

HISTORIC STRUCTURES REPORT

Tallgrass Prairie National Preserve

Tallgrass Prairie National Preserve
Strong City, Kansas

Recommended: _____ Date: _____
Chief, Cultural Resources

Concurred: _____ Date: _____
Superintendent, Tallgrass Prairie National Preserve

Approved: _____ Date: _____
Regional Director, Midwest Region

May 2004

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Final Submission

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Summary

Tallgrass Prairie National Preserve
Historic Structures Report

Summary

Statement of Purpose

The Tallgrass Prairie National Preserve was established to *"preserve, protect, and interpret for the public an example of a tallgrass prairie ecosystem...and to preserve and interpret for the public the historic and cultural values represented on the Spring Hill Ranch."* Established in 1996 as a unit in the national park system, the Tallgrass Prairie National Preserve includes the land formerly known as the Spring Hill Ranch, located in the Kansas Flint Hills. The 10,894 acres are dominated by vast regions of native tallgrass prairie with periodic corridors of woodland along the existing streams and drainage ways. Of the 400,000 square miles of original tallgrass prairie lands that once covered the North American continent, less than four percent remains, the majority of which is in the Flint Hills region. The site is significant for its association with the history of the cattle industry as well as its characteristic native tallgrass prairie.

This Historic Structures Report will recommend general and specific preservation treatments for the Spring Hill Ranch House, springhouse/curing room, barn, Lower Fox Creek Schoolhouse, outhouse, icehouse/cistern, carriage house, and poultry house in the Tallgrass Prairie National Preserve. Recommendations will be given with the objective of treating the complex in a consistent, integrated manner. Alternatives developed for the property build on the historical significance and integrity defined in the strategic vision of the General Management Plan of December 2000, and in the draft Cultural Landscape Report, Part 2, of April 2001.

General Building Description

The land constituting the Tallgrass Prairie National Preserve is known locally as the Z Bar Ranch and includes the land of the Spring Hill Farm and Stock Ranch that Stephen Jones, a stock raiser from Colorado, established in August of 1878. Jones participated in a key period of the nation's economic and developmental history through his accumulation of nearly 7,000 acres of land, upon which he raised thousands of head of cattle. In addition, he cultivated more than three hundred acres of property. He began constructing his residence in 1880 and completed the elaborate Late Victorian Second Empire mansion, along with numerous outbuildings, in 1881.

Not only is the breadth of historic resource types well represented at the ranch, but the overall integrity of the materials and design is of the highest level. The consistent utilization of native white limestone may accurately reflect the wealth available to make a capital investment over a single, short-term period of construction. The limestone construction of many of the buildings emphasizes the fact that the ranch operated as a unit, rather than as the separate buildings that comprise it. The contributing buildings, structures, and sites collectively compose an entity, a late nineteenth century enclosed

cattle ranch and headquarters, which serves as an exemplary model of the way of life on the southern plains of the United States. It is also an outstanding representation of the transition from open range to enclosed holdings of the large cattle companies of the 1880s. This aspect of the nation's history is not represented by any other property in this part of the plains. The Spring Hill Ranch House and barn are currently open for tours and also house rangers' offices, an office for the National Park Trust (primary preserve property owner), and a gift shop.

Administrative Background

The Spring Hill Ranch House was listed on the National Register of Historic Places in 1971 and the Lower Fox Creek Schoolhouse in 1974.

In 1994, the nonprofit National Park Trust purchased the 10,894-acre Spring Hill/Z Bar Ranch. Under congressional legislation in 1996, the Tallgrass Prairie National Preserve became the first national park unit devoted to protecting, preserving, and interpreting the tallgrass prairie. According to Title X, the National Park Service was allowed, by donation, to acquire not more than 180 acres of the preserve. Cooperative management of the preserve in conjunction with the property owner was also required.

In 1997, the entire 10,894 acres was designated as a National Historic Landmark. At this time, the National Park Service set up a site superintendent and a core of administrative and interpretive staff members.¹ In 2000, the National Park Service published a General Management Plan (GMP) and Environmental Impact Statement² that will guide park management decisions for the next 10-15 years.

In 2002, the National Park Trust donated 32.25 acres (the ranch headquarters and Schoolhouse areas) to the Federal Government. Eventually, up to 180 acres may be owned by the Federal Government.

Project Team Members

Following the objectives of the park, the National Park Service, Midwest Regional Office, engaged the professional services of Quinn Evans | Architects (QEA), an architectural firm specializing in historic preservation, to review documentary materials relating to the history and evolution of the Tallgrass Prairie National Preserve, and to conduct a comprehensive survey of the Spring Hill Ranch House, springhouse/curing

¹ Al O'Bright, *Fire Protection Assessment Report: Ranch House, Tallgrass Prairie National Preserve, Chase County, Kansas*, (Omaha, Nebraska: Midwest Regional Office, National Park Service, 29 June 2001).

² National Park Service staff, *General Management Plan, Environmental Impact Statement: Tallgrass Prairie National Preserve, Kansas*, (Omaha, Nebraska: Midwest Regional Office, National Park Service, U.S. Department of the Interior, December 2000).

room, barn, Lower Fox Creek Schoolhouse, outhouse, icehouse/cistern, carriage house, and poultry house.

Team members who provided support to Quinn Evans | Architects included Fitzpatrick Structural Engineering, P.C. for structural engineering, Affiliated Engineers Incorporated (AEI) for plumbing, mechanical, electrical, and communications systems, Gage Babcock & Associates (GBA) for security and life safety evaluation, LCA Associates for comparative analysis and architectural significance evaluation, Bluewater Studio for paint analysis, and R.W. Brown & Associates for cost estimating. This team has gathered information, in addition to that which had been previously researched and collected, to formulate strategies for repair and to recommend long range goals for the preservation of the nationally significant structures in the ranch headquarters area. The results of this investigative research and documentation are contained in this Historic Structures Report.

Report Summary

The report is organized in the following manner:

Summary

Presents statement of purpose, general building description, administrative background, project team members, report summary, investigation history and methodology, and executive summary.

Part 1: Developmental History

A. Historical Background and Context

Documents historic photographs and drawings, and general site history. Presents a comparative analysis of the Ranch House style and materials with those of the time, and an architectural significance analysis of the exterior and interior.

B: Building Chronology

Presents and analyzes historic building chronology information as derived from the historic and physical investigation.

C: Existing Conditions

Presents, analyzes and evaluates for the subject buildings existing site context, exterior envelope, interior finishes and elements, structural systems, plumbing systems, heating and cooling systems, electrical and lighting systems, communications systems, security systems, life safety, and accessibility.

Part 2: Treatment and Use

D: General

Provides design philosophy, and preservation and historic structure management strategy for the buildings.

E: Treatment and Alternatives

Proposes design alternatives for the appropriate treatment of ranch house, springhouse/curing room, barn, Lower Fox Creek Schoolhouse, outhouse, icehouse/cistern, carriage house, and poultry house. Proposes recommendations pertaining to exterior envelope, interior finishes and elements, structural systems, security systems, life safety, and accessibility.

F: Research Recommendations

Provides recommendations for further building or site area investigations.

Appendices

Includes bibliography, drawings for existing conditions and proposed design recommendations, paint analysis report, lead paint testing report, cistern coring report, list of historic buildings/structures, Class B cost estimate, and a report on the bedrock associated with the ranch house.

Investigation History and Methodology

The task of preserving an historic building requires that a preservation architect follow a disciplined approach to documenting and analyzing information. This is accomplished by utilizing investigative procedures, specialists in materials and construction methodology, scientific technology and various resources, documents, and photographs to begin to understand and compile the history of the historic resource.

Before determining the preservation concept, the preservation team studied in depth the provided documentary materials relating to the ranch house, barn, outbuildings, and site, including historical backgrounds and photographs. A thorough survey was undertaken to document architectural characteristics and construction techniques in order to gain insight into the construction and evolution of the Tallgrass Prairie National Preserve. To further record existing conditions, photographs were taken and drawings were prepared from the survey and from information provided by the Park Service.

This report is based on documentary evidence collected to date, limited physical probing and architectural inspection. Of necessity, the research process is not concluded with the completion of this report. Rather, it will be supplemented in the future by further information gathered through additional investigation, and by subsequent documents and information as they are discovered.

Executive Summary

The period of national significance for the Spring Hill Ranch, as defined in the National Historic Landmark designation, extends from the first purchases of the properties by Stephen Jones in 1878 through 1904, when Bernard “Barney” Lantry’s surviving sons sold off the ranch lands. The Historic Resource Study, completed in 2000, and the draft Cultural Landscape Report, ongoing, suggest that both the 19th and 20th century resources are significant at a state and local level and coincide with the development and decline of the railroads and their relationship to the resource until cattle shipment shifted to trucks in the 1960s through 1970.

The period of significance for the Spring Hill/Z Bar Ranch, for the purpose of this report, can be defined as 1878 to 1970 as a basis for treatment recommendations identified for resource structures. In particular, this Historic Structure Report (HSR) will place the highest priority on preserving the features that contribute to the National Historic Landmark period of significance, while respecting those features that have gained importance through association with the extended period of significance.

The proposed action defined for the Preferred Alternative in the *General Management Plan and Environmental Impact Statement* (GMP), is the integration of the management of the natural and cultural resources of the preserve. The intended use as an interpretive site along with the juxtaposition of the expanded period of significance renders preservation the overriding treatment according to *The Secretary of Interior’s Standards for the Treatment of Historic Properties*. Preservation, according to the standards, is defined as the act or process of applying measures necessary to sustain the existing form, integrity, and materials of an historic property. Work, including preliminary measures to protect and stabilize the property, generally focuses upon the ongoing maintenance and repair of historic materials and features rather than extensive replacement and new construction. The limited and sensitive upgrading of mechanical, electrical, and plumbing systems and other code-required work to make properties functional is appropriate within a preservation project. The character defining features, materials, spaces, and uses of the core buildings and adjacent cultural landscape are essentially intact and can be utilized, with minor accommodations, to convey the broad history of ranching in the Flint Hills.

The treatment recommendations, along with the proposed drawings, focus on preserving the Spring Hill/Z-Bar Ranch property by maintaining its significance and authenticity in terms of historic and architectural character, and introducing sensitive modifications to allow for barrier free accessibility, resolution to site drainage issues, and upgrading of building systems to respond to current codes deficiencies.

Tallgrass Prairie National Preserve
Historic Structures Report

Part 1: Developmental History

Tallgrass Prairie National Preserve
Historic Structures Report

A: Historical Background and Context

Tallgrass Prairie National Preserve
Historic Structures Report

Historic Photographs and Drawings

An effort has been made to include all available significant historical images of the site and historic structures. These photographs and drawings are presented in sections by structure. Within each section they are presented roughly chronologically and in order by room. See Appendix B, Existing Conditions drawings (EXA-), for room names, room numbers, and door and window numbers. In some cases images are grouped for the purposes of comparison.

1. Ranch Site

This lithograph, Figure A1-1 and A1-1a, is the earliest known image of the Spring Hill Ranch. It depicts the barn with the attached windmill to the north. The ranch house is shown complete with front porch, porch wings, rear porch, stone walls, and terraces in front. One path leads to the front (east) door, and one path leads to the rear (west) porch on the south side. There are no buildings between the barn and ranch house other than a small building with a pyramidal roof, at the top of the drive, which is too small and too far east to be the current carriage house or other known building. West of the ranch house, the ice house and cistern are visible. This lithograph, as well as the lithograph on the next page, appears to take artistic license, or shows what the owner had intended, rather than what was built. The small structure, for example, just north of the ranch house depicts a one-story building aligning with the east face of the ranch house. In addition, a door or window opening is depicted in the center of this elevation. This graphic interpretation does not match what is known to exist at this location.



Figure A1-1: Spring Hill Ranch, from the south, from The Kansas Picture Book, 1883.

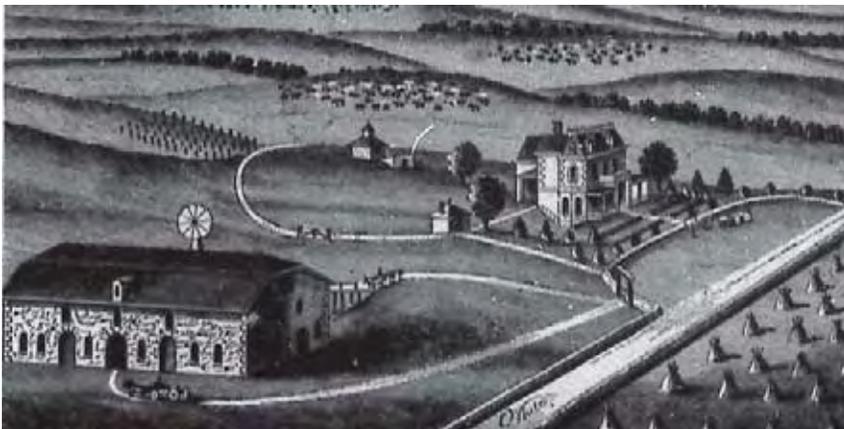


Figure A1-1a: Enlarged detail.

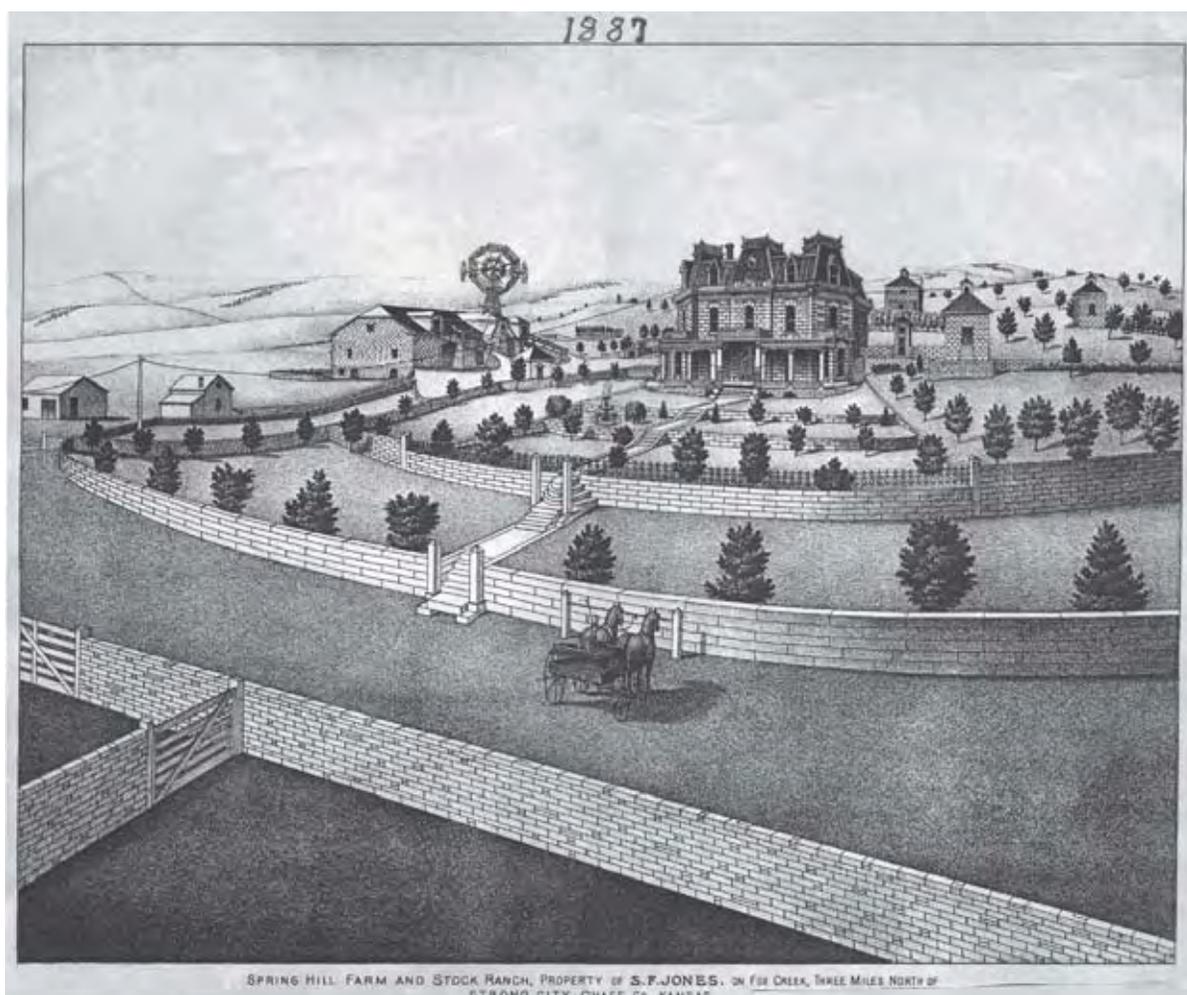


Figure A1-2: Spring Hill Ranch, from the east, from the Official State Atlas of Kansas, 1887.

This lithograph is a fairly accurate rendering of the Spring Hill Ranch, with its imposing stone terraces leading up to the house. The ranch house and barn are substantially as they are today. Despite the publication date of the book (1887), the lithograph depicts the renowned windmill, which was dismantled around 1884, perhaps again taking artistic license. It also shows arched openings into the second level of the barn. These openings are no longer arched, but physical evidence has confirmed that the upper parts of the openings were rebuilt at one time. Wooden structures, possibly houses, are shown to the southeast of the barn. A small stone building sits at the top of the drive between the barn and ranch house, similar to the one depicted in the 1883 lithograph. This stone building may have been an early carriage house or gatehouse. The mansard roof of the ranch house is topped by cast-iron cresting. The tunnel entrance, between the ranch house and springhouse, is shown with a window above the door and a pyramidal roof. The entrance to the curing room is shown on the east facade of the springhouse/curing room, probably for artistic composition purposes; the current entrance is on the west facade and there is no physical evidence of an east entrance. Between the barn and ranch house, the poultry house is shown, but not the current carriage house. The icehouse has a dormer on the north slope of the roof. The stone terrace walls in front of the ranch house are in a different configuration than in the 1883 lithograph.



Figure A1-3: Spring Hill Ranch, from the east, Kruxo postcard, ca. 1908.

This is the earliest known photograph of the ranch. From what can be seen, the ranch house is as it appears today, although the roof is a light color. The cast-iron cresting appears to be gone. The barn appears without the windmill but with the extended north middle dormer shed. There is a wooden structure to the southwest of the barn. Behind the ranch house, the north dormer on the roof of the icehouse can be seen. The poultry house appears but not the carriage house, and there is no small stone building at the top of the main drive, as depicted in the lithographs.



Figure A1-3a: Enlarged detail.



Figure A1-4: Spring Hill Ranch, from the southeast, Kinucan collection, ca. 1930s.

This photograph is the first that shows both the poultry house and the carriage house, and there is an additional wooden structure north of them. The ranch house rear porch south door can be seen. The icehouse cupola appears to be missing. The first floor windows on the barn east facade are the original full height, both silos are present, and there is a wooden structure west of the barn.



Figure A1-5: Spring Hill Ranch, from the southeast, Burtis collection, prior to 1983.

This photograph shows the icehouse, Quonset hut, carriage house, poultry house, barn and a structure to the west of the barn. There is only one silo. The barn has been modified with the two cupolas on the roof, and the first floor east windows have been shortened.

2. Spring Hill Ranch House

Exterior



Figure A2-1: Spring Hill Ranch House, from the southeast, Kinucan collection, ca. 1930s.

In this photograph the roof appears lighter than in the next photograph. Edith W. Benninghoven and two unknown women appear in the foreground. The cast-iron cresting is gone from the roof.



Figure A2-2: Ranch house, east elevation, Benninghoven collection, ca. 1920s or 30s.

The Benninghoven collection was donated to the National Park Service by Deone Benninghoven in 1998.

This photograph of the ranch house shows the dark (red) roof with contrasting (white) roping, original wooden storm windows, louvered oculus, and missing "J" crest.



Figure A2-3: Ranch hands outside the rear porch, from the southwest, Benninghoven collection, ca. 1930s.

The rear porch is shown here with two screen doors. Small windows are next to both doors. Fritz and Theodore Benninghoven are on the extreme right.



Figure A2-4: Curt Benninghoven outside the rear porch, from the west, Benninghoven collection, ca. 1930s.

This photograph shows the existing rear porch in apparently new condition. It appears as though there is no foundation wall next to the steps.



Figure A2-5: Edith, Daniel and Curt Benninghoven south of the rear porch, from the south, Benninghoven collection, ca. 1930s.

South entrance of the rear porch, steps, and stone path are visible.



Figure A2-6: Edith Wilson Benninghoven (top row, second from left), Enas Wilson (boy next to her), Pat Wilson (girl in front row), and others on the front porch, Warnken-Bourland donation, ca. 1942.

The Warnken-Bourland collection was donated to the National Park Service by Anna Warnken, who had been given a photograph by her mother Gladys Bourland. This group photograph was taken during a Home Demonstration Unit meeting of area residents.



Figure A2-7: Ranch house, east elevation, Burtis (Tax Credit) collection, ca. 1983.

The Burtis collection was donated to the National Park Service by Orville Burtis in May 1999. These photographs were used to document the rehabilitation that took place from 1983-1986. The photos labeled "tax credit" were part of the Historic Preservation Certification Application for tax credits.



Figure A2-8: Ranch house, east elevation, Burtis (Tax Credit) collection, 1986.



Figure A2- 9: Ranch house, east elevation, QEA 1997.

The roof is white (or light) in 1983, although this might be a primer. The vertical roping on the roof is present in 1986 but not in 1997. Rectangular storm windows have been added to the second and third floors by 1983, and to the first floor by 1997.



Figure A2-10: Ranch house, from the northwest, Burtis (Tax Credit) collection, 1986.



Figure A2-11: Ranch house, from the northwest, QEA 1997.



Figure A2-12: Ranch house and curing room, from the west, Burtis collection, ca. 1983.

The curing room is missing its cupola.



Figure A2-13: Ranch house rear porch, from the south, Burtis (Tax Credit) collection, ca. 1983.

The south door of the rear porch has been replaced by a window.



Figure A2-14: Ranch house rear porch, from the southwest, Burtis (Tax Credit) collection, 1986.

The small windows on either end of the rear porch (extreme left and extreme right in this photograph) were removed some time before 1997.



Figure A2-15: Ranch house, from the southeast, Burtis (Tax Credit) collection, ca. 1983.



Figure A2-16: Ranch house, from the southeast, QEA 1997.



Figures A2-17 and 18: Tunnel wall, from the northeast. Fig. 17, top: Burtis collection, ca. 1983; 18: Burtis (Tax Credit) collection, ca. 1986.

The east wall of the tunnel was repaired and raised by a course. The cap stones no longer line up with the narrow course on the entrance tower. In the lower photo, stones, possibly from the repair, have been placed in the grass to form a planter.



Figure A2-19: Root cellar roof, construction debris, from the south, Burtis collection, ca. 1983.

This construction debris is probably from the renovation of kitchen 205, since a kitchen sink, sheet flooring, a cabinet drawer, and substantial amounts of lath are visible.

Interior



Figure A2-20: Hall 101 and view of front doors, from the west, on landing, Kinucan collection, ca. 1935.

The Kinucan collection was donated to the National Park Service by Edith Seyfert Kinucan on 1 April 1998. Her aunt was Edith Wilson Kinucan. It is speculated that these photographs may have been taken upon foreclosure of the property by Prudential Life Insurance Company in 1935.



Figure A2-21: South parlor 102, looking southeast, Kinucan collection, ca. 1935.

The room, with vines growing in through the windows, dirt, droppings and debris, appears abandoned in this photograph. Base molding and possibly two lights on either side of the bay window are missing. Crown molding was originally decoratively painted throughout the house, which is evident in this room.



Figure A2-22: Old kitchen 105, from the southwest, Kinucan collection, ca. 1935.

The kitchen appears to be used as a utility room. The sink on the north wall is probably original. The purpose of the opening in the ceiling is unknown.



Figure A2-23: Spring house 108, from the southeast, Kinucan collection, ca. 1935.

The spring house appears to be in disrepair. The north circular vent/window is blocked.



Figure A2-24: Rear porch 207, from the north, Kinucan collection, ca. 1935.

The porch is screened. It contains a pump on the right of the photograph and a washing machine on the south wall. The roof structure visible is identical to what is there currently.



Figure A2-25: North room 203, from the southeast, Kinucan collection, ca. 1935.

Gas heater, telephone, and victrola are visible. Light fixture is electric adapted from gas.



Figure A2-26: North room 203, from the north, Kinucan collection, ca. 1935.



Figure A2-27: West room 204, from the northeast, Kinucan collection, ca. 1935.

Window sills and wall base are the original wood color. The room does not appear to be decorated as a dining room.



Figure A2-28: West room 204, from the southwest, Kinucan collection, ca. 1935.

The built-in cupboard between the two doors is not the same as the present, since the north wall of the room was moved after this photograph. The gas heater shown on the north wall was probably moved for the purposes of the photograph; it would have been connected to the pipes visible on the east wall of the room. The butler's pantry 205, just visible through the door on the left, contains simple shelving on the north wall. It appears to be a narrow rectangular room.



Figure A2-29: West room 204, from the southeast, Kinucan collection, ca. 1935.

The north wall in this photograph is about 2'-6" from the window. Because this wall was moved 27" south between 1935 and 1939, the cupboards shown no longer exist. The butler's pantry 205 is visible through the doorway.



Figure A2-30: West bedroom 304, from the northeast, Kinucan collection, ca. 1935.

Window sills and wall base are painted (white). There is a gas pipe at the south wall but no heater connected.



Figure A2-31: North bedroom 303, from the east, Kinucan collection, ca. 1935.

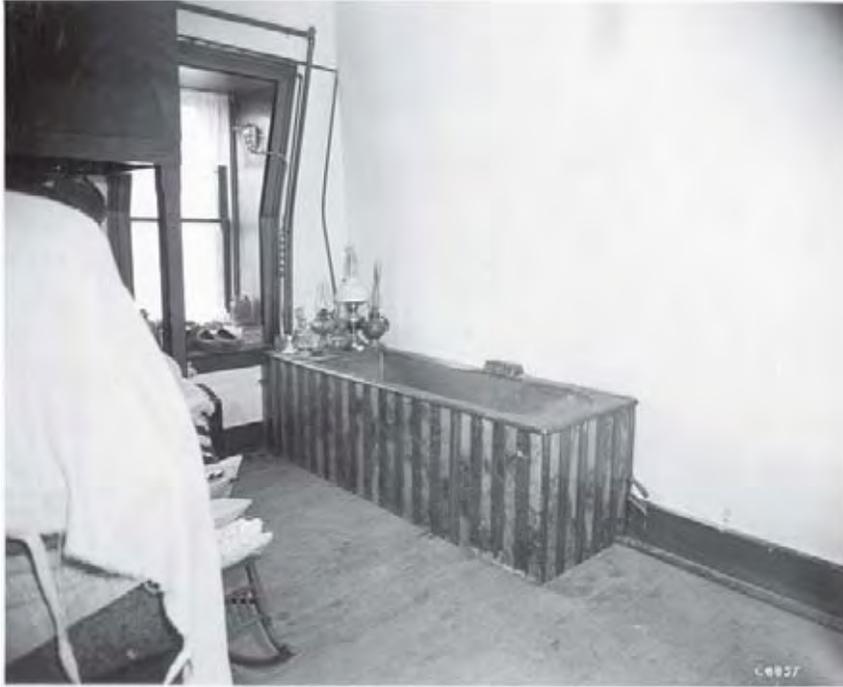


Figure A2-32: Bathroom 305, from the southeast, Kinucan collection, ca. 1935. The old tub, reportedly tin, copper, and wood, is on the north wall. An elevated tank or cistern to the left (on the south wall) fed the tub through pipes over the window casing.



Figure A2-33: Hall 306, from the south, Kinucan collection, ca. 1935.

The exhaust duct shown leads from the north bedroom to the chimney. There is a similar duct in the bathroom vestibule visible through the door. The walls of the hall do not appear to be papered.



Figure A2-34: North parlor 103, facing northeast, Burtis (Tax Credit) collection, ca. 1983.

The arch leading to the north bay window suffered repeated water damage. At the north bay window, there is crown molding at the decorative arch only on the north parlor side, as opposed to the "bay" side. At the south parlor bay window, there is crown molding on both sides of the arch.



Figure A2-35: North parlor 103 arch, looking up, Burtis (Tax Credit) collection, ca. 1983.

Via access holes cut through the plaster in 2002, the structure of the arch was determined. At this location there are two wood beams supporting the floor structure and wall above. One of these beams was treated with creosote and was most likely a replacement beam.



Figure A2-36: Bathroom 104, from the east, Burtis (Tax Credit) collection, ca. 1986.

A gas heater is shown venting out the under-porch window. The shower is shown after bathroom remodeling.



Figure A2-37: Old kitchen 105 and back door 206A , from the southwest, Burtis (Tax Credit) collection, ca. 1983.



Figures A2-38 and 39: Kitchen 205, from the east, Burtis (Tax Credit) collection, ca. 1983.

In style and material this kitchen appears to date to the 1930s; it is assumed that it dates to the 1938 renovation. The south wall has been moved to expand the size of the room. The south and west walls are covered in masonite faux tile; the stove probably sat under the vent shown. The floor is linoleum or sheet vinyl. The kitchen is empty, probably just prior to renovation.



Figures A2-40 and 41: Kitchen 205, from the west, Burtis (Tax Credit) collection, ca. 1983.

The east wall is painted and contains two vents, one of which is visible under the fold-out table. The fold-out table is said to have been made out of the inoperative dumbwaiter. There is a recess on the right where the overhead cabinets end that is not shown in the Figure A2-28.



Figure A2-42: Kitchen 205, from the southeast, Burtis (Tax Credit) collection, prior to 1983.

In this photograph the kitchen is in use and thus may be slightly older than other the Burtis Tax Credit photographs.



Figures A2-43 and 44: Kitchen 205, from the south, Burtis (Tax Credit) collection, ca. 1983.

The recess on the east wall is visible to the right. The fold-out table has been removed from the east wall.



Figure A2-45: Kitchen 205, from the east, Burtis (Tax Credit) collection, ca. 1983.

The kitchen ceiling during the 1983-84 renovation. Gypsum board has been installed in the ceiling.



Figure A2-46: Kitchen 205, from the north, Burtis (Tax Credit) collection, ca. 1983.

The south wall has been re-wired and refaced with gypsum board.



Figures A2-47 and 48: Kitchen 205, from the south, Burtis (Tax Credit) collection, ca. 1983.

Traces of the older cabinets and wall can be seen. The floor has been patched.



Figure A2-49: Kitchen 205 and back door 206A, from the west, Burtis (Tax Credit) collection, ca. 1983.

The east wall of the kitchen has been demolished. The stair to old kitchen 105 is behind the plywood partition.



Figure A2-50: Window sill in west room 204, from the east, Burtis (Tax Credit) collection, ca. 1983.

The sill and base molding are painted (white). The wall is papered.



Figure A2-51: Bathroom 305, closet door 305A, from the west, Burtis (Tax Credit) collection, ca. 1983.

During renovation of the bathroom the door has been stripped of its paint in preparation for grain-painting.



Figure A2-52: Bathroom 305, from the east, Burtis (Tax Credit) collection, ca. 1986.

The west wall of the bathroom is shown after renovation with wall paper, toilet, new shower and closet 305C on the left.

3. Barn

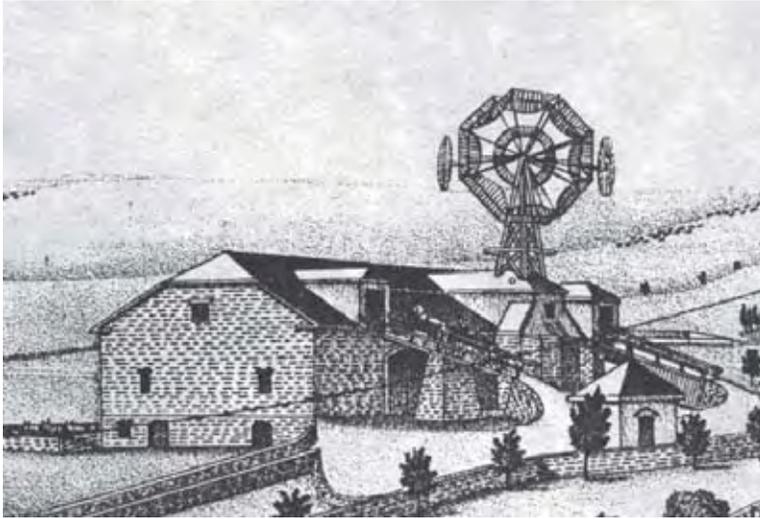


Figure A3-1: Detail of barn, from the northeast, from the Official State Atlas of Kansas, 1887.

The barn is pictured with the windmill and a stone base under an extended middle dormer on the north facade. No traces of the pyramid-roofed building at the top of the drive have been found.



Figure A3-2: Barn, from the northeast, Benninghoven collection, ca. 1920s.

This is the earliest known close-up photograph of the barn. The east facade of the barn has two taller windows on the first floor. Two concrete stave silos are present.



Figure A3-3: Barn, from the northeast, Kinucan collection, ca. 1935.

This photograph shows detail of the north facade of the barn. The windmill is gone and a wooden shed structure has been built on the north side of the barn. The roof is wood shingle with tin clad dormer sides.



Figure A3-4: Barn, from the east, Adair collection, prior to 1947.

The wooden shed with chute is visible on the north side of the barn. The two silos and extended middle north dormer are still present. The windows on the first floor of the barn are their original full height. The clipped gable is not visible because of the angle of the photograph, and therefore whether or not the cupolas are present is impossible to determine.



Figure A3-5: Detail of west wall of the barn, Burtis collection, ca. 1983.

The added door 101 and wood lintel on the first floor is visible in this photograph behind the corals.



Figure A3-6: Barn, from the northeast, Burtis (Tax Credit) collection, ca. 1983.

The barn before the tax credit repairs were conducted. Note that the main north entrances are no longer arched, and the cupolas have been added.



Figures A3-7 and 8: Barn cistern, from the north and the northwest, Burtis collection, ca. 1983.

The cistern parging is cracked. A pipe runs around the cistern from the east side to the collection pipe on the west. The gutter on the west feeds into the collection pipe.



Figure A3-9: Barn middle dormer, from the east, Burtis (Tax Credit) collection, ca. 1983.

The middle dormer on the north side of the barn is shown here in its shortened form. Cut floor joists are visible where the dormer meets the cistern roof.



Figure A3-10: Barn, from the northeast, Burtis (Tax Credit) collection, ca. 1986.

The barn after the tax credit repairs. The dormers have been sided with wood shingle.



Figure A3-11: Barn cistern, from the northwest, Burtis (Tax Credit) collection, ca. 1986.

The parging has been redone, the collection pipe replaced, and the gutter has been disconnected from the pipe.



Figures A3-12: Barn, from the west, Burtis (Tax Credit) collection, ca. 1986.



Figure A3-13: Barn, from the southeast, Burtis (Tax Credit) collection, ca. 1986.

The first floor windows are visible in their shortened version.



Figure A3-14: Barn, from the northeast, QEA 1998.

4. Lower Fox Creek Schoolhouse



Figure A4-1: Schoolhouse, from the southeast, Chase County Leader-News (1972), ca. 1882.

The original belfry is shown. There is a chimney on the west wall.



Figure A4-2: Schoolhouse, from the east, year unknown.

There was a stair leading up past a retaining wall directly east of the school. The gable was clearly higher at this time than currently.



Figure A4-3: Schoolhouse, from the south, Chase County Leader-News, 1972.

The gable is lower and the roof is tin. Both the belfry and chimney have been removed.



Figure A4-4: Schoolhouse, from the southeast, QEA 1997.

The south steps had not yet been replaced at the time of this photograph. The belfry replacement does not match the original.



Figure A4-5: Schoolhouse, from the east, QEA 1998.

The southeast steps have been replaced, and the lowered gable can be clearly seen.

5. Outhouse



Figure A5-1: Outhouse, from the south, Burtis (Tax Credit) collection, ca. 1983.



Figure A5-2: Outhouse, from the east, detail from the Official State Atlas of Kansas, 1887.



Figure A5-2: Outhouse, from the south, Burtis (Tax Credit) collection, ca. 1986.

The cupola has been repaired.

6. Icehouse and Cistern



Figure A6-1: Icehouse (upper left), tunnel entrance, springhouse, and outhouse, from the east, detail from the Official State Atlas of Kansas, 1887.

The icehouse has a large dormer to the north, above the location of the original door.



Figure A6-2: Icehouse, from the south, Burtis (Tax Credit) Collection, ca. 1983.

The cupola is missing. The new entrance is located on the south facade.



Figure A6-3: Icehouse, from the south, Burtis (Tax Credit) Collection, ca. 1986.



Figure A6-4: Icehouse, from the northwest, QEA 1998.



Figure A6-5: Cistern, from the east, QEA 1998.

7. Carriage House



Figure A7-1: Carriage house detail, from the southeast, Kinucan Collection, ca. 1935.

The gable window has four lights in this photograph. The wood-frame structure behind the carriage house is unidentified.



Figure A7-2: Carriage house, from the southeast, Burtis (Tax Credit) Collection, ca. 1983.

The gable window has eight lights at the time of this photograph.



Figure A7-3: Carriage house, from the south, Burtis (Tax Credit) Collection, ca. 1986.

8. Poultry House



Figures A8-1 and 2: Poultry house, from the south and the southeast, Burtis (Tax Credit) Collection, ca. 1986.



Figure A8-3: Poultry and carriage houses, from the south, QEA 1997.

General Site History

The land constituting the Tallgrass Prairie National Preserve is known locally as the Z Bar Ranch, and includes the land of the Spring Hill Ranch that Stephen Jones, a stock raiser from Colorado, established in August of 1878. The Preserve is situated within the Kansas Flint Hills, two miles north of Strong City on Kansas Highway 177 in Chase County in east-central Kansas. The Spring Hill Ranch House is located on the eastern edge of Section 31, Township 18 South, Range 8 East.¹

The progenitor of Stephen Jones, the Welshman Robert Jones, came to Massachusetts around 1636. At the end of the seventeenth century, some of the family moved south to Virginia. Erasmus Jones II (Jr.), was born in Virginia in 1799, and moved to Tennessee where he married Christina Bond in 1824. Stephen Fuqua Jones was born in 1826 as the second of thirteen children of Erasmus and Christina Jones² who lived southeast of Nashville, Tennessee, in what is today Cannon County.³ In 1849, at age 23, Stephen Jones moved to Alabama where he worked on a cotton plantation. There he met, and in November 1849 married, Louisa M. Barber, the sixteen-year-old daughter of Samuel R. and Adeline Barber, a fairly well-to-do family in Tallapoosa County, northeast of Montgomery, Alabama. Stephen and Louisa's first child, a daughter, was born in Tallapoosa County in 1850 or 1851 but she died in infancy.

Being a tight-knit family, the Jones' extended family successively migrated west. Stephen and Louisa Jones first moved to Van Zandt County, Texas, southeast of Dallas, where a second daughter, Christina Anna Jones, was born in February 1853. The family next bought land in Parker County, just west of modern Fort Worth, where both of Stephen Jones' parents were buried on their own land.⁴ Stephen and Louisa's third child, Samuel E. ("Bud") Jones, was born here in April 1856. A fourth child, their second son, Charles H. Jones, was born in October 1859.

Stephen Jones did not serve in the Army of the Confederate States of America although his five brothers did. Instead, he was in the Parker County Volunteer Home Guard formed to protect residents along the frontier from Indians and roughnecks who took advantage of the general lawlessness resulting from the withdrawal of United States Army troops to fight in the Civil War.⁵

¹ Deon K. Wolfenbarger and Dale Nimz, "National Historic Landmark Nomination Form, Spring Hill Ranch," (Prepared for the National Park Service, 12 April 1996), 7.

² Hal K. Rothman & Associates, *Historic Resource Study, Tallgrass Prairie National Preserve [95% draft]* (Omaha, Nebraska: Midwest Regional Office, National Park Service, September 1999), 113-114.

³ In 1841, the county was named Wise County but was later divided; the Jones family lived in the portion that is today Cannon County. Julia and Edward Hobbs, volunteers who have researched the Jones family at the Tallgrass Prairie National Preserve, provided this information.

⁴ Rothman & Associates, *Historic Resource Study*, 114.

⁵ Chase County, Kansas, newspaper listings of area residents who served in the Civil War never included Stephen F. Jones. Furthermore, no Stephen F. Jones appears in *The Roster of Confederate Soldiers, 1861-1865* (1996). Julia Hobbs provided this information.

During the war, the Texas cattle population multiplied due to their isolation from outside markets. Under Texas law, cattle belonged to anyone who claimed and branded them. Due to the abundance of cattle in Texas, and demand in other parts of the country, cattle traffic to northern shipping points could net twenty times the Texas price. However, since the traveling herds often brought diseases such as the “Texas fever” to farmers along their route, several states passed quarantine laws that prohibited the passage of animals from Texas. In 1867, a cattle-shipping railhead opened at Abilene, Kansas, in the middle of the Great Plains. When the Kansas Governor was persuaded to ignore the quarantine laws against transient Texas cattle, Texas ranchers gained easy access to cattle transportation north.⁶

In 1867, Stephen and Louisa Jones’ second son, Charles, died. In the same year, their daughter Christina Anna married Calvin (“Wit”) Adare. She was only fourteen and the young couple followed their families to the Colorado Territory the following year.⁷ In 1868, Stephen Jones and his two brothers Peyton and James drove stock north, eventually settling in southeastern Colorado near Fort Lyon, and then moved to Las Animas where Stephen Jones did very well. In Colorado, their herd size increased to more than 15,000 animals. The family purchased the best house in town at a cost of \$2,500, and extensively redecorated the house spending perhaps one to two thousand more.⁸ In addition to ranching, Jones owned a hotel, livery stable, and half interest in a grocery store. Stephen and Louisa Jones’s fifth and last child, Louisa M. (“Lutie”) Jones was born on September 5, 1871. An indication of the Jones family’s increasing prosperity is a mention in the April 19, 1878, edition of the *Las Animas Leader* that Louisa Jones had acquired a piano, presumably for lessons for their daughter, Lutie.⁹

The Jones family held deep religious convictions. The April 26, 1878, edition of the *Las Animas Leader* mentioned that Stephen Jones and a local minister had attended the General Assembly of the Methodist Episcopal Church held in Atlanta, Georgia.¹⁰ The family’s strict religious beliefs forbade drinking alcohol, which may explain why the Jones family did not attend the annual ball and banquet of the Live Stock Association of

⁶ Rothman & Associates, *Historic Resource Study*, 115-116.

⁷ Julia and Edward Hobbs provided this information.

⁸ According to Julia Hobbs, the house had been built for a local merchant who was also provisioner for wagon trains moving west.

⁹ Kenneth L. Ames makes the point that pianos were both more expensive and more difficult to play than parlor organs, which were widely available in the last quarter of the 19th century. Pianos were therefore symbols of higher status. See Ames, “Material Culture as Non Verbal Communication: A Historical Case Study,” in Edith Mayo, *American Material Culture* (Bowling Green, OH: Bowling Green State University Popular Press, 1984): 25-47.

¹⁰ Adeline Barber and her daughter, Louisa, had become Methodists in 1847. Stephen Jones joined the Methodist Church South when he married Louisa, although he had been raised a Baptist. Julia Hobbs provided this information. The Methodist Episcopal Church separated into two conferences, North and South, in 1844 over the issues of slavery and the power of the bishops. The Churches were reunited in 1939. See Sydney E. Ahlstrom, *A Religious History of the American People*, (New Haven: Yale University Press, 1972) pp. 661-663, and 921.

Chase County [Kansas] even though Stephen Jones was president. It may also explain why the only entertaining mentioned at the Spring Hill Ranch was for ten-year-old Lutie and her young friends.¹¹

In the late 1870s, they moved east again, this time to Kansas, in order to find grazing property closer to the railheads for fattening the cattle before shipping. James Jones first tried his luck with a Morris County property in 1877, but soon realized that it was too far from a railhead. Stephen Jones then bought a 160-acre farm in Chase County, Kansas, with land on both sides of Fox Creek, on August 28, 1878. He continued to buy adjoining land and eventually owned 7,000 acres.¹² His cattle brand (N) was registered on May 19, 1879, in Chase County.¹³

Their oldest son, Bud, had joined his father's business with his own cattle outfit in Colorado. In 1878, he was bitten by a rabid skunk and died in Weatherford, Texas, on November 4.

Stephen Jones' first property, two 80-acre plots, was originally homesteaded by John H. and Elizabeth Scribner late in 1860. The Scribner family lived there in a log cabin for six years, and then sold their land to William Barton on February 22, 1866, for \$800. In 1873, Barton sold the land to John C. and Jamima Rocker and William M. Langston for \$2,000. In 1878, Stephen F. Jones paid \$2,000 for the land of Rocker and Langston.¹⁴

The Jones family moved into a frame house on the property in January 1879, and lived there less than three years. According to the 1880 federal census, Stephen F. Jones (age 53) and his wife, Louisa M. Jones (age 46), lived in the frame house along with their daughter, Lutie M. (age 8), Becky Dean, niece and housekeeper (age 20), and John Henly, foster son and laborer (age 21).¹⁵ Living nearby on the property - possibly in an earlier log cabin - were the Williams family who were Black and had come from Texas. There is some indication that George Williams and his wife, Isabel, were originally slaves of Samuel R. Barber, Louisa Jones's father.¹⁶ The 1880 census identified the family members as George W. Williams (age 47), described as laborer for Jones, Isabel

¹¹ The February 18, 1886, edition of the *Chase County Leader* listed the attendees at the Stock Association ball and the December 7, 1882, issue of the *Strong City Independent* noted that "Mrs. Jones had a gathering last Saturday evening at which the young folks of the neighborhood had a fine time." According to Julia Hobbs, no other mention of entertaining at the house was found in the newspapers surveyed. Methodists north and south were the chief supporters of the Anti-Saloon League that would help secure the passage of the Eighteenth Amendment inaugurating prohibition in 1919. See Ahlstrom, *A Religious History*, p. 871.

¹² Rothman & Associates, *Historic Resource Study*, 117-119.

¹³ Chase County Historical Society, *Chase County Historical Sketches* (1948), 39.

¹⁴ Rothman & Associates, *Historic Resource Study*, 117-119; Bahr Vermeer & Haecker Architects, *Cultural Landscape Report*, 2-48 – 49.

¹⁵ Becky Dean was the daughter of one of Stephen Jones's sisters. John Henly was related to the family by marriage; he was the son of a sister of Witt Adare, husband of Christina Anna Jones. Julia Hobbs provided this information.

¹⁶ Interview with Julia Hobbs, March 10, 2003.

Williams (age 40) his wife, their son Toby (age 16), described as farm hand for Jones, three girls (ages 7-12) daughters attending Lower Fox Creek School, and three boys (ages 2-6) described only as “sons.” Lutie Jones attended the same Lower Fox Creek School as the Williams girls.¹⁷



Figure A9-1: Photograph of Stephen Jones. The photograph is from an album provided by the National Park Service. The photo was taken in Emporia, KS, possibly in 1879-1880.

In 1881, Stephen Jones (Figure A9-1) completed the construction of the Spring Hill Ranch House at the Spring Hill Ranch, overlooking Fox Creek Valley. The contractor was David Rettiger, who owned the stone quarry north of Strong City, and who had built the Chase County Courthouse in 1871-73. Jones’ buildings were in the style of the county courthouse, thus also sharing an association in the public mind.¹⁸ The eleven-room, three-story, mansard-roofed mansion was built in the Late Victorian Second Empire style of the nineteenth century. It was built with locally quarried white limestone, set upon several stone terraces. The name “Spring Hill” came from the numerous natural springs found on the ranch.¹⁹

¹⁷ The January 15, 1880, edition of the *Chase County Leader* mentions the children attending the Lower Fox Creek School. This information would seem to strengthen the argument that Stephen F. Jones was not a strong proponent of the Confederacy in the Civil War. However, Jones was a member of the Methodist Episcopal Church, South, formed in 1844 when the southern delegation seceded following the General Conference and a split over abolition as well as doctrinal issues. The Methodist Episcopal Church, South, continued to be successful in proselytizing among Black Americans during and after the Civil War. See Ahlstrom, *A Religious History*, p. 717. A common bond in Methodism might help explain why, in December 1882, Jones co-signed a note with George Williams so the Williams family could buy a house in Strong City. It is also interesting that the 1880 census shows that Louisa Jones’s household “help” was her niece and, contrary to expectations, Isabel Williams did not work outside her home. For the work of “help” and a comparison with that of servant, see Faye E. Dudden, *Serving Women: Household Service in Nineteenth-Century America* (Middletown CT: Wesleyan University Press, 1983).

¹⁸ Rothman & Associates, *Historic Resource Study*, 121.

¹⁹ Wolfenbarger and Nimz, “Landmark Nomination,” 4.

The other dominant structure on the ranch, in addition to the mansion, was the approximately 110x60 feet limestone barn. The barn contained stables on the ground level, machinery and equipment storage on the second level, and a grain threshing and storage space on the top level. The first floor could shelter about one hundred animals during the winter, with a separate room to house Jones' thoroughbred horses. The additional outbuildings included a barrel-vaulted poultry house, outhouse, icehouse, and cistern, all built of the native limestone. Over the next 70 years, the ranch would also include a carriage house, ranchhand house, Quonset hut, pole barn, scale house, and three sheds.

In 1882, the Lower Fox Creek Schoolhouse, also made of limestone, was built on Jones' property. He donated the land with the stipulation that it would revert to the ranch if the school closed. The school was completed and deed recorded on June 14, 1882, but there was no teacher available until 1884.²⁰ The school opened on September 1, 1884 with Dora Peer as the first teacher.²¹ The average enrollment was about five students. Almost fifty years later, in 1930, the school closed and the building reverted to the ranch. It was subsequently used for hay storage²² and ranch hand quarters.²³

In 1884, the cattle boom reached its apex nationally. The 1885 Kansas State Agricultural Census for Falls Township listed the residents of Spring Hill Farm & Stock Ranch as Stephen Jones (age 58), Louisa Jones (age 52), Lutie Jones (age 13), a "16 year old white student domestic," and two male laborers 16 and 21 years of age.²⁴ The domestic was "help" who lived in the house while the two laborers probably occupied an outbuilding.

In 1886, a decade of drought began.²⁵ The Jones family left Spring Hill this same year when Lutie and her nieces, Nettie and Collie Adare, enrolled in school in Kansas City. The September 9, 1886, edition of the *Strong City Independent*, reported Mr. and Mrs. Jones were shipping furniture to Kansas City, which would be their temporary home while the girls were in school. Two years later, the March 11, 1888, edition of the *Strong City Republican* announced that "S.F. Jones and family left for Kansas City this week where they will now make their permanent home."

On February 13, 1888, Stephen Jones sold the ranch for \$95,000 to his neighbor Bernard Lantry, purportedly in order to give his daughter and two grandchildren a good education by moving to Kansas City. The drought, and the fact that Jones' only adult son died ten years earlier, leaving him no heir to his cattle empire, may also have influenced his

²⁰ Heather Brown, the National Park Service, email to QEA, 21 February 2003.

²¹ Rothman & Associates, *Historic Resource Study*, 165.

²² Wolfenbarger and Nimz, "Landmark Nomination," 26.

²³ "TAPR Barn Equipment Assessment Notes" 28 January 1998, 8.

²⁴ This information is from a notebook compiled for the guides by Julia and Edward Hobbs; the notebook is in the collection of Spring Hill Farm & Stock Ranch.

²⁵ Rothman & Associates, *Historic Resource Study*, 139-140.

decision.²⁶ Of their three daughters and two sons, only two of their daughters, Christina Anna and Lutie, were still alive at this time. Louisa Jones died in 1908, and Stephen Jones died in Wichita, Kansas, on April 7, 1914. Both were buried in the Prairie Grove Cemetery, Chase County, Kansas.

Stephen Jones and Bernard Lantry represented two different ranching styles. Jones was a born and bred cattleman who actively directed the property on which he lived. Lantry lived on his Deer Park stock farm close to the Spring Hill Ranch but operated the ranch through a manager.²⁷ In 1895, Lantry died of diabetes and left his property to his sons Charles and Henry. In 1903, Charles sold his portion of the land to his brother Henry. When Henry died in 1904, his family sold the land back to Charles, who started to sell his father's holdings.²⁸

On March 14, 1907,²⁹ Charles Lantry sold 9,682.55 acres including the Spring Hill Ranch to C.C. and Nannie Patten of Reading, Kansas, for \$180,636.92. The other part of the ranch was sold to F.W. Freeman of the Merchants National Bank in Topeka on January 13, 1908.³⁰ Patten was an experienced farmer who continued to grow crops and raise cattle. On February 28, 1910,³¹ he in turn sold 1,080 acres including the Spring Hill Ranch House and barn to Otto and Flora Benninghoven for \$37,800 with \$10,000 as down payment. The other 8,602 acres were sold to Lester B. and Beulah Urschel for \$400,000 on April 6, 1921.³²

The Benninghovens were the only family to own *and* live at Spring Hill since the Jones family. After Otto Benninghoven's death in 1917, his widow Flora worked the ranch and paid off the mortgage. After the purchase, she ran the ranch with the help of her sons Curt, Fritz, and Rhein. Over the years, the ranch shifted from pasture operations with a large amount of farm products to farming.³³

According to a family member, Curt Benninghoven directed the ranch operations.³⁴ Curt and his wife Edith Wilson Benninghoven lived in a wood-framed house south of the ranch house. Edith raised turkeys and the ranch was sometimes referred to as the "Benninghoven Turkey Ranch" (Figure A9-2). According to the 1937 annual agricultural report, the Benninghoven ranch produced 500 to 1,000 turkeys annually.³⁵ The turkey sheds were located northwest of the ranchhand house. At Flora's death in 1941, Curt and

²⁶ Rothman & Associates, *Historic Resource Study*, 140-141, 164.

²⁷ Rothman & Associates, *Historic Resource Study*, 143.

²⁸ Rothman & Associates, *Historic Resource Study*, 161-162; Bahr, Vermeer & Haecker Architects, *Cultural Landscape Report*, 2-60.

²⁹ Heather Brown, email to QEA, 21 February 2003.

³⁰ Plain Deeds, Chase County Courthouse, book 43, p 70-71.

³¹ Plain Deeds, Chase County Courthouse, Index to Deeds, 1908-1922.

³² Bahr Vermeer & Haecker Architects, *Cultural Landscape Report*, 2-77 – 2-78.

³³ Rothman & Associates, *Historic Resource Study*, 184-85.

³⁴ Bahr Vermeer & Haecker Architects, *Cultural Landscape Report*, 2-100.

³⁵ Bahr Vermeer & Haecker Architects, *Cultural Landscape Report*, 2-100.

Edith moved into the Spring Hill Ranch House together with Edith's niece and nephew, Patricia and Enas Wilson.³⁶ Flora's obituary of 1941 is entitled "Well Known Resident Dies in Kansas City."³⁷ Curt and Edith lived on the ranch until 1943 when they relocated to Montana.³⁸



Figure A9-2: Edith Benninghoven displaying her turkeys, Benninghoven Collection, ca. 1939.

In 1929, the Great Depression hit America, followed by blizzards, drought, and soil erosion on the Kansas prairie. The Benninghovens were forced to sell. On April 18, 1935,³⁹ the ranch was transferred to the Prudential Life Insurance Company, and then sold to Kansas City grain dealer George H. Davis for \$30,000 on May 7, 1935.⁴⁰ The Benninghoven family continued to live on the Spring Hill Ranch until 1943 as noted above. They held the longest period of residency, 34 years.

In January of 1935, Davis bought the other part of the original Jones property from Urschel. With the purchase of the Benninghoven land, the original Spring Hill and Deer Park ranches were again united, now under the name of the Davis Ranch. The complete Davis Ranch exceeded 70,000 acres and included other sites across Kansas.

Davis was another absentee owner, hiring a local ranch manager, Fred H. Howard, to manage the Spring Hill Ranch in addition to three of his other ranches. Howard took up residence at the Deer Park ranch and lived there from 1935 to 1970. Howard in turn

³⁶ According to Patricia Wilson Thorpe, Flora Benninghoven died shortly after she and her brother arrived at Curt and Edith's house in 1941. Edith Wilson Benninghoven was Patricia's and Enas' aunt. The children came to live with Edith when the husband of Edith's sister abandoned the family, forcing her sister to place her five children with relatives. Her sister went to the University of Kansas in Lawrence, received a degree in Home Economics, and took a job in Jackson Hole, Wyoming, where the children rejoined her. Patricia Wilson Thorpe, interviewed by Heather Brown, Chief of Interpretation, Tallgrass Prairie National Preserve, May 2003.

³⁷ *Chase County News*, Strong City, Kansas, April 16, 1941.

³⁸ Patricia Wilson Thorpe, video interview, 1998.

³⁹ Bahr Vermeer & Haecker Architects, *Cultural Landscape Report*, 2-103.

⁴⁰ Bahr Vermeer & Haecker Architects, *Cultural Landscape Report*, 2-103.

hired Hazel Slabaugh, a local cowboy, as his top ranch hand. Hazel and his wife Erma lived at the Spring Hill Ranch House from 1943 or 1944 until 1968. Their son Marvin Slabaugh was born in 1944.⁴¹

When Davis died in 1955, ranching operations continued under Howard until his death in 1970. At this time, the ranch was called the Davis-Nolan-Merrill Grain Company Ranch. The new ranch manager, Hazel's brother Gerald Slabaugh, moved into the ranch house in 1968, together with his wife Gladys and sons Roy and Ron.⁴² Gerald retired and moved out of the house in 1982, but continued to work part time until 1983.⁴³

The Spring Hill Ranch House was listed in the National Register of Historic Places in 1971 and the Lower Fox Creek Schoolhouse in 1974.⁴⁴ In August 1975,⁴⁵ the Davis-Nolan-Merrill Grain Company merged with the Z Bar Cattle Company. The company name changed to the Z Bar Cattle Company and the ranch became known as the Z Bar Ranch.

From 1982 to 1986, Don Jenkins was ranch manager and lived in the ranch house together with his wife Peg and son Shane. Peg Jenkins initiated the remodeling of the kitchen (205) and the bathroom (305) in the early 1980s.⁴⁶

From July 1983 to July 1986, an extensive rehabilitation of the ranch house, barn, and outbuildings took place under Orville B. Burtis, Jr., president of the Z Bar Cattle Company, who submitted a Historic Preservation Certification Application for tax credits.⁴⁷ Sharon Hahn was one of the general contractors, and worked on restoring the property in 1985-1986.

In 1985, the company decided to cease its cattle and ranch operations. The two surviving stockholders, Orville Burtis Jr. and Elisabeth Merrill, voted to dissolve the corporation and were bought out. Orville Burtis had worked for the Z Bar Ranch since 1947. On November 26, 1986, the property was sold to the Trust Department of Boatmen's First National Bank of Kansas City. The bank leased the property for seasonal grazing.⁴⁸

⁴¹ Marvin Slabaugh, interviewed by Sharon LaRosa, August 5, 2003. According to Marvin, Erma and Hazel's son, they lived in the house when Marvin was born in 1944, and may have moved in as early as 1943.

⁴² Colleen Slabaugh, interviewed by Sharon LaRosa, August 2003. Colleen and her husband (Gerald's son Roy), helped Gerald move into the house in 1968.

⁴³ Colleen Slabaugh, interview.

⁴⁴ Wolfenbarger and Nimz, "Landmark Nomination," 4.

⁴⁵ Heather Brown, email to QEA, 21 February 2003.

⁴⁶ Interview with Shane Jenkins, son of Peg and Don Jenkins, May 28, 2001.

⁴⁷ Burtis, "Certification Application," 31 October 1984.

⁴⁸ Rothman & Associates, *Historic Resource Study*, 203-204.

Establishment of Tallgrass Prairie National Preserve

A national interest in preserving grasslands first emerged during the 1920s. From 1930 to 1958, the broad concept of creating a grasslands national park gradually narrowed down to a tallgrass prairie park, which was promoted as the “true prairie.”⁴⁹ Over the years, many different locations were considered. In 1988, the focus turned to the 10,894-acre Spring Hill/Z Bar Ranch located two miles north of Strong City, Kansas.⁵⁰

In June of 1988, the National Audubon Society secured a two-year option to purchase the ranch from the bank. Although the option expired and was never renewed, the Society’s proposal that the property be purchased and designated as part of the National Park System generated substantial local interest.⁵¹

From 1989 through 1991, the National Park Service, at the request of the Kansas Congressional delegation, conducted a feasibility study to evaluate the Z Bar Ranch as a potential addition to the National Park System.⁵² In May of 1991, a bill (H.R. 2369) was introduced that would authorize the National Park Service to acquire the Z Bar Ranch. The House Interior Committee approved this bill in September and the House of Representatives in October of 1991. At this time, both Kansas Senators announced that they would not support legislation authorizing the National Park Service to purchase and manage the Z Bar Ranch. Without their support, the bill would not make it through the Senate. However, Kansas Senator Nancy Kassebaum decided that she would support a private foundation created to purchase the Z Bar Ranch. In 1992, the Kassebaum commission, Spring Hill/Z Bar Ranch, Inc., was formed but the Boatmen’s Trust Department rejected their purchase proposal and instead the National Park Trust got involved.⁵³

The National Park Trust was formed in 1983 by the National Parks and Conservation Association in order to function as a nonprofit land trust. Encouraged by the Kansas Congressional delegation, the National Park Trust, with the help of a \$1.79 million loan from the National Parks Conservation Association, completed the purchase of the ranch in 1994.⁵⁴ The National Park Trust planned to keep the ranch in private ownership and enter into an affiliate ownership with the National Park Service to operate the ranch as a unit of the national park system. In order to help pay for their purchase, the National Park Trust negotiated a leasing agreement on the preserve with the Texas-based cattle rancher Edward Bass in 1995. The agreement allowed Bass a 35-year grazing lease that

⁴⁹ Tallgrass Historians L.C., *Tallgrass Prairie National Preserve Legislative History, 1920-1996* (Omaha, Nebraska: Midwest Regional Office, National Park Service, 1998), 2-4.

⁵⁰ Tallgrass Historians, *Legislative History*, 31.

⁵¹ Tallgrass Historians, *Legislative History*, 31-33.

⁵² National Park Service, “Task Directive, New Area Study, Spring Hill (Z-Bar) Ranch, Strong City, Kansas,” (December 1989).

⁵³ Tallgrass Historians, *Legislative History*, 34-44.

⁵⁴ Carol Estes, “Sea of Grass,” *National Parks*, March/April 1995.

he prepaid with \$2 million, and, in addition, he donated another \$1 million to the National Park Trust in support of the preserve. The agreement also offered buyout provisions that allow the National Park Trust to purchase all or part of the grazing lease in the future.⁵⁵

On December 9, 1994, the first and second floors of the ranch house were opened for public tours. Over 1000 people attended this event.⁵⁶

On November 12, 1996, President Clinton signed the Omnibus Parks and Public Lands Management Act and the property was designated as the Tallgrass Prairie National Preserve, the first national park unit in America devoted to protecting, preserving, and interpreting the unique tallgrass prairie ecosystem. The preserve was authorized under Subtitle A of Title X, Miscellaneous, of Public Law 104-333.⁵⁷ The legislation stated that the purposes of the preserve were “to preserve, protect, and interpret for the public an example of a tallgrass prairie ecosystem... and to preserve and interpret for the public the historic and cultural values represented on the Spring Hill/Z Bar Ranch.”

In order for the Department of the Interior to support legislation, a minimum of 180 acres was needed under federal ownership. Public Law 104-333 limited the National Park Service to acquiring no more than 180 acres by donation and required cooperative management of the preserve in conjunction with the property owner. This unique private/public partnership between the National Park Trust and the National Park Service ensured that the ranch would be preserved primarily via private ownership while at the same time receiving national recognition. Public Law 104-333 also established a thirteen-member Tallgrass Prairie National Preserve Advisory Committee to be appointed by the Secretary of the Interior.⁵⁸

In 1997, the entire 10,894 acres were registered as a National Historic Landmark. There are eight contributing buildings, four contributing structures, and two contributing sites in the landmark. The contributing buildings include the Spring Hill Ranch House, barn, springhouse/curing room, outhouse, icehouse, and poultry house/scratch house/equipment shed. The contributing structures are several miles of stone fencing, a stone cistern, and two stone corrals to the west and south of the barn. The contributing sites are the garden terrace stone walls topped with iron fences in front of the ranch house and the ranch lands. The ranch lands consist primarily of virgin tallgrass prairie with 456.4 acres in brome grass and 26 ponds. In the National Historic Landmark designation, the time period of 1878-1904 is identified as the period of national significance for the site.⁵⁹

⁵⁵ “Tallgrass Prairie Must Be Priority,” *National Parks*, September/October 1998, 16.

⁵⁶ Heather Brown, email to QEA, 21 February 2003.

⁵⁷ Tallgrass Historians, *Legislative History*, 48.

⁵⁸ Tallgrass Historians, *Legislative History*, 48-49.

⁵⁹ Wolfenbarger and Nimz, “Landmark Nomination,” 4.

On September 20, 2002, the National Park Trust donated 32.25 acres to the Federal Government, consisting of the core headquarters and schoolhouse sites.⁶⁰ The National Park Trust donates land to the Federal Government upon recommendation by the National Park Service. Eventually, up to 180 acres may be owned by the Federal Government.⁶¹

⁶⁰ Miller, Stephen T., Superintendent, Tallgrass Prairie National Preserve, interviewed by QEA, 18 August 2003.

⁶¹ Brown, Heather, Chief of Interpretation, Tallgrass Prairie National Preserve, email to QEA, 21 February 2003.

Tallgrass Prairie National Preserve Timeline

| <u>Ownership of Spring Hill/Z Bar Ranch</u> | <u>Year</u> | <u>Inhabitants Of Ranch House</u> |
|--------------------------------------------------------------|-------------|-------------------------------------------------------------------------------|
| John H. and Elisabeth Scribner 1860-1866 | 1860 | |
| | 1861 | |
| | 1862 | |
| | 1863 | |
| | 1864 | |
| | 1865 | |
| William Barton 1866-1873 | 1866 | |
| | 1867 | |
| | 1868 | |
| | 1869 | |
| | 1870 | |
| | 1871 | |
| | 1872 | |
| John C. and Jamima Rucker, and William M. Langston 1873-1878 | 1873 | |
| | 1874 | |
| | 1875 | |
| | 1876 | |
| | 1877 | |
| | 1878 | |
| Stephen F. and Louisa Jones 1878-1888 | 1879 | |
| | 1880 | |
| | 1881 | Spring Hill Ranch House constructed. Stephen F. and Louisa Jones 1881-1886 |
| | 1882 | |
| | 1883 | |
| | 1884 | |
| Bernard Lantry 1888-1895 | 1885 | |
| | 1886 | |
| | 1887 | |
| | 1888 | |
| | 1889 | |
| | 1890 | |
| Charles and Henry Lantry 1895-1903 | 1891 | |
| | 1892 | |
| | 1893 | |
| | 1894 | |
| | 1895 | |
| | 1896 | |
| Henry Lantry 1903-1904 Charles Lantry 1904-1907 | 1897 | |
| | 1898 | |
| | 1899 | |
| | 1900 | |
| | 1901 | |
| | 1902 | |
| | 1903 | |
| | 1904 | |
| | 1905 | |
| | 1906 | |

| <u>Ownership of Spring Hill/Z Bar Ranch</u> | <u>Year</u> | <u>Inhabitants Of Ranch House</u> |
|----------------------------------------------------------------------------------------|--------------------|------------------------------------------|
| Charles C. and Nannie Patten 1907-1910 | 1907 | |
| | 1908 | |
| | 1909 | |
| Otto and Flora Benninghoven 1910-1935 | 1910 | Otto and Flora Benninghoven 1910-1918 |
| | 1911 | |
| | 1912 | |
| | 1913 | |
| | 1914 | |
| | 1915 | |
| | 1916 | |
| | 1917 | |
| | 1918 | Flora Benninghoven 1918-1941 |
| | 1919 | |
| | 1920 | |
| | 1921 | |
| | 1922 | |
| 1923 | | |
| Prudential Life Insurance Company 1935-1935 George H. and Elisabeth Davis 1935-1955 | 1924 | |
| | 1925 | |
| | 1926 | |
| | 1927 | |
| | 1928 | |
| | 1929 | |
| | 1930 | |
| | 1931 | |
| | 1932 | |
| | 1933 | |
| | 1934 | |
| | 1935 | |
| | 1936 | |
| | 1937 | |
| | 1938 | |
| | 1939 | |
| | 1940 | |
| | 1941 | Curt and Edith Benninghoven 1941-1943 |
| | 1942 | |
| | 1943 | Hazel and Erma Slabaugh 1943/44-1968 |
| | 1944 | |
| | 1945 | |
| | 1946 | |
| | 1947 | |
| | 1948 | |
| 1949 | | |
| 1950 | | |
| 1951 | | |
| 1952 | | |
| 1953 | | |
| 1954 | | |
| Davis-Nolan-Merrill Grain Company 1955-1975 | 1955 | |
| | 1956 | |
| | 1957 | |

| <u>Ownership of Spring Hill/Z Bar Ranch</u> | <u>Year</u> | <u>Inhabitants Of Ranch House</u> |
|-------------------------------------------------------------------------------------------------|--------------------|-----------------------------------------------------------|
| | 1958 | |
| | 1959 | |
| | 1960 | |
| | 1961 | |
| | 1962 | |
| | 1963 | |
| | 1964 | |
| | 1965 | |
| | 1966 | |
| | 1967 | |
| | 1968 | Gerald Slabaugh 1968-1982 |
| | 1969 | |
| | 1970 | |
| | 1971 | |
| | 1972 | |
| | 1973 | |
| | 1974 | |
| Z Bar Cattle Company 1975-1986 | 1975 | |
| | 1976 | |
| | 1977 | |
| | 1978 | |
| | 1979 | |
| | 1980 | |
| | 1981 | |
| | 1982 | Don and Peg Jenkins 1982-1986 |
| | 1983 | |
| | 1984 | |
| | 1985 | |
| Boatmen's First National Bank of Kansas City 1986-1994 | 1986 | |
| | 1987 | |
| | 1988 | |
| | 1989 | |
| | 1990 | |
| | 1991 | |
| | 1992 | |
| | 1993 | |
| National Park Trust 1994-1996 | 1994 | Barbara Zurhellen of the National Park Trust 1994-1996 |
| | 1995 | |
| The National Park Trust in affiliation with the National Park Service 1996-2003 | 1996 | |
| | 1997 | |
| | 1998 | |
| | 1999 | |
| | 2000 | |
| | 2001 | |
| The Federal Government/ National Park Service National Park Service (core area) 2002-present | 2002 | |
| | 2003 | |

Comparative Analysis

The Flint Hills of eastern Kansas are dotted with structures built of the handsome native limestone. Among the earliest buildings are two farm houses today operated as house museums: the 1850-1851 Kaw Mission in Council Grove (Figure A10-1) and the 1860 Goodnow House in Manhattan (Figure A10-2), both properties of the Kansas State Historical Society. The original finishes and fireplaces within the Kaw Mission were replaced in the early 20th century, the sashes altered, shutters removed, and porches added giving the house a decidedly modern, almost suburban appearance. Fortunately the Goodnow House retains the shutters, early sash, and cornice returns associated with the Greek Revival Style.



Figure A10-1: Kaw Mission State Historic Site, Council Grove, QEA, 02/06/03. Placed on the National Register of Historic Places in 1977.

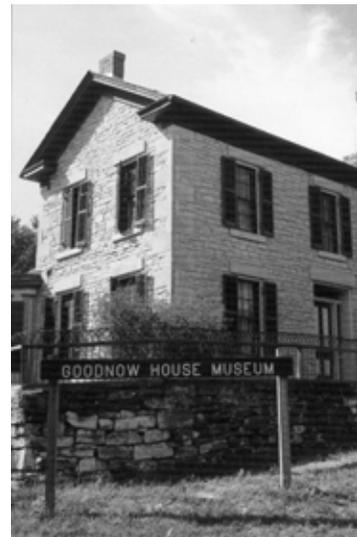


Figure A10-2: Goodnow House, Manhattan, photo from Goodnow House Museum brochure.

The house at Clover Cliff Ranch (Figure A10-3) also dates from 1860. The stone entry and enclosed veranda are more recent additions dating from 1916. The arched, pedimented windows and iron roof cresting grafted onto an otherwise plain structure suggest the new architectural styles gaining popularity in the years following the Civil War. A commodious stone house in Cottonwood Falls (Figure A10-4) has the dormer window and overhanging eaves associated with the Prairie and Bungalow Styles. But in reality this house, like Clover Cliff Ranch and Cottonwood Falls School (Figure A10-5), owes its character to the stonework. The same may be said for a renovated bank (Figure A10-6) and two commercial structures occupied by the Chase County Historical Society (Figure A10-8) and the offices of the National Park Service (Figure A10-7) in Cottonwood Falls. In clapboard, none of these structures would warrant a second glance.



*Figure A10-3: Clover
Cliff Ranch House,
Elmdale, QEA,
02/06/03.
Placed on the National
Register of Historic
Places in 1977.*



*Figure A10-4: Residence in Cottonwood
Falls, QEA, 02/06/03.*



*Figure A10-5: School, Cottonwood Falls,
QEA, 02/06/03.*



Figure A10-6: Bank, Cottonwood Falls, QEA, 02/06/03.



Figure A10-7: National Park Service headquarters at first floor, Cottonwood Falls, QEA, 02/06/03.



Figure A10-8: Chase County Historical Society, Cottonwood Falls, QEA, 02/06/03. The left part of the building (with four windows and pediment above) is the Cartter Building, the right part of the building is the Chase County National Bank (1882), both built by David Rettiger and placed on the National Register of Historic Places in 1977.

Gothic Revival Style structures are most evident in church architecture and the limestone buildings are no exception. The earliest Gothic building in Cottonwood Falls may be a small church with rusticated quoining, narrow lancet windows, and a pointed arch doorway (Figure A10-9). This simple but handsome structure compares favorably to a nearby Gothic Church (Figure A10-10) of later date complete with a tracery window and entrance tower with battlements. A third Gothic church and parsonage were built in Strong City (Figures A10-11 and A10-12). The church and adjoining bell tower have lancet windows with simple tracery while the parsonage has single and paired sashes embellished with ornamental stone lintels. The porch of the parsonage is either a modern replacement or has lost its Gothic or Stick Style detailing.



Figure A10-9: Church, Cottonwood Falls, QEA, 02/06/03.



Figure A10-10: Church, Cottonwood Falls, QEA, 02/06/03.



Figure A10-11: Church, Strong City, QEA, 02/06/03.



Figure A10-12: Parsonage, Strong City, QEA, 02/06/03.

The most sophisticated stone structure in the area - and the only one by an architect - is the Chase County Courthouse (Figure A10-13). It was designed by John G. Haskell, Lawrence, Kansas, in the Second Empire Style and completed in 1873. The massive three-pavilion structure is ornamented with paired brackets supporting the eaves, a straight-sided mansard roof with iron cresting, and a central clock tower topped by a convex mansard roof. The paired windows embellished with pediments or cornices, the variation in window size and type, and the belt course all add to the richness of the façade. With the exception of the clock face and sash colors, the courthouse today looks much the same as the day it opened (compare Figure A10-14 with A10-16, and A10-15 with A10-17).



Figure A10-13: Broadway Street, Cottonwood Falls, historic photograph with Chase County Courthouse in the background, date unknown. Chase County Courthouse was listed on the National Register of Historic Places in 1971.



Figure A10-14: Chase County Courthouse, Cottonwood Falls, historic photograph, date unknown.



Figure A10-15: Chase County Courthouse, Cottonwood Falls, historic photograph, date unknown.



Figure A10-16: Chase County Courthouse, Cottonwood Falls, QEA, 02/06/03.



Figure A10-17: Chase County Courthouse, Cottonwood Falls, QEA, 02/06/03.

The Chase County Courthouse undoubtedly influenced Stephen Jones and his mason, David Rettiger, when they set about creating the house at Spring Hill Ranch. Both house and courthouse are in the Second Empire Style. The size and the variety of the windows - including oculus windows (Figure A10-17) - are important features of each structure, as are the stairways with ornate newel posts and railings (Figures A10-18).



Figure A10-17: Chase County Courthouse, oculus window, QEA, 02/06/03.



Figure A10-18: Chase County Courthouse, newel post and staircase, QEA, 02/06/03.

Their straight-sided mansard roofs clad in standing seam metal are supported by paired brackets ornamented with cresting and metal flashing, although both cresting and flashing have been removed at Spring Hill. Unlike the Chase County Courthouse, the pavilion at either end of the façade of Spring Hill projects at a 45-degree angle and each is augmented with a three-window bay on the ground floor that sounds a domestic note. Unfortunately, the roofs of the bays have proved nearly impossible to keep watertight and both the siting and construction of the house have contributed to other problems described later in this report.

Nonetheless, in conception and execution the house at Spring Hill Ranch was for its time the grandest residence in the region. Some idea of the effect it had on its contemporaries is gleaned from a report in the April 13, 1882, edition of the *Chase County Leader* that called it a “mansion” and concluded, “We question if a more luxuriant and convenient residence can be found outside of the gilded palaces of the Vanderbilts and Tildens.”

Architectural Significance

The Spring Hill Ranch and house are tangible proof of Stephen Jones's financial success and mark his arrival in the upper class as defined on the Great Plains of the American West.¹ The October 1, 1880, edition of the *Chase County Courant* mentioned that S. F. Jones was building a new stone house on his land. Typical of the "boosterism" of the period, the local newspapers reported any progress on the Spring Hill Ranch House and outbuildings as newsworthy events. On July 7, 1881, the *Chase County Leader* noted the residence was completed by the Rettiger brothers who would soon begin work on a large stone barn. The paper added that 25 miles of stone fences would be erected on the farm.

David Rettiger lived in Strong City and was a member of the firm of Emslie, Rettiger & Company, described as "the pioneer rock men of Chase County."² His firm built the house although the design may have been a collaborative effort between builder and client, which could account for the various problems discussed elsewhere in this report.³ In September 1881, the *Chase County Leader* reported that L.P. Jenson was still at work on the interior of the Jones residence. Jenson was a local carpenter and was presumably responsible for the woodwork throughout the house.⁴ The large panes of glass in the first and second floor walkout windows were very impressive for that time.

The finished house was described as follows in the October 15, 1881, edition of the *Strong City Independent*:

It stands on a very prominent hill and can be seen for miles, either way. At a distance, it could be readily taken for an old Scotch [sic] castle, with secret stairways and underground passages. It is a magnificent structure....

The façade is imposing but the main block is only one room deep with a center hall and two rooms on each of the three floors. Attached to the northwest side is a three-story extension little more than one room per floor. The newspaper reporter had a vivid imagination. The house is not a castle; the "secret stairways" are the back stairs from the old kitchen 105 to the west room 204 that probably served as a dining room, and the

¹ For a discussion of class on the Great Plains, see Glenda Riley, *The Female Frontier* (Lawrence, KS: University of Kansas Press, 1988). Riley states the "upper class" began to emerge in urban areas and was composed of large farmers and ranchers, successful shop owners and miners, and professional people. In the isolation of the Plains, Cottonwood Falls constituted an "urban area."

² October 15, 1881, edition of the *Strong City Independent*.

