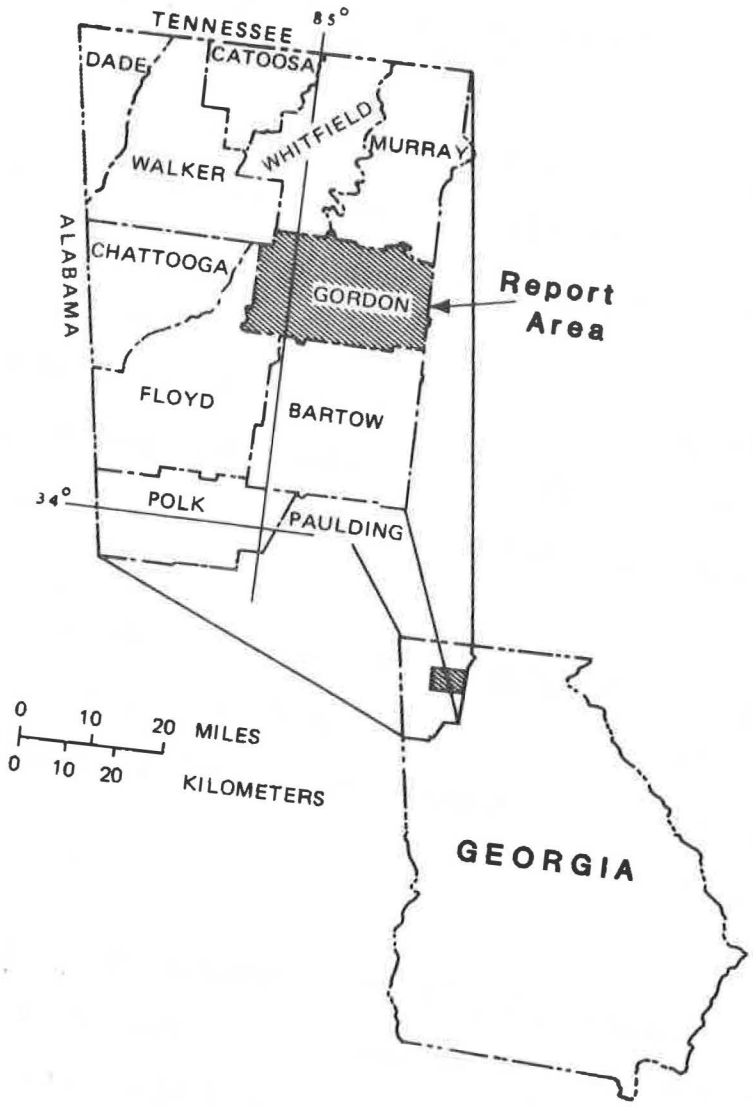


FIGURE 1

LOCATION OF GORDON COUNTY REPORT AREA

(after Cressler, and others, 1976)

TABLE 1

Summary of 20th Century Clay and Shale Mines and Companies in Gordon County, Georgia

Calhoun Brick Co. (1908?) Calhoun plant and pits: Brick from Conasauga shale and residual clay. Ceramic test: Gdn. 09V-2 (Veatch, 1909, p. 396 and 397; Butts and Gildersleeve, 1948, No. 87?)

B. Mifflin Hood Co. (Tn.), Legg Plant and pits, Calhoun: Brick from Conasauga shale and residual clay. Purchased from Legg Bros. Brick Co., 1919. Ceramic test: Gdn. 31S-51 (Smith, 1931, No. 51, p. 212).

Legg Brothers Brick Co. (1906), Calhoun plant and pits: Pressed face brick from Conasauga shale. Sold to B. M. Hood Co., 1919. Ceramic test: Gdn. 09V-1 (Veatch, 1909, p. 395 and 396; Smith 1931, No. 51, p. 212).

Plainville Brick Co. (1923), Plainville plant and pits: Face brick from Conasauga shale. Ceramic test: Gdn. 31S-58 and Gdn. 46-3 (Smith 1931, No. 58, p. 232; Butts and Gildersleeve, 1948, No. 85 and 86; Reighard 1963, p. 20 and 28).

NOTE:

The majority of the information for the companies listed above was taken from the Mining Directories (Circular 2, 1st to 18th editions) published by the Georgia Geologic Survey and its predecessors at irregular intervals since 1937. Some additional information came from the "Georgia Surface Mining and Land Reclamation Activities" published annually since 1960 by the Georgia Surface Mined Land Reclamation Program (Environmental Protection Division, Ga. Dept. of Natural Resources). Additional sources of information were found in the references cited at the end of each entry. Uncertainty in the dates is due to incomplete records in the Survey's files.

TABLE 2

Generalized Summary of Stratigraphic Units in Gordon County, Northwest Georgia

CHRONOSTRATIGRAPHIC UNIT	STRATIGRAPHIC UNITS - THICKNESS AND ROCK TYPES [1/]
Quaternary (and Tertiary?)	* Various unnamed bodies of alluvial, colluvial and residual material. Largely clay and sand, but also, locally gravel and breccia.
Mississippian	* Floyd Shale - Approx. 300-500 ft., silt and clay with some sandstone; limestone present at base. Fort Payne Formation (or Chert) - Approx. 100-200 ft., thin- to thick-bedded chert and cherty limestone. Locally includes: * Lavender Shale Member - Approx. 0-100 ft., shale, massive mudstone and impure limestone.
Devonian	Chattanooga Shale - Approx. 15-30 ft., carbonaceous, fissile black shale. Armuchee Chert - Approx. 60 ft., thin- to thick-bedded chert.
Silurian	Red Mountain Formation (formerly Rockwood Formation) - Approx. 600-1200 ft., sandstone, red and green shale, with conglomerate, limestone and local hematitic iron ore.
Ordovician	Moccasin Formation (or Limestone) - Approx 200-500 ft., red and yellow calcareous mudstone, blue limestone, and impure limestone.
Cambrian-Ordovician	(*)Knox Group - Approx. 3000-4000 ft., dominantly cherty dolostone, minor limestone. Includes: Longview Limestone - Approx. 500 ft.; Chepultepec Dolomite - Approx. 500 ft.; and Copper Ridge Dolomite - Approx. 2000-3000 ft.

TABLE 2

Generalized Summary of Stratigraphic Units in Gordon County, Northwest Georgia (continued)

CHRONOSTRATIGRAPHIC	STRATIGRAPHIC UNITS T THICKNESS AND ROCK TYPES 1/
Cambrian	** Conasauga Group (or Formation) - Approx. 3000-5000 ft., predominantly shale and limestone with minor sandstone. Includes: Maynardville Limestone Member - Approx. 1000 ft.; "Middle Unit" = Rutledge Limestone and Rogersville Shale?- Approx. 1000 ft.; and "Lower Unit" = Pumpkin Valley Shale? - Approx. 1000 ft., silty shale. * Rome Formation - Approx. 300-500 ft., red shale, and interbedded sandstone, siltstone and quartzite.
Precambrian	Ocoee Supergroup (or Series) - Approx. 20,000 ft., slate, phyllite, quartzite, metagraywacke, mica schist, and biotite gneiss.

NOTES:

* = Some ceramic firing tests have been made on shales or slates and clays of this unit.

(*) = Same as the above, but for residual clays only.

** = Numerous firing tests have been made on this unit.

1/ Descriptions based on data in Butts and Gildersleeve, 1948; Chowns, 1972, 1977; Cressler 1963, 1964a and b, 1970, 1974; Cressler and others, 1979; Croft, 1964; Georgia Geologic Survey, 1976.

EXPLANATION OF KEY TERMS ON THE CERAMIC TEST AND ANALYSES FORMS

The test data and analyses which are presented here were compiled on a set of standardized forms (Ceramic Tests and Analyses) in the most concise manner consistent with the various laboratories represented. These forms are modified in large part after those used by the Pennsylvania Geological Survey (e.g., O'Neill and Barnes, 1979, 1981).

It should be noted that, although the great majority of these tests were performed by the USBM, it was decided not to reproduce their data forms directly for several reasons. First, the USBM forms contain several entries which are not essential to this project (e.g., Date received) or do not make the most efficient use of space. Second, the USBM forms have been changed several times over the span of decades covered by the present compilation. Finally, investigators from other laboratories have reported parameters which were not measured by the USBM.

The paragraphs which follow briefly describe, in alphabetical order, the more critical entries on the forms, the nature of the information included and, where possible, the various factors and implications to be considered in their interpretation. Many of the particular comments here are based on descriptive information published in the following sources. Tests by Georgia Geologic Survey authors are described in Veatch (1909, p. 50 to 64) and in Smith (1931, p. 19 to 25), while the particulars of the USBM studies are given in Klinefelter and Hamlin (1957, especially p. 5 to 41) and in Liles and Heystek (1977, especially p. 2 to 16). The discussions which follow are not intended to be exhaustive but are merely meant to remind the reader,

and potential user, of the key aspects of the information presented. Various technical texts and reports should be consulted for more detailed information (e.g., Clews, 1969; Grimshaw, 1972; Jones and Beard, 1972; Norton, 1942; Patterson and Murray, 1983). The abbreviations used on these test forms are defined in Table 4.

1. Absorption (%)

The absorption is a measure of the amount of water absorbed by open pores in the fired specimen and is given as a percentage of the specimen's dry weight. For slow firing tests, it is measured on fired specimens which have been boiled in water for 2 to 5 hours and then kept immersed in the water for up to 24 hours while cooling (Smith, 1931, p. 22; Klinefelter and Hamlin, 1957, p. 27-28; Liles and Heystek, 1977, p. 3). For the quick firing tests, however, the specimens are not boiled but only cooled and then immersed in water for 24 hours (Liles and Heystek, 1977, p. 4).

The absorption gives an indication of the amount of moisture which may be absorbed and subject to destructive freezing in outdoor structures. Less than 22% absorption is considered promising for slow-fired materials.

2. Appr. Por. (%) - Apparent Porosity, Percent

The apparent porosity is a measure of the amount of open pore space in the fired sample, relative to its bulk volume, and is expressed as a percent. As in the case of absorption values, it is based on the weight and volume of the specimen which has been boiled in water for 2 to 5 hours and then kept immersed in water for several hours as it cools (Klinefelter and Hamlin, 1957, p. 27 to 28; Liles and Heystek,

TABLE 3

Abbreviations for Terms on the Ceramic Firing Test Forms

ABBREVIATIONS

Appr. Por. = Apparent Porosity
App. Sp. Gr. = Apparent Specific Gravity

Btw. = Bartow County

°C = Degrees Celsius
Ct. = Catoosa County
Cht. = Chattooga County

Dd. = Dade County
Dist. = District
DTA = Differential Thermal Analysis

E. = East

°F = Degrees Fahrenheit
Fl. = Floyd County

g/cm^3 = Grams per cubic centimeter
Gdn. = Gordon County

Lab. & No. = Laboratory (name) and number (assigned in laboratory)
Lat. = Latitude
LOI = Loss on Ignition
Long. = Longitude
lb/in^2 = Pounds per square inch
lb/ft^3 = Pounds per cubic foot

Mry. = Murray County

N. = North
NE. = Northeast
NW. = Northwest

org. = Organic

Plk. = Polk County

S. = South
SE. = Southeast
SW. = Southwest
Sec. = Section

Table 4. Abbreviations for Terms on the Ceramic Firing Test Forms (continued)

7 1/2' topo. quad. = 7 and 1/2 minute topographic quadrangle

Temp. = Temperature
TVA = Tennessee Valley Authority

USBM = U.S. Bureau of Mines
USGS = U.S. Geological Survey

W. = West
Wkr. = Walker County
Wf. = Whitfield County

XRD = X-ray diffraction

1977, p. 3). The apparent porosity is an indication of the relative resistance to damage during freezing and thawing. Less than 20% apparent porosity is considered promising for slow-fired materials (O'Neill and Barnes, 1979, p. 14, Fig. 4).

3. App. Sp. Gr. - Apparent Specific Gravity

As reported in earlier USBM studies, the apparent specific gravity is a measure of the specific gravity of that portion of the test specimen that is impervious to water. This is determined by boiling the sample in water for 2 hours and soaking it in water overnight or 24 hours (Klinefelter and Hamlin, 1957, p. 27 to 28). These data were replaced by bulk density and apparent porosity measurements after the USBM moved its laboratories from Norris, Tennessee to Tuscaloosa, Alabama in 1965.

4. Bloating

Bloating is the term given to the process in which clay or shale fragments expand (commonly two or more times their original volume) during rapid firing. It results from the entrapment of gases which are released from the minerals during firing but which do not escape from the body of the host fragment due to the viscosity of the host at that temperature. Bloating is a desirable and essential property for the production of expanded lightweight aggregate where an artificial pumice or scoria is produced. Expanded lightweight aggregate has the advantages of light weight and high strength compared to conventional crushed stone aggregate. Bloating is not desirable, however, in making other structural clay products such as brick, tile and sewer pipe where the dimensional characteristics must be carefully controlled. In these cases bloating is extremely deleterious since it leads to variable and uncontrollable warping, expansion and general disruption of the fired clay body (Klinefelter and Hamlin, 1957, p. 39-41).

5. Bloating Test (or Quick Firing Test)

The Bloating Test refers to the process of rapidly firing (or "burning") the raw sample in a pre-heated furnace or kiln to determine its bloating characteristics for possible use as a lightweight aggregate. Although specific details of the different laboratory methods vary, all use several fragments of the dried clay or shale placed in a refractory plaque (or "boat") which in turn is placed in the pre-heated furnace for 15 minutes (Klinefelter and Hamlin, 1957, p. 41; Liles and Heystek, 1977, p. 4).

6. Bulk Density (or Bulk Dens.)

The bulk density is a measure of the overall density of the fired specimen based on its dry weight divided by its volume (including pores). Determinations are the same for slow firing and quick firing test samples, although for the latter the results are given in pounds per cubic inch as well as grams per cubic centimeter units (Klinefelter and Hamlin, 1957, p. 27 to 28 and 41; Liles and Heystek, 1977, p. 3 and 4). If quick-fired material yields a bulk density of less than 62.4 lb/ft^3 (or if the material floats in water), it is considered promising for lightweight aggregate (K. Liles, oral communication, 1984).

7. Color

The color of the unfired material, unless otherwise stated, represents the crushed and ground clay or shale. In most cases this is given for descriptive purposes only since it is generally of no practical importance for ceramic applications (only the fired color is significant). Here only broad descriptive terms such as light-brown, cream, gray, tan, etc. are used. Fired colors are more critical and therefore more specific descriptive terms and phrases are used (Klinefelter and Hamlin, 1957, p. 18 and 19). In many cases the Munsell color is given for a precise description (see discussion below).

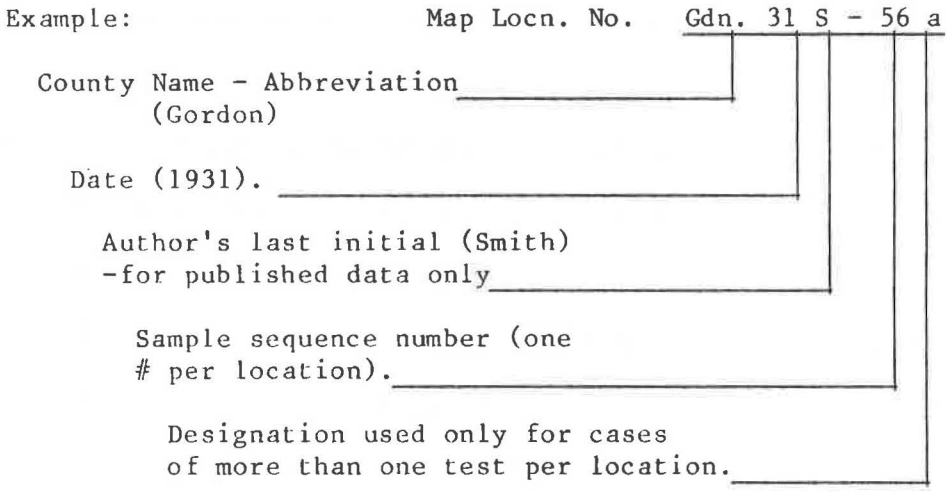
8. Color (Munsell)

This is a system of color classification based on hue, value (or brightness) and chroma (or purity) as applied to the fired samples in this compilation. It was used by Smith (1931, p. 23-25) and by the

USBM since the early 1970's (Liles and Heystek, 1977, p. 3; Liles, oral communication, 1982). In all other cases the fired color was estimated visually.

9. Compilation Map Location No.

This number or code was assigned by the author to provide a systematic designation to be used in plotting sample locations on the base maps as shown by the typical example below.



The map location number Gdn. 31S-56a is derived from the county name (e.g., Gdn. for Gordon County), the year the tests were performed (e.g., 31 for 1931) plus the last initial of the author for major published sources (e.g., S for Smith), followed by a sequence number assigned in chronological order or sequential order for published data. (The only exceptions to this are the tests reported in Smith, 1931, wherein the sequence number of the present report is the same as the "Map location No." of Smith.) Each map location number represents a

specific location, or area, sampled at a particular time. In cases where several separate samples were collected from a relatively restricted area, such as an individual property, such samples are designated a, b, c, etc. Different map location numbers have been assigned to samples which were collected from the same general locality, such as a pit or quarry, but which were collected by different investigators at different times.

10. Cone

Standard pyrometric cones, or cones, are a pyrometric measure of firing temperature and time in the kiln. They are small, three-sided pyramids made of ceramic materials compounded in a series, so as to soften or deform in progression with increasing temperature and/or time of heating. Thus, they do not measure a specific temperature, but rather the combined effect of temperature, time, and other conditions of the firing treatment. The entire series of cones ranges from about 1112°F (600°C) to about 3632°F (2000°C) with an average interval of about 20°C between cones for a constant, slow rate of heating (Klinefelter and Hamlin, 1957, p. 29). For the past several decades the use of these cones has been limited to the Pyrometric Cone Equivalent (PCE) test (Liles and Heystek, 1977, p. 16). However, all of the ceramic firing tests reported by Veatch (1909) and Smith (1931) as well as some of the earliest USBM tests report firing conditions in terms of the standard cone numbers.

11. Drying Shrinkage

The drying shrinkage is a measure of the relative amount of shrinkage (in percent) which the tempered and molded material undergoes

upon drying. Although there are a variety of ways by which this can be measured, in this report the shrinkage values represent the percent linear shrinkage based on the linear distance measured between two reference marks or lines imprinted on the plastic specimen before drying. Even though the methods have varied in detail, the drying is usually accomplished in two stages: first, by air drying at room temperature (usually for 24 hours) and second, by drying in an oven followed by cooling to room temperature in a desiccator (Klinefelter and Hamlin, 1957, p. 30-31; Liles and Heystek, 1977, p. 3). In most cases the heating was at 212°F (100°C) for 24 hours; however, studies by Smith (1931, p. 20 and 21) employed 167°F (75°C) for 5 hours followed by 230°F (110°C) for 3 hours.

12. Dry Strength

The dry strength (or green strength) is a measure of the apparent strength of the clay or shale after it has been molded and dried. Unless otherwise indicated, it represents the tranverse, or crossbreaking, strength as opposed to either tensile strength or compressive strength. For the great majority of cases only the approximate dry strength is indicated as determined by visual inspection, using such terms as low, fair, good, or high (Klinefelter and Hamlin, 1957, p. 32-33; Liles and Heystek, 1977, p. 2). Smith (1931, p. 12-13) reports a quantitative measurement of this strength using the modulus of rupture (MOR) expressed in units of pounds per square inch (psi).

13. Extrusion Test

More extensive tests are sometimes made on clays and shales which

show good plasticity and long firing range in the preliminary test. In the Extrusion Test several bars are formed using a de-airing extrusion machine (i.e., one which operates with a vacuum to remove all possible air pockets). These bars are fired and tested for shrinkage, strength (modulus of rupture) and water saturation coefficient (Liles and Heystek, 1977, p. 8).

14. Firing Range

The term firing range indicates the temperature interval over which the material shows favorable firing characteristics. For slow-fired materials such desirable qualities include: a) good strength or hardness; b) good color; c) low shrinkage; d) low absorption; and e) low porosity. For quick-fired materials these include: a) good pore structure; b) low absorption; and c) low bulk density. For slow-firing and quick-firing tests the firing range should be at least 100°F (55°C) to be considered promising (O'Neill and Barnes, 1979, p. 15-18).

