NPS FORM 10-900 (Rev. 8-86) OMB No. 1024-0018 [SD-SHPO # ECA-OH-597-1/89]
[use paper with at least 25% cotton rag content, use NLQ or LQ printer]

United States Department of the Interior -- National Park Service
NATIONAL REGISTER OF HISTORIC PLACES -- REGISTRATION FORM

This form is for use in nominating or requesting determinations of eligibility for individual properties or districts. See instructions in Guidelines for Completing National Register Forms (National Register Bulletin 16). Complete each item by marking "x" in the appropriate box or by entering "NA" for "not applicable." For functions, styles, materials, and areas of significance, enter only the categories and subcategories listed in the instructions. For additional space use continuation sheets (Form 10-900a). Type all entries.

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1. **Name of Property**
historic name: Woodbine Cottage Experimental Rammed Earth Wall
other name/ site number: NA

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2. **Location**
street & number: South Dakota State University Campus /NA/ not for publication
city, town: Brookings /NA/ vicinity
state: SOUTH DAKOTA code: SD county: Brookings code: SD 011 zip code: 57007

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3. **Classification**

Ownership of Property:	Category of Property	Contributing	Noncontributing	
/ / private	/ / building(s)			buildings
/ / public-local	/ / district			sites
/XX/ public-state	/ / site	1		structures
/ / public-federal	/XX/ structure			objects
	/ / object	1	0	Total

Number of Resources within Property (Contributing / Noncontributing) as above.

Name of related multiple property listing: NA

Number of contributing resources previously listed in the National Register: 0

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11. **Form Prepared by**
name/title: Sherry DeBoer & Janet Gritzner, consultants; with T/A by J. Rau, SHPO staff
organization: Brookings Historic Preservation Commission date: January 22, 1991
street & number: P. O. Box 270 telephone: 605-692-7104 (DeBoer)
city or town: Brookings state: SOUTH DAKOTA zip code: 57006

4. **State/Federal Agency Certification**

As the designated authority under the National Historic Preservation Act of 1966, as amended, I hereby certify that this / / nomination / / request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property /✓/ meets / / does not meet the National Register criteria. / / See continuation sheet.

Signature of certifying official — Date: 5/25/91

SHPO South Dakota
State or Federal agency or bureau

In my opinion, the property / /meets / / does not meet the National Register Criteria. / / See continuation sheet.

Signature of commenting or other official — Date

State or Federal agency or bureau

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5. **National Park Service Certification**

I, hereby, certify that this property is:

___✓___ entered in the National Register — Entered in the National Register — 6/28/91
____ see continuation sheet
___ determined eligible for the National Register
____ see continuation sheet
___ determined not eligible for the National Register
___ removed from the National Register
___ other, (explain)_____

Signature of the Keeper — Date

6. **Function or Use** (enter categories from instructions)

Historic functions:	Current Functions:
OTHER: Building Experiment Testing Facility	OTHER: Garden Wall

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7. **Description**

Architectural Classification:
(enter categories from instructions)
OTHER: Rammed Earth Wall

Materials:
(enter categories from instructions)

foundation	Concrete
walls	Earth
	Stucco
roof	NA
other	Concrete

Describe present and historic physical appearance: /XX/ see continuation sheet

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8. **Significance**

Certifying official has considered the significance of this property in relation to other properties: / / nationally / / statewide /XX/ locally

Applicable National Register Criteria / / A / /B /XX/C / /D

Criteria Considerations / /A / /B / /C / /D / /E / /F / /G

Areas of Significance (enter from instructions)
Engineering

Period of Significance
1934

Significant Dates
1934

Significant Person
NA

Cultural Affiliation
NA

Architect/Builder
Patty, Ralph L.
DeLong, Henry H.

State significance of property, and justify criteria, criteria considerations, and periods of significance noted above /XX/ see continuation sheet

Situated near the west-central edge of the campus of South Dakota State University, the Woodbine Cottage Experimental Rammed Earth Wall is an L-shaped earthen garden wall constructed in 1934 by professors and students of agricultural engineering in order to test rammed earth building techniques. It lies along the western property line of Woodbine Cottage (listed separately in National Register-- 1-26-90), the official residence of the president of the university at 929 Harvey Dunn Street in Brookings. Rising from concrete footings the 13.5-inch-thick wall is constructed of ancient "rammed earth" or "pisé de terre" technology, in which damp raw soil is poured layer-after-layer into forms and then tamped with heavy rods until dry and hard. Stucco of various experimental materials covers the wall surfaces. A 4-inch-thick concrete sill with a 3.5-inch overhang caps the structure.