³ Julia and Edward Hobbs, volunteers who have researched the Jones family at the Tallgrass Prairie National Preserve, believe the design quirks are attributable to Stephen Jones who wanted the house to appear impressive and be visible from the main road. Stephen Jones did not make this mistake again. In 1886, when the family built a new house in Kansas City, David Rettiger again supplied the stonework but "a prominent architect of Kansas City" furnished the design. The April 7, 1888, edition of the *Strong City Republican* reported that David Rettiger and three helpers were in Kansas City completing the house for the Jones family. Mention of the architect is taken from "One of the Most Frequent Questions Asked by Visitors," compiled by Julia and Edward Hobbs, February 8, 1998. According to Julia Hobbs, the Kansas City house was demolished in 1930 to make way for commercial development.

⁴ Julia Hobbs, interviewed by Gail Caskey Winkler, 10 March 2003.

“under-ground passages” are the tunnel 107 from the old kitchen to the springhouse 108. Nonetheless, the house – like the financial success and philanthropy of Stephen Jones – placed the family at the top of the social hierarchy being created on the Great Plains.⁵

The family probably moved into the house by the end of 1881 although no mention of the move was found in the local newspapers. The house was handsome but the plan was not entirely successful. The structure is a bank house with the lowest floor built into the slope of the hill west of the house. The front door on the east façade opens into the center hall 101 between the two parlors 102 and 103 while the back door on the west side opens onto the second floor of the house. As a consequence, the first floor parlors are cold and were probably unusable for a good portion of each year. Furthermore, the wood frame floors rested directly on the ground and were subject to termite infestation. Written accounts suggest the Jones family furnished the rooms on the first floor although they may never have found them very comfortable. Oral accounts suggest that the Benninghoven family (residents 1909-1943) did not use the first floor at the end of their residency.⁶ Photographs taken circa 1935 show three rooms on the first floor unfurnished and in a deteriorated state: the hall 101 (Figure A2-20), the south parlor 102 (Figure A2-21), and the old kitchen 105 (Figure A2-22).⁷

The second floor had two rooms, south room 202 and north room 203, in the main block and a large west room 204 plus a narrow butler’s pantry 205 in the western extension. During the Jones period, the two chambers were probably bedrooms with Stephen and Louisa Jones in 202 having an exterior door to the rear porch 207 and their young daughter, Lutie, in 203.⁸ The west room 204 also has an exterior door to the rear porch and may have served as both ranch office and dining room for the Jones family.⁹ The Benninghovens made small but significant alterations to the second floor. The south room 202 may have remained the master chamber but the north room 203 became the family living room and a doorway 204A was opened between it and the west room 204, which the family variously described as the dining room and the kitchen; it probably also

⁵ According to the April 7, 1882, edition of the *Strong City Independent*, Stephen F. Jones was a “man not only the possessor of great wealth, but who is an unassuming christian [sic] gentleman whose benevolence has prompted him to extend liberal aid to the building of churches, without regard to denomination, and to all worthy objects of charity around him.” According to Riley, *The Female Frontier*, “good works” were one of the characteristics of upper class status on the Plains. Julia Hobbs has found no supporting evidence that Stephen Jones was as philanthropic as depicted in the local newspaper.

⁶ Orville Burtis interview, 28 January 1998, and Erma Slabaugh interview, 5 October 1994. Burtis met Flora Benninghoven in 1932 or 1933 and worked as a ranch hand at Spring Hill in 1937 or 1938. From 1947-1987 he worked for the Z Bar Cattle Company. He recalled the first floor rooms were not used in the 1930s. When Erma Slabaugh, resident following the Benninghoven family, arrived at Spring Hill she found the front door off the hinges.

⁷ These three photographs taken circa 1935 show water damage in the entry hall, vines growing through the bay window in the south parlor 102, and the old kitchen 105 a virtual ruin.

⁸ Usage of rooms in the house during the Jones era is not fully documented, therefore room identifications, here and throughout the document, are tentative.

⁹ Throughout the 19th century, dining rooms had several purposes. They were the family sitting room and were usually furnished with one or two comfortable chairs or even a sofa. If the sofa permitted, the dining room might be an impromptu guest room. Between meals the family might gather around the dining table to read, study, sew, or play board games. This use of the dining room as informal study could incorporate the ranch office in the case of the Jones house.

served as ranch office. Photographs from the collection mentioned above show north room 203 furnished as a living room (Figures A2-25, 26) and west room 204 as a multipurpose room for dining, sewing, and office work (Figures A2-27, 28, 29).

The third floor of the house had two chambers in the main block, south bedroom 302 and north bedroom 303, and the western extension contained a small west bedroom 304 and a bathroom 305. During the Jones' occupancy, the female "help" probably slept in room 304 and the two large bedrooms were reserved for family visits.¹⁰ Later, the Benninghovens' sons may have occupied the three bedrooms.

The springhouse/curing room is an unusual combination, with the lower portion being a springhouse, excavated into the hillside. Although most springhouses were located at the spring source, this springhouse had water piped downhill from the west, entering into the southwest corner.¹¹ The upper, above-grade portion of the building possibly served as a curing house, with a pyramidal hip roof and vented cupola. Due to the unusual combination and a lack of historical usage information, the use of this room has been debated. For a long time it was referred to as the "smokehouse" although there are neither signs of smoke inside, nor any means of sealing the cupola or round side vents for smoking.

The May 25, 1882, edition of the *Chase County Leader* noted the front yard of the house had clover and blue grass watered with pipes from the reservoir on the hill west of the house. In June, the paper reported a fountain had been added which Lutie Jones "made a resort for fish."¹² A second fountain was added later.¹³

Entry and Stair Hall 101

The woodwork makes the most impressive statement in this space. The balustrade and handrail are walnut but the remaining wood trim (i.e., doors, door casings, and baseboards) were originally grained representing a variety of woods and burls. While the ornate newel post was probably ordered from a catalogue, the door and window surrounds are not stock items but resemble the type of decoration found on Renaissance Revival furniture including the frames of overmantel mirrors. Presumably, this woodwork was devised entirely by the carpenter, L.P. Jenson, perhaps to coordinate with the furnishings.

The etched glass pane at the top of each door is original and permitted natural light in the hall. At the present time, there is a hanging electric fixture in the hall but there is no

¹⁰ Louisa Jones's unmarried sister and her mother, Adeline Barber, sometimes spent the winter at Spring Hill. Hobbs interview.

¹¹ Wolfenbarger and Nimz, "Landmark Nomination," 13-14.

¹² The exact date of the June 1882 edition is unknown. The fountain became a planter after the Benninghovens left the house, when the dog belonging to Marvin Slabaugh, the ranch manager's son, drowned in it. Erma Slabaugh, interview.

¹³ In a video taped interview in 1998, Patricia Wilson Thorpe stated there were two fountains in the front yard, which she described as on the upper and lower terraces in line with one another.

evidence of a plaster medallion, which suggests that the 1880s daylight and portable kerosene lighting were the only sources of illumination.

The molded plaster cornice in hall 101 is identical to the cornice in the second floor hall 201 with the exception of the “brackets” placed over the seams. In hall 101, these brackets resemble the fancier ones used in the adjoining parlors 102 and 103. Paint investigation during the February 2003 site visit suggests the cornice had an early layer of blue paint.

The plaster walls have no build-up of paint layers and the assumption is they were originally finished in wallpaper. An indication of the colors in the earliest wallpaper layer might be gleaned from the colors in the plaster cornice, which is blue on the ground floor and coral on the second floor.

The original floor in the hall was tongue-and-groove pine, which appears in a photograph of the front doors 101 (Figure A2-20).¹⁴ The pine is now covered with 2 1/4 inch oak identical to that in the north and south parlors 102 and 103.¹⁵ There is no evidence of carpeting or carpet rods on the stairs leading from the first to the third floor.

South Parlor 102

The plaster cornice in the south parlor 102 is of lesser quality than that in the north parlor 103, suggesting the south parlor was intended as the second best room in the house, although its location would have made it more pleasant year round than the north or “best” parlor. A reporter who visited Spring Hill in 1882 described the house as “one of finest and most elegantly furnished” in eastern Kansas. He added, “the house is richly furnished throughout, the floors are all laid with velvet and Brussels carpets, while large and costly mirrors and an ample supply of appropriate furniture for the various rooms convince the visitor that rare good taste was employed in the selection.”¹⁶

The woodwork in the south parlor is similar to that throughout the first and second floors of the house but with slightly more elaborate graining and a bit more elaborate decorative painting.

A photograph taken circa 1935 of the bay window in the south parlor 102 (Figure A2-21) shows ivy growing between the sash and a degraded finish on the woodwork as if the room had not been used for a long time. They remained empty during Edith and Curt Benninghovens’ occupancy; Patricia Wilson Thorpe recalled that she and her younger

¹⁴ There is 3 1/4 inch pine flooring on the stair landing but this may not be original to the house because the replacement wood floor in the old kitchen 105 is also 3 1/4 inches wide.

¹⁵ In the 1998 video, “Restoration Tour by Sharon Hahn,” she mentions she found all the oak floors in place in 1985.

¹⁶ 7 April 1882, edition of the *Strong City Independent*. This same passage was used to describe the Jones Ranch in G.E. Tewksbury, *The Kansas Picture Book* (Topeka, Kansas, 1883), p. 41.

brother, Enas, thought they were ballrooms.¹⁷ Erma and Hazel Slabaugh who followed as ranch managers also did not use the parlors.¹⁸

The photograph shows no covering at the window in the bay (Figure A2-21). The current venetian blinds were not removed during the February 2003 site visit to determine whether roller shades had previously been installed at the windows; however, based on evidence found elsewhere in the house, roller shades were likely found in both parlors.

Pairs of holes located on each side of the window just below the wood cornice suggest there may have been barrel brackets holding a brass rod for lace curtains. A set of holes on the wood molding 49 inches above the floor may have been from large cup hooks that held tie-backs for each of the lace curtains. On the window frame at the point where the upper and lower sashes meet another set of holes indicates half curtains were used. These hung from the middle of the window to the floor and helped keep insects and dust out of the house. If wetted, they might also have acted as a swamp cooler.

The plaster cornice is the same style as that in the south room 202 above although the “brackets” covering the joints match those in the north parlor 103. The first layers of paint appear to be two shades of blue. The picture rail intersects the window cornice on the east wall with a generous amount of wall surface between it and the plaster cornice.¹⁹

In 1985, Sharon Hahn found wallpaper falling off the walls in both parlors and assumed it remained from the Benninghoven period. However, Figure A2-21 shows what appear to be painted walls. How the walls were finished is yet to be determined. Wallpaper was very popular and during the 1880s fashion, a coordinating frieze paper might have been placed between the cornice and the picture rail.²⁰

The original tongue-and-groove pine floor was covered with narrow oak boards sometime after 1935 because Figure A2-21 shows the pine still visible.

When the Jones family lived at Spring Hill, both the south and north parlors may have been outfitted with the velvet carpets mentioned in the 1882 newspaper account cited earlier. Velvet carpets were woven from drum-printed wool yarns that produced ornately patterned, cut-pile carpets. They were first woven in England during the 1830s and in America beginning in the 1840s. The realistic designs incorporating flowers and foliage found on most velvet carpets were fashionable during the middle decades of the 19th century but began to lose favor in the 1880s when more abstract patterns - especially Oriental carpets - became popular. Velvet carpets were not very durable and typically were found in lightly-trafficked areas like parlors. Mills ceased weaving velvet carpets in the 1930s and the looms were destroyed for scrap metal during the Second World War.

¹⁷ Thorpe, interview.

¹⁸ Marion and Eunice Ludwig, interviewed by Lucas Koch, 19 May 1998. Marion was Hazel Slabaugh's nephew. They visited the house in the 1970s.

¹⁹ The crown molding in the north parlor 103 was replaced in 1985 following the nail holes for the original piece. Hahn, interview.

²⁰ This picture rail was added by Sharon Hahn in 1985-86 along a line of nail holes that suggested the location of an earlier picture rail.

Following fashion, the Jones family would have had their velvet carpets installed wall-to-wall although the later oak flooring was not removed during the site visit to confirm it.

In addition to the velvet carpets, the 1882 newspaper account mentioned “large and costly mirrors and an ample supply of appropriate furniture for the various rooms.” The mirrors were probably the overmantel mirror in each parlor, which were typically of an impressive size. No mention is made of gilding, which suggests the frames were stained and finished wood, possibly ebonized to coordinate with the woodwork.

Parlor suites ranged in size from modest (one sofa, two arm chairs, four side chairs, and possibly a center table) to impressive (a pair of sofas, additional arm chairs and side chairs, a center table, a pair of sofa tables, and perhaps two etageres). If the parlor furniture came from a single manufacturer, it was probably upholstered *en suite*. Durable, easy to maintain fabrics such as mohair plush or horsehair were popular in the 1880s and certainly practical for Spring Hill. Lutie’s 1878 “box” piano may have stood on the east wall near the bay window.²¹

North Parlor 103

This room was intended as the best parlor with a more elaborate plaster cornice and more intricate decorative painting on the mantel and portions on the woodwork than found in the south parlor. These differences aside, the north and south parlors are identical and the description above applies equally to the north parlor.

Natural light reaches the north parlor for a limited time each day, which could make the room especially unpleasant during the winter, perhaps even uninhabitable. Evidence that this was the case comes from close inspection of the wood trim around the windows in the bay. A line of old, evenly spaced holes at the bottom of the cornice just above the frames on either side of the sash suggests that some sort of covering was suspended over the windows, possibly a set of heavy fabric panels intended to insulate the windows and block drafts. There is evidence for half curtains at these windows but no evidence for lace curtain panels. The Jones family may have used this room only during the warm months (therefore the half curtains) but closed the room during the winter months.

In addition to the careful line of holes at the bottom of the cornice, the woodwork just below the cornice has been damaged by repeated tacking suggesting the Benninghovens found the north parlor just as difficult as the Jones family had.

²¹ The April 19, 1878, edition of the Las Animas Leader mentioned that Louisa Jones had acquired a piano, presumably for lessons for Lutie. Low rectangular pianos known as “box pianos” were popular for parlors until the last decade of the 19th century when upright pianos began to replace them. Box pianos appear in a number of paintings and engravings in the 1870s. General and Mrs. George Armstrong Custer had one in 1875 at Fort Lincoln in Dakota Territory; see Harold L. Peterson, *American Interiors from Colonial Times to the Late Victorians* (New York: Charles Scribner’s Sons, 1971), plate 157-158. For additional views, see Elisabeth Garrett, *At Home, The American Family 1750-1870* (New York: Harry N. Abrams, Inc., 1989), pp. 52 and 59, and William Seale, *The Tasteful Interlude* (New York: Praeger Publishers, 1975), pages 30, 39, 47, 61, 70, 77, and 81. More research is required before deciding what type of piano to use in the parlor.

Bathroom 104, Old Kitchen 105, Root Cellar 106, Tunnel 107, Springhouse 108

The interpretation of the old kitchen 105 and its dependencies is key to distinguishing Spring Hill/Z Bar Ranch from many other late 19th-century house museums and for interpreting ranch life. Until the early 1940s, the bathroom 104 and the old kitchen 105 were a single large kitchen.²²

The kitchen walls may originally have been whitewashed as were the walls in the root cellar, the tunnel, and the springhouse.²³

The furniture in the old kitchen (104 and 105) included the built-in wood-framed sink, a cooking stove, a wood ledge or shelves at the south end of the room, and probably a work table and one or two inexpensive chairs. The sink was located in the northwest corner of room 105 and the water spigot was on the west wall. Both appear in Figure A2-22 (the enameled cast-iron sink presently on the west wall between the window and door to the root cellar 106 is not in the photograph but may have been added shortly thereafter when other plumbing changes were made). The stove location is unknown but logic suggests it was either on the east wall (where it could vent up the chimney flue shared with the north parlor) or on the west wall where the flue might have vented at the window. The abandoned vent pipe in the left sash was probably for the gas stove that Mrs. Slabaugh used for canning or possibly for a much later clothes dryer.²⁴

Patricia Wilson Thorpe recalled that root cellar 106 was fitted with shelves to hold canned goods, preserves, and root vegetables. Removing the shelves at the south end of the kitchen may have necessitated this alteration. She also remembered a milk separator in the old kitchen 105, containers of sauerkraut and pickles stored in the springhouse 108, and the curing room 208 above the springhouse being used by Flora Benninghoven for general storage. Of particular interest to visitors, Thorpe recalled that during bad storms with the threat of tornadoes, Curt Benninghoven collected the family in the tunnel 107 for safety.²⁵ The Slabaughs only used the old kitchen 105 for heavy work such as canning and laundry; there was a milk separator by the door leading to the tunnel 107.

There is an interesting history of a dumbwaiter installed in the kitchen. The earliest known reference is the April 7, 1882, edition of the *Strong City Independent* that mentioned the house was “furnished with an elevator from the kitchen to the *dining-room*” [emphasis added]. During a 1994 interview, Marguerite Buffon reported she thought the dumbwaiter went from the kitchen 105 to the butler’s pantry 205. During her 1998 interview, Patricia Wilson Thorpe was certain the dumbwaiter was located where the shelves appear in Figure A2-28; however, she was uncertain whether the dumbwaiter

²² Patricia Wilson Thorpe recalled the kitchen being divided to create the bathroom 104 while she lived at the house. Thorpe, interview.

²³ Patricia Wilson Thorpe recalled the walls were white, possibly whitewashed, but she was uncertain. Thorpe, interview.

²⁴ Marvin Slabaugh, interviewed by Robert Coon, April 21, 2002.

²⁵ Thorpe, interview.

opened into the back stairs or the dining room. In any case, she said it was inoperable during the time she lived in the house (1941-1943).²⁶ According to Colleen Slabaugh, it was located “in the corner of the old kitchen to the right of the steps as you face them.” She recalled that Gerald and Gladys Slabaugh removed the dumbwaiter and made it into a foldout table, possible the same table that is visible in Figure A2-41.²⁷ Sharon Hahn recalls the removal of the mechanical part remnants of the dumbwaiter in 1985-86. In figure A2-22, there is an opening in the ceiling, which may have been the location of the dumb waiter. However, no other physical indications to date have confirmed its existence or location.

Second Floor Hall 201

Hall 201 leads to the north and south rooms 202 and 203 in the main block of the house and the west room 204 in the extension. The woodwork is a continuation of the walnut balustrade and handrail and the grained doors and trim found in the first floor hall 101.

The plaster ceiling medallion suggests there was originally a hanging kerosene fixture in the hallway for evening illumination. Additional lighting was provided by the skylight over the stairs and the east window at the end of the hall.

The plaster cornice is identical to that in hall 101 with the exception of the regularly spaced brackets that cover the seams. The first floor brackets are somewhat architectural in character while the second floor brackets are composed of leaves and flowers. Initial paint investigation found pinkish coral in the cornice and the ceiling medallion.

The plaster walls have never been painted which suggests they have been wallpapered continuously since 1881. There is no picture rail in the hall at the present time.

The floor in the hall is narrow oak boards running east and west over the original 5 1/4 inch pine boards that were installed north and south. During the site visit a portion of the oak floor was removed to reveal the painted finish on the pine. Initial analysis suggested the first layer was light gray and the second ochre. The stair treads are original and have no evidence of carpet rods or tacking suggesting the stairs have never been carpeted.

South Room 202

When Louisa and Stephen Jones moved into the house in 1881, this room may have served as the best bed chamber. The eastern and southeastern exposures make the room bright and pleasant through most of the day and all seasons of the year while the transom over the west door supplied cross ventilation during the hottest months. City people might find this location odd for a bedroom but 19th-century American architectural pattern books always included a bedroom on the main floor of country houses. Farmers and ranchers understood the importance of a door leading directly outside when unexpected sounds from barns, coops, or paddocks awakened them in the night. Fire was

²⁶ Interview with Marguerite Buffon, October 19, 1994. Thorpe, interview.

²⁷ Colleen Slabaugh, interviewed by Sharon LaRosa, April 2003.

another worry for households who relied on open flame kerosene lamps for lighting and who lived miles from the closest engine company.

Flora and Otto Benninghoven used the south room 202 as their bedroom, especially as Patricia Wilson Thorpe recalled that Flora (whom she called “Grandma Benninghoven”) slept there. Curt and Edith Benninghoven also used this room as their bedroom and the bed was placed on the north wall.²⁸

The Slabaugh family slept on the second floor balconies during the summer. Erma Slabaugh, wife of Hazel Slabaugh, the ranch manager after the Benninghovens, recalled that her mother used the second floor bedroom, which was also outfitted with a pot-bellied stove.²⁹ When the Slabaughs left in 1970, this room became the ranch office, a function it continued through the 1980s.³⁰

The woodwork in this room is similar in form to the trimming L.P. Jenson supplied elsewhere in the house. The painted decoration is a combination of straight graining and burlled woods. Some portions have been repainted but the most sophisticated burl appears to be original to the house.

Each window is fitted with one-over-one sash, which is somewhat unusual for 1880. There is evidence of several applications of curtain hardware on the inside of the wood trim. Figures A2-25 and A2-26 from around 1935 of the north room 203 show a roller blind at the top of the window and similar shades were undoubtedly used in room 202. In addition to the roller blind, there are holes at the top of the inside window molding suggesting the installation of barrel brackets and a brass rod to hold lightweight curtain panels of some sheer fabric such as lace, bobbinet, or dotted Swiss. There is another set of holes on the frame where the upper and lower sash meet which might indicate a half curtain was used to keep out insects and dust.

The plaster cornice in this room is identical to the one in the north room 203. The picture rail and center ceiling medallion are also original to the room. A gas pipe protruding from the floor next to the chimney breast on the west wall suggests that gas lighting was used in this room and the circa 1935 photograph of room 203 illustrates a gas pipe with a light affixed to the chimney breast (Figure A2-25). The presence of a ceiling medallion also suggests there was a hanging kerosene fixture such as a two-arm light of the type typically found in bedrooms. The Benninghovens may have replaced it with a single hanging light similar to one seen in a photograph of room 203.

The walls may have originally been papered and later painted. During the site visit in February 2003, wallpaper was found on top of the baseboard in the closet as well as evidence for two layers of paint on the plaster walls.

²⁸ Thorpe, interview.

²⁹ Erma Slabaugh, interview.

³⁰ According to Julia Hobbs, the south room 202 became an office in 1970 (communication with Gail Caskey Winkler, 6 April 2003). Sharon Hahn stated this room was the ranch office when she began to work on the house in 1985. Hahn, interview.

At present, the floors are covered in 2 1/4 inch oak boards in short lengths that are laid east and west. This flooring was added on top of the 5 1/4 inch pine boards described elsewhere in this report. The oak was not removed so the finish of the pine floor during the Jones family's occupancy of Spring Hill has not been determined. The floor may have been carpeted wall-to-wall (see room 204) or painted as in the hall 201. According to the April 7, 1882, edition of the *Strong City Independent*, "the floors [were] all laid with velvet and Brussels carpets...." Brussels carpets were durable, level-looped pile carpets that were especially popular for dining rooms and best bed chambers because the looped pile was easier to maintain than cut pile. If the newspaper account was accurate, the best bedroom would certainly have been a candidate for a Brussels carpet.

The Benninghoven family installed the narrow oak flooring because the circa 1935 photographs show the flooring in both the north room 203 and the west (dining) room 204 (Figures A2-25, 26, 27, 28, and 29). The family's floor coverings including woven rag rugs and a bearskin without the head attached.³¹

Most of the furniture illustrated in the late 1930s photographs is mass-produced with little extra decoration suggesting the costs were modest. Two photographs of bedrooms on the third floor may provide some direction for furnishing the south room 202 (Figures A2-30, 31). Room 304 had a wash stand with bowl and basin, a rocking chair with upholstered seat, and a wood bedstead (A2-30). Room 303 was furnished with a pair of turned chairs and a table holding books and a kerosene lamp (A2-31).³² At some time the room also had a free-standing stove that vented into the chimney breast; an ornamental cover was placed over the opening during the 1985-1986 restoration.³³

North Room 203

While the Jones family lived at Spring Hill the north room may have been Lutie's bedroom. Its proximity to her parents' room was important if she were ill or cried out during the night and it permitted easy rescue in case of a fire. If the household had contained a number of children, they might have all slept on the third floor along with the household help. However, as the only child at home, Lutie was reportedly the pampered favorite and may have been given the second best chamber.

The Benninghoven family avoided the ground floor parlors and used the north room as a living room and added the doorway and folding door 204A on the west wall for easy access into the west (dining) Room 204. Subsequent ranch managers also used room 203 as a living room.³⁴

³¹ Thorpe, interview.

³² Some of these photographs were apparently composed for the camera. For example, the table, two chairs, and the kerosene lamp in the north bedroom 303 (Figure A2-31) also appear in a photograph of the north room 203 (Figure A2-26).

³³ Hahn, interview. Marvin Ratliff and his two sons, Ken and Max, were plasterers who produced the molds and covers. Ken Ratliff, interview, 5 August 2001.

³⁴ Burtis, interview. Burtis identified north room 203 as the "living room." Thorpe also called this room the "living room" and said the double door was in place when she lived there 1941-1943. Thorpe,

The woodwork is the same style as found in other rooms on the first and second floors and is decoratively painted in straight graining with burlled panels.

There are two large windows on the east wall of the room. The circa 1935 photographs show the only window covering as light-colored roller shades. There is evidence that drapery hardware was installed at the top of each window near the sash as well as where the upper and lower sashes meet, suggesting these windows were fitted with sheer curtain panels and half curtains as were other windows on the first and second floors of the house.

This room has a plaster cornice identical to that in room 202 although some portions were replaced in 1985.³⁵ Initial paint investigation revealed pinkish-coral paint in the cornice with a brown paint between the cornice and the picture rail. The cornice and wall down to the picture rail were painted white or cream by the time the room was photographed late in the 1930s.

The photographs show the walls beneath the picture rail were papered in a somewhat indistinct pattern with a vertical repeat of approximately sixteen inches. No investigation was made behind the door cornices or the flue hole cover during the February 2003 site visit, to determine if fragments of the earliest wallpapers survived there.

The oak floor in room 203 differs from others added to the house. It is only two inches wide while elsewhere the oak boards are 2 1/4 inches; in addition, it is about 3/8 of an inch lower than the oak floor in the hall 201 and the west (dining) Room 204. The Benninghovens probably added the oak flooring. The circa 1935 photographs of room 203 show there was no shoe on the baseboard at that time and area rugs used on the floor included a patterned carpet, a rag runner, and a bear skin (Figures A2-25, 26).

The room was furnished with a circa 1890 glass-fronted bookcase holding books and photographs, a Victrola, three rocking chairs, a pair of side chairs, a table with a kerosene lamp, a small footstool, a telephone on the west wall, two landscape prints (one apparently in a homemade frame), three throw pillows, and two plant stands each supporting a very healthy Christmas cactus. Patricia Wilson Thorpe recalled the phone and Victrola had belonged to Flora Benninghoven.³⁶

West Room 204 and Butler's Pantry/Kitchen 205

The butler's pantry 205 and its proximity to the stairs leading to the kitchen 105 indicates the Jones family used the west room 204 as a dining room. In most 19th-century households dining rooms served several functions. They were where the family and guests would take meals and, as the family's sitting room, they often held a desk and

interview. The door was found in the curing room 208 and returned to its original location in 1985. Hahn, interview.

³⁵ Hahn, interview. The molds made in 1985 were found in the barn during the February 2003 site visit.

³⁶ Thorpe, interview.

several comfortable chairs. According to the April 7, 1882, edition of the *Strong City Independent*, there was “an elevator” between the kitchen 105 and the west (dining) room 204, an obvious reference to the dumb-waiter.

When the Jones family lived at Spring Hill, the north wall of the west (dining) room had a door to the stairway leading to the kitchen 105 and a matching door to the butler’s pantry 205. Between the doors was a two-door cupboard, and to the west of the pantry door and the west wall was a three-door cupboard. Photographs taken circa 1935 show a storage unit composed of two drawers and two doors next to west wall beneath the cupboard (Figures A2-28, 29). This lower storage unit appears to be of less sophisticated construction than the other woodwork and lacks the decorative painting.

The photographs taken circa 1935 show two changes the Benninghovens made to the west (dining) room. First they inserted a doorway 204A with a bi-fold door between their living room 203 and their dining room 204. A photograph of the bi-fold door shows a painted finish similar to that on the lower storage unit, implying that both may have been done at the same time (Figure A2-28). The wood trim around the new door is a less skilled copy of the 1881 designs. The Benninghovens also added narrow oak flooring to the dining room.

According to a visitor to Benninghoven Ranch about 1932, the west room 204 was a kitchen and room 205 served as a butler’s pantry; only in 1936 did room 204 become a dining room and 205 a full kitchen.³⁷ However, the photographs provide conflicting evidence, showing neither room furnished as a kitchen and the ground floor kitchen 105 in shambles. According to Patricia Wilson Thorpe, the dining room wall was moved before Edith and Curt Benninghoven moved into the house after Flora Benninghoven’s death; the photographs therefore capture the rooms in transition.³⁸ A visitor to the house about 1940 remembered the cooking kitchen was in the butler’s pantry 205 which contained both a stove and refrigerator; she also remembered a dumb waiter that was not operable.³⁹ Patricia Wilson Thorpe, who lived in the house 1941-1943, remembered a wood-burning cook stove in the new kitchen 205; she also confirmed the dumb-waiter was inoperable.⁴⁰

The circa 1935 photographs of the west (dining) room show no window coverings although roller blinds would have been essential to control the afternoon sun (Figures A2-27, 29). Holes found on the right side of the sash of the northernmost window were from a bracket holding a flower pot (Figure A2-29). There is physical evidence of several hardware campaigns at the top of the window sash indicating there were curtain panels.

³⁷ Burtis, interview.

³⁸ Thorpe, interview.

³⁹ Edith Hartley, interviewed by Heather C. Brown, Chief of Interpretation, Tallgrass Prairie National Preserve, 17 March 2003.

⁴⁰ Thorpe, interview.

The plaster cornice in this room matches the cornice in the stair hall 201. There is neither a ceiling medallion nor a picture rail in this room and the photographs suggest there never was.

The photographs show the walls were papered during the Benninghovens' period; perhaps fragments of the original paper remain behind the new woodwork on doorway 204A. The wood trim was not pried away from the wall during the February 2003 site visit.

The Benninghovens also added the narrow oak boards over the original pine floors. When a piece of the oak was removed between the windows on the west wall, two carpet tacks were found imbedded in the pine floor, indicating there had once been wall-to-wall carpeting - perhaps the Brussels carpeting of the Jones family.⁴¹ The photographs show only a small rag rug in the west (dining) room (Figure A2-28).

The furnishings depicted are Spartan. An "Eastlake Style" sideboard on the east wall (Figure A2-28) and roll-top desk of similar style on the south wall (Figure A2-27) date to 1880-1900 and belonged to the Benninghovens. The treadle-operated White Sewing Machine probably did as well.⁴² The paucity of furniture in the house at the time the photographs were taken is underscored by using the same pieces in various rooms to create photographic sets. For example, the rocking chair, a side chair, one plant stand with Christmas cactus, and the footstool with fringe around the top are evident in photographs of rooms 203 and 204.

Third Floor Hall 301

This space has been little changed since the house was built. The woodwork is a simpler version of what was installed in the first and second floors of the house and it was grained in oak rather than the more formal dark walnut found elsewhere. A skylight provided natural light and there may also have been a window on the east wall behind the louvered oculus visible outside the house.⁴³

The plaster cornice in the third floor hall is identical to that used in the halls below except for a small area outside the door 304 where the "pole and leaf" motif used in south room 202 appears. Paint analysis might determine if the infill was original or a 1985 repair. Initial paint analysis found a first layer of what appeared to be pinkish-coral paint in the hall cornice.

⁴¹ Mentioned in the April 7, 1882, edition of *Strong City Independent*.

⁴² The name of the sewing machine manufacturer is visible on the iron support under the machine. Pat Wilson Thorpe didn't know what happened to the furniture after they moved to Montana.

⁴³ During the February 2003 site visit, slight irregularities in the plaster surface were found in the center of the east wall in the location of the oculus. Further investigation is needed to determine if there was a window or perhaps a ventilator in that location.

At the present time the walls are covered in the same paper used elsewhere in the halls and no investigation was undertaken to determine if the walls on this floor were papered, painted, or possibly remained in bare plaster for a number of years.

The third floor retains the original 5 1/4 inch tongue-and-groove pine boards laid north and south. The floors were repainted a number of times over the course of a century until they were stripped using lye in 1985-1986, removing all evidence of earlier paint colors.⁴⁴ Tack holes in front of the threshold to west bedroom 304 and by the balustrade indicate floor coverings were used frequently in the hall. The floor was sanded in 1985-1986, which undoubtedly removed some evidence of tack marks; it is possible that more would be found under the quarter-round shoe molding probably added during the 1980s restoration. Today the pine floors are varnished, a finish they did not have in the 19th and first half of the 20th centuries.

The narrow hall was unfurnished except for a cabinet, seen in the Benninghoven's circa 1935 photographs at the north end of the hall over which is a pipe leading from the stove in the north bedroom 303 across to the chimney stack (Figure A2-33). Patricia Wilson Thorpe remembered the third floor of the house as unheated.⁴⁵

South Bedroom 302

This is the largest bedroom on the third floor and the Jones family may have used it as the best chamber for guests at Spring Hill. Many stays were protracted, such as the winter that Louisa Jones's sister and mother spent at the house. In the 20th century when the second floor became the family living quarters, the third floor bedrooms came into regular use. According to Pat Wilson Thorpe, the south room was shared by her little brother, Enas Wilson, and Curt's and Edith's adopted son Jack. The last ranch manager, Don Jenkins, and his wife, Peg, shared this room from 1982 to 1986.⁴⁶ Visitors are not permitted on the third floor and the National Park Service presently uses this room as an office.

The windows in all the third floor rooms are two over two, the sort of sash common in 1880 houses, and their presence on this floor emphasizes how unusual the large panes of glass are on the first and second floors. The ceiling fixture in this room apparently dates to early in the Slabaugh's period (1943/44-1968).⁴⁷

The plaster cornice is the same "pole and vine" pattern as in rooms 202 and 203 but the brackets are floral and less architectural.

The Jones family used this room for guests but when the walls were first papered is yet to be determined. The Benninghovens papered the walls in the two other third floor bedrooms and probably in this room as well.

⁴⁴ Hahn, interview.

⁴⁵ Thorpe, interview.

⁴⁶ Shane Jenkins, interview, 28 May 2001.

⁴⁷ Marvin Slabaugh, interview.

The floor is the 5 1/4 inch tongue-and-groove pine found elsewhere in the house. No evidence of tack marks was found during the February 2003 site visit although furnishings made it difficult to examine the perimeter of the room and the floor had also been sanded and varnished. The floor may have always been painted with a few area rugs used by the beds and washstand.

North Bedroom 303

This room is the second best bedroom on the third floor, and both guests and ranch families occupied it. When Otto and Flora Benninghoven lived in the house, their sons, Fritz and Rhein, occupied this room.⁴⁸ After the Benninghovens left the ranch, Erma Slabaugh recalled sleeping in this room during her years at Spring Hill and Shane Jenkins had this room while his parents were ranch managers.⁴⁹ The Trust currently uses this room as an office.

Another photograph taken of the west wall of this room shows the woodwork grained a light color, probably oak (Figure A2-31).

Both windows in the room are two-over-two sash. Unfortunately, the restored graining makes it difficult to determine what, if any, coverings were used at these windows. Window shades and dotted Swiss curtains were popular for bedrooms from the 1880s through the 1950s and might be appropriate for this room.

The plaster cornice is identical to the one in the south bedroom 302. Like other rooms on the third floor, the north bedroom 303 lacks a picture rail. There is a handsome plaster ceiling medallion in this room and Marvin Slabaugh, whose family lived in the house from 1944 to 1968, believes the ceiling fixture is unchanged from his youth.⁵⁰

The walls in the north bedroom 303 and its closet 303A were covered in the same patterned paper when the circa 1935 photograph was taken (Figure A2-31). No fragment of this paper was found during the site visit in February 2003.

The floor is 5 1/4 inch pine boards that were stripped of their multiple paint layers, sanded, and varnished in 1985-1986. No tack holes were found around the perimeter but the sanding and the furniture placement may have covered the evidence. It is also possible this floor was always painted and area rugs were used.

The circa 1935 photograph of this room shows the same table, pair of side chairs, and kerosene lamp that appear in photographs of the north room 203 (Figure A2-31). One of the side chairs also appeared next to the desk in the photograph of the west (dining) room

⁴⁸ Thorpe, interview.

⁴⁹ Erma Slabaugh interview and Jenkins interview. Their residencies covered the years 1944-1968 and 1982-1986.

⁵⁰ Marvin Slabaugh, interview.

204, suggesting the furnishings were used mainly as “props” and had little to do with how the house was actually furnished.

The photograph of north bedroom 303 shows no evidence of a stove pipe on the west wall yet a stove pipe leading from room 303 across the north hall to the chimney stack appears in another photograph presumably taken at the same time (Figure A2-33). Marvin Slabaugh remembers small gas stoves throughout the house, with gas provided free because the well was north of the ranch.⁵¹

West Bedroom 304

The west bedroom is the smallest in the house and probably the noisiest as it was located next to the bathroom 305. One interpretation is that as the least attractive bedroom, it was probably assigned to the young female “help” employed by the Jones family. A second interpretation allows guides to discuss later changes in the house. During the 20th century the ground floor rooms were no longer used and the family living quarters moved to the second floor leaving the third floor as bedrooms. Patricia Wilson Thorpe slept in this room when she lived at the house from 1941 to 1943, and sometimes shared the room with one of the hired girls who came out from town.⁵² Marvin Slabaugh, the son of the subsequent ranch manager, slept in room 304 from 1944 until he was drafted into the army during the Vietnam War.⁵³ Shane Jenkins, who lived at Spring Hill from 1982 to 1986, recalled the west bedroom 304 was the guest room and the only room “to get decently cool with breezes,” although it lacks a transom over the door.⁵⁴

A circa 1935 photograph captures the southwest corner of west bedroom 304 showing the woodwork freshly painted a light color, possibly the white paint that Sharon Hahn found in 1985 (A2-30). On the back of door 304, Hahn found the light oak graining that was subsequently replicated throughout the third floor.

The windows in this room are both two-over-two as found elsewhere on the third floor. The photograph shows a light roller shade, either cream or ecru, at each window over a sheer half curtain covering the bottom sash (Figure A2-30). To augment the natural light, a single electric lamp fixture with fabric-covered cord hung in the middle of the room.

The pattern of the plaster cornice is unlike any other cornice in the house. When compared to the others it is fairly narrow, only about six inches high.

The photograph shows the walls papered with a multi-colored floral pattern that could be reconstructed by enlarging portions of the original image (Figure A2-30). This is probably the same floral paper that Patricia Wilson Thorpe remembered as “creamish

⁵¹ Marvin Slabaugh, interview.

⁵² Thorpe, interview.

⁵³ Marvin Slabaugh, interview.

⁵⁴ Jenkins, interview.

gold with lots of little flowers.”⁵⁵ The actual colors would be hypothetical unless fragments of the paper are found in the room or the closet.

The 5 1/4 inch floor was painted at the time the room was photographed. Nonetheless, evidence of carpet tacking is visible inside the room next to the threshold of the hall door. The room furnishings prevented a complete search of the perimeter of the floor. No carpet is visible in the photograph of this room (Figure A2-30).

The furnishings in the photograph (Figure A2-30) include a simple bedstead, a washstand with bowl and pitcher, a rocking chair, and two “throw” pillows. The rocking chair and pillows also appear in a photograph of room 203 (Figure A2-26). Pat Wilson Thorpe remembered using this furniture while she occupied the west bedroom.

Bathroom 305

Snapshots of bathrooms are rare; the two circa 1935 photographs of the bathroom at Spring Hill are therefore very unusual (Figures A2-32, 33). Together with the oral histories of those who lived at or visited the house, the photographs provide helpful guidelines for interpreting the room. Spring Hill was constructed with a bathroom (305) containing a commodious tub measuring about six feet in length judging from the photographs. The lining of the tub has been variously described as copper or tinned zinc and it was set into a wood frame composed of vertical strips of two different woods creating a striped effect.⁵⁶ This sort of bathtub was a first step toward indoor plumbing and in large cities by the 1880s was rapidly being replaced by footed, enameled cast-iron tubs. Nonetheless, this old-fashioned bathtub remained in use at Spring Hill into the middle of the 20th century.

There is no photographic evidence for a sink in bathroom 305. The logical locations (northeast corner and next to the cistern on the south wall) are today within closets. The washstand with pitcher and bowl set in the photograph of the west bedroom 304 (Figure A2-30) may indicate the standard equipment in all the bedrooms until the bathroom was remodeled during the second half of the 20th century.

The two-over-two window remains on the west wall of the bathroom as does a transom light over the door to the hall. Figure A2-32 shows a sheer curtain suspended from a rod at the top of the window. As expected, the photographs show no ornamental plaster cornice in this utilitarian space. A hanging bare-bulb light fixture is visible to the east of the bathtub in one of the photographs (Figure A2-33).

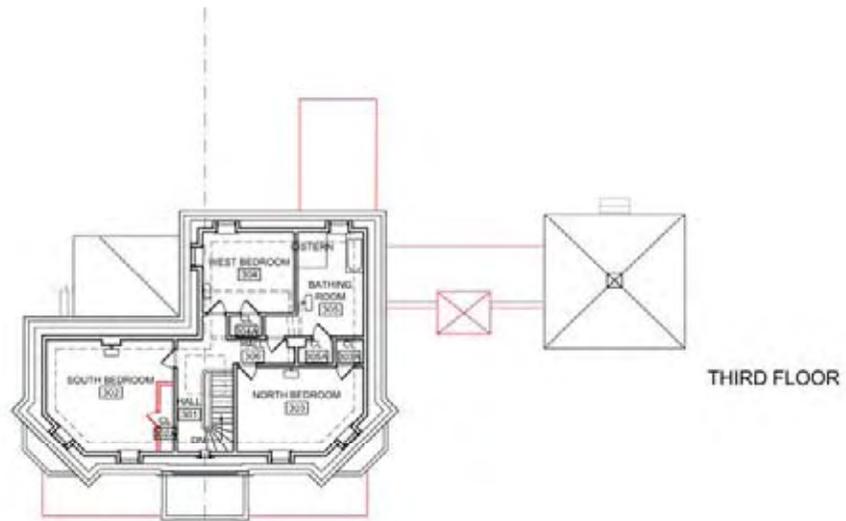
⁵⁵ Thorpe, interview.

⁵⁶ Edith Hartley and Dena Secrest interview, 2 May 2001. Both women recalled a copper bathtub in the bathroom during their visit in 1940. Sharon Hahn recalled the third floor bathroom tub was made out of wood and covered with copper on the outside with a tin lining on the inside. She thought it might still be in the barn. Unfortunately, no bathtub was found in the barn during the February 2003 site visit. Hahn, interview.

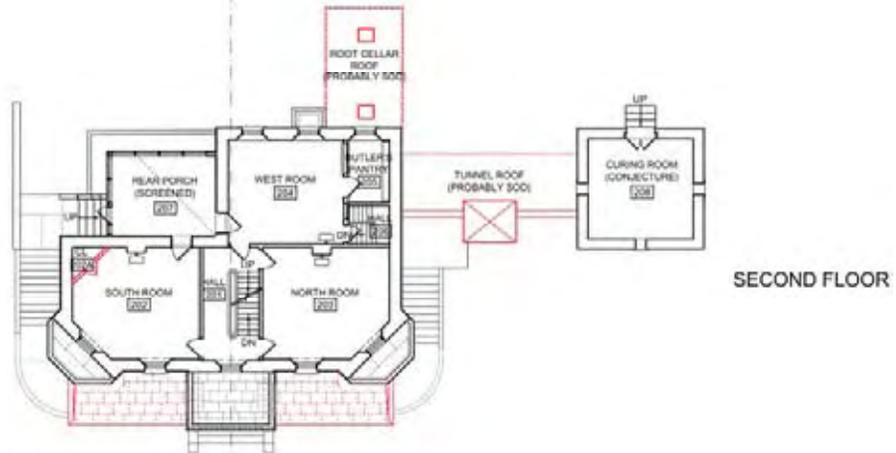
The plaster walls were not papered although they may have been painted in oil-based paint, which could withstand water.

The floor was finished with 5 1/4 inch pine boards laid in a north-south direction. This material has subsequently been covered with resilient flooring laid atop plywood. The circa 1935 photographs suggest the pine floor may have been painted. However, investigation of the area beneath the modern bathtub revealed a rubbed oil finish on the floor. One photograph shows a strip of patterned linoleum on the floor just inside the door.

B: Building Chronology

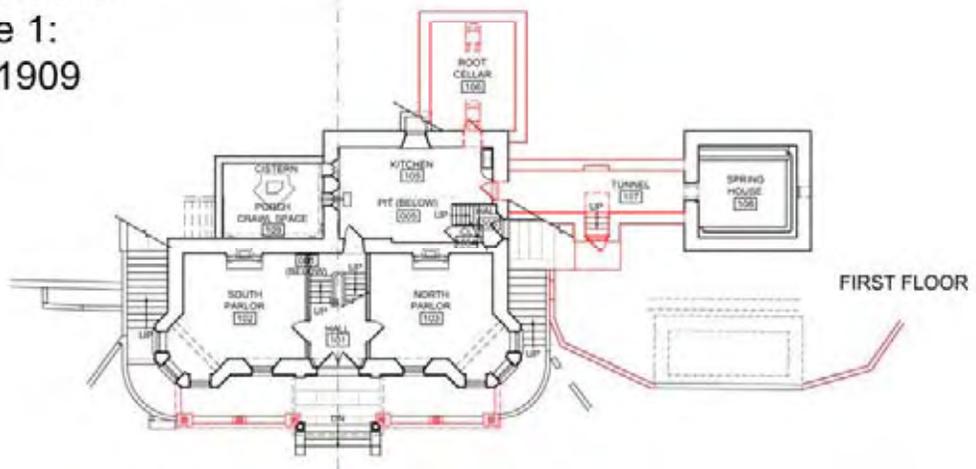


THIRD FLOOR



SECOND FLOOR

Ranch House
Episode 1:
1881 - 1909



FIRST FLOOR

B: Building Chronology

Developing a time sequence of alterations and modifications to the original structure will assist in determining the most significant periods of time with which to guide the preservation treatments. For each building, episodes have been established and analyzed utilizing historic documentation and physical investigation.

Within these episodes, the more significant architectural changes took place in 1881-82 (when the Spring Hill Ranch House, barn, and several of the outbuildings were built), in the early 1940s, and in the late 1940s (when the Benninghovens and George H. Davis respectively did several major renovation projects on the property). In the National Historic Landmark application, 1878-1904 is listed as the period of significance for Tallgrass Prairie National Preserve.¹ This period of national significance incorporates both the Jones and Lantry ownerships.

In the episode drawings, red lines indicate new or revised construction within that episode. Photographs and lithographs referred to in the text can be found either in the *Historic Photographs and Drawings* section (labeled A-) or at the end of this section (labeled B-).

1. Spring Hill Ranch House, Springhouse/Curing Room

Episode 1: 1881 - 1909

Completed in 1881, the original Spring Hill Ranch House is a three-story, ell-shaped limestone structure set into an east-facing hillside, with the third story formed by a mansard roof. The mansard roof is made of standing-seam metal and punctuated by several gable-roofed dormers. The roof was originally painted a deep red, glossy color (see Appendix C), and topped with cast-iron cresting. The corners of the roof were outlined with square-profile roping (figure A2-2). The east (front) façade has three projecting pavilions and a porch. At the center pavilion was an architrave with the words “A. D. 1881” and a medallion with the initial “J” for Jones. Only the center portion of the single-story front porch was part of the original ranch house. The porch wings appear in both a lithograph from the 1883 *Kansas Picture Book*² (figure A1-1) and a lithograph from the 1887 *Official State Atlas of Kansas*³ (figure A1-2). These lithographs have been compared to the actual building, and in comparison with the existing condition, the lithographs seem fairly accurate.

In front of the ranch house are three upper and two lower terraces down the east slope with five retaining walls. Steps along the north and south walls of the house lead from the east main entrance level (first floor) to the west rear entrance level (second floor). To

¹ Deon K. Wolfenbarger and Dale Nimz, “National Historic Landmark Nomination Form, Spring Hill Ranch,” (Prepared for the National Park Service, 12 April 1996), 14.

² G.E. Tewksbury, *Kansas Picture Book*, (Topeka, Kansas, 1883).

³ L.H. Everts & Co., *Official State Atlas of Kansas* (Philadelphia: 1887).

the north is a separate springhouse/curing room building connected to the ranch house by a tunnel.

Interior finishes consisted of plaster walls, ceilings and crown moldings, and pine flooring. The layers of original flooring in hall 101, parlor 102, and parlor 103 were confirmed by removing a floor vent in hall 101 during physical investigation. The original flooring was found to be 5" pine boards. The diagonal subfloor found is believed to have been added during mid-twentieth century floor repair work. By removing a supply register by the west wall in west room 204, the same wide layers were found. The flooring in old kitchen 105 was most likely rock or rubble stone,⁴ with a finished floor elevation 4" to 6" lower than what currently exists.

In hall 101, paint analysis indicates that the exterior surface of the front door 101 was originally stained a mid-tone amber. The door hardware in doors 101, 102, and 103 is original (figure B1-1, B1-2).



Figure B1-1: Ranch house, door 101A, original door hardware, QEA, 02/05/03.



Figure B1-2: Ranch house, original door hardware at door 101A, QEA, 02/05/03.

In the old kitchen 105, based on photographic documentation, the original sink was on the north wall (figure A2-22). During physical investigation, when the south jamb casing board at window 109 in the old kitchen 105 was pried away from the wall, it was found that the casing was constructed with cut nails, indicating that it was original to the house. The pit 005 below the kitchen has walls of random ashlar limestone and one course of brick; its use is unknown. These walls do not appear to be original, since they are not

⁴ Marguerite Buffon, interviewer unknown, 19 October 1994.

tied into the footing (east) wall. The brick only appeared on the east wall. Perhaps the pit was built when the furnace or previous heating unit was first installed.

The root cellar 106, the tunnel 107 between the ranch house and springhouse 108, the north and south wings of the front porch, and a spring-fed fountain on an upper east terrace in front of the house are all believed to have been added after 1881. According to the *Strong City Independent*, the tunnel was in place in 1882.⁵ The lithograph in the 1887 *Official State Atlas of Kansas* (figure B1-3) shows the ranch house complete with front porch and wings, tunnel, a tower above the tunnel entrance, and a fountain.

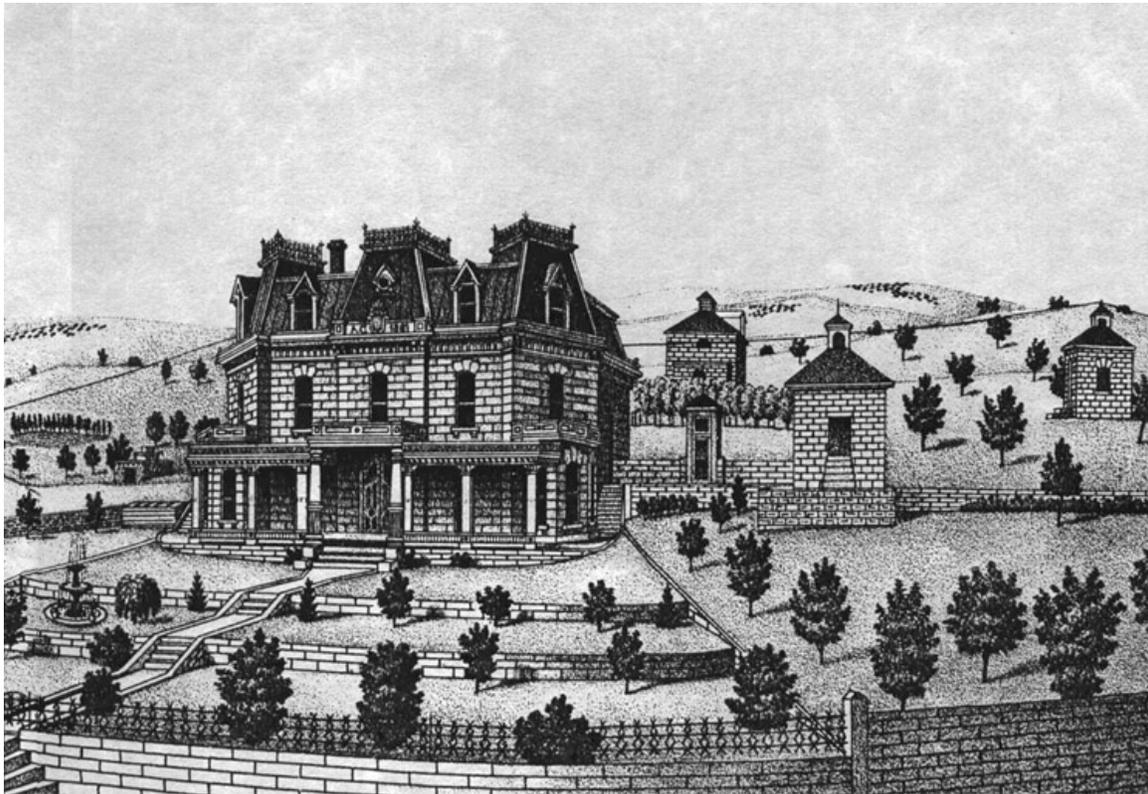


Figure B1-3: Spring Hill Ranch, east elevation, detail from lithograph in the Official State Atlas of Kansas, 1887.

Both the root cellar 106 and tunnel 107 were built into the hill, with walls and barrel-vaulted ceilings constructed of limestone. During physical investigation, it was observed that the construction of the east wall of root cellar 106 shows corner quoins characteristic for above-grade exterior house walls, indicating that the root cellar was added after the house was built (figure B1-4). Visible at the northern part of the west interior wall of root cellar door 106 are two courses of larger stones similar to exposed stones above. The random ashlar stones below these are typical for a foundation wall and would have been covered by soil. Door 106 also appears to have been cut into the existing western stone wall of the ranch house.

⁵ [R.M. Watson?], Article about S.F. Jones, *the Strong City Independent*, 17 April 1882.

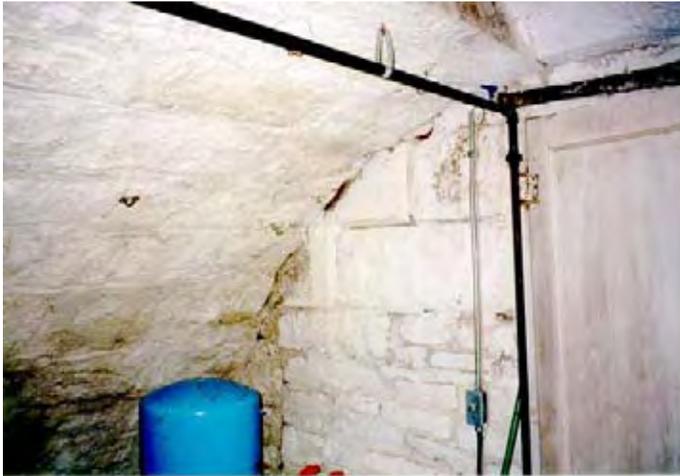


Figure B1-4: Ranch house, corner quoins at east root cellar 106 wall, QEA, 01/23/02.



Figure B1-5: Ranch house, arch at southeast springhouse/ tunnel wall, QEA, 01/25/02.

This evidence puts the original grade level of the northwest corner of the ranch house, before the root cellar and tunnel were built, at about 107'-0" (relative to current ranch house 100'-0" first floor parlor level). Since the flagstone landing for the backdoor 206A is also at about 107'-0", it is likely that the original grade sloped gradually down from west of the house through the area where the root cellar 106 and tunnel 107 are currently located. It is possible that the west window 109 of kitchen 105 was not originally entirely below grade.

Root cellar 106 is illuminated by cast iron skylights inset with small, convex circles of amethyst glass. The patent dates for the skylights are November 12, 1845 and March 27, 1855.⁶ Since the nearby poultry house had skylights in a sod roof, it is believed that the skylights in the root cellar are original, and that the original roof of the root cellar was a sod roof. Similarly, the roof of tunnel 107 was also likely sod over the limestone vault.

During physical investigation, it was also observed that both ends of the tunnel 107, as well as the root cellar 106, butt into adjoining structures without tothing in. At the south exterior wall of the springhouse 108 part of the original decorative stone arch is visible (figure B1-5), indicating that this building was originally freestanding with entry from the outside. The south façade of the springhouse is of higher complexity than its other façades; the large stone archway (doorway 108) has an inset stone panel and vent above

⁶ Bahr Vermeer & Haecker Architects, *Cultural Landscape Report, Part 2, Tallgrass Prairie National Preserve [50% draft]* (Omaha, Nebraska: Midwest Regional Office, National Park Service, 17 April 2001), 4-50.

it, visible from the inside of the springhouse. The stone panel is larger than the other vent panels, while the circular vent window in this panel is the same size as the other three vents (figure B1-6). Due to the position of tunnel 107, only parts of the panel and window are visible from the tunnel. In comparison to doorway 108, stones surrounding door 105 to kitchen 105 do not have the same tool joints at the jambs (figure B1-7). This opening was likely added when the tunnel was built. This supports the assumption that the tunnel was built subsequent to the ranch house and springhouse/curing building.



Figure B1-6: Ranch house, blind vent at springhouse door 108, QEA, 01/25/02.



Figure B1-7: Ranch house, door 105 as seen from tunnel 107, QEA, 01/25/02.

At the tunnel entrance 107, the 1887 lithograph shows two flanking retaining walls of the same height at each side of a tall access tower with a pyramidal roof. Comparing the lithograph to actual conditions at this location, the vertical portion of this entrance tower has since been truncated, but there is no evidence as to when or why, or if in fact the lithograph is accurate.

The original use of the second floor rooms is unclear. Perhaps south room 202 was the master bedroom for the Jones family. If this was the case, closet 202A may have been added in this episode. The February 2003 investigation by Al O'Bright revealed that original plaster finishes had been stripped from the west wall to accommodate construction of the closet wall. Ghosting of removed crown molding can be seen inside the closet, indicating that the closet is not original. The interior casing and base of the angled wall do not match, and the baseboard passes behind the wall intersection. Plaster at corner junctures is crudely done and may have been patched at a later date. Door 202

is a replacement door, with more detail than the original doors. There was probably no opening here originally.

The rear porch had been thought to be a later addition, but evidence indicates that it or a similar structure were original to the house. It is present in the 1883 lithograph from the *Kansas Picture Book* (figure A1-1a). In this picture, the rear porch is visible with either a center ridge beam or a shed roof, and a path leads only to the south entrance door, possibly the original entrance, unless the artist used artistic license for this composition.

During physical investigation below the existing rear porch 207, it was observed that windows 110 and 111 have pronounced heads and sills, which project beyond the face of the wall. The jamb stones have been roughly tooled, though not to the same refinement as the corner quoins of the ranch house. The remaining stones around the windows on the south wall of the house as well as the lower part of the west wall, are random size ashlar similar to the other foundation walls. Three stones are inset into the west wall, protruding beyond the face for bearing of the porch. Another stone protrudes from the south wall; this and the window header stones support the porch structure above. Inside the rear porch 207, the water table stones transition to flat stones that form the thresholds of the doors into the ranch house, doors 202B and 204 (figures B1-8, B1-9). The doors inside the rear porch, 202B and 204, are original and do not appear to have ever been exposed to weathering.



Figure B1-8: Ranch house, watertable at rear porch 207, QEA, 02/05/03.



Figure B1-9: Ranch house, threshold at door 204, QEA, 07/08/98

The 1887 lithograph (figure A1-2) shows the entry to the curing room 208 located on the east, as opposed to the west façade where it is currently located. No traces of an eastern entry have been found and it is assumed that the artist took the liberty of moving the entry to the east façade for the purposes of composition. The entrance on the west façade appears to be original.

The skylight over the main stair in hall 301 was probably original, although Margaret Buffon, a teacher at the Lower Fox Creek School in the 1920s, did not recall a skylight being there.⁷ There may have been a glazed gable or decorative skylight originally that might have been boarded up at some point due to leakage.

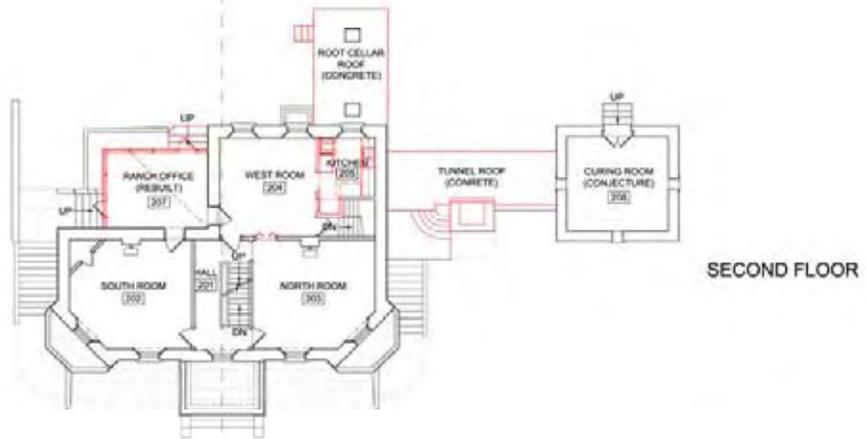
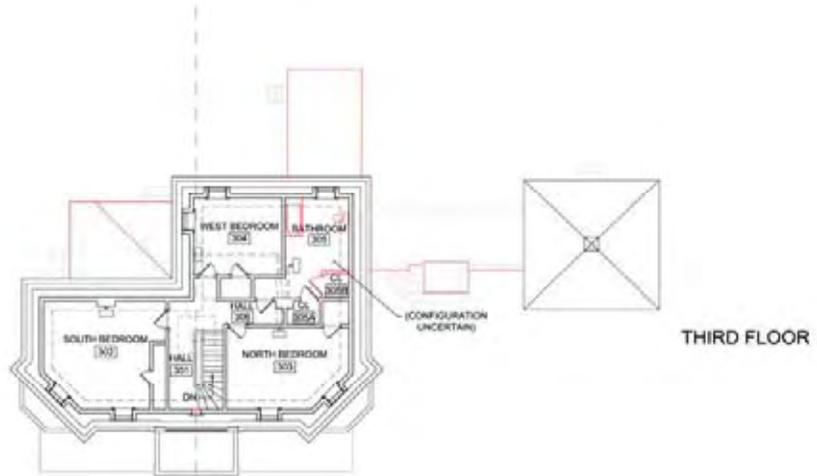
In the 1887 lithograph (figure A1-2), there is an oculus window shown at the third floor top center dormer on the east elevation. Today, this is a blind vent, but it is debatable whether it used to be a window or a blind vent. Plaster irregularities can be felt beneath the wallpapers at the east wall of hall 301 on the third floor. This may indicate that there was a window in this wall.

In south bedroom 302, closet 302A may have been added soon after the house was built. The original room base continues through the closet, but the crown molding goes around it with no traces of the crown visible inside the closet. The closet could have been built before the cornice was put in. The current door 302A is not original. It has only one panel, and not four as the other original doors, and does not have original hardware. In the north and west bedrooms 303 and 304, closets 303A and 304A are original. Door 304A is an original four-panel door, with the original hardware. Bathroom 305 is believed to have been used for bathing originally, with an elevated cistern supplying water to a bathtub, the butler's pantry 205 and kitchen 105. The bathtub and cistern are visible in figure A2-32. In bathroom 305, closet 305A is also original, but door 305A is not. Door 306 is original, with original hardware and hinges.

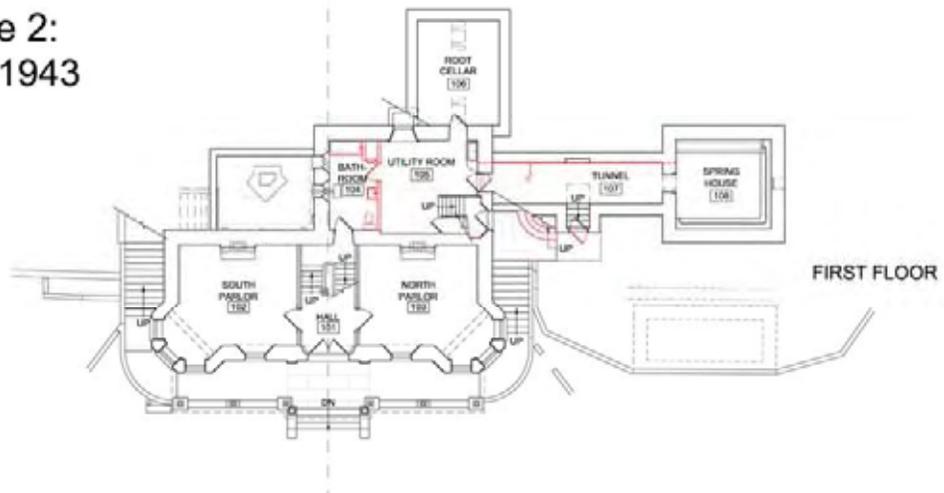
Stephen Jones lived in the ranch house with his family until 1886. In 1888, he sold the ranch to Bernard Lantry. The ranch house then became the quarters for Lantry's managers and ranch hands. In 1895, Bernard Lantry died and left his property to his sons Charles and Henry. It is unclear who resided at the ranch house at this time. In 1907,⁸ Charles Lantry sold the ranch to Charles C. Patten who also did not to reside in the ranch house. Based upon the fact that the owners were not living in the ranch house, it is presumed that there were no major modifications done to the ranch house during the period of the Lantry and Patten families, although this assumption is not verified.

⁷ Buffon, interview.

⁸ Hal K. Rothman & Associates, *Historic Resource Study, Tallgrass Prairie National Preserve [95% draft]* (Omaha, Nebraska: Midwest Regional Office, National Park Service, September 1999), 162.



**Ranch House
Episode 2:
1909 - 1943**



Episode 2: 1909 - 1943

In 1909, Otto and Flora Benninghoven purchased the ranch. After Otto died in 1917, his wife Flora and their three sons continued to run the ranch. In 1935,⁹ their lands were foreclosed due to a lawsuit filed by the Prudential Life Insurance Company. One of the sons, Curt, and his wife Edith Wilson Benninghoven, lived in a house south of the ranch, but moved into the ranch house together with Edith's niece and nephew, Pat and Enas Wilson, when Flora died in 1941. They continued to live and work on the ranch until 1943.

Marguerite Buffon, who studied at Lower Fox Creek School from 1917-23 and taught there from 1929-30, recalled a fountain in front of the house, and a stone walkway up to the house.¹⁰ Pat Wilson recalled a second fountain to the east.¹¹

Marguerite Buffon recalled that the old kitchen 105 took up the entire west part of the first floor, with the floor surface rock or rubble stone.¹² She also believed that the stair up from the old kitchen had stone steps, and that a dumbwaiter went up to the butler's pantry 205. There is no further evidence of stone steps but Pat Wilson also recalled a dumbwaiter, which was unsafe and inoperable at the time she lived there. During Curt and Edith's tenancy, the old kitchen was divided to create bathroom 104,¹³ and Edith Benninghoven used the old kitchen for entertaining since it was cool. Perhaps the shower in tunnel 107 was added at the same time. This shower has been referred to as the "cowboy shower," presumably since the ranch hands used it after work.

There appears to be stone build-up on top of the tunnel vault and tunnel entrance tower roof that created a level surface above the vault. The concrete topping currently there was poured on top of this layer, most likely as a waterproofing technique. It is believed that the tunnel 107 originally had a sod roof over the stone vault. Leaks into both root cellar 106 and tunnel 107 were probably repaired by replacing the sod with concrete slabs. Sometime in this episode (or in Episode 1) the pyramidal tower roof at tunnel entrance 107 was removed. At this time, the outdoor steps leading from back door 206A to the roof of the tunnel may have been added. These and other renovations around the site appear to date to the 1920s and 1930s. The Benninghoven family is credited with these renovations although these assumptions are not verified.

According to Orville Burtis, north room 203 was the living room, west room 204 was used as a kitchen, and the butler's pantry 205 functioned as a pantry. However, in the Benninghoven family photographs from before the pantry conversion, west room 204 does not look as if it were used as a kitchen (figure A2-27, A2-28, and A2-29). Burtis reported that in the late 1930s the Benninghovens converted the former "kitchen" (204) into a dining room, and turned the butler's pantry 205 into a kitchen.¹⁴ In Burtis'

⁹ Heather Brown, email to QEA, 21 February 2003.

¹⁰ Buffon, interview.

¹¹ Patricia Wilson Thorpe, video interview, 1998.

¹² Buffon, interview.

¹³ Thorpe, interview.

¹⁴ "TAPR Notes," 7.

Historic Preservation Certification (tax credit) Application, the date for the pantry conversion is given as approximately 1938.¹⁵

Photographs show that the butler's pantry originally was about 26" narrower than it is today. The wall between the west room 204 and pantry 205 was originally about 28" from the casing of window 207; currently it is about 2" from the casing (see figure A2-29). It is believed that the pantry 205 was enlarged at the time of the 1938 conversion to a kitchen, because in 1980s photos of a 1930s-era kitchen, the room 205 is already enlarged (figures A2-38, A2-43, A2-44). The new kitchen 205 had wood cabinets painted white, and no door. Current observations show that the casework ornament around the doors and windows in the west room 204 is of varying refinement. Both windows and doors 201, 204, and 206 have casework ornaments that appear to be original, matching the rest of the casework on the second floor. The current ornaments, especially the diamonds, of the built-in shelf on the north wall of west room 204 are of different manufacture, lacking the level of quality of the original shown in figure A2-28. This shelf dates to the kitchen/pantry 205 expansion circa 1938. The casework around door 206 appears to have been reused when the wall was moved. Door 206 has replacement hardware, possibly from this time. The "brackets" on the plaster crown molding were recast, the newer ones lacking the same level of crispness and detail.

The door between the north room 203 and the west room 204, door 204A, was added after the original construction of the house but before the Benninghoven photographs from circa 1935. The casework ornament around door 204A is fairly crude and the door is stained wood rather than grained. It is conjectured to have been added in the early part of this episode, perhaps in the 1910s.

Marguerite Buffon remembered that the rear porch 207 was a screened-in porch that was called the "new ranch office"¹⁶ (figure A2-24). The current rear porch may have been constructed in the 1920s or 1930s. The original porch had the same footprint, but since the original building was constructed with cut nails and the present porch is constructed with wire nails, this indicates that it is not original. Pat Wilson recalled a cistern that came up to waist height in the rear porch. It was closed up since Curt and Edith were afraid Pat or Enas would fall in. In the photograph, a hand pump is visible to the right. This pump brought water from the cisterns below (in the porch crawl space 109). In the background a washing machine can be seen. The current porch is also visible in a photograph from the 1930s with Curt Benninghoven sitting on the stoop of the west entrance door 207 (figure A2-4). This photograph shows that grade in front of this door was approximately 18" lower than present, or about 107'-5" (relative to the current ranch house 100'-0" datum). The dark area to the right of the steps might indicate that the porch sat on piers rather than the current stone foundation walls, although there is no further evidence available. Another photograph from the same period shows that the porch had two screened doors, one on the west façade in its present location, and one on

¹⁵ Orville B. Burtis, Jr., "Historic Preservation Certification Application Part 2 – Description of Rehabilitation," 31 October 1984, 5.

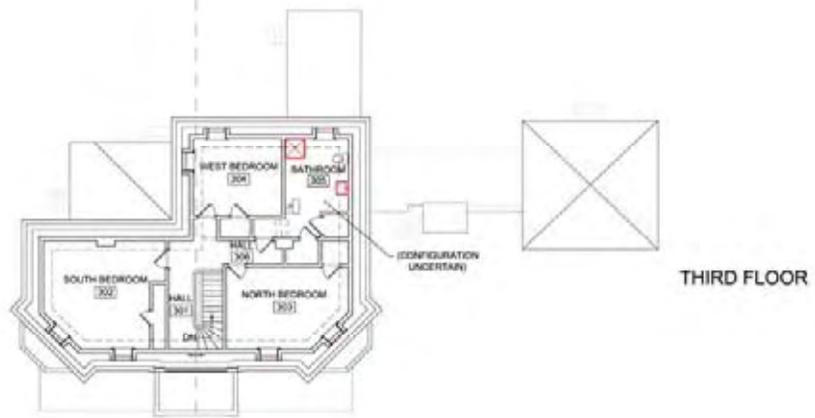
¹⁶ Buffon, interview.

the south facade where there is now a window (figure A2-3). The condition and details of the stone steps would indicate that the south entrance was original.

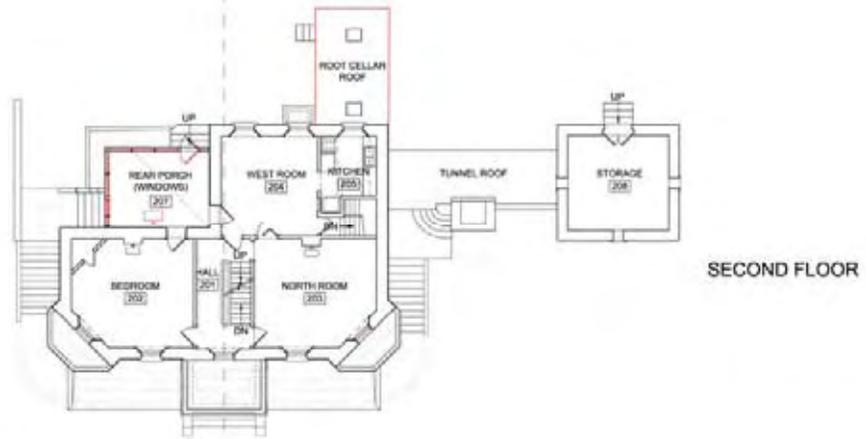
In a photograph from the 1930s, the oculus window is a louvered, blind vent. If it were originally a window in hall 301, it must have been altered before this time (figure A2-1).

The 1986 tax credit application speculates that bathroom 305 was remodeled circa 1938. Curt and Edith Benninghoven added a water closet to this room. They may also have added a shower, closet (305B), and small lavatory. Pat Wilson Thorpe remembers only a copper tub and water reservoir during her occupancy (to 1943), but Marvin and Erma Slabaugh recalled that the shower and two closets were in place when the family moved in shortly after the Benninghovens left.¹⁷ Door 305B is original to the house, but not original to closet 305B.

¹⁷ Thorpe, interview; Erma Slabaugh interview (confirmed by January 2005 telephone conversation between Heather Brown of TAPR and Marvin Slabaugh). It is possible that the bathroom was remodeled in the short time between the Benninghovens' departure and the Slabaughs' arrival. Further research may be needed to resolve conflicting accounts.

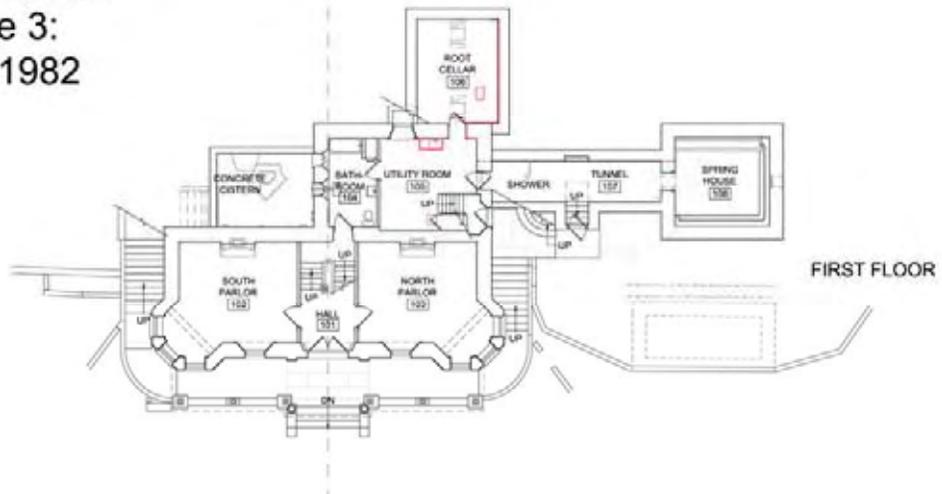


THIRD FLOOR



SECOND FLOOR

**Ranch House
Episode 3:
1943 - 1982**



FIRST FLOOR

Episode 3: 1943 - 1982

Prudential sold the property to George H. Davis in 1935, but the Benninghoven family continued to work on the ranch until 1943. Davis hired Fred Howard as manager for the ranch, and Howard's employees Hazel and Erma Slabaugh then lived in the ranch house from around 1943 to 1968. Their son, Marvin, was born in 1944 and lived in the ranch house until 1968 when he was drafted. From 1968-1982, Gerald Slabaugh, the new ranch manager, lived in the ranch house with his wife Gladys and sons Roy and Ron. In 1975, the Davis-Nolan-Merrill Grain Company merged with the Z Bar Cattle Company.¹⁸

According to interviews made in 1994 with Erma Slabaugh, the walkway up to the house was all grass, which contradicts the earlier recollections by Marguerite Buffon of a stone walkway. The fountain in front of the house was made into a flowerbed after Marvin Slabaugh's dog drowned in it.¹⁹ The flagpole was added in the 1950s or 60s.²⁰

According to Erma Slabaugh, there was a potbelly stove in bathroom 104.²¹ This stove may have been original to the old kitchen 105. The Slabaugh family (in an interview with various family members)²² stated that, "the kitchen area/downstairs area had massive termite damage at one time and the floors had to be replaced". This indicates that the floors may have been wood during the Slabaugh tenancy. However, based on the Buffon interview,²³ the old kitchen floor was "all rock – rubble stone." The concrete floors in the bathroom 104 and old kitchen 105 were poured either to replace the wood floor, or over the gravel floor. The floors were poured over the gravel that would have been the original surface. Concrete was probably laid in the pit 005, root cellar 106, tunnel 107, and springhouse 108 at the same time.

The root cellar caved in sometime in this period, and was later rebuilt.²⁴ Erma Slabaugh remembered shelves in the root cellar 106 and springhouse 108, and a "cowboy shower" in tunnel 107, where the ranch hands used to shower.²⁵ According to Marvin Slabaugh, there was a tunnel from the shower area in the tunnel to the icehouse. When he was young, the tunnel caved in and was blocked off. He remembered that the tunnel entrance was where the waterline comes through the wall, although there is no physical or archeological evidence yet available to verify this. Marvin also remembered a skylight, similar to the cast iron skylights in the root cellar, in the tunnel roof behind the old tower location.²⁶

Sometime during the Slabaugh's tenure, there was a fire in kitchen 205, caused by a pilot light that was stuck.²⁷ Possible repair following this fire may have further occluded

¹⁸ Rothman & Associates, *Historic Resource Study*, 195, 204.

¹⁹ Erma Slabaugh, interview.

²⁰ "TAPR Notes," 7.

²¹ Erma Slabaugh, interview.

²² The Slabaugh family, interviewer unknown, 24 September 2001.

²³ Buffon, interview.

²⁴ Marvin Slabaugh, interview by Robert Coon, 21 April 2002.

²⁵ Erma Slabaugh, interview.

²⁶ Marvin Slabaugh, interview.

²⁷ Erma Slabaugh, interview.

evidence of the original butler's pantry 205 configuration. Photographs from circa 1983 of the kitchen 205 show it as it probably was during most of this episode (figure A2-38 – A2-44). According to Colleen Slabaugh, wife of Roy Slabaugh, Gerald and Gladys took out the dumbwaiter and turned the upstairs part into a fold-out table. Colleen described the dumbwaiter as located in the corner of the old kitchen, to the right of the steps.