15. Hardness

The hardness, as measured on fired materials, indicates the resistance to abrasion or scratching. It is designated either in verbal, descriptive terms or in numerical terms using Mohs' hardness (Liles and Heystek, 1977, p. 3). It is used as an indication of the strength of the fired materials. Smith (1931), however, measured the fired strength with the modulus of rupture.

16. Hardness (Mohs')

The hardness of fired specimens using the Mohs' scale of hardness

is currently used by the USBM as a numerical measure of the fired bodies' strength (Liles and Heystek, 1977, p. 3). The values correspond to the hardness of the following reference minerals:

Mohs' Hardness No.	Reference Minerals
1	Talc
2	Gypsum
3	Calcite
4	Fluorite
5	Apatite
6	Orthoclase
7	Quartz
8	Topaz
9	Corundum
10	Diamond

A Mohs' hardness greater than 3 is considered promising for slow-fired materials.

17. HCl Effervescence

The effervescence in HCl is visually determined as none, slight or high based on the reaction of 10 ml of concentrated hydrochloric acid added to a slurry of 10 grams powdered clay or shale (minus 20 mesh) in 100 ml of water (Klinefelter and Hamlin, 1957, p. 17; Liles and Heystek, 1977, p. 4). This test gives a general indication of the amount of calcium carbonate present in the sample. An appreciable effervescence could be an indication of potential problems with lime pops and/or frothing of slow-fired ceramic products.

18. Linear Shrinkage, (%)

The term linear shrinkage represents the relative shrinkage of the clay body after firing. In most cases it represents the percent total linear shrinkage from the plastic state and is based on measurements

between a pair of standard reference marks imprinted just after molding (Klinefelter and Hamlin, 1957, p. 30-32; Liles and Heystek, 1977, p. 3). (Also see the discussion under Drying Shrinkage.) Smith (1931, p. 22) gives the shrinkage relative to both the dry, or green, state (under the column headed Dry) as well as the plastic state (under the column headed Plastic). A total shrinkage of 10% or less is considered promising for slow-fired materials.

19. Modulus of Rupture (MOR)

The modulus of rupture is a measure of the strength of materials (for crossbreaking or transverse strength in this compilation) based on the breakage force, the distance over which the force was applied and the width and thickness of the sample. The MOR is expressed in psi units (pounds per square inch) for the limited MOR data reported here (determined by Smith, 1931, p. 21 and 23).

20. Mohs'

See Hardness (Mohs').

21. Molding Behavior

See Working Properties.

22. Munsell

See Color (Munsell).

23. "MW" face brick

"MW" stands for moderate weather conditions. This is a grade of brick suitable for use under conditions where a moderate, non-uniform

degree of frost action is probable (Klinefelter and Hamlin, 1957, p. 36 and 37; ASTM Annual Book of Standards, 1974). (Also see "SW" face brick.)

24. PCE - Pyrometric Cone Equivalent

The PCE test measures the relative refractoriness, or temperature resistance, of the clay or shale; it is indicated in terms of standard pyrometric cones. The value given is the number of the standard pyrometric cone which softens and sags (or falls) at the same temperature as a cone made from the clay or shale being studied. These tests are usually only made on refractory materials which show favorable potential in the preliminary slow firing tests (i.e., high absorption, low shrinkage, and light fired color). The results are usually given for the upper temperature range Cone 12 (1337°C; 2439°F) to Cone 42 (2015°C; 3659°F) where the temperature equivalents are based on a heating rate of 150°C (270°F) per hour. With increasing temperature resistance the sample is designated as either a low-duty, medium-duty, high-duty, or super-duty fire clay (Klinefelter and Hamlin, 1957, p. 29-30 and 57-58; Liles and Heystek, 1977, p. 16).

25. pH

The pH is a measure of the relative acidity or alkalinity with values ranging from 0 to 14. (A pH of 7 is neutral. Values greater than this are alkaline whereas those which are less than 7 are acid.) Most of the ceramic tests by the USBM presented here show pH values as determined on the crushed and powdered raw material (in a water slurry) prior to firing (Klinefelter and Hamlin, 1957, p. 28; Liles and Heystek, 1977, p. 4).

Strongly acid or alkaline pH values may give some indication of potential problems with efflorescence and scum due to water-soluble salts in the clay. Unfortunately, no simple and direct interpretation is possible from the pH data alone. The best method for determining these salts is through direct chemical analysis as described under Soluble Salts. (Also see Solu-Br.)

26. Plasticity

See Working Properties.

27. Porosity, Apparent

See App. Por.

28. Quick Firing

See Bloating Test.

29. Saturation Coefficient

The saturation coefficient is determined only for specimens which have undergone the more extensive Extrusion Test. It is determined by submerging the fired specimen in cool water for 24 hours, followed by submerging the specimen in boiling water for 5 hours. The saturation coefficient is found by dividing the percent of water absorbed after boiling into the percent of water absorbed after the 24-hour submergence (Liles and Heystek, 1977, p. 8).

30. Shrinkage

See Drying Shrinkage and Linear Shrinkage.

31. Slaking

See Working Properties.

32. Slow Firing Test

Slow Firing Test refers to the process of firing ("burning") the dried specimen in a laboratory furnace or kiln. Although specific details of the different laboratory methods vary, all specimens are started at room temperature and are slowly heated to the desired temperature over a specific interval of time.

The majority of the slow firing tests by the USBM reported here were made using 15-minute draw trials. In this method a set of molded and dried test specimens are slowly fired in the kiln or furnace. The temperature is gradually raised to 1800°F (982°C) over a period of 3 to 4 hours (to avoid disintegration of the specimen as the chemically combined water is released) and the temperature is held constant for about 15 minutes. One specimen is removed from the kiln (a draw trial) and the temperature is raised to the next level (usually in intervals of 100°F). At each interval the temperature is again held constant for a 15-minute soak and then one specimen is withdrawn. This process is repeated until the final temperature is achieved (usually 2300 or 2400°F; 1260 or 1316°C) - see Klinefelter and Hamlin (1957, p. 19 and 30). The disadvantage of this draw trial method is that it tends to underfire the specimens, compared to the industrial process, since they are soaked for a relatively short time and quickly cooled by removal from the kiln.

Since the early 1970's the USBM has abandoned the draw trials and has adopted a method which more closely resembles the conditions of

commercial manufacture. As described by Liles and Heystek (1977, p. 2 and 3), one of the test specimens is slowly fired, over 24 hours, to 1832°F (1000°C), where it is held for a one-hour soak. The kiln is then turned off, but the specimen remains in the kiln as it slowly cools. (This gives a much closer approximation of most commercial firing processes.) This is subsequently repeated, one specimen at a time, for successive 50°C intervals usually up to 2282°F (1250°C). Unfortunately, only a relatively small part of the current data set is represented by USBM tests using this newer method.

The firing test methods used by Smith (1931, p. 21 and 22) are somewhat intermediate to the two methods described above. First, the specimens were slowly fired from 200 to 1200°F (93 to 649°C) over a period of 11 hours. The temperature was subsequently increased at a rate of 200°F per hour for approximately 4 hours followed by 100°F per hour until final temperature conditions were reached. At these later stages firing conditions were monitored using standard pyrometric cones in the kiln. The maximum firing temperature was determined from observed pyrometric cone behavior. This temperature was based on the temperature equivalent to 2 cones below the desired final cone. The kiln temperature was then held constant until the desired cone soaked down. Test specimens were then removed from the kiln and allowed to cool. Smith's firings averaged about 17 hours in the kiln and all specimens were fired to cones 06, 04, 02, 1, 3 and 5 wherever possible. No specific information is available on the methods employed by Veatch (1909) or the unpublished data from TVA or Georgia Tech.

33. Solu-Br. (Solu-Bridge)

Solu-Bridge measurements were used in the 1950's and 60's by the

USBM as a measure of the soluble salts (e.g., calcium sulfate) in the unfired raw material which might cause scum and efflorescence on fired products. "The solubridge and pH readings show the higher alkali samples. Solubridge determinations give the water soluble part of the alkalis and readings above 1.5 indicate fairly high soluble salt content. Clays containing high alkalies have rather short maturing temperatures and require closer firing control. The alkalies also influence the color and lower the vitrification temperature." (H.P. Hamlin, written communication, 1957). In this method the pulverized clay or shale is boiled in water, left to stand overnight, and filtered. The content of soluble salts in the solution is then measured using the Solu-Bridge instrument readings applied to suitable calibration tables (Klinefelter and Hamlin, 1957, p. 28-29). These data are no longer collected because consistent and meaningful results are difficult to achieve.

34. Soluble Salts

Excessive water-soluble salts can cause problems with efflorescence or scum on fired clay products. (More than 3 to 4% calcium sulfate, and 1/2% magnesium or alkali sulfates are considered excessive.)

The most accurate determinative method is to boil the finely powdered sample in distilled water for 1/2 to 1 hour and let it soak overnight. The decanted solution is then analyzed for the soluble salts using standard chemical methods. The Solu-Bridge readings may also be used as a general measure of the soluble salts (Klinefelter and Hamlin, 1957, p. 28).

35. Strength

See Dry Strength and Modulus of Rupture.

36. "SW" face brick

"SW" stands for severe weather conditions. This is a grade of brick suitable for use under conditions where a high degree of frost action is probable (Klinefelter and Hamlin, 1957, p. 36 and 37, and the ASTM Annual Book of Standards, 1974). (Also see "MW" face brick.)

37. Temp. °F (°C)

The temperature at which the material was fired (both slow and quick firing tests) is given in Fahrenheit (°F) followed by the Celsius (°C) conversion in parentheses. In cases where only pyrometric cone values are available, the approximate temperature is given on the form and is based on the table of temperature equivalents in Norton (1942, p. 756, Table 128) or in Veatch (1909, p. 57).

38. Water of Plasticity (%)

This is a measure of the amount of water (as weight percent relative to the dry material) required to temper the pulverized raw clay or shale into a plastic, workable consistency. This is not a precise measurement, being dependent upon the experience of the technician, the type of equipment used and the plasticity criteria. In most cases it represents the amount of water necessary for the material to be extruded into briquettes from a laboratory hydraulic ram press. In general, high water of plasticity values tends to correlate with a greater degree of workability, higher plasticity and finer grain size.

Unfortunately, high values also correlate with a greater degree of shrinkage, warping and cracking of the material upon drying. (See Klinefelter and Hamlin, 1957, p. 20-22; Liles and Heystek, 1977, p. 2.)

39. Working Properties (or Workability)

This area of working properties includes comments on the slaking, plasticity, and molding, or extruding behavior of the tempered material (Klinefelter and Hamlin, 1957, p. 5, 19-22 and 33-34). The term slaking refers to the disintegration of the dry material when immersed in water. It may range in time from less than a minute to weeks, but generally in the present report it is given only a relative designation such as rapid, slow, or with difficulty. Plasticity likewise is designated in a comparative manner in order of decreasing plasticity: plastic, fat (or sticky), semiplastic, short (or lean), semiflint and flint. Molding behavior is referred to as good, fair, or poor and is a general designation for the ease with which the material can be molded into test bars or briquettes.

These working properties are very imprecise and strongly dependent upon the judgement and experience of the operator. They do, however, give a general indication of how the material might respond to handling in the industrial process.

Ceramic Tests and Analyses of Clays, Shales and Slates in Gordon County, Georgia*

* The data presented in this report are based on laboratory tests that are preliminary in nature and will not suffice for plant or process design.

CERAMIC TESTS AND ANALYSES

Material Shale (Conasauga Group). Compilation Map Location No. Gdn.09V-1

County Gordon. Sample Number -

Raw Properties: Lab & No. Ga. Survey.

Date Reported 1909. Ceramist O. Veatch, Ga. Survey.

Water of Plasticity 25 % Working Properties Poor plasticity; slow slaking.

Color Yellow. Drying Shrinkage 4 % Dry Strength (tensile) 42 psi. (ave.)
56 psi. (max.)

Remarks Drying properties: Good.

Slow Firing Tests:

Approx. Temp. °F (°C)	Color	Hardness	Linear Shrinkage, %	Absorption %	Appr. Por. %	Other data: Bulk Dens. g/cm^3
1850 (1010) (=Cone 07)	Red	"Good"	2.1	-	-	-
1922 (1050) (=Cone 05)	Red	"Steel hard" (not vitrified)	3.1	5.4*	-	-
2102 (1150) (=Cone 1)	Dark red	-	-	-	(viscous)	-

*(absorption test made on half a common building brick made from this deposit.)

Remarks / Other Tests "This shale will make an excellent building brick, but is of doubtful value for vitrified brick. Its main defect is poor plasticity." (Veatch, 1909, p. 396).

Preliminary Bloating (Quick Firing) Tests: Not determined.

Crushing Characteristics (unfired material) -

Particle Size - Retention Time -

Chemical & Mineralogical Data: Not determined.

Chemical Analysis		Mineralogy	
Oxide	Weight %	Mineral	volume %
SiO_2			
TiO_2		Quartz	
Al_2O_3		Feldspar	
Fe_2O_3		Carbonate	
FeO		Mica	
MnO		Chlorite-vermiculite	
MgO			
CaO		Montmorillonite	
Na_2O		Others	
K_2O			
P_2O_5			
S (total)		Total	
C (org.)			
CO_2			
H_2O^-			
H_2O^+			
Ignition loss			
Total			

Analyst _____ _____

Date _____ _____

Method _____ _____

Sample Location Data:

County Gordon. Land Lot _____, Sec. _____, Dist. _____.

7 1/2' topo quad. Calhoun North (S. cntr.) Lat._____, Long. _____.

Field No. -, Collected by O. Veatch Date c. 1909

Sample Method Grab (?). Weathering/alteration Variably weathered.

Structural Attitude -

Stratigraphic Assignment Conasauga Group (Cambrian) shale.

Sample Description & Comments Sample from pit of the Legg Brothers Brick Co. at Calhoun (also see Gdn.31S-51) is used to make common and dry press building brick. It is yellow or brown to olive green in color, closely jointed and hard -- tending to be uniform in composition and texture, but variably consolidated (Veatch, 1909, p. 395-396).

Compiled by B. J. O'Connor Date 08-20-86

CERAMIC TESTS AND ANALYSES

Material Clay (residual from shale). Compilation Map Location No. Gdn.09V-2

County Gordon. Sample Number -

Raw Properties: Lab & No. Ga. Survey, #53.

Date Reported 1909. Ceramist O. Veatch, Ga. Survey.

Water of Plasticity - % Working Properties -

Color Yellow. Drying Shrinkage * % Dry Strength -

Slow Firing Tests: Not determined.

Temp. °F (°C)	Color (Munsell)	Hardness (Mohs')	Linear Shrinkage, %	Absorption %	Appr. Por. %	Other data: Bulk Dens. g/cm^3

Remarks / Other Tests *This clay was being used by the Calhoun Brick Co., but it had "excessive shrinkage" and the pebbles in the overlying gravels caused some difficulty (Veatch, 1909, p. 396).

Preliminary Bloating (Quick Firing) Tests: Not determined.

Crushing Characteristics (unfired material) -

Particle Size - Retention Time -

Chemical & Mineralogical Data:

Chemical Analysis

Oxide		Weight %
SiO_2		60.67
TiO_2		0.73
Al_2O_3		17.55
Fe_2O_3	(total)	7.21
FeO		-
MnO		trace
MgO		0.68
CaO		trace
Na_2O		3.61
K_2O		1.98
P_2O_5		-
S	(total)	-
C	(org.)	-
CO_2		-
H_2O^-		1.08
H_2O^+		-
Ignition loss		6.68
Total		100.22

Mineralogy: Not determined.

Mineral	volume %
Quartz	
Feldspar	
Carbonate	
Mica	
Chlorite-vermiculite	
Montmorillonite	
Others	
Total	

Analyst E. Everhart, Ga. Survey (in Veatch, 1909, p. 396-397 and Appendix B, No. 53, p. 412 - 413).

Date c. 1909.

Method Standard "wet".

Sample Location Data:

County Gordon. Land Lot , Sec. , Dist. .

7 1/2' topo quad. Calhoun South . Lat. , Long. .

Field No. -, Collected by O. Veatch. Date c. 1909.

Sample Method Grab (?). Weathering/alteration Residual clay.

Structural Attitude -

Stratigraphic Assignment Recent (?) residual clay derived from Cambrian Conasauga Group shale.

Sample Description & Comments Yellow residual clay capped by a thin deposit of red, sandy loam and coarse quartz gravel (used by the Calhoun Brick Company to make brick at their plant about 1 mile South of Calhoun (Veatch, 1909, p. 395-397.

Compiled by B. J. O'Connor Date 11-24-81

CERAMIC TESTS AND ANALYSES

Material Clay and shale (Conasauga). Compilation Map Location No. Gdn.31S-51

County Gordon. Sample Number G-1

Raw Properties: Lab & No. Ga. Tech., #51.

Date Reported 1931. Ceramist R. W. Smith, Ga. Survey.

Water of Plasticity 22.7 % Working Properties Plasticity poor and grainy (fair on aging overnight); rather slow slaking; molding behavior fair-column edges tend to tear.

Color Light brownish-gray. Drying Shrinkage 2.1 % Dry Strength (MOR) 75.5 psi.

Remarks Drying behavior: little or no warpage.

Slow Firing Tests:

Approx. Temp. °F (°C)	Color (Munsell)*	Hardness (MOR, psi.)	Linear Shrinkage, % dry (plastic)	Absorption %	Appr. Por. %	Other data: Warpage
1840 (1005)	Salmon (4YR-6/7)	912	3.6 (5.5)	16.8	-	Little or none
1920 (1050)	Dark salmon (2YR-6/6)	1019	4.1 (6.0)	14.3	-	Slight
2000 (1095)	Light red (10R-5/5)	1386	6.2 (7.5)	11.4	-	Slight
2060 (1125)	Good red (10R-4/5)	1674	7.5 (9.3)	8.5	-	Considerable
2090 (1145)	Deep red (10R-3/5)	1638	7.5 (9.5)	5.6	-	Considerable
2160 (1180)	Deep red (10R-3/4)	2231	8.5 (10.3)	4.9	-	Considerable (vitrified-appearing surface)

Remarks / Other Tests Firing range = Cone 1 to 3 (in commercial kiln = Cone 1 to 2). This mixture used by the B. M. Hood Co. to make common and face brick at the Legg Plant on the north side of Calhoun (Smith, 1931, p. 215 and 216).

Preliminary Bloating (Quick Firing) Tests: Not determined.

*Note: Munsell color notation "10R" corresponds to the original notation "R-YR" reported in Smith (1931).

Crushing Characteristics (unfired material) Easy grinding.

Particle Size -16 mesh. Retention Time Approx. 17 hours.

Chemical & Mineralogical Data:

Chemical Analysis

Oxide		Weight %
SiO_2		63.44
TiO_2		0.92
Al_2O_3		20.79
Fe_2O_3		5.50
FeO		0.89
MnO		-
MgO		0.55
CaO		0.00
Na_2O		0.37
K_2O		2.31
P_2O_5		trace
S	(total)	0.00
C	(org.)	-
CO_2		-
H_2O^-		-
H_2O^+		-
Ignition loss		5.35
Total		100.12*

Mineralogy: Not determined.

Mineral	volume %
Quartz	
Feldspar	
Carbonate	
Mica	
Chlorite-vermiculite	
Montmorillonite	
Others	
Total	

* = analysis recalculated on an H_2O^- free basis by Smith, 1931, p. 214.)

Analyst E. Everhart, Ga. Survey.

Date c. 1931.

Method Standard "wet".

Sample Location Data:

County Gordon. Land Lot _____, Sec. _____, Dist. _____.

7 1/2' topo quad. Calhoun North (S. cntr.). Lat. _____, Long. _____

Field No. G-1, Collected by R. W. Smith. Date 4-28-30

Sample Method Grab samples. Weathering/alteration Weathered clay (residual ?).

Structural Attitude -

Stratigraphic Assignment Conasauga Group (Cambrian) shale and Recent (?) residual (?) clay.