The wall can be divided into four sections. Section "A" extends 190 inches (15.83 feet) west from the western end of a hedge along Harvey Dunn Street in front of Woodbine Cottage. It is 72.5 inches high. Sections "B," "C," and "D" run a total of 2083 inches (173.59 feet) north from the western end of Section "A" and form a stepped barrier along the western border of the Woodbine garden. The longest section, "B," is 1368 inches (144 feet) long and is 72.5 inches high at its southern end and 85 inches high at its northern end. Section "C" is 608 inches (50.67 feet) long and 67 inches high. Finally, Section "D" is 107 inches (8.92 feet) long and 54 inches high. Rubble consisting of stucco and concrete found near the north end of Section "D" suggests that the wall once extended further north and then back to the east. The date of removal of these sections of the garden wall is unknown.

A plaque located near the center of Section "A" reads:

Experimental Pisé
or "Rammed Earth" Wall
Built for the purpose of studying
different methods of bonding
stucco to earth walls
by the Department of
Agricultural Engineering
South Dakota State College
Experiment Station
Federal Purnell Funds
Built 1934 A.D.

Between 1934 and 1940, professors Ralph L. Patty and Henry H. DeLong and their students used the garden wall to conduct carefully controlled experiments of rammed earth technology and publicized the results. Today, it survives in good condition with only minor cracking. One small section of the west wall

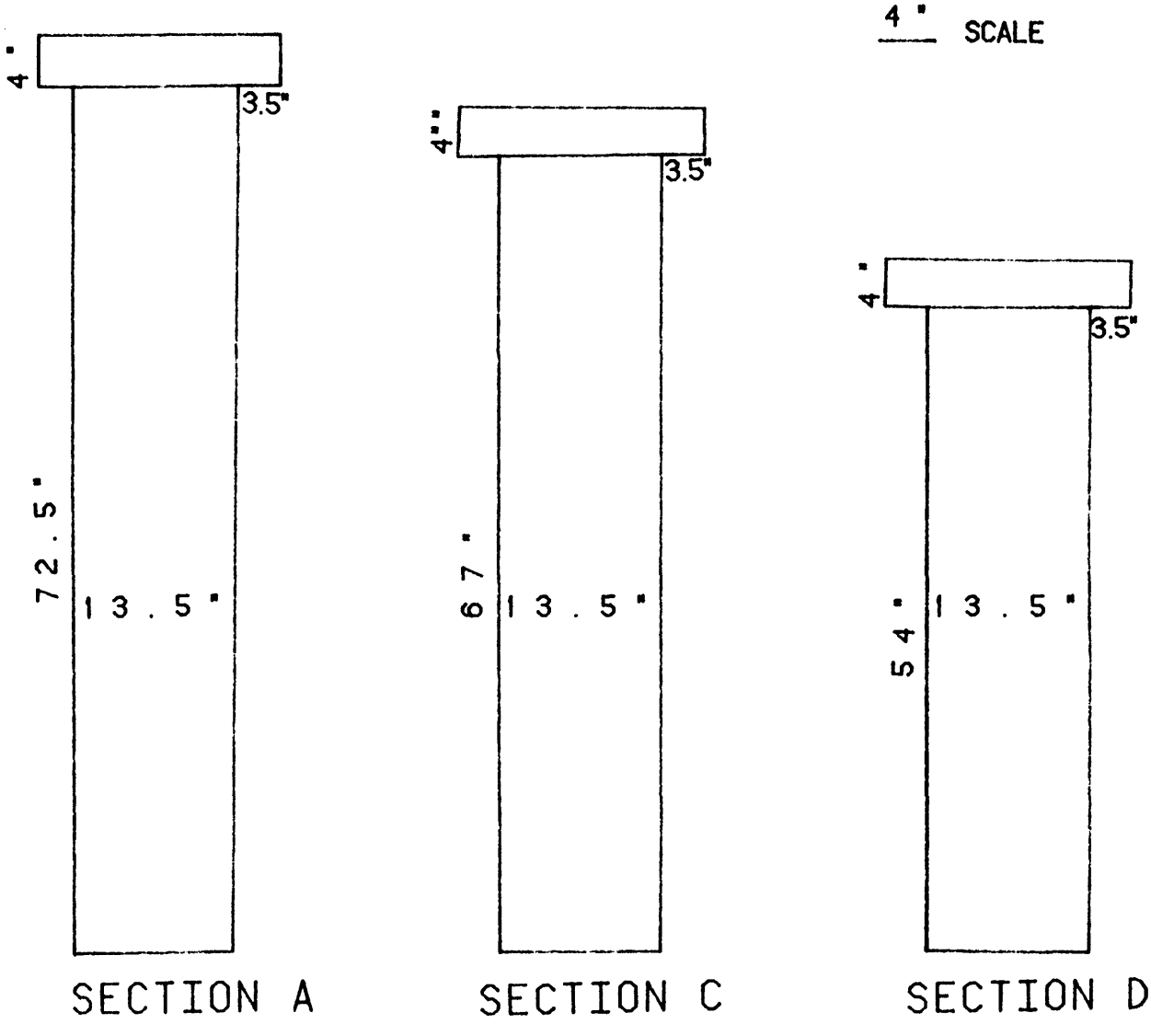
shows evidence of substantial repair to the stucco veneer. The wall is the best preserved facility remaining from the experiments conducted by Patty and his colleagues on the campus.