The rear porch 207 was still a screened porch when the Slabaughs lived there. At the rear porch was a cistern that collected water that came off the roof.²⁸ In the rear porch, the south screen door and the window next to it are now filled in; window 214 occupies the space of the door. Year-round windows were installed, replacing the screens, possibly after the Slabaugh's residence. It is not clear when these changes were made, but they could have occurred sometime in this episode. A photograph from circa 1983 shows that the custom wood storm windows on the second and third floor had been replaced with standard rectangular aluminum storm windows (figure A2-7).

According to Orville Burtis, who worked for the Z Bar Cattle Company from 1947 to 1987, the curing room 208, also known as the smokehouse, was not used as a smokehouse during his tenure.²⁹

When the skylight in hall 301 leaked, Erma reported that they covered it with a roof.³⁰ The only evidence of this currently is the larger opening surrounding the contemporary skylight, so perhaps the original skylight was the full 5'-6" x 5'-6" of the larger opening. The original skylight may have had a glazed gable or a laylight flush with the ceiling.

Erma also remembered that the casework was white in these days.³¹ This agrees with the Historic Preservation Certification Application Addendum from 1984, which explained that the casework in the third floor bedrooms 302, 303 (Erma's bedroom), and 304 (Marvin's bedroom), and bathroom 305 was painted white with blue trim (figure A2-30).³²

When Erma moved in, the third floor bathroom 305 was already built, complete with shower and two closets. She reported that they had to pump water up to the bathroom, and heat it on a potbelly stove.³³ This sounds similar to the configuration seen in figure A2-32 from the Benninghoven period. During this period the old wood tub, covered with copper and lined with tin, was removed.³⁴

²⁸ Erma Slabaugh, interview. This may be the cistern beneath the porch.

²⁹ "TAPR Notes," 1.

³⁰ Erma Slabaugh interview.

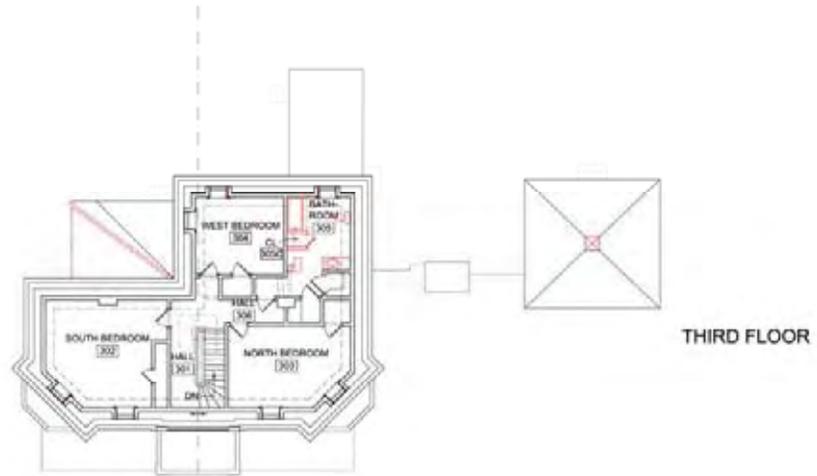
³¹ Erma Slabaugh, interview.

³² Orville B. Burtis, Jr., Historic Preservation Certification Application, Addendum, 31 October 1984, 2.

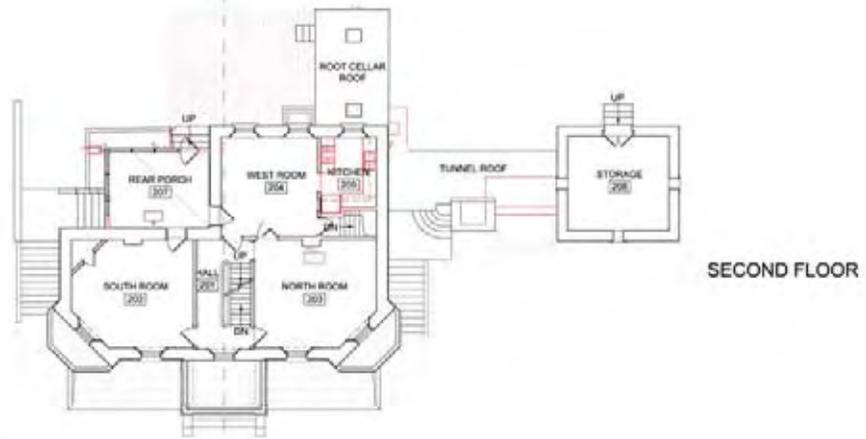
³³ Erma Slabaugh, interview.

³⁴ Slabaugh family, interview.

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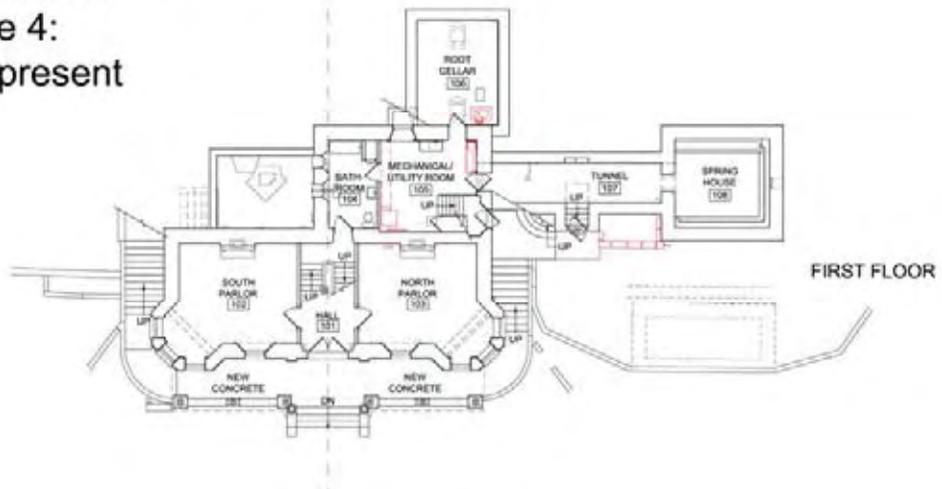


THIRD FLOOR



SECOND FLOOR

**Ranch House
Episode 4:
1982 - present**



FIRST FLOOR

Episode 4: 1982 - present

Don and Peg Jenkins were ranch managers from 1982 to 1986 and lived in the ranch house together with their son Shane. From July 1983 to July 1986, an extensive rehabilitation of the ranch house, barn, and outbuildings took place under Orville B. Burtis, Jr., president of the Z Bar Cattle Company. Most of the information below is gathered from the Historic Preservation Certification Application, which was submitted for tax credits.³⁵ Sharon Hahn led the rehabilitation work in 1985-1986.

The main areas rehabilitated from 1983 to 1986 were the exterior masonry walls, windows, front porch floors and balconies, roof, the front door 101, kitchen 205, bathroom 305, floors, casework, plaster, and electrical wiring.³⁶

The masonry walls were repointed, using mortar consisting of one part white portland cement, four parts hydrated lime, and eight parts river or masonry sand. All windows were reglazed and recaulked, wood window frames were painted, and weather stripping added or replaced. The first floor storm windows were replaced in 1986-87.³⁷

The patio on the west side of the house was built in the early 1980s with concrete staves from one of the silos south of the barn that was taken down prior to 1983 (figure A1-5). The stone blocks of the front porch floor were reset and repointed, and concrete floor areas on either side of the stone were replaced with new concrete. Front steps were realigned and repointed. One wood column was rebuilt. Rotted wood in the balcony above the main entrance was replaced and the porch roof surface, as well as the upper bay window roofs, was resealed.³⁸

The mansard roof was originally painted red (see Appendix C), and in about 1960 repainted with aluminum paint. In 1983-84, the mansard roof was completely stripped and repainted using red oxide paint, which was believed to match the original paint color and type. All leaks were sealed, new gutter lining was installed, and the exterior trim was painted. The square profile roping at the vertical corners of the mansard roof was removed at a later date. The skylight opening was made smaller; the domed plexiglass skylight dates from this time. The missing "J" crest on the east elevation was recreated. The roof of the curing room was also reshingled, and the cupola was replaced.³⁹

The front doors 101 were sanded, sealed, and stained. Figure A2-22 shows wainscoting in the old kitchen 105. This was probably removed in this episode, perhaps when the ceiling was replaced or repaired with gypsum board.

³⁵ Burtis, "Certification Application."

³⁶ Burtis, "Certification Application."

³⁷ Burtis, "Certification Application."

³⁸ Burtis, "Certification Application."

³⁹ Burtis, "Certification Application."

The retaining walls by tunnel 107 were in extremely poor condition, and eroded or spalling stones were replaced. The tunnel entrance tower (at door 107) currently has one course of narrow stones, which meets the top course of the south retaining wall, but these cap stones are higher on the north retaining wall. Pictures taken before the rehabilitation in the 1980s show both retaining walls at the same height (figure A2-17), but the north portion of the tunnel retaining wall was rebuilt to a higher elevation (figure A2-18). The face stones of the rebuilt section are consequently slightly different than at adjacent locations.⁴⁰

Peg Jenkins initiated the remodeling of kitchen 205. The 1930s cabinets were removed and replaced with new cabinets. New appliances (stove, sink, fridge, and dishwasher) were installed. The kitchen was further expanded by cantilevering the countertop on the east wall over the stair below; base cabinets on this wall are only 5" deep. Lath and plaster appears to have been removed and new drywall was installed, and the walls were papered (figures B1-10, A2-45 -- 49).⁴¹ Sharon Hahn recalls the removal of the mechanical part remnants of the dumbwaiter in 1985-1986.



Figure B1-10: Ranch house, rehabilitation, Burtis (Tax Credit) Collection, ca. 1983.

The small side windows on either end of the rear porch 207 were filled in with wood panels some time after 1986. Don and Peg Jenkins did minor improvements around the ranch house, such as replacing some flooring in the rear porch 207. According to them, the curing room 208 was used for storage at this time.⁴²

After the original plaster ceiling in west bedroom 304 fell down while Sharon Hahn and an associate were leaving the room after steaming off the wallpaper in 1985-86, the entire ceiling was replaced with drywall

In bathroom 305, a new tub was installed and lined with Formica, a vanity was built, walls were papered, and the casework was stripped of paint and grained. It is unclear if there was a toilet on the third floor before this renovation. Closet 305C was added at this time to make the tub niche.

⁴⁰ Burtis, "Certification Application."

⁴¹ Burtis, "Certification Application."

⁴² "TAPR Notes," 7.

The floors were sanded and refinished (possibly all floors except for west room 204 where the flooring was in better condition). The hardwood floor in the rear porch 207 was installed at this time. All third floor casework was regrained over the existing white paint. Damaged crown molding was remolded and replaced, in some places with a different, unmatching pattern (such as hall 301). Damaged wallpaper was removed, plaster cracks repaired, and the second and third floor walls repapered. Under the last layer of wallpaper plaster repair was found, so wallpaper may not have been the original wall finish, or all original paper had been removed in a previous episode.⁴³

The current heating system with furnace was installed at this time. The electrical wiring was also updated. Most of the old wiring was replaced, additional outlets were provided, all surface wire was removed, and new light fixtures were installed. During the rehabilitation, old surface wiring with many breaker boxes and wiring run through old gas pipes were found.⁴⁴ Later in this episode, further electrical wiring was installed on the third floor in surface-mounted conduit. A photograph from the tax credit package circa 1983, for example, shows the west wall of bathroom 305 after renovations. Currently, this wall contains much more surface-mounted electrical conduit and fittings (figures A-52, B1-11).

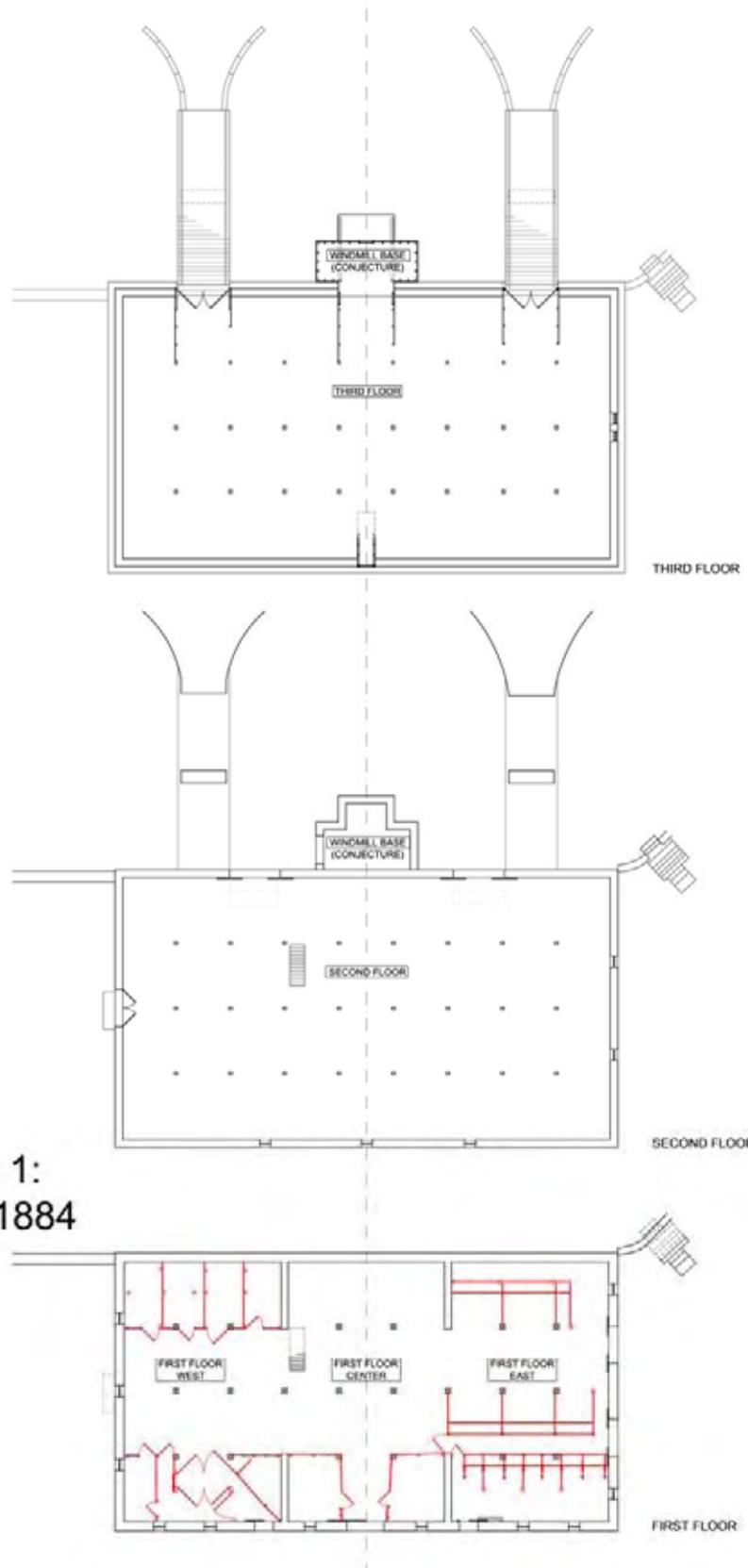


Figure B1-11: Ranch house, bathroom 305, west wall, QEA, 01/25/02.

The property was sold to Boatmen's First National Bank of Kansas City in 1986. After long negotiations between several interested parties, the National Park Trust purchased the ranch in 1994. In 1996, the Tallgrass National Park Preserve became devoted to preserving the unique tallgrass prairie.

⁴³ Burtis, "Certification Application."

⁴⁴ Burtis, "Certification Application."



**Barn Episode 1:
ca.1881 - ca.1884**

2. Barn

Episode 1: Circa 1881 – Circa 1884

The second most prominent building on the ranch is the three-story rusticated coursed ashlar limestone barn built in approximately 1881. Corners and openings are accentuated with square-cut, bush-hammered quoins. It is a bank barn built into a hillside so that the first floor/stable level is accessible from the south, the second floor/equipment level from the north, and the third floor via ramps from the north side. The hipped gable roof was originally clad in tin. Supposedly, it took over 5,000 pounds of tin to cover the roof.⁴⁵ The original boards on the ramps were purported to be railroad ties,⁴⁶ although based on the present condition there is no evidence of this.

As seen in both the 1883 and 1887 lithographs (figures A1-1, A3-1), there was originally a windmill attached to the barn roof.⁴⁷ It was located on the north side, above the middle dormer, which at the time was extended to the north, where the cistern currently is located. With the help of its 30-foot wingspan, this windmill reportedly could run a pair of corn burrs, a corn sheller, a hay chopper, root cutter, or oil-cake crusher.⁴⁸ The windmill was damaged in an 1884 windstorm, and was supposedly removed prior to 1887 for fear that its vibrations would cause damage to the barn during its operation.⁴⁹ It does not appear in the 1908 postcard (see figure A1-3). Cut-off beams and bracing that may have supported the windmill or its mechanism are still visible below the middle north dormer (figure B2-1).



Figure B2-1: Barn, third floor, assumed windmill mechanism, QEA, 10/10/02.

The mangers, first floor stalls, grain chute in northeast corner, and stair between first and second floor are all assumed original. There are anecdotal rumors of a tunnel leading from the first floor of the barn to the ranch house, but so far, no evidence has been found for this.

The north entrance doors 201 and 202 were originally arched openings, similar to all other door openings in the barn as shown on the lithograph circa 1887 and supported by a later photograph (figure A3-3).

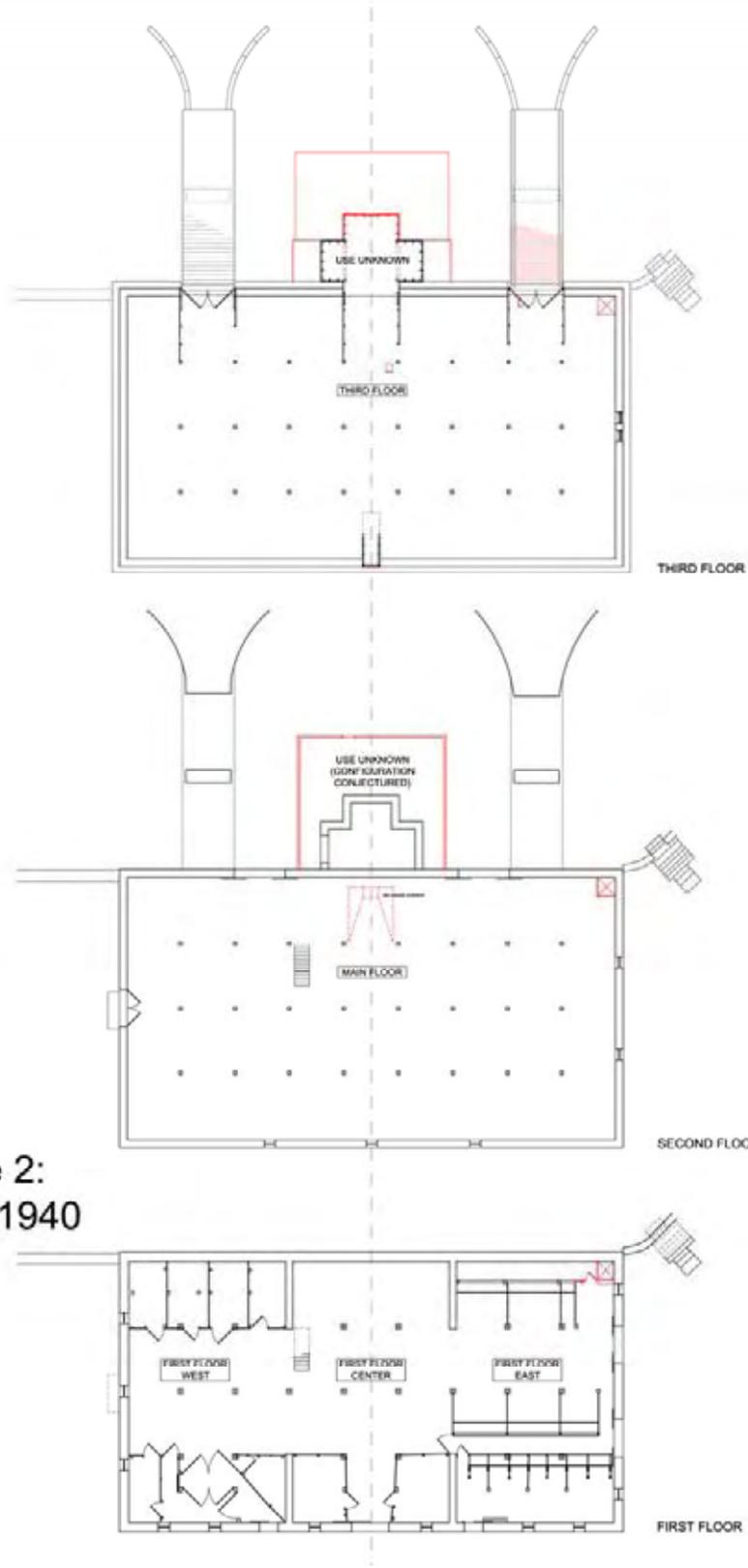
⁴⁵ Wolfenbarger and Nimz, "Landmark Nomination," 10.

⁴⁶ "TAPR Notes," 6.

⁴⁷ Everts & Co., *Official State Atlas of Kansas*.

⁴⁸ Wolfenbarger and Nimz, "Landmark Nomination," 10.

⁴⁹ Bahr Vermeer & Haecker Architects, *Cultural Landscape Report*, 2-69.



**Barn Episode 2:
ca.1884 - ca.1940**

Episode 2: Circa 1884 – Circa 1940

There is little documentation available about the barn during this period, beyond a postcard from 1908 (figure A1-3) and two exterior photographs from the Benninghoven era in the 1920s and 1930s (figures A3-2, A3-3).

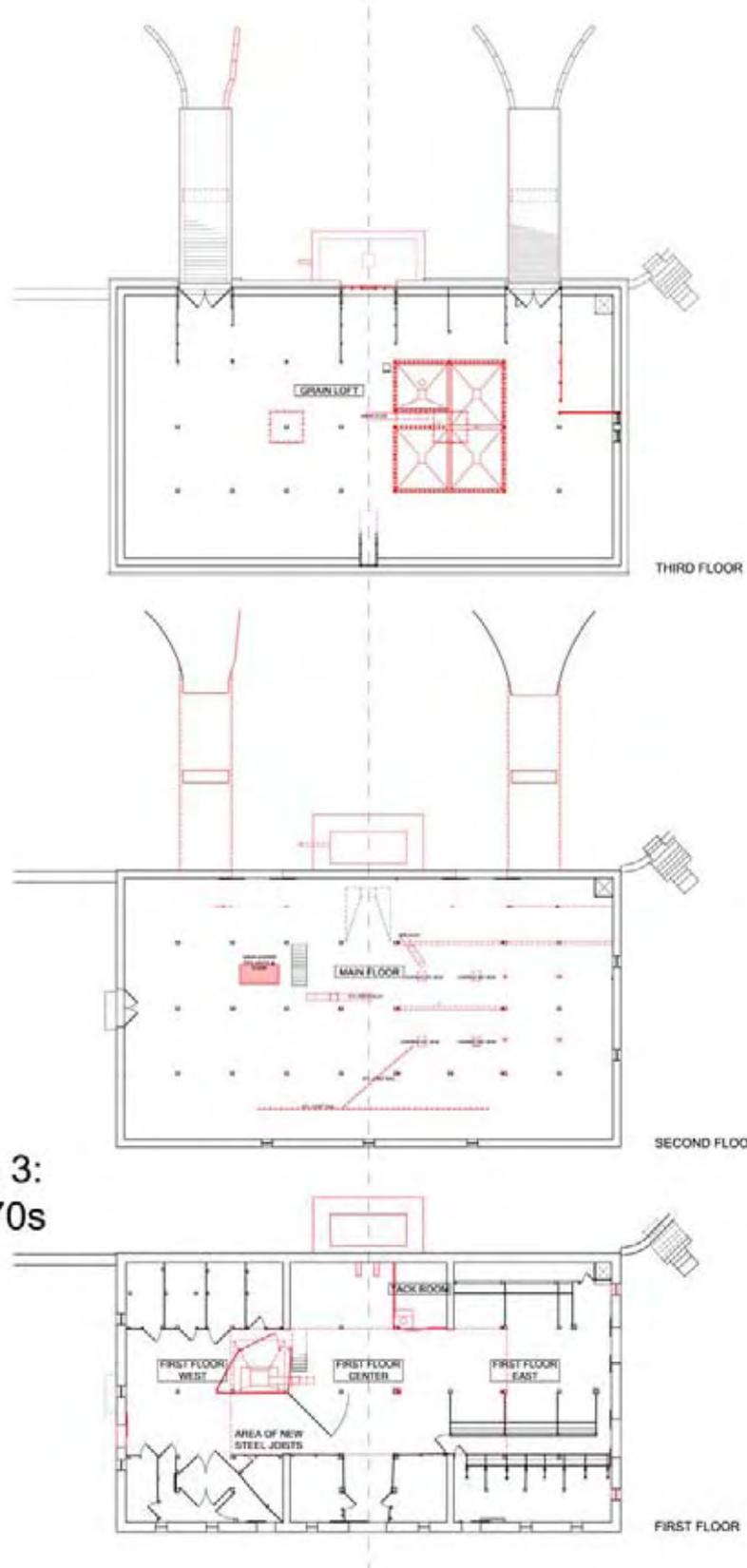
On the north side of the barn, the 1908 postcard shows the middle dormer shed structure with a lighter rectangle on the east side which is clearly visible on the Benninghoven photograph (figures A1-3 detail, A3-3) as a slanted roof protrusion which might have covered the machinery run by the windmill. This configuration is similar to the structure shown under the windmill in the 1887 lithograph. There appears to have been little change to the barn between the two photographs.

The original tin roof might have lasted for about 50 years. Sometime before the 1930s, the barn roof was resingled with wood shingles. In a Benninghoven photograph from circa 1935 (figure A3-3), the main roof and east and west dormers had wood shingles. While the northeast dormer walls were sheathed in tin and the middle dormer roof was roofed in tin in this photo, at some time between the 1930s and the 1980s the dormer walls and roofs were clad with asphalt shingles.

In figure A3-3, the eastern ramp to the third floor is decked with approximately 3" x 6" boards, possibly original. It has a low wooden railing on either side, matching the railing shown in the 1887 lithograph. The beams appear to be timber, and the ramp piers are the original coursed ashlar stone. The western ramp is decked with approximately 3" x 12" boards, possibly original and apparently the same boards as currently present, with no edging or railing. The small hatch door 301A in door 301 does not appear to be original by its construction. It can also be seen in figure A3-3.

In another Benninghoven photograph from circa 1930s (figure A1-4), the south dormer window is boarded up. Two silos are present to the south of the barn. These silos are not visible in the 1908 postcard. The retaining wall and steps at the northeast corner of the barn are in poor condition. Rubble and logs appear to have been placed along the bottom of the south face of the wall as shoring.

There is a wooden structure to the southwest of the barn not depicted in the 1880s lithographs, but visible in the 1908 photo-postcard. This structure was gone by the 1980s.



**Barn Episode 3:
ca.1940 - 1970s**

Episode 3: Circa 1940 – 1970s

In 1947⁵⁰ the Davis-Nolan-Merrill Grain Company installed grain bins in the center of the third floor and steel joists and beams below the second and third floors to support the grain bins. These steel joists and beams were of salvaged steel from the 1920s and 1930s. Steel girders were installed below the second floor to support trucks hauling grain into the barn.⁵¹

Two cupolas were added to accommodate the extra height the grain elevator required and to ventilate the grain dust. The retained earth of the western ramp was altered in order to allow semi trucks to back in, presumably at the same time. The tack room could possibly have been added at this time. The third floor joist strut reinforcement bracing is S4S and as such probably came after 1930. The size of the bracing is consistent with dimension lumber milled prior to 1968.

In the 1950s, according to oral accounts, a tornado hit the barn and lifted the entire roof off, only to set it down 12” off center. The roof itself was not damaged, but had to be jacked up and moved back to its original location.⁵² No physical evidence has been found for this. Some time after the 1930s the barn roof was re-shingled in asphalt composition shingle, perhaps after the 1950s, since the wood shingles depicted in the 1930s photograph might have lasted 20 years or more.

Between approximately the 1930s and 1970s, the wood structure on the north side of the barn was removed and the cistern was added in this location. The outer layers of the cistern are constructed of concrete blocks covered with portland cement mortar parging. When the wood shed on the north side was removed, the middle dormer was shortened and probably re-sided at this time with asphalt shingles. Cut-off third floor joists are still visible on the north elevation where the dormer was shortened (figures A3-9, B2-2). Since window 302 on the north façade of the middle dormer appears to be as old as window 303 on the west side, it was probably in the north wall of the original structure and reused when the shed was removed and the dormer shortened.



Figure B2-2: Barn, north elevation, cut-off beams at middle dormer, QEA, 10/10/02.

⁵⁰ Dwight Mott, interviewed by Sharon LaRosa, 5 August 2003. Dwight Mott was a ranch hand 1944-45 and 1947-48. During the ironwork, he stood by with a water hose to prevent fires from getting started due to the welding. Dwight Mott moved to Colorado in 1948, which indicates that the grain bins, ironwork and cupolas were completed at this time.

⁵¹ “TAPR Notes,” 2.

⁵² Marvin Slabaugh, interview.

The beams of both ramps appear to have been replaced with steel I-beams by 1983. The piers and beam supports, at the earth/rubble ramps, were reinforced with concrete bond beams some time after the 1930s (see figure A3-3, previous episode) and before 1983 (figure B2-3). The eastern ramp was rebuilt with 2x12 decking sometime after the 1930s.



Figure B2-3: Barn, northwest side, circa 1980.



Figure B2-4: Barn, east elevation, window 110, QEA, 10/07/02.

Marguerite Buffon remembered hearing about a tunnel from the barn to the ranch house.⁵³ In the 1970s, one of the ranch hands also reported rumors about a tunnel from the tack room (Equipment Storage) on the lower level of the barn up to the ranch house,⁵⁴ but there has been no further evidence of this tunnel's existence.

On the east elevation, there are two small windows on the first floor, 110 and 111, which have visible infill below the sill (figure B2-4). In figure A3-4 from the late 1940s, these windows are their original full height; they were reduced in size some time between about 1945 and 1980. On the west elevation, the first floor door 101 has a wood lintel and infilled sides instead of the usual stone lintel and quoins; it is not original (figure B2-5). This door is located precariously close to door 203 above and settling of the stones above the door due to deflection of the wood lintel can be seen in a circa 1983 photograph (A3-5). Both of these changes might have been made in this episode, but this has not been verified.

⁵³ Buffon interview.

⁵⁴ Vernon Lawrence, interviewed by Lucy Smith, 12 September 2002.



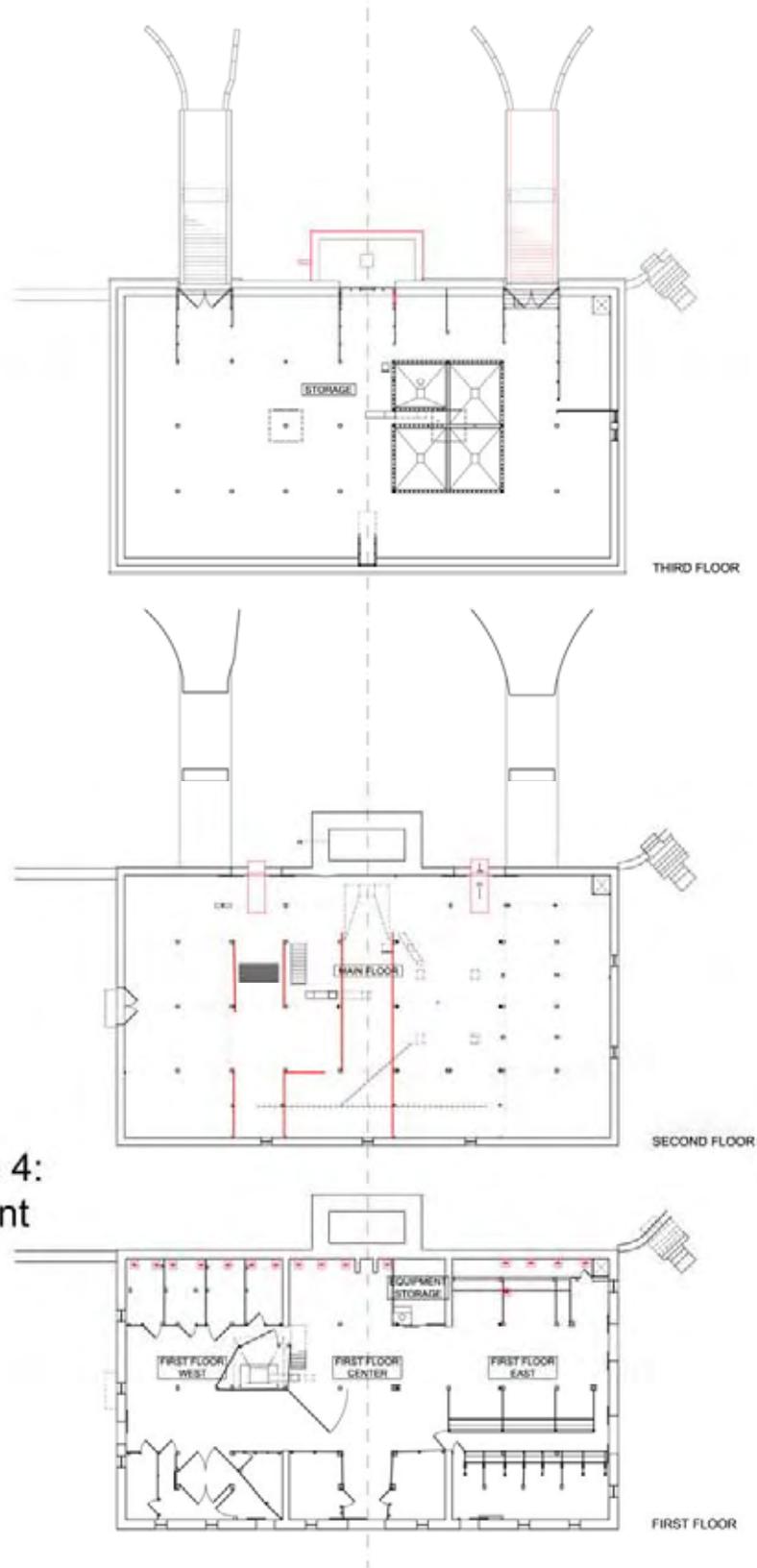
Figure B2-5: Barn, west elevation, door 101, QEA, 10/07/02.



Figure B2-6: Barn, north elevation, door 201, QEA, 10/09/02.

The two openings on the north elevation, 201 and 202, have beam lintels in photos circa 1983 (figure A3-6). It is probable that the two doorways were enlarged along with the other modifications that accommodated trucks backing in. The bottom nine quoin blocks are assumed original, while those above are of a different shape, texture, and tooling (figure B2-6). Interior knee braces of second floor columns near the doorways were also removed in a configuration that seems to accommodate large trucks. South of door 201, two columns were removed and steel beams added to support the third floor, while seven new columns were added in bays to the east. This also helped support the grain bins above.

**Barn Episode 4:
1970s- Present**



Episode 4: 1970s - present

During the rehabilitation that took place from July 1983 to July 1986, two layers of asphalt shingles appear to have been removed, some roof sheathing was replaced, and new asphalt shingles were installed (figure A3-10). Asphalt shingles covering the sides of the north dormers were stripped off and replaced with wood shingles.

The inside and outside of the masonry walls were repointed. The windows were reglazed and recaulked, frames were painted, and weather stripping was added or replaced. Window 301 on the east elevation of the middle dormer, which is anachronistic, was probably replaced at this time. The barn doors and dormers were painted white.⁵⁵ The cistern was re-plastered, covering the previous cracks in the walls, and pipes were replaced (figure A3-7, A3-8 and A3-11).

By 1983, the east ramp had approximately 4"x 8" boards on edge on each side instead of railings. In the 1984 photograph, the western ramp has 3" thick board on the flat as edging on each side. Currently (2002), the eastern ramp is the only one in use, and has 2x boards on the flat as edging.

In 1997, the first floor level was evaluated and repaired in order to increase its load rating for visitors. A beam and post system was installed along the north wall at the first floor level to support the north side of the second floor. Plywood was overlaid in certain areas on the second floor,⁵⁶ the railing at door 203 was added, and some interior partitions were erected.

In October 2002, the barn roof was again re-shingled in asphalt composition shingles, and some of the roof sheathing was replaced.

⁵⁵ Burtis, "Addendum," 4-5.

⁵⁶ Michael L. Schmidt, letter to Barbara Zurhellen, "Final Inspection of Repairs and Floor Load Rating, Historic Barn at Z Bar Ranch," 31 August 1997, 1-2.

3. Lower Fox Creek Schoolhouse

Episode 1: 1882 – 1930

The schoolhouse was built in 1882, approximately half a mile north of the Spring Hill ranch house. The land was donated by Stephen Jones, with the requirement that it would return to the ranch if the school ceased to operate. The schoolhouse is a one-story structure of native coursed rubble limestone, with a gable roof, chimney, and belfry. A stone medallion on the east gabled wall has the inscription “MAY 1882.” The corners and fenestrations have square-cut, dressed quoins. There are two doors in the east wall, one each for boys and girls, and seven four-over-four, double-hung windows in varying walls. There was a coalhouse attached to the west wall, a cistern and a flagpole outside to the northeast, and two outhouses to the west, one each for boys and girls. The cistern and flagpole still exist, but the current outhouse is not one of the original ones. Stone steps led up to the schoolhouse from the old highway. Inside, there was a stove by the coalhouse.

The school was completed and the deed was recorded on June 14, 1882, but there was no teacher available until 1884. The first term began on September 1, 1884⁵⁷ with Dora Peer as the first teacher. The average enrollment was about five students. Marguerite (Erickson) Buffon went to school there from about 1917 to 1923, and taught there as the last teacher during the school year of 1929-30. On August 29, 1919, Chase County Leader reported that there had been a fire at Lower Fox Creek Schoolhouse as a result of a lighting strike. While the schoolhouse interior was being repaired, the students went to school in a vacant house.⁵⁸ Physical evidence of a hot fire was found in the crawlspace during Al O’Bright’s 1998 investigation of the subfloor and during floor replacement work in 2000. The evidence, consisting of deeply charred floor joist ends and melted window glass, indicated a hot fire. In 1923, a water pump was erected to the northeast of the school at the cistern.⁵⁹ In 1929-30, the school was heated by natural gas instead of coal.

Episode 2: 1930 – 1940s

In 1930 the school closed for lack of students, and the property reverted to the ranch and was used for hay storage. In the 1930s, there were sheep in the schoolyard, kept in an old coal shed within the yard at night.

A hired man lived in the schoolhouse, and divided the house into four rooms. At some time up to four ranch hands may have lived there.

Episode 3: 1940s – circa 1970

⁵⁷ Rothman & Associates, *Historic Resource Study*, 165.

⁵⁸ Vera Ellerman Rodecap, *The Country Schoolteacher – A Kansas Legacy* (Holten, Kansas: Bell Graphics, Feb 1995), 36.

⁵⁹ National Park Service, “LCS Team Visit to Tall Grass Prairie: Field Notes and Descriptions,” November 1997, 6.

When Highway 177 was widened in 1956,⁶⁰ the road to the schoolhouse was relocated to go up the hill south of the schoolhouse, as opposed to up the hill to the east.

The schoolhouse roof blew off twice in the 1940s; once half the roof blew off, and the second time the entire roof blew off across the phone line. After that, it was replaced with sheet metal.⁶¹ In a photograph from 1972, the gable pitch has been lowered roughly eight courses (compare figures A4-1 and A4-3). In figure A4-3 the roof is clad in tin and the belfry has been removed.

From 1968-1972, citizens from 14 Garden Clubs in the Mid-East District of Kansas restored the school. They replaced the windows, installed two new doors matching the original, painted exterior trim, installed intruder wire over the windows and locks for the doors, and brought back the original stone steps.

Episode 4: Circa 1968 – present

The roof and ceiling were replaced and the chimney removed. The belfry was reconstructed in 1972, but does not match the photographs of the original belfry (figure A4-1), taken prior to its destruction by fire in 1919.⁶²

Also in 1972, the current flagpole with a stone monument was erected in honor of the restoration contributions of the Peterson family.⁶³ The Garden Clubs may also have constructed the current privy, which has an anachronistic concrete base. In 1998, the National Park Service replaced the roofing.

In 2001, the Park Trust renovated the schoolhouse together with a NPS preservation team. All of the exterior walls were repointed. The four-over-four double-hung windows were reglazed and repainted. The upper sash of the west window in the north elevation was replaced to match the original window profiles. The horizontal muntin in the upper sash of the center window, north elevation, was also replaced, as was the nonconforming bottom rail in the lower sash. Steps were installed by the south door on the east side. The floor was entirely replaced. The wood moldings were repainted, and the lower half of the south door was repaired.

4. Outhouse

Episode 1: 1882 – 1994

The construction of the ranch house outhouse was similar to that of the curing room, an unusual and elaborate shape for an outhouse, given that most outhouses in those days were made of wood in order to be easily removed and cleaned out. The outhouse is a cubic building located northwest of the ranch house and constructed of rusticated coursed ashlar limestone, with a wood-shingled pyramidal hip roof and a vented cupola. There

⁶⁰ Bahr Vermeer & Haecker Architects, *Cultural Landscape Report*, 2-71.

⁶¹ "TAPR Notes," 8, 11.

⁶² *Chase Country Leader – News*, 1972.

⁶³ National Park Service, "LCS Team," 6.

are four-over-four, double-hung windows on the east and west walls, and a door to the south. Inside are two seats for adults and a lower seat for children. No indication of a clean-out access was found during architectural investigations. It may have had a deep pit but further archeological investigation would be necessary to make this determination.

During the rehabilitation of the ranch that took place from July 1983 to July 1986, the roof was reshingled, a new cupola was built to replace the existing cupola, which was in poor condition, and the door was rebuilt and painted.⁶⁴ Compared to the 1887 lithograph (figure A1-2), the east side of the outhouse still looks the same.

Episode 2: 1994 - present

In 1994, the ranch was purchased by the National Park Trust, and was no longer a working ranch. From then on, it is assumed, the outhouse was no longer used for its original purpose.

5. Icehouse and Cistern

Episode 1: Circa 1881 – 1930s

The icehouse is also similar to both curing room and outhouse in that it is a limestone structure with a wood-shingled pyramidal hip roof with a cupola. The walls are of coursed rubble limestone with square-cut dressed quoins at the corners. The cistern is set back into the hillside, with a sod-covered roof, to the east of the icehouse. Only the east cistern stone wall is visible. The original door opening was located in the north wall. During investigation, it was found that the current window opening on the north elevation originally went all the way to the ground.

The 1887 lithograph (figure A6-1), shows the east side of the icehouse and cistern. Apart from the cupola and a wooden dormer on the north side of the icehouse roof, both of which are missing today, the two buildings still look the same. In the Benninghoven photographs from circa 1935, the icehouse does not have a cupola. It is unknown when it or the dormer was removed, and why.

Ice houses of the time were typically loaded from the bottom up through an opening that could be blocked with horizontal heavy boards as the ice load pile grew. By the time this house was nearly filled headroom was required near the roof, possibly precipitating the cupola seen in the photo as a means of entry. To lift ice blocks to that height a ramp, conveyor or block and tackle was required. The upsloping grade level at the north face of the building may have been an advantage in lifting the ice into the building. Ice was typically taken from ponds and lakes, not streams and rivers, as ice tended to be thicker and more firm from static water, and the removal operation was less hazardous.⁶⁵

⁶⁴ Burtis, "Certification Application," 12-13; Burtis, "Addendum," 6.

⁶⁵ O'Bright, Al and Marolf, Kristen R, *The Farm on the Gravois*, Historic Structures Report prepared for Ulysses S. Grant National Historic Site, St. Louis, MO, 1999.

Episode 2: 1930s – present

Sometime during their tenure, the Benninghovens converted the icehouse to a work shed, and sometime between 1930s-1970, Fred Howard cut a new door opening in the south wall.⁶⁶ The door opening was crudely cut and dark gray mortar patches can be seen inside the icehouse on both sides of the south door (figure B5-1). At this time, it is likely that they filled in the original door opening in the north wall. The shape of the original opening can still be seen. (figure B5-2).



Figure B5-1: Icehouse, south elevation, interior, new door, QEA, 10/08/02.



Figure B5-2: Icehouse, north elevation, exterior, location of original door, QEA, 10/08/02.

During the rehabilitation that took place from July 1983 to July 1986, the icehouse roof was reshingled, the walls were repointed, and the doors were repaired and repainted. The window was reglazed and recaulked, frames were painted white, and weather stripping was added or replaced.⁶⁷ On September 19-20, 1996, the cistern was cleaned out and cracks in its upper half were caulked.⁶⁸ The NPS again cleaned out and repaired the cistern in 2000.

⁶⁶ Bahr Vermeer & Haecker Architects, *Cultural Landscape Report*, 2-117.

⁶⁷ Burtis, "Certification Application," 15-17; Burtis, "Addendum," 7.

⁶⁸ William B. Kozlowski, Memorandum, "Trip Report: Z-Bar Ranch, Cottonwood Falls, KS." 12 November 1996, 1.

6. Carriage House

Episode 1: Circa 1910s – present

The carriage house is set into the hillside next to, but at a 45 degree angle from, the poultry house, connected by a low retaining wall. The roof is gabled, its walls are made of rusticated coursed ashlar limestone with gables of horizontal wood siding. There are two pairs of wooden garage doors on the southeast façade, one side-hinged and one overhead.

The carriage house, or “stone garage” as it is referred to in the National Historic Landmark nomination form, was not listed as a contributing building, since its construction date is unknown.⁶⁹ Neither the carriage house nor the poultry house is shown in the 1883 lithograph (figure A1-1). The carriage house is shown neither in the 1887 lithograph (figure B1-3) nor in the 1908 postcard (figure A1-3).

The carriage house is not visible in a photograph until the 1930s. In the Benninghoven photograph from circa 1935 (figure A7-1), the carriage house looks as it does today, although the southeast gable window has four panes, not eight as there are presently. Behind the northwest corner of the carriage house another small wooded structure can be seen in the photograph that was removed by 1983.

During the rehabilitation that took place from July 1983 to July 1986, the carriage house roof was reshingled, the walls were repointed, and the doors were rebuilt and painted.⁷⁰ The floor was paved with concrete silo stones salvaged after the demolition of one of the two silos south of the barn.

7. Poultry House

Episode 1: Circa 1887 – present

The poultry house is not present in the 1883 lithograph (figure A1-1), but is depicted in the 1887 lithograph (figure B1-3). It is also present in a Benninghoven photograph from circa 1935, including a sod roof as there is today (figure A7-1).

The poultry house was constructed of coursed rubble limestone with a barrel vaulted, sod-covered, stone roof. Corners and fenestrations have square-cut, bush-hammered quoins. This barrel-vault roof was not typical for a poultry house, and poses the question whether this building originally was used for some other purpose, such as wine cellar or food storage.⁷¹ There were two skylights or vents in the roof. The floor in the main portion of the poultry house is compacted earth. On the east side is an anteroom or storage room, also accessible from the exterior; its floor is dirt with quite a bit of debris and rubble. A window on the east end of the poultry house provides interior access to the

⁶⁹ Wolfenbarger and Nimz, “Landmark Nomination,” 11.

⁷⁰ Burtis, “Certification Application,” 14-15; Burtis, “Addendum,” 6.

⁷¹ National Park Service, “LCS Team Visit,” 4.

anteroom. This window has been boarded up with wood on the anteroom side; one of the boards is painted red.

On its west side, it is currently connected with a scratch house and two equipment sheds, all set into a south-facing hillside. The shed framing was built at a later date, but the stone retaining wall banking the hill at the north may date to the construction of the poultry house.

Hazel Slabaugh was said to have kept chickens in this building during their tenure (1943/44-1968),⁷² but Erma Slabaugh recalled being told that cowboys slept under the two skylights in the poultry house.⁷³ She even remembered a small wooden chicken house west of the ranch house, which was heated with natural gas in order to keep the chickens warm.⁷⁴ No evidence of a heater or flue has been found. According to Marvin Slabaugh, the poultry house was a cowboy bunkhouse during the Second World War, and was later used as a poultry house.⁷⁵

In the 1980s, the poultry house was referred to as the Utility Building by the Z Bar Cattle Company. During the rehabilitation that took place from July 1983 to July 1986, the walls were repointed and the door was repaired and repainted. The windows were reglazed and the frames were painted white.⁷⁶ The skylights are currently covered up. It is unknown at what date they were covered.

The gas pump adjacent to this building was put in sometime after 1947. It might have been owned by the fuel company, and provided as a service.⁷⁷ It is not visible in the circa 1935 photograph.

⁷² "TAPR Notes," 7.

⁷³ Erma Slabaugh, interview.

⁷⁴ Bahr Vermeer & Haecker Architects, *Cultural Landscape Report*, 2-111.

⁷⁵ Marvin Slabaugh, interview.

⁷⁶ Burtis, "Certification Application," 17-19; Burtis, "Addendum," 7-8.

⁷⁷ "TAPR Notes," 7.

Tallgrass Prairie National Preserve
Historic Structures Report

C: Existing Conditions

General

This section will describe in detail the present conditions of eight of the structures located within the Tallgrass Prairie National Preserve. Recommendations for each structure are included in *Part 2: E. Treatment and Alternatives* of this report.

Survey Methods and Analytic Standards

The original architectural existing conditions survey was performed in July of 1998, by Quinn Evans | Architects. The original structural existing conditions survey was also done in July of 1998 by Fitzpatrick Structural Engineering, P.C., and the National Park Service. The result of these surveys was published in the Tallgrass Prairie National Preserve Historic Structure Conditions Report of August 2000.

The architectural survey was updated by Quinn Evans | Architects during site visits in January, March, and October of 2002, and February of 2003. The structural survey was updated by Fitzpatrick Structural Engineering, P.C. during site visits in January and April of 2002, and February of 2003. In February of 2003, Affiliated Engineers Incorporated surveyed plumbing systems, heating and cooling systems, electrical and lighting systems, and communications systems. At the same time, Gage Babcock & Associates surveyed life safety and security systems. LCA Associates studied historic finishes and Bluewater Studio performed a paint analysis.

Most of the buildings' architectural and structural systems were easily accessible. For the structural systems that were covered with architectural finishes only selected destructive access was performed on the ranch house. Conditions of the buildings were noted during the inspections and photographs were taken. Some of the photographs are included within the existing conditions section of this report. The architectural survey made use of previous research and reference literature, as well as the existing architectural survey provided by the National Park Service and documented advisory literature.

1. The Spring Hill Ranch Site

Site Context

The Spring Hill Ranch property was designated a National Historic Landmark (NHL) on 18 February 1997. The NHL period of significance is 1878-1904, which is based on the property's ability to represent the NHL themes of westward expansion, peopling places, developing the American economy, and transforming the environment. In 1878 both Jones and Lantry were adjacent property owners and living on their lands; in 1904 Henry Lantry died and the land began to be dissembled.¹ The existing landscape continues to represent the NHL period of significance. Many character-defining features survive from the period of significance, and land use activities associated with the period are represented by extant resources that retain integrity. The existing landscape also

¹ Bahr Vermeer & Haecker Architects, *Cultural Landscape Report*, 3-2.

represents a local period of significance spanning from the earliest documented prehistoric human uses to 1970 when Fred Howard, Sr., who had managed the ranch property since 1935, died.²

Historic resources at the site include the ranch house, springhouse/curing room, barn, Lower Fox Creek Schoolhouse, outhouse, icehouse/cistern, carriage house, poultry house, former crop fields, cultivated grass pastures, areas of native tallgrass, corrals, roads, fences, gates, stone walls, fountain, topographic features, views of the surrounding Flint Hills, vegetation, and other small scale features. This HSR will address *only* site issues that relate to the structures. A Part II Cultural Landscape Report is being prepared separately addressing design and management recommendations for the entire historic landscape at the Spring Hill/Z Bar Ranch. Since the Part II CLR will provide new information, the landscape treatment alternatives provided herein may conflict with those set forth in the Part II CLR. Should that occur, reevaluation of the current recommendations will be necessary.

The Spring Hill/Z Bar Ranch site comprises a cluster of several agricultural and domestic buildings situated on an east and south facing slope of the Flint Hills. The design of the site reflects a desire to present an impressive public image as well as create a smoothly functioning ranch operation. The ranch operation required that utilitarian buildings be oriented with specific relationships to the natural landscape (in particular the topography) and to other buildings, roads, corrals, and paths. The public image was addressed by constructing an impressive residence and associated formal landscape that face the main public approach and dominate views from the road.

Currently, the main vehicular access route is a gravel road located to the south of the tunnel and formally landscaped terraces, and to the north of the barn. This road travels west from Kansas State Highway 177 and quickly climbs a steep slope to approach the second floor levels of the ranch house and barn. At the top of the slope the road splits and runs north toward the ranch house or continues west toward the barn and other outbuildings. The main visitor parking area is located at the bottom of the hill on the south side of the access road, directly west of the highway. A turn-around loop near the east side of the barn provides overflow parking and access for busses. Parking for persons with handicaps is provided at the top of the hill along the south side of the gravel road close to the barn. The route between the parking area and barn does not meet Universal Federal Accessibility Standards.

2. Spring Hill Ranch House, Springhouse/Curing Room

Site Context and Drainage

The Spring Hill Ranch House is situated on an east facing slope on the western side of Kansas State Highway 177 (figure C2-1). The house is sited well above the road, and a series of formally designed ornamental stone retaining walls and turf terraces step up from the elevation of the historic road grade to the building. The topography continues to

² Bahr Vermeer & Haecker Architects, *Cultural Landscape Report*, 3-2.

climb adjacent to the building, so that the front (first floor) entry is approx. 9'-7-3/4" below the back (second floor entry - located on the west side of the building). A series of stone steps and retaining walls adjacent to the building provide exterior pedestrian access. Directly west of the building is a level area beyond which a steep slope rises to the top of the hill, where the icehouse/cistern is located.



Figure C2-1: Spring Hill Ranch House, east elevation, QEA, 1998.

A steep hill on the west side of the ranch house channels surface water and ground water toward the building and adds to the moisture problems in the building. There is a level area between the hill and the west side of the building. Water is directed east towards the road but is stopped by the building. Thus, the water seeks its course through the structure and subsurface support materials, traveling through the west wall of the root cellar and tunnel, below the main stairway (as observed through the

access panel in the main stairway), below the front portion of the ranch house, eventually daylighting through the joints in the stone steps of the center porch. This would readily explain the sunken stone slabs of the original main entrance porch where supporting material may have been washed away.

Trenches that were excavated in 2003, adjacent to the ranch house, for construction of a new water system were examined by Robert S. Sawin of the Kansas Geological Survey in conjunction with field work to develop a geologic map for the ranch house and Lower Fox Creek School areas. According to Mr. Sawin's observations contained in his report entitled, "Bedrock Associated with the ranch house at the Tallgrass Prairie National Preserve, Chase County, Kansas" (Appendix H);

Alternating layers of shale and limestone that are characteristic of this area provide conditions for the subsurface movement of water. The fractures (joints) in the limestones contain water at various times, depending on the season and precipitation. These fractures are widened through time by flowing water. The underlying shales are relatively impermeable and therefore stop the downward movement of water, and the limestones serve as conduits to move water laterally. Where these water-bearing limestones intersect the hillside [or foundation walls], they can form springs or seeps.

Concrete slabs were historically poured on top of the root cellar and tunnel roofs in order to prevent water leaks from both surface and subsurface water flow. The concrete cap at the root cellar is crowned to drain, but with major cracks and areas of spalling. Inside the root cellar, there is evidence of leakage (figure C2-2). The skylights within it are of cast

iron with round colored glass lights. Several glass elements are missing and are replaced with rubber "stoppers." Inside the tunnel, there are cracks and evidence of leakage (figure C2-3).



Figure C2-2: Leakage at root cellar wall and ceiling, QEA, 01/23/02.

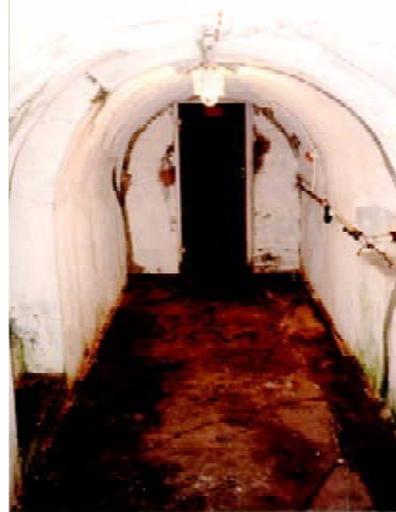


Figure C2-3: Leakage at tunnel walls and ceiling, QEA, 01/23/02.

There are currently only two downspouts directing the water from the roof down to the ground. These downspouts are not diverting the water away from the building.



Figure C2-4: Northeast downspout draining onto steps, QEA, 01/22/02.

The existing downspout #1 is located at the northeastern corner of the ranch house. The downspout may have tied into an underground drain that may have historically emptied into the cistern that is located to the north of the ranch house. The cistern is currently filled with earth, and the water from the downspout is flowing onto the steps on the north side of the house (figure C2-4). Stone steps at the northeast corner of the ranch house are decaying and subsiding as a result of a substantial amount of water being directed over them

from the downspout at this location. Some building stone deterioration in that location is the result of this downspout detailing.

The existing downspout #2 is located at the southwest corner of the ranch house rear porch. Water exits the pipe at the base of the building, draining the water close to the foundation.

Exterior Envelope

The following is an excerpt from the August 2000 *Historic Structure Condition Report* published by Quinn Evans | Architects. The discussion has been updated to reflect conditions observed in the 2002 site investigations.

The Spring Hill Ranch House is a three-story limestone structure set into a hillside, with the third story formed by a mansard roof. The ranch house faces east. There are three visible stories and three projecting pavilions on the east façade. A one-story porch runs the width of the east side. The rear (west) façade is only two stories above ground, and has a west wing and an enclosed porch. The ranch house is connected with a tunnel to a springhouse/curing room at the north side. The walls of these structures are rusticated coursed ashlar native limestone, with square-cut, bush-hammered quoins at the corners.

East Elevation

The north and south end pavilions project at 45-degree angles from the façade. They each incorporate a tripartite bay window at the lower level with a metal-paneled balustrade above the bay window. The main body of the east elevation has a center pavilion and two flanking bays. The pavilion contains the main door at grade and window above. There are two windows in each of the flanking bays, one each at the first and second floors.



Figure C2-5: Ranch house, east elevation, north pavilion bay window, QEA, 07/07/98.



Figure C2-6: Ranch house, north pavilion, window 108, repointed mortar, QEA, 07/07/98.

North Pavilion - Walls: The first floor portion of the north pavilion is shown in figure C2-5. The lower stone section shows staining, particularly around the base outside of the porch covering. The southeast corner of the bay window seems to have settled, and then tipped forward from the cornice to the window, and the water table is not level. The joint between the main body of the house and the bay window has widened considerably, more so at the top than the bottom. All of the stones in this area have been repointed with gray mortar (figure C2-6) but movement is still evident from the presence of new mortar cracks. Slight misalignment of the repaired mortar also indicates that the keystones above the windows have slipped. There is organic growth on the arch stones of the center window 107 because of the leaking roof overhead. At the north window 108, the stone west of the window sill is cracked.

At the second floor level, the stonework above window 205 is in good condition but stained. Approximately 50 percent of the joints have been repointed. Again, based on the size of the head joint, the keystone above this window has experienced movement. The paneled metal balustrade on top of the bay window has applied patches and a missing rosette on its north face.

North Pavilion - Windows: The sill stone of window 106 is cracked at the quarter point to the south, and the stone has shifted outward. (figure C2-7). The sash of window 108 needs glazing repair but is otherwise in good condition.



Figure C2-7: Ranch house, east elevation, north pavilion, sill of window 106, QEA, 07/08/98.

The second floor window 205 is weathered and has an opaque filler panel in the top sash. The north jamb has hardware cutouts that have been painted over.

The dormer window 304 at the top of the pavilion is a two-over-two double-hung sash, needs paint, and does not have a storm window in place. It does, however, have an air conditioning unit in its lower half.

Center Pavilion and Flanking Bays - Walls: At the first floor, the limestone is in good condition with minimal staining at the top of the pilasters on either side of the main door 101 and along the base stone of the porch. At the north window 105, there is further staining and the sill stone has cracked. The mortar joints are mostly original and in fair condition with some dark staining. Selective repointing has occurred, particularly above and below windows. The arch keystones have been repointed also. There is a bad patch at the joint between the body and the south end of the porch framing. The base of the south pilaster is damaged at the north and south corners.

At the second floor, the stone is in good condition with gray staining. The north joint where the center pavilion meets the body of the house has a dark vertical stain. The upper water table (between the first and second floors) is in good condition, although the vertical joints need repointing. Most of the mortar in this area appears to be original and

in fair condition. As at the first floor, gray mortar has been used to repoint above and below the windows. The keystones also have been repointed.

At the third floor, there is spalling at the bracket-bearing stones of the projecting cap stones on the north and south sides of the center pavilion.

Center Pavilion and Flanking Bays - Windows: Overall, the five windows in the center pavilion and flanking bays are in good condition. This includes the frame, sash, and storm. The north window 204 at the second floor requires selective glazing and its sill stone is cracked at the south jamb. Window 203 of the center pavilion is slightly weathered, but both this window and the storm window are in good condition.

Center Pavilion and Flanking Bays - Doors: The main door 101 and frame are in very good condition with minor deterioration at the sill. The sill stone is cracked through, north of the center line.

South Pavilion - Walls: At the first floor the stone is in good condition. The mortar joints have been selectively repointed, including the keystones. At the northeast panel of the bay window, the first course of stone up from the base has horizontal and vertical cracking adjacent to the jamb. Approximately 50% of the mortar joints in the center panel have been repointed with gray mortar. The lower face of the sill block of window 101 is fractured between brackets (figure C2-8). The tooled corner of the south jamb stone to the west of the window has broken off at the sill block. There is a damaged patch north of the sill block of window 102.



Figure C2-8: Ranch house, east elevation, south pavilion, base of window 101, QEA, 07/08/98.

The water table at the south pavilion has enlarged vertical mortar joints. The stone is in good condition, but the lower courses have biological growth and stains from backsplash. The joint between the pavilion and the south elevation is widening as it moves down the wall.

The stone at the second floor of the south pavilion is also in good condition. Most of the mortar joints at this level are original with some repointing. There is evidence of movement at the keystone from the slight misalignment of the repair mortar. The quoins blocks at the north edge of the pavilion

are stained. There is a crack between the pavilion and the remainder of the east elevation, similar to the one at the north pavilion but not as severe. The paneled metal balustrade railing atop the bay window is missing two rosettes, but is in fair-to-good condition otherwise.

South Pavilion - Windows: South pavilion dormer window 301 has an air conditioning unit in the lower half of the window. The window and sash are in good condition, as are the others in the south pavilion.

Porch and Steps: The porch, which extends the full width of the east elevation, is composed of three sections. The center section projects forward with the center pavilion, and its roof is higher than the sections to the north and south. The center section roof is supported on a pair of pilasters flanking the entry door and a pair of stone columns. The stone columns are set forward (to the east) of the line formed by three wood columns supporting each of the other two porch roof sections. Bases of the boxed wooden posts supporting porch wing roofs are set into concrete plinths. Wooden plinths probably were replaced by concrete during the mid-twentieth century after the wood decayed. Bases of the wood posts in contact with the concrete plinths are deteriorated. All six of the wooden columns have damaged stone collars into which the wood seats (figure C2-9).



Figure C2-9: Typical stone plinth, QEA, 07/08/98.



Figure C2-10: Ranch house, east elevation, center porch section. South column base at entry stair, QEA, 07/08/98.

The steps and railings are of stone. At both the north and south sections, the floor is of poured concrete with a broom finish. The floor of the center section is large stone paving blocks. The differences in the construction of the porch sections suggest that only the center section is original and the other sections were added at a later point in time.

The north section of the porch shows organic growth on both sides of the stone rail. The stone and mortar are tooled in the same style as the house, but the mortar color here is light gray. The first and third wood columns as counted from the north are replacement box columns, but are already warping and deteriorating at the base due to lack of ventilation of the inside of the “box”. The original columns were made of solid wood. There is a diagonal crack halfway into the joint at the center column, beginning high on the north and stepping down to grade on the south end. The wood trim has medium weathering and needs to be repainted.

A severely deteriorated base stone at the north stone column of the center porch was replaced in kind in 2000, along with the repointing of all the column joints. It was mortared over existing foundation stones. The south column base, however, is chipped

and the south column has a large spall in the southeast corner (figure C2-10). The stone floor has a pitted surface with cracks and spalling and the individual stones are no longer aligned with each other. The stone treads are in good condition, but the top of the lower tread has spalled and been patched.

At the south porch section, the center column is deteriorated at the southeast corner and its east and south wooden flower medallions are damaged.

South Elevation



Figure C2-11: Water table condition, QEA, 07/07/98.

Walls: The stone is in good condition overall along the course of the south elevation. In the region above the water table there are isolated areas in need of re pointing due to the fact that the original mortar has eroded. The water table joints also need repointing. There is a horizontal fracture in the top sloped edge of the water table at the intersection with the bay window. The stone below the water table is in a condition similar to that above. The joint between the stone stairs and the wall is in very poor condition. A main concern is that the mortar joint between the bay window

and the south elevation wall is completely open with a large crack. Gray mortar has been applied to this area from the water table down to the first floor. The south elevation of the west wing of the house is limestone in good condition, with selected areas in need of repointing. The water table at this area is in poor condition and its top is fractured (figure C2-11).

Rear Porch: There is an enclosed porch at the southwest corner of the house (figures C2-12, C2-13). The porch is constructed of wood, which is in overall good condition although weathered. The entire porch is settling at the west end. No major deterioration is apparent except at the skirt board, which is heavily weathered at the bottom and ends. The porch foundation stone is in poor condition, with numerous cracks and poor mortar joints. It appears that the stone is pushing outward at the base. The stone treads of the original office steps have heavy organic growth and the west stringer is misaligned and damaged. The entire stair is settled at the east end. The aluminum storm windows are in good condition, but are anachronistic.



Figure C2-12: South elevation of porch. The west wing is visible behind the porch. The main body of the house is to the right. QEA, 07/07/98.



Figure C2-13: Ranch house, south and west elevations of rear porch and west wing. QEA, 07/07/98.



Figure C2-14: West elevation, south window keystone. QEA, 07/07/98.

West Elevation

Rear Porch: The porch section of the west elevation is in good condition, with some weathering on the main body and more extensive weathering on the skirt board, including a hole to the south side of the skirt board. The floor boards at doorway 207 are exceptionally worn at the ends. The stone treads remain sound and level and the joint between the stone steps and the wall has been repointed. The foundation stones for the porch are cracked substantially as well as displaced. It should also be noted that the quoins stone at the walkway has significant organic growth.

The inner two wythes of the southwest corner of the rear porch foundation wall have partially collapsed causing the continued movement visible from the exterior. A relatively contemporary concrete foundation in the center of the west foundation wall, at the location of a circa 1940s cistern pump, is supporting much of the weight of the porch, reducing the severity of this situation. This condition, however, should be addressed in order to stabilize the wall until a longer-term solution can be under-taken.

Walls: The west elevation of the west wing is in overall good condition. The stone and mortar are in good condition and have been repointed. The water table is rough around the root cellar cap and the joint at that location has been repaired. It is obvious that work has been done in the mortar joints around all three lower windows. Despite this fact, all three keystones have dropped noticeably, especially the outer two (figure C2-14). When compared to the average mortar joint dimension, the joints above the keystone show a

wider joint dimension, and, although the joints had been repointed several times, they show recent cracks, which is an indication of continuous movement.

Windows: The window frames at grade are one-over-one, double-hung with arched-top closure panels. The dormer windows are two-over-two, double-hung. There is an air conditioning unit in the lower part of the south dormer window 306 and a main electrical feed running through the south jamb of the north dormer window 305. All windows are weathered and in need of reconditioning and reglazing.



Figure C2-15: Ranch house, north elevation. The curing room is partially visible at the extreme left, QEA 07/07/98.

North Elevation

Walls: The north elevation is shown in figure C2-15. The stone above the water table shows evidence of dark staining from organic growth on the lower half of the wall. The mortar joints have been repointed with gray mortar and the remaining original mortar is in good condition.

Door: There are no windows on the north elevation, but there is a doorway 206A which leads out to the curing room. The keystone over the doorway has dropped significantly despite the fact that the entire

area has been repointed. The western quoins have anchor holes similar to those noticed on the west elevation. The doors are slightly weathered and in need of new paint and the threshold has heavy organic growth. Also, the steps along the north façade have been damaged by water flowing out of a downspout from the roof.

Basement Electrical Panel

At the time of the December 1998 survey, progressive deterioration at the new installed electrical panels was noticed. The basement electrical panel, which was installed in 1997, has water dripping from the main feeder conduit, creating a hazardous condition. Investigation of the exterior service point revealed the following conditions:

- The concrete pad surrounding the service feed at the northwest corner of the house is cracked in several places, allowing the water to penetrate the openings leading to the basement and the holes for the grounding rod and connections. While the Park has tried to repair this condition, it will be difficult to ensure that the repairs are watertight, as evidenced by the continuation of the problem.
- The gaps between the pad and the stone foundation are open which further allows water to penetrate the ground and possibly work its way into the basement.

Cornices

All cornices are fabricated of 24 gauge galvanized steel. Rosettes are of stamped sheet zinc. While most lapped joints are fastened with cut nails, details and some joints are soldered.

At the north pavilion of the east elevation, the upper and lower cornices are in fair-to-good condition with some open joints between the sheet metal parts and around the cornice perimeters. The lower cornice is stained and rusted. Most of the upper and lower horizontal dentil joints and some of the vertical ones are open, while the remainder has been repointed with a gray mortar. There are gaps at the brackets.

At the center pavilion and flanking bays of the east elevations, there is a split in the northeast corner of the upper cornice, in addition to the splits in the mitered joints of the soffit. The majority of the top and bottom joints in the dentil stones are open and large gaps are present at the brackets.

At the south pavilion of the east elevations, the finish on the lower cornice is stained, rusted, and the paint is peeling. In addition, the soffit is separating at the mitered corners.

At the front porch, the north porch metal cornice is in good condition, but the southeast corner of the cornice has a large hole at the miter joint. The south porch metal cornice has a dented southeast corner, the coping is gapped, and the miter is split. As a result, the return assembly is pulling away from the wall.

On the south elevation, at the third floor level, the metal cornice and coping are in good condition except for the lower cornice which is missing some attachments at its inside bracket. At the west wing, a patch is evident on the southwest lower cornice. Most of the joints between the two cornices and the dentils are open. At the joint where this wing meets the main house, there is a large opening where the flashing penetrates the stone.



Figure C2-16: Open joint between dentils and brick, QEA, 07/07/98.

On the west elevation, the cornices are in good condition and appear to be intact although the lower cornice is stained and rusted. Nevertheless, the majority of the joints between the upper cornice, lower cornice, and stone dentils are open. The dentil stones in this area are in better condition than those previously mentioned, but of similar description and are quite stained. Vertical joints between the dentils, as well as a joint between the dentils and the first course, are open (figure C2-16). Mud wasps have created many nests within the dentil stone design around the entire house.



Figure C2-17: Ranch house, north elevation at pavilion, cracking at cornice, QEA, 07/07/98.

On the north elevation, the lower cornice has a split at the northwest corner miter and one at the northeast corner seam. The eastern bracket base is kicked out and a bird nest is located behind it (figure C2-17). The horizontal dentil joints are mostly open, although the vertical joints have been repointed with a gray mortar.

Roof – Ranch House

The third story of the Spring Hill Ranch House is formed by a mansard roof. The visible portion of the mansard roof is standing-seam metal, painted red, and penetrated by numerous gable-roofed dormers. The red paint is peeling, but the base metal is in good condition.

The flat, uppermost portion of the ranch house roof is a fully adhered EPDM roofing system installed in September 2001 by the NPS. The tin metal edge is painted and in good condition with some missing joint compound. There is a depression in the roof on the north side of the north chimney. This location and the area west of the skylight retain standing water and ice as observed on January 23, 2002 (figure C2-18). Evidence shows that frequent leaking has occurred through to the ceiling of hall 301 (figure C2-19). The leakage seems to have been stopped by the latest roofing membrane replacement, but it is still recommended to continue monitoring the roof for leaks.



Figure C2-18: Standing water and ice on roof, QEA, 01/23/02



Figure C2-19: Water leakage at hall 301 ceiling, QEA, 02/25/02.

The main body of the east elevation has a center and two flanking pavilions. The upper roofs of these three bays are bitumen with asphalt aggregate on top and lightning terminals at the midpoints. Former terminal locations are also evident at the corners. Additionally, there is excess lightning cable hanging at the center of the main roof on the east elevation.

Both the north and south chimneys have double unlined flues; each flue constructed with brick and mortar in an 8 x 8 configuration, and topped with a limestone cap and bird screen. The north chimney is in relatively good condition with some erosion of the mortar joints visible. The north flue services the room 105 furnace and the room 305 heating unit. A pipe or conduit terminates about ten feet down the flue. The south flue services the room 203 heating unit and the room 104 vent stack. There is also a two-inch cast iron sewer standpipe that rises up within sixteen brick courses of the crown. The south chimney is in good condition and services the room 207 heating unit. The top few feet of both chimneys were rebuilt with Portland cement mortar sometime during the past century.

Roof – Porches & Bays

East Porch: The wooden roof sub-structure and sheet metal parapet of the center porch section were repaired by the National Park Service in September 2001. The roof of the center and flanking north and south porches are flat seam tin roofs, painted gray, and are in good condition.



Figure C2-20: Ranch house, south pavilion, bay window roof, QEA, 07/08/98.

The southeast corner of the north porch cornice has decayed box framing directly behind the decorative metal skin. Deterioration seems to be concentrated at this corner due to an ill-designed downspout leading from the center porch roof. The south porch corner is pulling away from the house.

Bay Windows: The two bay window roofs are flat seam tin roofs that are painted gray, with some of the paint beginning to peel, and are in good condition. The roof over the south bay window has flashing that goes up the wall one foot, and is crowned to drain in both directions, with scuppers at the ends (figure C2-20). The only apparent problem is a rear vertical railing piece that has pulled away from the south bay window roof. The roof at the north bay window is sloped to drain down the drain pipe for the northern portion of the main roof.

West Porch: The roof of the west porch is flat seam tin, painted gray and is in good condition with no internal signs of leaking.

Springhouse and Tunnel

This portion of the ranch house is primarily underground. tunnel 107 connects the west wing with springhouse 108 directly below curing room 208.



Figure C2-21: Tunnel, entrance 107, QEA, 07/07/98.

Based on the historic rendering of the ranch in the 1887 *Official State Atlas of Kansas*, it is assumed that the vertical portion of entrance 107 (figure C2-21) has been truncated. Presuming that the rendering is accurate, the entrance was depicted with a higher eave line and a pyramidal roof. The stone band surrounding the tower entrance 107, connecting with the south retaining wall, is also visible from the inside of the entrance. It is dressed and located below the parging. There is a joint in this stone band at the same point as the back of the tower footprint where the stone meets the tunnel arch stone/topping stone. The tower intersects the arch about half way from the top of the arch at the spring line. The primary cause of a major crack in the north and south walls of the opening area is moisture penetration.

The stone is in fair condition with a number of inappropriate patches utilized where it has spalled. Two of the stones have fissured from the bedding planes and one cornerstone has a broken corner. The south wall stone and joints are in poor condition with numerous patches and contain many stones that are spalling and fissured. All the stone is darkened considerably by organic growth.

The stone is in fair condition with a number of inappropriate patches utilized where it has



Figure C2-22: Tunnel ground plane, QEA, 07/07/98.

The steps are of formed concrete, which is spalled and cracked. The ground plane over the tunnel is also of concrete that is cracking due to the fact it has no expansion capability. The concrete slab is crowned to drain (figure C2-22) and is assumed to have originally been sod.

The Curing Room

The curing room (figure C2-23) is a detached, one-story limestone structure located north of the ranch house. It has a pyramidal roof with wood shingles and a cupola. Directly below the curing room is the springhouse discussed previously, but there is no internal connection between the two.



Figure C2-23: Curing room, south elevation, QEA, 07/07/98.



Figure C2-24: Curing room, interior, west door 208, QEA, 07/07/98.

Walls: With the exception of the ground-level course, the stone walls are generally in good condition. The north wall is in good condition. In the center of the east wall a few mortar joints have deteriorated in the lower courses. The south wall displays mortar in five different colors. The wall is in good to fair condition with some loose mortar and spalling. At the west elevation the lower courses are spalling on either side of door 208 and mortar is deteriorating.

There are several instances of cracking that have been repointed with pink mortar. One is a diagonal crack on the south wall, starting east of the center of the round opening and moving upwards to the west. The other instance is in the east lower corner of the north wall, where there are two cracked stones within the field, in the lower two courses of the wall. The east wall also has an infilled portion at the lower center, which may have been a vent opening in the past, as well as an abandoned meter at the wall base.

The mortar is mostly original overall, with almost half of the joints repointed with brown mortar using a different tool than was used on the original joints.

Door: The entry door 208, on the west elevation, is inset behind the face of the stone. The bottom corner of its south leaf is rotted away (figure C2-24). The hardware is six hinges in total (three per door) and is in good condition.

Steps: There are open joints between the top tread and the door sill. Silo tiles are bridging the gap poorly between grade and the first step.

Roof: The top shingles of the roof are loose and a few of them are split. The southwest corner of the ridge cap has pulled away from the anchor at the center line joint. Some loose nails are visible. The wood trim is in good condition although it is weathered and in need of repainting. Insect damage is apparent on the north, west, and south fascias.

Interior Finishes and Elements

First Floor



Figure C2-25: Ranch house, hall 101, east wall, and panels of front doors 101, QEA, 1998.



Figure C2-26: Ranch house, inside hall 101, west wall and stairs, QEA, 1998.

Hall 101

The hand-grained entry doors 101 in the east wall are shown in figure C2-25 while the west wall and stairs are shown in figure C2-26. All of the woodwork, including the floor boards and door frames, is in good condition. The stairs themselves show normal wear, though the top decorative element of the newel post is loose. The walls are all paper over plaster. There is some separation at the paper seams and wrinkling at the corners. The crown mouldings are in good condition. The flooring is narrow tongue and groove oak flooring in good condition over a diagonal sub-floor and the original pine flooring. When a floor vent was removed during physical investigation, the pine flooring showed evidence of termite damage.

South Parlor 102

The south parlor contains a fireplace (figure C2-27) and a bay window (figure C2-28) that is part of the south pavilion. The floor in this room is oak tongue-and-groove over the original pine boards. There are capped steam pipes in the floor at the center of the east wall. The plaster walls are in relatively good shape. The lower foot of the east wall has minor cracking and peeling, evidence of moisture infiltration. There is also a vertical crack in the northeast and northwest corners. Another vertical crack is present north of the fireplace, just off the corner, all the way to the floor. The woodwork and crown moulding are in good condition, as is the ceiling, which shows only typical cracking in the plaster. The flooring is narrow tongue and groove oak flooring in good condition over a diagonal sub-floor and the original pine flooring, speculated to be termite damaged.



Figure C2-27: Ranch house, south parlor 102, center of west wall. QEA 1998.