Sample Description & Comments Samples from shale pit of the Hood Brick Co. on the N. side of Calhoun, E. of the Nashville RR and W. of the "Dixie Hwy. (Ga. 3), 1/2 mile N. of the Hood Co.'s brick plant. The Conasauga shale in 8 ft. deep pit is soft and light brown at the top, through semi-hard and greenish-drab to hard, dark gray shale at the bottom of the pit. In places the shale grades horizontally into a mottled red and light-brown clay (residual ?) with traces of a shaly structure (Smith, 1931, p. 212 to 216). Also see Gdn. 09V-1.

Compiled by B. J. O'Connor Date 08-20-86

CERAMIC TESTS AND ANALYSES

Material Soft to semi-hard shale (Conasauga). Compilation Map Location No. Gdn.31S-52

County Gordon. Sample Number G-7g

Raw Properties: Lab & No. Ga. Tech., #52

Date Reported 1931. Ceramist R. W. Smith, Ga. Survey.

Water of Plasticity 21.1 % Working Properties Plasticity is grainy at first, fair after aging overnight; a little slow slaking; molding behavior is fair.

Color Light brown. Drying Shrinkage 2.6 % Dry Strength (MOR) 77.8 psi.

Remarks Drying behavior: all test bars slightly warped.

Slow Firing Tests:

Approx. Temp. °F (°C)	Color (Munsell)*	Hardness (MOR, psi.)	Linear Shrinkage, % dry (plastic)	Absorption %	Appr. Por. %	Other data: Warpage
1840 (1005)	Dark salmon (2YR-6/7)	1326	4.2 (7.1)	11.6	-	Slight
1920 (1050)	Light salmon (10R-5/6)	1560	4.1 (7.0)	10.4	-	Some
2000 (1095)	Fair red (10R-5/5)	1713	4.8 (7.1)	10.2	-	Some
2060 (1125)	Good red (10R-4/5)	1733	6.3 (9.0)	7.8	-	Some
2090 (1145)	Deep red (10R-5/5)	2189	7.5 (9.5)	3.8	-	Bad
2160 (1180)	Deep red (10R-3/3)	3004	8.0 (10.2)	3.0	-	Bad

Remarks / Other Tests Firing range: Cone 01 to 5 (in commercial kiln: Cone 02 to 4). This material probably suitable for manufacture of brick, but dry strength probably too low for tile or sewer pipe - could be improved by blending with other clays (Smith, 1931, p. 218).

Preliminary Bloating (Quick Firing) Tests: Not determined.

*Note: Munsell color notation "10R" corresponds to the original notation "R-YR" reported in Smith (1931).

Crushing Characteristics (unfired material) Easy grinding.

Particle Size -16 mesh. Retention Time Approx. 17 hours.

Chemical & Mineralogical Data:

Chemical Analysis

Oxide		Weight %
SiO		58.62
TiO_2		0.92
Al_2O_3		24.62
Fe_2O_3		7.05
FeO		0.82
MnO		-
MgO		0.21
CaO		0.00
Na_2O		0.50
K_2O		2.05
P_2O_5		trace
S	(total)	0.00
C	(org.)	-
CO_2		-
H_2O^-		*
H_2O^+		-
Ignition loss		5.27
Total		100.06*

Mineralogy: Not determined.

Mineral	volume %
Quartz	
Feldspar	
Carbonate	
Mica	
Chlorite-vermiculite	
Montmorillonite	
Others	
Total	

(* = analysis recalculated on an H_2O^- -free basis by Smith, 1931, p. 217)

Analyst E. Everhart, Ga. Survey.

Date c. 1930.

Method Standard "wet".

Sample Location Data:

County Gordon. Land Lot 154 & 156, Sec. 3, Dist. 14.

7 1/2' topo quad. Calhoun North (SW.1/4). Lat. _____, Long. _____.

Field No. G-7g, Collected by R. W. Smith Date 4-29-30

Sample Method Grab samples from outcrops on 2 ridges. Weathering/alteration Weathered.

Structural Attitude -

Stratigraphic Assignment Conasauga Group (shale) - Cambrian.

Sample Description & Comments Material is soft to semi-hard, somewhat fissile, drab shale (similar to Gdn.31S-51 above) from the Chapman, Lewis and Henderson properties on low ridges just east of the Oostanaula River. This is about 1 1/4 miles north of Calhoun, and 1/2 to 3/4 mile west of the Nashville RR. and the B. M. Hood Company brick plant (Smith, 1931, p. 216-218).

Compiled by B. J. O'Connor Date 08-20-86

CERAMIC TESTS AND ANALYSES

Material Plastic yellow clay (residual/colluvial). Compilation Map Location No. Gdn.31S-53

County Gordon. Sample Number G-3

Raw Properties: Lab & No. Ga. Tech., #53.

Date Reported 1931. Ceramist R. W. Smith, Ga. Survey.

Water of Plasticity 32.8 % Working Properties Good plasticity, sticky; rapid slaking; good molding behavior.

Color Light tan. Drying Shrinkage 6.7 % Dry Strength (MOR) 241.2 psi.

Remarks Drying behavior: all test bars very slightly warped.

Slow Firing Tests:

Approx. Temp. °F (°C)	Color (Munsell)*	Hardness (MOR, psi.)	Linear Shrinkage, % dry (plastic)	Absorption %	Appr. Por. %	Other data: Warpage
1840 (1005)	Pinkish-ivory (5YR-7/6)	672	0.4 (7.3)	24.8	-	Very slight
1920 (1050)	Pinkish-tan, pale (5YR-7/6)	906	0.3 (7.1)	25.3	-	Very slight
2000 (1095)	Pinkish-tan, light (5RY-7/5)	1341	0.8 (7.4)	23.6	-	Very slight
2060 (1125)	Pinkish-tan, medium (5YR-6/7)	1022	1.3 (8.3)	24.1	-	Slight
2090 (1145)	Pinkish-salmon (4YR-6/6)	1251	1.0 (7.4)	23.6	-	Very slight
2160 (1180)	Pinkish-salmon (3YR-6/6)	1204	1.8 (8.5)	22.5	-	Slight

Remarks / Other Tests Firing Range: above Cone 5. Due to the high absorption this clay is suitable only for flower pots and crude pottery - also possibly porous roofing tile. It could be used in blends to increase the plasticity of slow-slaking shales (Smith, 1931, p. 220).

Preliminary Bloating (Quick Firing) Tests: Not determined.

*Note: Munsell color notation "5YR" corresponds to the original notation "YR" reported in Smith (1931).

Crushing Characteristics (unfired material) Easy grinding.

Particle Size -16 mesh. Retention Time Approx. 17 hours.

Chemical & Mineralogical Data:

Chemical Analysis

Oxide	Weight %
SiO_2	74.50
TiO_2	0.93
Al_2O_3	13.01
Fe_2O_3	3.24
FeO	0.72
MnO	-
MgO	0.28
CaO	0.00
Na_2O	0.59
K_2O	0.44
P_2O_5	trace
S (total)	0.00
C (org.)	-
CO_2	-
H_2O^-	*
H_2O^+	-
Ignition loss	6.32
Total	100.03*

Mineralogy: Not determined.

Mineral	volume %
Quartz	
Feldspar	
Carbonate	
Mica	
Chlorite-vermiculite	
Montmorillonite	
Others	
Total	

(* = analysis recalculated on an H_2O^- -free basis by Smith, 1931, p. 219.)

Analyst E. Everhart, Ga. Survey.

Date 1931.

Method Standard "wet".

Sample Location Data:

County Gordon. Land Lot _____, Sec. _____, Dist. _____.

7 1/2' topo quad. Calhoun North (SE.1/4). Lat._____, Long. _____.

Field No. G-3, Collected by R. W. Smith. Date 4-28-30

Sample Method Grab samples. Weathering/alteration residual or colluvial.

Structural Attitude -

Stratigraphic Assignment Recent (?) clay derived from Knox Group (Cambro-Ordovician) carbonate rocks.

Sample Description & Comments Yellow plastic clay from shallow outcrops at the edge of a meadow on the Prater property 2 miles northeast of Calhoun, east of the Newton road and 1 1/4 miles due east of the Nashville RR. It apparently was derived from relatively chert-free area of the Knox Group carbonates and is inferred to be either colluvial or residual in origin (Smith, 1931, p. 218-220).

Compiled by B. J. O'Connor Date 8-20-86

CERAMIC TESTS AND ANALYSES

Material Drab shale, soft to semi-hard (Conasauga). Compilation Map Location No. Gdn.31S-54

County Gordon. Sample Number G-8g

Raw Properties: Lab & No. Ga. Tech., #54.

Date Reported 1931. Ceramist R. W. Smith, Ga. Survey.

Water of Plasticity 21.8 % Working Properties Fair plasticity; fairly rapid slaking; fair molding behavior-edges tend to tear.

Color Yellow. Drying Shrinkage 3.0 % Dry Strength (MOR) 89.4 psi.

Remarks Drying behavior: all test bars slightly warped.

Slow Firing Tests:

Approx. Temp. °F (°C)	Color (Munsell)*	Hardness (MOR, psi.)	Linear Shrinkage, % dry (plastic)	Absorption %	Appr. Por. %	Other data: Warpage
1840 (1005)	Salmon (2YR-6/6)	766	2.9 (6.5)	16.9	-	Slight
1920 (1050)	Light red (10R-5/4)	1162	4.0 (7.0)	13.2	-	Slight
2000 (1095)	Good red (10R-4/4)	1229	4.5 (7.4)	11.5	-	Slight
2060 (1125)	Good red (10R-4/5)	1517	5.7 (8.0)	12.0	-	Some
2090 (1145)	Deep red (10R-4/3)	1690	6.5 (9.1)	7.0	-	Some
2160 (1180)	Deep red (10R-3/3)	1855	7.2 (9.5)	7.7	-	Some

Remarks / Other Tests Firing Range: Cone 1 to Cone 5 (in commercial kiln: Cone 01 to 4). Material is suitable for manufacture of brick and possibly medium-fired structural tile (Smith, 1931, p. 222).

Preliminary Bloating (Quick Firing) Tests: Not determined.

*Note: Munsell color notation "10R" corresponds to the original notation "R-YR" reported in Smith (1931).

Crushing Characteristics (unfired material) Fairly easy grinding, brittle.

Particle Size -16 mesh. Retention Time Approx. 17 hours.

Chemical & Mineralogical Data:

Chemical Analysis

Oxide		Weight %
SiO_2		55.23
TiO_2		0.92
Al_2O_3		26.25
Fe_2O_3		7.25
FeO		0.50
MnO		-
MgO		0.05
CaO		0.00
Na_2O		0.99
K_2O		1.52
P_2O_5		0.14
S	(total)	0.00
C	(org.)	-
CO_2		-
H_2O^-		*
H_2O^+		-
Ignition loss		7.20
Total		100.05*

Mineralogy: Not determined.

Mineral	volume %
Quartz	
Feldspar	
Carbonate	
Mica	
Chlorite-vermiculite	
Montmorillonite	
Others	
Total	

(* = analysis recalculated on an H_2O^- -free basis by Smith, 1931, p. 220)

Analyst E. Everhart, Ga. Survey.

Date c. 1930.

Method Standard "wet".

Sample Location Data:

County Gordon. Land Lot 8, Sec. 3, Dist. 14.

7 1/2' topo quad. Calhoun North (central), Lat. _____, Long. _____.

Field No. G-8g, Collected by R. W. Smith. Date 4-30-80

Sample Method Grab samples. Weathering/alteration Variable weathering.

Structural Attitude Bedding strikes NE and dips c. 45° SE in Ga. Hwy. 3 cut.

Stratigraphic Assignment Conasauga Group shales (Cambrian).

Sample Description & Comments Samples of soft to semi-hard, drab colored shale 3 & 1/2 miles north of Calhoun and just north of Damascus Church, from road cut on Ga. Hwy 3 (U. S. 41) - Freeman property - and from shallow outcrops on the low ridges to the east, but west of the Nashville RR - Pendley property (Smith, 1931, p. 220-222).

Compiled by B. J. O'Connor Date 8-20-86

CERAMIC TESTS AND ANALYSES

Material Shale, drab reddish-brown (Conasauga). Compilation Map Location No. Gdn.31S-55

County Gordon. Sample Number G-42g

Raw Properties: Lab & No. Ga. Tech., #55.

Date Reported 1931. Ceramist R. W. Smith, Ga. Survey.

Water of Plasticity 19.9 % Working Properties Fair plasticity; a little slow slaking; molding fair-column edges tend to tear.

Color Light brown. Drying Shrinkage 2.0 % Dry Strength (MOR) 79.2 psi.

Remarks Drying behavior: all test bars slightly warped.

Slow Firing Tests:

Approx. Temp. °F (°C)	Color (Munsell)*	Hardness (MOR, psi.)	Linear Shrinkage, % dry (plastic)	Absorption %	Appr. Por. %	Other data: Warpage
1840 (1005)	Light salmon (3YR-6/6)	656	2.7 (4.5)	17.9	-	Slight
1920 (1050)	Salmon (2YR-6/5)	909	3.9 (5.7)	15.5	-	Slight
2000 (1095)	Deep salmon (1YR-6/4)	1199	4.8 (6.8)	12.5	-	Slight
2060 (1125)	Medium red (10R-5/5)	1625	5.3 (7.5)	10.9	-	Slight
2090 (1145)	Good red (10R-4/5)	1636	6.5 (8.3)	10.4	-	Considerable
2160 (1180)	Deep red (10R-4/3)	2035	7.1 (8.6)	8.0	-	Considerable

Remarks / Other Tests Firing Range: Cone 01 to Cone 6 (Commercial kiln: Cone 02 to 5). Shale is suitable for manufacture of brick - possibly also for structural and roofing tile - although the somewhat poor working properties and low green strength need special attention in plant production (Smith, 1931, p. 224).

Preliminary Bloating (Quick Firing) Tests: Not determined.

*Note: Munsell color notation "10R" corresponds to the original notation "R-YR" reported in Smith (1931).

Crushing Characteristics (unfired material) Easy grinding.

Particle Size -16 mesh. Retention Time Approx. 17 hours.

Chemical & Mineralogical Data:

Chemical Analysis

Oxide	Weight %
SiO_2	64.22
TiO_2	0.73
Al_2O_3	19.89
Fe_2O_3	5.26
FeO	1.29
MnO	-
MgO	trace
CaO	0.00
Na_2O	0.48
K_2O	2.48
P_2O_5	trace
S (total)	0.00
C (org.)	-
CO_2	-
H_2O^-	*
H_2O^+	-
Ignition loss	5.63
Total	99.98*

Mineralogy: Not determined.

Mineral	volume %
Quartz	
Feldspar	
Carbonate	
Mica	
Chlorite-vermiculite	
Montmorillonite	
Others	
Total	

(* = analysis recalculated on an H_2O^- -free basis by Smith, 1931, p. 223.)

Analyst E. Everhart, Ga. Survey.

Date c. 1930.

Method Standard "wet".

Sample Location Data:

County Gordon. Land Lot 303 and 311-313, Sec. 3, Dist. 13.

7 1/2' topo quad. Calhoun North (N.cntr.). Lat. _____, Long. _____.

Field No. G-42g, Collected by R. W. Smith. Date 5-8-30

Sample Method Grab samples. Weathering/alteration Variable weathering.

Structural Attitude -

Stratigraphic Assignment Conasauga Group shale (Cambrian).

Sample Description & Comments Semi-hard to hard, drab to reddish-brown colored shale (fissile to massive) from outcrops on the Edwards property along the Resaca-Chatsworth road (Ga. Hwy. 136) about 1/2 to 1 mile northeast of Resaca, just east of the Conasauga River (Smith, 1931, p. 223 - 224). Also see Gdn.80-1.

Compiled by B. J. O'Connor Date 8-20-86

CERAMIC TESTS AND ANALYSES

Material Clay and soft shale. (Floyd). Compilation Map Location No. Gdn.31S-56a

County Gordon. Sample Number G-29

Raw Properties: Lab & No. Ga. Tech., #56.

Date Reported 1931. Ceramist R. W. Smith, Ga. Survey.

Water of Plasticity 36.5 %Working Properties Good plasticity; rapid slaking; and good molding behavior (tend to laminate in roll-press).

Color Brown. Drying Shrinkage 8.3 % Dry Strength (MOR) 232.1 psi.

Remarks Drying behavior: all test bars considerably warped.

Slow Firing Tests:

Approx. Temp. °F (°C)	Color (Munsell)*	Hardness (MOR, psi.)	Linear Shrinkage, % day (plastic)	Absorption %	Appr. Por. %	Other data: Warpage
1840 (1005)	Light salmon (3YR-6/7)	1411	5.2 (14.0)	17.7	-	Considerable
1920 (1050)	Medium salmon (2YR-6/7)	1590	5.7 (14.2)	15.9	-	Considerable
2000 (1095)	Salmon (4YR-6/7)	1482	6.1 (14.2)	14.4	-	Considerable
2060 (1125)	Light red (1YR-5/5)	2088	9.0 (16.3)	10.5	-	Considerable
2090 (1145)	Medium red (10R-4/4)	2249	9.5 (17.1)	7.3	-	Considerable
2160 (1180)	Good red (10R-4/3)	2398	10.0 (17.6)	6.0	-	Considerable

Remarks / Other Tests Firing Range: Cone 01 to 6 (in commercial kiln: Cone 02 to 05). According to Smith (1931, p. 226) the above firing and working properties (especially the high shrinkage and laminating tendencies) are unfavorable, but if blended with slower slaking material (eg. shale) it should be usable for brick, tile & pipe manufacture.

Preliminary Bloating (Quick Firing) Tests: Not determined.

*Note: Munsell color notation "10R" corresponds to the original notation "R-YR" reported in Smith (1931).

Crushing Characteristics (unfired material) Easy grinding.

Particle Size -16 mesh. Retention Time Approx. 17 hours.

Chemical & Mineralogical Data:

Chemical Analysis

Oxide	Weight %
SiO_2	67.64
TiO_2	0.92
Al_2O_3	14.88
Fe_2O_3 (total)	8.28
FeO	-
MnO	trace
MgO	trace
CaO	0.00
Na_2O	0.45
K_2O	0.98
P_2O_5	0.06
S (total)	0.00
C (org.)	-
CO_2	-
H_2O^-	*
H_2O^+	-
Ignition loss	6.95
Total	100.16*

Mineralogy: Not determined.

Mineral	volume %
Quartz	
Feldspar	
Carbonate	
Mica	
Chlorite-vermiculite	
Montmorillonite	
Others	
Total	

(* = analysis recalculated on an H_2O^- -free basis by Smith, 1931, p. 225.)

Analyst E. Everhart, Ga. Survey.

Date c. 1930.

Method Standard "wet".

Sample Location Data:

County Gordon. Land Lot 305, 316, 318 and 320. Sec. 3, Dist. 13.

7 1/2' topo quad. Sugar Valley (NE. side). Lat. _____, Long. _____.

Field No. G-29, Collected by R. W. Smith. Date 5-5-30

Sample Method Groove samples of 3 to 6 ft. in length from 3 different places on RR cut. Weathering/alteration Weathered.

Structural Attitude -

Stratigraphic Assignment Recent (?) clay and shale derived from deep weathering of Floyd "Shale" argillaceous carbonates (Mississippian).

Sample Description & Comments Soft, weathered, brown and drab shale and red to mottled red and gray clay from a 500 ft. long cut on the Southern RR. 1/2 mile south of Hill City and located on the G. Bandy property (Smith, 1931, p. 224-26).

Compiled by B. J. O'Connor Date 8-20-86

CERAMIC TESTS AND ANALYSES

Material Plastic clay, gray, blue and brown. Compilation Map Location No. Gdn.31S-56b

County Gordon. Sample Number G-30

Raw Properties: Lab & No. Ga. Tech., #56.

Date Reported 1931. Ceramist R. W. Smith, Ga. Survey.

Water of Plasticity 26.3 % Working Properties Good plasticity, but very sticky; rapid slaking; good molding-slight tendency to laminate.

Color Light brownish-gray. Drying Shrinkage 6.9 % Dry Strength (MOR) 307.1 psi.

Remarks Drying behavior: all test bars show considerable warpage.