Woodbine Cottage Experimental Rammed Earth Wall

Elevation Sketches on Reverse Side

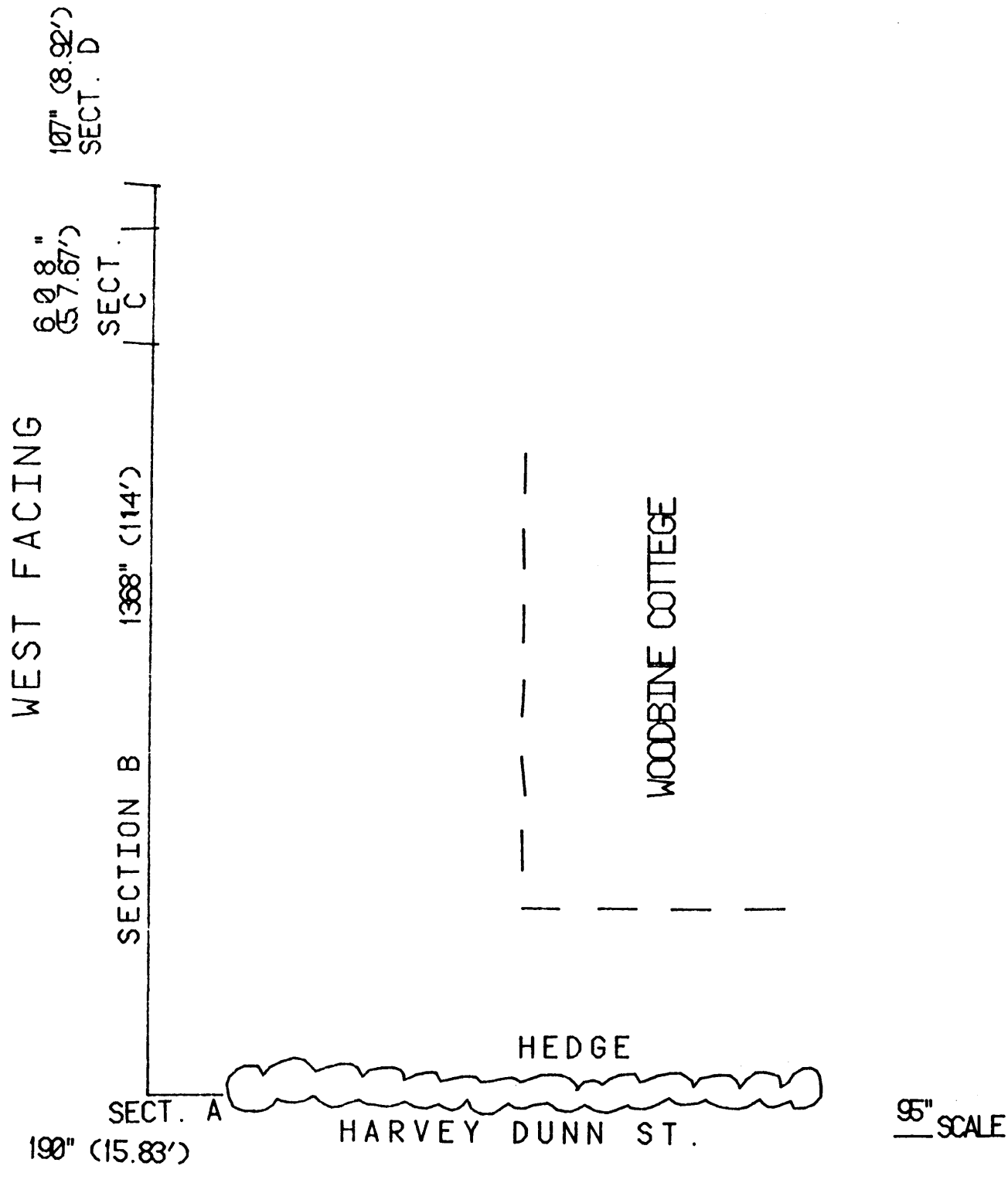
EXPERIMENTAL RAMMED EARTH WALL - 1934

SECTION B: HEIGHT OF RAMMED EARTH PORTION OF WALL RANGES FROM 72.5" ON SOUTH END OF WALL TO 85" ON NORTH END OF WALL SEGMENT



Woodbine Cottage Experimental Rammed Earth Wall

Sketch Map on Reverse Site



EXPERIMENTAL RAMMED EARTH WALL 1934

Under Criterion C of the National Register Criteria, the Woodbine Cottage Experimental Rammed Earth Wall is significant in the area of engineering, because it one of only three remaining resources on the campus of South Dakota State University (formerly South Dakota State College) that were products of testing conducted during the 1930s by the agricultural engineering department. Directed by Professor Ralph L. Patty with the assistance of professor Henry H. DeLong, students erected several rammed earth or pisé de terre buildings and walls with a variety of material compositions and tested their suitability for low cost agricultural use during the lean economic years of the Great Depression. Patty wrote numerous professional articles and reports based on these tests and drew national attention to the work of the department. Of the work on the campus, only two garden walls and a small machine shed remain extant. (The other wall is being nominated separately, and the shed is not being nominated at this time.) The Woodbine Cottage Wall, constructed in 1934, is the best preserved facility remaining from the Patty experiments. Under the South Dakota Historical Preservation Plan, the property relates to the following historic context: VI. The Great Depression.

Rammed earth construction, also called pisé construction or "pisé de terre," entails pouring or packing damp raw soil layer-after-layer into wooden forms and then tamping the material with heavy rods until dry and hard. The forms are then removed revealing a smooth freestanding wall. Often an exterior veneer is applied to protect the earthen walls from harmful environmental moisture.