Figure C2-28: Ranch house, south parlor 102, east side, QEA, 1998.

North Parlor 103

The floor in the north parlor is oak flooring in good condition over the original pine boards, speculated to be termite damaged. Some of the oak boards south of the fireplace are warping. There are three capped steam pipes centered on the east wall.



Figure C2-29: Ranch house, bay window in north parlor 103, QEA, 07/08/98. There is no crown molding at the window heads, unlike the bay window in south parlor 102 (Figure C1-31).



Figure C2-30: Ranch house, north parlor 103, fireplace at center of west wall, QEA 1998.

The plaster walls have numerous cracks but remain in good condition. This is especially the case at the base and arch of the angled wall framing the bay window (figure C2-29) which is part of the north pavilion. The bay window is missing the crown moulding that is above the window heads in the north parlor. The jamb of the south window 106 within the bay is damaged. The crown moulding throughout the room has some peeling paint. The moulding also has cracks in the north corner of the fireplace (figure C2-30) and at the right hand relief piece of the west wall (figure C2-31). On the same wall, at the south corner, the crown mould is pulling down from the ceiling. The woodwork is in good shape, but the baseboard at the fireplace is loose.



Figure C2-31: Ranch house, north parlor 103, west wall, cracked and peeling cornice moulding, QEA, 07/08/98.

The ceiling is plaster with only minor cracking and peeling paint. Northeast of the bay window arch, the secondary box beam shows signs of water damage. This damage can be traced back to the unrepaired flashing of the terrace roof above the bay window, which allows for water infiltration.

Bathroom 104

Bathroom 104 is south of the old kitchen 105. The vinyl asbestos tile flooring in this room, laid over concrete, was removed in the spring of 2004. Except for the north wall, which is a non-original frame partition, the walls are plaster over stone, with minor cracking. There are two basement casement windows along the south wall which look out under the rear porch. The east window 111 has a filler panel replacing one sash. The west window 110 is intact and in good condition. The ceiling in this room is plaster with some scaling and typical cracking evident.

Old Kitchen 105

The floor is in part an exposed concrete slab, with 3 ¼-inch wood tongue-and-groove boards partially over a wood-floored pit, at the bottom of the staircase. The same 3 ¼-inch flooring is found on the landing next to door 206A, installed over the original five-inch pine boards. Both the wood flooring and the trap door to the pit are in good condition. The walls are plaster over stone, with the exception of the south wall, which is a non-original plaster partition. The lower two feet of the plaster on the north and west walls has deteriorated (figure C2-32). The window, doors, and frames are all in good

condition. Window 104 on the west wall looks into a stone window well and has an abandoned vent pipe through the left sash. There is a gypsum board ceiling with one-by trim board that is assumed to be furred over the joists.



Figure C2-32: Ranch house, old kitchen 105, east wall, QEA, 07/08/98.



Figure C2-33: Ranch house, west wall of root cellar 106, QEA, 07/08/98.

During the February 2003 survey, the south jamb casing board at window 109 in the old kitchen 105 was pried away from the wall. Signs of termite damage, moisture damage and rot were found behind the board. The bottom part of the splayed jamb piece was very decayed from the concealed side. The entire area around this window was water damaged.

Stair between Old Kitchen 105 and West Room 204

The staircase that connects the old kitchen to the west room has walls composed of plaster over stone, except for the west wall, which is a combination of drywall and plywood. This wall appears to be of a later construction episode and exhibits cracking at the tape joints. The other walls show minimal cracking. It is obvious that this stairwell has been entirely refinished at some point.

Root Cellar 106

The concrete floor slopes up to the entrance and is in good condition, with minimal cracking. The root cellar is a stone vault that has been white washed (figure C2-33). There is evidence of organic growth on the stone and a water drip along the black iron pipe that runs the length of the vault. Nearly half of the mortar is loose or has open joints. The west wall has at least four holes low in the wall, which facilitate water intrusion. In

the center of the vault are two skylights made of cast iron with sidewalk lights of colored glass (figure C2-34).



Figure C2-34: Ranch house, skylight in root cellar 106, QEA, 07/08/98.



Figure C2-35: Ranch house tunnel, entry stair at entrance 107, QEA, 07/07/98.

Tunnel 107

The interior wall of the “cowboy entrance,” tunnel entry 107, is exposed stone with a plaster parge coat. This is presumably the entrance that the ranch hands used to get to the “cowboy shower,” hence its name. The stone stairs (figure C2-35) are covered in plaster and are in poor condition. In 1998 standing water was present on the lower tread from water penetration through the stone joints. The plaster in this area is also in poor condition, with heavy cracking, spalling, delaminating and substantial organic growth. The wooden door frame is in fair condition with areas of moisture damage, especially along the bottom. The door itself is very weathered, with the joints beginning to separate.

In the tunnel, the concrete floor shows signs of major cracking and shifting. There is a floor drain under the shower head on the west wall. The plaster in the tunnel is similar to that of the cowboy entrance, in that it is in poor condition with heavy cracking, spalling, and is beginning to chalk. Organic growth is also present on all the surfaces. The north wall of the tunnel is the painted, exposed stone of the springhouse (figure C2-36). The south wall is painted plaster parging over the original stone. Water infiltration is evident throughout the tunnel.

Springhouse 108

In the springhouse, the plaster condition is similar to the above instances and is failing in some areas. This is true for the walls as well as the vault (figure C2-37). The wood replacement door frame is in good condition, although the door is missing. The replacement frame is narrower than the original opening. At the north elevation, the lower circular opening has been modified and a wood screen has been installed on the inner wythe of the lower window opening.



Figure C2-36: Tunnel 107 looking north to springhouse 108, QEA, 07/07/98.



Figure C2-37: Springhouse, east half of south wall, QEA, 07/07/98.

Second Floor

Hall 201

The hallway walls are wallpaper over plaster. The wallpaper has some separation at the seams, but no visible signs of damage. One crack running diagonally from the northeast corner on the north wall is showing through the paper. The crown mould has a horizontal crack at the northwest corner, a miter crack at the southeast corner, a vertical crack and a rough patch at the southwest corner and some peeling paint. The wood work, including the balusters, is in good condition, but the door between the north room 203 and the hall 201 is missing. The ceiling has minor cracking on the main portion as well as at the soffit under the stair. The floor is narrow tongue-and-groove oak boards in good condition over the original wide board pine floor. The stair treads show normal wear.

South Room 202

The south room walls are papered to the picture mould and plastered above it (figure C2-38). There are no visible signs of damage, except for some cracking. On the south and west walls, horizontal cracks run from the window, below the crown mould, to the edges of the walls. Another crack is located in the northeast corner of the north wall and runs up the wall into the crown mould at the miter. In addition to these, there is a diagonal crack in the crown mould at the center of the south wall and a vertical one at the head of the south window 202 on the east wall. The south wall crown mould is separating from wall and ceiling and the paint is peeling severely. The plaster ceiling has some water-related staining in the southeast corner. Just north of the chimney there is a piping stub. The floor is narrow tongue and groove oak boards in good condition over the original wide board pine floor.

North Room 203

The north room 203 serves as a natural extension of the west room 204 (figure C2-39). Its walls are papered below a picture mould and plastered above it. The wallpaper is curled at the seams. There is a crack in the east corner of the south wall and another above the picture mould along the angled wall. These cracks are coming through the wallpaper and are related to the general movement of the exterior walls in the northeastern corner. The crown mould in this room is in good condition with minor cracking at the miters in the southeast and northwest corners, as well as hairline cracks all the way to the east end of the north wall. The plaster ceiling in this room has a continuous crack from the northwest corner to the southwest corner. The floor is narrow tongue-and-groove oak boards in good condition over the original wide board pine floor.



Figure C2-38: South room 202, north end west wall, QEA, 1998



Figure C2-39: Ranch house, north of room 203, south end of west wall and view into west room 204, QEA, 1998.

West Room 204

As is the case throughout the second level, the floor is narrow oak tongue-and-groove boards in good condition over the original pine, suspected to be termite damaged near the west wall. In the west room, the walls are wallpaper over plaster. The woodwork is in good condition except that a corner of the diamond trim piece is missing from the east jamb on the north wall. Some miscellaneous window hardware is also missing. Door 201 to the north room 203 appears to be a replacement (figure C2-40), as its profile fails to match any other in the house and it is not hand-grained with burl panels like the other doors. The ceiling is plaster with typical cracking and some stained plaster near the northwest corner.

Butler's Pantry 205

The entire butler's pantry is in good condition because it has been remodeled into a modern kitchen. The plaster was removed and replaced with drywall which was then covered in wallpaper. The wallpaper seams have begun to curl. All of the woodwork is new, including the sash of window 206. Contemporary sheet vinyl, in good condition, is installed over plywood sub-flooring.



*Figure C2-40: Atypical west room door 201, QEA
07/07/98.*

Rear Porch 207

Two of the interior walls of the rear porch at the southwest corner of the house are formed by exterior walls of the house. The keystones on both walls have slipped and have been repointed. The north wall shows minor cracking at the arch stones above door 204, in addition to loose mortar around the door frames. The corner of one base stone has been broken and repaired. The east wall has one open vertical joint in a base stone, and three anchors showing in the mortar joint. The doors and frames are in good condition with signs of normal usage, such as marks in the wood grain. The other two walls are of painted wood in good condition. The window trim needs refinishing and repainting. The

ceiling is also painted wood in good condition. The floor is narrow tongue-and-groove oak boards in good condition over the original wide board pine floor.

Curing Room 208

The south wall shows a major crack, just west of the round opening, from the base to the top of the wall. At the base of this crack the stone is turning to dust (figure C2-41). Another medium crack is found in the east corner stretching from the floor to the rafter. It appears that the southwest and north walls are deteriorating. The coursing and the mortar joints from the base to six feet above the floor are smaller and more carefully laid than the top two or three feet. The mortar in this top portion is in significantly worse condition and is missing entirely from many of the joints (figure C2-42).

The floor is composed of packed dirt and gravel with a stone threshold. The inner threshold stone has cracked and heaved.



Figure C2-41: Curing room interior. Deteriorating stone, QEA, 07/07/98.



Figure C2-42: Curing room interior, crack in south wall, QEA, 07/07/98.

Third Floor

Hall 301

The floor is the original butt-jointed pine flooring which has a stained, oil-rubbed finish, in good condition. There is one minor hole adjacent to the center of the south wall. The wallpaper over the plaster walls continues into hall 306 on the third level (figure C2-43). Along the north wall it is possible to feel the plaster bowing outward approximately six feet above the finished floor, although the bow is not visible. The crown moulding return at the west end is missing and crudely patched. Door 306 in the north wall is missing its inner hardware components. The ceiling in this area has a skylight coffer with wood trim around the perimeter which has been redone at some point. The vertical legs of this have indications of water damage. The rest of the ceiling is plaster, with water stains isolated toward the west side.

Third Floor Stair

The third floor stair walls are wallpaper over plaster, showing two major diagonal cracks through the paper at both the north and south walls. The crown mould is in good condition with peeling paint. It also has a wide split at the miter of the center doorway 304 in the west wall, which has spalled the adjacent ceiling plaster. Additionally, there is a piece of flexible conduit, exposed but painted, running from the joist space to the south wall. The door hardware for opening 302 on the south wall is missing the throw piece.

South Bedroom 302

The floor is the same as in hall 301. The south bedroom walls are also wallpaper over plaster, with no visible signs of damage. The woodwork here is grained lighter than that of the rest of the house and is in good condition. There is a slight hairline crack at the northeast miter of the north wall crown mould and some paint peeling. The hardware of door 302 is missing its throw piece. The ceiling is plaster, with a plaster bulge at the main crack in the west half of the room. The rest of the cracks in that area are typical.



Figure C2-43: Ranch house, hall 301, west wall, QEA, 07/08/98.

North Bedroom 303

The flooring here is the same wood floor that is present in hall 301 and previous upstairs bedrooms. The north bedroom walls are all paper over plaster. The only sign of damage is a crack showing through the paper, left of the northeast window. A crack at the crown mould exists in the same place. The ceiling shows only minimal cracking and is in good condition.

West Bedroom 304

The floor here is the same as in the hall 301, and is covered with area rugs to minimize further wear. The west bedroom walls are plaster covered with wallpaper. There is some

bowing in the plaster along the north wall. The paper itself has some seam splits and wrinkles. The crown moulding along the south wall has hairline cracks, a vertical miter crack just east of center, and a horizontal crack at the ceiling junction. The horizontal crack at the ceiling joint continues along the west and east walls. The ceiling in this room is drywall, in very good condition.

Bathroom 305

The bathroom on this level has been completely remodeled. Drywall has been installed on the walls and ceiling and then covered with wallpaper. All elements are in good condition with the exception that the wall paper is losing its bond to the walls. This room has sheet vinyl flooring.

Structural Evaluation

Introduction

The ranch house's exterior walls and one interior bearing wall are of multi-wythe limestone construction. The remaining walls are of wood stud construction. With the exception of a concrete slab-on-grade in the western half of the first floor level, the floors are constructed of wood joists spanning east-west between the stone masonry walls. The roof is a mansard roof of wood construction. The root cellar 106 and tunnel 107 are of stone construction. The springhouse 108 is the lower level of the curing room 208. The springhouse 108 and curing room 208 combined make a two-story, relatively square building built of limestone. The curing room 208 floor is of stone arch construction with gravel and earth floor on top of the arch. The hip roof is of wood construction with a cupola at the peak.



Figure C2-44: East elevation of Spring Hill Ranch House, Fitzpatrick Structural Engineering, PC; July 1998

This structural report will describe in detail each of the structural systems described above; methods and analytical standards used during the site inspections and in the analysis; the results of the structural analysis, including the safe allowable live load capacities of the floor systems; and recommendations regarding any structural distresses observed during the site inspections. Photographs taken during the site inspections have been included within this report. Also included in the appendix to this report are existing conditions drawings. The existing conditions drawings also depict the sizes, spans, and spacings of structural members; and live load capacities where applicable. The existing conditions drawings are entitled:

- EXS-101 Ranch House First Floor Structure and Layout
- EXS-102 Ranch House Second Floor Structure over First Floor Layout
- EXS-103 Ranch House Third Floor Structure over Second Floor Layout
- EXS-104 Ranch House Roof Structure over Third Floor Layout
- EXS-500 Ranch House Structural Details
- EXS-501 Ranch House Plumbness Charts

Details are shown on the drawings where the structural detailing could be verified in the site inspections.

Methods and Analytical Standards

Two site investigations were completed by Cheryl Kryscynski, PE of Fitzpatrick Structural Engineering, PC for the purposes of this report. The first trip was completed January 21, 2002, through January 23, 2002. The second trip was completed April 8, 2002, through April 11, 2002. During the site investigations, structural members, sizes, spacings and spans were determined. Conditions of the members observed were noted. Limited destructive access was obtained to the wall, second floor, and third floor structures during the second site investigation to determine framing conditions of the mansard roof. Mr. Alan O'Bright of the National Park Service Midwest Regional Office was of great assistance during both site investigations. Mr. Mark Hill of the National Park Service Ulysses S. Grant National Historic Site was also of great assistance during the April 2002 investigation. Fitzpatrick Structural Engineering, PC, had inspected the Spring Hill Ranch House and the other structures located within Tallgrass Prairie National Preserve in 1998 for the purposes of preparing the *Historic Structure Condition Report* published in August 2000. The information gathered during the 1998 site inspection was also used in preparing this report.

Finishes were removed in four areas of the house during the April 2002 site investigation. The plaster was removed at the north end of the arch framing at the northeast bay windows 106-108 in north parlor 103. A floor board at the third floor level, relatively centered with the southeast window 301 in south bedroom 302, was removed. The plaster on the wall was removed at the north end of the northeastern bay window 304 at the third floor level in two locations. One location was at the connection between the masonry wall construction and the wood stud construction, approximately 30 inches above the third floor. The second location was just below the ceiling cornice and aligned directly above the first hole. From these access points, inspection mirrors, No.10 wire, and photographs taken 'blindly' were used to determine the structural detailing. Refer to the existing conditions section of this report for detailed descriptions of these areas.

The *International Building Code 2000* and the *2001 and 2002 Supplements* have been used as the building code reference for the purposes of this structural report. Related material codes have also been used as a reference for the structural analysis. The August 2000 *Historic Structure Condition Report*, prepared by Quinn Evans / Architects and respective consultants was also considered, as discussed above. A complete listing of references has been included in the bibliography at the end of this report.

Samples of the wood joists in the Spring Hill Ranch House were taken to determine species. The sample of the first floor joists was taken from a joist exposed in the landing crawl space 001 below the grand central stair. A sample was also taken from a second floor joist through an access panel in the ceiling of the old kitchen 105. A third sample was taken during the second site inspection from a creosoted wood beam at the arched framing at the northeast bay window 106-108 in north parlor 103. The wood samples taken from the floor joists were determined to be White Pine (*Pinus Strobus*). The sample taken from the creosote beam was determined to be Hemlock (*Tsuga*).

In 1881, when the Spring Hill Ranch House was constructed, the stress values of building lumber were not tabulated and commonly distributed. The carpenters knew based on experience and common knowledge what size members were required for specific uses. The carpenters were using what is now referred to as 'old growth' lumber to build. 'Old growth' lumber has a higher stress rating than modern day dimension lumber. Modern day lumber is farmed; the trees are felled at a peak efficiency when the cost of farming is minimized versus the cost of producing high quality lumber. The lumber from 'old growth' trees was given ample time to strengthen before the tree was felled. The cell structure in wood can be thought of as a group of drinking straws clenched together. With time, these cells elongate and strengthen the overall capacity of the wood. The 'old growth' trees had the time to strengthen; as compared to modern-day farmed lumber. Because of this, it would be too conservative to use modern day stress values for White Pine and Hemlock to determine safe allowable live load capacities. Instead, the following basic stress values have been adopted and have been increased for use, size, duration of loading, etc. in the analysis as per the *1997 National Design Specification* for wood construction.

| | |
|----------------------------------------|-----------|
| Bending Stress, $F_b =$ | 1200 psi |
| Horizontal Shear Stress, $F_v =$ | 100 psi |
| Modulus of Elasticity, $E =$ | 1.8E6 psi |
| Compression Parallel to Grain, $F_c =$ | 1200 psi |

Samples of the limestone mortar were also taken from the interior side of the southeast wall over window 301 at the third floor structure elevation. As discussed in the existing conditions section of this report, the mortar is relatively soft and easy to break in pieces. Consideration to the condition of the mortar was given in completing the analysis for this report.

Existing Conditions

Overall the Spring Hill Ranch House, root cellar 106, tunnel 107, springhouse 108, and curing room 208 are in good condition. There are a few areas of concern. Plaster cracking was observed in several areas, some are due to serious structural issues, others are due to minor issues. Each area of structural concern is discussed in detail below.

Foundations

Built in the Flint Hills region in Kansas, the stone foundation walls bear directly on shale, as the depth of the soil over the stone is relatively shallow. The foundation walls could be observed in a few isolated areas. Generally, the foundations are in good condition.

At the exterior of the southeastern bay windows 101-103, foundation stones can be observed below the first floor level water table stone. The foundation stones appear to be ashlar and have been exposed, most likely due to settlement of the concrete slab adjacent to the house. The joints are missing mortar and the mortar is loose.

In the landing crawl space 001 below the central stair, a portion of the interior stone bearing wall has been parged. The parging is in good condition. With inspection mirrors and photographs taken 'blindly,' a stone bearing line was observed supporting the first floor joists at approximately midspan. Missing mortar was observed in the joints of this interior bearing 'wall,' however, the wall appeared to be in good condition overall.



Figure C2-45: Stone foundation at "mid-span" of eastern first floor joists at hall 101, Fitzpatrick Structural Engineering, PC; January 2002.



Figure C2-46: Header row of brick in center bearing wall foundation, east wall of pit 005 below old kitchen 105 floor, Fitzpatrick Structural Engineering, PC; January 2002.

In pit 005 below the floor of the old kitchen 105, the masonry foundation walls could be observed. The east wall of this mechanical room is the interior bearing wall of the Spring Hill Ranch House. It is in fair condition as the mortar is soft and powdery. There is a header row of brick in the stone foundation wall. The north and south walls of this mechanical room are not keyed into the east wall or the west wall; the north and south walls may have been added after the original construction. The northeast corner has a vertical crack of hairline width. The north, south and west walls are in good condition. There are isolated areas of missing mortar, but the walls have been repointed with a dark grey mortar. The dark grey mortar is hard, and is in good condition. There is a concrete slab-on-grade with a drain in this area. The concrete slab is in good condition with some minor shrinkage cracking related to the floor drain.

The stone foundation walls in the old kitchen 105 and in the closet 105A below the north stairs have been plastered and/or parged prohibiting inspection of the stone walls. The plaster below window 109 at the west wall, and the plaster at the north wall is deteriorating due to moisture. The moisture is penetrating the wall from the exterior.

Below the rear porch 207, in the southwest corner of the house, the ashlar stone foundation walls were inspected. The ashlar stone walls have collapsed in the southwest corner. Temporary shoring has been installed to support the floor joists in this area. The north and east walls of porch crawl space 109 are the exterior walls of the Spring Hill Ranch House. Original bearing stones can be observed on the north and east walls where the original porch would have been supported. Currently, the wood porch floor structure is supported on a set of stones protruding out, or corbelled, from the east wall to support the central beam line. The central beam is supported at the other end on an old cistern foundation. This cistern is also providing support for the stud walls above. A stone is missing at the east end of the north wall. Arch cracking has developed in the stone wall above this missing stone. Several of the mortar joints in the north wall (the south wall of the Spring Hill Ranch House) are missing mortar.

First Floor Framing

Mainly, the western half of the first floor structure is of concrete-slab-on-grade construction. The concrete slab is in good condition, although it is uneven at doorways 106 and 105 to root cellar 106 and tunnel 107. The floor area over pit 005 below the old kitchen 105 is of wood construction. The floor joists span north-south and were measured to be 1-1/2" x 7-1/4" spaced at 16-inch centers. With the exception of one joist, the joists are in good condition. Termites have infected the fourth joist from the east wall. Although the damage appears to be more severe than it actually is, temporary shoring has been installed to support this joist. The temporary shoring consists of a 2x on flat supported in one location by a 2x4 stud on a 2x base plate on the concrete slab. The joists have been headered off to allow the furnace to pass through the floor. The space was very warm during the inspection, thus the moisture content in the wood members is low.



Figure C2-47: Collapsed southwest corner of rear porch 207 foundation; temporary shore beam and post, Fitzpatrick Structural Engineering, PC; January 2002



Figure C2-48: Buckled finish flooring south of fireplace hearth in north parlor 103 at first floor level; also note cracked base board beyond, Fitzpatrick Structural Engineering, PC; April 2002



Figure C2-49: Cracked base board south of chimney in north parlor 103 at first floor level, Fitzpatrick Structural Engineering, PC; April 2002.

At the eastern half of the building, the first floor joists were accessible via the landing crawl space 001 below the central stair. The joists were measured to be 1-3/4" x 7-1/4" on average spaced at 16-inches on center. The joists are bearing on a wood shim plate that is bearing on the stone foundation walls. The stone foundation walls are at most 10 inches high, in some areas lower. Therefore the first floor joists are minimally placed above the flint stone bedrock. The joists show moderate to severe deterioration from insect damage. The doubled joists supporting the north and south walls of hall 101 are severely deteriorated, especially the southern doubled joists. Wood studs for the wall framing have also deteriorated as discussed in the "Walls" section below. The ends of the exposed first floor joists in hall 101 are insect damaged, however, the damage appears to

be minimal and localized at the ends of the members. In north parlor 103, on the south side of the fireplace, the wood floor is buckled and the baseboard at the wall is cracked. Although not verified, this area of the floor is also most likely insect damaged and repairs are required.

Second and Third Floor Structures

The rear porch 207 floor structure is of wood construction. The floor joists, 1-1/2" x 5-1/2" at 12-inch center-to-center spacings, span north-south. The joists are supported at midspan by a doubled nominal 2x6 beam with a 1-7/8" x 7" plate between the bottom of the joists and the top of the beam. The joists are in good condition. There is no lateral bracing at the bearing locations. At approximate midspan there is a 2x nailer on flat spiked to the underside of the joists bracing the tension face of the joists. The beam is in good condition. As stated above, the beam is bearing on three stones corbelled out of the west wall of the Spring Hill Ranch House. At the cistern, the beam is "shimmed" with a wood plate and a stone that is bearing on the capped off cistern. The third joist from the west is insect damaged.

The basic structure of the second and third floors of the house is 1-7/8" x 9" joists spanning east-west at 16-inch center-to-center spacings. The floors are headered off at the stair openings. The sizes of the header and stringer members are unknown. Based on the access gained from removing the floorboard at the third floor level in the south bedroom 302, the joists are pocketed into the masonry bearing walls. Minor water staining was observed near the masonry walls. There are two rows of cross bridging in the span. The joists are in excellent condition with few splits, checks, shakes, or knots. Mainly, the joists are clear, straight grained. There were several plaster keys (for the first floor plaster ceiling) loose within the joist spaces exposed, however, the existing keys appeared to be in excellent condition.

From the access panel in the ceiling of the old kitchen 105, the joist span, spacing and depth were verified. The width of the joists was assumed to be 1-7/8"; consistent with the other joists within the structure.



Figure C2-50: Four access holes cut to determine structure at arch at northeast bay windows 106-108 at first floor, Fitzpatrick Structural Engineering, PC; April 2002

From access holes cut in the arch at the northeastern bay windows 106-108 in north parlor 103, the span of the joists was reverified. The arch shape is non-structural, purely decorative. There are two wood beams supporting the second-floor joists and the masonry wall above, respectively. The beams span between the corners of the masonry walls created by the bay windows. The beam supporting the floor structure and wall was measured to be at minimum 4" x 8", but may be a full 8" x 8" beam. The flush framed connection between the floor joists and beam is unknown. The second beam is of a curious nature. The beam has had creosote applied to it; no other wood member within the house structure has been observed to be so treated. Wood treated with creosote or similar treatments will deter deterioration of the wood due to moisture and/or insects. The creosote beam was measured to be 7-3/4" x 14" deep. There is a one inch gap between the beams. In this gap rusted metal spikes at a regular spacing between the second floor support beam and the creosote beam can be seen. The wood fibers on the creosote beam appear to have pulled out from the surface of the beam at the spike locations (or the wood fibers were pushed out when the spike was driven?). There is also a wood stud at the north end of the arch. This stud is notched around the creosote beam and has a large (1" - 2" wide), tapered, vertical split. The split is widest at the top of the stud. There is a nominal 2x4 spiked to the exterior side of the beam to support the roof rafters for the bay window 106, 107, 108 area. The roof rafters were measured to be 2" x 6" members at 12 inch center-to-center spacings. The decorative arch is supported by 2x framing members. The 'exterior' 2x member is split in two locations, appearing as if it is three individual members. The 'interior' 2x member is in excellent condition and is a beautiful piece of dimension lumber (clear, dark grains). It should be noted in this area, metal lath was found as opposed to the wood lath used elsewhere in the house. Refer to the detail on sheet EXS-102 in the appendix.



Figure C2-51: Underside of creosote beam (on right) and floor support beam (on left), Fitzpatrick Structural Engineering, PC; April 2002

Figure C2-52: Underside of creosote beam (on right) and floor support beam (on left), note rusted steel spikes and 'pullout' of wood fibers from creosote beam in gap between beams, Fitzpatrick Structural Engineering, PC; April 2002

When this area is compared to the southeastern bay window 102 area, there are two notable differences. The floor to ceiling height at the southeast bay window 102 is three

inches higher than the floor to ceiling height at the northeast bay window 107. Secondly, at the southeastern bay window 102 the ceiling cornice detailing found throughout the house is on both sides of the decorative arch. At the northeastern bay window 107, the cornice detailing is not installed, and there is a 5-1/2" x 4" 'bump-out' on the exterior side of the arch. Plaster repairs are obvious due to the metal lath, and, most likely, the creosote beam is also a repair. Creosote was available and commonly used in the 1880s when the house was under construction, however, the 'bump-out,' the metal lath, and the lack of any other known treated members within the house structure suggest the beam is a replacement beam. As discussed under the "Walls" section below, the lean in the wall in this area is related to a structural failure. The failure is probably due to the deterioration of the original beam from moisture, insects, or both.

Roof Structure

The roof structure could be verified only through the access holes made in the north bedroom 303. The roof is a mansard roof of wood joist construction. There are two 'wall studs'; one vertical and one creating the sloped mansard roof. The vertical stud forms the interior of the wall surface above the limestone wall and continues upward until it intersects with the sloped stud. The sloped roof rafters/studs are spiked into a top 2x plate that is anchor bolted into the top of the stone wall. The vertical studs also bear on a 2x plate, however, in the locations visible with inspection mirrors, anchor bolts were not observed. The mortar in the joints between the top of the stone and the underside of the wood 2x plates was loose and could easily be removed. The ceiling joists at the third floor level are the roof rafters. The roof rafters bear on a 2x4 ribbon strip typically used in balloon framing. The ceiling joist/roof rafters bear on this ribbon strip adjacent to the sloping rafter/stud. In three areas, the sloped roof rafters/studs continue upward to form a perched mansard roof. There is a 2x top plate at the top of the sloping stud/rafters on which the upper roof joists bear on. This occurs over the northeast and southeast bay windows and at the center of the east elevation. With inspection mirrors, the roof framing was observed to be water stained and several wasp nests were observed. Refer to sheet EXS-104 in the appendix for details of these areas.

During the January 2002 inspection, relatively minimal ponding on top of the roof was observed. The EPDM roofing was recently installed (September 2001) directly over the metal roof. As evident in figure C2-56, water had severely penetrated this area of the roof previously. On April 8, 2002, there was an all-day rain, and there was no evidence of water leakage. The EPDM has sealed the 'crack.' The plaster and a 4" x 4" wood beam spanning the short hallway to the west bedroom 304 have been severely water damaged. When this area is repaired, the integrity of the structure should be verified. Other water staining has been observed at the chimneys and at the skylight. Again, when repairs are made, the integrity of the structure behind these finishes should be verified.



Figure C2-53: Connection of sloped stud/rafters to top of stone wall; note blocking between studs/rafters at bearing, Fitzpatrick Structural Engineering, PC; April 2002



Figure C2-54: Continuation of sloped rafter/stud up for framing of upper mansard roof, note water staining and wasp nests, note top plate and upper roof rafters at top of figure, Fitzpatrick Structural Engineering, PC; April 2002

The rear porch 207 roof is of wood construction with flat seam metal roofing over tongue-and-groove sheathing. Generally, the roof is in good condition. The rafters are nominal 2x6's spaced at 24-inches center to center on average. The nominal 2x6s are bearing on wood ledgers (2x4 and 2x6 nominal sizes, depending on location) that are anchor bolted into the masonry walls of the house structure every 48 inches. The rafters then meet at a nominal 2x10 hip ridge. The 2x10 ridge does not extend from corner to corner, rather from the northeast corner of the rear porch 207 to a single nominal 2x4 stud 3'-6" from the south wall. The ridge bearing at the single stud in the west wall is spiked into the northern surface of the stud; a nominal 2x6 rafter is spiked into the eastern surface of the stud. A nominal 1x4 ribbon strip reinforces these connections by tying the tops of the studs together just below the roof framing bearings. The single nominal 2x4 stud supporting the rafter and the ridge is leaning 1/4" in 2 feet when measured with a

four-foot mason's level. This member is inadequate to support the existing loads as discussed in the "Structural Analysis" section of this report. The connection of the ridge at the northeast corner is minimal at best. The ridge is notched from the top down to allow for the nominal 2x4 ledger beams to pass through and meet at the corner created by the masonry walls. The ridge is spiked into the ledger beams; however there is a vertical split in the ridge member at the notch.

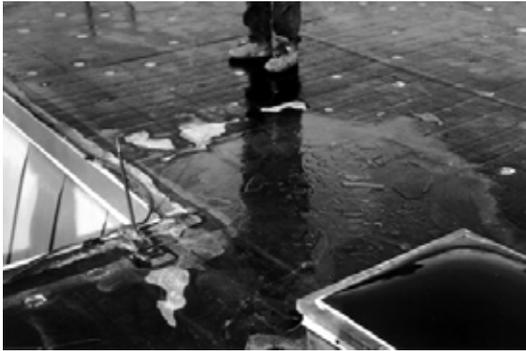


Figure C2-55: Ponding on roof west of skylight, Fitzpatrick Structural Engineering, PC; January 2002

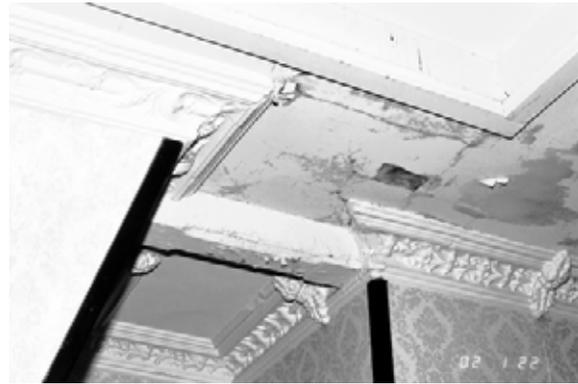


Figure C2-56: Extensive water staining at wall corner where ponding on roof was observed, Fitzpatrick Structural Engineering, PC; January 2002

Areas of the central front porch roof have been repaired recently (September 2001) by the National Park Service due to extreme deterioration of the wood members and stone columns. Similar to the rear porch 207 roof, the roofing for all three of the front porch roofs is a flat seam metal roof on tongue-and-groove wood sheathing on the wood rafter construction. The rafters are spanning to wood box-beams. Box-beams are beams formed from dimension lumber nailed together to form a hollow box section. The box-beam is cut to allow the rafters to span into the box-beam at the central porch. At the north and south end porches, the rafters were measured to be 1-3/4" x 5" at 24-inch average spacings. The rafters bear on a large 1-1/4" x 17-3/4" member, which bears on a box-beam below. Wood 'ceiling joists' stabilize the wood support columns and the sloped north and south porch roof rafters from any horizontal thrust. The 'ceiling joists' occur at the wood columns and are pocketed into the east wall of the house. The central porch rafters have beveled edges on the bottom creating a finished appearance for the 1-3/4" x 5-1/2" rafters spaced at 16-inches on center. The stringer members supporting the rafters between the box-beams are birdsmouthed at the ledger at the east wall of the house. There is bubbling and peeling paint at this connection at the north porch, indicating water damage. There is minimal bearing of the southernmost box beam at the east wall of the house. There is a nominal 2x4 joist and a small wood nailer pocketed into the east wall of the house. The joist and nailer are spiked to the box-beam; the box-beam does not have direct bearing. It may be reasonable to assume the connection of the northernmost box-beam to the east wall of the house is similar, however, the southern box-beam has pulled away from the house and exposed the connection.

The north and south porches are supported by three wood box-columns each. Dry rot is present in the box-columns as the wood members could easily be probed with a pocketknife, especially at the base of the columns and at the top of the southern column of the north porch. Dry rot occurs when the fungi naturally present in wood becomes active due to environmental changes such as an increase in the moisture content in the wood over 19 percent. The north and south columns of the north porch could easily be moved when pushed against. There is caulking between the base of the columns and the concrete plates the columns bear on. The caulking has trapped any moisture that has penetrated the box-columns from above, causing the deterioration at the column bases. The concrete plates the columns bear on have minor deterioration at the edges. These plates were cast in place around the wood posts in an attempt to 'embed' the posts in the concrete. This detail has created a basin for water to pond and deteriorate the wood columns.

Walls

The following is an excerpt from the August 2000 *Historic Structure Condition Report* published by Quinn Evans | Architects. The condition of the walls has been updated to reflect conditions observed in the 2002 site inspections.

The exterior walls are built of split-face Cottonwood Limestone. Quoin stones define each corner, except for the first floor of the east elevation. The quoin stones are tooled around the edges and hammered inside the tooled perimeter. Water table stones at both the first and second floor levels are also tooled like the edges of the quoins. At the first floor level, the water table stones are also hammered in the center to match the quoin stones. Both the quoin stones and the water table stones are set off (further out from) the wall surface. The cornice stones (top course of wall elevation) have a decorative finish. The window and door lintels are masonry arches built with three limestone pieces including the keystone, which is set off the wall surface and tooled in the same manner as the quoin stones. The first floor water table stone doubles for some of the window sills on the east elevation. At other window locations the sill is a tooled stone supported at its ends by decorative stones cantilevered from the walls.

In general, the walls have been well maintained over the years and are currently in good condition. Isolated stones are cracked or deteriorating; most of the joints have been repointed previously. Some of the joints have cracked (or re-cracked) and have loose or missing mortar. Several different colors of mortar were used for previous repointing efforts. The colors range from shades of brown to shades of grey and white. The light grey and white mortars are suspected to contain a high content of white Portland cement, which is harmful to the limestone. Several different tooling methods were used in the previous repointing efforts as well. The methods range from simple thumb tooling, to raised joints, to raised and tooled joints. The original joints are tooled and raised with a light brown color. Below is a detailed description of each elevation.

Several of the cracks and other distresses discussed below can be attributed to groundwater deteriorating and moving the stone foundations. During the 1998 December field investigation, water was reported to have damaged the Spring Hill Ranch House due

to the heavy rains that produced the flood in the area earlier that month. Specifically, the water was observed flowing through the joints of the steps at the middle porch, east elevation; and through the steps along the north and south walls of the Spring Hill Ranch House. The water was also reportedly observed inside the house under the stairs in hall 101, in the pit 005 below the old kitchen 105 floor and in root cellar 106. With grade at a higher elevation on the west side of the house as compared to the east, the groundwater is flowing downhill, through the house. The conditions of the structural members that could not be observed in any of the site inspections (foundations, floor joists, etc.) that are in contact with this groundwater may be questionable.



Figure C2-57: Continuously repointed cracks in north wall above door 206A, note large joint above keystone indicating that the keystone has dropped, Fitzpatrick Structural Engineering, PC; July 1998

North Elevation

The cracking discussed below is attributed to both water damage as discussed, and a probable structural failure of the support beam for the masonry wall above the northeast bay window 107. The masonry wall is supported on wood beams at the arch location as discussed in the "Second and Third Floor Structures" section of this report. The creosote beam discovered during the April 2002 site investigation is believed to have replaced the original beam. Water penetration, insect damage, or both, deteriorated the original beam at the north bearing. This deterioration caused a lack of structural integrity and the masonry wall moved outward at the top (refer to discussion below). This movement also allowed for further water penetration and cracking of the masonry wall. In January and April 2002, the movements have not appeared to have greatly increased since the 1998 inspections. Below is a detailed description of the movements observed.

The quoin stones in the north elevation are in good condition. Minor repointing has been done to the joints of the west quoin stones. Extensive repointing has been done to the joints of the east quoin stones. The cracking in the east quoin stones is near a downspout and is related to other joints cracking in this area. The cornice stones are in good condition. The joints between the cornice stones have been repointed; the joints on the west half of the wall are re-cracking. At the east end of the northwest elevation, there is a large opening between the wood soffit support and the cornice stone.

Overall, the wall itself has been repointed at least three times; at least five times on the north wall of the bay off north parlor 103. The path of the newer mortar highlights the path of step cracking that is recurring. The step cracks span from the top east corner, top center, and top west corner of the wall to meet at the center of the second floor level water table. The crack at the center of the wall is widest at 2 to 3 mm wide, and is related to cracking in the door 206A lintel in this elevation. The joints for the door 206A lintel have been previously repointed. The joint at the top of the keystone has cracked and mortar was noted to be missing in the joints on the underside of the lintel. There are isolated locations of missing mortar in the north exterior wall. The first stone above the second floor level water table, west of doorway 206A is beginning to exfoliate.

The water table stones at the second floor level were observed to have mild moss growth and discoloration of the stones. The west corner stone is rust stained and has experienced minor deterioration. The stone directly to the east of the west corner stone has a hairline, through stone crack. The smaller piece of the stone this crack created is loose. At the east end, near the downspout mentioned earlier, the joint between the water table stones has been heavily repointed and has re-cracked to a 2 mm width.

Below the second floor water table, hairline cracking was observed in a few locations. Moss growth was noted on the first and second courses above the landing and stairs. The sill of door 206A is in good condition.

The cracking at the downspout location continues on the northwest elevation of the bay off north parlor 103. The cracking is 2-1/2 mm wide and continues to the springline of the lintel of window 108 (the joint between the typical wall coursing and the end course for the window arch). There is a repointed vertical crack behind the downspout at the corner between the north and northwest walls; it is re-cracking below the second floor level water table. Isolated locations of missing mortar were observed below the second floor level water table on both the northwest and north walls of the bay off the north parlor 103. Hairline cracks were noted for the north wall of the bay off the north parlor 103. The west springline of the window 108 lintel in this elevation has previously been repointed, but has since reopened to 3-1/2 mm wide. This wide crack is associated with the cracking near the downspout. Hairline cracks and missing mortar were observed on the underside of the window lintel in the north elevation of the bay off the north parlor 103.

Northeast Elevation

The northeast wall, the angled wall in north room 203 and part of the bay off north parlor 103, has been repointed several times. Missing mortar for the joints was observed, including on the underside of the keystone for the lintel of the second floor window 205. Cracking of the keystone joints was observed on the underside of the lintel of the first floor window 107. The second floor level water table stones are in good condition. Moss growth was observed on the first floor level water table stones. One stone in the first floor level water table has spalled (defaced). Vertical cracking was observed between the stones and the wood window jamb at the first floor elevation.

East Elevation

The east wall of the bay off north parlor 103 has isolated locations of repointing of joints on either side of window 106. The lintel of window 106 has been repointed and has moved previously - the joints between the stones in the window 106 lintel are 3/4" to 1" wide. The window sill is the first floor water table. It has cracked and the pieces have moved relative to each other.

The southeast wall of the bay off the north parlor 103 is in good condition. A vertical crack in the corner at the east wall of the house was observed. The east wall of the house is in good condition. At the second floor level, the joints have been repointed. Mortar was noted to be missing on the underside of the keystones for all of the window and doorway arches. Hairline cracks were observed at the springlines for the arches at the first floor level. Vertical cracking between the stone and wood jambs for the openings at the first floor level were also observed. A corner is chipped and the corner piece is loose from the north face of a stone just south of the door. The sill stones at the second floor level are in poor condition. At the north window 204, the south end of the sill has surface corner cracks. At the south window 202 the sill is cracked through at the center where mortar is missing below the sill stone; the joint on the north side of the sill is cracked. The first floor level water table joints have been repointed. Both the joints and water table stones are cracked near the window and door openings at the first floor level.

The pilasters framing the doorway at the first floor level are built with five stones each. Four of the five stones are cut and tooled to appear as two smaller stones. The pilaster stones are tooled in the same manner as the quoins and first floor level water table. The southeast corner of the first floor level water table stone at the south pilaster is chipped off. Water staining was observed at the top of both pilasters.

The northeast wall of the bay off south parlor 102 is in good condition. Minor repointing was observed at the top of the wall.

The east wall of the bay off the south parlor 102 room has a vertical crack beginning between the stone and wood jamb for window 103. Some of the joints have been repointed; some are missing mortar. A through stone crack, north of the window 103, first course up from the first floor level water table, had previously been repaired, but has since re-cracked. The south end of the water table stone is deteriorating. The window

103 lintel has been repointed. A hairline to 1 mm wide crack on the north side of the window 103 lintel continues on the underside of the lintel.

Southeast Elevation

Cracking is predominant in the southeast exterior elevation. The majority of the joints have been repointed previously, but have since re-cracked, especially on the east end of the wall. Repaired joints were measured to be 1" wide. The mortar used to repair the joints is a light grey mortar, and may have a high Portland cement content. Some stone deterioration was noted, including a quoin stone, and may be related to the use of the harder, light grey mortar. The mortar under the keystone for the lintel of the second floor window 201 is loose (missing in April 2002). Above and below the first floor window 102, the mortar was noted to be loose and missing, including in the springlines of the window 102 lintel. A portion of the ashlar stone foundation wall is exposed below the first floor level water table. Extensive cracking in this small area of exposed foundation wall was noted.

South Elevation

The south wall of the bay off the south parlor 102 has repaired joints that are re-cracking at the top and bottom of window 101. Both the first floor level and second floor level water table stones appear to have moved down and outward.

The southwest wall of the bay off the south parlor 102 is in better condition than the south wall of the same bay. There are isolated areas of repointing, missing mortar, and hairline cracking. A vertical corner crack of hairline width was noted at the corner between the south wall of the house and the southwest wall of the bay off south parlor 102. The quoin stones are weathered. Missing mortar was observed for the joints between the cornice stones.

The south wall of the Spring Hill Ranch House is in good condition as well. Minor hairline cracking was noted around the quoin stones on the west end. Missing mortar in the joints between the water table stones and between the cornice stones was observed. The small exterior section of the south wall west of the rear porch 207 is in good condition. The second floor level water table stone and the stone just below it are deteriorating.

West Elevation

South of the rear porch 207, the west wall is in good condition. As on the south elevation hairline cracking was observed around the quoin stones on the south end. Missing mortar between the cornice stones and between the water table stones was noted. A gap between the cornice stone and wood soffit support was noted at the southwest corner.

North of the rear porch 207, the west wall below the second floor level water table is missing mortar. Above the second floor level water table but below windows 206-208, hairline cracking and minor through stone cracking were observed. White and grey

mortars were used to repoint the area of the wall where the through stone crack occurred. The hard mortar may be the cause of the crack.

Isolated locations of stone exfoliations were observed. The quoin stones are in good condition. The stones on the south side, below the second floor level water table, have been repointed at least twice. The quoin stone directly below the second floor level water table is exfoliating. The cornice stones are water stained, but are in good condition. The joints between the cornice stones have been repointed previously, but have since re-cracked and lost mortar. The joints between the second floor level water table are in similar condition. The second floor water table stone second from the south corner (north of the rear porch 207) has been repaired and is currently in good condition. Small stones were placed above the window sill stones to maintain the wall coursing. Around the sill stone for the north window 206, the joints have been previously repointed, but hairline cracking was observed. At the middle and south window sills, at windows 207 and 208, some of the joints have been repointed but are of sound condition. The window lintels are cracked and have been partially repointed at the window 207 and 208 lintels. The cracks were noted to continue on the underside of the arches where loose and missing mortar was noted at all the keystone joints. Cracks or gaps between the stone and the wood window jambs were noted.

In summary, most of the cracking observed is related to water penetration and the dropping of the keystones at the door and window openings. Working together, the cracks continue to open and require repointing. Above the second floor window 201, two stones were observed to be pushing outward at the common joint between the stones. This 'bulging' movement is due to water penetrating behind the stones and freeze-thaw action of the water pushing the stones outward. Other movements of stones discussed above are also due to movements related to the freeze-thaw action.



Figure C2-58: 'Bulging' stones above second floor window 201 above southeast bay, Fitzpatrick Structural Engineering, PC; January 2002

During the April 2002 site investigation, the plumbness of the walls was recorded with a level, 23-5/8" in length, both on the interior and on the exterior where possible. The measurements were compared for the building structure overall, for both the interior and the exterior, and for the full height of the wall. Overall, the top of the building is leaning down the hill towards the road. In the north-south direction, there is a slight lean outward at the top of the south wall, but the north wall has moved both inward and outward (assuming the walls were constructed plumb). The measurements taken on the exterior of

the wall were taken at the quoin stones only as the split face stone surfaces are too rough to create a plane of reference for the level. Where the interior and exterior measurements could be compared, the magnitude and direction of the slopes were similar. The wythes of the wall are acting together.

Typically, the wall movement for the full height of the walls was consistent both in magnitude and direction. The north wall was observed to be leaning both inward and outward at the different floor levels indicating the floor framing is adequately bracing the wall. However, the other walls were consistently found to be leaning outward at the top of the walls. The floor joists pocketed into the masonry walls may no longer be sufficiently anchored to the wall. The mortar around the joist pockets may be deteriorated due to age and the moisture penetration discussed above. At the joint above the third floor structure where the wood roof framing is bearing on top of the masonry wall, the walls were typically found to be acting separately. The magnitude and direction of the slope in the masonry differed from the magnitude and slope, if any, of the wood stud wall. The wood stud wall was commonly determined to be plumb. The exterior surface of the northwestern corner of the wall above the northeastern bay windows 106-108 was measured to be leaning outward at the top of the wall. As the level was placed higher along the wall, the magnitude increased from 1/2" to 7/8" in the 23-5/8" level length. This variance relates to the tapered joint repointed and re-cracking near the downspout at the north wall. The maximum slope recorded of 1-1/4" in 23-5/8" level length was taken at the stair at the third floor level. This was the slope of the masonry portion of the wall, not the wood stud portion of the wall, and is due to the lack of floor framing (due to the stair) bracing the wall. The wall is inadequate to span the full height of the building, thus is spanning horizontally between the north and south walls of the stairwell. These walls are stud walls and shear cracking has occurred at the east end of each of these walls. The shear cracking is the 'diagonal' cracking observed in the wallpaper and plaster at the third floor level.

Other cracking observed in the stud walls throughout the house is due to structural concerns and due to the age of the plaster. At the first floor level and in the stairwells, the insect damage to the first floor structure has created inadequate support for the walls above. In particular, in the landing crawl space 001 below the central stair, the studs for the north wall of south parlor 102 can be observed. As stated earlier, termites have damaged the doubled joist that supports this wall. The bottom of the western studs have been cut off. The studs may have been also damaged by the termites, or simply cut off due to lack of care when the furnace ductwork was installed. Regardless, the studs were left unsupported. The wall then settled, causing the plaster to crack as evident in south parlor 102 and the central stairwell. During the January 2002 site investigation, temporary shoring was installed to prevent further cracking until proper repairs can be completed. Also in the landing crawl space 001 area, the balloon framing for wood stud construction was verified. The central stair landing joists are bearing on a wood 1x4 ribbon strip let into the wood studs. This is a typical detail for balloon framing.



Figure C2-59: Maximum measurement recorded when measuring the plumbness of the walls, the top of the wall is leaning 1-1/4" in the nearly 2'-0" length of the level at the central stair at the third floor level, Fitzpatrick Structural Engineering, PC; April 2002



Figure C2-60: Temporary shoring of unsupported studs of north wall of parlor 102, Fitzpatrick Structural Engineering, PC; April 2002

Root Cellar 106

Root cellar 106 is a masonry arch structure. The top of the arch has been capped over with a concrete slab; however, the iron and glass skylights were kept visible. The grade is slightly higher on the north side of the arch than on the south side. The difference, however, is relatively minimal when the thickness of the stones are considered. The parging on the exterior of the arch is deteriorated and loose. Several of the stones behind the parging have also deteriorated; they have broken into several small pieces.

On the interior, the concrete slab-on-grade is in good condition. Water has been observed to pond below the well pump in the northeast corner. The top two courses of the east wall are of block stone, similar to those observed on the exterior of the Spring Hill Ranch House above grade. The lower portion of the east wall is of the ashlar foundation stone observed at the southeast bay windows 101-103. The east wall is in fair condition. The header for doorway 106 into the old kitchen 105 is a 2x wood member on flat and can be easily penetrated with a pocketknife. The west wall and stone arch have been built of block stones (as opposed to the ashlar stones). The vertical walls are not keyed with the arched walls. Moss was observed on all of the walls and the arch. Several attempts to

repoint the masonry joints were observed. Missing mortar was observed, especially in the south portion of the arch and at the skylights. The stones at the skylights are severely deteriorated and cracked. Other cracks, including through stone cracks, were observed in the arch structure.



Figure C2-61: Overall west elevation of Root Cellar 106, Fitzpatrick Structural Engineering, PC; July 1998



Figure C2-62: Overall south elevation of tunnel 107, Fitzpatrick Structural Engineering, PC; January 2002

Tunnel 107 and Tower

The following is an excerpt from the August 2000 *Historic Structure Condition Report* published by Quinn Evans / Architects. The discussion has been updated to reflect conditions observed in the 2002 site inspections.

A stone barrel arch tunnel connects the springhouse 108 to the Spring Hill Ranch House through doorway 105 in the north wall of the old kitchen 105. Tunnel 107 extends about 40 feet from the Spring Hill Ranch House to the springhouse 108 entrance. There is a doorway 107 near the center of the tunnel 107 on the east side of the tunnel 107. This doorway also serves as a foundation for a stone tower that no longer remains. The west side of the tunnel 107 is below grade; the top of the tunnel 107 has a concrete cap; the east exterior elevation has stone walls.

Exterior

The roof and the east elevation are the only areas of tunnel 107 that are exposed to the exterior. A concrete cap has been placed over the roof and is in fair condition. Several cracks appearing to be shrinkage related were observed in the concrete cap. The cap may have settled or may have been built to coincide with the shape of the stone arch. This is most apparent at the northwest corner of the concrete cap. At the northeast corner of the concrete cap, another slab has been built. This slab is a repair of the concrete cap. A shrinkage crack spanning east-west and a crack between the slab and the east wall were observed. The west side (northern portion) and the top of the east wall are in good condition. The stone is darker than the stone used elsewhere on the ranch; it is discolored. The stone foundation for the tower that no longer remains is located at the center of the east wall and projects approximately 4 ft above the concrete cap. The tower separates the tunnel 107's east elevation into two portions - the north and south portions. The north portion has been repointed with raised and tooled joinery. It is in good condition. The south portion of the east elevation is missing mortar. Cracking was observed at every joint. The stones next to the house at the bottom course have shifted 1/2" out from the adjacent stones. The stones in the wall are spalling; near the steps just south of the tower, the stones are exfoliating.

The steps south of the tower are concrete steps. Surface alligator (random) cracking is accelerating the surface spalling observed. The top step is in poor condition and requires replacement. The landing at the bottom of the stairs is in fair to poor condition. The surface of the concrete slab is cracking; a large crack has been repaired.

Overall, the tower is in good to fair condition. The corners of the tower have dressed quoin stones with tooled edges to accentuate the corners of the tower. The north wall has 5 to 6 mm wide step cracks. Two stones have been repaired with a concrete fill; other stones, especially on the top half, are beginning to exfoliate. Similar conditions were observed on the east wall in addition to organic growth and cracking around the lintel/coping stone.

The majority of the stones on the south wall of the tower are exfoliating. Both step and through stone cracks were observed over the entire wall surface and measured to have a maximum width of 6 mm. Minor step cracking at the north and south ends of the west wall was observed. A 1 mm wide through stone crack in the top course, south end was noted. Grid cracking on the top of the north and south walls is beginning to form.

Interior

Tunnel 107 has a concrete floor that is cracked. There is a 1/4" to 1/2" wide crack about one foot from the west wall for the length of the tunnel 107. The one-foot portion near the west wall is at a lower elevation than the remaining portion of the slab, indicating that the crack is a settlement crack. Several other cracks, mostly diagonal in nature, are related to this settlement crack. The walls and the ceiling in the tunnel 107 are stone barrel arches spanning east-west with a white washed finish. The plaster finish is severely cracked and portions have fallen off the walls. The cracking in the tunnel 107 is

moisture-related alligator cracking, the most severe order of cracking, and was measured at an average width of 4 mm. A repair was attempted for one crack on the west wall, but the crack has reopened. Vertical cracking in each corner was observed.

Part of the tower foundation on the east elevation of the tunnel 107 is a doorway 107 for the tunnel 107. The steps down from the east grade elevation to the concrete floor of the tunnel 107 are deteriorating. Heavy moss growth was noted for the area near doorway 107. The stone and concrete lintels framing doorway 107 are in poor condition. The stones exposed due to the doorway 107 opening are cracked into several small pieces. The stone joints on either side of the doorway 107 opening have been repointed, but are re-cracking. Grid cracking and an exposed steel reinforcing bar were observed in the concrete lintel over the steps. During the January 2002 site investigation, some of the plaster had been removed around the doorway at the tower. The same tooling of the quoin stones was found on some of the stones at this doorway indicating it was an original opening. Refer to the architectural sections of this report for further information on this area.



Figure C2-63: South elevation of curing room 208, note keystone arch near grade, Fitzpatrick Structural Engineering, PC; July 1998



Figure C2-64: Most severe crack inside curing room 208 on west end of south wall, Fitzpatrick Structural Engineering, PC; January 2002

Springhouse 108 and Curing Room 208

The following is an excerpt from the August 2000 *Historic Structure Condition Report* published by Quinn Evans / Architects. The discussion has been updated to reflect conditions observed in the 2002 site inspections.

The curing room 208 is directly above the springhouse 108. The majority of the springhouse 108 is below grade, however, the walls continue above grade and become the walls for the springhouse 108/curing room 208. The floor for the curing room 208 is earth over a limestone barrel arch structure. The underside of the barrel arch structure is the ceiling of the springhouse 108. The walls of the curing room 208 are of limestone construction. The block limestones have a rough split face finish; most of the joints are raised and tooled. The roof of the curing room 208 is a hip, cedar shake, skip board sheathed roof with a cupola. It is in fair condition.

Exterior

The stones in the north elevation of the springhouse 108 and curing room 208 are discolored, especially on the east end. Organic growth was observed on the bottom three courses of the wall. At the east end, in the bottom three courses, a through stone crack has been previously repaired, but has since re-cracked. Overall, the wall has been repointed at least three times. Shrinkage cracking was observed in the mortar around most of the stones.

Similar to the north elevation, the stones on the east elevation are discolored. Heavy organic growth was observed on the bottom wall course. Step cracking previously repaired is re-cracking. Missing mortar and a stone infill were noted at the bottom center of the wall.

The original arched opening to the springhouse 108 has been infilled for the tunnel 107 construction. The infill stones are set back; they are not flush with the arch stones. Missing mortar was noted at the base of the wall at the east and west ends. Four different mortar colors and joint details were observed indicating that the wall has been repointed at least three times. Several of the joints are cracked. A small, but discernible step crack in the bottom east corner is re-cracking. Just as visible are step cracks spanning between the top 1/4 points of the wall, around the window stones and to the keystone in the arch for the original springhouse 108 opening. Moisture and movement of the original arched opening are causing the continuing cracking observed in the south elevation.

Above the floor of the curing room 208, the exterior west wall of the springhouse 108 and curing room 208 is in good condition. Water staining was noted on the underside of the lintel of door 208. Below the dirt floor of the curing room 208, the joints have been repointed, the stones are deteriorating, and organic growth was observed on the northern bottom two courses. The stone steps to the curing room 208 entrance are in fair to good condition. Some of the joints require repointing; the undersides of the stone steps are deteriorating. There is a stone silo tile placed as a bottom step to accommodate the respective low elevation of grade at this location.

Interior

In the springhouse 108, the floor is a concrete slab-on-grade. Two cracks in the floor were observed, spanning from the doorway 108 and diverting to the northeast and northwest corners of the springhouse 108. The crack leading to the northwest corner is more severe. A vertical crack, widest at the top, spanning between the window to the trough on the north wall; a diagonal crack from the northeast corner to the light fixture; a vertical crack at the base of the east wall at the center of the wall; vertical cracks above doorway 108 and around the circular opening in the south wall; and vertical cracks in all four corners were all observed in the springhouse 108. The stones are deteriorating at a few areas of through stone cracking. The plaster has fallen off in some areas of the walls.

The curing room 208 has a rubble and earth floor. The walls are of a combination of the block stone used on the exterior and ashlar stone used on the interior. The mortar joints are all flush with the stone surface, but some have a "stick" finish - a stick or the edge of the trowel was cut through the mortar before it hardened to form sharp lines. Typically, missing mortar was observed on each of the walls, especially at the base of the walls. At some locations at the base of the wall, a cement parging was used for infilling. Vertical cracks were noted at each corner to have re-cracked after the joints had been repointed. Other vertical cracks, mostly spaced 1 to 2 ft from the corners were observed. On the north wall, about 1 ft from the west wall, a vertical crack was observed on the bottom half of the wall. On the east wall, a step crack spanning from the bottom of the window down to the base of the wall and horizontally along the base of the wall was observed. This crack is related to the vertical crack observed in the interior east wall of the springhouse 108. Near each corner at the south wall of the curing room 208, vertical cracks were noted. The crack closest to the east wall is widest at the base; the crack closest to the west wall is the widest crack in the curing room 208 measured at 1/2"±. This 1/2" wide crack has not been repointed and re-cracked as the others have. On the west wall, a step crack on the south side of the door was noted. The cracking patterns in the walls indicate settlement of the south wall. About 1 to 2 ft above the curing room 208 floor, the south wall was observed to be soft and powdery to the touch.

The ceiling and roof structures are exposed in the curing room 208. The ceiling joists, 1-3/4"x5-3/4" at nearly 24 inches on center, are pocketed into the east and west walls of the curing room 208. The rafters, 1-3/4"x3-5/8", span between the walls and the ridgelines. The ridge members were measured to be 1-3/4" x 5-3/4". The cupola framing (1-3/4"x3-5/8" wood stud columns) bears on the center ceiling joists with mortise and tenon connections. Birdsmouth and spiked connections are also used throughout the roof structure. The rafters bearing on top of the stone walls are severely notched over the top sill plate. Some of the wood members are rotted at the connections, especially near the cupola framing. The diagonal bracing at the cupola framing is missing on the north side and severely rotted on the west side of the cupola. The skip board sheathing is heavily water stained. Full 2" x 2" wood tenons were noted to be cut into a 2x ledger and pocketed into the north and south walls. These "knobs" may be remnants of an earlier ceiling structure.

Structural Analysis

As described in the "Survey Methods and Analytic Standards" section of this report, the 2000 IBC and the 1998 ASCE 7-98 have been used to develop the load cases used in the analysis of the Spring Hill Ranch House, tunnel 107, springhouse 108 and curing room 208. Safe allowable live load capacities for the floor structures were determined by assuming the allowable stress values discussed earlier, and backsolving for the maximum load capacity. Superimposed dead loads were taken to be the weight of the structure and finishes on the walls and floors. The dead loads were then used to reduce the maximum capacity to the safe allowable maximum live load. Members and connections were considered sound and adequate for the purposes of this analysis. Reinforcement of deteriorated members is discussed in the "Recommendations" section of this report.

In detail, the ground snow load of 20psf was reduced by factors related to the landscape, geometry of the structure, and the use of the structure to develop a 12psf loading on the sloped rafters of the mansard roof of the house. However, the minimum roof live load of 20psf was applied to the flat rafters of the mansard roof, and the minimum roof live load of 15psf was applied to the curing room 208 roof rafters. The ranch is located in a seismic design category A, the minimal seismic category. When compared with the wind loading, the wind loads were greater than the forces generated by the seismic forces, thus the wind loading is more critical in the analysis. A basic wind speed of 90mph was used in the analysis, and was calculated to be 20psf of wind pressure using the components and cladding system. This was a slightly conservative approach to the wind loading, however, the results, as discussed below, are within allowable tolerances with the conservative loading.

A one family home is typically designed for 40psf live load on the 'public' areas of the house, and 30psf in the sleeping room areas. Because of the current and intended public use of the structure, however, the codes require the floors to be adequate for 100psf live load capacity. The capacity of the stone barrel arches was not verified as the thickness of the arches could not be verified. However, the stone arch is considered to be one of the best, if not the best, structural systems for vertical loadings if the arch is working as a complete unit. Therefore, the stone arch structures (root cellar 106, tunnel 107, curing room 208) are adequate for the 100psf live load capacity providing the recommendations discussed within this report are completed. Similarly, the concrete slab-on-grades at the first floor level are also inherently adequate for 100psf live load capacity.

In general, the house is very well constructed. Attention to detail was given in the original construction of the house with the double rows of cross bridging in the third floor joists and the full-depth blocking at the sloped rafter bearing locations. Very few modifications have been done to the structure, and the majority of the structural modifications were done soon after the house was built. The general safe allowable live load capacities of the floor structures are:

First Floor Structure 100 psf

| | |
|------------------------|--------|
| Enclosed Porch | 20 psf |
| Second Floor Structure | 50 psf |
| Third Floor Structure | 50 psf |

There are isolated areas of concern, however, these areas should be able to be reinforced with little impact to the structure, architecture, or historical fabric of the house.

In particular, in the first floor structure, the termite damaged joist in the wood floor of the old kitchen 105 is also a stringer supporting the headered opening for the furnace. Typically, a header and stringer are doubled 2x members. These members, however, are not doubled; they are single, nominal 2x8s. The header is adequate as a single member for the 100psf required safe allowable live load capacity. The stringer, the termite damaged joist, is not. The maximum safe allowable live load for this member is 40psf without any shoring or reinforcing considered. This capacity can easily be increased by reinforcing the stringer with CCA treated lumber or providing a permanent shore post and beam system at the header connection.

All of the eastern first floor structure joists were assumed to be bearing on a short stone foundation wall observed from the landing crawl space 001 below the central stair. If this stone wall does not exist in the south parlor 102 and the north parlor 103, the safe allowable live load capacity is reduced to 30psf. The capacity is controlled by live load deflection. Live load deflection is typically set to control cracking in plaster and other finishes. The first floor joists do not have any plaster on the underside of them, thus the deflection criteria of $L/360$ ('L' is the span length in inches) is not as critical, however, the live load deflection will affect the interaction of the wood flooring as well, and therefore, it is a concern.

The enclosed porch first floor structure has a maximum safe allowable live load of 20psf. This live load is limited by the shear capacity of the center support beam. If this beam is reinforced or replaced, shear capacity of the floor joists limit the maximum safe allowable live load to 80psf. The safe allowable basic stresses used for the enclosed porch framing were assumed to be:

| | |
|--------------------------------|-----------|
| Bending Stress, F_b | 1100 psi |
| Horizontal Shear Stress, F_v | 75 psi |
| Modulus of Elasticity, E | 1.3E6 psi |

The basic allowable stresses were reduced from that used for the remainder of the analysis because the enclosed porch is not original. The enclosed porch is believed to have been built in the early 1900s.

The stair framings, both the central stair and north stair, have lower safe allowable live load capacities based on assumptions made in the analysis. The header and stringer systems were not verified in the site investigations, thus it is unknown if the members are doubled or single members. If the members are doubled, the required live load capacity of 100psf can be met. However, if the members are single 2" x 9" members the safe

allowable live load capacity is limited to 33psf. Some cracking in the plaster at the central stair below the landings was observed during the site investigations. This cracking may be due to the inadequacy of the header and stringer systems. At the north stair, nominal 2x10s were considered due to relatively recent remodels of the butler's pantry/kitchen 205 area. The analysis of the stringer produced unreasonable results as the structure is working presently. Further investigation would be required to determine the exact capacity of the header and stringer system at the north stair. At the north stair landing, the southernmost joist is limited to 80psf safe allowable live load. However, similar to the termite-damaged joist in the first floor structure, this joist can be reinforced with little impact to the historic fabric or architecture to meet the 100psf live load requirement.

The joists of the second and third floor structures are limited by live load deflection to the 50psf safe allowable live load capacity stated above. The L/360 deflection criterion was used in the analysis due to the plaster ceiling finishes. The 50psf capacity is more than adequate for a residential use. The joists can be reinforced to increase the capacity of the floors for public loadings, or the number of people on the floor structures can be limited to 25 people at one time. This would have the greatest effect in the winter season when the presentation video is set up in the south room 202. People will congregate in this room and remain for several minutes for the video presentation.

The beams framing the bay window openings in the northeast and southeast corners limit the maximum safe allowable live load of the second and third floors. The beams, however, support a relatively minimal area of each floor system, thus their live load capacities do not limit the entire second or third floor structures.

In the northeast bay window 107 area, as discussed in the existing conditions section of this report, the beam has been replaced with a creosoted beam. Assuming a full 8" x 8" beam adjacent to the creosoted beam, the beams are adequate to safely support a maximum live load of 25psf on each of the second and third floors (or 50psf total live load between the two floors). The beam capacities are limited by the safe allowable shear stresses. In the southeast bay, two 8" x 8" white pine beams were assumed to span the opening. To support a 50psf live load on the second and third floor structures, the shear stress in the beams exceeds the allowable assumed stress of 100psi. In addition, the total load deflection was determined to be approximately 3/8" (L/296). Although L/296 is generally acceptable for total load deflection of wood floor structures, these beams are supporting a masonry wall above. The masonry wall requires a stiff support with maximum deflection criteria of L/600, or 3/16 of an inch. If this deflection criteria is not met, cracking in the upper level masonry wall will result. Cracking was observed in these walls above the northeast and southeast bay windows 107 and 102, respectively. To achieve the desired 100psf live load capacity, the beams would most likely need to be replaced with properly designed steel beams.

The roof structure and stone wall structures were verified to work for the snow and wind loads discussed above. Verification of the detailing of the roof structure in the April 2002 site investigation proved to be very useful in determining the causes of the movements observed and performing the roof analysis. The eastern porch roofs were

also determined to be adequate for the required snow loads. The central porch roof rafters are near the allowable limits, however, the rafters are adequate for flat roof snow load and drift loads. The western rear porch 207 roof members, however, are not adequate to support the required snow loading when drift loads are considered. The nominal 2x6 rafters, the nominal 2x10 ridge beam, and the nominal 2x4 stud supporting the southwest end of the ridge beam require reinforcing. The roof members do not meet minimal deflection criteria ($L/180$). The stud exceeds the safe allowable compression capacity. Although the reinforcing cannot be hidden from view, the members can be reinforced without altering the space greatly. To the casual observer, the changes will be minimal. Reinforcing the stud may prove to be the most difficult as it affects the adjacent windows 210 and 211.

An analysis was performed on the stability of the tunnel 107 barrel arch structure. Although barrel arches are famous for supporting vertical loads, they are not as adequate supporting horizontal loads. Soil pressure increases with depth, similar to water pressure, and acts horizontally against foundation and retaining walls. A 45pcf soil pressure was assumed for the purposes of this analysis. The thickness of the arch was assumed to be 12-inches thick. The stone arch is adequate to resist the soil pressures, a surcharge load created by the weight of the soil and the 100psf live load capacity on the top concrete slab. The movements and cracking observed during the site inspection are due to water penetration. The structural integrity of the barrel arch may be compromised due to deterioration of the mortar and/or stone.

The curing room 208 roof structure requires reinforcement similar to the rear porch 207 roof structure. The rafters, ridge members, and ceiling joists supporting the cupola framing all exceed the minimal live load deflection criteria of $L/180$. The loads considered were a minimal 10psf dead load and the minimum roof live load of 15psf determined through ASCE 7-98. This analysis may add light to the debate of the original use of this building. The existing ceiling joists would deflect, or sag, greatly if fully loaded and used as a Smokehouse.

Plumbing Systems

The newspapers hint at the amenities available to the ranch. For example, the April 7, 1882, edition of the *Strong City Independent* informed readers that within the “magnificent mansion ... all the principal apartments are supplied with both soft and spring water.”³ The soft water came from rain water collected off the roof in a cistern located under the rear porch; this water was used for laundry and possibly bathing.⁴ The

³ “Soft” water was rain water that lacked the minerals found in “hard” or spring water that made washing so difficult. No evidence of sinks piped for water was found in any of the parlors or bedrooms during the February 2003 site visit. The term “principal apartments” usually refers to the most commodious and formal rooms in a house; in this instance, however, the reporter apparently meant the kitchen 105, the butler’s pantry 205, and the bathroom 305.

⁴ Figure A2-24 shows the rear porch 207 set up as a laundry room ca.1935. Patricia Wilson Thorpe remembered the open cistern was enclosed to prevent her and her younger brother, Enas, from falling in. The photograph shows a hand pump into the rainwater cistern beneath the porch. During a tour of Spring Hill, January 28, 1998, Jesse Miser, who had lived in Chase County all his life, identified pieces of a “water

harder but purer spring water came from three springs leading to a reservoir a hundred feet west of the house with a capacity for 8,500 gallons.⁵ This water was used for cooking and, according to an 1882 newspaper report, it was also “carried to the spring-house, where it runs in circles and eccentrics [sic] around the milk vessels, and is finally discharged into another reservoir from which a fountain, to be erected, will be supplied, and the terraced grounds in front can be irrigated if necessary.”⁶ At some point, after the introduction of electricity to the site, a pump and pump house was added and water was supplied from the pump to the Ice House cistern and from there to both the barn and the ranch house.

In the old kitchen, the sink was located in the northwest corner and the water spigot was on the west wall. Both appear in figure A2-22. The enameled cast-iron sink presently on the west wall between the window and door to the root cellar 106 is not in the photograph but may have been added shortly thereafter when other plumbing changes were made. figure A2-30 of west bedroom 304 shows a pitcher, so perhaps pitchers were used in the bedrooms.

A hand-operated ram pump was needed to move water from the cistern to the third floor bathroom 305 since there was insufficient water pressure from the icehouse reservoir to provide adequate pressure to the fixtures in 305. An automated ram pump found in the barn during the February 2003 site visit may have been the one used to raise the water supply to the house.⁷

Filling the tub in bathroom 305 was complicated. In most plumbed houses of the period, a lead-lined wood frame cistern was constructed in the attic over the bathroom so water could be gravity fed to taps throughout the house. The attic cistern also supplied water to a boiler mounted next to the kitchen stove providing a continuous loop of hot water to the bathroom and laundry. Spring Hill had neither an attic nor such a sophisticated system. One photograph shows a large wood container supported on chamfered wood legs in the southwest corner of the room opposite the tub (figure A2-32).⁸ Three narrow pipes extend across the top of the west wall from the bathtub to this precarious structure that held the water cistern to fill the tub and possibly the sinks in the butler’s pantry 205 and the kitchen 105 below. When the fall of water was not sufficient to fill a cistern, a ram pump or force pump was used. Either the Spring Hill families used the rain water cistern or the fall of water from the spring-fed cistern on the hill west of the house did not have sufficient pressure to reach the third floor cistern, thus necessitating a pump. Erma

elevator” and cistern cover on the third floor of the barn. For information on the operation of these pumps see Gordon Bock, “In Praise of Field Pumps,” *The Old-House Journal*, July-August, 1995, pp.24-26.

⁵ Tewksbury, *The Kansas Picture Book*, p. 41. This source reports the volume as 11,000 barrels. Recent measurements indicate the reservoir has a capacity of about 8,500 gallons. This may be another instance of “buffery” on the part of the reporter.

⁶ The April 13, 1882, edition, *Chase County Leader*.

⁷ For a detailed description of rams see Arthur Channing Downs, Jr., “The Introduction of the American Water Ram, ca.1843-1850,” *APT Journal*, vol. 7, no. 4 (1975), 56-103, and “The American Water Ram, Part II,” in *APT Journal*, 11, no. 1 (1979), 81-94.

⁸ Patricia Wilson Thorpe who lived in the house 1941-1943 remembered the tub and cistern in room 305 and identified them as a “copper tub with reservoir above.” Video-taped interview, 1998.

Slabaugh recalled that water had to be pumped to bathroom 305 where it was heated on a stove for bathing, suggesting no water heater was connected to the kitchen stove.⁹ The tub was replaced at some point during the Slabaugh family's tenure as ranch managers.¹⁰

The house lacked a water closet during the Jones and most of the Benninghoven years. During the day, family members used the rather pleasant privy just northwest of the house and at night they resorted to chamber pots, which they emptied into the privy each morning.¹¹ At the time the house was constructed, water closets were not particularly efficient and disposing of sewage presented problems far more complex than a privy. By the end of the 1880s, however, water closets resembling their modern counterparts were being manufactured and urban sewerage systems created. A water closet was added to the ranch house when Edith and Curt Benninghoven lived there but it was in the new bathroom 104 they had carved out of the old kitchen 105 early in the 1940s.¹² During the site visit in February 2003 a "Modernus" model water closet manufactured by the Standard Sanitary Manufacturing Company (later American Standard) was found in the barn. This fixture was probably the first water closet in the house. According to a mid-1930s Standard catalogue, "The Modernus is a washdown type closet, with the straight front design. It meets fully the demand for strictest economy."¹³ This water closet should be preserved in case the ranch house is ever interpreted to the 1940s.

Currently, the ranch house third floor toilet and ranch hand house toilet are the only functioning facilities at the site. Park visitors use portable toilets located in a shed north of the barn.

A potable water system was recently installed. It enters the ranch house from the root cellar 106. The old pressure tank and compressor station located in the root cellar were removed and replaced with a water meter and isolation valves. There is a water heater in the old kitchen 105. From there water is supplied to the bathroom 104, the old kitchen 105, the tunnel 107, the butler's pantry 205, and the third floor bathroom 305.

Floor drains located in tunnel 107 and pit 005 below the old kitchen were tested in 2002. Both drains easily accepted water flow from a garden hose, however, the location to which the water drained is unknown. The water neither drained out below the main house stair in crawl space 001 nor across the front steps on the east side of the house.

⁹ Erma Slabaugh, interview, 5 October 1994.

¹⁰ Younger members of the Slabaugh family recalled the copper bathtub being taken out of the house and the tub sitting outside the house and barn for a number of years. Slabaugh family interview, 24 September 2001.

¹¹ Patricia Wilson Thorpe described taking "our little cans out in the morning." Thorpe interview

¹² Patricia Wilson Thorpe remembers the privy in 1941 but a water closet being installed shortly thereafter; Thorpe interview. Erma Slabaugh stated she never used the outhouse, which confirms the presence of the water closet, Erma Slabaugh interview.

¹³ *The Well-Appointed Bath*, introduction by Gail Caskey Winkler (Washington, DC: The Preservation Press, 1989), p. 109.

There is a new septic field located north and east of the ranch house, installed in 2001. An 80,000 gallon water reservoir was recently installed in the former location of the Quonset hut.

Heating and Cooling Systems

The only fireplaces and mantels in the ranch house are in the two ground floor parlors. The fireplaces are decoratively painted cast-iron, and the mantels consist of stone sections bolted to the wall with faux finish painting. In the south parlor, the mantel was marbleized in a granite finish. The general form of the mantel and the arched opening to the firebox are forms that appeared in the east during the 1850s. The shallow firebox was intended for a small coal grate or a gas-fired burner. Since no soot is visible, gas-fired burners may have been used. At the present time there is a 1920s gas heater connected to a gas pipe in the firebox. The interior of the firebox has been relined and one brick is stamped “Mexico Mo.”¹⁴ The chimneys from these fireplaces rise up through south room 202, and the common wall between north room 203, and west room 204. Nineteenth-century chimneys were typically constructed without dampers and a damper was added to both Spring Hill fireplaces during the Benninghoven period; the dampers bear the patent date of August 20, 1912, and the manufacturer’s name, H.W. Covert, New York.

Investigation during the site visit revealed evidence of additional attempts to warm the south parlor. Initially a coal-burning stove may have been placed in front of the hearth; if so, evidence might remain on the pine boards beneath the oak flooring. At some point a gas stove was installed near the east side of the room where a gas pipe projects from the floor. The exhaust duct opening is capped by an ornamental plaster cover for the pipe outlet, visible on the chimney breast below the picture rail.¹⁵ There are capped exhaust duct openings in both the south room 202 and north room 203 approximately eight feet above the floor suggesting that there might have been a wood or gas burning heater or stove in these rooms at one time.

The stove location in the old kitchen 105 is unknown but logic suggests it was either on the east wall (where it could vent up the chimney flue shared with the north parlor) or on the west wall where the flue might have vented at the window. The abandoned vent pipe in the left sash was probably for the gas stove that Mrs. Slabaugh used for canning or possibly for a much later clothes dryer.¹⁶

¹⁴ Stamped fire brick was manufactured from 1919 to 1931 by the A.P. Green Fire Brick Company of Mexico, Missouri, indicating when the fireboxes were relined. See Karl Gurcke, *Bricks and Brickmaking, A Handbook for Historical Archaeology* (Moscow, Idaho: The University of Idaho Press, 1987), pp. 264-265. Al O’Bright provided this reference. The fireboxes were cleaned in 1985; see video, “Restoration Tour by Sharon Hahn,” 1998.