Slow Firing Tests:

Approx. Temp. °F (°C)	Color (Munsell)*	Hardness (MOR, psi.)	Linear Shrinkage, % dry (plastic)	Absorption %	Appr. Por. %	Other data: Warpage
1840 (1005)	Cream yellow (7YR-7/7)	990	0.7 (7.3)	19.1	-	Considerable
1920 (1050)	Pale salmon (6YR-7/7)	973	0.8 (7.1)	19.2	-	Considerable
2000 (1095)	Light salmon (5YR-7/6)	1203	1.1 (7.8)	17.6	-	Some
2060 (1125)	Medium salmon (4YR-6/6)	1382	1.8 (8.7)	16.4	-	Considerable
2090 (1145)	Salmon (2YR-5/6)	1521	2.6 (9.3)	15.5	-	Considerable
2160 (1180)	Salmon (3YR-5/5)	1683	3.4 (10.4)	13.9	-	Bad

Remarks / Other Tests Firing Range: Cone 3 to 8 and higher (commercial kiln: Cone 2 to 7 and higher). This clay is suitable for manufacture of flower pots, crude pottery and possibly porous roofing tile-other uses are precluded by its poor fired colors, rather high absorption and lamination tendency (Smith, 1931, p. 228).

Preliminary Bloating (Quick Firing) Tests: Not determined.

*Note: Munsell color notation "5YR" corresponds to the original notation "YR" reported in Smith (1931).

Crushing Characteristics (unfired material) Easy grinding.

Particle Size -16 mesh. Retention Time Approx. 17 hours.

Chemical & Mineralogical Data:

Chemical Analysis

Oxide		Weight %
SiO_2		84.35
TiO_2		1.10
Al_2O_3		7.20
Fe_2O_3		2.17
FeO		trace
MnO		-
MgO		0.14
CaO		0.51
Na_2O		0.48
K_2O		0.47
P_2O_5		trace
S	(total)	0.00
C	(org.)	-
CO_2		-
H_2O^-		*
H_2O^+		-
Ignition loss		3.26
Total		99.95*

Mineralogy: Not determined.

Mineral	volume %
Quartz	
Feldspar	
Carbonate	
Mica	
Chlorite-vermiculite	
Montmorillonite	
Others	
Total	

(* = analysis recalculated on an H_2O^- -free basis by Smith, 1931, p. 227.)

Analyst E. Everhart, Ga. Survey.

Date c. 1930.

Method Standard "wet".

Sample Location Data:

County Gordon. Land Lot _____, Sec. 3, Dist. 13.

7 1/2' topo quad. Sugar Valley (NE. side). Lat. _____, Long. _____.

Field No. G-30, Collected by R. W. Smith. Date 5-5-30

Sample Method 4 ft. grooved sample from prospect pit. Weathering/alteration Residual (alluvial?) clay.

Structural Attitude -

Stratigraphic Assignment Recent (?) residual (or possibly alluvial ?) clay probably derived by deep weathering of an impure Conasauga (Cambrian) limestone.

Sample Description & Comments Material is a very plastic clay containing some grit. It ranges from light gray and brown-stained at the top to "bright blue" at the bottom of a 5 ft. deep prospect pit from the G. Bandy property 3/4 mile south of Hill City (Smith, 1931, p. 226-228). (This is approximately 0.1 mile north of the paved NW-SE paved road recently designated as Ga. Hwy. 136 conn.).

Compiled by B. J. O'Connor Date 8-20-86

CERAMIC TESTS AND ANALYSES

Material Brown soft shale/clay (Floyd). Compilation Map Location No. Gdn.31S-57

County Gordon. Sample Number G-13

Raw Properties: Lab & No. Ga. Tech., #57.

Date Reported 1931. Ceramist R. W. Smith, Ga. Survey.

Water of Plasticity 32.7 % Working Properties Fair plasticity, somewhat "short"; fairly rapid slaking; fair molding behavior.

Color Brown Drying Shrinkage 2.5 % Dry Strength (MOR) 132.2 psi.

Remarks Drying Behavior: test bars all slightly warped.

Slow Firing Tests:

Approx. Temp. °F (°C)	Color (Munsell)*	Hardness (MOR, psi.)	Linear Shrinkage, % dry (plastic)	Absorption %	Appr. Por. %	Other data: Warpage
1840 (1005)	Pale salmon (5YR-7/6)	1266	2.2 (4.9)	24.3	-	Slight
1920 (1050)	Light salmon (6YR-7/6)	1461	2.8 (5.1)	22.7	-	Some
2000 (1095)	Medium salmon (3YR-6/6)	1770	3.8 (6.3)	19.5	-	Slight
2060 (1125)	Salmon (1YR-5/5)	2202	6.5 (8.6)	16.2	-	Considerable
2090 (1145)	Light chocolate-red (10R-5/5)	2491	8.3 (10.3)	12.5	-	Some
2160 (1180)	Medium chocolate-red (1YR-4/4)	2700	8.3 (10.8)	12.0	-	Some

Remarks / Other Tests Firing Range: Cone 3 to 5 and higher (commercial kiln: Cone 2 to 5). Material is suitable for manufacture of brick and possibly medium-fired structural tile (Smith, 1931, p. 230).

Preliminary Bloating (Quick Firing) Tests: Not determined.

*Note: Munsell color notations "5YR" and "10R" correspond to the original notations "YR" and "R-YR" respectively reported in Smith (1931).

Crushing Characteristics (unfired material) -

Particle Size -16 mesh. Retention Time Approx. 17 hours.

Chemical & Mineralogical Data:

Chemical Analysis

Oxide		Weight %
SiO_2		73.85
TiO_2		0.74
Al_2O_3		14.66
Fe_2O_3		3.83
FeO		trace
MnO		-
MgO		0.66
CaO		0.00
Na_2O		trace
K_2O		1.95
P_2O_5		trace
S	(total)	0.00
C	(org.)	-
CO_2		-
H_2O^-		*
H_2O^+		-
Ignition loss		4.35
Total		100.04*

Mineralogy: Not determined.

Mineral	volume %
Quartz	
Feldspar	
Carbonate	
Mica	
Chlorite-vermiculite	
Montmorillonite	
Others	
Total	

(* = analysis recalculated on an H_2O^- -free basis by Smith, 1931, p. 229.)

Analyst E. Everhart, Ga. Survey.

Date c. 1930.

Method Standard "wet".

Sample Location Data:

County Gordon. Land Lot 113, Sec. 3, Dist. 14.

7 1/2' topo quad. Sugar Valley (SE.1/4). Lat. _____, Long. _____.

Field No. G-13, Collected by R. W. Smith. Date 5-1-30

Sample Method Grab samples. Weathering/alteration Deeply weathered (residual) clay.

Structural Attitude -

Stratigraphic Assignment Recent (?) clay/shale weathered from Mississippian Floyd Shale argillaceous limestone.

Sample Description & Comments Ranges from a soft, brown, sandy "shale" (slight fissility) to nearly a sandy clay containing numerous fossil casts and probably derived from an argillaceous limestone in the Floyd Shale. Taken from the J. Russell property at the SE. foot of Baugh Mtn. on the Southern RR. 1 1/2 miles south of Sugar Valley and about 3/4 mile NW. of the Oostanaula River (Smith, 1931, p. 229- 230).

Compiled by B. J. O'Connor Date 8-20-86

CERAMIC TESTS AND ANALYSES

Material Brick, unfired (from Conasauga shale, soft to hard). Compilation Map Location No. Gdn.31S-58

County Gordon. Sample Number -

Raw Properties: Lab & No. Ga. Tech., #58.

Date Reported 1931. Ceramist R. W. Smith, Ga. Survey.

Water of Plasticity 21.3 % Working Properties Good plasticity; rapid slaking; and good molding behavior.

Color Light brown. Drying Shrinkage 3.0 % Dry Strength (MOR) 177.8 psi.

Remarks Drying Behavior: good, with little or no warpage.

Slow Firing Tests:

Approx. Temp. °F (°C)	Color (Munsell)*	Hardness (MOR, psi.)	Linear Shrinkage, % dry plastic	Absorption %	Appr. Por. %	Other data: Warpage
1840 (1005)	Dark salmon (1YR-5/6)	1241	2.2 (5.9)	15.7	-	Slight
1920 (1050)	Light red (10R-5/5)	1631	3.0 (6.1)	15.1	-	Slight
2000 (1095)	Medium red (10R-5/4)	2217	5.3 (8.2)	9.5	-	Slight
2060 (1125)	Good red (10R-4/5)	2237	5.7 (8.5)	8.4	-	Some
2090 (1145)	Good deep red (10R-4/4)	2679	7.2 (9.9)	5.2	-	Some
2160 (1180)	Good deep red (10R-3/4)	2797	7.5 (10.1)	4.8	-	Some

Remarks / Other Tests Firing Range: Cone 02 to 5 and higher (commercial kiln: 01 to 5). These tests are on samples of green (unfired) brick made from the Conasauga shale by the Plainville Brick Co. at Plainville (Smith, 1931, p. 232-234).

Preliminary Bloating (Quick Firing) Tests: Not determined.

*Note: Munsell color notation "10R" corresponds to the original notation "R-YR" reported in Smith (1931).

Crushing Characteristics (unfired material) Easy grinding.

Particle Size -16 mesh. Retention Time Approx. 17 hours.

Chemical & Mineralogical Data:

Chemical Analysis

Oxide	Weight %
SiO_2	56.96
TiO_2	0.73
Al_2O_3	23.98
Fe_2O_3 (total)	8.32
FeO	-
MnO	0.38
MgO	0.71
CaO	0.81
Na_2O	0.99
K_2O	1.18
P_2O_5	0.11
S (total)	0.17
C (org.)	-
CO_2	-
H_2O^-	*
H_2O^+	-
Ignition loss	6.64
Total	100.98*

Mineralogy: Not determined.

Mineral	volume %
Quartz	
Feldspar	
Carbonate	
Mica	
Chlorite-vermiculite	
Montmorillonite	
Others	
Total	

(* = analysis recalculated on an H_2O^- -free basis by Smith, 1931, p. 232.)

Analyst E. Everhart, Ga. Survey.

Date c. 1930

Method Standard "wet".

Sample Location Data:

County Gordon. Land Lot _____, Sec. _____, Dist. _____.

7 1/2' topo quad. Plainville (SE.1/4). Lat. _____, Long. _____.

Field No. - , Collected by R. W. Smith. Date 7-30-29

Sample Method Random sample of several green bricks. Weathering/alteration (Shale weathered at top of pit only).

Structural Attitude Shale in pit: strike N.45°E., dipping c. 45°SE.

Stratigraphic Assignment Shale from Conasauga Group (Cambrian).

Sample Description & Comments Shale at Plainville Brick Co. pit on the east slope of a low ridge just north of Plainville, just west of the brick plant and west of the Southern RR. The shale ranges from soft and brownish-drab colored, at the weathered surface, to hard and grayish-drab, at 15 - 20 feet deep in the pit where light gray to greenish-gray, calcite-bearing streaks are occasionally observed. These last are discarded during mining to avoid any possibility of scumming of the brick surface on firing (Smith, 1931, p. 232-234).

Compiled by B. J. O'Connor Date 8-20-86

CERAMIC TESTS AND ANALYSES

Material Hard shale, drab (Conasauga). Compilation Map Location No. Gdn.31S-59

County Gordon. Sample Number -

Raw Properties: Lab & No. Ga. Tech., #59.

Date Reported 1931. Ceramist R. W. Smith, Ga. Survey.

Water of Plasticity 18.9 % Working Properties Slaking is very slow; plasticity very poor and grainy-even after aging a week; molding behavior very poor.

Color Brownish-gray. Drying Shrinkage 1.2 % Dry Strength (MOR) 60.9 psi.

Remarks Drying Behavior: fairly rapid, with slight warpage.

Slow Firing Tests:

Approx. Temp. °F (°C)	Color (Munsell)*	Hardness (MOR, psi.)	Linear Shrinkage, % dry (plastic)	Absorption %	Appr. Por. %	Other data: Warpage
1840 (1005)	Salmon (3YR-6/6)	456	1.0 (2.0)	18.2	-	Slight
1920 (1050)	Dark salmon (2YR-5/5)	618	1.6 (2.9)	16.5	-	Considerable
2000 (1095)	Light red (3YR-5/5)	765	2.8 (4.2)	13.5	-	Slight
2060 (1125)	Fair red (10R-4/5)	1274	3.2 (4.5)	13.4	-	Some
2090 (1145)	Good red (9R-4/4)	1594	4.1 (5.3)	11.3	-	Bad
2160 (1180)	Good red (9R-4/3)	2142	4.3 (5.3)	11.5	-	Bad

Remarks / Other Tests Firing range: Cone 3 to 5 and higher (commercial kiln: Cone 2 to 5. The shale is suited only for making common brick due to the high absorption and low strengths which are probably due to the hardness of the shale. These problems may be overcome by fine grinding and longer pugging (Smith, 1931, p. 236-238).

Preliminary Bloating (Quick Firing) Tests: Not determined.

*Note: Munsell color notation "10R" corresponds to the original notation "R-YR" reported in Smith (1931).

Crushing Characteristics (unfired material) Fairly easy grinding.

Particle Size -16 mesh. Retention Time Approx. 17 hours.

Chemical & Mineralogical Data:

Chemical Analysis

Oxide	Weight %
SiO_2	63.97
TiO_2	0.82
Al_2O_3	19.76
Fe_2O_3 (total)	7.77
FeO	-
MnO	-
MgO	0.03
CaO	0.00
Na_2O	0.98
K_2O	1.51
P_2O_5	-
S (total)	0.00
C (org.)	-
CO_2	-
H_2O^-	*
H_2O^+	-
Ignition loss	5.24
Total	100.08*

Mineralogy: Not determined.

Mineral	volume %
Quartz	
Feldspar	
Carbonate	
Mica	
Chlorite-vermiculite	
Montmorillonite	
Others	
Total	

(* = analysis recalculated on an H_2O^- -free basis by Smith, 1931, p. 237.)

Analyst E. Everhart, Ga. Survey.

Date c. 1930.

Method Standard "wet".

Sample Location Data:

County Gordon. Land Lot _____, Sec. _____, Dist. _____.

7 1/2' topo quad. Plainville (E. side). Lat. _____, Long. _____.

Field No. - , Collected by R. W. Smith. Date c. 1930

Sample Method Grab samples. Weathering/alteration Somewhat weathered.

Structural Attitude Beds strike N.30°E. and dip 60° to 75°NW.

Stratigraphic Assignment Conasauga Group shale (Cambrian).

Sample Description & Comments Outcrop samples from a low ridge on the old Reeves Farm (Maddox & Matthews property) 1/2 mile east of the Southern RR., west of Ga. Hwy. 54, and south of the road to Curryville, 3 miles NE of Plainville. Shale is hard, greenish- to reddish-drab colored and sampled from outcrops on the east and south sides of the 80-100 ft. high ridge (Smith, 1931, p. 236-238).

Compiled by B. J. O'Connor Date 8-20-86

CERAMIC TESTS AND ANALYSES

Material Shale (Conasauga). Compilation Map Location No. Gdn.31S-60

County Gordon. Sample Number G-21-2

Raw Properties: Lab & No. Ga. Tech., #60.

Date Reported 1931. Ceramist R. W. Smith, Ga. Survey.

Water of Plasticity 25.1 % Working Properties Fair plasticity; a little slow in slaking; molding behavior fair-column edges tear.

Color Light brown. Drying Shrinkage 2.7 % Dry Strength (MOR) 100.8 psi.

Remarks Drying Behavior: test bars all slightly warped.

Slow Firing Tests:

Approx. Temp. °F (°C)	Color (Munsell)*	Hardness (MOR,) psi.)	Linear Shrinkage, % dry (plastic)	Absorption %	Appr. Por. %	Other data: Warpage
1840 (1005)	Light red (2YR-5/6)	1310	6.8 (9.4)	11.1	-	Slight
1920 (1050)	Fair red (10R-5/7)	1471	6.0 (9.0)	10.1	-	Some
2000 (1095)	Medium red (10R-5/4)	1848	6.8 (9.1)	8.0	-	Slight
2060 (1125)	Good red (10R-4/5)	2363	9.5 (11.9)	5.3	-	Some
2090 (1145)	Chocolate red (10R-4/4)	2068	7.3 (9.9)	4.6	-	Considerable
2160 (1180)	Deep chocolate red (10R-3/4)	2485	7.6 (10.0)	3.2	-	Bad (vitreous surface)

Remarks / Other Tests Firing range: Cone 03 to 5 (commercial kiln: Cone 04 to 4). This shale is suitable for making brick and possibly tile (Smith, 1931, p. 241).

Preliminary Bloating (Quick Firing) Tests: Not determined.

*Note: Munsell color notation "10R" corresponds to the original notation "R-YR" reported in Smith (1931).

Crushing Characteristics (unfired material) Easy grinding.

Particle Size -16 mesh. Retention Time c. 17 hours.

Chemical & Mineralogical Data:

Chemical Analysis

Oxide		Weight %
SiO_2		59.15
TiO_2		0.92
Al_2O_3		23.56
Fe_2O_3		5.65
FeO		1.43
MnO		-
MgO		0.28
CaO		0.00
Na_2O		0.49
K_2O		2.01
P_2O_5		trace
S	(total)	0.00
C	(org.)	-
CO_2		-
H_2O^-		*
H_2O^+		-
Ignition loss		6.45
Total		99.94*

Mineralogy: Not determined.

Mineral	volume %
Quartz	
Feldspar	
Carbonate	
Mica	
Chlorite-vermiculite	
Montmorillonite	
Others	
Total	

(* = analysis recalculated on an H_2O^- -free basis by Smith, 1931, p. 240.)

Analyst E. Everhart, Ga. Survey.

Date c. 1930.

Method Standard "wet".

Sample Location Data:

County Gordon. Land Lot 143 and 158 Sec. 3, Dist. 15.

7 1/2' topo quad. Calhoun South (S.cntr.). Lat. _____, Long. _____.

Field No. G-21-2, Collected by R. W. Smith. Date 5-2-30

Sample Method Grab samples. Weathering/alteration Weathered.

Structural Attitude -

Stratigraphic Assignment Conasauga Group shales (Cambrian).

Sample Description & Comments Samples of soft to semi-hard, brownish-drab colored shale (with narrow bands of red clay) taken at intervals from a 1/4 mile stretch of exposure along a dirt road just west of the Nashville RR., about 1/4 mile north of the Bartow County line west of Oothkalooga Creek, on the H. R. Bennett property (Smith, 1931, p. 239-241).

Compiled by B. J. O'Connor Date 8-20-86

CERAMIC TESTS AND ANALYSES

Material Shale (Rome). Compilation Map Location No. Gdn.46-1

County Gordon. Sample Number 7

Raw Properties: Lab & No. N.C. State College Research Lab, Asheville, North Carolina; TVA # 103

Date Reported 10-8-46. Ceramist M. K. Banks, TVA.

Water of Plasticity - % Working Properties -

Color Red-green-gray. Drying Shrinkage - % Dry Strength -

Slow Firing Tests: Not determined.

Temp. °F (°C)	Color (Munsell)	Hardness (Mohs')	Linear Shrinkage, %	Absorption %	Appr. Por. %	Other data:

Preliminary Bloating (Quick Firing) Tests: Positive.

Temp. °F °C	Absorption %	Bulk Density g/cm^3	Bulk Density lb/ft^3	Remarks: Pore Structure
2350 (1288)	-	-	-	-
2400 (1316)	-	-	67	Excellent.
2450 (1343)	-	-	40	Excellent.

Remarks Bloating range = 2350-2500°F (1288-1371°C); best at 2450°F (1343°C).

Crushing Characteristics (unfired material) -

Particle Size -8 mesh. Retention Time 30 min. (in muffle furnace).

Chemical & Mineralogical Data: Not determined.

Chemical Analysis		Mineralogy	
Oxide	Weight %	Mineral	volume %
SiO_2			
TiO_2		Quartz	
Al_2O_3		Feldspar	
Fe_2O_3		Carbonate	
FeO		Mica	
MnO		Chlorite-vermiculite	
MgO		Montmorillonite	
CaO		Others	
Na_2O			
K_2O			
P_2O_5			
S (total)		Total	
C (org.)			
CO_2			
H_2O^-			
H_2O^+			
Ignition loss			
Total			

Analyst _____ _____

Date _____ _____

Method _____ _____

Sample Location Data:

County Gordon. Land Lot _____, Sec. _____, Dist. _____.