The technique can be traced to ancient times. Even the Roman natural historian Pliny (23-79 A.D.) described rammed earth towers reportedly erected by the Carthaginian general Hannibal (247-183 B.C.) during his campaign in Spain. Throughout the Middle Ages and early modern times, a variety of earthen construction technologies including puddled clay, unfired clay brick, and wattle-and-daub, as well as rammed earth developed in Europe and spread to the New World. By the 18th Century, several buildings in English Colonial America were of pisé construction. Furthermore, S. W. Johnson of New Brunswick, New Jersey, conducted detailed experiments with rammed earth and published his findings in 1806.

Earthen construction also saw early use in Dakota Territory. Fur traders and homesteaders were quick to build using native materials partly out of necessity and partly out of tradition. Certainly, the ubiquitous plains sod house is one prominent illustration. But, more refined earthen buildings also dotted the early Dakota landscape. European immigrants, who had centuries of experience with well crafted earthen folk buildings in the old country, brought many of their traditional building arts with them. German-Russian and Czech pioneers, for example, used rammed earth as well as other earthen tech-

niques in building many of their first generation houses and barns.

Yet except for the tests by Johnson at the beginning of the 19th Century, serious scientific consideration of the technology as a model for modern America lagged until the 20th Century. T. A. H. Miller from the Division of Agricultural Engineering at the U. S. Department of Agriculture conducted some of the earliest of these tests on rammed earth buildings. In 1926, the owners of the Hill Crest Plantation in South Carolina stirred Miller's interest by asking for help repairing the rammed earth Church of the Holy Cross, which stood on their property. Numerous published tests by Miller and others ensured for the next two decades.