¹⁵ In the 1998 video, Sharon Hahn mentioned the plaster covers were produced by a carpenter working on the house in 1985-1986. According to interviews on August 5, 2001, the plaster work was done by Marvin Ratliff and his sons, Ken and Max. Molds for the stovepipe covers and for repairing plaster cornices were found in the barn during the February 2003 site visit.

¹⁶ Marvin Slabaugh, interviewed by Robert Coon, 21 April 2002.

In each of the third floor bedrooms a gas pipe is stubbed and capped at floor level. Gas heaters of some kind were used; one remains hooked up in bathroom 305. Exhaust ducts lead, or would have led, to the chimneys. Erma Slabaugh relates the use of potbelly stoves for heating in several locations, including her mother's second floor bedroom south room 202. This would explain the capped duct connections at the chimneys in the south parlor 102, north parlor 103, south room 202, and north room 203. The gas heater in figure A2-28 may be the same equipment that is stored in the barn.

There is a possibility that the heating system may have been later changed to steam in the two parlors. Pipe stubs are capped near the windows of the south parlor 102 and the north parlor 103 and in the nook of the hall 101 formed by the staircase. In each case, three pipes are present and they appear to connect and are visible in the landing crawl space 001. The arrangement of the pipes suggests that a steam system was first added to combat the chill in these rooms, and perhaps to replace the potbelly stoves. This could have been installed prior to the introduction of electricity to the site since a steam radiator system would not require a pump. At some later point, this system may have been converted to hot water. This would have occurred after the installation of electricity since the hot water system does require an electric pump. Another possibility is that the initial steam installation was a single pipe system allowing the return to flow back through the same pitched pipe. Performance of this type of installation was often less than optimal and the system could have been converted to a two pipe system to improve performance. No evidence of a boiler or its likely location was found and no evidence that either of these systems was used above the first floor was found.

Currently the main house is heated by a combination of a relatively recent Lennox gas fired furnace and individual gas heaters. The furnace provides heat to the hall 101, south parlor 102, north parlor 103, bathroom 104, old kitchen 105, west room 204, and butler's pantry/kitchen 205. There are gas heaters in south room 202, north room 203, rear porch 207, and bathroom 305. There are also gas connections to the fireplaces in the south parlor 102 and north parlor 103. Ductwork from the furnace runs overhead to floor grilles in the west room 204 and the butler's pantry/kitchen 205. Additional supply ductwork extends below the furnace and under the stairs in hall 101 to supply grilles in hall 101, south parlor 102 (baseboard mounted), and north parlor 103. No returns are present.

Air conditioning is provided in several rooms using window air conditioners. Power for these A/C units is typically routed outside the house and in through the window frame. A/C units were observed in the west room 204 and all three of the third floor bedrooms. No central air conditioning exists.

Electrical and Lighting Systems

Exactly how the Jones family illuminated the house is unknown. Kerosene had been available for lighting since the 1860s and presumably the Jones family had portable kerosene lamps in addition to a hanging kerosene fixture wherever there was a ceiling medallion. Gas for lighting was not available until about 1906 and then only in limited

areas of Chase County where gas was located. No evidence has been found that the Jones family incurred the added expense of installing their own gas retort and it certainly seems something the local newspapers would have trumpeted. Stephen Jones may have piped the house for gas in anticipation of eventually having a source but none had become available during the time the family remained at Spring Hill.

Electricity was available in the area as early as 1905.¹⁷ The light company hoped to have streetlights in Cottonwood Falls by November of 1905 and was placing poles between Cottonwood Falls and Strong City at this time. In 1906 they expanded their plant near the river and began offering twenty-four hour service. Telephone lines had been run to the ranch from Strong City in 1885 so the means existed to provide electricity to the ranch as early as 1905. The local electric utility, Inter County Electric Company, was well established by 1918 and by 1923 was distributing electric power from Kansas Electric Power Company of Emporia. The long high-line ran right past the property. It would seem reasonable that commercial electric power was made available to the ranch at some point during this period. No confirming evidence was found regarding the actual time frame for introduction of electricity.

The Rural Electrification Association (REA) set the electric lines at the ranch in 1943,¹⁸ with a pole to the “big house” and meter for the well.¹⁹ However, while electric lights appear in some circa 1935 photographs of the interior of the house, they were powered by an electric emergency generator on a concrete slab at the east side of the root cellar 106. Curt Benninghoven only used the generator during emergencies or other necessary times; for everyday use the family used kerosene lamps instead. The photographs show a few wall-mounted gas fixtures as well as the modern electric lights and electric wall switches added during the Benninghoven occupancy.

Erma Slabaugh remembers a Delco Generator in the barn that provided power for the ranch when she lived there between 1943/44 and 1968. Sharon Hahn was hired in 1985 to renovate the house and as part of the renovation project, they converted the gas lights to electric. In doing so, they used the gas pipe to run the wires.

At the present time, there is a hanging electric fixture in hall 101 but there is no evidence of a plaster medallion, which suggests that in the 1880s daylight and portable kerosene lighting were the only sources of illumination.

No early lighting was found in old kitchen 105 during the site visit. A gypsum board ceiling prevented looking for evidence of ceiling mounted gas or electric fixtures such as may have been found in the north and south ends of the room. For additional lighting near the sink and the stove, the Jones family probably used wall-mounted kerosene

¹⁷ Lorna Marvin, email to Robert Bucci, AEI, 6 February 2003.

¹⁸ Carolyn M. Steere, Flint Hills Rural Electric Cooperative Association, Inc, letter to Darryl Meierhoff of the NPS, 23 April 2003.

¹⁹ The statement concerning the electrical pole and meter are from a letter dated April 23, 2003, to Darryl Meierhoff, National Park Service, Cottonwood Falls Office, from Carolyn M. Steere, billing supervisor, Flint Hills Rural Electric Cooperative Association, Inc.

fixtures. Until site-generated electricity was added, daylight and kerosene lighting were probably sufficient for the root cellar, tunnel, and springhouse.

The circa 1935 photographs of north room 203 show three forms of artificial illumination: a gas wall sconce atop a pipe attached to the chimney breast, a hanging, single-light electric fixture in the center of the room, and a kerosene lamp on a table between two chairs on the south wall. There is also a switch plate on the wall next to the southwest doorway leading to the hall (figure A2-25, 26).²⁰ There is no plaster ceiling medallion in room 203, suggesting the first ceiling mounted fixture was the electric one added by the Benninghovens. It is not unusual to find kerosene, gas, and electric lighting in photographs taken of city houses at the turn of the century. Gas was rarely used as a table lamp because it required that a hose be run between the lamp and a gas nipple on either a wall sconce or ceiling fixture. Most families used kerosene lamps when fuel became plentiful following the Civil War. When first introduced, electricity was a temperamental light source subject to unexpected outages as well as restricted to certain hours of the evening.

Photographs of west room 204 show two forms of artificial illumination in the room, kerosene lamps on the desk and sideboard (figures A2-27, 28) and a hanging electric fixture in the middle of the room (figure A2-29) that appears to be identical to the fixture in north room 203. There is a hanging bare-bulb fixture in the middle of the butler's pantry 205 (figure A2-29).

The current electrical service to the ranch house is single phase, 120/240 volt, 200 amp served from a pole mounted transformer. Overall, the site is fed from an overhead utility line running along Highway 177. The ranch house is separately metered at the transformer pole and then fed overhead.

The ranch house electrical panels are located in old kitchen 105. There are two 200amp panels, both with breaker space available. Branch circuit wiring of at least three vintages is observable within the house. No safety or code violations were observed.

Communications Systems

A telephone line was extended from Strong City to the ranch in 1885, (see figure A1-2). According to the paper, "Bell Telephone instruments will be used."²¹ No record was found of where this line may have terminated on the ranch.

Currently, the ranch is served underground from a buried service running along Highway 177. There is a telephone company pedestal located at the rear of the ranch house, near the north-west corner. Telephone demark equipment is located under the stairs in old kitchen 105. The bookstore (room 203), rear porch 207, the computer server in hall 301,

²⁰ Figure A2-25 shows the gas sconce and hanging electric fixture; figure A2-26 illustrates the kerosene lamp, the electric fixture, and the wall switch. The modern wall switch is in the same location.

²¹ The November 26, 1885 edition of the Strong City Independent mentioned the telephone and the new lines.

and the third level bedrooms are all wired for telecommunications. The south bedroom 302 is the location of the local file server.

Security Evaluation

The Spring Hill Ranch House is located on the Tallgrass Prairie National Preserve and faces Route 177. The house is directly bordered by a large group of trees directly to the north. The remainder of the site is primarily unobstructed with exception to the rolling hills that surround the property. The ranch house currently has no wired security system. Exhibit protection is not a focus of this analysis.

Physical Security

Currently, the site is not well lit, which provides no opportunity for natural surveillance for the surrounding area. Additionally, the back and side of the house provide multiple points of discreet and quick entry.

The house windows at grade are easily accessible and allow access into the core of the house. Additionally, windows on the second level are also accessible from grade via architectural handholds on the corner of the house, which would allow someone to climb to the second floor with relative ease. Additional windows, including a cellar window and roof windows for the root cellar, would also allow access to the house. Tallgrass Prairie National Preserve staff report no vandalism or break-ins. Most accessible floors, specifically entries at hall 208, north and south parlors 102, 103 were equipped with chain locks affixed to the interior of the door, installed by the previous house residents. We believe these doors were equipped with chains to prevent entry to the residence from the first floor windows, thereby compartmentalizing the core of the house.

Site Lighting

Currently, limited site lighting is located around the site buildings, but most do not function.

Life Safety Evaluation

Several criteria must be considered when evaluating the effective evacuation of a building during an emergency situation. The criteria employed in this report are in compliance with the Building Construction and Safety Code (NFPA 5000), 2003 edition, (hereafter, NFPA 5000) published by the National Fire Protection Association. All references in this chapter are to sections in NFPA 5000, unless noted otherwise. The following is a summary of conditions, which generally apply to the Spring Hill Ranch House:

Definitions

Accessible means of egress: A means of egress that provides an accessible route to an area of refuge, a horizontal exit, or a public way.

Exit: That portion of a means of egress that is separated from all other spaces of a building or structure by construction or equipment as required to provide a protected way of travel to the exit discharge.

Exit access: That portion of a means of egress that leads to an exit.

Exit discharge: That portion of a means of egress between the termination of an exit and a public way.

Means of egress: A continuous and unobstructed way of travel from any point in a building or structure to a public way consisting of three separate and distinct parts: (1) the exit access, (2) the exit, and (3) the exit discharge.

Use and occupancy classification

Structures or portions of structures shall be classified with respect to occupancy in one or more of the groups listed in Chapter 6 of NFPA 5000. These groups are based on the fire safety and relative hazard involved in the use and occupancy. Minimum egress requirements are based on the nature of the occupancy, which then determines the occupancy load per square foot, and the number of exits required.

Since the Spring Hill Ranch House is open to the public as a historic interpretive house museum, the rooms open to the public must now be considered as assembly use for the visiting public although they may have had different uses historically. In the evaluation of the Spring Hill Ranch House as a house museum, the following use and occupancy classification is applicable, and is defined as follows:

Assembly Occupancy: An occupancy (1) used for a gathering of 50 or more persons for deliberation, worship, entertainment, eating, drinking, amusement, awaiting transportation, or similar uses; or (2) used as a special amusement building, regardless of occupant load. (NFPA 5000: 6.1.2.1)

Types of construction

Buildings and structures are classified in one of the five construction types defined in Chapter 7 of NFPA 5000. This construction type defines the fire resistance rating of building elements and exterior walls.

The existing type of construction of the Spring Hill Ranch House is Type III (200). Type III construction is that in which the exterior walls are of noncombustible materials and the interior building elements are of any material permitted by this code. The fire-resistance rating requirement for exterior bearing walls for this type is 2 hours. For the other elements, there is no rating required. (NFPA 5000: Table 7.2.2.)

Based on allowable area requirements in Table 7.4.1, the Spring Hill Ranch House could actually be of Type V (000) construction. This eliminates any required ratings for the exterior walls. There is no penalty for exceeding minimum requirements.

However, the Spring Hill Ranch House may have difficulty complying with the allowable height requirements of Table 7.4.1 or Assembly Occupancies with less than 300 people. The Spring Hill Ranch House is considered to have three stories above grade per Section 3.3.523.2. This is based upon the second floor having a height above grade that exceeds 12 feet in the front of the house. For a non-sprinklered facility, the maximum permitted height in stories is one for either Type III (200) construction (as currently provided) or Type V (000) construction (as permitted based upon allowable area). This number increases to two when the facility is sprinklered.

Section 15.9.4.12 provides relief from this issue in historic buildings. It permits historic buildings that do not comply with the minimum construction type requirements in Table 7.4.1 to be provided with automatic sprinkler systems in lieu of retroactively meeting the required construction type. This is an appropriate solution for the Spring Hill Ranch House because it barely misses being classified as having only two stories above grade. In this case, sprinkler protection and Type V (000) construction would meet the requirements of NFPA 5000 for new buildings.

Fire protection systems

Based upon the requirements for sprinkler systems due to construction type deficiencies, the rest of the building code analysis assumes that sprinkler protection will be provided. However, it should be noted that NFPA 5000 does not normally require sprinkler systems for Assembly Occupancies with less than 300 occupants (NFPA 5000: 16.3.5.1). A complete fire protection system will be installed in the house in 2004.

Fire alarm and detection systems

NFPA 5000 does not normally require sprinkler systems for Assembly Occupancies with less than 300 occupants (NFPA 5000: 16.3.4).

In 2004 a fire detection and alarm system was installed in the ranch house.

Means of egress

General means of egress

Design occupant load

The occupant load in any building or portion thereof shall be not less than the number of persons determined by dividing the floor area assigned to that use by the occupant load factor for that use as specified in Table 11.3.1.2.

The occupancy load factor was selected from Table 11.3.1.2 based on the listed use, which most closely resemble the current intended use. The following occupant load factor was utilized for this evaluation: "Assembly: Less concentrated use, without fixed seating: 15 sq. ft. net floor area per occupant." In determining the occupant load, all portions of a building shall conservatively be presumed to be occupied at the same time.

See table for design occupant load calculations. The first floor of the Spring Hill Ranch House has a total computed occupant load of 85 people, the second floor 66 people, and the third floor 48 people. The occupant load for the entire House is thus 199 people. Since the occupant load for any one room is less than 50, only one exit is required per room. Please note that the occupant load factors used in this analysis are based upon gross square footage. The occupant load factors in Table 11.3.1.2 are based on net square footage for the space, which permits reductions for exhibits, furniture, and other items. Therefore, the calculated occupant load used in this analysis is very conservative.

Exits serving more than one story

Where exits serve more than one story, only the occupant load of each story considered individually shall be used in computing the required capacity of the exits at that story, provided that the required egress capacity of the exit is not decreased in the direction of egress travel. (NFPA 5000: 11.3.2.4)

Since the third floor occupants use the exit (door 207) on the second floor, this provision means that the second floor exit only needs to be dimensioned for each floor individually, not for the sum of occupants from both floors. This is also true for the first floor exit (doors 101) that is used by occupants exiting from both the first and the second floor. There are provisions within Section 11.3.1.5 that require additional egress width where required exits converge at the same floor, but that does not apply to the configuration of the Spring Hill Ranch House.

Egress width

The width of any means of egress component shall be not less than that required for a given egress component...and shall not be less than 36 inches. (NFPA 5000: 11.3.4.1)

For the Spring Hill Ranch, the factor for stairways is 0.3 inches per occupant and the factor for other egress components is 0.2 inches per occupant. (NFPA 5000: Table 11.3.3.1)

The required width of the means of egress for stairways calculated per the above directions is 25.5" for the first floor, 19.8" for the second floor and 14.4" for the third floor. The required width of the means of egress of other egress components is 17" for the first floor, 13.2" for the second floor and 9.6" for the third floor.

In addition to the minimum width based on occupant load, the width of a stairway or corridor shall not be less than 36" when serving an occupant load of less than 50. The minimum width of door openings shall provide a clear width of not less than 32". (NFPA 5000: 11.3.4.1, 11.2.1.2.4)

The width of the main stair is 42". The width of the service stair is 35" and the tunnel stair is 39 1/2". Since the occupant load for the first and second floor is more than 50, the stairway needs to be 44" wide. These stairways are thus not compliant. However, Section 15.9.5.5 permits existing door openings, and corridor and stairway widths of less than those that would be acceptable for non-historic buildings. Therefore, these deficient

egress components can remain provided there is sufficient width and height for a person to pass through the opening or traverse the exit and that the capacity of the exit system is adequate for the occupant load. The Spring Hill Ranch House meets these requirements.

The tunnel 107 is 6 feet wide and thus wider than 44". Hall 306 is only 40 1/2" wide.

See Handicap Accessibility Assessment - Doors for door widths.

Ceiling height and protruding objects

The means of egress shall have a ceiling height of not less than 7 ft 6 in. with projections from the ceiling not less than 6 ft 8 in. nominal height above the finished floor. (NFPA 5000: 11.1.5)

See Handicap Accessibility Assessment - Headroom for ceiling heights.

Floor surface

Walking surfaces shall be slip resistant under foreseeable conditions. The walking surface of each element in the means of egress shall be uniformly slip resistant along the natural path of travel. (NFPA 5000: 11.1.6.4)

See Handicap Accessibility Assessment - Surface Textures for floor surfaces.

Elevation change

Changes in level of means of egress shall be achieved by an approved means of egress where the elevation difference exceeds 21 inches. Maximum slope of 1 in 12 is permitted. (NFPA 5000: 11.1.7.1, Table 11.2.5.2)

See Handicap Accessibility Assessment - Slope for elevation changes.

Exit signs

Exits and exit access doors shall be marked by an approved exit sign readily visible from any direction of egress travel. Access to exits shall be marked by readily visible exit signs in cases where the exit or the path of egress travel is not immediately visible to the occupants. Exit sign placement shall be such that no point in an exit access corridor is more than 100 feet from the nearest visible exit sign. However, exit signs are not required in rooms or areas that require only one exit or exit access. Main exterior exit doors which obviously and clearly are identifiable as exits need not have exit signs where approved by the building official. The local jurisdiction shall be permitted to accept an alternate exit sign or egress path marking location where such sign or marking would have an adverse effect on the historic character. Alternative signs shall identify the exits and egress paths. (NFPA 5000: 16.2.10, 11.10, 15.9.4.11)

There are currently no exit signs.

Means of egress illumination

The means of egress, including the exit discharge, shall be illuminated at all times the building space served by the means of egress is occupied. The means of egress illumination level shall be no less than 1 foot-candle at the floor level and 0.1 foot-candle measured along the path of egress at floor level. The means of egress illumination shall comply with NFPA 5000. (NFPA 5000: 11.9)

There is currently no means of egress illumination.

Guards

Guards shall be located along open-sided walking surfaces, mezzanines, industrial equipment platforms, stairways, ramps and landings which are located more than 30" above the floor or grade below. Guards shall be adequate in strength and attachment in accordance with NFPA 5000. Guards shall form a protective barrier not less than 42" high, measured vertically above the leading edge of the tread, adjacent walking surface or adjacent seatboard. Open guards shall have balusters or ornamental patterns such that a 4-inch-diameter sphere cannot pass through any opening up to a height of 34 inches. From a height of 34" to 42" above the adjacent walking surface, a sphere 8" in diameter shall not pass. Existing handrails and guards shall be permitted to remain, provided that they are not structurally dangerous. (NFPA 5000: 15.9.4.10)

The stair handrails in the Spring Hill Ranch House are all less than 42 inches high and on one side of the stair only. The main stair handrail is 31" high and the service stair handrail is 23-1/2" high. Both handrails are significant historic architectural features of the house.

Outside, to the north of the house, is a 45" high retaining wall without guardrail between the ranch house and the curing room. At this retaining wall, there are steps, also to a total height of 45" without guardrail. There is also a 36" tall tower base, with a drop of 81" to the level below, lacking guardrail. Outside of door 107, there is another retaining wall/terrace 53" above the next garden level. The steps along this terrace do not have a guardrail. The steps to the curing room 208 entrance are 38" above the ground. To the south, there are retaining walls without rail. At the south side of rear porch 207, there are a few unused dead-end steps up to the porch level at total height of 34". All other exterior steps are less than 30 inches above ground and do not require guardrail (steps at rear porch: 26-1/2", steps at root cellar concrete slab: 19", steps at front porch: 27 1/4".)

Means of egress components - doors

Exit access and exit doors shall be designed and arranged to be clearly recognizable. Hangings or draperies shall not be placed over exit doors or located to conceal or obscure any exit. Mirrors shall not be placed on exit doors. Mirrors shall not be placed in or adjacent to any exit in such a manner as to confuse the direction of exit. (NFPA 5000: 11.5.2.2)

The doors serving the means of egress system are currently not concealed.

Size of doors

The minimum width of each door opening shall be sufficient for the occupant load thereof and shall provide a clear width of not less than 32". Clear openings of doorways with swinging doors shall be measured between the face of the door and the stop, with the door open 90 degrees. Where this section requires a minimum clear width of 32" and a door opening includes two door leaves without a mullion, one leaf shall provide a clear opening width of 32". The maximum width of a swinging door leaf shall be 48" nominal. (NFPA 5000: 11.2.1.2.4)

See Handicap Accessibility Assessment - Doors for door widths.

See Handicap Accessibility Assessment - Headroom for door heights.

Egress doors shall be side-hinged swinging. Doors shall swing in the direction of egress travel, that is, open outward, where serving an occupant load of 50 or more persons. When approved by the local jurisdiction, the existing front doors shall not be required to swing in the direction of exit travel, provided that other approved exits having sufficient capacity to serve the total occupant load are provided. (NFPA 5000: 11.2.1.4.1, 15.9.4.5)

In the Spring Hill Ranch House only doors 104 and 306 swing in the direction of egress travel. All other doors open inwards. As long as the National Park Service opens up the egress doors during business hours, then they comply with the intent of the code.

Floor elevation

The elevation of the floor surfaces on both sides of a door shall not vary by more than ½ in. The elevation shall be maintained on both sides of the doorway for a distance not less than the width of the widest leaf. Thresholds at doorways shall not exceed ½ in. in height. Raised thresholds and floor level changes in excess of ¼ in. at doorways shall be beveled with a slope not steeper than 1 in 2. (NFPA 5000: 11.2.1.3)

At the rear porch door 207 there is a 7-1/2" step down; at door 206A there is an 8" step down, at doors 202B and 204 there is a 9" step down, at door 208 there is an 8" step down and at the front doors 101 there is a 8-1/4" step down to the outside.

See Handicap Accessibility Assessment - Slope for slopes.

Stairwell landings

Stairs shall have landings at door openings. Stairs and intermediate landings shall continue with no decrease in width along the direction of egress travel. In new buildings, every landing shall have a dimension measured in the direction of travel that is not less than the width of the stair. (NFPA 5000: 11.2.2.3.2)

There are no landings at doors 107, 207 and 208. The first floor landing of the main stair at the service level measures 34" in length and the second floor landings measure 41-1/2"

in length by door 201 and 43" in length by door 203 respectively. The landing by door 206 is 40" long, and by door 206A 39 1/4" long.

Thresholds

The maximum height of thresholds at doorways shall be 1/2 inch. Such thresholds shall have beveled edges on each side. (NFPA 5000: 11.2.1.3)

See Floor Elevations for steps at doorways.

See Handicap Accessibility Assessment - Doors for threshold heights.

Locks and latches

Doors shall be arranged to be opened readily from the egress side whenever the building is occupied. Locks, if provided, shall not require the use of a key, a tool, or special knowledge or effort for operation from the inside of the building. Exterior doors are permitted to be equipped with key-operated locking devices from the egress side provided that: 1.) The locking device is readily distinguishable as locked; 2.) A readily visible durable sign is posted on the egress side on or adjacent to the door per 1003.3.1.8.-2.2; and 3.) The use of key-operated locking devices is revocable by the building official for due cause. The unlatching of any leaf shall not require more than one operation (NFPA 5000: 11.2.1.5.1)

Most doors have door knobs and lockable cylinder locks. Doors 107 and 207 have lever handles and mortise locks. These doors comply as long as the doors are kept unlocked. Doors 101 and 207 may be locked if the above regulations are followed.

Bolt locks

Manually operated flush bolts or surface bolts are not permitted. (NFPA 5000: 11.2.1.5.4)

The main entry doors 101 have flush-mounted surface bolts. These are a historic feature of the door.

Hardware height

Door handles, pulls, latches, locks and other operating devices shall be installed 34" minimum and 48" maximum above the finished floor. Locks used only for security purposes and not used for normal operation are permitted at any height. (NFPA 5000: 11.2.1.5.4)

Most door knobs and lever handles are located at 34" above finished floor.

Occupant load

Spring Hill Ranch House

Use group: Assembly

| ROOM NAME | FLOOR AREA (sq. ft.) | OCCUPANCY RATE (sq.ft./occupant) | TOTAL OCCUPANTS | EXITS REQUIRED |
|-----------------------------|-------------------------|-------------------------------------|-----------------|-------------------|
| <u>First floor</u> | | | | |
| 102 South Parlor | 283 | 15 | 18 | 1 |
| 103 North Parlor | 283 | 15 | 18 | 1 |
| 104 Bathroom | 85 | 15 | 5 | 1 |
| 105 Old Kitchen | 163 | 15 | 10 | 1 |
| 106 Root Cellar | 187 | 15 | 12 | 1 |
| 107 Tunnel | 162 | 15 | 10 | 1 |
| 108 Springhouse | 183 | 15 | 12 | 1 |
| TOTAL | | | 85 | |
| <u>Second floor</u> | | | | |
| 202 South Room | 258 | 15 | 17 | 1 |
| 203 North Room | 271 | 15 | 18 | 1 |
| 204 West Room | 215 | 15 | 14 | 1 |
| 205 Kitchen | 91 | 15 | 6 | 1 |
| 207 Rear Porch | 168 | 15 | 11 | 1 |
| TOTAL | | | 66 | |
| <u>Third floor</u> | | | | |
| 302 South Bedroom | 251 | 15 | 16 | 1 |
| 303 North Bedroom | 211 | 15 | 14 | 1 |
| 304 West Bedroom | 156 | 15 | 10 | 1 |
| 305 Bathroom | 131 | 15 | 8 | 1 |
| TOTAL | | | 48 | |
| TOTAL FOR ALL FLOORS | | | 199 | |

Table 1: Occupant loads.

Means of egress components - stairways

Existing stairway widths of less than those that would be acceptable for nonhistoric buildings under this Code shall be approved, provided that, in the opinion of the local jurisdiction, there is sufficient width and height for a person to pass through the opening or traverse the exit and that the capacity of the exit system is adequate for the occupant load. Where renovations are made, parts of the existing building not subject to the work involved shall not be required to comply with the requirements of this code for new construction. (NFPA 5000: 15.9.4.4, 15.4.1.3)

The stairways in the Spring Hill Ranch House do not comply with most of the requirements for new construction in Section 11.2.2. However, the stairwells are also not part of any renovation work within the Spring Hill Ranch House.

Exit access

Exit or exit access doorways required

Two exits or exit access doorways from any space shall be provided where the common path of egress travel exceeds 75 feet for rooms with less than 50 occupants. (NFPA 5000: 16.2.5.1.2) The common path of egress travel refers to that portion of exit access where the occupants are required to traverse before two separate and distinct paths of egress travel to two exits are available. Paths that merge are common paths of travel. Common path of egress travel shall be included within the permitted travel distance.

The longest common path of egress travel on the first floor is 73 feet from the springhouse to the main stairway landing, where you can choose to go down a flight and out the main doors 101 or up a flight and out through the rear porch door 207. If using stair 107 this path would be reduced to only 12 feet. On the second floor, the common paths of egress travel are all short. On the third floor, the longest common path of egress travel is 62 feet from bathroom 305 and down the stairway to the second floor, where you can go out the rear porch door 207 or down another two flights of stairs and out the main doors 101.

Egress through intervening spaces

Egress from a room or space shall not pass through adjoining or intervening rooms or areas, except where such adjoining rooms or areas are accessory to the area served; are not a high-hazard occupancy; and provide a discernible path of egress travel to an exit. Egress shall not pass through kitchens, store rooms, closets, or spaces used for similar purposes. An exit access shall not pass through a room that can be locked to prevent egress. (NFPA 5000: 16.2.5.2.)

Since the Spring Hill Ranch House was built as a house, the spaces are organized accordingly. Egress from a room is usually passing through adjoining rooms. On the first floor, egress passes through the old kitchen 105 and bathroom 104. On the second

floor, egress may pass through the west room 204 and rear porch 207 depending on which path is selected. These rooms are not high-hazard occupancies.

Exit access travel distance

Exits shall be so located that the maximum length of exit travel measured from the most remote point to the entrance to an exit along the natural and unobstructed path of egress travel, shall not exceed 250 feet. (NFPA 5000: 16.2.6)

The longest exit access travel distance on the first floor is approximately 92 feet from the springhouse to the main doors 101. The longest exit access travel distance on the second floor is approximately 40 feet to the rear porch door 207 and 52 feet down to the main doors 101 on the first floor. The longest exit access travel distance on the third floor is approximately 92 feet down to the rear porch door 207 on the second floor and 114 feet down to the first floor main doors.

Corridors

With a sprinkler system, no rating is required for corridors. (NFPA 5000: 16.3.6 exception 2)

The only room in the Spring Hill Ranch House that might classify as a corridor would be tunnel 107. The tunnel's walls may be considered equivalent of a 1-hour fire-resistance-rating, but the doors are not rated. The width is 72" but the headroom is only 76". If door 107 is considered an exit, then there is no dead end in tunnel 107, otherwise the sequence of tunnel 107, old kitchen 105 and bathroom 104 would constitute a dead end of 58 feet.

Exits

Minimum number of exits

Every floor area shall be provided with two approved independent exits (NFPA 5000: 11.4.1.1)

According to NFPA, the minimum number of exits for an occupant load of 1-500 is two exits per floor. There are currently four exits on the first floor: the main entrance doors 101, the service stair up through door 206A, the tunnel door 107, and the main stairway up to the second floor and out through the rear porch door 207. Of these four exits only the main entrance doors 101 and the main stairway up to the second floor and out through the rear porch door 207 would be considered main exits. There are two exits on the second floor: the rear porch door 207 and the main stairway 201 down to the first floor and out through the main entrance doors 101. The third floor has only one exit, the main stairway 301 down to the second floor and out through the rear porch door 207. However, the occupants can reach the second floor with a common path of travel of approximately 62 feet, less than the permitted 75 feet.

Vertical stair enclosures

Interior exit stairways shall be enclosed. Vertical exit enclosures less than four stories shall be 1-hour fire-resistance rated. The number of stories shall be computed as all floor levels, including basements but excluding mezzanines. An exit enclosure shall not be used for any purpose other than means of egress. Vertical exit enclosures shall be constructed as fire barriers in accordance with Section 706. In buildings of three stories or less, exit enclosure construction shall limit the spread of smoke by the use of tight-fitting doors and solid elements. Such elements shall not be required to have a fire rating. (NFPA 5000: 11.1.3.2.1, 15.9.4.8.2)

The main stair in the Spring Hill Ranch House is three stories tall and is not enclosed. The plaster walls may be considered equivalent of 1-hour fire-resistance rating, but the doors in the enclosure are not rated. This stair is also not used exclusively for egress but is the only means of accessing all floors.

Enclosures under stairways

The walls and soffits within enclosed usable spaces under enclosed and unenclosed stairways shall be protected by 1-hour fire-resistance-rated construction, or the fire-resistance rating of the stairway enclosure, whichever is greater. Access to the enclosed usable space shall not be directly from within the stair enclosure. (NFPA 5000: 11.2.2.5.3)

Below the main stairway, on the first floor, is an access door to a space below the stair, landing crawl space 001. The soffits and inside walls of this space are not fire-resistance-rated. Access to this enclosed space is from within the stair enclosure, although the stair as mentioned before is not completely enclosed.

Exit discharge

Exits shall discharge directly to the exterior of the building. The exit discharge shall be at grade or shall provide direct access to grade. (NFPA 5000: 11.7.1)

The exit discharge locations provide direct access to grade. At the main doors 101, there is a porch level outside the doors and 36-3/4" to ground level from there. At the rear porch door 207, there is a stair down to ground of 26-1/2". Doors 206A and 107 exit at grade but there are steps to reach these doors on the interior side.

Accessibility Assessment

Federal and federally funded facilities, including facilities such as the Spring Hill Ranch House, are required to be compliant with the Uniform Federal Accessibility Standards (UFAS). The Building Construction and Safety Code (NFPA 5000) references ICC/ANSI A117.1-1998 (ANSI). UFAS and ANSI are very similar in their requirements. This assessment is based upon UFAS, but also relates any additional requirements per ANSI. This assessment is done with the assumption that the Spring Hill

Ranch House will continue to be used as a house museum. Thus, restrooms and kitchen facilities in the ranch house are not considered as being in use.

UFAS lists minimum requirements for historic preservation that shall be applied to "qualified" historic buildings and facilities. "Qualified" buildings or facilities are those that are eligible for listing in the National Register of Historic Places, or designated as historic by the appropriate state or local government body. The Spring Hill Ranch House was listed in the National Register of Historic Places in 1971. The Advisory Council shall determine, on a case-by-case basis, whether the general provisions for accessible routes (exterior and interior), ramps, entrances, toilets, parking, and displays and signage, would threaten or destroy the historic significance of the building or facility. If this is the case, then the special application provisions below for that feature may be utilized. These minimum requirements are less stringent than the general provisions. The minimum requirements are as follows (see UFAS 4.1.7):

1. At least one accessible route from a site access point to an accessible entrance shall be provided. The exception states that a ramp with a slope no greater than 1:6 for a run not to exceed 2 feet may be used as part of an accessible route at an entrance.
2. At least one accessible entrance, which is used by the public, shall be provided. The exception states that if it is determined that no entrance used by the public can comply with UFAS, then access at any entrance not used by the general public but open with directional signs at the primary entrance may be used.
3. If toilets are provided, then at least one toilet facility shall be provided along an accessible route.
4. Accessible routes from an accessible entrance to all publicly used spaces on at least the level of the accessible entrance shall be provided. Access should be provided to all levels of a building or facility whenever practical.
5. Displays and written information, documents, etc., should be located where a seated person can see them. Exhibits and signage displayed horizontally, e.g. books, should be no higher than 44" above the floor surface.

While the code provides exceptions for historic buildings, this assessment summarizes elements that fall short of complying with UFAS. Means of providing alternate or improved accessibility will be suggested where appropriate.

Accessible route

Definitions

An accessible route is "a continuous unobstructed path connecting all accessible elements and spaces in a building or facility. Interior accessible routes may include corridors, floors, ramps, elevators, lifts, and clear floor space at fixtures. Exterior accessible routes may include parking access aisles, curb ramps, walks, ramps, and lifts." The word

accessible describes “a site, building, facility, or portion thereof that complies with [UFAS] and that can be approached, entered, and used by physically disabled people.” (See UFAS 3.5.)

Location

At least one accessible route within the boundary of the site shall be provided from public transportation stops, accessible parking, and accessible passenger loading zones, and public streets or sidewalks to the accessible building entrance they serve. At least one accessible route shall connect accessible buildings, facilities, elements, and spaces that are on the same site. At least one accessible route shall connect accessible building or facility entrances with all accessible spaces and elements within the building or facility. (See UFAS 4.3.2.)

There is currently no designated accessible route connecting the ranch house to public transportation stops, accessible parking, accessible passenger loading zones, etc., or other accessible buildings on site, nor is the route into and through the ranch house accessible.

Width

The minimum clear width for single wheelchair passage shall be 32” at a point and 36” continuously. (See UFAS 4.2.1.) The minimum clear width of an accessible route shall be 36”, except at doors where 32” is acceptable for openings less than 24” in depth. If a person in a wheelchair must make a turn around an obstruction, the minimum clear width of the accessible route shall be as shown in Diagram 1. (See UFAS 4.3.3.)

The main stair landing by bathroom 104 is 34" deep, the service stair landing by hall 206 is 30" deep, and part of bathroom 305 is 34-3/4" wide. These widths are too narrow. All other widths exceed the required width of 36".

For clear door openings, see Doors.

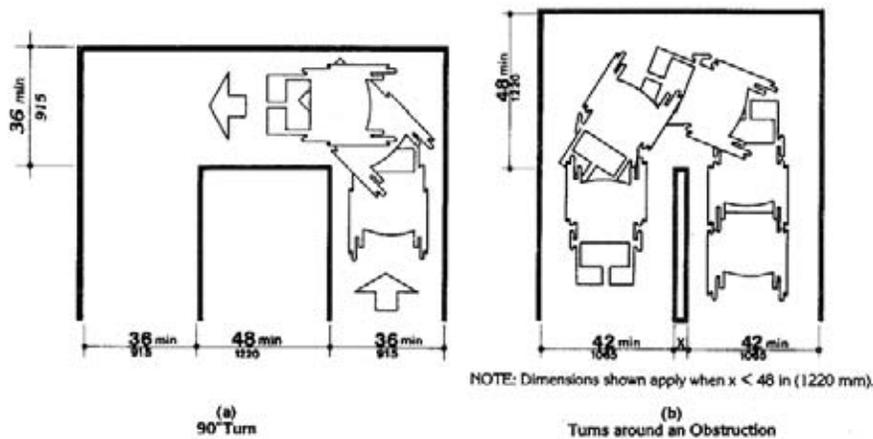


Diagram 1: 90 degree turn and turn around an obstruction, UFAS.

Passing space

The minimum width for two wheelchairs to pass is 60". (See UFAS 4.2.2.) The space required for a wheelchair to make a 180-degree turn is a clear space of 60" diameter or a T-shaped space of 60"x60". (See UFAS 4.2.3.) If an accessible route has less than 60" clear width, then passing spaces of at least 60"x60" shall be located at reasonable intervals not to exceed 200 feet. A T-section of two corridors or walks is an acceptable passing space. (See UFAS 4.3.4.)

There is enough space for two wheelchairs to pass in most rooms. Exceptions are the main stair landings, kitchen 205, halls 301, 306, and bathroom 305, but there are spaces adjacent to these rooms that can serve as passing spaces.

Headroom

Walks, halls, corridors, passageways, aisles, and other circulation spaces shall have 80" minimum clear headroom. If vertical clearance of an area adjoining an accessible route is reduced to less than 80", a barrier to warn blind or visually impaired persons shall be provided. (See UFAS 4.4.2.)

According to ANSI, the leading edge of such guardrail or barrier shall be 27" maximum above the floor or ground. (See ANSI 307.4.)

The following spaces do not comply with the headroom provisions:

The space by the main stair in hall 101 slopes to less than 80" clear underneath. The headroom in the main stair varies, the lowest being 78-1/2" by door 104A and 78-1/4" by door 203. The service stair by old kitchen 105 has only 74" clear headroom.

The ceilings of both root cellar 106 and tunnel 107 are arched. In the tunnel, the entire ceiling is lower than 80", its highest being 76" at the apex. In the root cellar, the ceiling arches down from 86" to the floor.

Since the third floor is beneath the mansard roof, the ceiling height reaches a low point of 58" by the exterior walls around the perimeter of the floor.

Door 106 to root cellar 106 has 77" clear, door 105 to tunnel 107 has 76" clear, and doorway 108 to springhouse 108 has only 63-3/4" clear headroom. The doors on the third floor all have less than 80" clear headroom. All other doors have 80" or more in clear headroom.

Surface textures

Ground and floor surfaces along accessible routes and in accessible rooms and spaces, including floors, walks, ramps, stairs, and curb ramps, shall be stable, firm and slip-resistant. (See UFAS 4.5.1.)

If carpet or carpet tile is used on a ground or floor surface, then it shall be securely attached. Exposed edges of carpet shall be fastened to floor surfaces and have trim along the entire length of the exposed edge. (See UFAS 4.5.3.)

The ground surface along the route from the designated accessible parking to the entrance of the ranch house consists of coarse gravel. The outdoor stairs are uneven and possibly slippery. These conditions are not compliant.

There are loose mats in hall 101, south parlor 102, north parlor 103, south room 202, rear porch 207, and bedroom 302 that are not securely attached to the floor. These are not compliant.

Slope

Any part of an accessible route with a slope greater than 1:20 is considered a ramp. The maximum slope of a ramp in new construction shall be 1:12. The maximum rise for any run shall be 30". If space limitations prohibit the use of a 1:12 slope in existing buildings, the slope may vary between 1:12 and 1:10 for a maximum rise of 6" and a maximum run of 60", and between 1:10 and 1:8 for a maximum rise of 3" and a maximum run of 24". The minimum clear width of a ramp shall be 36".

Ramps shall have level landings at the bottom and top of each run. The landing shall be at least as wide as the ramp run leading to it with a minimum length of 60" clear. If ramps change direction at landings, the minimum landing size shall be 60"x60". If a doorway is located at a landing, then the area in front of the doorway shall comply with Diagram 2.

If a ramp run has a rise greater than 6" or a run greater than 72", then it shall have handrails on both sides. The inside handrail on switchback or dogleg ramps shall always be continuous. If handrails are not continuous, they shall extend at least 12" beyond the top and bottom of the ramp segment and shall be parallel with the floor or ground surface. The clear space between the handrail and the wall shall be 1-1/2". Top of handrail gripping surfaces shall be continuous and mounted between 30"-34" above ramp surfaces. (See UFAS 4.3.7, 4.8.)

The floor surface slopes steeply at the old kitchen door 105 (slope 1:13.5, rise 4-1/2", run 61", no landing at door, no handrails), the root cellar door 106 (slope 1:6, rise 13-1/2", run 70", no landing at door) and the springhouse doorway 108 (slope 1:21, rise 1-1/2", run 32", no landing at door). The slope at door 105 complies with the above except for lacking a level landing by the door. The slope at door 106 is too steep, and both landing and handrails are lacking. The slope at doorway 108 does not classify as a ramp.

Changes in level

Changes in level up to 1/4" may be vertical and without edge treatment. Changes in level between 1/4" and 1/2" shall be beveled with a slope no greater than 1:2. Changes in level greater than 1/2" shall be accomplished by means of a curb ramp, ramp, elevator, or platform lift. Stairs shall not be part of an accessible route. (See UFAS 4.3.8; 4.5.2.)

The following level changes are not compliant.

At the front door 101, there is an approximate 27" rise from ground level to the front porch via an exterior stair, and 9-3/4" rise from the front porch to the stone threshold.

At the rear porch, there is an approximate 26-1/2" stair rise from ground level to the porch floor and another 9-3/4" rise from the porch floor to south room 202 and west room 204.

The three floor levels are connected by stairways. From the first floor main entrance, there is an approximate 43" rise to the first floor service area. From this level, there is an approximate rise of 8'-4" to the second floor. From the second floor, there is an approximate rise of 11'-0" to the third floor.

Doors

Doorways shall have a minimum clear opening of 32" with the door open 90 degrees, measured between the face of the door and the stop. If the doorway is more than 24" deep, the minimum clearance is 36", as mentioned in the "Width" section above.

Minimum maneuvering clearances at doors that are not automatic or power-assisted shall be as shown in Diagram 2. The floor or ground area within the required clearances shall be level and clear.

The minimum space between two hinged or pivoted doors in series shall be 48" plus the width of any door swinging into the space. Doors in series shall swing either in the same direction or away from the space between the doors.

Thresholds at doorways shall not exceed 3/4" in height for exterior sliding doors or 1/2" for other types of doors. Raised thresholds and floor level changes at accessible doorways shall be beveled with a slope no greater than 1:2.

Handles, pulls, latches, locks, and other operating devices on accessible doors shall have a shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist to operate. Lever-operated mechanisms, push-type mechanisms, and U-shaped handles are acceptable designs. Hardware for accessible door passage shall not be mounted higher than 48" above finished floor. (See UFAS 4.13.)

Only two doors, 102 and 103, are compliant with this provision. On the first floor, door openings 104, 104A, 105, 105A and 106 are less than 32" wide, providing a clear door opening of 29"-30". The second floor doors measure 32", so the actual clear openings are subsequently narrower, approximately 29"-30". The third floor doors are about 30" wide, with clear door openings of approximately 27"-28".

Doors 104, 104A, 105, 106, 107, 201, 203, 204, 206, 206A, 303, 304, 306, do not have compliant maneuvering areas, per Diagram 2. Some doors, for instance 203, may easily become accessible by moving furniture.

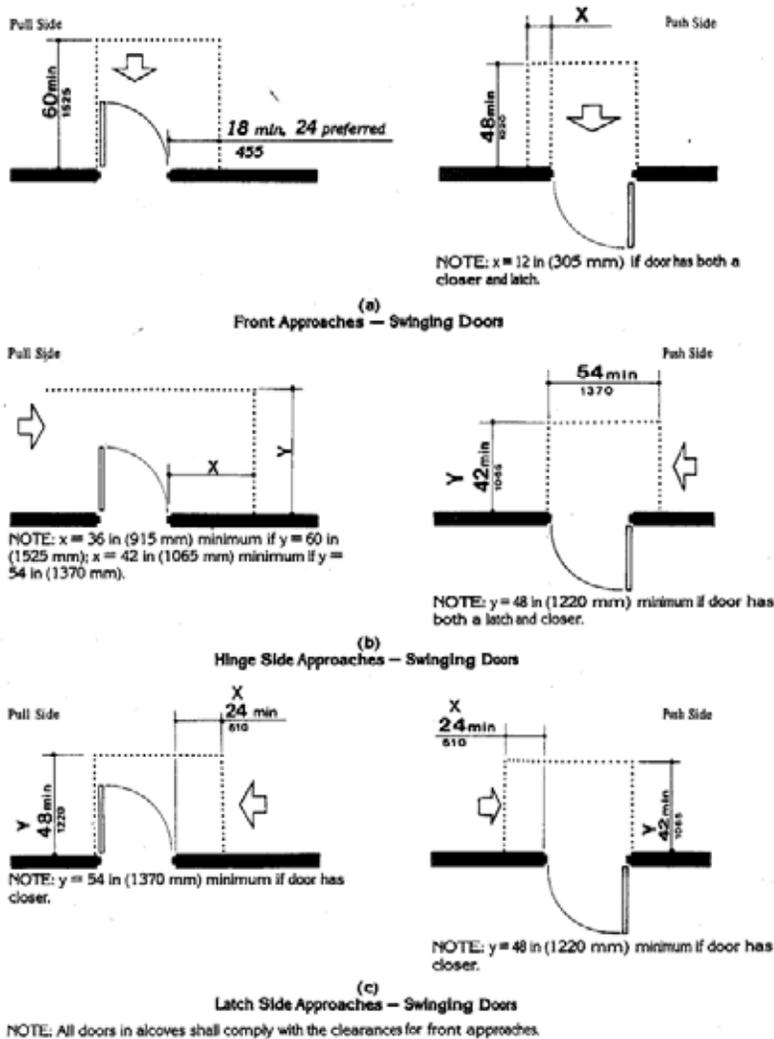


Fig. 25
Maneuvering Clearances at Doors

Diagram 2: Maneuvering clearances at doors, UFAS.

At tunnel door 105, service door 206A, and rear porch door 207 there are storm doors in addition to the main doors. These are mounted a few inches apart from the main door.

At the front door 101, there is a 2-1/4" high wood threshold (edges not beveled) on top of the 9-3/4" high stone threshold with 3/4" down (bevel 1:0.8) to the finished floor. This is not compliant.

At the south room door 202B and the west room door 204 there is a 9" step up from the rear porch 207. On top of this step is a 1-1/4" high threshold (bevel 1:0.8) at the rear porch side and 1/2" down to the south and west rooms (bevel 1:1). These are not compliant.

At the old kitchen door 105 there is a threshold 1-3/4" high on one side and 3/4" on the other (edges not beveled). At tunnel door 107, there is a 1-1/2" threshold (edges not beveled). At the hall door 206A, there is a threshold 1-3/8" high to the outside (bevel 1:0.7) and 3/8" to the inside (bevel 1:1.6). At the north parlor door 203, doorway 203A and west room door 204 there is a 1/2" level change down into the north parlor 203. All third floor thresholds are 3/4" high with a bevel of 1:1. At the bathroom door 306, the floor level is raised another 1/2" (bevel approx. 1:1). None of these level changes complies with UFAS requirements.

Most doors have doorknobs and lockable cylinder locks. These doors would not be accessible to individuals with limited graspable hand control. However, since most of the doors remain in the open position during tours, the handles would constitute less of a barrier. Only doors 107 and 207 have lever handles and mortise locks. Most doorknobs and lever handles are located 34" above finished floor. Thus, the height of the hardware complies but not the hardware type.

Egress

Accessible routes serving any accessible space or element shall also serve as a means of egress for emergencies or connect to an accessible place of refuge. Such accessible routes and places of refuge shall comply with the requirements of the administrative authority having jurisdiction. (See UFAS 4.3.10.)

See Life Safety Evaluation for a complete egress analysis.

Parking and passenger loading zones

Parking spaces for disabled people and accessible passenger loading zones that serve a particular building shall be the spaces or zones located closest to the nearest accessible entrance on an accessible route. (See UFAS 4.6.)

Designated accessible parking is currently located by the barn. An approximately 360-foot long gravel road connects the barn to the ranch house. Due to its coarse surface texture, this gravel road cannot currently be considered accessible. There is no designated passenger loading zone.

Stairs

On any given flight of stairs, all steps shall have uniform riser heights and uniform tread widths. Stair treads shall be no less than 11" wide, measured from riser to riser. Open risers are not permitted on accessible routes. The underside of nosings shall not be abrupt.

Stairways shall have handrails at both sides of all stairs. They shall be continuous along both sides of stairs. The inside handrail on switchback or dogleg stairs shall always be continuous. If handrails are not continuous, they shall extend at least 12" beyond the top riser and at least 12" plus the width of one tread beyond the bottom riser. At the top, the extension shall be parallel with the floor or ground surface. At the bottom, the handrail shall continue to slope for a distance of the width of one tread from the bottom riser; the remainder of the extension shall be horizontal. The clear space between handrails and wall shall be 1-1/2". Gripping surfaces shall be uninterrupted by newel posts, other construction elements, or obstructions. Top of handrail gripping surface shall be mounted between 30" and 34" above stair nosings. Ends of handrails shall be either rounded or returned smoothly to floor, wall, or post.

Outdoor stairs and their approaches shall be designed so that water will not accumulate on walking surfaces. (See UFAS 4.9.)

Per ANSI, risers shall be 4" high minimum and 7" maximum. (See ANSI 504.2.) The top of gripping surfaces of handrails shall be 34" minimum and 38" maximum vertically above stair nosings and ramp surfaces. (See ANSI 505.4.) Handrails shall have a circular cross section with an outside diameter of 1 1/4" minimum and 2" maximum, or shall provide equal graspability by a perimeter dimension of 4" minimum and 6 1/4" maximum, and provided their largest cross-section dimension is 2 1/4" maximum. (See ANSI 505.7.1.)

In general, the existing stairs in the ranch house do not meet UFAS and ANSI requirements. The main stair treads measure 9", the old kitchen 105 stair treads measure 7-1/2", and the tunnel 107 stair treads measure 9-1/2" on an average. Due to new flooring laid on top of the old flooring in hall 101, old kitchen 105, hall 201, and hall 206, the first riser of the main stair and the service stair are lower. The risers vary in size by several inches. If there are nosings, they are not sloped appropriately, and railings are not provided on both sides of the stairways, at the correct height, or the correct shape.

There is water accumulation at several of the outdoor steps after precipitation.

Space allowances and reach ranges

See "Width" (UFAS 4.2.1) and "Passing space" (UFAS 4.2.2 and 4.2.3) above.

The minimum clear floor or ground space required to accommodate a single, stationary wheelchair occupant is 30"x48". (See UFAS 4.2.4.1.) One full unobstructed side of the clear floor or ground space for a wheelchair shall adjoin or overlap an accessible route or adjoin another wheelchair clear floor space. If a clear floor space is located in an alcove or otherwise confined on all or part of three sides, additional maneuvering clearances shall be provided. (See UFAS 4.2.4.2.) Forward reach for a person in a wheelchair is from 15" to 48" above the floor. (See UFAS 4.2.5.) Side reach is between 9" and 54" above the floor. (See UFAS 4.2.6.)

Per ANSI, side reach is between 9" and 48" above the floor. (See ANSI 308.3.1.)

There is enough space to accommodate stationary wheelchair occupants in all rooms.

The light switch in old kitchen 105 is mounted at 49". The light switches in hall 201 and north room 203 are mounted at 55". These are mounted too high. All other light switches can be reached from the side, and several with forward reach.

Lead Paint Testing Report Summary

See Appendix D for the complete Lead Paint Testing Report. Below find a summary for the Spring Hill Ranch House, springhouse and curing room.

Lead paint testing at Tallgrass Prairie National Preserve was performed during the week of December 3-10, 1997, by Dick Fisher, Environmental Engineer of MWRO. The testing proved that significant levels of lead were present in the buildings. Most exterior painted surfaces indicated that lead paint had been utilized at some time in the past, as did interior painted and varnished wood trim surfaces. Much of the exterior paint has since weathered off, and at the time for the lead testing, lead was only present in areas protected from severe weather, as well as in areas with several layers of paint. In case renovations and painting are to take place at the site, it is important that measures be taken to assure that those employed in these activities utilize the necessary precautions.

At the ranch house, all of the exterior painted surfaces indicated elevated lead content. Inside, all of the painted and varnished interior wood surfaces indicated very high levels of lead (10.0+ Mg/cm²). This included doors, windows, and wood trim in: hall 101 (stairwell, 1st landing), parlor 102, parlor 103, old kitchen 105, tunnel 107 (hallway), springhouse 108, hall 201 (stairwell), south room 202 (video room), north room 203 (book sales room), west room 204, kitchen 205, hall 206 (back stairway to 2nd floor), rear porch 207, hall 301 (stairwell), south bedroom 302 (Ranger office), north bedroom 303 (Director's office), west bedroom 304 (assistance office), and bathroom 305. Names in parentheses are those used in the Lead Paint Testing Report in Appendix E. Since most of these surfaces were in very good repair, there is no immediate health threat, but if these elements were to be refinished or removed, extensive cautionary methods will be required.

Most of the wood floors have been sanded and refinished with varnish in recent years. These refinished floors did not indicate the presence of lead. Where the floors have not been refinished, high lead levels were indicated. Both wood steps and railings in the main stair and the service stair in the old kitchen 105 indicated high lead levels. Ceilings, walls, cornices, medallions, etc., did not indicate the presence of lead.

3. Barn

Site Context and Drainage

The Spring Hill/Z-Bar Ranch Barn has exterior entrances on three levels. The barn is built into a south-facing slope. Stone retaining walls and sloping topography enable at-grade entrances on the first and second floors of the barn. First floor entrances are located on the west, south, and east sides of the building. Two second floor entrances are located on the north side of the structure. Two large ramps on the north side of the barn provide access to the third floor. The north wall of the barn functions as a retaining wall that is built into the slope. The first floor entries are roughly 10 to 11 feet below the second floor entries. Retaining walls extend from the north wall of the barn to the west and east.

Downspouts: An existing downspout is located at the northwest corner of the barn. Water exits the downspout at the base of the building and flows to a low point northwest of the building corner. It appears that overflow in this area has caused damage to the retaining wall that extends from the corner of the barn towards the west.

A second existing downspout is located at the northeast corner of the barn, along the north wall of the barn. The downspout is tied into a PVC pipe that runs to the south, over the stone retaining wall, and along the east side of the barn. The pipe daylights near the first floor door number 106. The impact of the water exiting this pipe is creating erosion problems at door number 106.

Two additional existing downspouts are located at the southwest and southeast corners of the barn. Each of these downspouts bends to the south and ends abruptly, day-lighting about five-feet above the ground.

Exterior Envelope

The following is an excerpt from the August 2000 *Historic Structure Condition Report* published by Quinn Evans | Architects. The discussion has been updated to reflect conditions observed in the 2002 site investigations and work completed since then..

South Elevation

The south elevation of the barn (figure C3-1, figure C3-2) dominates the ranch landscape. The limestone and mortar joints are in good condition overall. However, the spring stone on the east jamb of the center door 103 has a large fragment missing from its lower face. The trim boards and siding are weathered and in need of repainting.

In 2003, the cupolas, doors, and second and third floor windows were removed, stripped of lead-based paint, repaired and repainted. The dormer fasciae, soffits, and windows were repaired and painted in 2004. All the remaining sash in the building should be checked for tightness of joints and be repainted.

The dormer's wood shingle siding appears to be fine, as do the roof and drip edge.

The second and third floor windows were recently repaired and are in good condition. The sills on this elevation are highly weathered and require reconditioning. Window 109 has a major crack in the header stone, east of center. The frame of window 106 immediately west of center is quite deteriorated at the jamb. Several of the window panes are cracked or missing altogether. The doors are in good condition.



Figure C3-1: Barn, west end of south elevation, QEA, 1998.



Figure C3-2: Barn, east end of south elevation, QEA, 1998.



Figure C3-3: Barn, west elevation, QEA, 1998.



Figure C3-4: Barn, west elevation, second floor opening with unsafe timber, QEA, 07/09/98.

West Elevation

The west elevation is shown in figure C3-3. The limestone, mortar, and window conditions are the same as found on the south elevation. In addition, the timber lintel across the south door 101 is heavily weathered and needs protective paint. The timber piece below the second floor opening appears very precarious and requires removal (figure C3-4). Three window panes are broken in window 103. The fascia is weathered and in need of new paint. A few open joints are present between the roof and the closure board at the top of the wall.



Figure C3-5: Barn, north elevation, showing ramps and cistern, looking from the west side, QEA, 07/09/98.

North Elevation

The north elevation features three dormers, two ramps from grade to the second floor, and a cistern (figure C3-5). Some problems with the limestone and mortar joints are present at the north elevation. While both remain in good condition, there are isolated areas of open joints toward the base of the wall. The bottom two feet is prone to erosion because of splashback from the ground, and therefore shows organic growth, especially near the cistern. The bottom nine quoin blocks of the openings 201 and 202 are original, while those above are differently shaped, textured, and tooled (figure C3-6). The above blocks date from the 1950s-1970s. The east doors 201 are sliding doors that need repainting. The beam above these doors is rusted.



Figure C3-6: Barn, north elevation, west entrance 202, QEA, 07/09/98.

The gutter that runs along the north elevation, is discontinued across the west doors 202 and below the ramp, but is in good condition. The fascia over the west entrance has a damaged spot on its west end. The cupolas and dormers were repaired and repainted in

2003-4. There is a diagonal crack west of the east doors 201 from ground level west towards the cistern.

The windows and doors on the cupolas were repaired in 2003-4, as well as the fascia and soffits. An interior vertical support is pushing the top of the east wall of the east dormer outward. At the center dormer (figure C3-8), the floor joists protrude through the wall and deterioration is visible.



Figure C3-7: Barn, north elevation, east dormer, QEA, 07/09/98.



Figure C3-8: Barn, north elevation, center dormer above cistern and cistern top, QEA, 07/09/98.

The Terracon Cistern Coring report (Appendix E), indicates that the cistern has concrete walls with parged masonry concrete blocks to the north, east and west. The south wall has brick back up and concrete on the inside of the barn limestone wall. Its top is constructed of concrete with a built-in gutter. This gutter aligns with a pipe at the west end which drips off the stone cap and down to the wall. There is an access lid at the center. The wall cap consists of sloped concrete with a sealant joint where the back of the cap meets the concrete roof. Currently the dormer downspout leads into a water diverter that in turn directs the water to the roof gutter. This water diverter needs to be made out of a stronger material and placed at a steeper slope.

The ramp abutments have been repointed but are spalling and need to be repointed. The east ramp has been rebuilt. The west ramp is deteriorated and needs repair.



Figure C3-9: Barn, east elevation, QEA, 1998.

East Elevation

The east elevation is shown in figure C3-9. The limestone is in good condition with open joints in only one spot near the grade line, north of the north door 106. The wood doors and fascia are heavily weathered, especially toward the bottom sill and middle edge. Both doors, sill and the fascia need reconditioning and repainting. On the first level, the south jamb of the south window 110 is warping and bowing toward the north at the center. The sashes all need to be reconditioned. On the second level, the frame of the south window 204 is bending at the end and is weathered. Similarly, the smaller first floor windows, 110 and 111, are weathered. The south door 105 has a concrete sill rounded to the door from grade, while the north door 106 has a gap between the door and grade that is large enough for a small animal to pass through. During the October 2002 investigation, the plumbness of the east wall was checked on the exterior. It appears that the barn is leaning towards the south.

Roof

The roof was resingled on October 10, 2002.

Interior Finishes and Elements

This barn is one of the largest in the state and utilizes three complete floors: the lower level or first floor for the stables, the main or second floor for machinery, and the third floor for grain. For survey purposes, the plan has been subdivided into thirty-six bays numbered as shown in figure C3-10.

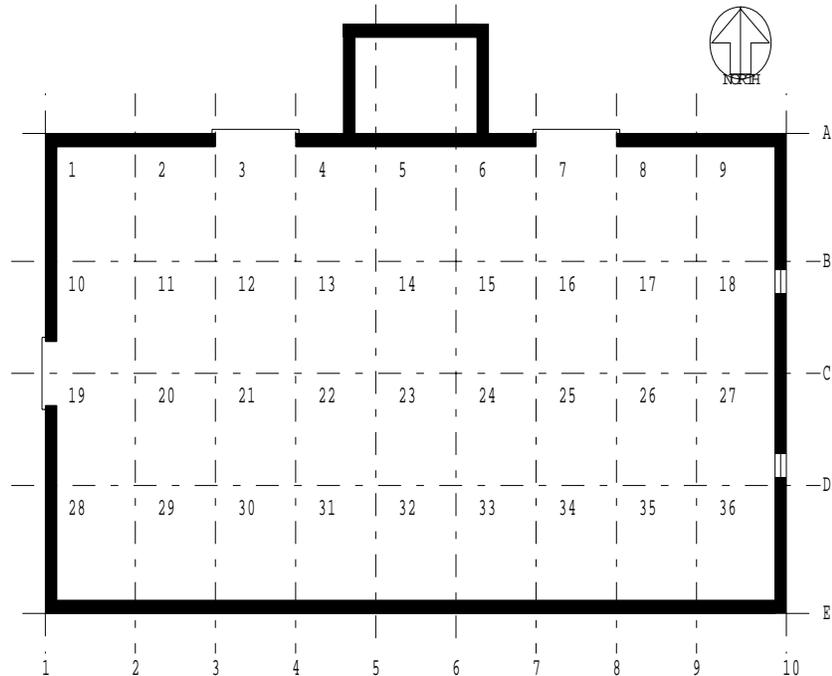


Figure C3-10: Barn, diagram of interior bays, not to scale.

First Floor

The first floor was used for stables. The floor material is dirt throughout the entire level.

North Wall: The north wall of the stables has stone and mortar in good condition. In bay 2, there is evidence of severe stone erosion in the center of the bay, causing entire faces of stone to spall (figure C3-11). Toward the east side of bay 2, heavy saturation of water from the barn opening at doors 202 above down to the floor was observed at the wall in 1998. This appears to be a long-term problem. In addition, the joints are beginning to deteriorate at the bearing column line.

Bay 3 also had water at the intersection of the stone foundation wall and the exterior wall as well as indications of erosion. There is poured concrete between the joist spaces of the entry ramp outside. Erosion is visible in bay 4 (figure C3-12), and the stone condition is poor due to the fact that the entire section of wall is bowing inward at the center.



Figure C3-11: Barn, first floor, north wall, bay 2, water, QEA, 07/08/98



Figure C3-12: Barn, first floor, north wall, bay 4, stone erosion, QEA, 07/09/98.



Figure C3-13: Barn, first floor, north wall, bay 5, QEA, 07/09/98.

Bay 5 contains the cistern pipe and valve, which penetrate the wall approximately six feet above the floor (figure C3-13). The mortar joints inside at the north wall of the chase has open joints. In bay 6, part of the floor is concrete and relatively new wood partition walls have been added. There is an extra wythe of stone on the exterior wall and all of the joints appear to have been repointed. In 1998, there was water present that was entering the wall just above eye level and continuing down the wall to the floor (figure C3-14). A bulge at the middle of the wall is also perceptible. The east wall of this bay is in good condition with some erosion of the mortar joints along the bottom. Bays 7 and 8 are in a similar state with slight erosion of mortar and stone at the base of the wall and damp floors.



Figure C3-14: Barn, first floor, north wall, bay 6, QEA, 07/09/98.



Figure C3-15: Barn, first floor, north wall, bay 9, wall behind bin, QEA, 07/09/98.

In bay 9 the stone and mortar show slight erosion at the base along the wall up to the grain bin. Behind the grain bin there are a significant number of open joints and the stone has shifted or fractured at the bedding planes in isolated instances (figure C3-15). The east wall of this bay is in a similar situation. The sash of window 111 in this wall has a deteriorated bottom rail.

There is a new post and beam system installed along the north wall in all bays except for bay 6. It is connected with light-weight screws instead of bolts.

East Wall: The sliding door 106 in bay 18 is in working order despite its rusted hardware. Both the door and frame are heavily weathered and the leading edge and bottom corner of the west door show heavy deterioration as a result of moisture. Door 105 in bay 27 is also weathered at the bottom. It is nailed shut but appears operable despite its rusted hardware. Bay 36 houses cribbing behind which may be some open joints, but the rest of the stone and mortar on each of the walls is in good condition.

South Wall: The components of bay 28 are all sound. Window 105 in bay 29 has one cracked light, but the other components are fine. All of the elements in bay 30 are in good condition. There is a wood guide set into the dirt for door 102. Within bay 34 there is a partial height concrete curb used to guide door 103, and another poured concrete footing for a vertical two-by member supporting the track board (figure C3-16). All of the other elements are in good condition, except for the moisture coloration of the stone and mortar at the base of the west wall.

Bay 32 includes door 103 whose hardware is rusted, but remains operable. In bay 33, the stone and mortar are in good condition with erosion at the base of the wall. The bottom two feet of the wall shows moisture, possibly coming from the ground. The sash of window 107 shows some deterioration of the bottom rail and its top sash is coming undone at the joints. One pane is missing and one is broken.



Figure C3-16: Barn, first floor, south wall, bay 34, QEA, 07/09/98.



Figure C3-17: Barn, first floor, south wall, bay 34, QEA, 07/09/98.

In bay 34, the wood enclosure of sliding door 104 is built upon a short concrete curb. The west corner of the curb is unsupported (figure C3-17). The east two boards of the enclosure have been broken, which has resulted in a significant hole into the cavity. The stone within the enclosure has mostly open joints, but the rest within this bay show only minor deterioration at the base. The door here is sturdy, stable, and operable. Bay 35 has stone and mortar in good condition. Window 108 is similar except for the fact that the lower sash is missing one light and the bottom rail of that sash is coming loose at the joints (figure C3-18).

West Wall: On the first floor, along the west wall of the stables, the stone and mortar are in good condition. In bay 1, moisture is entering the wall at eye level in the corner. This corner, as well as the earthen floor, was wet during the rain at the time of survey in 1998 (figure C3-19). Window 101 in bay 1 has a crack in the sill block, just north of center (figure C3-20). At door 101 in bay 19, the threshold is stone capped in concrete. The sliding door is weathered but sound, and despite the rust on the hardware, it operates. Window 102 in bay 19 has an unusual screen in place, the lower left corner of the frame is missing a piece, and the sash is slightly eroded. There is some erosion noted along the base of the wall, particularly in bays 19 (figure C3-21) and 28. The glass in the lights of window 103 in bay 28 is broken and one is missing completely.



Figure C3-18: Barn, first floor, south wall, bay 35, QEA, 07/09/98.



Figure C3-19: Barn, first floor, west wall, bay 1, water damage, QEA, 07/08/98.



Figure C3-20: Barn, first floor, west wall, bay 19, window 101, QEA, 07/08/98.



Figure C3-21: Barn, first floor, west wall, bay 19, QEA 1998.

Interior Bays: The stalls within the center of the barn sit upon a floor that is predominately dirt but has concrete under the fence posts and feed bins. The pens and chutes are in fair condition, as their use and weathering is evident (figure C3-22). Some partial height vertical pen supports are loose. The typical strap hinges and cast iron hooks that comprise the hardware are rusted, but operable.



Figure C3-22: Barn, first floor, interior, northwest stable stalls, QEA, 07/09/98.



Figure C3-23: Barn, second floor, north wall, bay 2, wall deterioration, QEA, 07/09/98.

Second Floor

The second floor was used to store mechanical equipment. The floor material and level varies throughout the second floor. All of the second floor windows are four-over-two double-hung. There are mud wasp nests between the ceiling joists throughout the entire second floor ceiling. The ceiling throughout this level is open and the flooring varies as noted.

North Wall: Along the ceiling of the north wall, there are some open joints and missing stones. The wall in bay 2 shows evidence of severe deterioration that has occurred over time at the floor line (figure C3-23). The flooring in bays 1 and 2 is 4x8 plywood over what is assumed to be the original planking. Bay 3 contains the barn's west entry, door 202, and has a series of stepped wood planks on the floor leading to the opening. The door track is constructed of an iron pipe set into concrete. For pedestrian accessibility, shallow ramps have recently been built to span over the high concrete and steel thresholds of doors 201 and 202.



Figure C3-24: Barn, second floor, north wall, bay 3, planking at equipment level entry doors 202, QEA 07/09/98.



Figure C3-25: Barn, second floor, north wall, bay 4, bulge in north wall, QEA, 07/09/98.

The original planking is exposed, with plank steps to the opening. Both planking and steps are weathered (figure C3-24). Bay 4 has cement parging along the bottom four feet of the north wall. There is a dark stain and severe bulge in the center of the wall approximately where the inside of the cistern wall meets the barn (figure C3-25). The Portland cement-based parging continues into bays 5 and 6.

There is an isolated area of open joints in the wall with dark stains about thirteen and a half feet west of the east barn entry. The stone and mortar in this area are in good condition, with the exception of some open joints behind the wood nailer. In bays 4 and 5, the floor surface returns to the 4x8 plywood over the original planking near the exterior wall, and weathered wood planking elsewhere. In bay 6 only 4x8 plywood is used. Original planking is used in bay 7, with the plank steps to the opening as in bay 3.

In bay 9, the wall parging that runs from the floor up to a six foot level is broken at the bottom. There are also open joints and loose stones along this line. The wood grain chute in the corner is in good form (figure C3-26). Bays 8 and 9 have 4x8 planking adjacent to the exterior wall and weathered wood planking with isolated sheet metal patches elsewhere. Along column line eight, the flooring is recessed the thickness of the planking. This area is more scarred than the former areas and is attached with cut nails here, as opposed to the wire nails found previously.



Figure C3-26: Barn, second floor, northeast, bay 9 grain chute, QEA, 07/09/98.



Figure C3-27: Barn, second floor, east corner wall, window 205 in bay 18, QEA 1998.

East Wall: The wall parging in bay 18 is about five feet high and has areas of delamination and cracking. Window 205 in this bay has mortar around the perimeter that is cracked and loose (figure C3-27). The parging in bay 27 improves somewhat to a point where the instances of delamination are isolated. Some of the mortar joints are open enough for air to penetrate. Bay 36 has wall parging to a point five feet from the floor, with some areas of delamination and cracking. The stone and mortar joints are deteriorating at the floor line. The floor along the east wall is the original planking with cut nails.

South Wall: The joint between ceiling and wall is open. Bays 28, 29, 30, and 31 have similar wall parging although it is cracked and delaminating in places. Window 201 in bay 30 is in good condition, but the outer sill is weathered. There is a construction display partially obscuring this window. There is evidence of a vertical nailer in bay 31 with open anchor holes in the wall. In bay 32 the parging only goes to a height of three feet from the floor on the west portion of the bay. The entire panel of the upper sash in window 202 is loose and the sill is heavily weathered. Bay 33 shows some lost mortar at the floor line. In bay 34, there is parging to a five foot height with one open joint. The south wall in bay 35 is the same as that in bay 36.

The flooring in bays 28 and 29 is 4x8 plywood. The flooring in bay 30 through part of bay 33 is raised planking over the original planking. The other part of bay 33, and bays 34 and 35 has the original flooring.



Figure C3-28: Barn, second floor, interior bays, floor misalignment at column line "D", QEA, 07/09/98.

West Wall: In bay 1, the stones adjacent to the third floor joists have numerous open joints. Door 203 and its frame in bay 10 are in good shape despite the weathering at the face and bottom. Bay 10 has the scarred and weathered original plank flooring, attached with cut nails. There is some overlay in this area of a second layer of planking near the column line. In bay 19, the stone and mortar are both in good condition, except there are areas of delamination and breakage in the parging. The flooring is 4x8 plywood over the original planking. The walls in bay 28 have parging over the bottom three and a half feet

with delamination at the top of the parging. Above this, the stone and mortar are both in good condition.

Interior Bays: The flooring continues to vary. Bay 11 has the scarred and weathered original plank flooring, attached with cut nails. In bay 12, there is a second layer of wood planking over the original. There are also two heavy cast iron grain hopper grates in the center. There is a metal stair and grain elevator through the floor in bay 13. The original wood planking is weathered and scarred and is attached with cut nails. Bays 14, 15, 16 and 23 have the overlay planking using wire nails. Bay 17 has the original planking with cut nails. Bay 20 reverts back to the 4x8 sheets of plywood over the original planking, while bays 21, 22, 24 and 25 are the original planking with wire nails. The floor in bay 26 is the original planking with cut nails. Bay 29 has 4x8 sheets of plywood over the original planking. In bays 30, 31 and 32 the floor is overlay planking running parallel to the joists, with wire nails. This condition continues approximately three feet into bay 33 and the rest of that bay and all of bay 34 are wood planking with wire nails. Finally, the flooring in bays 35 and 36 is planking with cut nails. It should be noted that the floor along column line 'D' between bays 35 and 36, and 26 and 27 does not align (figure C3-28).



Figure C3-29: Barn, third floor, north wall, east dormer, QEA, 07/09/98.

Third Floor

The upper level of the barn was used to thresh and store grain and hay. The grain bins are located in bays 15, 16, 24 and 25. The bracing at the south side of the grain bins is supported by the floor. The flooring for this level is predominantly heavily worn wood planking with wire nails. For the most part, this is in fair condition, with the exception occurring in bays 5, and 28 through 32, where a number of boards are missing and those

that are in place are more deteriorated than the rest on the floor. The planking varies in width and thickness throughout the floor, and is doubled up in some cases. There are three dormers located along the north wall and two ventilation cupolas in the roof. The cupolas are in good condition. There are mud wasps' and birds' nests throughout the ceiling.

North Wall: The three dormers on the north side are of whitewashed wood construction, with fairly heavy weathering apparent. At the east dormer, the garage-sized doors 301 utilize large cast iron strap hinges and hook and eye clasps as hardware. The west half of the double door includes a pedestrian door 301A within its perimeter (figure C3-29). The roof in bays 3 and 4 received new sheathing in 1983-1984. The west dormer is in a similar state as a whole to the east dormer. The cast iron strap hinge at the east door is sagged. The central dormer is the location of the original windmill. The windows in the dormers and on the second and third floor were repaired and repainted in 2004. The main electrical panels are found within this dormer (figure C3-30).

Figure C3-30: Barn, third floor, north wall, center dormer, east window 301, QEA, 07/09/98.



Figure C3-31: Barn, third floor, east wall, windows 306 and 305, QEA, 07/09/98.



East and West Walls: Along the east and west walls the stone and mortar are in good condition with no visible problems. The sills in both windows in the east wall, 305 and 306, are weathered, but the frames are fine. They were repaired and repainted in 2004.

South Wall: The second and third floor windows were repaired and painted in 2004.

Interior Bays: There are signs of moisture damage in bays 12, 13, 21, and 22 below the cupola.

Structural Evaluation



Figure C3-32: Northeast elevation of barn. Fitzpatrick Structural Engineering, 1998

The barn is a three story structure with 20” thick limestone masonry exterior walls above the second floor level and 24” thick limestone masonry walls below the second floor level. The barn is built into the side of a hill so that the entrance to the main machinery level (second floor) occurs at grade along the north elevation as shown in figure C3-32. A lower stable level (first floor) opens on the lower grade side at the east, south, and west sides of the barn. A loft level (third floor) is situated above the main machinery level. Access to the third floor is provided by two ramp/bridges from the higher grade (north) side of the barn. The original floor and roof framing consists of a wood joist, beam, and column system.

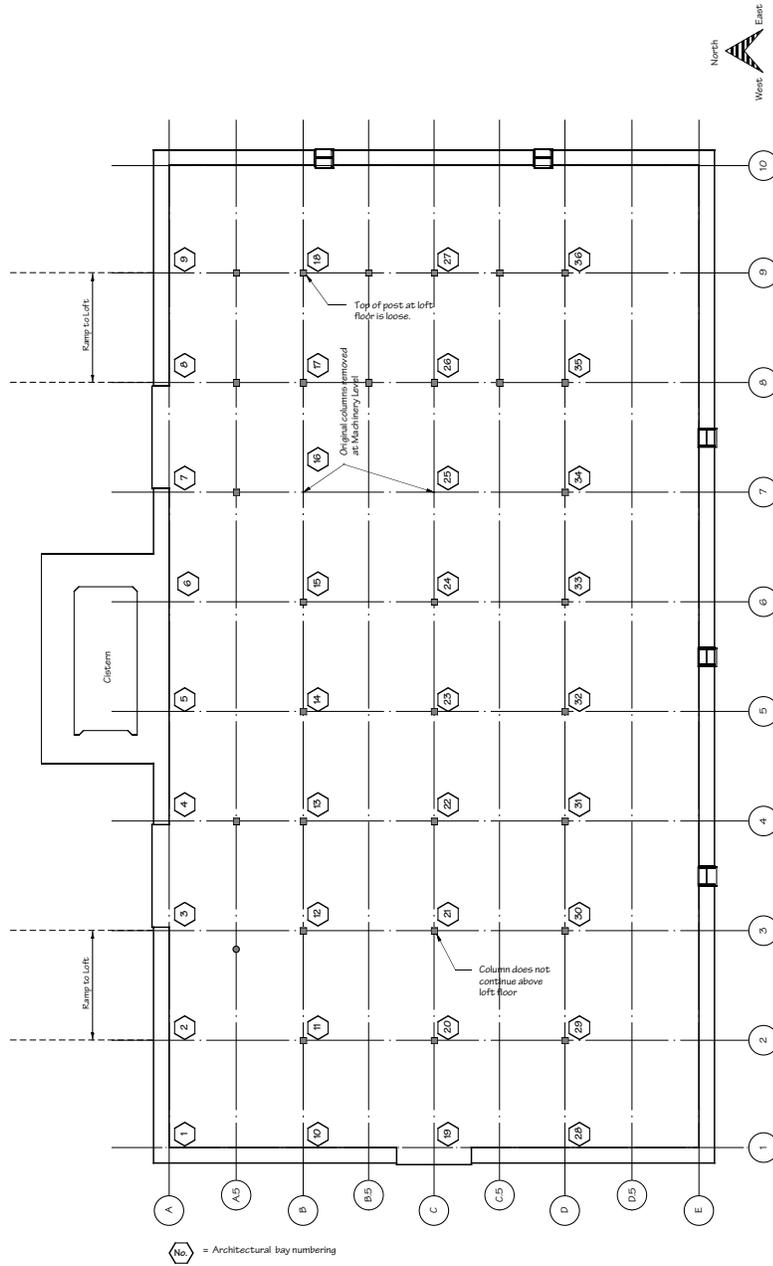
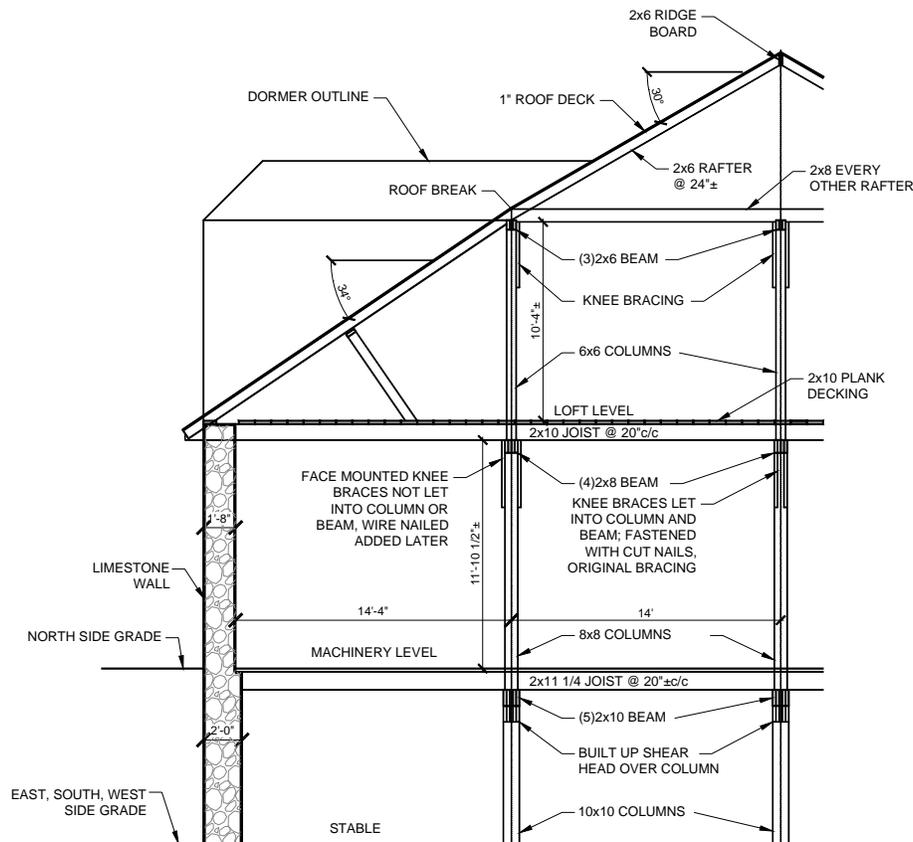


Figure C3-33: Main machinery level plan of barn.