7 1/2' topo quad. Calhoun N. (N. side). Lat. _____, Long. _____.

Field No. 7, Collected by K. H. Teague (TVA). Date 1946?

Sample Method Grab (?). Weathering/alteration _____

Structural Attitude -

Stratigraphic Assignment Rome Formation (Cambrian).

Sample Description & Comments Interim report on tests from N. C. Research Lab via H. S. Rankin (TVA, 10-22-46). Material is a red-green-gray shale (somewhat sandy but not excessively so) and is fairly typical of the Rome Formation in this area. It weathers to a hard, flaky splinter, but is somewhat blocky when fresh. Large tonnage are available. Sample is "from road cut 1/2 mile south of the Whitfield-Gordon County line, along U.S. Hwy.41, Gordon Co." (Butts and Gildersleeve, 1948, p. 125, Table 8, no. 1).

Compiled by B. J. O'Connor Date 8-20-86

CERAMIC TESTS AND ANALYSES

Material Shale (Rome). Compilation Map Location No. Gdn.46-2

County Gordon. Sample Number 8

Raw Properties: Lab & No. N.C. State College Research Lab, Asheville, North Carolina; TVA #104

Date Reported 10-8-46. Ceramist M. K. Banks, TVA.

Water of Plasticity - % Working Properties -

Color Red to green. Drying Shrinkage - % Dry Strength -

Slow Firing Tests: Not determined.

Temp. °F (°C)	Color (Munsell)	Hardness (Mohs')	Linear Shrinkage, %	Absorption %	Appr. Por. %	Other data:

Preliminary Bloating (Quick Firing) Tests: Positive.

Temp. °F °C	Absorption %	Bulk Density g/cm^3	Bulk Density lb/ft^3	Remarks: Pore Structure
2350 (1288)	-	-	-	-
2400 (1316)	-	-	45	Excellent.
2450 (1343)	-	-	36	Good.

Remarks Bloating range = 2350-2450°F (1288-1343°C); best at 2400°F (1316°C).

Crushing Characteristics (unfired material) -

Particle Size -8 mesh. Retention Time 30 min. (in muffle furnace).

Chemical & Mineralogical Data: Not determined.

Chemical Analysis		Mineralogy	
Oxide	Weight %	Mineral	volume %
SiO_2			
TiO_2		Quartz	
Al_2O_3		Feldspar	
Fe_2O_3		Carbonate	
FeO		Mica	
MnO		Chlorite-vermiculite	
MgO		Montmorillonite	
CaO		Others	
Na_2O			
K_2O			
P_2O_5			
S (total)		Total	
C (org.)			
CO_2			
H_2O^-			
H_2O^+			
Ignition loss			
Total			

Analyst _____ _____

Date _____ _____

Method _____ _____

Sample Location Data:

County Gordon. Land Lot _____, Sec. _____, Dist. _____.

7 1/2' topo quad. Plainville (SE. 1/4). Lat. _____, Long. _____.

Field No. 8, Collected by K. H. Teague (TVA). Date 1946?

Sample Method Grab (?). Weathering/alteration _____

Structural Attitude -

Stratigraphic Assignment Rome Formation (Cambrian).

Sample Description & Comments Interim report on tests from N. C. Research Lab via H. S. Rankin (TVA, 10-22-46). Sample "from roadcut 1 mi. N.W. of Plainville R.R. Station" (Butts and Gildersleeve, 1948, p. 125, Table 8, no. 2). Bright red to green shale-relative hard and tough when fresh but weathers to a bright red soil. It is easily mined and present in workable quantities.

Compiled by B. J. O'Connor Date 8-20-86

CERAMIC TESTS AND ANALYSES

Material Shale (Conasauga). Compilation Map Location No. Gdn.46-3

County Gordon. Sample Number 8-A.

Raw Properties: Lab & No. N.C. State College Research Lab, Asheville, North Carolina; TVA# 105

Date Reported 10-8-46. Ceramist M. K. Banks, TVA.

Water of Plasticity - % Working Properties -

Color Gray-green. Drying Shrinkage - % Dry Strength -

Slow Firing Tests: Not determined.

Temp. °F (°C)	Color (Munsell)	Hardness (Mohs')	Linear Shrinkage, %	Absorption %	Appr. Por. %	Other data:

Preliminary Bloating (Quick Firing) Tests: Negative.

Temp. °F °C	Absorption %	Bulk Density g/cm^3	Bulk Density lb/ft^3	Remarks: Pore Structure
2350 (1288)	-	-	-	-
2400 (1316)	-	-	-	Vitrified only (too refractory).
2450 (1343)	-	-	-	-

Remarks Not usable, by itself, for expanded light weight aggregate manufacture.

Crushing Characteristics (unfired material) -

Particle Size -8 mesh. Retention Time 30 min. (in muffle furnace).

Chemical & Mineralogical Data: Not determined.

Chemical Analysis		Mineralogy	
Oxide	Weight %	Mineral	volume %
SiO_2			
TiO_2		Quartz	
Al_2O_3		Feldspar	
Fe_2O_3		Carbonate	
FeO		Mica	
MnO		Chlorite-vermiculite	
MgO		Montmorillonite	
CaO		Others	
Na_2O			
K_2O			
P_2O_5			
S (total)		Total	
C (org.)			
CO_2			
H_2O^-			
H_2O^+			
Ignition loss			
Total			

Analyst _____ _____

Date _____ _____

Method _____ _____

Sample Location Data:

County Gordon. Land Lot _____, Sec. _____, Dist. _____.

7 1/2' topo quad. Plainville (SE. 1/4). Lat. _____, Long. _____.

Field No. 8-A, Collected by K. H. Teague (TVA). Date 1946?

Sample Method Grab (?). Weathering/alteration _____

Structural Attitude -

Stratigraphic Assignment Conasauga Group (Cambrian).

Sample Description & Comments Interim report on tests from N. C. Research Lab via H. S. Rankin (TVA, 10-22-46). Sample of typical gray-green Conasauga shale from Plainville Brick Co. pit 1/2 mi. east of the Plainville R.R. station (Butts and Gildersleeve, 1948, map locn. #86). This is the same belt of Conasauga from which Samples 5 and 6, in Whitfield Co., were taken. Available tonnages are large.

Compiled by B. J. O'Connor Date 8-20-86

CERAMIC TESTS AND ANALYSES

Material Shale (Conasauga Group). Compilation Map Location No. Gdn. 64-1

County Gordon. Sample Number 34

Raw Properties: Lab & No. USBM, Norris, Tenn., No. 1554-F

Date Reported 5-8-64 (revised 1967) Ceramist M.V. Denny, USBM (revised by M.E. Tyrrell, Tuscaloosa, Ala.)

Water of Plasticity 16.2% (Low plasticity.) Working Properties Short working, mealy, gritty. pH = 6.72 (Not efervescent with HCl.)

Color Light gray. Drying Shrinkage 1.0 % Dry Strength Poor. (Low.)

Remarks Drying Characteristics: Poor, rough, edge cracking. (No defects).

Slow Firing Tests:

Approx. Temp. °F (°C)	Color	Hardness (Mohs')	Linear Shrinkage, %	Absorption %	Appr. Por. %	Other data: Bulk Dens. gm/cc
1800 (982)	Tan	Soft (2)	2.0	17.5	31.9	1.82
1900 (1038)	Tan	Fair hard (3)	2.0	14.3	27.6	1.93
2000 (1093)	Light brown	Hard (4)	4.0	12.1	24.1	1.99
2100 (1149)	Brown	Hard (4)	4.5(4.0)	9.9	20.4	2.06
2200 (1204)	Chocolate	Very hard (5)	7.0	7.4	16.1	2.18
2300 (1260	Dark brown	Broke to pieces	-	-	-	-

Remarks / Other Tests Could be added to a clay that has high shrinkage and high absorption to make a good brick and tile product. (Should fire to "MW" face brick specifications at about 2000°F (1093°C). Low plastic strength.) Potential use: None. (Face brick.)

Preliminary Bloating (Quick Firing) Tests: Negative.

Note: Appr. Por. and Bulk Dens. plus data and remarks in parentheses are from 1967 revised data sheets by Tyrrell.

Crushing Characteristics (unfired material) -

Particle Size - 20 mesh. Retention Time 15 min. draw trials (following 3-4 hr. to 1800°F, 982°C).

Chemical & Mineralogical Data: Not determined.

Chemical Analysis		Mineralogy	
Oxide	Weight %	Mineral	volume %
SiO_2			
TiO_2		Quartz	
Al_2O_3		Feldspar	
Fe_2O_3		Carbonate	
FeO		Mica	
MnO		Chlorite-vermiculite	
MgO		Montmorillonite	
CaO		Others	
Na_2O			
K_2O			
P_2O_5			
S (total)		Total	
C (org.)			
CO_2			
H_2O^-			
H_2O^+			
Ignition loss			
Total			

Analyst _____ _____

Date _____ _____

Method _____ _____

Sample Location Data:

County Gordon. Land Lot _____, Sec. _____, Dist. _____.

7 1/2' topo quad. - Lat. _____, Long. _____.

Field No. 34, Collected by J.W. Smith? Date c. 1963

Sample Method Grab (?). Weathering/alteration -

Structural Attitude -

Stratigraphic Assignment Conasauga Group (Cambrian).

Sample Description & Comments No further data available.

Compiled by B. J. O'Connor Date 08-20-86

CERAMIC TESTS AND ANALYSES

Material Shale (Conasauga). Compilation Map Location No. Gdn. 64-2

County Gordon. Sample Number 35

Raw Properties: Lab & No. USBM, Norris, Tenn.; No. 1554-G

Date Reported 5-8-64 (revised 1967) Ceramist M.V. Denny, USBM (revised by M.E. Tyrrell, Tuscaloosa, Ala.)

Water of Plasticity 16.2 % (Low plasticity.) Working Properties Short working, smooth, mealy. pH=6.55. (Not effervescent with HCl.

Color Buff. Drying Shrinkage 1.0 % Dry Strength Poor. (Low.)

Remarks Drying Characteristics: Fair, rough surface. (No defects.)

Slow Firing Tests:

Temp. °F (°C)	Color	Hardness (Mohs')	Linear Shrinkage, %	Absorption %	Appr. Por. %	Other data: Bulk Dens. gm/cc
1800 (982)	Light brown	Soft (2)	0.0(1.0)	14.8	27.8	1.88
1900 (1038)	Medium brown	Fair hard (3)	2.5	10.7	21.7	2.03
2000 (1093)	Brown	Hard (4)	5.0	8.8	18.3	2.08
2100 (1149)	Brown	Hard (4)	5.0	7.6	16.2	2.13
2200 (1204)	Chocolate	Very hard (5)	6+(6.0)	4.9	10.9	2.22
2300 (1260)	Dark brown	Glassy	In pieces (Expanded)	-	-	-

Remarks / Other Tests Slight bloating, soft, fair color, too short working, not plastic. (Should fire to "SW" face brick specifications at about 2050°F (1121°C). Low plastic strength.) Potential Use: Possible bloating for lightweight aggregate. (Face brick.)

Preliminary Bloating (Quick Firing) Tests: Positive. (Negative.)

Temp. °F (°C)	Absorption %	Bulk Density g/cm^3	Bulk Density lb/ft^3	Remarks
1900 (1038)	33.0	2.56	160	-
2000 (1093)	21.0	2.54	158	-
2100 (1149)	15.5	2.55	159	Slight coating.
2200 (1204)	24.0	1.65	103	Temperature a little high commercially.
2300 (1260)	19.0	1.30	81	Probably bloat about 2150°F (1177°C).

Remarks: Not recommended - too heavy in rotary kiln, too high temperature.

Note: Appr. Por. and Bulk Dens. plus data and remarks in parentheses are from 1967 revised data sheets by Tyrrell.

Crushing Characteristics (unfired material) -

Particle Size - 20 mesh. Retention Time 15 min. draw trials (following 3-4 hr. to 1800°F, 982°C).

Chemical & Mineralogical Data: Not determined.

Chemical Analysis		Mineralogy	
Oxide	Weight %	Mineral	volume %
SiO_2			
TiO_2		Quartz	
Al_2O_3		Feldspar	
Fe_2O_3		Carbonate	
FeO		Mica	
MnO		Chlorite-vermiculite	
MgO		Montmorillonite	
CaO		Others	
Na_2O			
K_2O			
P_2O_5			
S (total)		Total	
C (org.)			
CO_2			
H_2O^-			
H_2O^+			
Ignition loss			
Total			

Analyst _____ _____

Date _____ _____

Method _____ _____

Sample Location Data:

County Gordon. Land Lot _____, Sec. _____, Dist. _____.

7 1/2' topo quad. - Lat. _____, Long. _____.

Field No. 35, Collected by J.W. Smith? Date c. 1963

Sample Method Grab (?). Weathering/alteration -

Structural Attitude -

Stratigraphic Assignment Conasauga Group (Cambrian).

Sample Description & Comments No further data available.

Compiled by B. J. O'Connor Date 08-20-86

CERAMIC TESTS AND ANALYSES

Material Shale (Conasauga). Compilation Map Location No. Gdn. 64-3

County Gordon. Sample Number 38

Raw Properties: Lab & No. USBM, Norris, Tenn.; No. 1554-J

Date Reported 5-8-64 (revised 1967) Ceramist M.V. Denny, USBM (revised by M.E. Tyrrell, Tuscaloosa, Ala.)

Water of Plasticity 25.4 % Working Properties Long working, smooth, plastic, fatty. (Moderate plasticity.) pH=7.90. (Slight effervescence with HCl.)

Color Tan. Drying Shrinkage 4.5(4.0)% Dry Strength Fine. (Fair.)

Remarks Drying Characteristics: Good, slight warping. (No defects.)

Slow Firing Tests:

Temp. °F (°C)	Color	Hardness (Mohs')	Linear Shrinkage, %	Absorption %	Appr. Por. %	Other data: Bulk Dens. gm/cc
1800 (982)	Tan	Fair hard (3)	6.0	13.3	25.0	1.88
1900 (1038)	Red-brown	Hard (4)	10.5(10.0)	10.6	20.8	1.96
2000 (1093)	Red-brown	Very hard (5)	13.0	2.3	5.4	2.35
2100 (1149)	Chocolate	Very hard (5)	13.0	1.9	4.5	2.38
2200 (1204)	Dark brown	Glassy	Expanded	27.6	-	-
2300 (1260)	Dark brown	Glassy	Expanded	41.0	-	-

Remarks / Other Tests Too high shrinkage for brick & tile, too short firing range, good bloater. (Should fire to "SW" face brick specifications at about 1950°F (1066°C). Abrupt vitrification.) Potential Use: Lightweight aggregate. (Face brick; sewer pipe.)

Preliminary Bloating (Quick Firing) Tests: Positive. (Negative.)

Temp. °F (°C)	Absorption %	Bulk Density g/cm^3	Bulk Density lb/ft^3	Remarks
1900 (1038)	16.5	2.60	162	Shaley.
2000 (1093)	15.7	2.34	145	Irregular bloating.
2100 (1149)	16.5	1.67	104	Irregular bloating.
2200 (1204)	15.2	2.25	140	Irregular bloating.
2300 (1260)	11.6	1.67	104	Shaley bloating.

Remarks: Very irregular bloats - too heavy, high absorption.

Note: Appr. Por. and Bulk Dens. plus data and remarks in parentheses are from 1967 revised data sheets by Tyrrell.

Crushing Characteristics (unfired material) -

Particle Size - 20 mesh. Retention Time 15 min. draw trials (following 3-4 hr. to 1800°F, 982°C).

Chemical & Mineralogical Data: Not determined.

Chemical Analysis		Mineralogy	
Oxide	Weight %	Mineral	volume %
SiO_2			
TiO_2		Quartz	
Al_2O_3		Feldspar	
Fe_2O_3		Carbonate	
FeO		Mica	
MnO		Chlorite-vermiculite	
MgO		Montmorillonite	
CaO		Others	
Na_2O			
K_2O			
P_2O_5			
S (total)		Total	
C (org.)			
CO_2			
H_2O^-			
H_2O^+			
Ignition loss			
Total			

Analyst _____ _____

Date _____ _____

Method _____ _____

Sample Location Data:

County Gordon. Land Lot _____, Sec. _____, Dist. _____.

7 1/2' topo quad. - Lat. _____, Long. _____.

Field No. 38, Collected by J.W. Smith? Date c. 1963

Sample Method Grab (?). Weathering/alteration -

Structural Attitude -

Stratigraphic Assignment Conasauga Group (Cambrian).

Sample Description & Comments No further data available.

Compiled by B. J. O'Connor Date 08-20-86

CERAMIC TESTS AND ANALYSES

Material Shale (Conasauga). Compilation Map Location No. Gdn. 64-4

County Gordon. Sample Number 39

Raw Properties: Lab & No. USBM, Norris, Tenn.; No. 1554-K

Date Reported 5-8-64 (revised 1967) Ceramist M.V. Denny, USBM (revised by M.E. Tyrrell, Tuscaloosa, Ala.)

Water of Plasticity 25.2 % Working Properties *Long working, smooth, plastic, fatty. pH=6.40. (Not effervescent with HCl.)

Color Tan. Drying Shrinkage 2.5% Dry Strength Fine. (Low).

Remarks Drying Characteristics: Good, some warping. (No defects.)

Slow Firing Tests:

Temp. °F (°C)	Color	Hardness (Mohs')	Linear Shrinkage, %	Absorption %	Appr. Por. %	Other data: Bulk Dens. gm/cc
1800 (982)	Tan	Fair hard (3)	4.5(4.0)	15.4	28.6	1.86
1900 (1038)	Red brown	Hard (4)	5.5(5.0))	11.0	22.3	2.03
2000 (1093)	Red brown	Hard (4)	10.0	10.5	21.2	2.02
2100 (1149)	Medium red-brown	Very hard (5)	10.0	7.1	15.5	2.19
2200 (1204)	Chocolate	Glassy	5.0 Expanded	2.6	-	-
2300 (1260)	Dark brown	Shattered	Expanded	-	-	-

Remarks / Other Tests Fair color. (Should fire to "MW" face brick specifications at about 1900°F, (1038°C). Potential Use: Brick if not heated too high; light-weight aggregate. (Face brick.)

Preliminary Bloating (Quick Firing) Tests: Negative.

Note: Appr. Por. and Bulk Dens. plus data and remarks in parentheses are from 1967 revised data sheets by Tyrrell.

* With revisions by K.J. Liles (written communication, 1987).

Crushing Characteristics (unfired material) -

Particle Size - 20 mesh. Retention Time 15 min. draw trials (following 3-4 hr. to 1800°F, 982°C).

Chemical & Mineralogical Data: Not determined.

Chemical Analysis		Mineralogy	
Oxide	Weight %	Mineral	volume %
SiO_2			
TiO_2		Quartz	
Al_2O_3		Feldspar	
Fe_2O_3		Carbonate	
FeO		Mica	
MnO		Chlorite-vermiculite	
MgO		Montmorillonite	
CaO		Others	
Na_2O			
K_2O			
P_2O_5			
S (total)		Total	
C (org.)			
CO_2			
H_2O^-			
H_2O^+			
Ignition loss			
Total			

Analyst _____ _____

Date _____ _____

Method _____ _____

Sample Location Data:

County Gordon. Land Lot _____, Sec. _____, Dist. _____.

7 1/2' topo quad. - Lat. _____, Long. _____.

Field No. 39, Collected by J.W. Smith? Date c. 1963

Sample Method Grab (?). Weathering/alteration -

Structural Attitude -

Stratigraphic Assignment Conasauga Group (Cambrian).

Sample Description & Comments No further data available.

Compiled by B. J. O'Connor Date 08-20-86

CERAMIC TESTS AND ANALYSES

Material Shale (Conasauga). Compilation Map Location No. Gdn. 64-5

County Gordon. Sample Number 76

Raw Properties: Lab & No. USBM, Norris, Tenn.; No. 1555-U

Date Reported 5-28-64 (revised 1967) Ceramist M.V. Denny, USBM (revised by M.E. Tyrrell, Tuscaloosa, Ala.)

Water of Plasticity 28.8 % Working Properties Short working, smooth, plastic. (Moderate plasticity.) pH=5.30. (Not effervescent with HCl.)