Dr. Ralph L. Patty, head of the agricultural engineering department at South Dakota State College, the state's only land grant institution, began his work with rammed earth building technology in January of 1930 in an attempt to respond to constituents' questions addressed to the Agricultural Experiment Station. Assisted by colleague Henry H. DeLong and student labor, he first experimented with the construction of rammed earth livestock buildings. In the 1933 South Dakota Agricultural Experiment Station Bulletin No. 277 he published an article entitled "Rammed Earth Walls for Farm Buildings," in which he provided details of the methods used to construct a rammed earth poultry house (which is no longer extant). The group examined among other things the insulating properties of such walls in the control of frost deposit for housing livestock. Most of his later research was on paints, plasters, and different methods for bonding stucco to rammed earth, many of which he tested on the Woodbine Cottage garden wall.

Patty received much national attention for the research. By 1936, all inquires about rammed earth received by the U. S. Department of Agriculture were referred to Dr. Patty. Scores of foreign and domestic visitors came to inspect his work first hand. In addition, he published numerous reports about his tests. A photograph of the garden wall appears on page 9 of Patty's 1940 article entitled "Paints and Plasters for Rammed Earth Walls," South Dakota Agricultural Experiment Station Bulletin No. 336. The caption reads: "Twenty-eight bonding panels were used on this wall, including methods of nailing and joining bonding wire. Picture taken after four years." Details of these experiments are included in the publication.

Promotion of the idea continued through the 1930s, in a large part due to the efforts of South Dakota publicist Leland Case and his brother Congressman Francis Case. Moreover, New Deal programs such as the Resettlement Administration and Works Progress Administration are known to have undertaken the construction of several rammed earth buildings. But, it was Patty's work and that of his colleague and students that proved the worthiness and economy

of rammed earth agricultural buildings. From 1930 to his death in 1941, he directed the construction of 2 full-sized buildings, a smaller building, 2 garden walls, and 29 smaller wall sections at South Dakota State College. Interest in rammed earth for agricultural building waned during World War II, due to improved commodity prices and scarcity of laborers, and the experiments were discontinued. Eventually all properties except the machine shed and the two garden walls were demolished. The Woodbine Cottage Experimental Rammed Earth Wall, thus, remains a rare testament to the ingenuity and skill of Patty and his fellow researchers.

The period of significance of the nominated property does not extend beyond its date of construction in 1934.

9. **Major Bibliographical References** **/XX/ see continuation sheet**

Previous documentation by NPS:
/ / preliminary determination of individual listing (36 CFR 67) has been requested
/ / previously listed in the National Register
/ / previously determined eligible by the National Register
/ / designated a National Historic Landmark
/ / recorded by Historic American Buildings Survey # _____
/ / recorded by Historic American Engineering Record # _____

Primary location of additional data:
/XX/ State historic preservation office
/ / Other State agency
/ / Federal agency
/XX/ Local government
/ / University
/ / Other
Specify repository:
Brookings Historic Preservation Commission

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10. **Geographical Data**
Acreage of property: Less than one acre

UTM References:

A =	/14/	/676-360/	/4909-250/		B =	/ /	/	/	/	/
C =	/ /	/	/	/	D =	/ /	/	/	/	/
	ZONE	EASTING	NORTHING			ZONE	EASTING	NORTHING		

Quad: Brookings Scale: 1:24000

/ / see continuation sheet

Verbal Boundary Description:

/XX/ see continuation sheet

Boundary Justification:

/XX/ see continuation sheet

"Building with Rammed Earth." Northwest Farmer. XLV (January 1926).

Coffin, E. H. and H. B. Humphrey. Lower Cost Building: Handbook on Building Walls with Rammed Earth. New York: The Publicity Corporation. 1934.

_____. "Making Houses Out of Earth." Wallaces' Farmer. XLVIII (December 1923): 1723.

_____. "Rammed Earth Houses." Country Gentleman. LXXXIX (June 1924): 11.

Dacy, G. H. "Rammed Earth Lowers House Cost." Popular Mechanics. XLII (November 1924): 838-840.

"DeLong Recalls His Rammed Earth Research." Brookings (South Dakota) Register. September 27, 1988.

Ellington, Karl Johann. "More Mud Houses." Scientific American. CXXXIV (March 1926): 174-175.

"Experiments in Rammed Earth Construction Gains Attention." Brookings Register. November 5, 1936.