As with most utility buildings, the internal structure of the barn has been modified and reinforced several times as the needs and demands of the building have changed. The footprint of the barn measures approximately 60 feet in the north-south direction by 108'-7" in the east-west direction. A one-story cistern projects from the barn in the middle of the north side. Figure C3-34 shows half of a cross section of the original typical barn framing.



ORIGINAL BARN HALF CROSS SECTION

Figure C3-34: Half cross section of original barn framing. Fitzpatrick Structural Engineering, 2003.

Lithographs and other reports indicate that the barn had a large windmill that projected from the north side in the same area as the present cistern. The windmill was shown to connect to the loft at the center dormer on the north side of the barn. Some evidence was observed to support the idea that a structure was removed from that area of the barn.

Loft-level floor framing that apparently once extended north of the barn in the vicinity of the cistern appears to have been cut off. Additionally, there is some structural support at the middle dormer roof level for an axle and pulley system that could have been part of abandoned milling machinery connected to the windmill.

There are also reports that horse drawn wagons were driven up the ramps to the loft floor and loads of grain or hay were unloaded at that level. There is no loft-level column at the grid C-3 location in the loft. Some evidence that a column originally existed at this location was discovered, however it is not known whether or not the column was removed subsequent to construction of the barn or if it was omitted during construction. The beam in the third floor at that location has a pocket (mortise) in it that may have accommodated a column tenon See figure C3-37. The removal of this column would have permitted greater maneuverability of horse-drawn wagons on the loft floor. Grain bins have been constructed in the opposite location at the east end of the loft, and it is not apparent that the column was originally omitted at that location. Some reports indicate that the wagons would enter at one ramp, circle around the loft, and exit at the opposite ramp. Certainly, the elimination of columns at both sides would facilitate this traffic pattern. However, it is doubtful that a ranch operation would sacrifice so much valuable space to circulation, and therefore, the column removal or omission was most likely provided to ease turning of the rigs in a limited space.



Figure C3-35: Hip framing at southeast roof area of barn. Fitzpatrick Structural Engineering, 1998.



Figure C3-36: Roof framing and loft level of barn looking southwest. Note missing column in row C in background. Fitzpatrick Structural Engineering, 1998.



Figure C3-37: Loft level beam at column C-3, note mortise at top of beam. Fitzpatrick Structural Engineering, 2003.

Roof

The barn roof is framed with 2x6 rafters spanning north-south, spaced at approximately 24" centers. The rafters support 1" x 12" plank sheathing. The slope of the roof changes at rows B and D, which creates a gambrel roof shape typical of many barns. The rafters frame into a 2x ridge board at the ridge. Typically, 2x8 collar ties are provided at every other rafter location, but this system has been modified at the grain bins located in architectural bays 15, 16, 24, and 25. A partial hip framing occurs at the east and west ends of the roof as shown in figure C3-35. Roof rafter framing between the center dormer (rows 5 to 6) and west dormer (rows 2 to 3) between rows A and B appears to be a more recent repair. The rafters are supported on beams built up with (3) full dimension 2x6 members at rows B and D (see structural existing condition drawings for actual sizes). A similar beam is located at the same elevation along row C, but this beam is located at the collar tie elevation and does not support the ridge of the roof. Face mounted knee braces are provided between the beam lines and columns in the east-west direction. Collar ties are lapped and notched over the center beam at row C in order to assist the lateral restraint function. There are signs of water staining on the sheathing throughout. The barn was re-roofed in 2002 and the deteriorated sheathing has been replaced.

Figure C3-36 shows the roof framing on the southwest area of the barn from the center of the loft area. The column at C-3 may have been removed or was never constructed as discussed earlier and an apparent sag occurs in the center (row C) beam on the right side of the figure. The second column from the front, on the right side of the figure, is located at the intersection of rows C and 4 and corresponds to the center of the cupola above this area of the roof. Column C-4 has knee braces extending in both the east-west and north-south directions, compared to the typical condition of east-west bracing only. Essentially the cupola is supported by the beam along row C together with the knee braces, and the collar tie framing above this column. Figure C3-38 is a view of the cupola support system from above the collar tie area. The long beam span (due to omitted column C-3) must

support part of the cupola. This results in some sag in the beam. It should be noted that both cupolas are later additions to the structure, reportedly added around 1947.



Figure C3-38: West barn cupola support. Fitzpatrick Structural Engineering, 1998.



Figure C3-39: Interior of west cupola of barn Fitzpatrick Structural Engineering, 1998.



Figure C3-40: North side of east dormer of Barn, east wall framing. Fitzpatrick Structural Engineering, 1998.

Figure C3-39 showing the west cupola interior is typical of both cupolas. Note the water staining and roof daylight shown in the figure. These conditions are ideal for insect infestation and wood rot within the cupolas.

The north side east dormer roof gable and hip framing are not tied together with collar ties. The lateral thrust at the wall supports appears to be pushing the dormer walls outward at the top. One timber wall stud was broken on the east wall of this dormer as shown in figure C3-40. This may be the result of the roof thrust taken together with other superimposed loading. The north side west dormer exhibits similar conditions and has only two collar ties. The roof of the center dormer on the north side has sufficient collar ties. Figure C3-42 views the center dormer from the northwest exterior side. The window frames and trim show advanced wood rot, which indicates a moisture problem within this dormer. Note the cut-off wood extensions just above the cistern roof. These may be the remains of the original windmill wood floor at the loft area.



Figure C3-41; Struts and bracing for lower roof slope at south side, note deformation in doubled 2x on the flat, Fitzpatrick Structural Engineering, 2003.

The lower portion of the gambrel roof is braced with double 2xs on the flat and diagonal struts back to the third floor (loft) level as shown in figure C3-41. The doubled member on the flat is wavy and shows significant deflection. The strut angle varies, and intersects the third floor (loft) at different locations. This framing was added to support the roof rafters at the lower portion of the gambrel. These rafters likely sagged over time and required additional support. Generally, the member on the flat is not positioned to provide substantial support for the rafters without sagging which results in the waviness of those members. Additionally, the location of the support struts reduce the capacity of the third floor to carry load.

Third Floor

The original third floor (loft floor) framing consisted of 2x10 planking supported by 2x10 joists spaced at about 20" centers. The actual joist sizes range between 1-5/8" to 2" thick x 9-1/2" to 10" deep (see existing condition structural drawings in Appendix B for actual

sizes). Floor joists span in the north-south direction and are supported at the exterior walls and at the interior beams at rows B, C, and D. The joists are lapped and notched over the beams. The original beams are built up from randomly spliced (4) 2x8 wood members. Original 8x8 columns supported these beams, although some of the columns have been replaced and others have been removed due to modifications over the years. The loft floor decking was observed to be in poor condition in the southwest area of the barn and in the north side center cupola area during the 1998 inspection. This was the result of water infiltration as discussed in the previous roof section of this report. The floor sheathing in this area was replaced with plywood during the re-roofing. It was also noted in 1998 that the column located at B-9 was loose at the top and could easily be moved by pushing at the base. This condition was corrected prior to the 2003 survey.



Figure C3-42: Center dormer of barn, north side, Fitzpatrick Structural Engineering, 1998.



Figure C3-43: Beam and column support at row C-8 of barn. This is a modification to the original structure, Fitzpatrick Structural Engineering, 1998.



Figure C3-44: Loft level joist reinforcing in barn, Fitzpatrick Structural Engineering, 1998.



Figure C3-45: Loft level joist strut reinforcing in barn, Fitzpatrick Structural Engineering, 1998.

Additional column and beam support has been added along row A.4, between rows 3 and 4, and rows 7 to 10. Rows B.5 and C.5 also have additional columns and beams added between rows 8 and 10. The additional column and beam supports do not have corresponding column or foundation support in the lower stable level. Therefore, they are

being supported by the beams and joists in the second floor. Structural analysis discussed later indicates that these beam lines compromise the load capacity of the second floor if they are working members. The additional columns and beams were probably an effort to shore up the third floor loft, either due to weaknesses in the members, or some need to support heavy grain storage loads in these areas of the loft. In bays 8 to 10 and B to C, some of the joists have been cut and lapped over the beam line at row B.5 and this condition is likely a repair to originally distressed joists. The beam along row B from 8 to 10 has been replaced with a nominal 10" deep steel beam.

The columns located at rows B-7 and C-7 have been removed between the main machinery level and the loft. Deep steel beams have been added above, between rows 6 and 8, to support the loft floor and columns. The loft floor has been heavily reinforced in these bays. This was done to accommodate access to and operation of the down feeding grain bins above. The sizes of the steel beams were measured and are presented in Table 1. Figure C3-43 shows the steel beam end condition and bay reinforcing of the wood joists along row C at row 8. Note that a square hole is cut through the web of the beam to permit a pipe penetration. Newer built up wood beams and built up post reinforcement was observed along row D, between rows 6 to 8. Several of the beams along rows B and C, rows 3 to 5 appear to be salvaged beams from the original first floor. These beams have shear heads that in some cases are eccentric (not centered on the columns). As such, the shear heads are ineffective in assisting the beams in carrying load.

Table 1: Steel Replacement Beams in Loft Floor

| Location | Depth | Flange Width | Web Thickness | Flange Thickness |
|------------------|----------|--------------|---------------|------------------|
| Row C, 6 to 8 | 24" | 9" | 0.5" | 0.73" |
| Row B, 6 to 8 | 21 1/16" | 8 1/8" | 0.19" | 0.64" |
| Row B, 8 to 10 | 10 1/4" | 5 3/4" | NA | 0.426" |
| Row A.5, 8 to 10 | 10 1/4" | 5 3/4" | NA | 0.426" |

Third floor loft joists in architectural bays 11, and 20 through 23 (refer to figure C3-33) show an attempt to reinforce the joist members. A newer strut system has been added to the sides of the original wood members as shown in figures C3-44 and C3-45. Note in figure C3-45 that one joist is split and broken and no longer provides structural support. Analysis of the strut bracing system indicates that it provides only minimal support for the floor joists. The diagonal struts frame into the beams. The strut lateral forces required to provide additional support for the floor joists are very large. The beam cannot provide total resistance for the lateral forces in the strut. The strut system undoubtedly provides some support, but only in a minimal sense. This system was probably added after 1930, as the members are S4S and prior to 1968 due to the member dimensions.

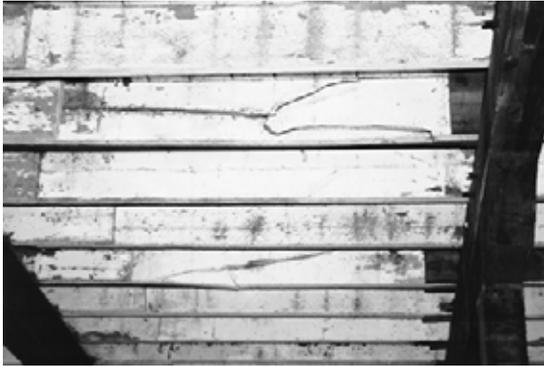


Figure C3-46: Broken, distressed joists near row B.5, between rows 9 and 0, of barn, Fitzpatrick Structural Engineering, 1998.



Figure C3-47: Column C-3 of barn viewed from the south. Detail of original knee bracing. Note brace on left side was cut off, Fitzpatrick Structural Engineering, 1998.

Figure C3-46 shows two split and broken joists in the area of rows B.5 from rows 9 to 10. Several areas of broken and replaced joists were noted. A partial tabulation of broken members follows. The tabulation is not intended to be a comprehensive list and is presented to reflect an observed recurring problem. This type of failure is usually caused by overload of the members and appears to be principally a bending distress.

Table 2: Distressed Loft Level Joists

| Location | Number of Distressed Joists in Bay |
|-----------|--------------------------------------------------------------------------------------------------------------|
| C-D, 2-3 | One joist broken and reinforced with new sister. Two additional joists have been replaced with newer joists. |
| D-E, 1-2 | Two joists replaced. |
| D-E, 3-4 | 4 joists broken and reinforced with new sisters. |
| C-D, 4-5 | 2 joists broken and reinforced with sisters. |
| B.5, 9-10 | 2 broken joists, unreinforced. |

Figure C3-47 shows a detail of the original knee bracing system along row C. Note that the brace on the left side of the figure has been cut off flush with the face of the column. The original braces were let into the columns and beams along this line, and are fastened to the columns and beams with cut nails. Other bracing along rows B and D is face mounted and fastened with wire nails, indicating that they were a later addition to the framing system. Analysis indicates that the later face-mounted column knee braces are ineffective in providing additional support for vertical load on the beams. The forces from nominal light floor loading in the struts are fairly large. The struts in each case have adequate capacity but the nailed connection does not. The let in original struts acting in compression would tend to increase the load capacity of the beams.

Second Floor

The typical original framing for the second floor level floor consists of 2x12 (see existing condition drawings in Appendix B for actual sizes) wood joists, spanning in the north-south direction, and spaced at approximately 20" centers. Beams along rows B, C, D and D.5 support the joists. The beams are built up from (5) 2x10 members, and typically rest over large built up shear heads. This condition is shown in figure C3-48. Typically, 10x10 wood columns supported the beams on the regular grid spacing. It is not clear what type of foundation system, if any, supports the columns. However, because bedrock is observed in the cattle yards surrounding the barn, the columns may bear on the bedrock itself. Stone or concrete foundations may also transfer the loads from the columns to the bedrock. In any case, there is no indication that the foundation system is a problem.

North-south 18" thick interior walls occur between the first floor level and the second floor level at rows 4 and 7. These walls extend from rows A to B on the north side, and from rows D to E on the south side. The walls support the original beams in lieu of wood columns. The north-south interior walls appear to be original construction.



Figure C3-48: North wall of stable level west of tack room in barn (between rows 4 and 6). Note wall staining and newer shoring in background. Column B-5 in foreground is original, Fitzpatrick Structural Engineering, 1998.

Considerable reinforcement of the main machinery level floor has occurred over the years. A row of relatively recent treated wood shoring posts and beams have been added just south of the first floor wall. This shoring does not align with the columns added above the main machinery level floor. Part of this shoring system can be seen in the background of figure C3-48. The floor joists have wet rotted completely through at their north bearing (row A). The shoring row along row A.1 just south of the north barn wall is an effort to restore support for the end of these joists. It should be noted however, that the north barn wall relies on the second floor system to provide lateral support for the wall against the inward pressure of the soil at the opposite side. This support is essentially nonexistent since the ends of the joists at this wall have rotted completely through. While the shoring system provides vertical support for the deteriorated joists, it does not provide needed lateral support for the wall.

There are additional columns added at B-9.4 and C-9.7 with shear heads. These columns tend to increase the load capacity of the second floor in the east end bays.

An older east-west shoring row (D.5) was added between rows D and E. Again, the column locations for this shoring do not align with the columns that were added above the main machinery level floor. Therefore, there are no direct load paths to the ground for columns above, and the shoring beams and existing floor joists must support the upper columns. Columns for row D.5 also do not align with the major column grid at the east end of the building. Analysis indicates that this beam line does assist in supporting the second floor.

An in-floor steel shoring system has been added in architectural bays 12, 16, and 21 through 25. This system consists of steel beams spanning north-south over columns and walls. These beams in turn support steel beams that span east-west. Two east west beams per bay are provided in most bays, which divide the bay into thirds thereby shortening the joist span. The system is unusual, but it is a successful attempt to increase the load capacity of the second floor in those areas. Evidently, heavy equipment and possibly trucks were moved onto this floor area.

Walls

An overall survey was performed for the stone masonry walls. Crack widths were noted where accessible, and some areas such as parge coats were sounded with a hammer to determine hollowness of coatings. Normally, parge coats delaminate from stone masonry when moisture penetrates the wall, migrating either through the wall or from leakage. Crack widths in the range of hairline (0.1 mm to 0.2 mm) are probably due to thermal expansion and contraction of the barn walls.

The barn is unheated and undergoes the entire range of temperature change through the full thickness of the masonry. Some cracking from hairline to moderate crack width is also a result of moisture penetration, and moisture penetration into thermal cracks will contribute to further deterioration and distress.



Figure C3-49: Newer door 101 to stable in west wall of barn. Note jambs are rebuilt. Note wood lintel over door, Fitzpatrick Structural Engineering, 1998.



Figure C3-50: Window 103 at south side of west wall of barn. Note sill through stone crack, Fitzpatrick Structural Engineering, 1998.

West Wall

A newer stable level door 101 was cut into the south side of this wall, as shown in figure C3-49. Considerable jamb width has been reconstructed with masonry on each side of the door. A wood lintel was placed over the opening. There is evidence of older wall cracking above the main machinery level floor at the interior side of this wall. A diagonal crack was observed south of the main machinery level door. This cracking relates to the addition of this door, the wood lintel, and the location of the door. The wall above the door is attempting to arch over this opening since a relatively flexible wood lintel was used for the newer stable door. Opening 203 above this door is in close proximity to the stable door, and the arching action was compromised to some degree. In addition, a main machinery level floor beam loads the wall at this opening, which further aggravates the problem. The cracking above appears to be stable at this time and there is no indication that continuing distress is occurring. However, wall cracking above this door should be monitored. Figure C3-50 shows the exterior face of window 103 at the south side of the stable. A vertical through stone crack occurs in the sill stone of this window. The interior side of the west wall at the stable level appears to be in good condition, however, a slight inward lean of the wall was recorded on the north side.

Cementitious parging has been applied to the interior face of the wall at the second floor level, south of door 203. The wall parging extends 3'-6"± above the floor, and stone

masonry is exposed above it. The north side of the door is not parged. Random mortar joint thermal cracking was noted north of the door. Crack widths of less than 1/64" were recorded. Stone spalls were observed at the door arch springline location at this level. Figure C3-51 shows this cracking.



Figure C3-51: Head of west wall door 203 at second floor level of barn. Note stone spall at arch springline, Fitzpatrick Structural Engineering, 1998.

South Wall

The exterior face of the south wall appears to be in good condition with two exceptions. The rain conductors at each end of the wall may not adequately direct water away from the wall. There appears to be some sign of base erosion near the west corner of the wall. Stable level window 109 at the east end of the wall shows a through stone crack at the lintel as shown in figure C3-52.



Figure C3-52: South wall east window 109 at stable level of barn. Note through stone crack at lintel, Fitzpatrick Structural Engineering, 1998.

A parge coat also occurs on the interior of this wall at the main machinery level. The parge extends from the west corner to just east of row 5, and resumes east of window 203 between rows 7 and 8, continuing to the east corner. This wall was investigated in three parts as follows:

Wall Section Observations

Rows 1 to 4: Hollow sounding parge coat noted at random locations. Thermal cracking was recorded throughout this section of wall to be ~ 1/256" (0.1 mm) wide. A larger ~1/64" (0.45 mm) crack was noted just east of row 3.

Rows 4 to 7: Random thermal cracking was recorded at ~1/256" (0.1 mm) wide. A water stain was observed west of row 5. The stain extends vertically for the full height of the wall. Mortar loss was noted along the stain line. The stain is an indication of water penetration into the structure from the loft/roof level and can lead to accelerated deterioration of the wall at this location.

Rows 7 to 10: Random hairline (~ 1/256" or 0.1 mm ± width) thermal cracking was noted in mortar joints. The parge coat sounded hollow in several locations near the east end (rows 9 to 10).

East Wall

The exterior face of the east wall appears to be in reasonably good condition. Stable level windows at the north and south side of this wall have been modified. The original windows were taller and they have been infilled with stone masonry above the original sill location. Figure C3-53 shows the modification of the north side window 111. Original sills for these windows were very low and they were probably modified to abate problems with livestock. Figure C3-54 shows a spalled quoin stone at the north side of the south stable level door 105. The hole was the anchorage location for a livestock gate pintle, which pulled out of the corner and spalled the stone. Figure C3-55 shows a modification to the stone arch over the south side of the south stable door. A similar condition occurs at the north side of the north door 106. The arch modifications may be original to the building, and the stone was cut and fitted to accommodate main machinery level floor beam framing.



Figure C3-53: East wall, north first floor level window 111 of barn. Note original stone sill remains near base of original window, Fitzpatrick Structural Engineering, 1998.



Figure C3-54: East wall, south first floor level door 105 of barn. Note stone spall at gate lintel, Fitzpatrick Structural Engineering, 1998.



Figure C3-55: East wall of barn, south first floor level door 105 arch springline, Fitzpatrick Structural Engineering, 1998.

Parging at the main machinery level extends the full width of the east wall and occurs on the bottom 3'-6" of the wall. Parging has been replaced with a newer patch just north of the south window 204 between rows C and C.5. Newer parge has been placed in the north corner to the north side of the north window 205. The parging sounded out as hollow in many random locations including within the newer parged wall areas. Random thermal cracks in mortar joints were noted with widths ranging from $\sim 1/256''$ (0.1 mm to 0.2 mm). Some larger moderate cracks were also recorded on this wall. A relatively newer $\sim 1/16''$ to $\sim 1/32''$ (1.5 mm to 0.5 mm) crack was recorded just south of the south window

204. This crack extends from the top of the parge downward to the floor. A $\sim 1/64$ " (0.25 mm) crack was noted south of this crack at about row D.5 just above the parging. A 0" to $\sim 1/32$ " (0 to 0.6 mm) crack extends diagonally down and to the south away from the sill of the north window 205.

North Wall

At the first floor level, east end (rows 7 to 10), the north wall shows signs of bowing inward from top to bottom. The inward bow was recorded to be $3/8$ " to $3/4$ " in a four foot height of wall as recorded in 1998. There were indications during the 2003 inspection that the bow has increased. There are some signs of moisture staining on the face of this section of wall, particularly toward the tack room between rows 7 and 8. The staining may relate to drainage problems discussed later for the upper portion of the wall. Soil pressures are responsible for the inward movement of the wall, and as discussed earlier the lateral restraint for this wall is compromised by wet rotted joists. This is further aggravated by a water saturated condition of the soil. However, there are no signs of serious crack distress that usually indicate a major structural concern in this section of the wall.

The middle section of the stable level interior wall from rows 4 to 7 shows varying signs of deterioration. The tack room part of the wall between rows 6 and 7 appears to be a newer wall built in front of the original wall in the manner of a veneer. It should be noted that the newer wall occurs in the vicinity of the east cistern wall, and that the above grade sections of the wall at that location show serious water damage. Figure C3-56 shows severe water staining on the surface of the tack room wall at the same location as the exterior water problem. The figure also shows a large damp area on the floor below this wall. The newer wall was probably built in front of the original wall to cosmetically cover serious water damage to the original wall. This damage is related to both the cistern, as discussed later, and to the poor surface drainage condition around the exterior of the cistern at this location. Figure C3-57 shows the area of wall west of the tack room between rows 4 and 6. Dark colored areas of severe water staining occur at the left of the figure (rows 4 to 5). The west cistern wall intersects this wall above grade at this location. The wall bows inward at the west end, and there is a severe loss of mortar and some loss of stone in this bay. The wall above at the main machinery level floor shows severe distress and bulging. Soil surcharge from the cistern and water laden soil at the opposite face of this wall contributes to the observed distress. Poor surface drainage around the cistern also contributes to the damage at this level. This section of wall probably reflects what happened at the tack room, although the damage to the original wall at the tack room was more severe.



Figure C3-56: Tack room of barn, north wall between rows 6 & 7, Fitzpatrick Structural Engineering, 1998.



Figure C3-57: North wall of barn west of tack room, Fitzpatrick Structural Engineering, 1998.

The west section of the north first floor level wall (rows 1 to 4) also shows signs of water infiltration. The wall is heavily stained, and the ground in these bays is very damp or wet. Loss of stone and mortar is noted at the interior face. A bow or bulging was also observed on this section of wall.

The exterior face of the north wall above grade (at the second floor level), shows signs of water related damage. A rain conductor at the east end of the wall does not direct water adequately away from the corner as observed in 1998. A vertical water stain was observed at the east side of the east ramp extending the full height of the wall. This water stain coincides with the interior condition of the wall as well as the interior staining at the lower stable level at this location. Figure C3-58 shows deterioration at the base of the north wall at its juncture with the east cistern wall. Loss of mortar and stone is shown in the figure. This condition was due to poor roof drainage from the cistern. The water staining noted in the tack room relates to this condition. Similar damage was observed at the juncture of the north wall and the west cistern wall. The moisture problems at the juncture of the west cistern wall contribute to the damage noted earlier in this report at the stable level between rows 4 and 5. This situation has been improved since the 1998 inspection by reconfiguring the roof drainage. Some evidence was found in the stone coursing that the large doors 201 and 202, east and west of the cistern, were originally framed with stone arches, rather than the present flat lintel.

Parging was observed for a 3'-6" height on the interior of the north wall, extending from the east side of the west door 202 (row 4) to the east end of the wall. The wall area west of the west door had no parging. Conditions of the interior of the north wall were recorded as follows:



Figure C3-58: Bulge in the north wall of barn at juncture with the east cistern wall, Fitzpatrick Structural Engineering, 1998.

Wall Section Observations

Row 7 to 10: An area of several $\sim 1/256$ " (0.10 mm) wide cracks was noted in the parge coat in the vicinity of row 9. This location corresponds to the east side of the east ramp where vertical water staining was noted. Hollow soundings were noted in the parging between rows 8 and 9.

Row 4 to 7: This section of wall seems to be in the poorest condition of the main machinery level walls. It occurs opposite the cistern. Hollow soundings were recorded in many locations. Water staining was observed throughout. Water staining relates to poor cistern roof drainage. The area west of row 5, corresponding to the west cistern wall at the opposite side, shows moist parging. A large bulge occurs at the same location as shown in figure C3-59. The bulged area has been pointed with portland-based mortar, but loose stones were noted. The damaged area relates to the poor cistern drainage, but also is due to some problem with the interior of the cistern, when it was in operation. A vertical anchor board located east of row 5 was pried away from its top anchor bolt, revealing deteriorated original mortar within the wall. The anchor, however, remained securely embedded in the wall. This condition is shown in figure C3-60. It was noted that the parging stops each side of the board location.



Figure C3-59: North wall of barn, interior west of row 5, just opposite the west wall of the cistern. Note large bulge and deterioration, Fitzpatrick Structural Engineering, 1998.



Figure C3-60: North wall of barn between rows 5 and 6. Note wall condition behind anchor board, Fitzpatrick Structural Engineering, 1998.

Row 1 to 4: A large area of reset stone was noted at the base of the wall between rows 2 and 3. Random thermal cracking was recorded in the range of $\sim 1/192''$ (0.15 mm) crack widths.

Cistern

The cistern is centered on the north barn wall between column rows 4 and 7. It extends 12 feet north of the barn, and measures about 22' -5" out to out in the east west direction. Figure C3-61 is a cross section through the structure. Rough interior dimensions were obtained along the north wall of the cistern to determine the depth and condition of the subgrade foundations. Terracon took two cores through the cistern walls in June 2003. (Refer to *Appendix E: Terracon Cistern Coring Report*.) The first core (B-1) was taken through the north wall of the cistern 4 foot above the ground surface and 6' -6" from the northwest corner of the cistern. The second core (B-2) was taken from the inside of the cistern through the south wall of the cistern. Core B-2 was located 42" above the barn second floor and 6' -5" from the southwest corner (the area of the bulge in the north barn wall). Terracon's 2003 report is included in Appendix G of this report. Figure C3-63 shows a plan developed by Fitzpatrick Structural Engineering in 1999 with core locations and material indications based on Terracon's 2003 report. Figure C3-64 is a reproduction of the core information found by Terracon for cores B-1, and B-2.

Core B-1 indicates that the north wall of the cistern is constructed of 8 ½” of masonry concrete block with cementitious exterior parging at the exterior wythe of the wall. The interior wythe is about 33 ½” of concrete at the core location. Terracon reported that a significant portion of the concrete just inside the block masonry is broken. Since the parging on the east and west walls shows telegraphing crack patterns consistent with the north wall and representative of masonry block back up, it is likely that the construction of the east and west walls is similar to the north wall (e.g. block masonry at the exterior and concrete at the interior of the walls).

Core B-2 through the south wall of the cistern (north wall of the barn) was cored from the inside of the cistern. The wythe to the interior of the cistern is made up of about 9 ½” of concrete. The next two wythes are reported to be constructed of brick for a total thickness of about 10 ½”. The remainder of the wall is the typical limestone barn wall. Terracon also reported that the interior concrete south wall of the cistern showed a ‘concave’ bowing. The bowing of the wall is consistent with the observed bowing of the barn wall, which was verbally confirmed by Terracon. Further, no gaps were reported between the various wythes making up the wall. The cistern is a later addition to the barn. The cistern probably dates after 1915 given the use of concrete and masonry block. The bowing of both the cistern wall concrete and the corresponding barn wall stone was most likely caused by water pressure due to the filling of the cistern in the past. Additionally, this condition may be aggravated by the lack of lateral restraint of the second floor at this location due to the rotted joist ends at the floor bearing. If any soil exists below the cistern (as shown in C3-61) it will exert a lateral force on the barn wall causing the wall to bow inward between the loft and first floor, providing that the base of the barn wall is restrained. The weight of the cistern and any water contained within will further increase the lateral soil pressure due to surcharge of the soil.

The parged concrete wall wythe may have been added over original masonry walls in an effort to protect and/or cover deterioration of the original masonry walls. In any case, the parging is telegraphing the concrete block jointing as shown in figure C3-62. Large through block vertical cracking also appears to be mirrored on the exterior of the cistern walls. These vertical cracks roughly correspond with cracking at the sloped coping portion of the concrete top slab. The jointing at the top slab may be compromised around the perimeter, which is allowing water to penetrate the walls. In any case, the conditions of the walls are a structural concern. Keeping the cistern free of water will not cause further structural damage and should relieve the existing pressure on the north wall of the barn.

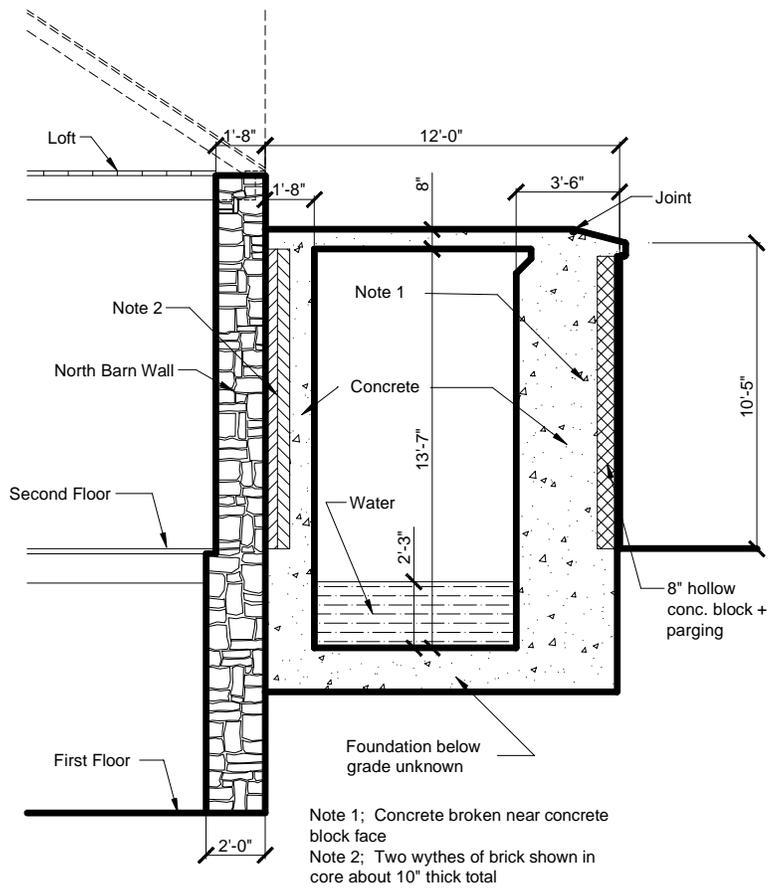
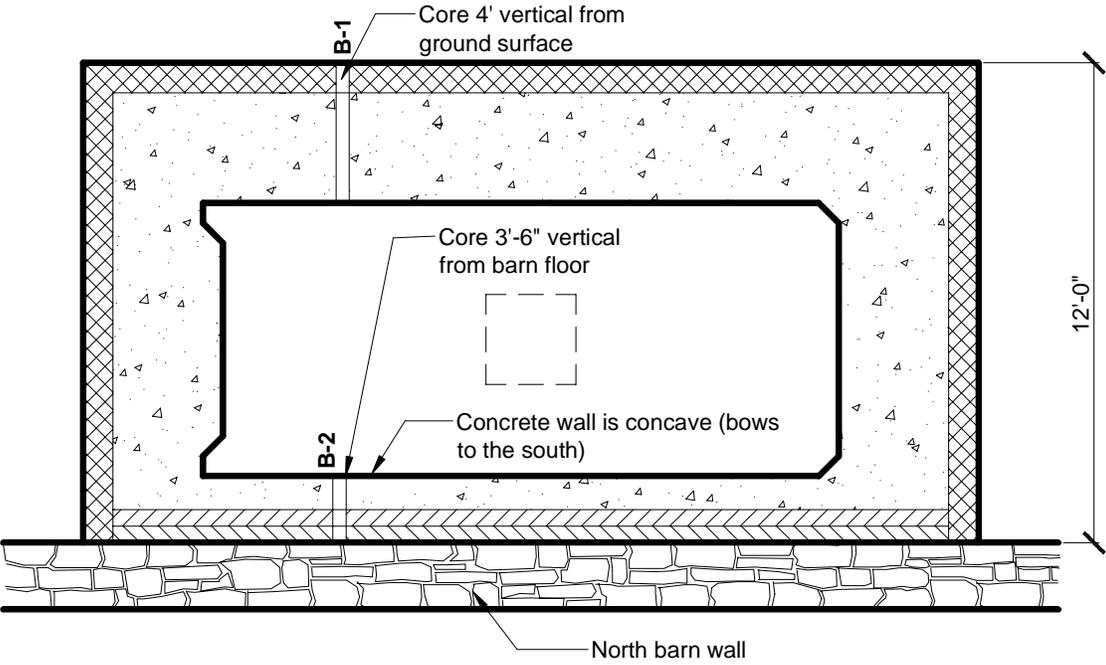


Figure C3-61: Cistern at barn cross section, Fitzpatrick Structural Engineering, 1999. Updated 2003.



Figure C3-62: East wall of cistern at barn, Fitzpatrick Structural Engineering, 1999.



Cistern Plan

Figure C3-63: Plan of cistern, Fitzpatrick Structural Engineering, 1999 and Terracon 2003.

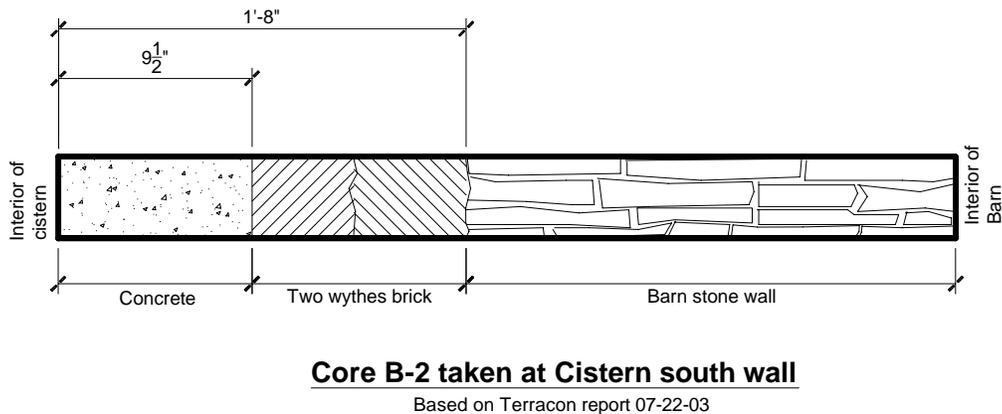
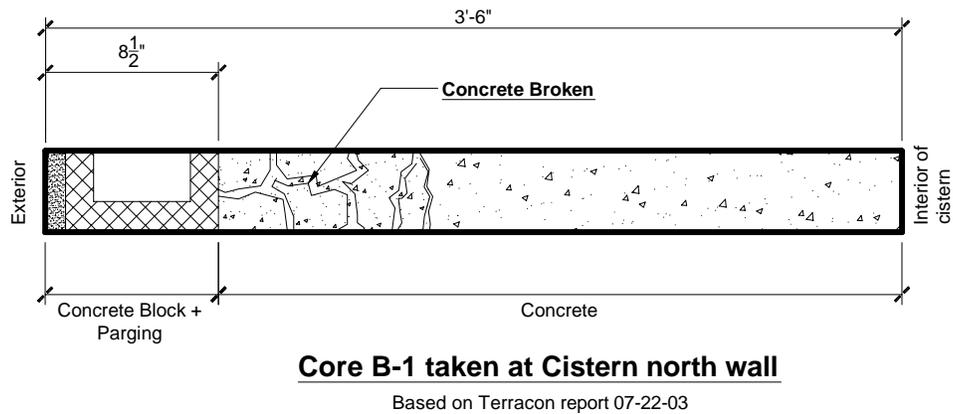


Figure C3-64: Cross section of cistern cores reproduced from Terracon report of 22 July 2003, Fitzpatrick Structural Engineering, 2003.

Ramps

Both the west and east ramps are two span bridge structures extending from grade to large dormer openings at the loft level on the north side of the barn. Stone ramp abutments are located well north of the barn and serve as approaches to the bridge structures. A hammer head center pier is located about 17 feet south of the south face of the ramped abutments. The hammer head pier is tapered with a 24" wide top head. The top head on the pier is concrete, while the tapered pier is limestone. The south face of the top head of the pier is located about 19 feet north of the north wall of the barn. On the west ramp, 3" x 11-1/2" wood decking is used, and newer treated 1-1/2" x 11-1/4" wood decking is used on the east ramp. The width of the decking was measured at 11'-4-1/2" to the outsides of the curbing. A 3" x 11-1/2" curbing was found at the west ramp, and a

similar 2x curbing was observed at the east ramp. The curbing is spiked to every plank member. Every third plank is bolted to the steel superstructure on the west bridge. The deck slope is approximately a 16 percent grade. The steel superstructure is six longitudinal stringers spaced at 22" centers on both ramps. These members are steel I-sections having a depth of 7", a flange width of 3-11/16", and a 0.2" web thickness. The following conditions were observed for the ramp elements.

East Ramp

- Decking is in good condition; replaced around 1997.
- Steel beams are in reasonable condition with some rusting. They should be cleaned and painted.
- Open jointing noted between stones in the pier.

West Ramp

- Decking is in poor condition; Wood has rotted and failed in some cases as shown in figure C3-63. At least 8 to 9 of the 37 planks should be replaced.
- Steel beams are in reasonable condition with some rusting. They should be cleaned and painted.
- Moderate cracking of pointing mortar in abutment indicating continuing movements. Suspect that Portland based mortar was used for pointing.



Figure C3-63: Wood rot at west ramp decking of barn, Fitzpatrick Structural Engineering, 1998.

Structural Analysis

A structural analysis was performed for the barn. The following assumptions were made regarding material properties:

Wood Members

All wood section properties are based on average of actual field measurements.

Modulus of Elasticity 1600 ksi

Fb 1400 psi allowable bending stress

Fv 180 psi allowable horizontal shear stress

Steel members

Steel beam sizes based on field measurements, date of manufacture, and *Iron and Steel Beams 1873 to 1952*, AISC, 1953

Fy 33 ksi 1940 to 1960 steel yield stress

Fb allowable 22 ksi fully braced compact section maximum

Fv allowable 13.2 ksi shear stress

Load Source

Roof loading and wind loading were determined from *ASCE 7-98*, by the American Society of Civil Engineers, and the *International Building Code 2000*.

Analysis Basis

General

Wood member capacities were analyzed for load capacity using the *National Design Specification (NDS)*, 2001, by American Wood Council with modifications where appropriate to accommodate the historic conditions. Steel member capacities were analyzed using the *Manual of Steel Construction ASD (AISC-ASD)*, by the American Institute of Steel Construction. Computer models were developed for the typical roof conditions, full third floor, and the second floor where appropriate and to take into account the interrelation between various members in the system such as continuity and shear head contribution to load capacity. Individual members such as floor joists were evaluated on a hand and spreadsheet calculation basis. Continuous beams at all levels are constructed of wood built up 2x members with random splicing of the individual members. The splice locations for adjacent individual members of the beam do not occur at the same location along the length of the beam. These beams occur typically along rows B, C, and D as well as some other locations depending on the floor level. Since the beams have splices they do not obtain the full capacity as the sum of the capacities of all the individual members, and as such, the capacity for these members in bending was estimated as 85% of the full capacity, with the beam being fully continuous over several columns. This is a stiffer and stronger system compared to a simply supported non-continuous system even with a 15% reduction of capacity.

Roof

The roof system was analyzed for the typical bay configuration and the anticipated code prescribed loadings for wind and roof load. The minimum roof load governed compared to snow load. The loading used is as follows:

- Vertical Roof Live Load 17 psf
- Wind Load 90 mph base velocity per ASCE 7
- Superimposed Dead Load 6 psf Sheathing and roofing
- Self Weight Dead Load As it occurs for each structural member

The roof rafters for the lower roof of the gambrel were initially analyzed without the strut bracing and members on the flat in order to determine if that bracing was needed. Indeed, these rafters are overstressed and exhibited excessive deflection without the bracing. The rest of the rafters (upper portion of the gambrel) could resist the required loads within acceptable code limits. A second analysis was performed utilizing a proposed strut and beam bracing with members appropriately located for structural advantage. The diagonal struts (2x8) were located at column lines and extended from the base of the column at the third floor upward and perpendicular to the roof rafters. A continuous beam of (2) 2x8s was connected to the struts and was oriented with the strong axis normal to the studs (as opposed to being on the flat). This system does not load the third floor and therefore will not reduce the capacity of that floor level. This system will provide the needed capacity for the rafters without compromising other parts of the structure. The beams and columns supporting the roof all fell within acceptable allowable levels of stress and deflection.

The column omitted at C-3 does not cause a serious structural concern although the beam along row C between 2 and 5 does show significant sag. This beam should be reinforced to minimize the sag.

Loft Level (Third Floor)

The strut bracing for the floor joists that occurs in some bays is not effective in reinforcing the joists to obtain larger capacities as discussed earlier. Therefore, they were neglected in the analysis. Since the struts reinforce some cracked distressed joists, some additional reinforcing should be added to the distressed joists. Some beam rows were added to this floor at row A.4 between rows 2 to 10, row B.5 between rows 8 and 10, and row C.5 between rows 8 and 10. This was an apparent effort to strengthen the third floor structure in those areas. However, in most cases the column support for these beams does not continue below the first floor (there are no corresponding columns at the first floor stable). In some cases, the column rests on and is supported by floor joists. These beams and columns severely compromise the capacity of the second floor and therefore were neglected in the load capacity of the third floor loft. In some cases, the floor joists are spliced over

the added beams. This was probably due to distress and cracking in the original joists. The joists spliced over these beams should be replaced or have full span sistered members added. Additionally, the bracing struts were not counted in the beam capacities for reasons discussed previously.

The third floor area between rows B and D, and 6 to 8 has been extensively modified. Two columns at grid B-7, and C-7 have been omitted between the second and third floor. Heavy steel and wood framing has been added in this area. This was done to provide access to the area below the third floor loft grain bins, and to support the heavy grain bins. The omission of the columns does not limit the capacity of the third floor in this area.

The analysis assumed that the permanent in-place dead load of flooring and joists was about 6 psf, and the actual self weight of beams was taken as they occurred. A bending and shear capacity was determined for each member and total loadings were determined. This involves a trial and error method for continuous members, but can be directly derived for simple span members. The permanent dead load was deducted from the total load capacity to arrive at a superimposed live load capacity. The superimposed load capacities of the members are shown in Table 3 below. Note that the live load capacity is quite low in many cases in bays with built up wood beams and is as low as 5 psf for beam row C, between 5 and 6. This beam should be reinforced. The live loads are primarily limited by bending stress in the built up wood beams. It would be possible to reinforce these beams to obtain higher capacities if needed.

Table 3: Third Floor Superimposed Load Capacities

| Member | Span | Limit | Load | Comment |
|--------------------|----------------|---------|---------|--------------------------------------------------------------------------------------------------------------|
| Floor Joists | 14.50 ft | Bending | 78 psf | |
| Grain Bin Joists | 14.0 ft | Bending | 100 psf | |
| | | | | |
| Beam Row B | | | | |
| Span 1-3, 5-6 | 11.5/11.75 ft | Bending | 19 psf | Full load on all spans simultaneously |
| Span 3-4 | 11.67 ft | Bending | 95 psf | Full load on all spans simultaneously |
| Span 4-5 | 11.75 ft | Bending | 25 psf | Full load on all spans simultaneously |
| Span 6-10 (Steel) | Varies | Bending | 100 psf | Full load on all spans simultaneously |
| | | | | |
| Beam Row C | | | | |
| Span 1-3 | 11.5/11.75 ft | Bending | 21 psf | Full load on all spans simultaneously |
| Span 3-5 | 11.67/11.75 ft | Bending | 100 psf | Full load on all spans simultaneously |
| Span 5-6 | 11.75 ft | Bending | 5 psf | Full load on all spans simultaneously |
| Span 6-8 (Steel) | 11.75 ft | Bending | 100 psf | Full load on all spans simultaneously |
| Span 8-10 | 11.58/11.67 ft | Bending | 16 psf | Full load on all spans simultaneously |
| | | | | |
| Beam Row D | | | | |
| Spans 1-6, 8-10 | Varies | Bending | 18 psf | Full load on all spans simultaneously |
| Spans 6-8 | 11.75ft | Bending | 48 psf | Full load on all spans simultaneously |
| | | | | |
| Full Floor Minimum | | | 20 psf | Based on the minimum limits and reinforcing of Row C beam from 5 to 6, some areas have much higher capacity. |
| | | | | |

Second Floor (Main Machinery Level)

The shear heads for the second floor beams were effective in producing larger load capacities for the beam lines and were included in the computer modeling. The analysis assumes that all damaged and distressed joists will be replaced in kind. Methods similar to those described for the third floor analysis were employed to determine the superimposed live load capacity of the floor members. Live load capacities are listed in Table 4. As discussed previously, the intermediate columns that had no column below were neglected in the analysis. The continuous east-west beams were analyzed for two types of loads. One condition is with the floor fully loading all spans simultaneously and the second is for a combination of alternate span live loads that would produce a maximum stress in a given member. For example, it is not likely that all spans will be loaded at the same time. If a span is loaded and alternate spans are loaded beyond, then that span will experience higher bending stress (or have less load capacity) compared to having all spans fully loaded. This is commonly referred to as checkerboard loading and generally limits the beam loading. Generally, the overall live load capacity of the second floor is 75 psf. This could be significantly increased if needed with the simple addition of a few columns at the first floor and some minimal reinforcing of the beams along row B.

It should be noted that the floor diaphragm is ineffective in providing lateral support for the north wall of the barn. The rotted joist ends should be restored or some connection between the wall and the floor diaphragm should be provided. Another alternative would be to brace the walls with diagonal bracing between the first floor and the second floor, but this would tend to be intrusive and expensive.

Ramps

A hand analysis was performed for the ramp beams and planking. The superimposed live load capacity for the ramps is limited to 118 psf. A deflection limit of $\text{Span}/240$ for the steel beams is the limiting factor. This limit assumes that the damaged decking on the west ramp is replaced in kind.

Table 4: Second Floor Superimposed Load Capacities

| Member | Span | Limit | Load | Comment |
|--------------------|------------------------|---------------|---------|------------------------------------------------------------------------------------------------------------|
| Floor Joists | 14.00 ft | Bending | 101 psf | |
| Floor Joists | 12.75 ft | Bending | 110 psf | |
| Floor Joists | 4.83 ft | Shear | 737 psf | |
| South side Joists | 7.17 ft | Bending/shear | 362 psf | |
| | | | | |
| Steel Beams | Varies 11.75 and 14 ft | Bending | 214 psf | |
| | | | | |
| Beam Row B | Varies | Bending | 100 psf | Full load on all spans simultaneously |
| Span 1-2 | 11.17 ft | Bending | 75 psf | Checkerboard limit + moment |
| Bal. of spans | Varies | Bending | 85 psf | Checkerboard limit |
| | | | | |
| Beam Row C | Varies | Bending | 100 psf | Full load on all spans simultaneously |
| Span 1-2 | 11.17 ft. | Bending | 75 psf | Checkerboard limit + moment |
| Bal. of spans | Varies | Bending | 100 psf | Checkerboard limit +/-moment |
| | | | | |
| Beam Row D | Varies | Bending | 135 psf | Full load on all spans simultaneously |
| All spans | Varies | Bending | 100 psf | Checkerboard limit |
| | | | | |
| Beam Row D.5 | Varies | Bending | 170 psf | Full load on all spans simultaneously |
| Span 1-2 | 11.17 ft | Bending | 125 psf | Checkerboard limit + M |
| | | | | |
| Full Floor Minimum | | | 75 psf | Load can be improved by reduction of west end beam spans in rows B and C and/or some reinforcing of beams. |
| | | | | |

Plumbing Systems

The historic plumbing system consisted of a windmill and a cistern. The cistern still exists though it is not currently used. There is a water spigot pedestal in the west end of the barn that was used to water horses, and a valve riser against the north wall that regulated the barn cistern filling. This system was shut down due to recently installed water supply work. No modern plumbing was observed in the barn.

Heating and Cooling Systems

No heating or cooling systems were observed in the barn nor was there any evidence of a historic system.

Electrical and Lighting Systems

The Rural Electrification Association (REA) set the electric lines at the ranch in 1943,¹ with a pole to the “big house” and meter for the well.² There is evidence of at least three vintages of wiring in the barn and both abandoned and currently used panelboards and disconnects. No actual dates for when the equipment was installed could be established.

Currently, the barn is fed overhead from the same transformer that feeds the ranch house. Service to the barn is 120/240 volts, single phase, 100 amps and terminates in a panelboard located in the upper barn. New lights and outlets were installed for exhibits on the second floor of the barn in 1997.

Communications Systems

There is a telephone jack in the barn and the base station and antenna for the park radio.

Security Evaluation

The barn is bordered by a large group of trees directly north of the house and barn. The remainder of the site is primarily unobstructed with exception to the rolling hills that surround the property. The barn currently has no wired security system, although an intrusion system for the ranch house and barn is planned for installation in 2005. Specific exhibit protection is not a focus of this analysis.

Physical Security

Currently, the site is not well lit, which provides no opportunity for natural surveillance for the surrounding area. The barn is accessible at multiple points at grade, and allows for easy access to the roof via two ramps that lead to the third floor. In addition, a third floor

¹ Carolyn M. Steere, Flint Hills Rural Electric Cooperative Association, Inc, letter to Darryl Meierhoff of the National Park Service, 23 April 2003.

² The statement concerning the electrical pole and meter are from a letter dated April 23, 2003, to Darryl Meierhoff, National Park Service, Cottonwood Falls Office, from Carolyn M. Steere, billing supervisor, Flint Rural Electric Cooperative Association, Inc.

window located at the rear of the barn provides an excellent opportunity to discretely gain access.

Site Lighting

Currently, there is no effective site lighting.

Life Safety Evaluation

Several criteria must be considered when evaluating the effective evacuation of a building during an emergency situation. The criteria employed in this report are in compliance with the Building Construction and Safety Code (NFPA 5000), 2003 edition, (hereafter, NFPA 5000) published by the National Fire Protection Association. All references in this chapter are to sections in NFPA 5000, unless noted otherwise. The following is a summary of conditions, which generally apply to the barn:

Definitions

Accessible means of egress: A means of egress that provides an accessible route to an area of refuge, a horizontal exit, or a public way.

Exit: That portion of a means of egress that is separated from all other spaces of a building or structure by construction or equipment as required to provide a protected way of travel to the exit discharge.

Exit access: That portion of a means of egress that leads to an exit.

Exit discharge: That portion of a means of egress between the termination of an exit and a public way.

Means of egress: A continuous and unobstructed way of travel from any point in a building or structure to a public way consisting of three separate and distinct parts: (1) the exit access, (2) the exit, and (3) the exit discharge.

Use and occupancy classification

Structures or portions of structures shall be classified with respect to occupancy in one or more of the groups listed in Chapter 6 of NFPA 5000. These groups are based on the fire safety and relative hazard involved in the use and occupancy. Minimum egress requirements are based on the nature of the occupancy, which then determines the occupancy load per square foot, and the number of exits required.

Since the barn is open to the public as an historic interpretive house museum, the spaces open to the public must now be considered as assembly use for the visiting public although they may have had different uses historically. In the evaluation of the barn as a house museum, the following use and occupancy classification is applicable, and is defined as follows:

Assembly Occupancy: An occupancy (1) used for a gathering of 50 or more persons for deliberation, worship, entertainment, eating, drinking, amusement, awaiting transportation, or similar uses; or (2) used as a special amusement building, regardless of occupant load. (NFPA 5000: 6.1.2.1)

Type of construction

Buildings and structures are classified in one of the five construction types defined in Chapter 7 of NFPA 5000. This construction type defines the fire resistance rating of building elements and exterior walls.

The existing type of construction of the barn is Type V (000) construction. Type V construction is that in which the building elements are of any material permitted by the code. This eliminates any required ratings for the structural elements.

However, the barn may have difficulty complying with the allowable height requirements of Table 7.4.1 or Assembly Occupancies with less than 300 people (this assumes that the occupant load will be limited to less than 300 occupants). The barn is considered to have three stories above grade per Section 3.3.523.2. This is based upon the second floor having a height above grade that exceeds 6 feet for more than 50% of the perimeter. For a non-sprinklered facility, the maximum permitted height in stories is one for Type V (000) construction (as permitted based upon allowable area). This number increases to two when the facility is sprinklered.

Section 15.9.4.12 provides relief from this issue in historic buildings. It permits historic buildings that do not comply with the minimum construction type requirements in Table 7.4.1 to be provided with automatic sprinkler systems in lieu of retroactively meeting the required construction type.

Fire protection systems

Based upon the requirements for sprinkler systems due to construction type deficiencies, the rest of the building code analysis assumes that sprinkler protection will be provided. However, it should be noted that NFPA 5000 does not normally require sprinkler systems for Assembly Occupancies with less than 300 occupants (NFPA 5000: 16.3.5.1). A complete fire suppression system with pull station was installed in the barn as part of the water installation project in 2004.

Fire alarm and detection systems

NFPA 5000 does not normally require sprinkler systems for Assembly Occupancies with less than 300 occupants (NFPA 5000: 16.3.4).

A fire alarm and detection system was provided for the barn as part of the water system installation and rehabilitation project completed in 2004.

Means of egress

General means of egress

Design occupant load

The occupant load in any building or portion thereof shall be not less than the number of persons determined by dividing the floor area assigned to that use by the occupant load factor for that use as specified in Table 11.3.1.2.

The occupancy load factor was selected from Table 11.3.1.2 based on the listed use, which most closely resembles the current intended use. The following occupant load factor was utilized for this evaluation: *"Assembly: Less concentrated use, without fixed seating: 15 sq. ft. net floor area per occupant."* In determining the occupant load, all portions of a floor shall conservatively be presumed to be occupied at the same time.

See Table 5 for design occupant load calculations. Each floor of the barn has floor area of approximately 5,936 sq. ft. The occupant load factor is 15 sq. ft. net floor area per occupant. Therefore, assume that approximately 25% of the floor area is exhibit space or unoccupiable. This leaves 4,452 gross sq. ft. This works out to an occupant load per floor of 297 occupants per floor. For all practical purposes, an occupant load of nearly 300 per floor is unlikely, therefore, this analysis assumes that at any one time the maximum occupant load on a floor is 300, however the maximum building wide occupant will also be capped at 300. The third floor of the barn is not open to the public and is only accessed for storage and maintenance activities.

Exits serving more than one story:

Where exits serve more than one story, only the occupant load of each story considered individually shall be used in computing the required capacity of the exits at that story, provided that the required egress capacity of the exit is not decreased in the direction of egress travel. (NFPA 5000: 11.3.2.4)

This requirement does not apply as there are no stairwells that are used in the means of egress. The one stair in the barn that connects the first floor to the second floor is for convenience only.

Egress width

The width of any means of egress component shall be not less than that required for a given egress component...and shall not be less than 36 inches. (NFPA 5000: 11.3.4.1)

For the barn, the factor for stairways is 0.3 inches per occupant and the factor for other egress components is 0.2 inches per occupant. (NFPA 5000: Table 11.3.3.1)

The total required width of the means of egress for each floor (based upon an occupant load of 297) is 59.4 inches. This is based upon horizontal evacuation as there are no stairwells figuring into the egress analysis.

See Handicap Accessibility Assessment - Doors for door widths.

Vertical Openings

Unenclosed floor openings forming a communicating space between floor levels shall be permitted, provided that the following conditions are met: (1) the communicating space does not connect more than three contiguous stories, (2) the lowest or next to lowest story within the communicating space is a street floor (3) the entire floor area of the communicating space is open and unobstructed, such that a fire in any part of the space will be readily obvious to the occupants of the space prior to the time it becomes an occupant hazard. In addition, there are five other requirements to allow unenclosed vertical openings. (NFPA 5000: 8.12.2)

The barn has three levels that are connected by unprotected openings. This arrangement appears to be compliant. However, it may be necessary to provide smoke detection and alarm to satisfy the requirement that “a fire in any part of the space will be readily obvious to the occupants of the space prior to the time it becomes an occupant hazard.” To satisfy this requirement, a fire alarm and detection system was installed in 2004.

Ceiling height and protruding objects

The means of egress shall have a ceiling height of not less than 7 ft 6 in. with projections from the ceiling not less than 6 ft 8 in. nominal height above the finished floor. (NFPA 5000: 11.1.5)

See Handicap Accessibility Assessment - Headroom for ceiling heights.

Floor surface

Walking surfaces shall be slip resistant under foreseeable conditions. The walking surface of each element in the means of egress shall be uniformly slip resistant along the natural path of travel. (NFPA 5000: 11.1.6.4)

See Handicap Accessibility Assessment - Surface Textures for floor surfaces.

Elevation change

Changes in level of means of egress shall be achieved by an approved means of egress where the elevation difference exceeds 21 inches. Maximum slope of 1 in 12 is permitted. (NFPA 5000: 11.1.7.1, Table 11.2.5.2)

See Handicap Accessibility Assessment - Slope for elevation changes.

Occupant load

Barn

Use group: Assembly

| ROOM NAME | FLOOR AREA sq. ft. | REDUCTION FACTOR | OCCUPANT LOAD FACTOR | OCCUPANTS | # OF EXITS |
|----------------------------|-----------------------|---------------------|----------------------------|-----------|----------------|
| <u>First floor</u> | 5,936 | 75% | 1/15 | 297 | 2 (2 provided) |
| <u>Second floor</u> | 5,936 | 75% | 1/15 | 297 | 2 (6 provided) |

Table 5: Occupant loads.

Exit signs

Exits and exit access doors shall be marked by an approved exit sign readily visible from any direction of egress travel. Access to exits shall be marked by readily visible exit signs in cases where the exit or the path of egress travel is not immediately visible to the occupants. Exit sign placement shall be such that no point in an exit access corridor is more than 100 feet from the nearest visible exit sign. However, exit signs are not required in rooms or areas that require only one exit or exit access. Main exterior exit doors which obviously and clearly are identifiable as exits need not have exit signs where approved by the building official. The local jurisdiction shall be permitted to accept an alternate exit sign or egress path marking location where such sign or marking would have an adverse effect on the historic character. Alternative signs shall identify the exits and egress paths. (NFPA 5000: 16.2.10, 11.10, 15.9.4.11)

There are currently no exit signs.

Means of egress illumination

The means of egress, including the exit discharge, shall be illuminated at all times the building space served by the means of egress is occupied. The means of egress illumination level shall be no less than 1 foot-candle at the floor level and 0.1 foot-candle measured along the path of egress at floor level. The means of egress illumination shall comply with NFPA 5000. (NFPA 5000: 11.9)

There is currently no means of egress illumination.

Guards

Guards shall be located along open-sided walking surfaces, mezzanines, industrial equipment platforms, stairways, ramps and landings which are located more than 30" above the floor or grade below. Guards shall be adequate in strength and attachment in accordance with NFPA 5000. Guards shall form a protective barrier not less than 42" high, measured vertically above the leading edge of the tread, adjacent walking surface or adjacent seatboard. Open guards shall have balusters or ornamental patterns such that a 4-inch-diameter sphere cannot pass through any opening up to a height of 34 inches. From a height of 34" to 42" above the adjacent walking surface, a sphere 8" in

diameter shall not pass. Existing handrails and guards shall be permitted to remain, provided that they are not structurally dangerous. (NFPA 5000: 15.9.4.10)

None of the egress paths require guardrails. However, on the second floor, a guardrail is required at door 203 and surrounding the convenience stair. The convenience stair is provided with handrails and guardrails that do not meet the requirements of NFPA 5000.

Means of egress components - doors

Exit access and exit doors shall be designed and arranged to be clearly recognizable. Hangings or draperies shall not be placed over exit doors or located to conceal or obscure any exit. Mirrors shall not be placed on exit doors. Mirrors shall not be placed in or adjacent to any exit in such a manner as to confuse the direction of exit. (NFPA 5000: 11.5.2.2)

The doors serving the means of egress system are currently not concealed.

Size of doors

The minimum width of each door opening shall be sufficient for the occupant load thereof and shall provide a clear width of not less than 32". Clear openings of doorways with swinging doors shall be measured between the face of the door and the stop, with the door open 90 degrees. Where this section requires a minimum clear width of 32" and a door opening includes two door leaves without a mullion, one leaf shall provide a clear opening width of 32". The maximum width of a swinging door leaf shall be 48" nominal. (NFPA 5000: 11.2.1.2.4)

See Handicap Accessibility Assessment - Doors for door widths.

See Handicap Accessibility Assessment - Headroom for door heights.

Egress doors shall be side-hinged swinging. Doors shall swing in the direction of egress travel, that is, open outward, where serving an occupant load of 50 or more persons. When approved by the local jurisdiction, the existing front doors shall not be required to swing in the direction of exit travel, provided that other approved exits having sufficient capacity to serve the total occupant load are provided. Horizontal sliding doors are permitted to serve the means of egress provided that the criteria in Section 11.2.1.14 are met. (NFPA 5000: 11.2.1.4.1, 15.9.4.5, 11.2.1.14)

All means of egress doors are the horizontal sliding type. Because of the age and type of door, these doors do not comply with the code. However, as long as the National Park Service opens up the egress doors during business hours, then they comply with the intent of the code.

Floor elevation

The elevation of the floor surfaces on both sides of a door shall not vary by more than 1/2 in. The elevation shall be maintained on both sides of the doorway for a distance not less than the width of the widest leaf. Thresholds at doorways shall not exceed 1/2 in. in

height. Raised thresholds and floor level changes in excess of 1/4 in. at doorways shall be beveled with a slope not steeper than 1 in 2. (NFPA 5000: 11.2.1.3)

At the two main doors on the second floor (201 and 202) non-compliant ramps have been provided. All other doorways have floor elevations that do not meet these requirements.

See Handicap Accessibility Assessment - Slope for slopes.

Stairwell Landings

Stairs shall have landings at door openings. Stairs and intermediate landings shall continue with no decrease in width along the direction of egress travel. In new buildings, every landing shall have a dimension measured in the direction of travel that is not less than the width of the stair. (NFPA 5000: 11.2.2.3.2)

There are no stairwell landings that are required to comply with these requirements.

Thresholds

The maximum height of thresholds at doorways shall be 1/2 inch. Such thresholds shall have beveled edges on each side. (NFPA 5000: 11.2.1.3)

See Floor Elevations for steps at doorways.

See Handicap Accessibility Assessment - Doors for threshold heights.

Locks and latches

Doors shall be arranged to be opened readily from the egress side whenever the building is occupied. Locks, if provided, shall not require the use of a key, a tool, or special knowledge or effort for operation from the inside of the building. Exterior doors are permitted to be equipped with key-operated locking devices from the egress side provided that: 1.) The locking device is readily distinguishable as locked; 2.) A readily visible durable sign is posted on the egress side on or adjacent to the door per 1003.3.1.8.-2.2; and 3.) The use of key-operated locking devices is revocable by the building official for due cause. The unlatching of any leaf shall not require more than one operation (NFPA 5000: 11.2.1.5.1)

The doors comply as long as they are kept unlocked during occupied hours.

Hardware height

Door handles, pulls, latches, locks and other operating devices shall be installed 34" minimum and 48" maximum above the finished floor. Locks used only for security purposes and not used for normal operation are permitted at any height. (NFPA 5000: 11.2.1.5.4)

Most door handles are located between 34 and 48 inches above finished floor.

Means of egress components - stairways

Existing stairway widths of less than those that would be acceptable for nonhistoric buildings under this Code shall be approved, provided that, in the opinion of the local jurisdiction, there is sufficient width and height for a person to pass through the opening or traverse the exit and that the capacity of the exit system is adequate for the occupant load. Where renovations are made, parts of the existing building not subject to the work involved shall not be required to comply with the requirements of this code for new construction. (NFPA 5000: 15.9.4.4, 15.4.1.3)

There are no stairways that will be used for a means of egress within the barn.

Exit access

Exit access travel distance

Exits shall be so located that the maximum length of exit travel measured from the most remote point to the entrance to an exit along the natural and unobstructed path of egress travel, shall not exceed 250 feet (assuming sprinkler protection). (NFPA 5000: 16.2.6)

The longest exit access travel distance on the first floor is approximately 66 feet. The longest exit access travel distance on the second floor is approximately 90 feet.

Corridors

With a sprinkler system, no rating is required for corridors. (NFPA 5000: 16.3.6 exception 2)

There do not appear to be any corridors within the barn, but should there be, they are not required to have a fire resistive rating as the barn is protected with sprinklers.

Exits

Minimum number of exits

Every floor area shall be provided with two approved independent exits (NFPA 5000: 11.4.1.1)

According to NFPA, the minimum number of exits for an occupant load of 1-500 is two exits per floor. There are currently six potential exits on the first floor: through doors 101, 102, 103, 104, 105, and 106. Of these, only doors 103 and 106 will serve as required exits. There are two exits on the second floor: through doors 201 and 202.

Exit discharge

Exits shall discharge directly to the exterior of the building. The exit discharge shall be at grade or shall provide direct access to grade. (NFPA 5000: 11.7.1)

The exit discharge locations for both the first and second floors provide direct access to grade.

Accessibility Assessment

As mentioned in the Spring Hill Ranch House accessibility assessment, federal and federally funded facilities, such as the barn, are required to be compliant with the Uniform Federal Accessibility Standards (UFAS). The Building Construction and Safety Code (NFPA 5000) references ICC/ANSI A117.1-1998 (ANSI). UFAS and ANSI are very similar in their requirements. This assessment is based upon UFAS, but also relates any additional requirements per ANSI. See the Accessibility Assessment for the Spring Hill Ranch House for further explanations of UFAS and ANSI. This assessment is done with the assumption that the first and second floors of the barn are currently used for visitor orientation. Toilets are not provided. The third floor was not assessed.

UFAS states that the minimum requirements for historic preservation shall be applied to "qualified" historic buildings and facilities. "Qualified" buildings or facilities are those that are eligible for listing in the National Register of Historic Places, or designated as historic by the appropriate state or local government body. The barn is listed as a contributing building in the National Historic Landmark Nomination of 1997.

In UFAS, there is also a section pertaining to alterations of existing buildings or facilities. This section is less stringent than the general provisions, but still requires altered elements, spaces, features, and areas to comply with UFAS. At least one accessible route and one accessible entrance are required. Full extension of stair handrails is not required where this would be hazardous or impossible due to plan configuration. Existing thresholds are allowed to be retained at ¾" high or less, as long as edges are beveled on each side. In assembly areas, seating shall adjoin an accessible route that also serves as a means of emergency egress. (See UFAS 4.1.6.)

While the code provides exceptions for historic buildings, this assessment summarizes elements that fall short of complying with UFAS. Means of providing alternate or improved accessibility will be suggested where appropriate.

Accessible route

Location

There is currently no designated accessible route connecting the barn to public transportation stops, accessible parking, accessible passenger loading zones, etc., or other accessible buildings on site. While there are two wheelchair accessible entrances to the second floor, 1/2 to 2 inch changes in floor elevations in various locations create barriers to universal accessibility within the building, nor is there a universally accessible route connecting the first and second floors.

Width

The clear width of most of the main areas of the first and second floors exceeds the minimum required width of 36". On the first floor, there are pathways by the mangers that are less than 36" clear, the narrowest being approximately 31 ¼". At certain locations, also by the mangers, the clear width is less than 32" at point locations; at one location by the northeast mangers the clear width is only 26 ½".

Passing space

There is enough space for two wheelchairs to pass (60") at most locations in the barn.

Headroom

In the following spaces, the headroom is lower than 80" and thus not compliant:

At the first floor the headroom varies, the lowest being approximately 69 ½" from floor level to bottom of beams in certain locations. Door 101 only has 75" of headroom. At the bottom of the stair between the first and second floor, the headroom varies from 61" to 85" due to the grain elevator crossing the landing at a diagonal overhead.

At the second floor, there is more headroom below the beams than on the first floor. Below the bracing, at the column connections, the lowest headroom is approximately 79 ¼".

Surface textures

The ground surface along the route from the accessible parking to the entrance of the barn consists of coarse gravel. The grounds to the east, south, and west sides are grassy, uneven, and mostly inaccessible. These conditions are not compliant.

Both floors are uneven. The first level of the barn has a dirt floor, which could be slippery as it slopes and is eroded at locations. The second level floor has joints in between different materials, which vary a few inches in level.

Slope

The first floor slopes at many locations, mostly due to use and erosion.

At the main entrance doors 201 and 202, there are short plywood ramps sloping up towards the threshold both outside and inside. At both doors, the indoor rise is 9 ½" and run 96" (approximate slope 1:10); for this slope, the rise is higher than the allowed 6". The indoor ramps are 44.5" wide and have 34" handrails; these handrails are compliant in height, but are both open and unstable. The outdoor run is 36" at door 201 (approximate slope 1:3.8) and 30 ¼" at door 202 (approximate slope 1:3.2); these ramps are not compliant.

Changes in levels

The first level of the barn has a dirt floor. This floor is both uneven and slopes at various locations.

The second floor has several different kinds of flooring; original plank flooring, new plank flooring, and overlaid sheets of plywood for stabilizing reasons. The various materials not only slope in different directions, but also have level changes in between them varying up to 1 ¾". Since these level changes are vertical and above ¼", they are not compliant.

Doors

All door openings are wider than 32", which is the minimum clear width for doors.

At all floor levels the floor is uneven, and may slope quite significantly by the doors, including within the maneuvering clearances. Thresholds are usually higher than the allowed ¾" for exterior sliding doors or ½" for other types of doors. Door hardware is often not accessible either.

At door 101 there is a 12 ½" step down to the inside, which is flush with the outside ground level. At door 102, there is a steep slope up to the inside, and at doors 103, 104, and 106 there is also a slope up. At door 105, there is a rounded concrete step with sloping ground to the outside, which makes for a height variation from 9" to 1'-7". At doors 102, 103, 104, and 106, there are slopes up or down to the immediate inside of the doors. Door 106 has a steel threshold. There are manger gates that are as narrow as 29".

At doors 201 and 202 there are thresholds at a height of 9 ½", with non-compliant ramps leading up to them. Double door 203 is often open for view to the west corrals. The wood gate that serves as guardrail at the 6'-6" drop, is less tall than the required 42". This is a life safety issue.

The door hardware on several of the barn doors is not accessible. However, it is not yet decided which doors will actually be used and which doors will remain locked. Only National Park Service staff will open and close the main entrance to the barn, and the public will not be operating these doors.

Egress

See Life Safety Evaluation for a complete egress analysis.

Parking and passenger loading zones

Designated accessible parking is currently located close to the barn. Due to its coarse surface texture, the gravel road cannot currently be considered accessible. There is no designated passenger loading zone.

Stairs

In the barn, there is only one stair. This steep metal stair leads from the second (main) floor down to the first floor and is not compliant with UFAS or ANSI. The stair has only 29 ½" clear width. Both treads and risers are 8 ¼", which is less than the required 11" tread length. The treads do not overlap, and the risers are open. There are 34" high handrails on both sides of the stair, but the handrails are also open, without the extra 12" extension at the top and 12" plus thread width extension at the bottom. Several of these issues are also life safety issues.

Space allowances and reach ranges

There is enough space to accommodate stationary wheelchair occupants in all rooms.

The light switch mounting height varies from 40" to 70". However, it is not yet decided which light switches will actually be used. Only National Park Service staff will use the light switches, not the public.

Other

Although not mentioned in UFAS or ANSI, the high level of dust on the first floor of the barn may also need to be addressed, since this could cause potential problems for people with asthma, allergies, or any other issue related to breathing.

Lead Paint Testing Report Summary

See Appendix D for the complete Lead Paint Testing Report. Below find a summary for the barn.

In the barn, lead was present in all exterior wood surfaces that were painted (10.0+ Mg/cm²). None of the interior surfaces of the barn had any lead present. The interior used to be whitewashed, which precluded the introduction of lead paint to the inside of this structure.

In 2004, lead paint was abated from the surfaces of the cupolas, dormers, second and third floor windows, and second and third floor doors. Lead paint remains on the roof fascia boards and the first floor windows and doors.

4. Lower Fox Creek Schoolhouse

Site Context

The Lower Fox Creek Schoolhouse is sited on the highpoint of a steep slope. The building has two entrances on the east side that are accessed by stone steps. The gable roof does not have gutters and water runoff from the roof has caused erosion problems on the north and south sides of the building.

Exterior Envelope

The following is an excerpt from the August 2000 *Historic Structure Condition Report* published by Quinn Evans | Architects. The discussion has been updated to reflect conditions observed in the 2002 site investigations.



Figure C4-1: Schoolhouse, southeast elevation, QEA 1998.

Walls: The schoolhouse, shown in figure C4-1, is a simple one-story structure with a gable roof. It was constructed in 1882. The masonry bearing walls, including the foundation, are of native coursed rubble limestone. The corners and fenestrations have square cut, dressed quoins of a darker limestone. The exterior stone surfaces were repointed in 2000. There is slight spalling at a few locations. At the corners of the building, by the soffit, the stone is deteriorated. Slight organic growth is obvious around the entire exterior of the building.

Windows: The original stone sills have cracks. Four of the window sills are cracked, one severely, and one stone head is also severely cracked. The sash ropes are missing from all of the windows except for the eastern window on the south elevation. At the south elevation, the left window has hairline cracks at both of its bearing blocks (figure C4-2). Window sashes were stripped, repaired and refinished in 2000, although exterior lead paint was not stripped.

Doors: There are two doorways in the east elevation. The wood doors and frames are all sound, although in need of new paint. The jambs are pulling away from the wall, creating a gap. Both display marked damage on the strike faces and the door stops are missing. The north door is a modern replacement which does not match the existing profile or design of the south door. The south door was stripped of paint and repaired in 2000, but it

remains cracked. The original stone sills have been replaced with concrete, which is cracking. Both north and south door steps are leaning toward the building as well as cracking and heaving at the base (figure C4-3).



Figure C4-2: Schoolhouse, west window south wall, QEA, 07/07/98.



Figure C4-3: Schoolhouse, north entrance steps, east wall, QEA, 07/07/98.

Roof: The soffit panels are in good to fair condition and in need of new paint, with some of the panels starting to shift out of plane at the joints. The north soffit, in particular, is very warped along its entire length with an opening to the east side. The fascia and breakboard are both in good form, although they are slightly weathered. There are exposed nailers on the east and west sides of the building. The roofing was replaced in 1998 by volunteer labor (figure C4-4).



Figure C4-4: Schoolhouse, northeast view of cupola, QEA, 07/07/98.

Interior Finishes and Elements

The interior of the schoolhouse is one room with a band of chalkboards on three walls. It was restored by local volunteers in 1968-72. Overall, it is in good condition.

Floor: The wood flooring and framing system was completely replaced in 2000 as a result of extensive termite damage. The new flooring matches the 1x4 tongue-and-groove

flooring found prior to the work. All new framing is of treated lumber. A baiting system was installed that same year around the structure to control termites.

Walls: The plaster walls are generally in good condition, but stress cracks are visible above the doors and windows and the plaster is flaking below the east window. The wood moulding is sound for the most part. The baseboards are pulling away from the south walls and the ceiling trim is pulling away from walls and ceiling. At the east elevation, the baseboard between the doors is missing a piece of quarter-round shoe mould. There currently is no exterior outlet for the stove pipe attached to west wall.

Doors: The interior strike side jambs of the north and south doors are damaged at the strike plate.

Ceiling: The ceiling is a gypsum board replacement installed after the new roof was put in place. The ceiling near the east wall is heavily damaged due to a chronic leak at the cupola. The stove pipe originally went up through the ceiling, then out through the west gable. The original outlet is visible above the level of the replacement ceiling, with the circular area filled in with brick.