Color Orange. Drying Shrinkage 6.0(5.0)% Dry Strength Good. (Fair.)

Remarks Drying Characteristics: Good. (No defects.)

Slow Firing Tests:

Temp. °F (°C)	Color	Hardness (Mohs')	Linear Shrinkage, %	Absorption %	Appr. Por. %	Other data: Bulk Dens. gm/cc
1800 (982)	Tan	Fair hard (3)	5.5(5.0)	20.1	34.2	1.70
1900 (1038)	Tan	Hard (4)	10.0	16.1	29.3	1.82
2000 (1093)	Tan	Hard (4)	10.0	15.6	28.7	1.84
2100 (1149)	Tan	Hard (4)	10.0	15.5	28.8	1.86
2200 (1204)	Light brown	Very hard (5)	13.5(13.0)	11.2	22.3	1.99
2300 (1260)	Brown	Steel hard (6)	14.0	6.8	14.5	2.13

Remarks / Other Tests High shrinkage, high absorption, good color. (Should fire to "MW" face brick specifictions at about 2150°F (1177°C). High firing shrinkage.) Potential Use: None. (Face brick.)

Preliminary Bloating (Quick Firing) Tests: Negative.

Note: Appr. Por. and Bulk Dens. plus data and remarks in parentheses are from 1967 revised data sheets by Tyrrell.

Crushing Characteristics (unfired material) -

Particle Size - 20 mesh. Retention Time 15 min. draw trials (following 3-4 hr. to 1800°F, 982°C).

Chemical & Mineralogical Data: Not determined.

Chemical Analysis		Mineralogy	
Oxide	Weight %	Mineral	volume %
SiO_2			
TiO_2		Quartz	
Al_2O_3		Feldspar	
Fe_2O_3		Carbonate	
FeO		Mica	
MnO		Chlorite-vermiculite	
MgO		Montmorillonite	
CaO		Others	
Na_2O			
K_2O			
P_2O_5			
S (total)		Total	
C (org.)			
CO_2			
H_2O^-			
H_2O^+			
Ignition loss			
Total			

Analyst _____ _____

Date _____ _____

Method _____ _____

Sample Location Data:

County Gordon. Land Lot _____, Sec. _____, Dist. _____.

7 1/2' topo quad. - Lat. _____, Long. _____.

Field No. 76, Collected by J.W. Smith? Date c. 1963

Sample Method Grab (?). Weathering/alteration -

Structural Attitude -

Stratigraphic Assignment Conasauga Group (Cambrian).

Sample Description & Comments No further data available.

Compiled by B. J. O'Connor Date 08-20-86

CERAMIC TESTS AND ANALYSES

Material Shale (Conasauga). Compilation Map Location No. Gdn. 64-6

County Gordon. Sample Number 77

Raw Properties: Lab & No. USBM, Norris, Tenn.; No. 1555-V

Date Reported 5-28-84 (revised 1967) Ceramist M.V. Denny, USBM (revised by M.E. Tyrrell, Tuscaloosa, Ala.)

Water of Plasticity 23.6 % Working Properties *Short working, smooth, plastic. pH = 5.50. (Not effervescent with HCl.)

Color Buff. Drying Shrinkage 5.0 % Dry Strength Good. (Low.)

Remarks Drying Characteristics: Good, surface cracks. (No defects.)

Slow Firing Tests:

Temp. °F (°C)	Color	Hardness (Mohs')	Linear Shrinkage, %	Absorption %	Appr. Por. %	Other data: Bulk Dens. gm/cc
1800 (982)	Tan	Fair hard (3)	5.0	23.2	39.2	1.69
1900 (1038)	Tan	Hard (4)	7.5	23.1	39.3	1.70
2000 (1093)	Light brown	Hard (4)	7.5	17.4	32.5	1.87
2100 (1149)	Brown	Very hard (5)	10.0	17.0	31.6	1.86
2200 (1204)	Brown	Steel hard (6)	10.0	14.9	28.9	1.94
2300 (1260)	Brown	Steel hard	10.0 (Expanded)	15.8	-	-

Remarks / Other Tests Crazed and mottled surface; fair color. (Abrupt vitrification.) Potential Use: Inside brick or tile. (No suitable for use in vitreous clay products.)

Preliminary Bloating (Quick Firing) Tests: Negative.

Note: Appr. Por. and Bulk Dens. plus data and remarks in parentheses are from 1967 revised data sheets by Tyrrell.

* With revisions by K.J. Liles (written communication, 1987).

Crushing Characteristics (unfired material) -

Particle Size - 20 mesh. Retention Time 15 min. draw trials (following 3-4 hr. to 1800°F, 982°C).

Chemical & Mineralogical Data: Not determined.

Chemical Analysis		Mineralogy	
Oxide	Weight %	Mineral	volume %
SiO_2			
TiO_2		Quartz	
Al_2O_3		Feldspar	
Fe_2O_3		Carbonate	
FeO		Mica	
MnO		Chlorite-vermiculite	
MgO		Montmorillonite	
CaO		Others	
Na_2O			
K_2O			
P_2O_5			
S (total)		Total	
C (org.)			
CO_2			
H_2O^-			
H_2O^+			
Ignition loss			
Total			

Analyst _____ _____

Date _____ _____

Method _____ _____

Sample Location Data:

County Gordon. Land Lot _____, Sec. _____, Dist. _____.

7 1/2' topo quad. - Lat. _____, Long. _____.

Field No. 77, Collected by J.W. Smith? Date c. 1963

Sample Method Grab (?). Weathering/alteration -

Structural Attitude -

Stratigraphic Assignment Conasauga Group (Cambrian).

Sample Description & Comments No further data available.

Compiled by B. J. O'Connor Date 08-20-86

CERAMIC TESTS AND ANALYSES

Material Shale (Conasauga). Compilation Map Location No. Gdn. 64-7

County Gordon. Sample Number 78

Raw Properties: Lab & No. USBM, Norris, Tenn.; No. 1555-W

Date Reported 5-28-64 (revised 1967) Ceramist M.V. Denny, USBM (revised by M.E. Tyrrell, Tuscaloosa, Ala.)

Water of Plasticity 26.8 % Working Properties *Short working, smooth, plaastic. pH=5.60. (Not effervescent with HCl.)

Color Buff. Drying Shrinkage 4.5(4.0% Dry Strength Good. (Low.)

Remarks Drying Characteristics: Good, slight warping. (No defects.)

Slow Firing Tests:

Temp. °F (°C)	Color	Hardness (Mohs')	Linear Shrinkage, %	Absorption %	Appr. Por. %	Other data: Bulk Dens. gm/cc
1800 (982)	Tan	Fair hard (3)	4.5(4.0)	23.0	36.6	1.59
1900 (1038)	Tan	Hard (4)	5.5(5.0)	19.5	33.0	1.69
2000 (1093)	Tan	Hard (4)	5.5(5.0)	16.9	29.6	1.75
2100 (1149)	Brown	Very hard (5)	9.0	12.4	23.4	1.89
2200 (1204)	Brown	Very hard (5)	10.5(10.0)	11.9	22.7	1.91
2300 (1260)	Dark brown	Steel hard (6)	10.5(10.0)	8.8	17.3	1.97

Remarks / Other Tests Fair color, slight cracking, high absorption. (Should fire to "MW" face brick specifications at about 2100°F, 1149°C.) Potential Use: Inside brick and tile. (Face brick.)

Preliminary Bloating (Quick Firing) Tests: Negative.

Note: Appr. Por. and Bulk Dens. plus data and remarks in parentheses are from 1967 revised data sheets by Tyrrell.

* With revisions by K.J. Liles (written communication, 1987).

Crushing Characteristics (unfired material) -

Particle Size - 20 mesh. Retention Time 15 min. draw trials (following 3-4 hr. to 1800°F, 982°C).

Chemical & Mineralogical Data: Not determined.

Chemical Analysis		Mineralogy	
Oxide	Weight %	Mineral	volume %
SiO_2			
TiO_2		Quartz	
Al_2O_3		Feldspar	
Fe_2O_3		Carbonate	
FeO		Mica	
MnO		Chlorite-vermiculite	
MgO		Montmorillonite	
CaO		Others	
Na_2O			
K_2O			
P_2O_5			
S (total)		Total	
C (org.)			
CO_2			
H_2O^-			
H_2O^+			
Ignition loss			
Total			

Analyst _____ _____

Date _____ _____

Method _____ _____

Sample Location Data:

County Gordon. Land Lot _____, Sec. _____, Dist. _____.

7 1/2' topo quad. - Lat._____, Long. _____.

Field No. 78, Collected by J.W. Smith? Date c. 1963

Sample Method Grab (?). Weathering/alteration -

Structural Attitude -

Stratigraphic Assignment Conasauga Group (Cambrian).

Sample Description & Comments No further data available.

Compiled by B. J. O'Connor Date 08-20-86

CERAMIC TESTS AND ANALYSES

Material Shale (Conasauga). Compilation Map Location No. Gdn. 64-8

County Gordon. Sample Number 79

Raw Properties: Lab & No. USBM, Norris, Tenn.; No. 1555-X

Date Reported 5-28-64 (revised 1967) Ceramist M.V. Denny, USBM (revised by M.E. Tyrrell, Tuscaloosa, Ala.)

Water of Plasticity 25.6 % Working Properties Short working, smooth, plastic. (Moderate plasticity.) pH=5.45. (Not effervescent with HCl.)

Color Red-brown. Drying Shrinkage 5.0 % Dry Strength Good. (Fair.)

Remarks Drying Characteristics: Good. (No defects.)

Slow Firing Tests:

Temp. °F (°C)	Color	Hardness (Mohs')	Linear Shrinkage, %	Absorption %	Appr. Por. %	Other data: Bulk Dens. gm/cc
1800 (982)	Tan	Fair hard (3)	5.0	19.0	32.1	1.69
1900 (1038)	Tan	Hard (4)	9.5(9.0)	11.5	22.3	1.94
2000 (1093)	Tan	Hard (4)	10.0	9.9	19.8	2.00
2100 (1149)	Brown	Very hard (5)	14.5(14.0)	2.5	5.8	2.33
2200 (1204)	Brown	Steel hard (6)	15.0	1.9	4.4	2.33
2300 (1260)	Dark brown	Steel hard (6)	15.0	1.0	2.4	2.36

Remarks / Other Tests Good color, high shrinkage. Combine with clay of low shrinkage and high absorption for brick and tile possibilities. (Should fire to "MW" face brick specifications at about 1900°F, 1038°C.) Potential Use: None without additive. (Face brick.)

Preliminary Bloating (Quick Firing) Tests: Negative.

Note: Appr. Por. and Bulk Dens. plus data and remarks in parentheses are from 1967 revised data sheets by Tyrrell.

Crushing Characteristics (unfired material) -

Particle Size - 20 mesh. Retention Time 15 min. draw trials (following 3-4 hr. to 1800°F, 982°C).

Chemical & Mineralogical Data: Not determined.

Chemical Analysis		Mineralogy	
Oxide	Weight %	Mineral	volume %
SiO_2			
TiO_2		Quartz	
Al_2O_3		Feldspar	
Fe_2O_3		Carbonate	
FeO		Mica	
MnO		Chlorite-vermiculite	
MgO		Montmorillonite	
CaO		Others	
Na_2O			
K_2O			
P_2O_5			
S (total)		Total	
C (org.)			
CO_2			
H_2O^-			
H_2O^+			
Ignition loss			
Total			

Analyst _____ _____

Date _____ _____

Method _____ _____

Sample Location Data:

County Gordon. Land Lot _____, Sec. _____, Dist. _____.

7 1/2' topo quad. - Lat. _____, Long. _____.

Field No. 79, Collected by J.W. Smith? Date c. 1963

Sample Method Grab (?). Weathering/alteration -

Structural Attitude -

Stratigraphic Assignment Conasauga Group (Cambrian).

Sample Description & Comments No further data available.

Compiled by B. J. O'Connor Date 08-20-86

CERAMIC TESTS AND ANALYSES

Material Shale (Conasauga). Compilation Map Location No. Gdn. 64-9

County Gordon. Sample Number 80

Raw Properties: Lab & No. USBM, Norris, Tenn.; No. 1555-Y

Date Reported 5-28-84 (revised 1967) Ceramist M.V. Denny, USBM (revised by M.E. Tyrrell, Tuscaloosa, Ala.)

Water of Plasticity 20.4 % (Low plasticity.) Working Properties Short working, smooth, mealy. pH = 6.79. (Not effervescent with HCl.)

Color Light gray. Drying Shrinkage 2.5 % Dry Strength Good. (Low.)

Remarks Drying Characteristics: Good. (No defects.)

Slow Firing Tests:

Temp. °F (°C)	Color	Hardness (Mohs')	Linear Shrinkage, %	Absorption %	Appr. Por. %	Other data: Bulk Dens. gm/cc
1800 (982)	Tan	Fair hard	0.5(2.5)	17.1	30.4	1.78
1900 (1038)	Tan	Hard (4)	4.5(4.0)	12.8	24.6	1.92
2000 (1093)	Tan	Hard (4)	5.5(5.0)	11.3	22.1	1.96
2100 (1149)	Brown	Very hard (5)	7.5	4.5	9.9	2.21
2200 (1204)	Brown	Steel hard (6)	7.5	3.8	8.5	2.24
2300 (1260)	Dark brown	Melted hard	(Expanded)	-	-	-

Remarks / Other Tests Good color, rough surface, some cracking. (Should fire to "MW" face brick specifications at about 1900°F, 1038°C.) Potential Use: Brick and tile, decorative brick if color no objection. (Face brick.)

Preliminary Bloating (Quick Firing) Tests: Negative.

Note: Appr. Por. and Bulk Dens. plus data and remarks in parentheses are from 1967 revised data sheets by Tyrrell.

Crushing Characteristics (unfired material) -

Particle Size - 20 mesh. Retention Time 15 min. draw trials (following 3-4 hr. to 1800°F, 982°C).

Chemical & Mineralogical Data: Not determined.

Chemical Analysis		Mineralogy	
Oxide	Weight %	Mineral	volume %
SiO_2			
TiO_2		Quartz	
Al_2O_3		Feldspar	
Fe_2O_3		Carbonate	
FeO		Mica	
MnO		Chlorite-vermiculite	
MgO		Montmorillonite	
CaO		Others	
Na_2O			
K_2O			
P_2O_5			
S (total)		Total	
C (org.)			
CO_2			
H_2O^-			
H_2O^+			
Ignition loss			
Total			

Analyst _____ _____

Date _____ _____

Method _____ _____

Sample Location Data:

County Gordon. Land Lot _____, Sec. _____, Dist. _____.

7 1/2' topo quad. - Lat. _____, Long. _____.

Field No. 80, Collected by J.W. Smith? Date c. 1963

Sample Method Grab (?). Weathering/alteration -

Structural Attitude -

Stratigraphic Assignment Conasauga Group (Cambrian).

Sample Description & Comments No further data available.

Compiled by B. J. O'Connor Date 08-20-86

CERAMIC TESTS AND ANALYSES

Material Shale (Conasauga). Compilation Map Location No. Gdn. 64-10

County Gordon. Sample Number 81

Raw Properties: Lab & No. USBM, Norris, Tenn.; No. 1555-Z

Date Reported 5-28-64 (revised 1967) Ceramist M.V. Denny, USBM (revised by M.E. Tyrrell, Tuscaloosa, Ala.)

Water of Plasticity 21.1 % Working Properties Short working, smooth, mealy. (Low plasticity.) pH = 6.45. (Not effervescent with HCl.)

Color Buff. Drying Shrinkage 2.5 % Dry Strength Fair. (Low.)

Remarks Drying Characteristics: Fair-cracking. (No defects.)

Slow Firing Tests:

Temp. °F (°C)	Color	Hardness (Mohs')	Linear Shrinkage, %	Absorption %	Appr. Por. %	Other data: Bulk Dens. gm/cc
1800 (982)	Tan	Fair hard (3)	1.0(2.5)	16.0	28.6	1.79
1900 (1038)	Tan	Hard (4)	4.5(4.0)	11.9	22.8	1.92
2000 (1093)	Tan	Hard (4)	5.5(5.0)	10.4	20.4	1.96
2100 (1149)	Brown	Very hard (5)	9.5(9.0)	4.5	9.9	2.20
2200 (1204)	Brown	Very hard (5)	9.5(9.0)	4.0	8.8	2.20
2300 (1260)	Dark brown	Steel hard (6)	9.5(9.0)	1.9	4.4	2.29

Remarks / Other Tests Fair color, warped surface, local cracking. (Should fire to "MW" face brick specifications at about 1900°F, 1038°C.) Potential Use: Brick, if color not objectionable. (Face brick.)

Preliminary Bloating (Quick Firing) Tests: Negative.

Note: Appr. Por. and Bulk Dens. plus data and remarks in parentheses are from 1967 revised data sheets by Tyrrell.

Crushing Characteristics (unfired material) -

Particle Size - 20 mesh. Retention Time 15 min. draw trials (following 3-4 hr. to 1800°F, 982°C).

Chemical & Mineralogical Data: Not determined.

Chemical Analysis		Mineralogy	
Oxide	Weight %	Mineral	volume %
SiO_2			
TiO_2		Quartz	
Al_2O_3		Feldspar	
Fe_2O_3		Carbonate	
FeO		Mica	
MnO		Chlorite-vermiculite	
MgO		Montmorillonite	
CaO		Others	
Na_2O			
K_2O			
P_2O_5			
S (total)		Total	
C (org.)			
CO_2			
H_2O^-			
H_2O^+			
Ignition loss			
Total			

Analyst _____ _____

Date _____ _____

Method _____ _____

Sample Location Data:

County Gordon. Land Lot _____, Sec. _____, Dist. _____.

7 1/2' topo quad. - Lat. _____, Long. _____.

Field No. 81, Collected by J.W. Smith? Date c. 1963

Sample Method Grab (?). Weathering/alteration -

Structural Attitude -

Stratigraphic Assignment Conasauga Group (Cambrian).

Sample Description & Comments No further data available.

Compiled by B. J. O'Connor Date 08-20-86

CERAMIC TESTS AND ANALYSES

Material Shale (Conasauga). Compilation Map Location No. Gdn. 64-11

County Gordon. Sample Number 88

Raw Properties: Lab & No. USBM, Norris, Tenn.; No. 1555-G

Date Reported 6-26-64 (revised 1967) Ceramist M.V. Denny, USBM (revised by M.E. Tyrrell, Tuscaloosa, Ala.)

Water of Plasticity 22.8 % Working Properties Low plasticity. pH = 7.1 Not effervescent with HCl.

Color Gray. Drying Shrinkage 0.0 % Dry Strength Low.

Remarks Drying Characteristics: No defects.

Slow Firing Tests:

Temp. °F (°C)	Color	Hardness (Mohs')	Linear Shrinkage, %	Absorption %	Appr. Por. %	Other data: Bulk Dens. gm/cc
1800 (982)	Tan	2	1.0	18.2	30.8	1.69
1900 (1038)	Tan	3	5.0	13.9	25.0	1.80
2000 (1093)	Brown	4	6.0	10.3	19.7	1.91
2100 (1149)	Dark brown	5	10.0	2.1	4.8	2.30
2200 (1204)	-	-	Expanded	-	-	-

Remarks / Other Tests Should fire to "MW" face brick specifications at about 1950°F (1066°C). Potential Use: Face brick.

Preliminary Bloating (Quick Firing) Tests: Negative.

Crushing Characteristics (unfired material) -

Particle Size - 20 mesh. Retention Time 15 min. draw trials (following 3-4 hr. to 1800°F, 982°C).

Chemical & Mineralogical Data: Not determined.

Chemical Analysis		Mineralogy	
Oxide	Weight %	Mineral	volume %
SiO_2			
TiO_2		Quartz	
Al_2O_3		Feldspar	
Fe_2O_3		Carbonate	
FeO		Mica	
MnO		Chlorite-vermiculite	
MgO		Montmorillonite	
CaO		Others	
Na_2O			
K_2O			
P_2O_5			
S (total)		Total	
C (org.)			
CO_2			
H_2O^-			
H_2O^+			
Ignition loss			
Total			

Analyst _____ _____

Date _____ _____

Method _____ _____

Sample Location Data:

County Gordon. Land Lot _____, Sec. _____, Dist. _____.