Johnson, S. W. Rural Economy: Containing a Treatise on Pise' Building as Recommended by the Board of Agriculture in Great Britain; with Improvements by the Author; On Buildings in General; Particularly on the Arrangement of These Belonging on Farms; On the Culture of the Vine and on Turnpike Roads. N. p. 1806.

Miller, T. A. H. "The Durability of Rammed Earth Walls." Agricultural Engineering. X (August 1929): 259-260.

_____. Report on the Condition of Rammed Earth Buildings Built 1820-1854, Sumter, South Carolina. Mimeographed: [Washington]: U. S. Department of Agriculture, Bureau of Agricultural Engineering. 1926.

_____. "Pise' de Terre Houses: An Ancient Style Revived." Country Gentleman. XCII (April 1927): 13-14.

_____. and M. C. Betts. "Rammed Earth Walls for Buildings." in Farmers Bulletin No. 1500. [Washington]: U. S. Department of Agriculture. 1927.

"North Dakota Men Inspect New Type of Building Material." Brookings Register. May 14, 1935.

Patty, Ralph L. "Determining Colloids in Soil for Rammed Earth Construction." Agricultural Engineering. XVI (July 1935).

_____. "Paints and Plasters for Rammed Earth Walls." in South Dakota Experiment Station Bulletin No. 336. [Brookings, SD: South Dakota State College]. 1940.

_____. "Protective Coatings for Rammed Earth Walls." Agricultural Engineering. XIV (March 1933).

_____. "Rammed Earth for Farm Building Walls." Agricultural Engineering. XV (January 1934).

_____. "Rammed Earth Walls for Farm Buildings." South Dakota Agricultural Experiment Station Bulletin No. 277. [Brookings, SD: South Dakota State College]. 1933.

_____. "The Relationship of Colloids in Soils to Its Favorable Use in Pise and Rammed Earth Walls." South Dakota Experiment Station Bulletin No. 298. [Brookings, SD: South Dakota State College]. 1936.

Porter, J. W. "Houses of Mud." Scientific American. CXXX (April 1924): 233.

"Rammed Earth Construction." Dakota Farmer XLV (November 1925): 989.

"South Dakota State College Agriculture and Mechanic Arts Building Survey." M.s.: [Pierre, SD]: South Dakota Temporary State Building and Planning Commission. July 1955.

"Suggests Rammed Earth for Building." Brookings Register. August 17, 1933.

Vivian, C. H. "Houses of Rammed Earth." Building Age. XLIX (September 1927): 102-104.

VERBAL BOUNDARY DESCRIPTION

The nominated property is bounded by a set of imaginary lines that intersect to form an L-shaped polygon around the L-shaped garden wall. The western boundary line lies 20 feet west of the westernmost surface of the structure and runs parallel to that surface. The northern boundary line lies 10 feet north of the northernmost surface of the structure and runs parallel to that surface. The eastern boundary line lies 10 feet east of the easternmost surface of the structure and runs parallel to that surface. The southern boundary line lies 10 feet south of the southernmost surface of the structure and runs parallel to that surface. The property is situated along the west property line of Lot 2 of Sublot b, Block 13, Morehouse Subdivision, City of Brookings, Brookings County, South Dakota.

BOUNDARY JUSTIFICATION

The boundaries of the nominated property are set to include only the L-shaped wall and to exclude any public roadways. The boundaries also exclude Woodbine Cottage, which has been listed in the National Register separately under another context.

United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

Section number photos Page 1

1.
Woodbine Cottage Experimental Rammed Earth Wall
Brookings, Brookings County, South Dakota
By: Howard Phillips
August 1989
Negative: Brookings Historic Preservation Commission
South and west facades, camera facing northeast
Photograph #1

2.
Woodbine Cottage Experimental Rammed Earth Wall
Brookings, Brookings County, South Dakota
By: Howard Phillips
August 1989
Negative: Brookings Historic Preservation Commission
West facade, camera facing southeast
Photograph #2

3.
Woodbine Cottage Experimental Rammed Earth Wall
Brookings, Brookings County, South Dakota
By: Howard Phillips
August 1989
Negative: Brookings Historic Preservation Commission
East facade, camera facing northwest
Photograph #3

4.
Woodbine Cottage Experimental Rammed Earth Wall
Brookings, Brookings County, South Dakota
By: Howard Phillips
August 1989
Negative: Brookings Historic Preservation Commission
South facade, detail of plaque, camera facing north
Photograph #4