Privy

The privy, a small board-and-batten wood structure with a gable roof, is in extremely poor condition (figure C4-5). All of the wood is heavily weathered and is deteriorating significantly around the base, and the entire structure is leaning. The roof sheathing and framing are both dilapidated. At the shingles both red and white paint is visible. The floor and commode base are seemingly sound but are formed in possibly anachronistic concrete.



Figure C4-5: Privy, southeast elevation, QEA, 07/07/98

Structural Evaluation

The following is an excerpt from the August 2000 *Historic Structure Condition Report* published by Quinn Evans | Architects. The discussion has been updated to reflect conditions observed in the 2003 site investigations.

The schoolhouse has dressed stones forming the corners and the window and door openings. Between the dressed stones, the walls are built up with ashlar stone as shown in figure C4-6.

Exterior

Walls: The schoolhouse exterior stone has been recently repointed and appears in good condition. The dressed stones have a hammered face with a tooled finish around the edges of each stone. The tooled edge finish is not as defined as it is on similar stones in the buildings on the ranch.

Movements of the walls have occurred in the past. The northwest corner was previously noted to have questionable joint integrity at the top and extensive repointing of wide joints at the base of the west wall, north end. More apparent, however, was the east wall movement. Cracks were noted on the east end of both the north and south elevations. Step cracks spanning between the roof line and the center of the doorway arches on the east elevation were originally noted as well (figure C4-7). These cracking patterns may indicate movement of the east wall down and away from the building, and may be related to the relatively steep soil grading at the east elevation or other unforeseen foundation problems which were indeterminable at the time of the field investigations. Presently, the pointing effort appears to have corrected the cosmetic distress at these locations. However, the walls should be monitored for recurrence of the distress. If old crack locations re-crack, then a foundation investigation will be required.

Windows: The window stone sills and lintels are in fair to poor condition. The top of the west window lintel on the north elevation is deteriorating. There is a 5/64" wide vertical crack at the west bearing of the center window lintel, north elevation as shown in figure C4-8. On the south elevation, the dressed stones the window lintels bear on have fine to ~1/32" wide cracking below the lintel bearings. The sill stones are in fair condition overall. The sill stones on the south elevation are cracked and split in several locations as is the east window sill on the north elevation. The underside of the north corner of the window sill on the east elevation is broken off.

Doors: Missing mortar around the keystones for the doorway arches in the east elevation has been repaired. As recorded in the 1998 survey, there was a step crack from each of the doorway arches up to the roof line. The door sills have been replaced with concrete. Cracking was observed on the south door sill. The stone steps at the doorways are weathered, deteriorating, and have moved from their original positions (figure C4-9).



Figure C4-6: Composition of schoolhouse wall. Note window sill stone is broken and pieces of the stone are missing. To the right of the sill stone the wall has been repointed and patched, Fitzpatrick Structural Engineering, 1998.



Figure C4-7: Vertical step crack between roof line and south doorway on east elevation of Schoolhouse, Fitzpatrick Structural Engineering, 1998.



Figure C4-8: Cracked lintel stone at right side of the middle window on the north wall, Fitzpatrick Structural Engineering, 2003.



Figure C4-9: Movement of stone steps at south doorway on east elevation of schoolhouse, Fitzpatrick Structural Engineering, 1998.

Roof: The cedar shake roof appears to be in good condition. The ridge line appears to be straight. There is no effective ventilation to the exterior of either the roof structure or the crawl space area.

Interior

The one-room schoolhouse has 3" wide tongue and groove wood decking spanning east-west as its flooring. The walls are plastered with wood trim finishes. The ceiling has a drywall finish.

Floor: The floor system was replaced in 2000, since the original inspection. The floor joists were replaced with pressure treated lumber and are not in contact with the ground. Wood rot and insect damage of the original floor was reported by Mr. Al O'Bright, Historic Architect for the NPS.

Walls: The walls are in good condition. Cracks in the east wall were observed at the same locations as on the exterior of the east wall. Cracks were observed above and below windows on the north and south walls and above and below the chalkboard on the west wall.

Attic: The plaster finish continues into the attic space on the east wall, but not on the west. In the west wall, just above the ceiling structure, a brick patch was observed in the ashlar stone wall as shown in figure C4-10.



Figure C4-10: Schoolhouse roof framing looking west. Note brick patch in ashlar stone wall just above ceiling framing, Fitzpatrick Structural Engineering, 1998.

Roof: The roofing is of plywood overlaying skip board sheathing. The rafters are nominal 2x4s with vertical struts from each rafter to the ceiling structure. The skip board sheathing pattern reflects the original roof sheathing typical of shake roofs of this vintage. The original sheathing provided ample ventilation of the roof. Plywood placed over the original sheathing compromises this ventilation.

Privy

A privy remains standing to the northwest of the schoolhouse. Of wood construction, except for a concrete slab and commode, the structure is in poor condition. The roof structure, nominal 2x4s at 24" spacing, is rotted and insect penetration was observed. Cedar shake shingles are missing from the skip board sheathed roof, as are 12" tongue-

and-groove side panels from the nominal 2x4 stud walls. The concrete slab is in good condition.

Lead Paint Testing Report Summary

See Appendix D for the complete Lead Paint Testing Report. Below find a summary for the Lower Fox Creek Schoolhouse.

In the schoolhouse, lead was present in all of the exterior window sashes and casings (4.0+ Mg/cm²), and on the interior surface of the southeast door (10.0+ Mg/cm²). All other painted surfaces seemed to be lead free. The window sashes and south door were stripped of lead paint in 2000, but the frames were not.

5. Outhouse

Site Context

The outhouse is located northwest of the springhouse and ranch house. It is within easy walking distance of the back porch door of the ranch house. The outhouse is situated on a slope that descends to the east, exposing the stone foundation on the north, east, and south sides of the building (maximum change in elevation from west to east is approximately 24”). The sole entrance to the building is a door located on its south side.

The outhouse is a simple square shape, one story in height with a hip, cedar shake roof and cupola. It is constructed of limestone walls and has a wood floor and roof structures.

Exterior Envelope

The following is an excerpt from the August 2000 *Historic Structure Condition Report* published by Quinn Evans | Architects. The discussion has been updated to reflect conditions observed in the 2002 site investigations.



Figure C5-1: Outhouse, south elevation, QEA, 07/06/98.

The exterior walls of the structure (figure C5-1) are of rusticated coursed ashlar native limestone. The walls are in good condition overall, with the exception of some apparent damage at the base, where there is some discoloring due to organic bacteria. There is evidence of past delamination of the stone, which has been corrected and stabilized. On the south side white and silver colored paint has stained the stone. The majority of the mortar joints have been repointed using various mortar colors and tools; however, some of these new joints in the foundation are popping.

The cornice moulding is in fair condition and is beginning to pull away from the fascia board, which is weathered and splitting at its mitered corners. Both elements show instances of stabilized water damage on all elevations and significant insect damage on the north and east (figure C5-2).

The shakes comprising the roof are also in good condition. Some cupping is evident as well as significant organic growth on the west side. The cap is spreading at the southeast corner. The top row of shakes at the base of the cupola is missing on both the north and east sides. The cupola is constructed of painted plywood, which is delaminating. The louver third from the bottom on the west side is rotted.

All of the four-over-four double-hung windows are in need of repairing and reglazing. The trim will require filling and repainting and a few questionable muntins and sash pieces require attention. Some wood rot is apparent at the sills due to the fact that water stands on the level surface (figure C5-3). The door frame is slightly weathered at the bottom. The door is weathered at the bottom, which has resulted in the installation of a metal patch in the lower left corner. The standard box-lock hardware and wrought iron hook lock are operable. There is significant spalling below the west window.

Interior Finishes and Elements

The walls are rough cut ashlar stone, which is dressed at the windows. The joints are in very good condition and are randomly mortared. The worn wooden bench has openings for two adults and one child and is missing quarter round moulding at the base (figure C5-4). A wooden pipe vents to a point just below the roof structure and then out through the cupola. The floor is composed of unfinished tongue-and-groove floorboards in fair condition. One of the joints is rotting and opening.

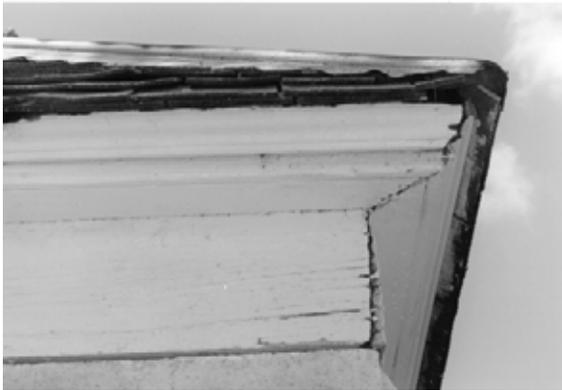


Figure C5-2: Outhouse, southeast corner, QEA, 07/06/98.



Figure C5-3: Outhouse, west window, interior sill, QEA, 07/06/98.



Figure C5-4: Outhouse interior; bench, QEA, 07/06/98.

Structural Evaluation

The following is an excerpt from the August 2000 *Historic Structure Condition Report* published by Quinn Evans | Architects. The discussion has been updated to reflect conditions observed in the 2003 site investigations.

Exterior

The exterior walls are built with block limestone. The mortar joints have large granular sand and are raised and tooled. The keystones have a hammered face with the edges of the stone tooled. The corner stones also have the tooled edges. The fourth, fifth, and sixth stone courses above the water table are of a darker grey color when compared to the buff color of the other stones used in the building.

The stones below the water table are in fair condition. The joints have been repointed, but most have re-cracked and are missing mortar. On the north and south elevations, heavy organic growth is present. On the east elevation, the stones at grade level are undercut, splitting, and exfoliating as seen in figure C5-5.

Above the water table, the stones are in better condition. Miscellaneous locations of missing mortar were observed in the north elevation. Heavy organic growth on the top portions of the east wall was observed. The mortar joints in the east wall are hairline cracked. The lintel for the east window has been repointed; mortar is missing on the underside of the keystone. The fascia board for the east and west elevations was cut to fit around the keystones. At the west elevation, the lintel has dropped; there is a gap between the keystone and the fascia board. The west and south arches have been repointed; shrinkage cracking was observed at the springlines. Organic growth was noted on the shingles of the west elevation.



Figure C5-5: Undercut stones; through stone cracks and repointed joints at base of east elevation of Outhouse, Fitzpatrick Structural Engineering, 1998.

Interior

The floor structure is of wood 2xs spanning east-west with wood decking spanning north-south. It is in good condition. The walls are built with ashlar stone except around the window and door openings where the dressed block stone used on the exterior is used. The lintels for the doors and windows are 2xs laid flatwise. Many locations of missing mortar and a few locations of through stone cracking were observed. A pack rat was found nesting at the top of the wall in the southwest corner. The 2" x 4" rafters frame from the limestone walls to the cupola framing. The 2" x 2" tenons described in the curing house were also observed in the outhouse spanning north-south.

Lead Paint Testing Report Summary

See Appendix D for the complete Lead Paint Testing Report. Below find a summary for the outhouse.

In the outhouse, lead was present in all exterior painted surfaces (10.0+ Mg/cm²).

6. Icehouse and Cistern

Site Context

The icehouse and cistern are located at the highpoint of the site, directly west of the ranch house. They are accessible from the ranch house via timber steps cut into the earth of the steep slope. The route is rough and water runoff from rain events flows down the steps creating washouts.

The icehouse is a square one-story limestone building with a hip cedar shake roof. The walls are built with ashlar stone between dressed corner stones. The edges of the corner stones are tooled. As discussed below, the structure has been modified over the years.

Exterior Envelope

The following is an excerpt from the August 2000 *Historic Structure Condition Report* published by Quinn Evans | Architects. The discussion has been updated to reflect conditions observed in the 2002 site investigations.



Figure C6-1: Icehouse, south elevation, QEA, 07/06/98.

Like the curing room/springhouse, the icehouse is a freestanding limestone structure with a pyramidal roof. The shingles are wood and the original cupola at the top of the truncated pyramid is missing. The exterior walls (figure C6-1) are in good condition and have all been repointed with a high-Portland cement content mortar. The north elevation mortar is white or gray in color. Some of these joints have begun to erode at the base. There is occasional spalling on the west wall and a rust stain at the sill by the arched window. The southwest corner of the building is stained. The wood elements are weathered to the extent that the soffit is warped and cracking and also split in the southwest corner. The fascia has been patched at the south end of the east side.

The roof shingles are cupping and deteriorating on the steeply sloped portion leading up to the flat metal roof of the truncated pyramid. On the south side, shingles are missing. The cap flashing is also showing signs of rust and deterioration. The top ridge has a manufacturer's mark stamped into the metal which is believed to read, "Milcore Old

Style, Copperoid Metal, 40 pound _____.” There is significant organic growth on the north side.

While the arched openings have been infilled with plywood to the west and rusted sheet metal to the east, the actual six-over-six double-hung window is intact and mortared into the wall. However, it has a thoroughly deteriorated sill and will require reglazing as well as repainting. The meeting rail of the upper sash is deteriorated and loose. The muntins are new. The current entry is through a relatively new double barn door within a modified opening. The sides of this opening have been infilled or repointed with gray mortar. The infill to the west of the opening does not match the original wall in width. This door is damaged at the bottom, deteriorated and lacking paint.

The stone cistern is shown in figure C6-2. Despite a few instances of spalling, the stone is in good condition. The north edge of the east wall is eroding and organic growth is evident in the back splash region and throughout the east face. The mortar is also in good shape and has been repointed. Some joint erosion and cracking is apparent at the base of the wall and also in the joint left of the keystone. The other faces of the structure are buried within the hill and covered in grass. The visible portion of the connector to the icehouse appears sound.



Figure C6-2: Cistern, east elevation, QEA, 07/10/98.



Figure C6-3: Icehouse interior, east window opening on north wall, QEA, 07/07/98.

Interior Finishes and Elements

The interior of the icehouse is shown in figure C6-3. The non-original concrete slab floor slopes up to the entry and is cracked and pitted, but is sound overall. The random course ashlar walls show severe cracking at the northwest corner of the west wall as well as minor cracking around the arches on the north wall. It should be noted that the center window of the north wall was formerly an arched opening wider than the present one, with the east jamb unchanged. The wall at the east side of the doors is infilled and severely deteriorated.

Structural Evaluation

The following is an excerpt from the August 2000 *Historic Structure Condition Report* published by Quinn Evans | Architects. The discussion has been updated to reflect conditions observed in the 2003 site investigations.



Figure C6-4: Vertical cracking in north end of west interior wall of icehouse, Fitzpatrick Structural Engineering, 1998.

Exterior

The stone walls are generally in good condition. Minor loss of mortar was observed on all of the elevations. The original mortar is coarse grained, raised and tooled. Nearly all of the exterior walls have been repointed at least once with a thumb jointed finish, using a mortar that appears to have a high Portland cement content. Vegetation was observed to be growing up the wall and roof of the north elevation, damaging the stone. Moss growth was also observed at the base of the north wall. A level was taped to a 50-5/8" long 2x member to determine plumbness of the north wall. The wall was determined to be plumb except at the existing window where a 1-1/2" measurement was recorded for the top of the wall leaning to the south. This lean is due to the stone infill at this original opening.

Interior

The original floor of the icehouse was lower than the existing concrete floor. To capture the melt from the ice, the water flowed from the icehouse through the semicircular opening in the west wall of the cistern. The existing concrete floor is spalling in areas. Shrinkage cracks spanning north-south were observed.

The newer window opening in the north wall was part of an arched opening believed to be the original door into the icehouse. The original opening was infilled with the existing window and ashlar stone with a dark grey mortar. The level used on the exterior of the north wall was also used on the interior. Three measurements taken to the west of the window were recorded as essentially plumb (leaning slightly to the south). The doorway in the south wall is not original. The sides of the opening are rough; the surfaces are not flat, and have been extensively repointed. The lintel over the doorway in the south wall is deflecting (sagging) preventing the doors from closing tightly. Some insect penetration and wood rot was observed, but the 2x lintel seems sound. The sagging is due to the relatively small depth of the member compared to the width of the opening. The west wall has a semicircular window in the top center of the wall. The joints around the lintel have been repointed, but have since re-cracked to a 5/64" estimated width. Wide vertical cracking in the north end of the west wall was observed as shown in figure C6-4. The cracks run the full height of the wall, has been repointed, and are re-cracking.

To support the ceiling and roof structures, doubled 2x4 nominal studs have been placed in two locations: one near the north window at a split ceiling joist, and one at the south side of the opening in the ceiling. The top of the north shore post was measured to lean to the north 1" in the 50-5/8" level length, and to the east 3/4" in the 50-5/8" level length. The top of the south shore post was measured to lean to the east 3/4" in the 50-5/8" level length. A grade stamp indicating kiln-dried (15 percent moisture content) southern pine, No. 2 grade was observed on one of the shore posts, confirming that the shore posts are relatively new additions.

The ceiling structure of the icehouse has been altered several times. The 2" x 2" tenons observed in the curing room and outhouse were observed in the north wall of the icehouse as well. Other (probably original) ceiling joists are pocketed into the east and west walls; all but two of the original joists are headered with a newer 2x member. The newer 2x member supports the existing ceiling joists spanning east-west. The newer 2x bears on the north and south walls and the two original joists that are not headered. These two original joists frame the opening in the ceiling. The joists are not continuous from east to west, but are spliced together with the opening framing, which is spiked to the wood posts hung from the roof structure. The base of the post in the northeast corner is rotted; the post in the southwest corner is split. The southern original joist is supported at the splice location with the newer southern shore post discussed above. (See figures C6-4 and C6-5 for details.) The overall stability of the ceiling and roof structures is questionable.



Figure C6-4: Original joists spliced together center opening in ceiling structure in icehouse. Note newer shore post is not centered with joint in joists, Fitzpatrick Structural Engineering, 1998.



Figure C6-5: Newer split ceiling joist supported with doubled 2x4 nominal north shore post in icehouse, Fitzpatrick Structural Engineering, 1998.

Only the flat roof structure is visible. At approximate two foot center-to-center spacings, the nominal 2x4 rafters appear to be in good condition. The rest of the roof structure is hidden due to full wood sheathing.

Cistern



Figure C6-6: Stone deterioration at north end of east wall of cistern, Fitzpatrick Structural Engineering, 1998.

A limestone barrel arch having spring lines at the north and south wall, the cistern has one wall exposed above grade. The top five courses of the east wall are above grade. The roof is an earth roof.

Exterior

The east wall has a semi-circular opening centered on the wall. The joints have been repointed, but hairline to 3/64" wide step cracks were observed. Mortar was noted to be missing on the south side of the keystone for the opening. Organic growth was observed along the base of the wall. The stones north of the opening are exfoliating and spalling. (Refer to figure C6-6)

Interior

Approximately four feet of water was in the cistern during the July field investigation. The walls appear to be parged and in good condition. Caulking was observed in the southwest corner. Heavy organic growth was observed on the barrel arched (curved) portions of the north and south walls and to a similar elevation on the east and west walls as in figure C6-8. A semicircular, or half moon, opening in the west wall just below the top of the arch has been infilled with stone as shown in figure C6-7. A steel pipe extends through this opening; rust staining is located below the pipe.



Figure C6-7: Infilled opening in west wall of cistern. Note rust staining below steel pipe extending through opening. Note heavy organic growth, Fitzpatrick Structural Engineering, 1998.

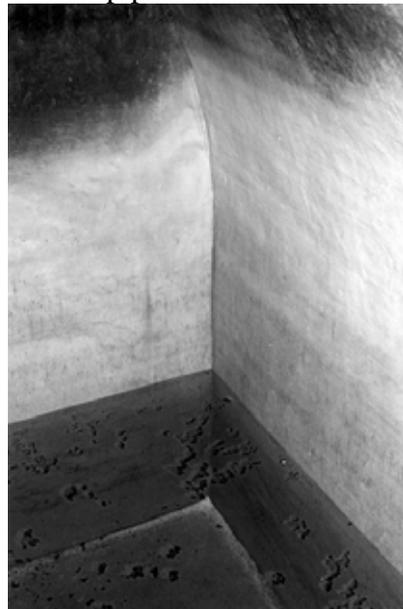


Figure C6-8: Northwest interior corner of cistern. Note heavy organic growth on arched portions of walls, Fitzpatrick Structural Engineering, 1998.

Lead Paint Testing Report Summary

See Appendix D for the complete Lead Paint Testing Report. Below find a summary for the icehouse.

In the icehouse, lead was present in the exterior door and trim (10.0+ Mg/cm²).

7. Carriage House

Site Context

The carriage house is located between the ranch house and barn, where the ranch road splits. It is on the north side of the ranch road, and close to the poultry house. A steep slope behind the building rises to the north. The doorway of the building faces the ranch road.

The carriage house is a square, one-story stone building with a gabled, cedar shake roof. The ridgeline is straight. The building is located at an angle respective to the other buildings on the ranch, and is built into the side of a hill.

Exterior Envelope

The following is an excerpt from the August 2000 *Historic Structure Condition Report* published by Quinn Evans | Architects. The discussion has been updated to reflect conditions observed in the 2002 site investigations.



Figure C7-1: Carriage house, south elevation, QEA, 07/08/98.

The carriage house is shown in figure C7-1. Other than the organic growth around the base, the stone walls are in good condition. The condition of the mortar joints varies from wall to wall. While the joints are in very poor condition on the south wall, those that are visible on the north wall are in relatively good condition with only a few open joints. Those joints on the east and west walls have been sporadically repointed with a hard gray mortar and the original joints are rough with periodic openings. There is some missing mortar near grade on the east wall. Protruding above the window on the south elevation are the ends of two abandoned pieces of conduit. East of the window are two holes where conduit was removed.

The gable window and frame are both in fair condition, and weathered. The window needs to be reglazed. The west set of doors are swing doors and the east door is an

overhead door. Both frames are in fair condition with splits through the frame and deterioration occurring at the bottom. The west door is racked due to a lack of cross-bracing and heavy weathering.

The roof is in good condition overall though some of the shingles are curling, exposing sheathing. In addition, some of the shingles are split. There is organic growth at the northeast portion of the roof. The uphill sides of the eaves are damaged due to splash back from the ground level. The gutters are wired down to the drain along the west and east sides. The wood gable is in good condition with moderate weathering and peeling paint.

Retaining Wall between Carriage House and Poultry House

The three-foot high limestone retaining wall between the carriage house and the poultry house is in good condition. The joints have been repointed with a thumb-tooled finish. Organic growth was observed on the stones. The coping stone is exfoliating from the top and bottom, especially on the southwest end.

Interior Finishes and Elements

The floor is composed of a series of precast flat silo tiles that are in fair to good condition, with some areas of heaving. The interior stone walls are in good condition except for one of the base stones in the south wall, which is missing a corner face. The majority of the joints have been repointed with a high cement gray mortar, but many are broken and open. The original mortar joints are soft and sandy. At the center of the north wall is a rotted nailer insert at approximately eye level. In the northeast corner is a similar piece located at waist level. Also in the north wall, the window is covered by plastic, as is part of the ceiling. The ceiling is open rafters with partial attic joists at the south end.

Structural Evaluation

The following is an excerpt from the August 2000 *Historic Structure Condition Report* published by Quinn Evans | Architects. The discussion has been updated to reflect conditions observed in the 2002 site investigations.

Exterior

The stone of the north wall is entirely below grade; only the gable end is above grade. The wood sheathed gable end is in good condition. The grade descends along the east and west walls to the floor elevation of the carriage house at the south elevation. The east and west walls are missing mortar in several locations, especially in courses directly above the grade line. Each of the walls has been partially repointed; more so on the east wall.

The south elevation has two sets of wood doors, which are rotted at the bottom. The west set of doors are swing doors and the east door is an overhead door. The relatively small area of stone wall between the doors is in good condition as evidenced by figure C6-2. The joints for the bottom three courses of the wall are hairline cracked and missing mortar. The cracking continues on the interior side of the wall.

Interior

The floor of the carriage house is constructed with salvaged silo tiles. The floor bows down at each location where a carriage or car would have been parked. In the eastern bay, the floor is oil stained. See figure C6-3.

The walls are missing extensive mortar (90 to 95 percent of the wall area). The walls have been repointed at least two or three times previously. The joints are finished similar to the joints in the curing room, with a stick or trowel edge swept through the wet mortar to harden with sharp lines in the joints. A hairline to 3/64" wide vertical crack is found in the southern half of the southwest wall. Wood nailers laid into the stone coursing on the northeast and northwest walls are rotted and missing. Organic growth was observed, especially in the lower north corner.

The lintels over the doubled doors in the southeast elevation are doubled nominal 2x6s bearing on the nominal 2x6 door jambs. The wood gable ends are constructed with nominal 2x4s with 5" tongue-and-groove wood planking and appear to be in good condition. Minor water staining was noted near the window openings and at the top of the stone walls. The rafters at the gabled walls are cut into the 2x4 wall studs.



Fitzpatrick Structural Engineering, 1998.



Figure C7-2 (left): Stone wall between doubled doors in southeast elevation of carriage house. Large joints repointed, re-cracked, missing mortar. The bottom of the doors and the door jambs are rotted, Fitzpatrick Structural Engineering, 1998.

Figure C7-3 (above): North interior corner of carriage house. Note deflection and staining of silo tile floor, organic growth in north corner, water stained sheathing,

Most of the roof structure was covered with a large plastic tarp allowing only limited inspection of the rafters. Where visible, the roof structure is in good condition. The skip board sheathing over the rafters is water stained and has been replaced in some locations. The rafters are nominal 2x4's at approximate two foot center to center spacing. There is no ridge member; the rafters are set against each other.

Near the doubled doors, four nominal 2x6 ceiling joists at 16" center-to-center spacing bear on the northeast and southwest walls. From the east end of the stone pier in the southeast elevation to the center of the western doorway, 3" tongue and groove wood planking is laid over the ceiling joists.

Lead Paint Testing Report Summary

See Appendix D for the complete Lead Paint Testing Report. Below find a summary for the carriage house.

In the carriage house, lead was present in all exterior painted surfaces (10.0+ Mg/cm²).

8. Poultry House

Site Context

The poultry house is located directly to the west of the carriage house. It is on the north side of the ranch road, across from the northeast corner of the barn. The door opens to the south.

The poultry house is a rectangular limestone building. The north and south walls form the spring line of a stone barrel arch. The roof is an earth roof with two skylight openings. The building is built into the side of a hill.

Exterior Envelope

The following is an excerpt from the August 2000 *Historic Structure Condition Report* published by Quinn Evans | Architects. The discussion has been updated to reflect conditions observed in the 2002 site investigations.



Figure C8-1: Poultry house, south elevation, QEA, 07/10/98.

The exterior walls are in good condition. The joints have been re pointed but show evidence of deterioration and some openings. The joints are eroding where the original mortar still exists. The south elevation is shown in figure C8-1. Stone is spalling at several locations on the south elevation. Along the base of the wall, there is discoloration due to the organic growth from splash backs.

The east window frame on the south elevation is in poor condition, due to significant weathering. The sill is in very poor condition, as it is heavily deteriorated. The sash is also in poor condition because of weathering, and needs reconditioning and refitting. The west window frame is heavily weathered and in poor condition. The sill is weathered and cracking. Both the upper and lower sash of this window appear salvaged, and wood

pieces are blocking the gap in between them (figure C8-2). The muntin bar of the lower sash is separating due to the two lower glass panes missing.

The east doorframe is in fair condition overall. It is weathered and split, but serviceable. The door itself is loose at the top hinge and weathered at the leading bottom corner. The hardware is a cast iron hook and eye. The wood sill is very weathered and worn and is not painted. The west doorframe is in good condition despite the fact it is weathered at the bottom and missing part of the lower doorstop on the east jamb. The door is in fair condition, as it is weathered at its leading bottom edge and loose on its hinges. The sill is heavily weathered and lacking paint.

At the west elevation, the joints are deteriorating and show some openings. The cornice stone is spalling. The mortar is sandy and completely missing between the upper stones. There are traces of white paint visible on the stones. The unpainted wood frame, sill, and gate are in good condition.

The majority of the north elevation is embedded in a hillside. The cornice stone is spalling.

The east elevation is shown in figure C8-3 and is in good condition. It has been repointed and both the old and new mortar joints are in good shape. The door into the anteroom on the east elevation is in fair shape, with erosion at the edge and bottom. The frame shows heavy weathering and deterioration at the bottom, where it is also kicking inward. The sill is deteriorated.

The roof is covered in sod and has grass growing on it. The horizontal joints in the stone are eroded or filled with organic material. There is one area near the west end that has a wooden hatch door, accessible only from the inside.



Figure C8-2: Poultry house, west window in south elevation, QEA 1998.



Figure C8-3: Poultry house, east elevation, QEA, 7/10/98.

Interior Finishes and Elements

The concrete floor is in fair condition throughout. On the east end of the structure is an anteroom that is in good to fair condition. The west stone wall is evenly parged except on the lower two feet and sporadically parged on the face of the east wall. The lower two feet of the west wall are in poor condition with spalling, erosion, missing stones, and no mortar or parge coat. The opening from this room into the coop area is boarded over with wood planking.

The stone on the interior walls of the coop is fair with sporadic parging on the east, west, and lower south walls. There is extensive organic growth along the north wall where it is below the grade line. The fact that the north wall is embedded into the hillside is the possible cause for the large and evident moisture infiltration. The mortar is in poor condition with many open joints, especially on the north wall. A separation crack is found where the wall butts the vault. The tie rods are rusted solid (figure C8-4). The skylights within the vault are both boarded over; however, the one on the west end remains accessible.



Figure C8-4: Poultry house, showing tie rods in coop area, QEA, 07/10/98



Figure C8-5: Poultry house, interior, east elevation, QEA, 07/10/98.

The opening at the west end that leads into the scratch house has dressed stones at the top of the wood frame and ashlar stone up to a large stone header. It is possible that, at some point, the door had a ventilation transom because the stone lintels are pieces of the original stone fabric (figure C8-5).

Structural Evaluation

The following is an excerpt from the August 2000 *Historic Structure Condition Report* published by Quinn Evans | Architects. The discussion has been updated to reflect conditions observed in the 2002 site investigations.

Exterior

The north wall is mainly below grade. The joints in the top courses above grade have been repointed. Some of the exposed stones are exfoliating. Hairline through stone and step cracking were observed on the east end. About every four feet, aligning with the joints between the coping stones, the wall is water stained. The coping stone west of the center coping stone is deteriorating.

The entire east wall has been repointed at least twice. Shrinkage cracks in the mortar joints were observed. Some of the stones are exfoliating. A corner crack in a stone was noted on the north end. The north coping stone is deteriorating.

The south elevation has been repointed at least twice. There are several locations of missing mortar, especially at the base of the wall. Hairline cracking west of the west door was observed. Above the door and window openings, the stones are deteriorating and exfoliating, including the top of the east window lintel and some of the coping stones.

The west wall of the poultry house is also the east wall of the scratch shed.

Interior

The floor of the poultry house is a concrete slab. It is in good condition with some surface cracking. The north and south walls form a barrel arch. The east and west walls enclose the arch. The east and west walls create two rooms: the coop and a storage room on the east end of the building. The 24" thick limestone walls are in fair condition.

A cementitious parging placed over the walls has fallen off exposing the limestone walls. The joints between the stones are missing mortar. Extensive green organic growth was observed on the north wall. Some of the stones in the arch and in the west wall are exfoliating. One stone has fallen out of the west wall.

Two skylights at the crown of the arch have wood decking at the top of the stone that is rotted. Daylight was observed through the west skylight. The stones framing the openings are in good condition; the joints are missing mortar. The stone on the north side of the east skylight has a through stone vertical crack.

Lead Paint Testing Report Summary

See Appendix D for the complete Lead Paint Testing Report. Below find a summary for the poultry house.

In the poultry house, lead was present in all exterior painted surfaces (10.0+ Mg/cm²).

Part 2: Treatment and Use

Tallgrass Prairie National Preserve
Historic Structures Report

D: General

Tallgrass Prairie National Preserve
Historic Structures Report

Design Philosophy

The Tallgrass Prairie National Preserve was listed as a National Historic Landmark (NHL) in 1997 for its association with the cattlemen's empire of the late 19th century and its association with the transition from the open range to the enclosed holdings of the large cattle companies in the 1880s. The period of national significance extends from the first purchases of the properties by Stephen Jones in 1878 through 1904, when Bernard "Barney" Lantry's sons sold off the ranch lands.¹

The Historic Resource Study (HRS), completed in 2000, agrees with the National Historic Landmark designation's national level of significance, but "finds that the built and natural resources of the property are important for their ability to represent the convergence of the environmental, economic, and cultural factors that transformed the American West in the years between 1878-1993."² The HRS suggests that both 19th and 20th century resources are significant at the state and local level.

The Cultural Landscape Report (CLR), Part 1, further defines the period of significance to coincide with the development and decline of the railroads and their relationship to the resource. The railroads played a critical role in this local economic development, first enabling, then sustaining the larger cattle operations of the area until cattle shipment shifted to trucks in the 1960s-1970s.³

The period of significance for the Spring Hill/Z-Bar Ranch Headquarters, for the purpose of this report, can therefore be defined as 1878 through the 1970s. The Cultural Landscape Report, Part 2 will consider this period of significance as the basis for the treatment recommendations set forth for review and approval by the National Park Service. In particular, this Historic Structure Report (HSR) will place the highest priority on preserving the features that contribute to the National Historic Landmark period of significance, while respecting those features that have gained importance through association with the extended period of significance.

Preservation and Historic Structure Management Strategy

The proposed action defined for the Preferred Alternative in the *General Management Plan and Environmental Impact Statement* (GMP), is the integration of the management of the natural and cultural resources of the preserve. The guidelines require full consideration be given to the preservation of historic fabric and landscapes, adaptive use, and to visitor needs and safety.

¹ United States Department of Interior. National Park Service, *General Management Plan Environmental Impact Statement* – Kansas: December 2000, page 78.

² United States Department of Interior. *General Management Plan*, page 33.

³ United States Department of Interior. *General Management Plan*, page 33.

The GMP also recommends that the ranch headquarters, management area be the focal point for interpreting the story of ranching in the Flint Hills region.

“The ranching character of the historic Spring Hill/Z-Bar Ranch headquarters would be retained to the greatest extent possible. The ranch house, barn and associated outbuildings, and landscape features would be restored, rehabilitated, and/or preserved according to the recommendations made in the CLR, HRS, [and HSR]. Preservation of cultural resources would be supplemented by interpretive activities so visitors would understand the broad history of ranching in the Flint Hills from the mid-19th century through the late 20th century. Some structures, or portions of structures, may be managed as historically furnished interiors.”⁴

The intended use as an interpretive site along with the juxtaposition of the expanded period of significance renders preservation the overriding treatment according to *The Secretary of Interior's Standards for the Treatment of Historic Properties*. Preservation, according to the standards, is defined as the act or process of applying measures necessary to sustain the existing form, integrity, and materials of an historic property. Work, including preliminary measures to protect and stabilize the property, generally focuses upon the ongoing maintenance and repair of historic materials and features rather than extensive replacement and new construction. New exterior additions are not within the scope of this treatment, however, the limited and sensitive upgrading of mechanical, electrical, and plumbing systems and other code-required work to make properties functional is appropriate within a preservation project. Preservation is used as a treatment when the property's distinctive materials, features, and spaces are essentially intact and thus convey the historic significance without extensive repair or replacement; when depiction at a particular period of time is not appropriate; and when a continuing use does not require additions or extensive alterations.

The site's level of historic integrity is high, even when considering the periodic modifications to the structures associated with the ongoing ranching operations. The character defining features, materials, spaces, and uses of the core buildings and adjacent cultural landscape are essentially intact and can be utilized, with limited and sensitive repairs and upgrades, to convey the broad history of ranching in the Flint Hills.

⁴ United States Department of Interior. *General Management Plan*, page 38.

E: Treatment and Alternatives

1. The Spring Hill Ranch Site

Barrier Free Accessibility - Overview of Alternatives

The site design alternatives provided herein address issues related to limited universal accessibility at the Spring Hill Ranch. These alternatives have been prepared based on the goals provided in the project scope, and focus on obtaining universally accessible entrances to both the first and second floors of the ranch house and barn and the pathway between the two structures. An additional goal, of developing alternatives that are as minimally intrusive as possible to the historic landscape, was also included in the design process.

While the design of parking areas is not a part of this contract, achieving universal accessibility to the buildings will require changes to the current parking situation. The design alternatives include recommendations for locations of accessible parking spaces.

A Part II Cultural Landscape Report for Tallgrass Prairie National Preserve (CLR) is currently being prepared under a different contract. This report will address the entire historic landscape at Spring Hill Ranch, and provide recommendations for treatment. Part I of the CLR was completed in April 2000, and has provided historical and base information for the current site design alternatives. Since the Part II CLR will provide new information, the landscape treatment alternatives provided within the current report may conflict with those set forth in the Part II CLR. Should that occur, these recommendations should be reevaluated in light of the information presented within the CLR.

Base information utilized to prepare this section included architectural drawings and notations regarding elevations (prepared by Quinn Evans | Architects), schematic maps obtained from the Part I Cultural Landscape Report, a digital utility base, and photographs and notes compiled during site investigations conducted on March 7 and 8, 2002, and October 7 through 9, 2002. A digital site survey was provided by the National Park Service in March 2003, and the design alternatives have been overlaid on this base. The site design alternatives are conceptual.

Overall Site Alternative #1

Pedestrian Circulation

This alternative provides maximum universally accessible pedestrian circulation and maximum impacts to the historic landscape. Included are universally accessible exterior routes to the first and second floors of the ranch house and barn. The routes present a variety of opportunities for visitor pedestrian circulation through the site. The route will require extensive grading on the north side of the ranch house.

The existing ranch road will be reconditioned and resurfaced between the second floors of the ranch house and the barn. The uneven surface will be leveled, and slopes will be restricted to 5% maximum. Crusher fines of local gravel will be used for the surface. The ranch road will also be reconditioned and resurfaced continuing to a point that lies on

the existing road, directly west of the southwest corner of the barn. A pedestrian path will connect from this location to the first floor barn door 102. This path traverses the corral area, providing visitors with an opportunity to see this part of the ranch. The presence of people in this area would eliminate the possibility of using certain corrals for livestock. At the second floor of the barn, visitors will enter through doors 201 and 202. Due to space limitations, only the entrance ramp at door 201 will be made accessible. The entrance ramp at door 202 will not be made compliant.

At the second floor of the ranch house, an exterior ramp and steps provide universal access to the rear porch door 207. The floor elevation of the porch is approx. 27-1/4" above the exterior ground/terrace elevation. A landing at the porch elevation provides access to a series of ramps as well as steps to the terrace. The landing is elongated to the west to ensure that the existing planter wall around the porch is not impacted by the ramp. The new steps are positioned in the same east-west direction as the existing steps. The ramp begins at the south side of the porch landing, west of the porch wall. The ramp parallels the porch wall, has an 8% slope, is 42" wide, and includes two 48" x 92" 180-degree turn-around landings. The design specifically avoids bringing the ramp further south than the building, in order to limit visibility of the ramps and railings from the east (front) of the house.

Once inside the rear porch, a second, steeper interior ramp is necessary, since the second floor level is approx. 8" above the floor of the rear porch. Due to the porch size, the landing will be less than the required five feet long and the ramp will be both shorter and steeper than allowed. Due to these limitations, ranger assistance will be needed in order for the disabled to get up to the second floor level. Although this interior ramp is proposed as an option, it is not code-compliant. Since the rear porch door 207 provides less than the required 32" clear width, it needs to be exchanged for a 36" wide door, which would provide a 32" clear door opening.

Universal accessibility to the first floor of the ranch house is achieved via a five foot wide paved pedestrian route that begins at the second floor entrance 207 (southwest corner of the building). The path travels north along the western side of the ranch house past the curing room, and then curves around to approach the first floor porch from the north. This route requires a series of four ramps at 8% slope to accomplish nine feet of grade change between the upper and lower levels. Each ramp requires handrails. The ramps occur along the west and north sides of the building, in order to minimize their visibility along the east (front) facade. The ramp that occurs at the northernmost portion of the path would be the most visible from the front of the building. Implementation of this route would require extensive grading around the ramps. The portion of the path that lies along the eastern side of the building is offset five feet from the existing stone retaining wall. The slope of the path in this area mimics that of the existing terrain as much as possible. The path crosses the northeast corner of the front porch curb. The entire porch floor is raised up approx. 8-3/4" to the level of the watertable, one inch below the first floor parlor level, in order to make the first floor accessible at front doors 101. The threshold will be removed, and an additional tread will be added both at the center steps and at the south end of the porch.

Universally Accessible Parking

This design provides two universally accessible parking spaces on the west side of the shed, located across the farm road and to the north of the barn. The spaces are adjacent to the ranch road. While the parking spaces are somewhat centrally located, the distance from the parking spaces and the second floor barn entrance to the ranch house is approximately 390 feet. Placement of the parking spaces in this location would eliminate the existing vehicular turnaround. It would also require alteration of the grades and the construction of a retaining wall at the north side of the parking spaces.

Overall Site Alternative #2

Pedestrian Circulation

This alternative depends on a lift located inside the barn to provide linked universally accessible routes to the first and second floors of the ranch house and barn. The route requires visitors to pass through the barn in order to gain access to the universally accessible path to the first floor of the ranch house.

A path leads from the parking area to barn door 103. An accessible route within the barn exits at barn door 106. A path leads from barn door 106 to the northeast across the ranch road, and parallels the existing stone wall to approach the first floor of the ranch house at the southeast corner of the porch. The path is offset five feet from the existing stone wall, and mimics the slope along this wall for the majority of its length. The existing terrain slopes downward toward the east. It is likely that the path surface would require a small amount of cut and fill to provide an acceptable cross-slope. As the path approaches the building porch, it follows an S-curve to avoid an existing tree and meet the porch at the southeastern landing. The landing elevation will be raised to the porch floor elevation. A ramp then runs along the east wall of the ranch house in order to provide access to the center stone floor section. The center stone section is raised up to the water table, one inch below the first floor parlor level. The threshold will be removed. An additional tread will be added at the center steps and at the north end of the center porch.

This route would not require a slope greater than 5%, and therefore would require no handrails. It would require the removal of one or more of the large stones that are located at the western corner of the existing stone wall. It is unclear if these stones are contributing elements to the historic landscape. The design assumes that the existing tree, stone wall, porch curb walls, and small angled wall are all contributing elements to the cultural landscape and attempts to limit impacts to these elements. If the tree is not a contributing element, the path could be straightened somewhat to provide a more gentle curve.

Entrance to the second floor of the ranch house is provided via two separate routes. The west rear porch door 207 serves as the universally accessible entrance, and is accessed via a series of three landings and three ramps. The entire system fits within a conceptual footprint created between the western edge of the existing terrace and the southern wall of the rear porch. Since the rear porch door 207 provides less than 32" clear width, it needs to be exchanged for a 36" wide door, which would provide a 32" clear door opening.

Once inside the rear porch, a second, steeper interior ramp is necessary, since the second floor level is approx. 8” above the floor of the rear porch. Due to the porch size, the landing will be less than the required five feet long and the ramp will be both shorter and steeper than allowed. Due to these limitations, ranger assistance will be needed in order for the disabled to get up to the second floor level. Although this interior ramp is proposed as an option, it is not code-compliant.

At the south side of the rear porch, the historic entrance at the southeast corner is recreated, utilizing the existing historic stone steps at the southeast corner. This entrance is not universally accessible.

The existing ranch road will be reconditioned and resurfaced to provide a universally accessible route between the second floors of the ranch house and the barn. At the second floor of the barn, visitors will enter through doors 201 and 202. Due to space limitations, only the entrance ramp at door 201 will be made accessible. The entrance ramp at door 202 will not be made compliant. The existing gravel road surface will be replaced with finely crushed limestone (crusher-fines) to provide an accessible surface. The new surface will be densely compacted and even (areas that are uneven will be leveled). The road will be re-graded in areas where the slope is greater than 5% to result in a route that does not exceed a 5% grade in any location.

Universally Accessible Parking

Universally accessible parking for this alternative occurs in two separate locations. Universally accessible parking for access to the first floors of the barn and ranch house is located on the existing loop road. To reach the ranch house, parking visitors must pass through the barn and corral area. Universally accessible parking for the second floors of the barn and ranch house is provided adjacent to the ranch road, near the northwest corner of the barn.

Overall Site Alternative #3 (Preferred Alternative)

Pedestrian Circulation

This alternative provides an exterior universally accessible route between the second floors of the ranch house and barn. It does not provide exterior universally accessible routes between the first and second floors of the ranch house or barn. While no exterior route connects the first and second floors of the barn, an interior lift will enable visitors with mobility impairments to move between the first and second floors of the barn.

The existing ranch road will be reconditioned and resurfaced to provide a universally accessible route between the second floors of the ranch house and the barn. The existing gravel road surface will be replaced with finely crushed limestone (crusher-fines) to provide an accessible surface. The new surface will be densely compacted and even (areas that are uneven will be leveled). The road will be re-graded in areas where the slope is greater than 5% to result in a route that does not exceed a 5% grade in any location. The accessible route will extend to both barn doors 201 and 202, but due to

space limitations, only the entrance ramp at door 201 will be made accessible. The entrance ramp at door 202 will not be made compliant.

One universally accessible entrance to the second floor of the ranch house is provided at the rear porch door 207. The rear porch will be reconstructed with a floor level 9-3/4" higher than the current floor level. This will bring the rear porch floor up to the same level as the second floor rooms. In order to accommodate this modification, the roof pitch and ceiling height will be lowered. A 5' x 5' landing will be provided on the west side of door 207 at the new porch floor elevation. An exterior lift measuring approximately 53" x 49-1/2" will be installed at the west side of the landing for use of visitors with mobility impairments. The existing 32" rear porch door 207 will be replaced by a 36" door in order to provide the necessary 32" clear width.

An additional entrance to the second floor will be provided at the southeast corner of the rear porch. At this location, there used to be a door. This historic entrance will be reconstructed, utilizing the existing stone steps. Two extra steps will need to be added, to accommodate the new porch floor level.

Universally Accessible Parking

Two or more universally accessible parking spaces are located near the northwest corner of the barn and adjacent to the ranch road. They are located along an accessible route to the second floor entrances of both the barn and ranch house.

Analysis of Alternatives

Analysis of Overall Alternative #1

This alternative would have major impacts on the existing site, due to the grading necessary to implement the accessible pedestrian routes and accessible parking. The topography would be altered dramatically, as would the visual character of the areas where these changes are made.

While the path along the east side of the ranch house would be fairly low profile, the ramp and railings required would be visible from the front of the building. In addition, the presence of the path would impact the overall historic landscape design. Although the ramps and landings would technically provide universal accessibility, the opportunity to enjoy the character of the site would be greatly diminished for all visitors by the extent of alterations required to achieve that accessibility. Raising the floor level of the front porch would alter the historic fabric and experience of the front porch. Access to the first floor of the ranch house will only allow visitors with mobility impairments to see the two east rooms on the first floor. They would not be able to go to the other rooms that are a half-flight up on this lower level. In addition, the addition of the stairs and ramp system at the west porch entry would change the character of the porch and the terrace. The interior ramp cannot be made code compliant due to the limited size of the existing rear porch.

The accessible route between the first and second floors of the barn requires manipulation of the topography at the northwest corner of the corral that could impact the shed or stone walls.

The route between the second floors of the ranch house and barn provides a reasonable pedestrian circulation path and blends well with the historic landscape by utilizing an historic route.

This alternative is not recommended due to the extensive grading and implementation of ramps that will impact the historic landscape around the ranch house. In addition, the route between the first and second floors of the barn eliminates the possibility of using certain corrals for livestock, and may impact the historic corrals.

Analysis of Overall Alternative #2

This alternative has extensive impacts to the historic landscape and a low level of proposed universally accessible exterior circulation. Introduction of a new pedestrian route within the front view of the property would impact the overall historic landscape design, and view of the property from the east, as would any necessary grading. The path providing an accessible route to the first floor of the ranch house would also require the removal of a portion of the fence. Raising the center floor level of the front porch and ramping up the south section would alter the historic fabric and experience of the front porch. Access to the first floor of the ranch house will only allow visitors with mobility impairments to see the two east rooms on the first floor. They would not be able to go to the other rooms that are a half-flight up on this lower level.

At the west entrance to the second floor of the ranch house, the ramp and landings would change the character of the area, but to a lesser degree than Alternative #1. The interior ramp cannot be made code compliant due to the limited size of the existing rear porch. The reestablishment of the south porch door would provide one entrance similar in character to the historic entry.

Inside the barn, the existing stair between the first and second floors would be replaced by a new, code compliant, L-shaped stair and wheelchair lift. Although the stair run would be different, visitors would still enter the stair at its original beginning on the second floor.

This alternative is generally less intrusive to the historic site than Alternative One, although it requires the development of two separate accessible parking areas. It also provides a potentially frustrating visitor experience for visitors with disabilities, requiring them to pass through the first floor of the barn to go to or from the first floor of the ranch house.

Analysis of Overall Alternative #3 (Preferred Alternative)

This alternative minimizes impacts to historic resources and provides good circulation routes for all visitors. Universally accessible exterior routes to the second floors of the ranch house and barn are provided. An interior route is provided for visitors to move between the first and second floors of the barn.

This alternative does not provide a universally accessible route to the first floor of the ranch house. Historically, the two parlors and entrance hall on the lowest level of the first floor were used only by the Jones Family, and then probably minimally. Additionally, these rooms, along with the third floor guest/help rooms, only marginally contribute to the fuller understanding of the ranch's broader period of significance. Consideration of the alternatives for providing exterior access to the first floor of the ranch house led to the rejection of each due to the extensive impacts they would have on the historic landscape and building. The historic designs of the exterior of the building and the adjacent landscape were intended to be viewed from the east, and to convey the prominence and importance of the ranch. Each of the three alternatives would impact the view from the east by modifying the topography or adding modern structures (the lift or the ramps and handrails). The alternative routes are all long and complicated, providing poor access opportunities for visitors with mobility impairments. Overall, the minimal benefits to the interpretive story of providing a universally accessible route to the ranch house's first floor do not outweigh the impacts to the historic resources that would be inherent in the construction of the route.

This alternative greatly minimizes impacts to the historic landscape by utilizing the existing ranch road as the main site circulation route for all visitors. The addition of a lift at the west rear porch door 207 of the ranch house would impact the historic character of the site in this area; however, this structure would be significantly smaller and less intrusive than the ramps presented in Alternatives One and Two. The rear porch would be reconstructed with a higher floor level, with a slightly lower roof pitch and ceiling height, but the re-establishment of the south porch door would add to the integrity of the ranch house and site circulation. Since the rear porch at present only has enough structural integrity to support 20 psf, rebuilding the rear porch will alleviate this situation and allow the structural members to be strengthened.

The steep topography and retaining walls near the north, west, and east sides of the barn make it very difficult to construct a universally accessible exterior route between the first and second floors of the barn. Each of the universally accessible exterior circulation alternatives provides poor access opportunities for visitors with mobility impairments, due to their length and awkward circulation patterns.

This alternative relies on the installation of a lift and stairs inside the barn to provide visitor access to the first floor of that building. Inside the barn, the existing stair between the first and second floors would be replaced by a new, code compliant, L-shaped stair and wheelchair lift. Although the stair run would be different, visitors would still enter the stair at its original beginning on the second floor.

Site Drainage

Currently, the Spring Hill Ranch House and Barn are being severely impacted by water that flows both at and below grade. The steep hill located directly to the west of the house and north of the barn channels surface runoff quickly toward the structures. In addition, the top layer of sub-surface limestone intersecting the foundation walls is suspected of channeling sub-surface water directly against those walls. Furthermore, insufficient fall in the grades adjacent to both buildings allow water to pond and seep down the face of the foundation walls and eventually weep into the walls and interior spaces. Recommendations are graphically depicted on drawing sheet A002, Proposed Drainage Plan. See *Part F: Research Recommendations* for soils assessment and archaeological investigation prior to removing any soil.

Treatment Recommendations for the Ranch House Drainage

The primary concern regarding drainage is how to channel the water away from the building, both underground and on the surface. To accomplish this task, water must be removed from the foundation, intercepted, and routed to the north and south around the building.

1. Area on West Side of the Ranch House
 - a. Construct a drainage swale that runs from the north to the south on the west side of the ranch house.
 - b. Provide an inlet structure at the northwest side of the pedestrian path.
 - c. Install an underground pipe from this structure to a storm drain structure located at the “y” in the ranch road.
 - d. Connect a pipe to this structure that continues to the east under the ranch road and daylight in the existing ditch that is parallel to the highway.
2. West Wall of Ranch House
 - a. Remove soil next to west basement wall (springhouse walls, west tunnel wall, root cellar walls, and porch crawl space 109 walls).
 - b. Repair cracks and repoint tunnel and root cellar walls inside and out before applying waterproofing.
 - c. Waterproof entire west basement wall (springhouse walls, west tunnel wall, root cellar walls, and porch crawl space 109 walls) with fluid-applied waterproofing in order to prevent further water penetration.
 - d. Place drain tiles around the ranch house in order to divert the water in the northeast and southeast directions.
 - e. Re-grade to provide positive drainage away from the building to the west, north and south.

3. East (front) Porch
 - a. Investigate area below the center front porch floor since water used to flow beneath this location. If this area is eroded it may prove necessary to add compacted fill and re-lay the stones.
4. Existing Downspout #1 (northeast)
 - a. Replace the existing pipe with a new underground pipe that connects to the downspout and extends to the north. To do this, the stone steps need to be temporarily removed.
 - b. Provide an underground storm structure at the point where the pipe extends past the existing retaining wall.
 - c. Install another pipe from the new structure to the east.
 - d. Daylight the pipe in an inconspicuous location and provide any necessary pipe end structure or erosion control materials. Carefully select the location for the pipe to daylight, avoiding impacts to the view of the property from the east.
 - e. Reinstall temporarily removed stone steps.
5. Existing Downspout #2 (southwest)
 - a. Install an underground storm drainpipe and connect the downspout to the pipe. Connect the pipe to the underground storm structure that is located at the northwest side of the pedestrian path.
 - b. Install an underground pipe from this structure to a storm drain structure located at the “y” in the ranch road.
 - c. Connect a pipe to this structure that continues to the east under the ranch road and daylights in the existing ditch that is parallel to the highway.
6. At the ground level north of the ranch house, a concrete slab was poured on top of the tunnel roof in order to prevent further water leaks.
 - a. Remove this concrete slab.
 - b. Repair tunnel vault roof surfaces below, repoint, waterproof, and cover with sod and grass. (This recommendation replicates the sod roof speculated to have been original; alternate would be to replace the concrete slabs that were removed to replicate the changes made over time at this location.

Treatment Recommendations for the Barn Drainage

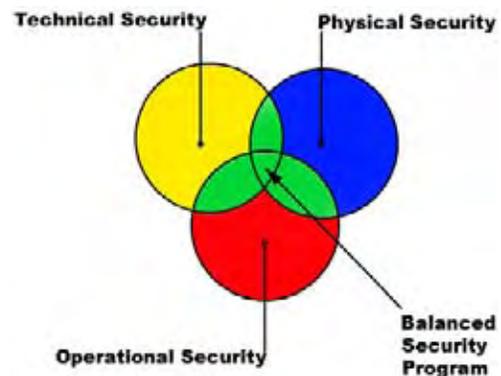
1. Northwest Corner of Barn
 - a. Regrade the area between the retaining wall and the ranch road to create a low point near the northeast corner of the barn and to channel other water to the north and west toward the ranch road.
 - b. Install an underground storm drainpipe and connect the downspout to the pipe.

- c. Provide a catch basin at the low point, and connect the pipe to it.
 - d. Install another pipe from the structure that extends to the west, under the ranch road and daylights at the existing swale on the west side of the ranch road.
 - e. If necessary, provide a pipe end structure or erosion control materials that blend into the historic site.
2. Downspout at Northeast Corner of Barn
 - a. Install an underground drainage pipe and connect the downspout to the pipe.
 - b. Connect the pipe to the underground storm structure proposed at the north side of the barn (located under the ranch road).
 - c. Connect a pipe to this structure that continues to the east under the ranch road and daylights in the existing ditch that is parallel to the highway.
 3. Downspouts at Southwest and Southeast Corners of the Barn
 - a. Leave these two downspouts the way they are.
 4. Water Diverters at Cistern
 - a. Replace water diverters on the north side of the barn roof with a stronger material at a steeper slope.

Site Security

Developing a security program to mitigate the effects of risk is a multi-phase approach. The plan involves creating a well-defined list of deficiencies. Once a clear understanding of the potential problems are formulated, a security plan must be introduced that involves the “concentric circles of security” (physical, technical and operational security) into an overall optimum security plan. The ideal plan can be graphically expressed in the following way:

- Physical Security: architectural components of security including doors, windows, walls and fencing.
- Technical Security: access control devices, security systems, door alarms and Closed Circuit Television (CCTV) systems.
- Operational Security: policies and procedures such as an emergency action preparedness plan, post orders, etc.



No one layer can independently compose a security program. In addition, to the concentric circles of security, a fourth component closely related to physical security

addresses the utilization of the sitewide natural components to enhance the actual perceived security environment to further displace crime. This fourth component is called Crime Prevention through Environmental Design (CPTED). Proactive implementation and integration of these components results in a comprehensive and methodical approach to security and helps allocate available security resources.

Site Lighting

Security lighting is installed to create a perception of greater security and greater border definition and thereby protects people and property from criminal activities. Lighting should be integrated into the overall security planning to necessitate the effectiveness of other security devices, such as closed circuit television systems, if required at a later date. Lighting illuminates objects, people and property lines and thereby assists in natural observation and reduces the ability for a criminal to conceal their approach. This helps in creating a mindset of fear of detection and apprehension, which reduces crime and enhances the perception of security.

Security lighting for this controlled area should provide uniform illumination so that anyone moving around can be easily seen. Lighting design should provide enough illumination so that either an intrusion or attempted intrusion is easily detected. Existing site lighting should be repaired before determining additional lighting requirements. The recommended average luminance for security lighting is as follows (please note these are under review currently and a new security lighting document is expected to be authored by the Illumination Engineering Society North America (IESNA)):

| Security Lighting Application | Average Horizontal Illumination Level on Ground |
|-------------------------------|-------------------------------------------------|
| Perimeter Fence | 2.0 fc |
| Walkways | 4.0 fc |
| Entrances | 1.0 fc |
| Gatehouses | 3.0 fc |
| Entrances (active) | 3.0 fc |
| Entrances (inactive) | 2.0 fc |
| Large Open Areas | 3.0 fc |
| Exterior Buildings | 1.0 fc |
| Open Parking Facilities | 3.0 fc |

Standard security practice dictates that site lighting is extremely important and should adequately light the whole site. Lighting has always been hailed as the number one deterrent to crime as it allows natural surveillance, defines site borders, and is instrumental in conjunction with Closed Circuit Television Systems. Because of the remoteness of the site, lighting fixtures could also become the targets of vandalism and therefore should be hardened to prevent damage (i.e. from rock throwing, BB guns, small caliber weapons etc.). The design of additional security lighting needs to be balanced with concerns about light pollution in a nationally historic setting and adjacent properties.

Psychological deterrents

Historically, buildings that are remotely located are inherently susceptible to vandalism. One method to minimize vandalism is by defining borders, illuminating perimeters and surrounding areas as well as implementing way finding to define territoriality. By enforcing this principle, the buildings are clearly identified as being occupied.

Treatment Recommendations

The focus of the following architectural recommendations is to preserve the Spring Hill Ranch property, maintaining its significance and authenticity in terms of historic and architectural character.

General

Mortar Recommendations: In terms of structural recommendations, one of the general concerns regards the mortars. Generally, when repointing the stone walls, a design mix based on original or historic mix(es) is used. Alternatively, a latex modified, Type "S" mortar can be used for stone masonry work. When latex is substituted for fifty percent or more of the mixing water, the strength, bond and flexibility of the Type "S" mortar is significantly increased. A Type "N" mortar may also be used, but it will be less durable. An historic mortar or a Type "N" mortar requires repointing more often than the recommended latex modified Type "S" mortar. Mortars with a high content of Portland cement should not be used as they are not compatible with stone masonry and cause deterioration of the stone. Match color, tooling, and texture of original mortar. It is generally recommended to make the building weather and water tight. Reinforcement or replacement of any wood members with Chromated Copper Arsenate (CCA) treated lumber with a retention of 0.4 lbs/ft³ is recommended. The CCA treatment protects the wood from insect penetration and deterioration of the wood related to moisture. CCA treated lumber may not be available after December 31, 2003 for residential structures. Proper alternatives may need to be considered when the repairs are to be completed.

Three general issues should be taken into consideration. First, the sequence of repairs should focus on eliminating the cause of the damage, then on improving the exterior appearance. Second, as a National Historic Landmark, treatment recommendations that involved the removal of historic fabric require the completion of photographic and measured drawing documentation before work is undertaken. Third, of special concern in this case are archaeological investigations. As a general approach, such investigations should take place for each location on site where any construction activity will imply ground disturbance (i.e. foundation drain tiles at the ranch house, leveling floor of the barn, removal and/or replacement of concrete floors, test excavation for the cistern, etc.). Depending on the location and importance of the findings, archaeological investigations should be performed during or preceding construction.

2. Ranch House, Tunnel, Springhouse/Curing Room

Exterior Envelope

General

1. Remove anachronistic grey mortar from stone joints, and repoint with mortar matching color, texture, composition, and tooling of original mortar.
2. Repoint all open or deteriorated mortar joints in stone, especially around keystones, dentil stones, and at the upper and lower cornices; mortar to match the color, texture, composition, and tooling of the original mortar.
3. Remove existing aluminum screen/storm combination windows and doors. Replicate and install exterior storm windows per figures A2-1 and A2-2, and per screens stored in the barn loft.
4. Remove organic growth from stone, including steps; clean the stone with a chemical cleaner and apply a biocide water repellency treatment to retard future growth.
5. Remove and control mud wasp nest construction between stone dentils.
6. Conduct lead-containing paint abatement.
7. Seal open joints between sheet metal cornice and stone fascia.

North Elevation

1. Repair/replace the cracked and split second floor level water table stone directly east of the second floor level northwest water table stone.
2. Repaint door and window sash and frames.
3. Remove concrete patch at northwest corner ground level. Seal all penetrations and re-sod.

East Elevation

4. Seal open gaps in sheet metal cornice and roof surface, especially at mitered corners.
5. Secure or repair loose/damaged sheet metal at upper cornice and balcony railings.
6. Replicate and install missing decorative ornamentation on sheet metal railings.
7. Isolate and repair leaks in balconies' metal roof panels.
8. Repair/replace deteriorating stone in first floor level water table in east wall of cove off south parlor 102.
9. Repair cracks in first floor level water table stones.
10. Repair through stone crack in stone north of window 103 in east wall of cove off south parlor 102, first course up from the first floor level water table.
11. Repair cracks in sill stones.

12. Repair vertical joint between the bay windows and the body of the house with a polyurethane sealant, color tinted to match the stone, to allow for anticipated movement
13. Repair/rebuild deteriorated stone collars on the pediment caps of the stone porch railings where they accept the wood porch columns.
14. Repair spalled areas of the stone entrance steps with dutchman patches to match the original stone.
15. Fill gap between wood soffit support and cornice stone.
16. Repair/replace stone south of door on east elevation; north face of stone (the corner is chipped and the corner piece is loose).
17. Repair surface corner cracks at north window sill, second floor level, east elevation.
18. Repair/replace south window sill stone, second floor level, east elevation.
19. Reglaze windows where original glazing is loose, broken, or missing.
20. Repaint wood trim on windows and porches.

East (Front) Porches

21. Replace deteriorated south stone base blocks for the original south stone porch column with a new base stone and foundation matching the original, repoint stone column joints, secure column capitals to porch structure.
22. Replace north and south columns of north porch to match other columns and rebuild connections at the top and bottom of the columns.
23. Repair damage to concrete collars of pilaster bases.
24. Secure loose wooden porch columns on north and south flanking porches.
25. Rebuild connection of south beam of south porch roof to ranch house.
26. Replace porch roof members that have rotted connections.
27. Repoint porch stone walls.
28. Reset original porch floor stones level and true, adding compacted fill as required for proper support.
29. Reset stone steps at center porch, adding compacted fill as required for proper support.
30. Replace bottom stone step that is exfoliating.
31. Fill joint between north and south concrete slabs and east wall of house with an expansion joint.
32. Repair crack in slab centered on window in southeast wall.
33. Replicate the wooden flower medallions on the wood columns and replace the broken ones. Historic medallions should be salvaged and placed in Park archives.

South Elevation

34. Repair cracks in watertable stone.
35. Repair second floor level water table stone and stone below it on south wall west of rear porch.
36. Infill gap between cornice stone and wood soffit support at southern southwest corner of ranch house.
37. Replace missing attachments at the inside bracket at the lower cornice.
38. Repair and repaint window and door frames.

Steps along South Elevation

39. Reset toe guard stones that turn the corner from the east porches to the steps along the south elevation and at the middle of the stair.
40. Reset top landing stones.

Rear Porch Exterior

41. Reconstruct the rear porch, with the floor raised approx. 8" to match the second floor level. Lower ceiling height and roof pitch.
42. Rebuild foundation to a higher elevation.
43. Widen the door opening at door 207. Replace door 207 with a 36" wide, out-swing screen door.
44. Provide a 5' x 5' landing on the west side of door 207, and install an exterior lift.
45. Recreate the south entrance to the rear porch.
46. Add two extra steps to the existing south steps.
47. Recreate screened windows 209A and 214A and replace all existing rear porch windows with screens (after new Visitors' Center is constructed).

West Elevation

48. Repair joints between upper cornice, lower cornice, and stone dentils. Remove rust from cornice and repaint.
49. Repair through stone crack below left support for south window 208 sill on west elevation.
50. Repair/Replace exfoliating quoin stone directly below second floor water table on west elevation.
51. Patch the areas of deterioration at the skirt board of the porch.
52. Repair and repaint window and door frames.
53. Remove silo pavers and replace with grass.

Root Cellar Exterior

54. Seal the cracks and repair the spalls in the concrete cap at the root cellar.

55. Replace cracked concrete patch near electrical piping penetration in northwest corner.
56. Fill joint between concrete cap and ranch house west wall with an expansion joint.
57. Repair/Replace cracked, exfoliating and deteriorating stones.
58. Replace missing pieces of colored glass in the root cellar skylights in kind. Make skylights weather-tight
59. Remove steps at south wall.

Tunnel Exterior

60. Locate, isolate, and repair the leaks at entrance 107. Repair or replace screen door.
61. Repair/Replace existing exfoliating stones in south portion of east wall of tunnel.
62. Repair fissured stones on the exterior of the entrance 107.
63. Remove and reconstruct steps from door 206A landing to the top of the tunnel.
64. Repair cracks in concrete cap at top of truncated tunnel tower.
65. Replace concrete slab at lower stair landing, door 206A, in south portion of east wall of tunnel.
66. Replace doorframe that has been damaged by water at entrance 107.
67. Replace interior frame of wood screen at entrance 107.

Curing Room and Springhouse Exterior

68. Stabilize arch for original springhouse opening on south elevation.
69. Repoint step cracked joints and joints with missing mortar in the bottom center of the east wall and step cracked joints in south wall.
70. Repair through stone crack in north elevation, bottom three courses.
71. Repair/replace deteriorated and exfoliating stones in west elevation.
72. Clean exterior stonework to remove paint, staining, and organic growth.
73. Secure steps at west elevation.
74. Repoint steps at west elevation.
75. Raise grade at steps at west elevation.
76. Replace soffit and fascia that show insect damage.
77. Replace loose and split shingles.
78. Reattach the ridge cap.
79. Replace south leaf of entry door 208.

Roof and Cornice

80. Keep monitoring the roof for potential leaks.

81. In the next replacement cycle, rework roof drainage and provide sufficient slopes in order to avoid ponding on top of the roof. This can be accomplished either by installing tapered insulation below the roof membrane or by sloping the roof decking.
82. Remove paint, prepare, and paint.
83. Repoint mortar joints on both chimneys.
84. Repair delaminating chimney cap, north side of central chimney.
85. Install rain hoods on both chimneys.
86. Remove abandoned lightning protection elements from roof.
87. Inspect existing lightning protection system.

Interior Finishes and Elements

General

1. Clean, repaint, and varnish interior grained surfaces.
2. Prepare and paint plaster walls and ceilings.

Hall 101

3. Remove oak and original flooring in order to gain access to inspect the original joists, condition of substrate, and water flow beneath the ranch house. Examine original pine boards for any evidence of paint or floor covering. Repair/replace damaged joists. Replace flooring with tongue-and-groove pine to match original.
4. Remove wallpaper, repair plaster underneath, prime wall surfaces.
5. Clean stair treads and leave uncovered.
6. In landing crawl space 001, provide support for stud that does not have bearing on foundation.
7. Tighten the top post of the staircase.

South Parlor 102

8. Remove oak and original flooring in order to gain access to inspect the original joists, condition of substrate, and water flow beneath the ranch house. Examine original pine boards for any evidence of paint or floor covering. Repair/replace damaged joists. Replace flooring with tongue-and-groove pine to match original.
9. Repair plaster cracks. Prepare and prime walls.
10. Examine and document the walls for evidence of wallpapers.
11. Investigate further the possibility of moisture damage on the lower portion of the west wall where minor cracking and peeling of the plaster is evident.
12. Monitor water staining at arch at the cove. Prevent water penetration at this area from porch roofs. See structural.

North Parlor 103

13. Remove oak and original flooring in order to gain access to inspect the original joists, condition of substrate, and water flow beneath the ranch house. Examine original pine boards for any evidence of paint or floor covering. Repair/replace damaged joists. Replace flooring with tongue-and-groove pine to match original.
14. Locate, isolate and repair the leak in the northeast bay. See structural.
15. Repair plaster cracks. Prepare and prime walls.
16. Examine and document the walls for evidence of wallpapers.
17. Repair cracks in crown moulding.
18. Investigate area south of fireplace due to previous distresses.
19. Redo plaster and paint finish at arch at the cove. Investigate and document the structure and its condition at the arch when existing plaster is removed. Prevent water penetration at this area from porch roofs. See structural.

Bathroom 104 and Old Kitchen 105

20. Remove filler panel in the east window 111 and replace with window identical to the one in the west 110 opening.
21. At the south wall, remove existing deteriorating plaster finish and inspect foundation wall. Repoint and repair foundation wall as necessary.
22. Replace or reinforce insect damaged existing joists in wood portion of old kitchen floor. This is a life safety issue.
23. North and west walls, remove existing deteriorating plaster finish and inspect foundation wall. Repoint and repair foundation wall as necessary.
24. Seal crack in concrete slab in pit 005.

Root Cellar 106

25. Repair water damaged areas.
26. Replace cracked concrete patch near electrical piping penetration in northeast corner.
27. Repoint joints in walls and barrel arch.
28. Repair through stone cracks in stones in arch.
29. Replace east door 106 lintel with structurally adequate member.
30. Prevent water from well pump from ponding on the concrete floor.

Tunnel 107 and Springhouse 108

31. Repair damaged plaster, especially at entrance 107.
32. Remove the organic growth from the stairs at Door 107. Apply a biocide water repellency treatment to retard future growth.
33. Repair water damaged areas.
34. Seal the doorway 107 at the east elevation of the tunnel weather-tight.

35. Remove plaster parging from barrel arches and walls. Repoint 100 percent of barrel arch and walls in tunnel. Repoint where required in springhouse barrel arch and walls.
36. Repair/Replace deteriorated stones in barrel arches and walls.
37. Replace stone and concrete lintels, sills, and steps at the doorway 107.
38. See *Research Recommendations* for recommendation to investigate tunnel from tunnel 107 to icehouse.
39. Investigate and document tunnel ceiling for possible location of skylight by tower entrance.

Hall 201 and Stair

1. Remove wallpaper, repair plaster underneath, prime wall surfaces.
2. Replace missing elements of all door hardware.
3. Repair cracks in crown moulding and prime paint.

South Room 202

4. Repair cracks in crown moulding and prime paint.
5. Remove wallpaper, repair plaster underneath, prime wall surfaces.

North Room 203

6. Repair cracks in crown moulding and prime paint.
7. Remove wallpaper, repair plaster underneath, prime wall surfaces.

West Room 204

8. Repair cracks in crown moulding and prime paint.
9. Remove wallpaper, repair plaster underneath, prime wall surfaces.

Butler's Pantry 205

10. No work at this time.

Rear Porch 207

11. Also see rear porch exterior.
12. Reconstruct the rear porch with floor ½" below floors of west and south rooms (approx. 111'-11 ½".) Roof pitch will be more shallow, and ceiling height slightly lower to compensate for raised floor.
13. Repoint joints at interior stone walls with mortar matching color, texture, composition, and tooling of original mortar.
14. Remove stove (after new Visitors' Center is constructed).
15. Remove or lower thresholds at doors 202B and 204.

Curing Room 208

16. Repair soft and powdery stones at base of south wall.
17. Replace or reinforce rotted members in roof structure.

18. Remove cement parging at base of walls and repoint joints.
19. Repoint vertical cracks in walls.
20. Repaint exposed wood members.

Hall 301

1. Remove wallpaper, repair plaster underneath, prime wall surfaces. Investigate and document to determine if this location used to be wallpapered. If so, replace with wallpaper with documented wallpaper.
2. Repair cracks in crown moulding.
3. Replace crown moulding that does not match at southwest corner of hall 301.
4. Repair water-stained plaster near the skylight coffer above the stairs.
5. Repair the broken pine floor board at the center of the south wall.

South Bedroom 302

6. Reattach plaster ceiling.
7. Remove air conditioning unit and associated wall-mounted electrical conduit.
8. Remove wallpaper, repair plaster underneath, prepare and prime wall surfaces. Replace wallpaper with documented wallpaper.
9. Replace newer door hardware with hardware matching the original.

North Bedroom 303

10. Remove air conditioning unit and associated wall-mounted electrical conduit.
11. Remove wallpaper, repair plaster underneath, prepare and prime wall surfaces. Replace wallpaper with documented wallpaper.

West Bedroom 304

12. Remove air conditioning unit and associated wall-mounted electrical conduit.
13. Remove wallpaper, repair plaster underneath, prime wall surfaces. Replace wallpaper with documented wallpaper.
14. Replace newer door hardware with hardware matching the original.
15. Apply plaster skimcoat to gypsum board ceiling, prime paint.

Bathroom 305

16. Remove powdery plaster in bathroom closet 305A near chimney. Inspect and document existing roof structure and its condition. Repoint joints in brick chimney if required. Prevent water penetration and reapply plaster finish.

Hall 306

17. Remove wallpaper, repair plaster underneath, prime wall surfaces. Investigate and document to determine if this location used to be wallpapered. If so, replace with wallpaper with documented wallpaper.

18. Replace missing elements of all door hardware. Replace newer door hardware with hardware matching the original.
19. Replace missing return piece of crown moulding on the north wall near door 304.
20. Replace unmatching plaster crown moulding outside door 304.
21. Remove and replace plaster in ceiling of hallway into west bedroom 304. Inspect and document structure when existing plaster is removed.

Structural Systems

Overall, the Spring Hill Ranch House is well constructed and is in good condition. The majority of the cracking observed in the plaster and in the masonry walls is due to either insect damage or to water penetration, or both. Ideally, all of the finishes should be removed in the house to repoint the masonry walls and reinforce all of the insect damaged members. This solution, however, is not practical. Practically, areas of known distress should be repaired, being careful to fully record any structural members if they are exposed during the repairs. Each area of repair is discussed below:

Foundation and First Floor Structure

1. Verify insects are no longer active. Continue investigation on an annual basis to verify the insects have not returned.
2. Verify the sources of water penetration from flood discussed during December 1998 site investigation. Refer to the architectural treatment recommendations above.
3. Rebuild southwestern corner of ashlar stone foundation wall of rear porch 207.
4. Repoint east wall of pit 005 below old kitchen 105.
5. Reinforce the termite damaged joist in the old kitchen 105 wood floor structure.
6. Replace or reinforce deteriorated doubled joist below north stud wall of south parlor 102. Reinforce studs to provide full and adequate bearing down to the foundations.
7. Remove floor boards in the hall 101 and parlors 102 and 103 to inspect the condition of floor joists and foundations. Reinforce or repair as required.

Second and Third Floor Structures

8. At the rear porch 207, reinforce the joists and beam to all for 100psf safe live load capacity.
9. Reinforce the floor joists to achieve the 100psf live load capacity for public use. As an alternative to reinforcing the floor joists for public use, offer controlled tours (25 people maximum at one time) through the house.
10. The third floor joists are adequate for use as office space (50psf live load). Avoid stacking heavy file cabinets and bookcases in one area to prevent the acceleration of natural creep of the wood joists. If public use is desired, the floor joists are to be reinforced or the number of people within the house is to be controlled.

11. Limit the live load in the northern portion of the north bedroom 303 and north room 203 to 25psf and monitor the support beams in the decorative arch in north parlor 103 for any movement or similar distresses. If higher floor live load capacities are desired, reinforce the 8x14 treated beam with a steel flitch plate. Verify the size of the original beam adjacent to the 8x14 treated beam and provide positive connections between the two beams.
12. Limit the live load in the southern portion of the south bedroom 302 and the south room 202 to minimal loadings. The beams should be exposed to determine their exact size and condition. With known member sizes, steel flitch plates may be designed to stiffen the beams to meet the L/600 deflection criteria for the masonry wall above. A worst case scenario would involve replacement of the wood beams with properly designed steel beams.
13. When the plaster at the stair framing is repaired, verify the existing header and stringer systems at the stair structures. The stair opening floor headers and stringers should at least be doubled members. A full structural analysis of this area should be completed when the framing is known.

Roof Structures

14. Maintain the watertightness of the roof structure to prevent any further water penetration and deterioration of the roof members.
15. Reinforce the rear porch 207 roof. Due to the amount of work required it may be most beneficial to rebuild the enclosed porch.
16. Reinforce or replace the deteriorated members on the east porches. Provide adequate bearing for the box-beams at the north and south ends of the east porch. Remove caulk at column bases and reinforce or replace the wood columns as needed. Provide full bearing and anchorage for the columns to improve stability.

Walls

17. Repoint walls with correctly designed mortar as discussed in the architectural treatment recommendations above. Avoid mortars with a high content of Portland cement to prevent the limestone from cracking. Match the original mortar composition or use a Type 'S' mortar with a latex additive for the stone masonry. Match the color, tooling, and texture of the original mortar.
18. Determine locations where water is penetrating the walls and relocate the water drainage. Refer to the architectural treatment recommendations above.
19. Reinforce the stud walls at the third floor level hall 301 as wood shear walls and provide proper anchorage to the east masonry wall.
20. Begin a close monitoring program of all of the cracks in the stone walls, with particular attention to the crack behind the downspout at the north elevation. The monitoring should be done on a monthly basis for a minimum of one year by the same person to avoid discrepancies. General weather conditions should be noted since the last measurement, for example, freeze-thaw cycles often, heavy rain, dry and humid, etc. If movement is continuing, bracing of the walls, or at worst, rebuilding of the walls in some areas may be required.

21. Remove and reinstall the bulging stones above the second floor window 201 above the southeastern bay window 101, 102, and 103.

Root Cellar 106

22. Repoint the exterior walls and install a waterproofing system as discussed in the architectural treatment recommendations above.
23. Remove whitewash, clean with mild detergent and repoint all joints. Epoxy inject through stone cracks in stone headers at skylights. Use an epoxy suitable for limestone. Replace headers severely cracked and deteriorated.
24. Ideally remove concrete topping from top surface of root cellar; however, patching the deteriorated areas may be adequate.