7 1/2' topo quad. - Lat. _____, Long. _____.

Field No. 88, Collected by J.W. Smith? Date c. 1963

Sample Method Grab (?). Weathering/alteration -

Structural Attitude -

Stratigraphic Assignment Conasauga Group (Cambrian).

Sample Description & Comments No further data available.

Compiled by B. J. O'Connor Date 08-20-86

CERAMIC TESTS AND ANALYSES

Material Shale (residual). Compilation Map Location No. Gdn. 66-1

County Gordon. Sample Number 127

Raw Properties: Lab & No. USBM, Tuscaloosa, AL; G-8-7

Date Reported 10-6-66 Ceramist M.E. Tyrrell, USBM.

Water of Plasticity 24.5 % Working Properties Low plasticity. pH = 5.5
Not effervescent with HCl.

Color Tan. Drying Shrinkage 0.0 % Dry Strength Low.

Remarks No drying defects.

Slow Firing Tests:

Temp. °F (°C)	Color	Hardness (Mohs')	Linear Shrinkage, %	Absorption %	Appr. Por.* %	Other data: Bulk Dens. gm/cc
1800 (982)	Tan	2	0.0	25.5	40.3	1.58
1900 (1038)	Orange-tan	3	5.0	16.1	30.3	1.88
2000 (1093)	Light brown	4	10.0	8.4	17.7	2.11
2100 (1149)	Red-brown	5	12.5	3.9	8.9	2.28
2200 (1204)	-	-	Expanded	-	-	-

Remarks / Other Tests Should fire to "SW" face brick specifications at about 2000°F (1093°C). Low green strength. Color marginal. Potential Use: Face brick mixtures.

Preliminary Bloating (Quick Firing) Tests: Negative.

*Data from USBM files (K.J. Liles, written communication, 1987).

Crushing Characteristics (unfired material) -

Particle Size - 20 mesh. Retention Time 15 min. draw trials (following 3-4 hr. to 1800°F, 982°C).

Chemical & Mineralogical Data: Not determined.

Chemical Analysis		Mineralogy	
Oxide	Weight %	Mineral	volume %
SiO_2			
TiO_2		Quartz	
Al_2O_3		Feldspar	
Fe_2O_3		Carbonate	
FeO		Mica	
MnO		Chlorite-vermiculite	
MgO		Montmorillonite	
CaO		Others	
Na_2O			
K_2O			
P_2O_5			
S (total)		Total	
C (org.)			
CO_2			
H_2O^-			
H_2O^+			
Ignition loss			
Total			

Analyst _____ _____

Date _____ _____

Method _____ _____

Sample Location Data:

County Gordon. Land Lot _____, Sec. _____, Dist. _____.

7 1/2' topo quad. - Lat. _____, Long. _____.

Field No. 127, Collected by J.W. Smith? Date c. 1966

Sample Method Grab (?). Weathering/alteration Residual clay.

Structural Attitude -

Stratigraphic Assignment Conasauga Group (Cambrian).

Sample Description & Comments Residual clay from weathering of limestone. No further data available.

Compiled by B. J. O'Connor Date 8-20-86

CERAMIC TESTS AND ANALYSES

Material Shale, weathered. Compilation Map Location No. Gdn. 66-2

County Gordon. Sample Number 128

Raw Properties: Lab & No. USBM, Tuscaloosa, AL; G-8-8

Date Reported 10-6-66 Ceramist M.E. Tyrrell, USBM.

Water of Plasticity 18.4 % Working Properties Low plasticity.
pH = 6.4. Not effervescent with HCl.

Color Tan. Drying Shrinkage 0.0 % Dry Strength Low.

Remarks No drying defects.

Slow Firing Tests:

Temp. °F (°C)	Color	Hardness (Mohs')	Linear Shrinkage, %	Absorption %	Appr. Por.* %	Other data: Bulk Dens. gm/cc
1800 (982)	Tan	2	0.0	19.8	33.7	1.70
1900 (1038)	Tan	2	0.0	19.4	33.4	1.72
2000 (1093)	Light brown	3	0.0	13.8	26.1	1.89
2100 (1149)	Brown	4	0.0	8.8	18.4	2.09
2200 (1204)	Dark brown	5	5.0	5.8	12.6	2.18
2300 (1260)	Dark brown	6	5.0	3.7	8.1	2.19

Remarks / Other Tests Low green strength. Poor color. Not suitable for use in vitreous clay products.

Preliminary Bloating (Quick Firing) Tests: Negative.

*Data from USBM files (K.J. Liles, written communication, 1987).

Crushing Characteristics (unfired material) -

Particle Size - 20 mesh. Retention Time 15 min. draw trials (following 3-4 hr. to 1800°F, 982°C).

Chemical & Mineralogical Data: Not determined.

Chemical Analysis		Mineralogy	
Oxide	Weight %	Mineral	volume %
SiO_2			
TiO_2		Quartz	
Al_2O_3		Feldspar	
Fe_2O_3		Carbonate	
FeO		Mica	
MnO		Chlorite-vermiculite	
MgO		Montmorillonite	
CaO		Others	
Na_2O			
K_2O			
P_2O_5			
S (total)		Total	
C (org.)			
CO_2			
H_2O^-			
H_2O^+			
Ignition loss			
Total			

Analyst _____ _____

Date _____ _____

Method _____ _____

Sample Location Data:

County Gordon. Land Lot _____, Sec. _____, Dist. _____.

7 1/2' topo quad. - Lat. _____, Long. _____.

Field No. 128, Collected by J.W. Smith? Date c. 1966

Sample Method Grab (?). Weathering/alteration Weathered.

Structural Attitude -

Stratigraphic Assignment Conasauga Group (Cambrian).

Sample Description & Comments Weathered shale. No further data available.

Compiled by B. J. O'Connor Date 08-20-86

CERAMIC TESTS AND ANALYSES

Material Clay/shale? Compilation Map Location No. Gdn. 67-1

County Gordon. Sample Number 150

Raw Properties: Lab & No. USBM, Tuscaloosa, Al; G-9-13

Date Reported 1-11-67 Ceramist M.E. Tyrrell, USBM.

Water of Plasticity 25.3 % Working Properties Low plasticity. pH = 7.1
Not effervescent with HCl.

Color Tan. Drying Shrinkage 2.5 % Dry Strength Low.

Remarks Drying Characteristics: No drying defects.

Slow Firing Tests:

Temp. °F (°C)	Color	Hardness (Mohs')	Linear Shrinkage, %	Absorption %	Appr. Por. %	Other data: Bulk Dens. gm/cc
1800 (982)	Tan	2	2.5	25.0	39.0	1.56
1900 (1038)	Tan	3	2.5	23.1	37.4	1.62
2000 (1093)	Tan	4	5.0	18.3	31.8	1.74
2100 (1149)	Light brown	5	10.0	12.9	24.4	1.89
2200 (1204)	Dark brown	6	10.0	9.3	18.4	1.98
2300 (1260)	Dark brown	7	10.0	6.8	13.7	2.02

Remarks / Other Tests Should fire to "MW" face brick specifications at about 2150°F (1177°C). Low green strength. Poor color. Potential Use: Building brick.

Preliminary Bloating (Quick Firing) Tests: Negative.

Crushing Characteristics (unfired material) -

Particle Size - 20 mesh. Retention Time 15 min. draw trials (following 3-4 hr. to 1800°F, 982°C).

Chemical & Mineralogical Data: Not determined.

Chemical Analysis		Mineralogy	
Oxide	Weight %	Mineral	volume %
SiO_2			
TiO_2		Quartz	
Al_2O_3		Feldspar	
Fe_2O_3		Carbonate	
FeO		Mica	
MnO		Chlorite-vermiculite	
MgO		Montmorillonite	
CaO		Others	
Na_2O			
K_2O			
P_2O_5			
S (total)		Total	
C (org.)			
CO_2			
H_2O^-			
H_2O^+			
Ignition loss			
Total			

Analyst _____ _____

Date _____ _____

Method _____ _____

Sample Location Data:

County Gordon. Land Lot _____, Sec. _____, Dist. _____.

7 1/2' topo quad. - Lat. _____, Long. _____.

Field No. 150, Collected by J.W. Smith? Date c. 1966

Sample Method Grab (?). Weathering/alteration -

Structural Attitude -

Stratigraphic Assignment -

Sample Description & Comments No further data available.

Compiled by B. J. O'Connor Date 8-20-86

CERAMIC TESTS AND ANALYSES

Material Clay/shale? Compilation Map Location No. Gdn. 67-2

County Gordon. Sample Number 151

Raw Properties: Lab & No. USBM, Tuscaloosa, AL; G-9-14

Date Reported 1-11-67 Ceramist M.E. Tyrrell, USBM.

Water of Plasticity 31.8 % Working Properties Low plasticity. pH = 5.9. Not effervescent with HCl.

Color Yellow. Drying Shrinkage 2.5 % Dry Strength Low.

Remarks No drying defects.

Slow Firing Tests:

Temp. °F (°C)	Color	Hardness (Mohs')	Linear Shrinkage, %	Absorption %	Appr. Por. %	Other data Bulk Dens. gm/cc
1800 (982)	Tan	2	2.5	35.5	48.3	1.36
1900 (1038)	Tan	3	2.5	33.3	46.6	1.40
2000 (1093)	Tan	4	7.5	27.3	42.0	1.54
2100 (1149)	Light brown	5	10.0	20.3	34.7	1.71
2200 (1204)	Red-brown	6	12.5	17.9	31.3	1.75
2300 (1260)	Dark brown	7	12.5	13.9	25.6	1.84

Remarks / Other Tests Low green strength; high maturing temperature. Not suitable for use as the principal component in vitreous clay products.

Preliminary Bloating (Quick Firing) Tests: Negative.

Crushing Characteristics (unfired material) -

Particle Size - 20 mesh. Retention Time 15 min. draw trials (following 3-4 hr. to 1800°F, 982°C).

Chemical & Mineralogical Data: Not determined.

Chemical Analysis		Mineralogy	
Oxide	Weight %	Mineral	volume %
SiO_2			
TiO_2		Quartz	
Al_2O_3		Feldspar	
Fe_2O_3		Carbonate	
FeO		Mica	
MnO		Chlorite-vermiculite	
MgO		Montmorillonite	
CaO		Others	
Na_2O			
K_2O			
P_2O_5			
S (total)		Total	
C (org.)			
CO_2			
H_2O^-			
H_2O^+			
Ignition loss			
Total			

Analyst _____ _____

Date _____ _____

Method _____ _____

Sample Location Data:

County Gordon. Land Lot _____, Sec. _____, Dist. _____.

7 1/2' topo quad. - Lat. _____, Long. _____.

Field No. 151, Collected by J.W. Smith? Date c. 1966

Sample Method Grab (?). Weathering/alteration -

Structural Attitude -

Stratigraphic Assignment -

Sample Description & Comments No further data available.

Compiled by B. J. O'Connor Date 8-20-86

CERAMIC TESTS AND ANALYSES

Material Clay/shale? Compilation Map Location No. Gdn. 67-3

County Gordon. Sample Number 160

Raw Properties: Lab & No. USBM, Tuscaloosa, AL; G-9-22

Date Reported 1-11-67 Ceramist M.E. Tyrrell, USBM.

Water of Plasticity 30.4 % Working Properties Moderate plasticity.
pH = 4.7. Not effervescent with HCl.

Color Brown Drying Shrinkage 5.0 % Dry Strength High.

Remarks No drying defects.

Slow Firing Tests:

Temp. °F (°C)	Color	Hardness (Mohs')	Linear Shrinkage, %	Absorption %	Appr. Por. %	Other data Bulk Dens. gm/cc
1800 (982)	Tan	2	5.0	28.7	43.6	1.52
1900 (1038)	Tan	2	7.5	26.5	41.6	1.57
2000 (1093)	Tan	3	10.0	19.4	34.1	1.76
2100 (1149)	Light brown	4	12.5	13.9	26.4	1.90
2200 (1204)	Red-brown	5	12.5	10.3	20.4	1.98
2300 (1260)	Dark brown	6	15.0	4.6	9.8	2.14

Remarks / Other Tests Should fire to "MW" face brick specifications at about 2150°F (1177°C). Good color. Potential Use: Face brick.

Preliminary Bloating (Quick Firing) Tests: Negative.

Crushing Characteristics (unfired material) -

Particle Size - 20 mesh. Retention Time 15 min. draw trials (following 3-4 hr. to 1800°F, 982°C).

Chemical & Mineralogical Data: Not determined.

Chemical Analysis		Mineralogy	
Oxide	Weight %	Mineral	volume %
SiO_2			
TiO_2		Quartz	
Al_2O_3		Feldspar	
Fe_2O_3		Carbonate	
FeO		Mica	
MnO		Chlorite-vermiculite	
MgO		Montmorillonite	
CaO		Others	
Na_2O			
K_2O			
P_2O_5			
S (total)		Total	
C (org.)			
CO_2			
H_2O^-			
H_2O^+			
Ignition loss			
Total			

Analyst _____ _____

Date _____ _____

Method _____ _____

Sample Location Data:

County Gordon. Land Lot _____, Sec. _____, Dist. _____.

7 1/2' topo quad. - Lat. _____, Long. _____.

Field No. 160, Collected by J.W. Smith? Date c. 1966

Sample Method Grab (?). Weathering/alteration _____

Structural Attitude -

Stratigraphic Assignment -

Sample Description & Comments No further data available.

Compiled by B. J. O'Connor Date 8-20-86

CERAMIC TESTS AND ANALYSES

Material Shale (Conasauga Formation). Compilation Map Location No. Gdn. 69-1

County Gordon. Sample Number GOR-1

Raw Properties: Lab & No. USBM, Tuscaloosa, Al; GOR-1.

Date Reported March 1969. Ceramist M.E. Tyrrell, USBM.

Water of Plasticity 19.4 % Working Properties -

Color Green-gray. Drying Shrinkage 1.0 % Dry Strength -

Slow Firing Tests:

Temp. °F (°C)	Color (Munsell)	Hardness (Mohs')	Linear Shrinkage, %	Absorption %	Appr. Por. %	Other data:
1900 (1038)	Medium tan	4.0	1.2	21.3	-	1.55
2000 (1093)	Medium tan	4.5	1.2	19.4	-	1.72
2100 (1149)	Dark tan	4.5	5.0	11.9	-	1.78
2200 (1204)	Dark tan	6.5	8.5	8.2	-	1.99

Remarks / Other Tests Hollenbeck & Tyrrell (1969, p. 20).

Preliminary Bloating (Quick Firing) Tests: Negative.

Crushing Characteristics (unfired material) -

Particle Size - 20 mesh. Retention Time 15 min. draw trials (following 3-4 hr. to 1800°F, 982°C).

Chemical & Mineralogical Data: Not determined.

Chemical Analysis		Mineralogy	
Oxide	Weight %	Mineral	volume %
SiO_2			
TiO_2		Quartz	
Al_2O_3		Feldspar	
Fe_2O_3		Carbonate	
FeO		Mica	
MnO		Chlorite-vermiculite	
MgO		Montmorillonite	
CaO		Others	
Na_2O			
K_2O			
P_2O_5			
S (total)		Total	
C (org.)			
CO_2			
H_2O^-			
H_2O^+			
Ignition loss			
Total			

Analyst _____ _____

Date _____ _____

Method _____ _____

Sample Location Data:

County Gordon. Land Lot _____, Sec. _____, Dist. _____.

7 1/2' topo quad. Fairmount (center), Lat. _____, Long. _____.

Field No. GOR-1, Collected by R.P. Hollenbeck. Date 1967

Sample Method Channel (?), Weathering/alteration Slightly weathered.

Structural Attitude -

Stratigraphic Assignment Conasauga Formation (Cambrian) shale.

Sample Description & Comments Sample of light gray slate, slightly weathered (about 20 feet exposed) overlain by soil. Sampaled from lower 8 feet of road cut on north side of Ga. Hwy. 53, 0.6 mile west of intersection with U.S. Hwy. 411 (Hollenbeck and Tyrrell, 1969, p. 18).

Compiled by B. J. O'Connor Date 8-20-86

CERAMIC TESTS AND ANALYSES

Material Shale (Conasauga). Compilation Map Location No. Gdn. 80-1

County Gordon. Sample Number Clay No. 8.

Raw Properties: Lab & No. Marazzi Ceramiche, #M.P. 1797.

Date Reported March 1980. Ceramist L. Lorici.

Water of Plasticity - % Working Properties Compact.

Color Buff-tan. Drying Good. % Dry Strength -
Pressing Good. Fluidizing Good.

Slow Firing Tests: (50 x 100 x 8 mm. pressed tiles.)

Temp. °F (°C)	Color (Munsell)	Hardness (Mohs')	Linear Shrinkage, %	Absorption %	Appr. Por. %	Other data:
1976 (1080) (= cycle 1)	-	-	-	-	-	-
2030 (1110 (= cycle 2)	-	-	4.1	-	3.8	-
1994 (1090) (= cycle 3)	-	-	5.8	-	0.6	-

(DTA & Dilatometric Analyses on file. - unpubl. report.)

Remarks / Other Tests Illitic clay with low % chlorite - shows typical dilatometric curve. ("A": interesting technological features; further sampling is necessary.) It could be useful in making tiles.

Preliminary Bloating (Quick Firing) Tests: Not determined.

Crushing Characteristics (unfired material) -

Particle Size <40 microns Retention Time Cycle 1: 40-45 min.
Cycle 2: 70-75 min. in roller kiln.
Cycle 3: 200-230 min.

Chemical & Mineralogical Data:

Chemical Analysis

Oxide	Weight % (A)	(B)
SiO_2	54.34	59.4
TiO_2	0.70	1.0
Al_2O_3	25.38	23.7
Fe_2O_3	7.26	8.7
FeO	-	-
MnO	0.01	-
MgO	1.60	1.2
CaO	0.45	-
Na_2O	0.45	0.6
K_2O	4.05	4.0
P_2O_5	-	-
S (total)	-	-
C (org.)	-	-
CO_2	-	-
H_2O^-	-	-
H_2O^+	-	-
Ignition loss	5.55	(5.5)
Total	99.79	98.7 w/o LOI

Mineralogy

Mineral	volume % (A)	(B)
Quartz		x
Feldspar		
Carbonate		
Mica (Muscovite)		X
Chlorite (+ kaolinite)	X	low
vermiculite		
Montmorillonite		
Illite	X	
Total	-	-

x = present.
(A) = clays and micas only.

Analyst A) R. Landrum, GA Survey. B) Marazzi Ceramiche

Analyst A) M. A. Tadkod, GA Survey B) M. Ceramiche

Date Aug. & Sept. 1979

Date Aug. & Sept. 1979

Method A) Atomic Absorption. B) XRF & Spectrophotometry.

Method X-ray diffraction.

Sample Location Data:

County Gordon. Land Lot _____, Sec. _____, Dist. _____.

7 1/2' topo quad. Calhoun North (N.cntr.) Lat. _____, Long. _____.

Field No. 12, Collected by M.A. Tadkod. Date July 1979.

Sample Method Grab. Weathering/alteration -

Structural Attitude -

Stratigraphic Assignment Conasauga Group (Cambrian).

Sample Description & Comments Sample from roadcut on Ga. Hwy. 136 about 1 mi. NE. of Resaca (Tadkod, 1979 and 1980, unpubl. data). Also see Gdn. 31S-55.

Compiled by B. J. O'Connor Date 8-20-86

CERAMIC TESTS AND ANALYSES

Material Shale (Conasauga). Compilation Map Location No. Gdn. 80-2

County Gordon. Sample Number Clay No. 9.

Raw Properties: Lab & No. Marazzi Ceramiche, #M.P. 1798.

Date Reported March 1980. Ceramist L. Lorici.

Water of Plasticity - % Working Properties Compact.

Color Light brown Drying Good. Dry Strength -
Pressing Good. Fluidizing Good.

Slow Firing Tests: (50 x 100 x 8 mm. pressed tiles.)

Temp. °F (°C)	Color (Munsell)	Hardness (Mohs')	Linear Shrinkage, %	Absorption %	Appr. Por. %	Other data:
1976 (1080) (= cycle 1)	-	-	-	-	-	-
2030 (1110) (= cycle 2)	-	-	8.3	-	2.3	-
1994 (1090) (= cycle 3)	-	-	9.7	-	0.0	-

(DTA and Dilatometric Analyses on file. - unpubl. report.)

Remarks / Other Tests Low-firing, illitic shale with low % kaolinite and montmorillonite. ("A": interesting techological features for making tile; further sampling is necessary). The high shrinkage might cause some trouble.

Preliminary Bloating (Quick Firing) Tests: Not determined.

Crushing Characteristics (unfired material) -

Particle Size <40 microns Retention Time Cycle 1: 40-45 min.
Cycle 2: 70-75 min. in roller kiln.
Cycle 3: 200-230 min.

Chemical & Mineralogical Data:

Chemical Analysis

Oxide	Weight % (A)	(B)
SiO_2	54.86	60.0
TiO_2	0.50	0.9
Al_2O_3	25.65	24.9
Fe_2O_3	6.65	7.7
FeO	-	-
MnO	0.01	-
MgO	1.53	1.3
CaO	0.34	0.0
Na_2O	0.14	0.2
K_2O	3.32	3.8
P_2O_5	-	-
S (total)	-	-
C (org.)	-	-
CO_2	-	-
H_2O^-	-	-
H_2O^+	-	-
Ignition loss	6.85	(7.2)
Total	99.85	98.8 w/o LOI

Mineralogy

Mineral	volume % (A)	(B)
Quartz		x
Feldspar		
Carbonate		
Mica (Muscovite)		X
Chlorite (+ kaolinite)	X	
vermiculite		
Montmorillonite		low
Illite	X	X
Kaolinite (disordered)		low
Total	-	-

x = present.
(A) = clays and micas only.

Analyst A) R. Landrum, GA Survey. B) Marazzi Ceramiche.
A) M. A. Tadkod, GA Survey. B) M. Ceramiche.

Date Aug. & Sept. 1979.
Aug. & Sept. 1979.

Method A) Atomic Absorption. B) XRF & Spectrophotometry.
X-ray diffraction.

Sample Location Data:

County Gordon. Land Lot _____, Sec. _____, Dist. _____.

7 1/2' topo quad. Sugar Valley (E. edge). Lat. _____, Long. _____.

Field No. 13, Collected by M.A. Tadkod. Date July 1979.

Sample Method Grab. Weathering/alteration -

Structural Attitude -

Stratigraphic Assignment Conasauga Group (Cambrian)?*

Sample Description & Comments Sample from roadcut on Ga. Hwy. 136c (formerly 143) about 1/8 mi. S. of Sugar Valley (Tadkod, 1979 and 1980, unpubl. data).
*This location shown as Floyd Shale (Mississippian) by Cressler (1974, Pl. 1).

Compiled by B. J. O'Connor Date 8-20-86

CERAMIC TESTS AND ANALYSES

Material Shale (Conasauga). Compilation Map Location No. Gdn. 80-3

County Gordon. Sample Number Clay No. 10.

Raw Properties: Lab & No. Marazzi Ceramiche, #M.P. 1799.

Date Reported March 1980. Ceramist L. Lorici.

Water of Plasticity - % Working Properties Compact.

Color Reddish brown Drying Good. Dry Strength -
Pressing Good. Fluidizing Good.

Slow Firing Tests: (50 x 100 x 8 mm. pressed tiles.)

Temp. °F (°C)	Color (Munsell)	Hardness (Mohs')	Linear Shrinkage, %	Absorption %	Appr. Por. %	Other data:
1976 (1080) (= cycle 1)	-	-	-	-	-	-
2030 (1110) (= cycle 2)	-	-	3.2	-	6.7	-
1994 (1090) (= cycle 3)	-	-	5.5	-	4.0	-

(DTA and Dilatometric Analyses on file. - unpubl. report.)

Remarks / Other Tests Illitic shale with some micaceous minerals and kaolinite. ("Bl": too refractory for making tile.)

Preliminary Bloating (Quick Firing) Tests: Not determined.

Crushing Characteristics (unfired material) -

Particle Size <40 microns Retention Time Cycle 1: 40-45 min.
Cycle 2: 70-75 min. in roller kiln.
Cycle 3: 200-230 min.

Chemical & Mineralogical Data:

Chemical Analysis

Oxide	(A) Weight %	(B)
SiO_2	57.54	61.9
TiO_2	0.50	0.9
Al_2O_3	23.60	22.6
Fe_2O_3	8.10	8.2
FeO	-	-
MnO	0.01	-
MgO	0.56	0.9
CaO	0.45	0.0
Na_2O	0.38	0.6
K_2O	3.10	3.9
P_2O_5	-	-
S (total)	-	-
C (org.)	-	-
CO_2	-	-
H_2O^-	-	-
H_2O^+	-	-
Ignition loss	5.60	(5.6)
Total	99.84	99.0 w/o LOI

Mineralogy

Mineral	volume % (A)	(B)
Quartz		x
Feldspar		
Carbonate		
Mica (Muscovite)		X
Chlorite (+ kaolinite)	(29)	
vermiculite		
Montmorillonite		low
Illite	(71)	X
Kaolinite (disordered)		X
Total	-	-

x = present.
(A) = clays and micas only.

Analyst A) R. Landrum, GA Survey. B) Marazzi Ceramiche.
A) M. A. Tadkod, GA Survey. B) M. Ceramiche.

Date Aug. & Sept. 1979.
Aug. & Sept. 1979.

Method A) Atomic Absorption. B) XRF & Spectrophotometry.
X-ray diffraction.

Sample Location Data:

County Gordon. Land Lot _____, Sec. _____, Dist. _____.

7 1/2' topo quad. Calhoun North (W. side). Lat. _____, Long. _____.

Field No. 14., Collected by M.A. Tadkod. Date July 1979.

Sample Method Grab. Weathering/alteration -

Structural Attitude -

Stratigraphic Assignment Conasauga Group (Cambrian).

Sample Description & Comments Sample from roadcut on Ga. Hwy. 136c (formerly 143) about 1 1/2 mi. SE. of Sugar Valley (Tadkod, 1979 and 1980, unpubl. data; notes, however, state "1 mi. N. of Calhoun").

Compiled by B. J. O'Connor Date 8-20-86

CERAMIC TESTS AND ANALYSES

Material Shale (Conasauga). Compilation Map Location No. Gdn. 80-4

County Gordon. Sample Number B shale.

Raw Properties: Lab & No. Georgia Tech., #BS.

Date Reported 12-10-80. Ceramist J. F. Benzel, Georgia Tech.

Water of Plasticity - % Working Properties -

Color - Drying Shrinkage - Dry Strength -

Slow Firing Tests: (1x1= 9 in. bars.)*

Temp. °F (°C)	Color	Strength (MOR, psi.)	Linear Shrinkage, %	Absorption %	Appr. Por. %	Other data:

Remarks / Other Tests *No further testing because test bars of this material could not be extruded.

Preliminary Bloating (Quick Firing) Tests: Not determined.

Crushing Characteristics (unfired material) -

Particle Size _____ Retention Time _____

Chemical & Mineralogical Data: Not determined.

Chemical Analysis		Mineralogy	
Oxide	Weight %	Mineral	volume %
SiO_2			
TiO_2		Quartz	
Al_2O_3		Feldspar	
Fe_2O_3		Carbonate	
FeO		Mica	
MnO		Chlorite-vermiculite	
MgO		Montmorillonite	
CaO		Others	
Na_2O			
K_2O			
P_2O_5			
S (total)		Total	_____
C (org.)			
CO_2			
H_2O^-			
H_2O^+			
Ignition loss	_____		
Total			

Analyst _____ _____

Date _____ _____

Method _____ _____

Sample Location Data:

County Gordon. Land Lot _____, Sec. _____, Dist. _____.

7 1/2' topo quad. Plainville (SE. 1/4). Lat._____, Long. _____.

Field No. B shale., Collected by O'Connor and Benzel. Date Aug. 1980.

Sample Method Random grab samples. Weathering/alteration Some weathered.

Structural Attitude -

Stratigraphic Assignment Conasauga Group (Cambrian).

Sample Description & Comments Sample from abandoned pit (formerly Plainville Brick Co.) just N. of Plainville Rd., 3/4 mi. W. of Ga. Hwy. 53 and 0.6 mi. W. of the Southern RR. in Plainville.

Compiled by B. J. O'Connor Date 8-20-86

DATA SOURCES AND REFERENCES CITED

American Society for Testing and Materials, 1974 Annual Book of ASTM Standards:

- C4-62 (Reapproved 1970) Standard specification for clay drain tile, Part 16, p. 1-7.
- C13-69 (Replaced by C700-74) Specifications for standard strength clay sewer pipe, Part 16, p. 409-413.
- C24-72 Pyrometric cone equivalent (PCE) of refractory materials, Part 17, p. 9-14.
- C27-70 Classification of fireclay and high-alumina refractory brick, Part 17, p. 15-17.
- C43-70 Standard definitions of terms relating to structural clay products, Part 16, p. 33-35.
- C62-69 Standard specification for building brick (solid masonry units made from clay or shale), Part 16, p. 121-125.
- C216-71 Standard specification for facing brick (solid masonry units made from clay or shale), Part 16, p. 121-125.
- C410-60 (Reapproved 1972) Standard specification for industrial floor brick, Part 115, p. 217-218.
- C479-72 Standard specification for vitrified clay liner plates, Part 16, p. 283-284.
- C330-69 Specification for lightweight aggregates for structural concrete, Part 14, p. 229-232.
- C315-56 (Reapproved 1972) Standard specification for clay flue linings, Part 16, p. 169-171.

American Society for Testing and Materials, 1974 Annual Book of ASTM Standards: Part 16, Chemical-resistant nonmetallic materials; clay and concrete pipe and tile; masonry mortars and units; asbestos-cement products.

Bergenback, R.E., Wilson, R.L., and Rich, M., 1980, Carboniferous Paleodepositional Environments of the Chattanooga Area: in Frey, R.W., ed., Excursions in Southeastern Geology, vol. I, Field Trip No. 13, p. 259-278, American Geological Institute, Falls Church, Va.

Butts, C., and Gildersleeve, B., 1948, Geology and Mineral Resources of the Paleozoic Area in Northwest Georgia: Georgia Department of Mines, Mining and Geology Bulletin 54, 176 p.

Chowns, T. M., editor, 1972, Sedimentary Environments in the Paleozoic Rocks of Northwest Georgia: Georgia Geological Survey Guidebook 11, 102 p.

_____, editor, 1977, Stratigraphy and Economic Geology of Cambrian and Ordovician Rocks in Bartow and Polk Counties, Georgia: Georgia Geological Survey Guidebook 17, 21 p.

Chowns, T.M., and McKinney, F.M., 1980, Depositional Facies in Middle-Upper Ordovician and Silurian Rocks of Alabama and Georgia: in Frey, R.W., ed., Excursions in Southeastern Geology, vol. 2, Field Trip No. 16, p. 323-348, American Geological Institute, Falls Church, VA.

Clews, F. H., 1969, Heavy Clay Technology: 2nd ed., Academic Press, New York, N.Y., 481 p.

Crawford, T.J., 1983, Pennsylvanian Outliers in Georgia: in Chowns, T.M., ed., "Geology of Paleozoic Rocks in the Vicinity of Rome, Georgia" 18th Annual Field Trip, Georgia Geological Society, p. 30-41.

Cressler, C. W., 1963, Geology and Ground-water Resources of Catoosa County, Georgia: Georgia Department of Mines, Mining and Geology Information Circular 28, 19 p.

_____, 1964a, Geology and Ground-water Resources of the Paleozoic Rock Area, Chattooga County, Georgia: Georgia Department of Mines, Mining and Geology Information Circular 27, 14 p.

_____, 1964b, Geology and Ground-water Resources of Walker County, Georgia: Georgia Department of Mines, Mining and Geology Information Circular 29, 15 p.

_____, 1970, Geology and Ground-water Resources of Floyd and Polk Counties, Georgia: Georgia Department of Mines, Mining and Geology Information Circular 39, 95 p.

_____, 1974, Geology and Ground-water Resources of Gordon, Whitfield and Murray Counties, Georgia: Georgia Geological Survey Information Circular 47, 56 p.

Cressler, C. W., Franklin, M. A., and Hester, W. G., 1976, Availability of Water Supplies in Northwest Georgia: Georgia Geological Survey Bulletin 91, 140 p.

Cressler, C. W., Blanchard, H. E., Jr., and Hester, W. G., 1979, Geohydrology of Bartow, Cherokee, and Forsyth Counties, Georgia: Georgia Geologic Survey Information Circular 50, 45 p.

Croft, M. G., 1964, Geology and Ground-water Resources of Dade County, Georgia: Georgia Department of Mines, Mining and Geology Information Circular 26, 17 p.

Georgia Geological Survey, 1976, Geologic Map of Georgia: Georgia Geological Survey, scale 1:500,000.

Gillespie, W.H. and Crawford, T.J., in press, Plant Megafossils from the Carboniferous of Georgia, U.S.A.: in 10th International Congress of Carboniferous Stratigraphy and Geology (Madrid), Proceedings.

Grimshaw, R. W., 1972, The Chemistry and Physics of Clays and Other Ceramic Raw Materials: 4th ed., rev., Wiley-Interscience, New York, N.Y., 1024 p.

Hollenbeck, R.P., and Tyrrell, M.E., 1969, Raw materials for lightweight aggregate in Appalachian Region, Alabama and Georgia: U.S. Bureau of Mines RI-7244, 21 p.

Jones, T. J., and Beard, M. T., 1972, Ceramics: Industrial Processing and Testing: Iowa State University Press, Ames, Iowa, 213 p.

Kelly, K. L. and Judd, D. B., Color. Universal Language and Dictionary of Names: U.S. Dept. of Commerce, NBS Special Publication 440, 158 p.

Kline, S. W. and O'Connor, B. J., editors, 1981, Mining Directory of Georgia, 18th. ed.: Georgia Geologic Survey Circular 2, 49 p.

Klinefelter, T. A., and Hamlin, H. P., 1957, Syllabus of Clay Testing: U.S. Bureau of Mines Bulletin 565, 67 p.

Liles, K. J., and Heystek, H., 1977, The Bureau of Mines Test Program for Clay and Ceramic Raw Materials: U.S. Bureau of Mines IC-8729, 28 p.

Norton, F. H., 1942, Refractories: 2nd ed., McGraw-Hill Book Co., N.Y., 798 p.

O'Neill, B. J., Jr., and Barnes, J. H., 1979, Properties and Uses of Shales and Clays, Southwestern Pennsylvania: Pennsylvania Geological Survey Mineral Resources Report 77, 689 p.

_____, 1981, Properties and Uses of Shales and Clays, South-central Pennsylvania: Pennsylvania Geological Survey Mineral Resource Report 79, 201 p.

Patterson, S. H., and Murray, H. H., 1983, Clays: in Lefond, S. J., and others, eds., Industrial Minerals and Rocks; 5th ed., American Institute of Mining, Metallurgical and Petroleum Engineers, Inc., New York, p. 585-651.

Smith, J. W., 1968?, Tests for Clay Products in Northwest Georgia; unpublished manuscript, 47 p. (brief summary in: 1967 Annual Report of the Department of Mines, Mining, and Geology, 1968, p. 17-19).

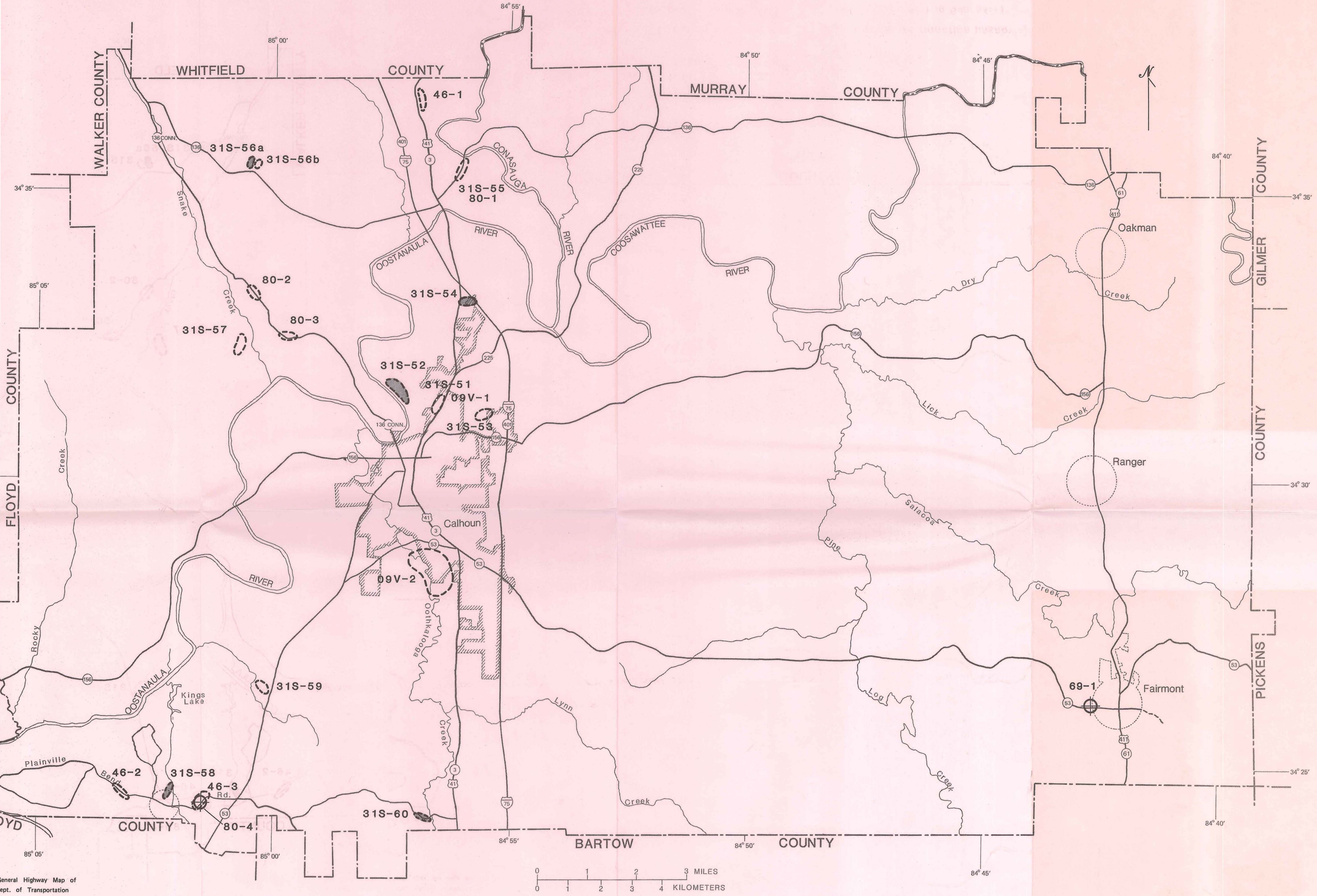
Smith, R. W., 1931, Shales and Brick Clays of Georgia: Georgia Geological Survey Bulletin 45, 348 p.

Spencer, J.W.W., 1893, The Paleozoic Group; The Geology of Ten Counties of Northwestern Georgia: Georgia Geological Survey, 406 p.

Thomas, W.A., and Cramer, H.R., 1979, The Mississippian and Pennsylvanian (Carboniferous) Systems in the United States - Georgia: U.S. Geological Survey Professional Paper 1110-H, 37 p.

CLAY AND SHALE TEST LOCATIONS IN GORDON COUNTY

Georgia Geologic Survey
Information Circular 69
Plate 1



General Highway Map of
ept. of Transportation

EXPLANATION

09V-1 Numbers correspond to the "Map Location No." in text

Exact sample location

Approximate sample location

Several samples collected over the enclosed area
Boundary dashed where approximate

Location numbers:

Gdn. 09V-1 and Gdn. 09V-2
Gdn. 31S-51 to Gdn. 31S-60
Gdn. 46-1 to Gdn. 46-3
Gdn. 69-1
Gdn. 80-1 to Gdn. 80-4

Not shown (location unknown):

Gdn. 64-1 to Gdn. 64-11
Gdn. 66-1 and Gdn. 66-2
Gdn. 67-1 to Gdn. 67-3