Tunnel 107

25. Repoint the exterior walls and install a waterproofing system as discussed in the architectural treatment recommendations above.
26. Remove whitewash, clean with mild detergent and repoint all joints. Epoxy inject through stone cracks in stone headers at doorway. Use an epoxy suitable for limestone. Replace headers severely cracked and deteriorated.
27. Repair and seal concrete floor slab.

Springhouse 108 and Curing Room 208

28. Repoint the exterior walls and install a waterproofing system as discussed in the architectural treatment recommendations above.
29. Remove white wash, clean with mild detergent and repoint all joints.
30. Seal cracks in concrete floor slab.
31. Repoint cracks in masonry walls, both interior and exterior of curing room 208. Continuous repointing of the south elevation may be required unless the earth is removed and the tunnel 107 exposed to determine why the masonry arch at the springhouse is falling. The arch has been infilled with stone when the tunnel 107 was built with the exception of the relatively small door opening into the springhouse. The mortar or the stones exposed to grade may be deteriorating causing the movement. When the excavation for the waterproofing system is done, the masonry walls should be inspected and fully documented.
32. Reinforce roof members and replace members deteriorated from water damage.

Security Recommendations

Physical and Technical Security

To help protect the ranch house from vandalism and unlawful entry, it may be advisable to furnish and install dual technology false-immune motion detection sensors in all areas that are accessible on the first and second floors. The inclusion of these additional detectors would assist in protecting assets which are stored in these rooms. Additionally, grade level windows should be modified to delay entry into the house, but still include architectural facets and historical representation. The intrusion detection systems should

be connected to a central station monitoring service or directly to the police department. This system should automatically poll the phone line for a dial tone. In an event a dial tone is lost, the system would automatically switch to a cellular back up system. Both of these systems should be equipped with an eight-hour back up battery.

Another approach would be a separate system with similar attributes, as discussed above. Because of the remoteness of this facility, the ranch house could employ a local alarm system that would notify and warn potential criminals that an alarm has been triggered and that the police have been summoned. This type of system would be most likely to prevent further damage to the dwellings and exhibits.

Life Safety Recommendations

This section will discuss recommendations and alternatives to correct egress and fire safety deficiencies in the building. The following is a summary of things that need to be done in order to bring the Spring Hill Ranch House into full compliance with the NFPA 5000 requirements:

The Spring Hill Ranch House is required to have an automatic sprinkler system per NFPA 5000 based upon the construction type of the facility. A fire alarm and suppression system was installed in 2004, meeting this requirement.

With a current occupant load of 85 people for the first floor and 66 people for the second floor, any main stairway or corridor would need to be a minimum of 44" wide. The width of the main stair is 42" and hall 306 is only 40 1/2" wide. When serving an occupant load of less than 50 the stairway or corridor width shall not be less than 36", which means that if the occupant load of the ranch house is limited to 50, then compliance is reached. Additionally, NFPA 5000 permits this arrangement to remain since the Spring Hill Ranch House is an historic structure.

See Handicap Accessibility for ceiling heights.

See Handicap Accessibility for floor surfaces.

See Handicap Accessibility for elevation changes.

There are currently no exit signs. In order to be compliant exit signs are needed at main entry doors 101, south room door 202, west room door 204, rear porch door 207, and in hall 306.

There is currently no means of egress illumination. In order to be compliant means of egress illumination is needed.

Guardrails of a height of 42" are required when open-sided walking surfaces, mezzanines, industrial equipment platforms, stairways, ramps or landings are located more than 30" above the floor or grade below. There are currently no guardrails at the

Spring Hill Ranch House. The stair handrails are all less than the required 42" high and on one side of the stair only. There are also several locations outside the house where open-sided walking surfaces are located more than 30" above the floor or grade below. In order to comply with the new requirements of NFPA 5000, guardrails are needed at the retaining wall to the north of the ranch house between the house and the curing room, at the steps by this retaining wall, at the tower base, at the terrace by door 107, at the steps along this terrace. There are even more retaining walls without rail to the south, but unless the nearby walking surfaces are frequently used, guardrails would not be necessary. Modifications to the stairwells are not required by NFPA 5000 given the extent of the proposed work and the historic nature of the Spring Hill Ranch House.

Currently, the main stairway is less than the required 48" wide, lacks an area of refuge and has unrated doors. However, it is now considered an accessible means of egress due to the installation of an automatic sprinkler system in 2004. Since the main stairway is 42" wide, limiting the occupant load to less than 50 would also allow a required width of 36" minimum.

There is currently no signage indicating the location of accessible means of egress. Once an accessible means of egress is provided signage is required.

See Handicap Accessibility for door widths.

See Handicap Accessibility for door heights.

Most doors do not swing in the direction of egress travel. In order to comply they would need to be rehung to swing in the direction of egress travel, or the occupant load could be limited to 50 persons. When the occupant load is less than 50 persons the doors do not need to swing in the direction of egress travel.

Doors 101, 202B, 204, 206A, 207, and 208 do not have landings on each side of the door as required. In the Handicap Accessibility alternatives, landings are provided at doors 101, 207, 202B and 204, which also are the doors that are part of the means of egress.

See Handicap Accessibility for slopes.

The stair landings are all less than the required 44". To enlarge the landings would drastically affect the historic fabric of the house and is not possible due to limited stair width. Modifications to the stairwells are not required by NFPA 5000 given the extent of the proposed work and the historic nature of the Spring Hill Ranch House.

See Handicap Accessibility for threshold heights.

See Handicap Accessibility for door arrangement - storm doors.

See Handicap Accessibility for door knobs.

The main entry doors 101 have flush-mounted surface bolts, which are not permitted according to NFPA 5000.

The stairways in the Spring Hill Ranch House do not comply with most of the NFPA 5000 requirements. However, existing stairways in an existing structure shall not be required to comply with the requirements of a new stairway where the existing space and construction will not allow a reduction in pitch or slope.

If door 107 is considered an exit, then there is no dead end in tunnel 107, otherwise the sequence of tunnel 107, old kitchen 105 and bathroom 104 would constitute a dead end of 58 feet, which is much more than the maximum allowed of 20 feet. Door 107 serves as an acceptable exit from this facility.

The third floor has only one exit. NFPA 5000 requires a minimum number of two exits per floor for an occupant load of 1-500. The third floor is not compliant. However, given the low occupant loading of the third floor and the relatively short common path of travel to get to the second floor, a variance seems appropriate. In order to apply for a variance, an equivalent level of protection needs to be provided. This can be accomplished by limiting the occupant load to a few people, and to people who are familiar with the space. The provision of a fire alarm and sprinkler system in 2004 has also raised the level of protection. Together, these modifications significantly improve the existing condition of the third floor.

The soffits and inside walls of the landing crawl space 001 in hall 101 are not fire-resistance-rated. Access to this enclosed space is from within the main stair enclosure, which is not allowed. All fuel loading and potential sources of ignition should be removed.

See Handicap Accessibility for accessible route. At least one accessible route from a site arrival point to an accessible entrance shall be provided. An accessible route from an accessible entrance to public spaces on the level of the accessible entrance shall be provided.

There is currently no signage at the Spring Hill Ranch House. Signage is required at the following locations: at accessible parking places, accessible passenger loading zones, accessible areas of refuge, and accessible entrances (where not all entrances are accessible). Directional signage indicating the route to the nearest accessible element shall be provided at inaccessible building entrances. These directional signs shall include the International Symbol of Accessibility. Signs indicating special accessibility provisions shall be provided at each door to an exit stairway (tactile sign, including raised letters and Braille, stating EXIT) and at exits serving a required accessible space, but not providing an approved accessible means of egress, sign shall be installed indicating the location of accessible means of egress.

Accessibility Recommendations

The following is a summary of recommendations that need to be implemented in order to bring the Spring Hill Ranch House into compliance with the requirements of the Uniform Federal Accessibility Standards (hereafter, UFAS), and ICC/ANSI A117.1-1998 (hereafter, ANSI). These recommendations are presented with the assumption that the ranch house will continue to be used as a house museum. Restrooms and kitchen

facilities will not be used by the public. Due to the difficulty inherent in making the ranch house accessible without drastically affecting the historic fabric, it is proposed that only the second floor is made accessible, and that, in addition, there will be alternate means developed for experiencing the entire house without physically walking through it. However, recommendations are given for all three floors.

Accessible route

Location

A designated accessible route needs to be provided to connect the ranch house to public transportation stops, accessible parking, accessible passenger loading zones, etc., and other accessible buildings on site. There also needs to be an accessible route into and through the ranch house. This can be accomplished by the below recommendations. See *Part E: Alternatives* for detailed descriptions of site accessibility alternatives, and *Appendix B: Drawings* for the preferred alternative.

Width

At the main stair landing by bathroom 104, the service stair landing by hall 206, and bathroom 305, the clear width is less than the required 36". In order for these spaces to be accessible, the clear width needs to be increased to 36". Since it is difficult to make the first floor service level and the third floor accessible without drastically affecting the historic fabric, there will need to be alternate means developed for experiencing these spaces without actually going through them. Only the second floor is recommended to be made accessible.

Headroom

The headroom is less than the required 80" below the main stair in hall 101, in the main stair, in the service stair by the old kitchen 105, in root cellar 106, in tunnel 107, along the exterior walls on the third floor, and in doorways 106, 107 and 108. Barriers that warn blind or visually impaired persons need to be provided at these locations. The barrier should have a leading edge 27" maximum above the floor. However, the first and third floors are not recommended to be made accessible.

Surface textures

If the ground surface and outdoor stairs are to be part of an accessible route, then these surfaces need to be improved in order to be stable, firm, and slip-resistant.

Loose mats in hall 101, south parlor 102, north parlor 103, south room 202, rear porch 207, and bedroom 302 need to be securely attached to the floor. This could be accomplished by tack strips at the perimeter of area rugs.

Slope

The slope of the floor surface at the old kitchen door 105 is too steep (1:13.5), and needs to form a level landing at the door. The floor slope at root cellar door 106 (1:6) needs to be less steep, and needs both landing and handrails in order to be compliant. Since these areas will be difficult to make compliant without drastically affecting the historic fabric,

there will need to be alternate means developed for experiencing the entire house without actually going through these spaces. The first floor is not recommended to be made accessible.

Doors

Doors 104, 104A, 105B, 105C, 106, 107, and all doors on the second and third floor are less than the required 32" wide. These need to be widened in order to be compliant. However, only the second floor is recommended to be made accessible. The second floor door openings are about 30" wide, so it would be possible for wheelchairs to navigate through these doors with assistance. Rear porch door 207 should be increased to a 36" door since this is recommended to be an accessible entrance. For the other floors, there need to be alternate means developed for experiencing the entire house without actually going through these spaces.

At doors 104, 104A, 105, 105A, 106, 107, 201, 202A, 203, 204, 206, 206A, 303, 304, 306, the minimum maneuvering clearances are less than required. In order to be compliant the spaces need to be reconfigured to provide minimum maneuvering clearances. These conditions cannot be improved without drastically altering the historic fabric of the house.

At tunnel door 107, service door 206A and rear porch door 207 there are storm doors mounted a few inches apart from the main doors. Since the space between the doors is less than the required 48", the storm doors will need to be removed in order to make this situation compliant.

Front doors 101, old kitchen door 105, tunnel door 107, hall door 206A, south room doors 202B and 204, north room door 203, doorway 203A, west room door 204, and all third floor doorways all have thresholds or level changes that are not compliant with UFAS. Some of these thresholds could be beveled 1:2 in order to comply; some would be difficult to change without altering the historic character of the building.

Most doors have door knobs and lockable cylinder locks and not the required lever-type mechanisms, push-type mechanisms or U-shaped handles. Any doors that are part of the accessible route should have compliant door hardware. Because the intent is not to replace the historic hardware, the doors could alternately be propped open during business hours to comply with the intent of the code.

Egress

See Life Safety for egress recommendations.

Parking and passenger loading zones

The designated accessible parking at the barn is not connected to the ranch house with an accessible route. There needs to be both accessible parking marked with accessibility signs, passenger loading zone, and an accessible route connecting to the house.

Stairs

The existing stairs in the house do not meet UFAS requirements. The riser heights and tread widths vary in size, the nosings are not sloped appropriately, and railings are not provided on both sides of the stairways, at the correct height, or the correct shape. Any accessible alternative (make stairway accessible, install ramp, elevator, or platform lift) would drastically affect the historic fabric. Therefore, it is proposed that the stairway remain inaccessible and alternate means be developed for experiencing the entire house without actually going through it, such as a videotaped house tour.

Space allowances and reach ranges

The light switches in old kitchen 105, hall 201 and north room 203 need to be lowered to a mounting height of maximum 48" in order to be compliant. However, light switch height revisions should not be addressed until a decision is made as to what floors will be made accessible. Since it is doubtful that the old kitchen ever will be made accessible due to the difficulty in making the first floor accessible, no changes need to be made here.

3. Barn

Exterior Envelope

General

1. Conduct lead-containing paint abatement.
2. Repoint all open, cracked and deteriorated joints in stone; mortar to match color, texture, composition, and tooling of original.

North Elevation

1. Remove organic growth from stone; apply a biocide water repellency treatment to retard future growth.
2. Repaint the exposed wood members, siding, doors, windows, and trim.
3. Replace the east window 301 in the middle dormer with one that is appropriate to the style of the building.

Ramps

4. Replace rotted and damaged wood plank decking on the west ramp/bridge. A total of 8 to 9 planks were noted to be in poor condition. Replacement should be the same thickness of the existing.
5. Clean and wire brush steel ramp beams. Prime and paint the beams.
6. Point all open joints and areas of loose mortar on the ramp abutments and piers. Repair crack noted in west abutment.

South Elevation

7. Repair large crack in lintel at the lower right window 109; to match the stone with appropriate patching and injection grout use Jahn Products (see Cathedral Stone Products, Inc., www.jahnmortars.com) or equal material.
8. Restore first floor wood windows.

- a. Rebuild sash units.
 - b. Replace damaged or cracked glass.
 - c. Repair frames.
 - d. Replace sash cords and weights.
 - e. Reglaze all lights.
 - f. Repaint exterior and touch-up stain and varnish on interior.
 - g. Recaulk all joints.
9. Repaint all exposed wood.

East Elevation

10. Restore first floor wood windows.
- a. Rebuild sash units.
 - b. Replace damaged or cracked glass.
 - c. Repair frames.
 - d. Replace sash cords and weights.
 - e. Reglaze all lights.
 - f. Repaint exterior and touch-up stain and varnish on interior.
 - g. Recaulk all joints.
11. Replace the south jamb of the south window 110.
12. Regrade at door 106 for egress accessibility and to close gap below door.
13. Repair north and south doors, repaint.
14. Repaint all exposed wood members.

West Elevation

15. Document and remove timber structure outside of the second floor door 203.
16. Replace wood lintel and reinforce with concealed steel at door 101.
17. Seal the open joints between the roof and the closure board at the top of the wall.
18. Repoint failing joints.
19. Repaint the fascia board and all exposed wood members including doors and windows.
20. Seal cracked sill of the south window 103; to match the stone with appropriate patching and injection grout use Jahn Products (see Cathedral Stone Products, Inc., www.jahnmortars.com) or equal material.
21. Restore first floor wood windows.
- a. Rebuild sash units.
 - b. Replace damaged or cracked glass.

- c. Repair frames.
- d. Replace sash cords and weights.
- e. Reglaze all lights.
- f. Repaint exterior and interior frame and sash.
- g. Recaulk all joints.

Roof

22. Remove diagonal bracing struts and flats at the lower slope of the gambrel roof. Replace with appropriately detailed double 2x8 beam placed normal to the rafters and new diagonal struts. A single 2x8 on the flat in addition to the normal doubler will assist in connection detailing. The new diagonal struts should be placed at the base of the columns at the third floor and extend diagonally upward and intersect the rafters perpendicular to the rafter. The struts should be securely attached to the double 2x8.
23. Reinforce the beam along row C from column location C.2 to C.4 just below the collar ties to reduce sag in the beam.
24. Replace any failed or damaged rafters and ties. Alternately sister new members to damaged members.
25. Place appropriate collar ties in the north side east and west dormers roof framing in order to prevent roof thrust to the walls.

Interior

First Floor (Stable Level)

1. Remove isolated stones from the newer tack room north wall at selected locations. Inspect condition of original wall in this area. Repairs in this area will be dictated by the original wall condition.
2. Repoint all open, cracked and deteriorated joints in stone; mortar to match color, texture, composition, and tooling of original. Replace missing stones.
3. Clean interior stonework to remove staining and organic growth.
4. Remove parging unless damaging to stone.
5. Repair deterioration on the door edges.
6. Recondition and repaint door and window frames, sashes and sills.
7. Cover center portion of floor with crusher fines matching existing floor color, in order to make the floor accessible. Grade and level egress routes to doors 103 and 106 and cover with crusher fines.
8. Seal the cracked lintel at the stable level window 109 at the east end of the south wall; to match the stone with appropriate patching and injection grout use Jahn Products (see Cathedral Stone Products, Inc., www.jahnmortars.com) or equal material. Alternatively, replace the stone lintel.
9. Provide lateral wall support for the north stable wall at the main floor level framing. Rotted joist ends cannot be counted on as providing necessary support.

Second Floor (Equipment Level)

10. Reinforce selected beam spans along row B and provide new column and foundation support for beam span rows 1 to 2 at rows B and C to obtain a minimum of 100 psf live load capacity (code prescribed load for public or assembly spaces).
11. Replace or sister new joists in kind at all cracked and damaged joists.
12. Monitor cracking in all interior machinery level walls. Place crack monitors on areas that re-crack and record data.
13. Repoint all open, cracked and deteriorated joints in stone in exterior walls; mortar to match color, texture, composition, and tooling of original.
14. Clean interior stonework to remove staining and organic growth.
15. Remove areas of parging unless damaging to stone.
16. Repair deterioration of the doors.
17. Remove plywood floor covering, repair/replace original floor boards below.
18. Rebuild the east ramp and handrails at door 201 to be compliant with accessibility codes.
19. Rebuild the west ramp and handrails at door 202. Due to space restrictions, this ramp will not be compliant with accessibility codes.
20. Document and remove existing stair to first floor. Install new, code-compliant stair and wheelchair lift. The design should be sensitive to historic appearance of original.

Third Floor (Loft Level)

21. Replace or sister new joists in kind at all cracked and damaged joists. This should also be done where the joists are presently reinforced with strut/truss system.
22. Replace or reinforce cracked timber studs in dormers.
23. Replace soft deteriorated floor decking in the north center dormer area, and southwest loft area.
24. Repoint all open, cracked and deteriorated joints in stone; mortar to match color, texture, composition, and tooling of original.
25. Reinforce selected beam spans if this level is to be used for anything but very light storage.
26. Sister or replace in kind all joists that are spliced over the intermediate beam rows A.4, B.5, and C.5 so that this floor does not load the joists at the level below.

Barn Cistern

1. Do not allow water to accumulate in cistern. Alternately, consider removal of the cistern if that will fit into the restoration episode plans.
2. At least one isolated test pit should be excavated alongside of the cistern walls. The pit should extend to the bottom of the cistern foundations in order to

determine the base condition and to provide information for evaluating the effect of the cistern on the barn walls.

3. Seal all cracks in the top of the cistern to prevent water infiltration. Reseal all top slab jointing. Redirect roof drainage away from the barn.

Security Recommendations

Physical and Technical Security

It is understood that the installation of an intrusion system is planned for the barn and ranch house in 2005, with the barn's fire and intrusion systems connected to a pump house building panel. In order to properly protect the barn from vandalism and unlawful entry, this system should include dual technology false-immune motion detection sensors. The inclusion of these additional detectors would assist in protecting assets in the future, which could be stored in these rooms. These detectors should be placed in areas of travel, specifically, common areas, staircases, and immediately in front of entrances. The intrusion detection systems should be connected to a central station monitoring service or directly to the police department. This system should automatically poll the phone line for a dial tone. In an event where a dial tone would be lost, the system would automatically switch to a cellular back up system. Both of these systems should be equipped with an eight-hour back up battery.

Another approach would be a separate system with similar attributes, as discussed above. Because of the remoteness of this facility, the barn could employ a local alarm system that would notify and warn potential criminals that an alarm has been triggered and that the police have been summoned. This type of system would be most likely to prevent further damage to the dwellings and exhibits.

Life Safety Recommendations

This section will discuss recommendations and alternatives to correct egress and fire safety deficiencies in the building. The following is a summary of things that need to be done in order to bring the barn into full compliance with the NFPA 5000 requirements:

See Handicap Accessibility for ceiling heights.

See Handicap Accessibility for floor surfaces.

See Handicap Accessibility for elevation changes.

There are currently no exit signs. In order to be compliant, exit signs are needed at doors 103, 106, 201 and 202.

There is currently no means of egress illumination. In order to be compliant means of egress illumination is needed.

Guardrails of a height of 42" are required when open-sided walking surfaces, mezzanines, industrial equipment platforms, stairways, ramps or landings are located more than 30" above the floor or grade below. There are currently no guardrails at the barn. The interior stair is not provided with guardrails or compliant handrails. The opening to the stair on the second floor is not provided with a guardrail. The two ramps up to the third floor are not provided with the required handrails and guardrails. Additionally, the opening served by door 203 does not have a guardrail. It is recommended that guardrails be placed at door 203, and surrounding the interior stairwell.

There is currently no signage indicating the location of accessible means of egress. Once an accessible means of egress is provided signage is required.

See Handicap Accessibility for door widths.

See Handicap Accessibility for door heights.

All exit doors are horizontal sliding and should be maintained such that they can meet the requirements of NFPA 5000 for the minimum required force necessary for opening, including accessible or reconditioned door hardware and tracks on doors 201, 202, 103 and 106.

See Handicap Accessibility for door landings.

See Handicap Accessibility for slopes.

See Handicap Accessibility for threshold heights.

See Handicap Accessibility for door arrangement - storm doors

The interior stairway in the barn does not comply with most of the NFPA 5000 requirements. However, existing stairways in an existing structure shall not be required to comply with the requirements of a new stairway where the existing space and construction will not allow a reduction in pitch or slope.

The interior stair and other openings create three levels of communicating space connected by unprotected openings. This is permitted by NFPA 5000 provided each requirement from Section 8.12.2 is met. This requirement has already been achieved through the provision of a fire alarm and detection system throughout the barn to give early warning to every occupant of the building in the event of a fire emergency.

See Handicap Accessibility for accessible route. At least one accessible route from a site arrival point to an accessible entrance shall be provided. An accessible route from an accessible entrance to public spaces on the level of the accessible entrance shall be provided.

There is currently no signage at the barn. Signage is required at the following locations: at accessible parking places, accessible passenger loading zones, accessible areas of

refuge, and accessible entrances (where not all entrances are accessible). Directional signage indicating the route to the nearest like accessible element shall be provided at inaccessible building entrances. These directional signs shall include the International Symbol of Accessibility. Signs indicating special accessibility provisions shall be provided at each door to an exit stairway (tactile sign, including raised letters and Braille, stating EXIT) and at exits serving a required accessible space, but not providing an approved accessible means of egress, sign shall be installed indicating the location of accessible means of egress.

Accessibility Recommendations

The following is a summary of recommendations that need to be implemented in order to bring the barn into compliance with the requirements of the Uniform Federal Accessibility Standards (hereafter, UFAS), and ICC/ANSI A117.1-1998 (hereafter, ANSI). These recommendations are presented with the assumption that the first and second floors of the barn will be used for exhibit space, and that the third floor will not be open to the public.

Accessible route

Location

A designated accessible route needs to be provided that connects the barn to public transportation stops, accessible parking, accessible passenger loading zones, etc., and other accessible buildings on site. There also needs to be an accessible route into and through the barn. This can be accomplished by the below recommendations. See *Part E1: Treatment and Alternatives* for detailed descriptions of site accessibility alternatives, and *Appendix B: Drawings* for the preferred alternative.

Width

At the mangers on the first floor, there are pathways where the clear width is less than the required 36", and point locations where the clear width is less than the required 32". In order for these locations to be accessible, the clear width needs to be increased to 36" continuously and 32" at point locations respectively. If these specific locations do not need to be part of an accessible route, then the width does not need to be increased.

Headroom

The headroom is less than the required 80" in many locations at the first floor, at door 101, at the bottom of the stair between the first and second floor, and also at bracing at the second floor. Barriers that warn blind or visually impaired persons need to be provided at these locations in order for them to be accessible. The barrier should have a leading edge 27" maximum above the floor.

Surface textures

If the road and ground surface by the barn are to be part of an accessible route, then these surfaces need to be improved in order to be stable, firm, and slip-resistant.

See also "Changes in levels" below.

Slope

The outdoor and indoor ramps at entrance doors 201 and 202 are currently non-compliant in terms of rise, run, slope, and handrails. These ramps need to be made compliant in order to be accessible. One accessible ramp at door 201 is recommended. Due to space constraints to the inside of door 202, the ramp at this door will be non-compliant.

See “Changes in levels” for slopes on the first and second floors.

Changes in levels

The eroded and uneven dirt surface of the first floor needs to be leveled in order to be compliant. This could be accomplished by a layer of crusher fines or compacted earth, which would still preserve the original surface underneath.

The second floor also needs to be leveled in order to be compliant. One way to accomplish this is to remove the plywood sheeting and repair the wood floor beneath. Joint locations shall be a maximum of ½” and beveled. Slopes shall be a maximum of 1:20 in order not to constitute ramps.

Doors

At doors 101, 102, 103, 104, 105, and 106, the maneuvering clearances are uneven, thresholds are generally too high, and door hardware is also non-compliant. The maneuvering clearances need to be level, and thresholds and door hardware compliant, if these doors are to be accessible.

At doors 201 and 202, thresholds and ramps are non-compliant per “Slopes” above and need to be made accessible.

If door 203 is to remain open for view to the west corrals, then a 42” guardrail needs to be installed. This is a Life Safety issue.

A few of the manger gates on the first floor are narrower than 32”, and would need to be widened in order for them to be accessible. If they are not to be part of the accessible route, then they do not need to be widened.

Egress

See Life Safety Evaluation for egress recommendations.

Parking and passenger loading zones

The designated accessible parking at the barn is not connected to the barn with an accessible route. There needs to be both accessible parking marked with accessibility signs, passenger loading zone, and accessible route connecting to the house.

Stairs

The metal stair from the second floor down to the first floor of the barn is not accessible. This stair needs to be replaced by an accessible stair and wheelchair lift.

4. Lower Fox Creek Schoolhouse

Exterior Envelope

1. Conduct lead-containing paint abatement.
2. Determine condition of foundations, particularly east foundation. Monitor east façade for future cracking.
3. Remove miscellaneous protrusions through stone.
4. Reset stone entry treads level, plumb and with equal riser height, both doors.
5. Repair cracked sill stones. Replace elements if necessary.
6. Epoxy inject cracked north center window lintel. Remove capping material and thoroughly clean stone.
7. Monitor cracked lintel bearing stones at south elevation. Replace stone if distress increases.
8. Replace threshold stone at both entrance doors with new stone matching original.
9. Apply a biocide water repellency treatment to retard future organic growth.
10. Secure warped soffit boards at north and south eave lines and east and west rakes.
11. Repaint wood trim at eaves and rakes.
12. Remove vegetation on north wall.
13. Make sure grade slopes away from the building.
14. Remove hand rail at north door.
15. Install one handrail each stair (total of two) on inside edge. Material to be appropriate to and compatible with building.
16. Repair roof as necessary where water is infiltrating.

Interior

1. Determine if insect infestation is active. Continue investigation on an annual basis to verify that the insects have not returned.
2. Replicate and replace missing shoe moulding.
3. Secure loose base moulding.
4. Ventilate crawl space and attic.
5. Repair plaster cracking on north and south walls. Monitor for future cracking.

Privy

1. Document completely the existing structure (dimensions, materials, location, etc.).
2. Replace deteriorated wood framing members and siding, stabilize remaining.

3. Replace deteriorated roof structure, sheathing and shingles, in their entirety, with new material.
4. Stabilize existing wood seat and reuse.

5. Outhouse

Exterior Envelope

1. Conduct lead-containing paint abatement.
2. Replace missing shingles.
3. Repair the spreading cap at the southeast corner of the roof.
4. Seal the joint between the stone and fascia board.
5. Replace stones at grade level on east elevation that are undercut, splitting and exfoliating. Stone to match existing with mortar to match original in color, texture, tooling, and composition.
6. Replace spalled stones on west elevation below window sill. Stone to match existing with mortar to match original in color, texture, tooling, and composition.
7. Stabilize west window lintel.
8. Repoint all open, cracked and deteriorated joints in stone; mortar to match color, texture, composition, and tooling of original.
9. Remove organic growth from roof.
10. Remove the organic growth from limestone; apply a biocide water repellency treatment to retard future growth.
11. Replace wood members that show excessive insect damage.
12. Repair openings at the mitered joints of the fascia board.
13. Fill and repaint the wood members.
14. Restore wood windows.
 - a. Rebuild sash units.
 - b. Replace damaged or cracked glass.
 - c. Repair frames.
 - d. Replace sash cords and weights.
 - e. Reglaze all lights.
 - f. Repaint exterior and interior frame and sash.
 - g. Recaulk all joints.

Interior

1. Repoint all open, cracked and deteriorated joints in walls; mortar to match color, texture, composition, and tooling of original.

2. Repair stones and through stone cracks to match the stone with appropriate patching and injection grout as manufactured by Jahn Products (see Cathedral Stone Products, Inc., www.jahnmortars.com) or equal material.
3. Replace missing oakum at interior.
4. Replace missing quarter round moulding at bench base.
5. Complete an annual investigation for insect activity in the wood structures.
6. Complete a structural analysis of the roof and floor structure.

6. Icehouse and Cistern

Exterior Envelope

1. Conduct lead-containing paint abatement.
2. Replace missing shingles on roof.
3. Remove the organic growth from limestone; apply a biocide water repellency treatment to retard future growth.
4. Repoint all open, cracked and deteriorated joints in stone; mortar to match color, texture, composition, and tooling of original.
5. Repair severe cracking on the west wall to match the original stone with appropriate patching and injection grout as manufactured by Jahn Products (see Cathedral Stone Products, Inc., www.jahnmortars.com) or equal material. Repair natural stone joints with mortar to match color, texture, composition, and of original mortar.
6. Repair splits in the wood soffit.
7. Repaint fascia board.
8. Reglaze windows where original glazing is loose, broken, or missing.
9. Repair and repaint window frames and sash.
10. Paint and recondition doors and frames.

Interior

1. Complete a structural analysis of the roof structure.
2. Remove existing ceiling structure and replace with one structurally adequate.
3. Replace or reinforce rotted roof members.
4. Repoint joints around window opening in west wall with mortar to match color, texture, composition, and of original mortar.
5. Repoint and monitor vertical crack in north end of west wall with mortar to match color, texture, composition, and of original mortar.
6. Replace concrete slab to match configuration of the existing.
7. Finish the ends of the opening in the south elevation square.

8. Monitor insect damage and wood rot in lintel over opening in south elevation (temporary measure). Continue annual investigation of insect activity in the wood structure.
9. Replace lintel over opening in south elevation with a structurally adequate member.

Cistern

1. Remove the organic growth from limestone; apply a biocide water repellency treatment to retard future growth.
2. Repoint all open, cracked and deteriorated joints in stone; mortar to match color, texture, composition, and tooling of original.
3. Repair/replace exfoliating stones on north end of east elevation.
4. Remove current chicken wire placed over opening as a safety feature; restring metal semi-circular cover and attach so it will not be lost inside the cistern. Install a gate to ensure that visitors will not fall into the cistern.

7. Carriage House

Exterior Envelope

1. Conduct lead-containing paint abatement.
2. Replace and repair gutter and downspout.
3. Remove the organic growth from limestone; apply a biocide water repellency treatment to retard future growth.
4. Remove anachronistic grey mortar from stone joints, and repoint with mortar matching color, texture, composition, and tooling of original mortar.
5. Repoint all open, cracked and deteriorated joints in stone; mortar to match color, texture, composition, and tooling of original.
6. Repaint the existing wood gable.
7. Replace south fascia board.
8. Reglaze windows where original glazing is loose, broken, or missing.
9. Reset the areas of silo tile flooring level and true, adding compacted fill as required for proper support.
10. Replicate doors.
 - a. Repair/replace frames in existing openings.
 - b. Install doors in frames.
 - c. Paint doors and frames.
 - d. Install new compatible hardware on doors.
 - e. Recaulk all joints.

Interior

1. Repoint joints in bottom three courses of stone pier in southeast elevation with mortar matching color, texture, composition, and tooling of original mortar.
2. Repoint 90 to 95 percent of wall area with mortar matching color, texture, composition, and tooling of original mortar.
3. Infill locations where wood nailers have deteriorated and are missing.
4. Complete a structural analysis of the roof structure.
5. Complete an annual investigation of any insect activity in the wood structure.

Retaining Wall between Carriage House and Poultry House

1. Repair/Replace exfoliating coping stone.

8. Poultry House

Exterior Envelope

1. Conduct lead-containing paint abatement.
2. Remove earth roof, repoint top of barrel arch, apply waterproofing material, and replace earth roof.
3. Replace the flashing on the west elevation.
4. Repair/replace deteriorating stones at top of south wall.
5. Repair/replace exfoliating and cracked stones.
6. Repair/replace deteriorating coping stones.
7. Repair spalled areas with stone dutchman.
8. Remove organic growth from stone; apply a biocide water repellency treatment to retard future growth.
9. Repoint all open, cracked and deteriorated joints in stone; mortar to match color, texture, composition, and tooling of original.
10. Repair and paint the east door on the south elevation. Tighten hinges.
11. Recondition and repaint door and window frames, sashes and sills. Replace as needed.

Interior

1. Remove organic growth from stone; apply a biocide water repellency treatment to retard future growth.
2. Repoint all open, cracked and deteriorated joints in stone; mortar to match color, texture, composition, and tooling of original.
3. Repair separation crack where the wall butts the vault to match the original stone with appropriate patching and injection grout as manufactured by Jahn Products

(see Cathedral Stone Products, Inc., www.jahnmortars.com) or equal material at through stone cracking. Repair natural stone joints with mortar to match color, texture, composition, and of original mortar.

4. Repair through stone crack on north side of the east skylight.
5. Remove cementitious parging from walls and barrel arch.
6. Repair/replace exfoliating stones in walls and barrel arch.
7. Replace missing stone in west wall.
8. Repair damage to wood hatch covering the west skylight opening.
9. Investigate the skylight locations in the poultry house. These skylights were likely to have matched those in the root cellar. If evidence found for this, recreate the cast iron skylights.
10. Seal skylights for weather-tightness.

Storage Room

11. Replace wood door sill.

F: Research Recommendations

Research Recommendations

More research is needed on the following issues when opportunities occur to schedule the investigation and the professionals to perform it:

1. As a general approach, archaeological investigations should take place for each location on site where any construction activity will imply ground disturbance (i.e. foundation drain tiles and below grade water proofing at the ranch house, leveling the floor of the barn, removal and/or replacement of ranch house first floor concrete floors, test excavation for the cistern, etc.).
2. According to Marvin Slabaugh there was a tunnel leading from the tunnel 107 to the icehouse. This tunnel supposedly started at the “cowboy shower” area where the water line comes through the wall, but was closed off after caving in. Further research at this location is recommended.
3. At the ranch house third floor hall 301 ceiling, the current skylight is smaller than the surrounding skylight coffer. It is debatable whether the skylight is original or not, and whether it used to be as large as the larger opening or the size of the current smaller skylight. Further research is warranted to find out if the framing is original.
4. At the ranch house third floor top center dormer on the east elevation, there is currently a blind, louvered vent. In the 1887 lithograph from the State Atlas of Kansas this is shown as an oculus window, but it is debatable whether it was a window or a blind vent at this time. Plaster irregularities can be felt beneath the wallpapers at the east wall of the stairwell on the third floor. Further research is recommended to find out whether there was ever a window at this location.
5. The ceiling of the old kitchen and back stairwell should be inspected for evidence of the dumbwaiter if construction takes place in this area.
6. There appears to be some conflict among oral accounts as to the furnishings in bathroom 305B during the Benninghoven and Slabaugh periods. Further research should be undertaken to resolve these conflicts.
7. Further research is recommended on the use and furnishings of the rooms during the Jones era. In particular, one source mentions Lutie Jones’ “box” piano; research into the types of pianos sold in the area at that time may clarify what hers looked like.
8. An oral history interviewee stated there was a tunnel between the barn and the ranch house, approximately twenty feet down in the ground, possibly leading from the tack room. The area below the tack room should be investigated for evidence of the tunnel, including a metal door and access route.
9. The method of maintenance/clean out of the outhouse is not apparent. Archeological investigation is recommended to determine if it was built over a deep pit or cleaned out from inside.
10. The school privy was not included in the scope of this investigation but is closely

10. tied to the usage of the schoolhouse. Further investigation is recommended to determine if the existing privy is original, the date of its concrete floor and base, and what the other concrete remains nearby represent.
11. Further archeological investigation of the poultry house floor might inform of use and occupation of this building.
 12. In order to better understand the impacts of handicap accessibility and drainage treatments, a greater understanding of the historic circulation patterns and day-to-day activities at the site is necessary. Detailed research regarding the site specific use of the porches, garden terraces, pedestrian and vehicular routes, and livestock activities could provide this type of information.
 13. The path that comes directly down the hill from the icehouse towards the ranch house is a major concern for runoff. If the historic landscape analysis indicates that this path is not a contributing feature, consider rerouting it to a gentler grade, or at least in a direction that channels water away from the building. Establish vegetation in the area of the path to help reduce surface runoff.
 14. Soil borings should be taken at selective spots throughout the management area to help better understand the soil/bedrock type, stratifications, and bearing capacity.

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Appendix B: Drawings

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Appendix C: Paint Analysis Report

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Paint Analysis Report

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A. Introduction and Description

The purpose of this report is to document the chromachronology of exterior and limited interior finishes for the Spring Hill/Z-Bar Ranch House and outbuildings of the Tallgrass Prairie National Preserve, Strong City, Kansas.

The report includes the following sections:

- Part A: Introduction and Description
- Part B: Methods and Analysis
- Part C: Existing Conditions and Physical Investigation
- Part D: Finish Conclusions
- Part E: Summary and Recommendations
- Part F: Finishes Analysis
- Part G: Sample Location Drawings

The investigation began with a review of the historic material provided by QUINN EVANS/ARCHITECTS, dated 1/27/03, and labeled 'Site history and chronology (DRAFT).' On site research was executed from February 3, 2003 through February 6, 2003. Microscopic analysis of sample chromachronology was conducted from February 17, 2003 to March 4, 2003. The final writing and assembly of this report took place between March 4, 2003 and March 7, 2003.

B. Methods and Analysis

After arriving on site the afternoon of February 3, 2003 the architectural team met with National Park Service staff for introductions and review of work to be executed. Following the meeting, a walk-through of the ranch house and review of materials stored in the barn took place.

On February 4, 2003 an initial walk-through of the ranch house took place with Al O'Bright, Steve Jones, and Gail Winkler. Following the walk-through, the team continued to work inside the house to investigate the history of the existing surfaces, and to determine those that were likely part of the original structure dating to 1881. Additional dating of non-original surfaces took place, along with removal of non-original material to execute sampling. During this time photographs were taken of the interior for documentation purposes. Miscellaneous sampling also took place inside the ranch house.

From February 5 to February 6, 2003 all of the remaining samples included in this report were removed from the site locations. Although the amended scope of work dated June 19, 2002 called for an assumed total of 80 samples to be removed, a total of 137 samples were ultimately removed, and a total of 134 samples were analyzed.

The primary focus of the analysis was the exterior paint chromachronology for the ranch house, springhouse/curing room, barn, outhouse, icehouse, poultry house, and carriage house. The main purpose of the analysis was to provide information regarding building chronology and finish colors. For this reason, all paint layers have been reviewed and matched to the Munsell Color Notation System for all exterior samples removed. The interior samples were analyzed for substrate and the first two paint/finish coatings. If additional coatings are identified for the interior samples, it is due to the fact that the coatings shown are likely original to the first campaign.

Prior to sample removal the chronology of the buildings exterior changes was reviewed with Steve Jones and Al O'Bright. Samples were then removed from surfaces determined to be original to the structure dating to 1881, with the exception of some front porch elements of the ranch house. On each surface sampled, the most appropriate area with a representation of a typical paint/finish build-up for structures of this age was identified. The appropriate identified surface area was then sampled using an *Exacto* knife with a number 19 wood chisel blade.

Sampling was conducted to include a portion of the given surface substrate, and all of the subsequent finish layers. Samples were placed in labeled, acid free, coin envelopes and stored in sequence. All samples were labeled for exact sample location, project name, and date of sample. Each sample location was labeled and photographed for reference following the sample removal. The sample photographs are not included in the report, but are available for reference upon request.

All samples were inspected under a 60X and 120X Meiji binocular microscope with a Stocker & Yale 5200 degree Kelvin illuminator, insuring a color match under conditions closely simulating natural light.

All coating finish colors were then matched to The Munsell Color Notation System (Glossy Collection.)

C. Existing Conditions and Physical Investigation

Exterior:

The existing condition of the ranch house and outbuildings included in this study is generally stable and fair to good. Microscopic investigation indicates several coats of paint for most of the surfaces sampled. However, for a somewhat active farm and occupied ranch house built in 1881, we should expect a greater number of coatings built up.

In addition, weathering of the surfaces can cause a great deal of paint degradation or loss. If a painted surface is not thoroughly maintained, then eventual maintenance can result in the scraping or sanding removal of any loose and/or flaking paint. Exterior surfaces facing south typically heat up more than those facing east, west, or north, causing more and greater expansion and contraction. This can lead to separation of materials with different expansion and contraction rates, and eventual loss. Additionally, excessive light exposure can cause color change through fading.

It is very likely that given the age of the structures, maintenance required in the given environment, and the number of coatings identified, a number of surface areas have undergone complete coating removal and repainting. This condition is especially likely for surfaces with a metal substrate that has no tooth for adhesion assistance.

During the physical investigation several wood surfaces were identified that included a dark paint layer close to the substrate. Microscopic investigation has identified six coating colors believed to be from the original period of painting.

Prior to executing sampling from the ranch structures included in the study, all of the structure's surfaces were reviewed and inspected to determine the most appropriate sample location. In some cases, where more than one appropriate location was identified, the sample was removed from that location which was safest and/or easiest to access.

It was noted that the north and south sections of the ranch house front porch were installed after the center section, although were selected for sampling for cross-reference only. This holds true for the parapet wall surfaces of the front porch.

Additionally, it was noted that the cupolas of the barn were not original to the first structure, but were sampled in two areas for reference.

D. Finish Conclusions

Exterior:

A review of the exterior sample analysis indicates two definitive paint campaigns, in addition to the current top coat. The first campaign directly adjacent is certainly the most

colorful, using at least five or six colors on the ranch house as detected during the microscopic analysis. The location of these colors adjacent to the given substrate, or applied over a thin, white/off-white primer coating, or in existence as a stain in the substrate, shows the use of warm earth-tones. A review of the outbuildings chromachronology also shows the presence of a deep red matching Munsell color 10R 2/4 in a majority of the samples taken.

The second definitive campaign is consistently found in most of the ranch house samples, but is a monochrome motif painted in a light to mid-toned yellow matching Munsell color 5Y 8.5/4. However, this yellow layer is not found in any of the outbuilding samples. A gray-green paint matching Munsell color 5GY 6/2 is found in most of the Spring House samples and all of the Privy samples.

In addition, an aluminum paint was applied to moldings adjacent to the roof on the curing room, outhouse, and icehouse two or three layers beneath the top coat.

It should be noted that the four deepest colors could be interpreted as two colors. Those colors are 10R 2/4 & 10R 3/6, and 10YR 2/2 & 7.5YR 2/4. The locations and colors identified are as follows:

| <u>Building</u> | <u>Location</u> | <u>Color</u> |
|--------------------------------|-----------------------------------|--------------------|
| Ranch House | Roof – standing seam | 10R 3/6 (10R 2/4?) |
| | Dormer – panel | 10R 3/6 |
| | Dormer – trim/casing | 7.5YR 2/4 |
| | Dormer – bracket | 10R 3/6 |
| | Roof – cornice bracket face | 2.5Y 6/4 |
| | Window – sash | 7.5YR 2/4 |
| | Front Door - #101 | amber varnish |
| | Window – casing | 10R 3/6 |
| | Door – jamb | 10R 3/6 |
| | Door – casing | 2.5Y 7/4 |
| | Front porch – ceiling | 7.5YR 2/4 |
| | Front porch – column bracket face | 7.5YR 2/4 |
| | Front porch – column rosette | 10YR 2/2 |
| | Front porch – cornice dentil face | 2.5Y 5/4 |
| | Rear porch – soffit | 10R 3/6 |
| | Rear porch – clapboard | 2.5Y 6/4 |
| | Rear porch – fascia above windows | 10R 3/6 |
| | Rear porch – beadboard | 10R 3/6 |
| | Door – inside Rear Porch/202B | 5YR 6/4 |
| | Door – casing for 202B | 10R 2/4 |
| Door – casing ¾ round for 202B | 10R 3/6 | |

The first exterior paint campaign identified incorporates the soft yellow/brown color of the limestone ranch buildings within a palette ranging from deep red and red/brown to

softer browns and yellow/browns. The painted surfaces of the outbuildings were all likely treated with deep red or red/brown. This paint scheme is typical of the colors and polychroming executed during the late 1800s, and may date to the construction of the structures.

The second exterior paint campaign, which is preceded and followed by layers of white and off-white, is the only additional paint color found, and likely dates to a period of occupancy of the ranch house. The campaign could very well be associated with the Benninghoven timeline. Due to the fact that the ranch and structures changed ownership several times before and after the Benninghovens occupancy, it may be possible that the layers of white paint were applied merely as a maintenance measure rather than having some decorative purpose.

Interior:

The interior surfaces of the ranch house were sampled for reference only. Any future work for interpretation should include additional sampling and analysis. In most of the rooms sampled, and consistent with the renovation and tax credit documents provided from the 1970s and 1980s, it is evident that very few original ceiling surfaces exist.

It can be noted that the plaster ceiling medallions and crown moldings existing in most of the rooms are original to the structure, except where repaired or replaced during earlier renovations. Some original plaster may remain on the ceilings or upper walls, although extensive removal of overpaint, drywall and/or patching material would be required to confirm the existence of original surfaces.

Throughout the ranch house original woodgraining can be found in most of the formal spaces and stair halls. This graining incorporates a walnut look to the stiles and rails of doors, window casing, and baseboards, with the panels painted to simulate burl with oak panel surrounds. These elements are also outlined with gold leaf pinstriping. Although some of this graining has been replicated or touched up, most is original and in good condition. In addition, possible wood graining on the top tread of the stairs in room 301 is cause to consider further finish investigation if the over-flooring on the 1st and 2nd floors is ever removed.

On the third floor the woodwork has been regrained to simulate what was original to those surfaces, primarily in the form of a combed oak finish.

Decoratively, the crown moldings and upper walls show the presence of soft, yet vibrant accent colors applied in the form of light blue, cream, pink, lavender-brown, and green. One to two colors were likely used for each cornice, and possibly more for the ceiling medallion, consistent with the incorporation of a complimentary wallpaper color scheme. The original paint finish of the ceiling medallions and cornices has been identified as calcimine (distemper) paint. These paints were very prevalent during the 1800s and into the early 1900s, in part due to the fact that they could be applied directly over wet or uncured plaster. Unfortunately, however they can remain water soluble, depending on the

binder used, and frequently fail to hold overpaint for a very long period of time. Another positive trait of calcimine paints is strong color retention, due to lack of natural, yellowing oils.

E. Summary and Recommendations

Given the age and location of the ranch buildings it is a wonder that they are in such fine condition, so similar to the grounds they preside on. However, the warm summers, cold winters and numerous occupants have taken their toll on the building finishes. Additional sampling could assist in determining a more exact paint scheme for the exterior of the structures, and it also may not help at all.

To complete a paint color scheme for the ranch house exterior, it is recommended that the Park Service incorporate the colors of the initial campaign identified herein, into a model using an elevation drawing, completing missing surfaces with the given palette. If apprehension or work load prevents the Park Service from completing this exercise, additional services could be provided by our firm at a nominal rate to complete the same.

Great care should be taken to execute proper surface preparation during any repainting. Moisture levels should be ideal and appropriate primers determined for given substrates exposed. In lieu of current V.O.C. regulations, a high bonding 100% acrylic primer is recommended. Given the superb color retention of acrylics, and the given V.O.C. regulations, this may be a perfect time to make a change over to an entirely acrylic paint system.

Future cross-referencing of paint research for other structures owed by the same owners of this property could help produce a more exact interpretation of the colors and coatings at Spring Hill Ranch.

F. Finishes Analysis

The following finishes analysis listing is a record of the chromachronology of the samples taken from the exterior of the Tallgrass Prairie National Preserve ranch structures as outlined herein.

The list below records the general building location, sample number, specific location, and chromachronology. Under the listing for Chromachronology the substrate is listed first, followed by the finish color notations, with the top coat listed last. All of the finishes have been matched to The Munsell Color Notation System/Glossy Collection and The Munsell Neutral Value Scale/Glossy Edition.

Immediately following each Munsell color notation, a symbol can be found to identify the thickness of the sample, and in some cases, a description of the amount of the sample. The following is a list of symbols and descriptions used:

| <u>Symbol</u> | <u>Description</u> |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| - | Thin sample, typical of a thin coat of paint. |
| -- | Very thin sample, typical of a wash or worn finish. |
| + | Thick sample, typical of a good coat of paint. |
| ++ | Very thick sample, typical of an excessively thick finish. |
| * | Denotes first definitive paint campaign. |
| • | Denotes second definitive paint campaign. |
| Traces | Denotes worn, chipped, inconsistent, or incomplete coating. Usually associated with a percentage of finish present. |
| C/D | Calcimine/distemper paint. Watercolor paint bound with glue. Used from 18 th century to early 1900's. Can be applied over wet plaster. Non-yellowing. Strong color retention. Water soluble. |

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| <u>Sample No.</u> | <u>Location</u> | <u>Chromachronology</u> |
|---------------------------------|-------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Miscellaneous Interior Samples: | | |
| 01 | Ranch House/ Hall 201 - floor between balusters | -wood substrate -bet. 7.5YR 5/6 & 10YR 5/6, +* (mid-tone yellow/brown) -10YR 2/2, -, possibly a thin clear coat -2.5Y 6/2, + -bet. 10YR 5/4 & 2.5Y 5/4, -, thinned paint |
| 02 | Ranch House/South Rm. 202 - baseboard in closet | -wood substrate -5YR 6/4, +* (mid-tone, soft red/brown) -bet. 5YR 2/4 & 7.5YR 5/4, +, glaze, 1 to 2 coats* |
| 03 | Ranch House/West Rm. 204 - floor at west wall floor vent | -wood substrate -7.5YR 4/2, -, worn & dark in areas* |
| Ranch House Exterior Samples: | | |
| 04 | Roof trim molding | -tin substrate -10Y 9/1, + -5GY 9/1, + -5Y 9/2, - -aluminum paint, - -5Y 8.5/4, +•(mid-tone yellow) -5Y 8/4, + -5Y 9/1, + -N9.25, +, possibly 2 coats -7.5R 3/6, - -N9.25, - |

| | | |
|----|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 05 | Roof standing seam | -copper substrate -10R 3/6, -(deep red/brown) -10Y 9/1, + -7.5R 3/8, - -7.5R 3/6, - -7.5R 3/6, - -10R 3/6, - -7.5R 3/8, - -dirt |
| 06 | Dormer panel | -wood substrate -10R 3/6, trace stains (20%)* (deep red/brown) -5GY 9/1, -, pitted -dirt -5Y 9/2, - -N9.5, - -10Y 9/1, -, traces of dirt (5%) |
| 07 | Dormer trim/casing | -wood substrate -7.5YR 2/4, trace stains (15%)* (dark brown) -5Y 7/1, + -5Y 8/1, + -10Y 8/1, + -dirt, -, even film -5Y 9/2, + -dirt, -, even film -5Y 8.5/4, +●(mid-tone yellow) -5Y 8/4, + -N9.5, + -10Y 9/1, + -7.5R 3/6, traces (5%) -N9.5, + |

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| | | |
|----|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 08 | Dormer bracket | -wood substrate -10R 3/6, trace stains (10%)* (deep red/brown) -10Y 9/1, traces (25%) -10R 3/6, -, (75%) -5Y 7/1, + -5Y 8/1, + -10Y 8/1, + -2.5G 4/4, - traces (5%) -aluminum paint, - -5Y 8.5/4, +●(mid-tone yellow) -5Y 9/2, + -N9.5, + -dirt, -, even film -aluminum paint -7.5R 3/6, traces (5%) -5GY 9/1, - -N9.5, + -7.5R 3/8, - -N9.5, + |
| 09 | Roof cornice | -tin substrate -dirt, -, even film -10R 6/14, - -5Y 9/2, + -N9.5, - -5Y 8.5/4, +●(mid-tone yellow) -dirt, -, even film -5Y 8/4, + -5GY 9/1, - -N9.5, + |
| 10 | Roof cornice/soffit | -tin substrate -dirt, -, even film -10R 6/14, - -5Y 9/2, + -N9.5, - -5Y 8.5/4, +●(mid-tone yellow) -10Y 9/1, + -N9.5, + |

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| 11 | Roof cornice/bracket face | -tin substrate -dirt, -, traces -2.5Y 8.5/2, + -2.5Y 6/4, -*(mid-tone yellow/brown) -2.5Y 8.5/2, - -2.5Y 8/2, - -dirt, -, even film -10Y 9/1, -, traces (5%) -10R 6/14, - -5Y 9/2, + -dirt, -, even film -5Y 9/2, - -5Y 8.5/4, +●(mid-tone yellow) -5Y 8.5/4, + -10Y 9/1, - -N9.5, - |
| 12 | Roof cornice/bracket side | - same as sample #11 |
| 13 | Window 106/sash - bottom/north | -wood substrate -7.5YR 2/4, trace stains (10%)* (dark brown) -5Y 9/1, - -2.5Y 9/2, + -5Y 8.5/4, +●(mid-tone yellow) -10Y 9/1, - -10Y 9/1, - |
| 14 | Door 101 (double)/stile - beneath stop/north door | -wood substrate -amber varnish, -* -amber to black varnish, + -7.5YR 3/2 pigmented varnish, + |

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Historic Structures Report

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| 15 | Porch parapet wall - recessed panel/north | -tin substrate -N9.5, -, traces (2.5%) -10Y 9/1, -, soiling -10R 6/14, - -5Y 9/2, + -5Y 8.5/4, -●(mid-tone yellow) -5Y 9/2, - -10Y 8/1, + -bet. N8.25 & N5.25, ++ -N9.5, - |
| 16 | Porch parapet wall - panel molding/north | -tin substrate -dirt, -, even film -10R 6/14, + -5Y 9/2, + -5Y 8.5/4, +●(mid-tone yellow) -5Y 9/2, - -N9.5, + -N1.25, + |
| 17 | Porch parapet wall - wall field/north | -tin substrate -N9.5, -, traces -aluminum paint, -, traces (30%) -10R 6/14, + -5Y 9/2, + -5Y 8.5/4, +●(mid-tone yellow) -5Y 9/2, - -N9.5, + |
| 18 | Porch parapet wall - cap/north | -tin substrate -same chromachronology as sample #17 |
| 19 | Porch parapet wall - ogee molding/north | -tin substrate -same chromachronology as sample #17 |
| 20 | Porch parapet wall - base molding/north | -tin substrate -same chromachronology as sample #17 |

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| 21 | Window 108 - casing/left side | -wood substrate -10R 3/6, +, traces (33%)* (deep red/brown) -5Y 9/2, - -2.5Y 8.5/2, - -5Y 9/2, - -5Y 8.5/4, +●(mid-tone yellow) -5Y 8/1, + -N9.5, - |
| 22 | Door 101 - jamb/south side | -wood substrate -10R 3/6, -, traces (20%)* (deep red/brown) -5Y 9/2, - -2.5Y 8.5/2, - -5Y 8.5/4, +●(mid-tone yellow) -5Y 8/1, - -10Y 9/1, + -N9.5, - |
| 23 | Door 101 - casing/south side | -wood substrate -2.5Y 7/4, -*(soft yellow/brown) -10R 3/6, + -2.5Y 8.5/2, + -5Y 9/1, - -5Y 8.5/4, +●(mid-tone yellow) -10Y 9/1, + -N9.5, - |
| 24 | Front porch - ceiling/north side of center | -wood substrate -7.5YR 2/4, -*(dark brown) -10Y 8/1, -, traces (2.5%) -5Y 8.5/4, +●(mid-tone yellow) -5Y 9/1, - traces (5%) -10Y 9/1, + -N9.5, - |

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 Historic Structures Report

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| 25 | Front porch - inside fascia/north side | -wood substrate -5Y 8/2, + -dirt, -, even film -bet. 5Y 5/1 & N5, + -N6.75, - -5Y 7/1, - -5Y 9/2, - -5Y 8.5/4, +●(mid-tone yellow) -5Y 9/1, - -5Y 9/2, + -N9.5, + |
| 26 | Front porch - soffit/north side | -wood substrate -2.5Y 8.5/2, + -5Y 8.5/4, +●(mid-tone yellow) -5Y 9/1, - -5Y 9/2, + -N9.5, - |
| 27 | Front porch - column bracket/face/north | -wood substrate -7.5YR 2/4, -, traces & staining* (dark brown) -2.5Y 7/4, -, traces (2.5%) -10Y 9/1, -, traces (33%) -5Y 8.5/4, +●(mid-tone yellow) -5Y 9/1, - -5Y 9/2, + -N9.5, - |
| 37 | Front porch - column bracket/panel/north | -wood substrate -same chromachronology as sample #27 |
| 28 | Front porch - column/top/north | -wood substrate -same chromachronology as sample #26 |
| 29 | Front porch - column/top molding/north | -wood substrate -same chromachronology as sample #26 |

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| 30 | Front porch -column/lower molding/north | -wood substrate -same chromachronology as sample #26 |
| 31 | Front porch - column/main shaft/north | -wood substrate -same chromachronology as sample #26 |
| 32 | Front porch - column/rosette/north | -wood substrate -10YR 2/2, -, traces & staining* (dark brown) -same chromachronology as sample #26 -N1.25, - |
| 33 | Front porch - cornice/cove/north | -tin substrate -7.5GY 3/4, + -same chromachronology as sample #26 |
| 34 | Front porch - cornice/dentil recess/north | -tin substrate -2.5Y 8.5/2, + -10Y 9/1, - -5Y 8.5/4, +•(mid-tone yellow) -10Y 9/1, + -N9.5, - |
| 35 | Front porch - cornice/dentil face/north | -tin substrate -2.5Y 5/4, +, traces (20%)* ((deep yellow/brown) -N4.5, + -2.5Y 8.5/2, + -10Y 9/1, -, traces (5%) -5Y 8.5/4, +•(mid-tone yellow) -10Y 9/1, + -N9.5, + |

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Historic Structures Report

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| 36 | Front porch - cornice/outer fascia/north | -tin substrate -same chromachronology as sample #34 |
| 37 | Front porch - column/bracket panel/north | -see listing above following sample #27 |
| 38 | Rear porch - molding at roof/west | -wood substrate -dirt, traces (10%) -2.5Y 8.5/2, + -10Y 9/1, - -5Y 8.5/4, +●(mid-tone yellow) -10Y 9/1, + -dirt, -, even film -2.5Y 8.5/2, + -N9.5, + |
| 39 | Rear porch - fascia/west | -wood substrate -same chromachronology as sample #38 |
| 40 | Rear porch - soffit/west | -wood substrate -10R 3/6, trace staining (50%)* (deep red/brown) -N9.5, -, traces (10%) -5Y 9/2, - -2.5Y 8.5/2, + -10Y 9/1, - -5Y 8.5/4, +●(mid-tone yellow) -10Y 9/1, + -dirt, -, even film -2.5Y 8.5/2, + -N9.5, + |

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| 41 | Rear porch - clapboard/west | -wood substrate -2.5Y 6/4, +* (mid-tone yellow/brown) -10Y 9/1, + -5Y 9/2, + -5Y 8.5/4, +●(mid-tone yellow) -10Y 9/1, + -dirt, -, even film -2.5Y 8.5/2, + -N9.5, + |
| 42 | Rear porch - molding below drip edge | -wood substrate -2.5Y 8.5/2, + -10Y 9/1, - -5Y 8.5/4, +●(mid-tone yellow) -N9.5, -, traces (10%) -10Y 9/1, + -N9.5, - |
| 43 | Rear porch - fascia above windows/west | -wood substrate -10R 3/6, -, trace staining (20%)* (deep red/brown) -N9.5, -, traces (5%) -5Y 8/1, + -5Y 8.5/4, +●(mid-tone yellow) -10Y 9/1, + -2.5Y 8.5/2, + -N9.5, + |
| 44 | Rear porch - door & window casing/west | -wood substrate -same chromachronology as sample #42 |
| 45 | Rear porch - door & window sill/west | -wood substrate -same chromachronology as sample #42 |

Tallgrass Prairie National Preserve
Historic Structures Report

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| 46 | Rear porch - beadboard/west | -wood substrate -10R 3/6, -, trace staining (15%)* (deep red/brown) -2.5Y 6/4, +*(?) -10Y 9/1, + -5Y 9/2, + -5Y 8.5/4, +●(mid-tone yellow) -10Y 9/1, + -dirt, -, even film -2.5Y 8.5/2, + -N9.5, + |
| 47 | Rear porch - skirting/south | -wood substrate -5Y 8/1, + -10Y 8/1, + -5Y 8.5/4, +●(mid-tone yellow) -5Y 9/2, + -N9.5, + -7.5R 3/6, - -5GY 9/1, - -N9.5, + |
| 48 | Door 206A - stile | -wood substrate -2.5Y 8.5/2, +, traces (20%) -5Y 9/2, + -5Y 8.5/4, +●(mid-tone yellow) -10Y 9/1, + -dirt, -, even film -2.5Y 8.5/2, + -N9.5, + |
| 49 | Door 202B – interior/exterior - stile | -wood substrate -5Y 8/2, -, traces (75%) -5YR 6/4, -* (mid-tone yellow/brown) -5Y 8/2, + -5YR 2/4, +, glaze |

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| 50 | Door 202B – interior/exterior - casing/south | -wood substrate -10R 2/4, -* (dark red/brown) -dirt, -, traces (33%) -5Y 8/2, + -5YR 2/4, +, glaze |
| 51 | Door 202B – interior/exterior - casing/ ¾ round/south | -wood substrate -10R 3/6, -* (deep red/brown) -5Y 5/1, -, traces (10%) -5Y 8/2, + -5YR 2/4, +, glaze |
| Curing Room Exterior Samples | | |
| 52 | Soffit molding/outer/south | -wood substrate -10R 2/4, +* (dark red/brown) -dirt, traces (10%) -10Y 9/1, + -dirt, -, even film -aluminum paint -dirt, -, even film -N9.5, + |
| 53 | Soffit flat surface/south | -wood substrate -same chromachronology as sample #52 |
| 54 | Soffit molding/inner/south | -wood substrate -same chromachronology as sample #52 |
| 55 | Door jamb/casing/west | -wood substrate -10R 2/4, +*(dark red/brown) -10R 3/6, + -5GY 6/2, +●(mid-tone green) -10Y 9/1, - -5Y 9/2, - -10Y 9/1, - -N9.5, - |

Tallgrass Prairie National Preserve
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| 56 | Door panel - left side/west | -wood substrate -same chromachronology as sample #55 |
| Outhouse Exterior Samples | | |
| 57 | Door/south | -wood substrate -same chromachronology as sample #55 |
| 58 | Door/casing/south | -wood substrate -same chromachronology as sample #55 |
| 59 | Door/casing - ¾ round/south | -wood substrate -same chromachronology as sample #55 |
| 60 | Window/sash/west | -wood substrate -same chromachronology as sample #55 |
| 61 | Window/casing/west | -wood substrate -same chromachronology as sample #55 |
| 62 | Window/casing - ¾ round/west | -wood substrate -same chromachronology as sample #55 |
| 63 | Cornice/ogee/west | -wood substrate -same chromachronology as sample #52 |
| 64 | Cornice/vertical flat/west | -wood substrate -same chromachronology as sample #52 |
| 65 | Cornice/soffit/west | -wood substrate -same chromachronology as sample #52 |

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| 66 | Cornice/fascia/west | -wood substrate -same chromachronology as sample #52 |
| Icehouse Exterior Samples | | |
| 67 | Window/sash/north | -wood substrate -10R 2/4, -, trace staining (5%)* (dark red/brown) -5Y 9/2, + -dirt, -, even film -5Y 9/2, - -N9.5, + |
| 68 | Window/casing/north | -wood substrate -5Y 9/2, - -N9.5, + |
| 69 | Cornice/fascia/north | -wood substrate -5Y 9/2, + -dirt, -, even film -aluminum paint, - -10Y 9/1, - -N9.5, - |
| 70 | Cornice/soffit/north | -wood substrate -5Y 9/2, + -dirt, traces (5%) -10Y 9/1, - -N9.5, - |
| Carriage House Exterior Samples | | |
| 71 | Roof/rafter/west | -wood substrate -N9.25, - -5Y 8/1, + -10Y 9/1, ++ -N9.5, + -10Y 8/1, + -N9.5, - |
| 72 | Roof/soffit/north | -wood substrate -same chromachronology as sample #71 |

Tallgrass Prairie National Preserve
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| 73 | Clapboard/north | -wood substrate -10R 2/4, -, trace staining (15%)* (dark red/brown) -5GY 6/2, +●(mid-tone green) -10Y 9/1, + -N9.5, + -10Y 9/1, - -N9.5, - |
| 74 | Window/casing/north | -wood substrate -5Y 8/1, ++ -N9.5, - -10Y 9/1, ++ -N9.5, + -10Y 8/1, + -N9.5, - |
| 75 | Window/sash/north | -wood substrate -5Y 8/1, ++ -N9.5, - -10Y 9/1, ++ -N9.5, + -10Y 8/1, + -N9.5, - |
| Poultry House Exterior Samples | | |
| 76 | Door/east | -wood substrate -10R 2/4, -, trace staining (25%)* (dark red/brown) -10Y 9/1, - -5Y 9/2, + -10Y 9/1, + -N9.5, + |
| 77 | Door/casing/east | -wood substrate -10R 2/4, -, trace staining(5%)* (dark red/brown) -5Y 9/2, + -10Y 9/1, + -N9.5, + |

Barn Exterior Samples

| | | |
|----|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| 78 | South utility door - 1 st floor/east | -wood substrate -10R 3/6, +* (deep red/brown) -5Y 9/2, + -10Y 9/1, + -10Y 9/1, + -N9.5, + |
| 79 | Utility door - 1 st floor/west | -wood substrate -10R 3/6, +* (deep red/brown) -5Y 9/2, + -10Y 9/1, - -N9.5, + |
| 80 | Window/sash - 1 st floor/west | -wood substrate -5Y 8/1, ++ -N9.5, - -10Y 9/1, ++ -N9.5, + -10Y 8/1, + -N9.5, - |
| 81 | Window/casing - 1 st floor/west | -wood substrate -10Y 9/1, - -5Y 9/2, - -10Y 9/1, ++ -N9.5, - |
| 82 | Utility door - 2 nd floor/north | -wood substrate -10R 3/6, -* (deep red/brown) -5Y 9/2, - -10Y 9/1, ++ -N9.5, + |

Tallgrass Prairie National Preserve
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| 83 | Utility door/casing - 2 nd floor/north | -wood substrate -5Y 8/1, ++ -N9.5, - -dirt, -, even film -10Y 9/1, + -N9.5, - -10Y 8/1, + -N9.5, - |
| 84 | Cupola/rafter | Not sampled. |
| 85 | Cupola/soffit | Not sampled. |
| 86 | Cupola - clapboard/south | -wood substrate -N9.5, - -dirt, - -5Y 8/1, - -N9.5, + -10Y 9/1, + -5Y 8/1, -- -10Y 8/1, + -dirt, -, even film -N9.5, - |
| 87 | Cupola - window/casing/south | -wood substrate -10Y 9/1, - -5Y 9/2, + -10Y 9/1, ++ -10Y 8/1, - -dirt, - -10Y 8/1, + -N9.5, + |
| 88 | Cupola - window/sash/south | Not sampled. |

Ranch House Miscellaneous Samples

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| 89 | Exterior - stone mortar joint - south of door 101/east | -mortar substrate -N1.75, - |
| 90 | Exterior - window screen - stored in barn | -wood substrate -7.5GY 3/4, + -N1.5, + -aluminum paint, - |
| 91 | Miscellaneous Paint – (roof?) - Sample found in grass | -no substrate -7.5Y 6/6, -, traces (30%) -10GY 4/4, - -aluminum paint, - -2.5G 2/2, ++ -5Y 9/1, + -10R 3/6, + -dirt, -, even film |
| 92 | Miscellaneous Paint - Sample removed from can Salvaged from dump | -10GY 4/4 |
| Ranch House Interior Samples | | |
| 93 | Room 101 - ceiling | -plaster substrate -N9.5, - -10Y 9/1, + |
| 94 | Room 101 - crown molding | -plaster substrate -2.5PB 8/4, + (C/D)* -5B 8/2, - (C/D)* |
| 95 | Room 101 - wall/above pict. rail | -plaster substrate -5B 8/2, trace staining (15%)* -10Y 9/1, + -lining paper, + |

*Tallgrass Prairie National Preserve
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| 96 | Room 102 - ceiling | -plaster substrate -2.5Y 8/4, - (C/D)* -bet. 10YR 7/6 & 2.5Y 7/6, - |
| 97 | Room 102 - crown molding | -plaster substrate -5B 8/2, +* -bet. 10YR 7/6 & 2.5Y 7/6, + |
| 98 | Room 102 - upper wall | -plaster substrate -7.5YR 8/2, + -fine gypsum compound, ++ -5Y 9/2, + |
| 99 | Room 103 - ceiling | -plaster substrate -bet. 10YR 7/6 & 2.5Y 7/6, -* -N9.5, - -5Y 9/2, + |
| 100 | Room 103 - crown molding | -plaster substrate -same chromachronology as sample #97 |
| 101 | Room 103 - upper wall | -plaster substrate -2.5Y 8/4, + -7.5YR 8/2, + |
| 102 | Room 104 - ceiling | -plaster substrate -2.5Y 8/2, + -2.5Y 8.5/2, + -10BG 7/2, + |
| 103 | Room 104 - wall | -plaster substrate -same chromachronology as sample #102 |

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| 104 | Room 105 - ceiling (removed from above drop ceiling) | -plaster substrate -2.5Y 8/4, + -2.5Y 8.5/2, + |
| 105 | Room 105 - wall | -plaster substrate -2.5Y 8/4, + -10YR 8/4, + |
| 106 | Room 105 - stair tread (complete) | -wood substrate -5Y 9/2, - -10R 3/6, -* -7.5YR 6/2, + -10Y 9/1, - -10YR 4/4, + -7.5YR 4/6, + |
| 107 | Room 105 - stair/balustrade | -wood substrate -5Y 9/2, - -10YR 8/4, +* -10YR 7/6, + |
| 108 | Room 105 - stair/balustrade/cap | -wood substrate -5Y 9/2, - -10YR 8/4, +* -10YR 4/4, +* |
| 109 | Room 201 - ceiling | -plaster substrate -N9.5, + -10Y 9/1, + |
| 110 | Room 201 - crown molding | -plaster substrate -7.5YR 7/4, +* -bet. 10YR 7/6 & 2.5Y 7/6, -* -2.5Y 8/4, + |

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| 111 | Room 202 - ceiling | -plaster substrate -N9.5, + -2.5Y 8.5/2, + |
| 112 | Room 202 - crown molding | -plaster substrate -7.5YR 7/4, +* -2.5Y 8/4, + |
| 113 | Room 202 - upper wall | -plaster substrate -same as sample #111 |
| 114 | Room 202 - picture mould | -plaster/gesso substrate -10YR 7/4, +* -7.5YR 2/4, +, glaze* |
| 115 | Room 203 - ceiling | -plaster substrate (10YR 8/2) -N9.5, + -2.5Y 8.5/2, + |
| 116 | Room 203 - crown molding | -plaster substrate -7.5YR 7/4, +* -2.5Y 8/4, +* |
| 117 | Room 203 - upper wall | -plaster substrate -N9.5, + -2.5Y 8.5/2, + |
| 118 | Room 203 - picture mould | -plaster/gesso substrate -10YR 7/4, +* -7.5YR 2/4, +, glaze* |
| 119 | Room 204 - ceiling | -plaster substrate -N9.5, + -2.5Y 8.5/2, + |

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| 120 | Room 204 - crown molding | -plaster substrate -5GY 7/2, +* -10YR 8/2, + |
| 121 | Room 204 - upper wall | Insufficient data. |
| 122 | Room 204 - picture mould | Insufficient data. |
| 123 | Room 205 - ceiling | Same as sample #118. |
| 124 | Room 205 - wall | Not sampled. |
| 125 | Room 206 - ceiling | -plaster substrate -7.5YR 8/4, -* -2.5Y 8/4, -* |
| 126 | Room 206 - wall | -plaster substrate -same as sample #125 |
| 127 | Room 206 - baseboard | -wood substrate -10Y 6/1, +* -dirt, traces (10%) -N9.5, - -2.5Y 8.5/2, + |
| 128 | Room 207 - ceiling | -wood substrate -5Y 7/1, +* -2.5Y 8.5/2, + |
| 129 | Room 207 - window & door/casing | -wood substrate -5Y 5/1, +* -5GY 5/1, - -10Y 9/1, + |

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| 130 | Room 207 - beadboard | -wood substrate -same as sample #128 |
| 131 | Room 301 - ceiling | -plaster substrate -N9.5, - -5Y 9/2, + |
| 132 | Room 301 - ceiling/skylight molding | -wood substrate -10Y 9/1, - -bet. 5Y 7/1 & 5Y 8/1, +* |
| 133 | Room 301 - crown molding | -plaster substrate -2.5Y 8.5/2, + -dirt, -, even film -10YR 7/6, + |
| 134 | Room 302 - ceiling | -plaster substrate -N9.5, - -7.5YR 8/2, - |
| 135 | Room 302 - crown molding | -plaster substrate -5YR 7/4, +, traces (75%)* -2.5Y 8/4, +, traces (50%)* |
| 136 | Room 303 - ceiling | -plaster substrate -N9.5, - -7.5YR 8/2, - |
| 137 | Room 303 - crown molding | -plaster substrate -5YR 7/4, +* -2.5Y 8/4, +* |
| 138 | Room 304 - ceiling | Insufficient date: new drywall. |

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| 139 | Room 304 - crown molding | -plaster substrate -5YR 7/4, +* -7.5YR 6/2, +* |
| 140 | Room 301 - stair tread | -wood substrate -10Y 9/1, -* -5YR 6/4, +* -bet. 7.5YR 2/2 & 7.5YR 2/4, +* -7.5YR 2/2, -, pigment glaze/varnish |

G. Sample Location Drawings

See Appendix B: Drawings – Existing Conditions.

Tallgrass Prairie National Preserve
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Appendix D: Lead Paint Analysis Report

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Appendix E: Terracon Cistern Coring Report

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Appendix F: List of Historic Buildings/Structures

Tallgrass Prairie National Preserve
Historic Structures Report

TALLGRASS PRAIRIE NATIONAL PRESERVE
LIST OF HISTORIC BUILDINGS/STRUCTURES

Definitions:

AS Archeological Site. Item or structure that has archeological significance that is located below the surface of the ground.

Kansas State Historical Society (KSHS). Numbers assigned by the KSHS to archeological sites. The number includes three sections. First two characters (14) identify Kansas, second two characters (CS) identify Chase county, and fifth character identifies individual/agency that found and submitted the site. 100 series identifies federal agencies, 300 series identifies KSHS, and 400 series identifies other individuals. This number is to be included in the List of Classified Structures database in the alternate name data field.

HS Historic Structure. Item or structure that has and is maintained due to cultural or historical significance. These items or structures are located on the surface of the ground. **DO NOT identify items or structures that are not government property unless approved by the National Park Trust (NPT).**

Parks geographic numbering locations. 100 series- Spring Hill/Z Bar Ranch site, 200 series- Fox Creek School site, 300 series- Lantry "Deer Park" site, 400 series- other preserve areas located west of State Highway 177, and 500 series- other preserve areas located east of State Highway 177.

Directions used for identifying and numbering of items or structures.

1. Item or structure that is to be maintained due to its cultural or historic significance.
2. Similar features in one location (i.e., mortared stone retaining walls at Ranch House, wooden corral fences at barn).
3. Feature that shares boundary between two locations (i.e., loose laid stone fence between the Gas House and Windmill Pastures)

| | |
|-------|---------------------------------------------------------------------------------|
| HS101 | Ranch house |
| HS102 | Stone fountain in front lawn of ranch house |
| HS103 | Stone steps and front walkway from old roadway to front porch of ranch house |
| HS104 | Terraced lawn areas around ranch house |
| HS105 | Mortared stone retaining walls around ranch house |
| HS106 | Loose laid stone fences around ranch house and headquarters area |
| HS107 | Curing room/summer kitchen and spring house (two story structure) |
| HS108 | Tunnel passage from ranch house to spring house |
| HS109 | Outhouse |
| HS110 | Barn |
| HS111 | Silo |
| HS112 | Stone corrals near barn |
| HS113 | Mortared stone retaining walls near barn |
| HS114 | Shed #3 at northwest corner of stone corrals near barn |
| HS115 | Wood corrals south of barn |
| HS116 | Scale house (small 6'X6' metal shed—within wood corrals south of barn) |
| HS117 | Chute shed at southwest corner of wood corrals south of barn |
| HS118 | Carriage house |
| HS119 | Poultry house |
| HS120 | Scratch shed |
| HH121 | Shed #1 (first shed west of scratch shed—stone walls and metal roof) |
| HS122 | Shed #2 (second shed west of scratch shed—wood frame and metal siding and roof) |

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| HS123 | Ranchhand house |
| HS124 | Quonset hut foundation |
| HS125 | Icehouse |
| HS126 | Cistern near ice house |
| HS127 | Spring box |
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| HS201 | Lower Fox Creek schoolhouse |
| HS202 | Water well and pump |
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| HS301 | Barn |
| HS302 | Poultry house |
| HS303 | Tack barn |
| HS304 | Earth bermed flood control structure |
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| | |
| HS401 | Stone fences in West Branch Pasture |
| HS402 | Stone fences in Gas House Pasture |
| HS403 | Stone fence (constructed east to west) between Gas House and Windmill Pastures |
| HS404 | Stone fence (constructed north to south) between Windmill and West Traps Pastures |
| HS405 | Stone fences in West Traps Pastures |
| HS406 | Stone fence (constructed east to west) between Windmill and Red House Pastures |
| HS407 | Stone fences Red House Pastures |
| HS408 | Red House ruins |
| HS409 | Red House spring box |
| HS410 | Red House barn foundation |
| HS411 | Red House corrals (wire fence with wood posts) |
| HS412 | Stone fence (constructed east to west) between Red House and Crusher Hill Pastures. |
| HS413 | |
| HS414 | |
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| HS501 | Well house #1 |
| HS502 | Well house #2 |
| HS503 | Railroad spur |
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| AS14CS 104 | |
| AS14CS 105 | |
| AS14CS 106 | Spring Hill Ranch headquarters site |
| AS14CS 107 | |
| AS14CS 108 | |
| AS14CS 109 | |
| AS14CS 110 | |
| AS14CS 111 | Red House site |

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|---------------|------------------------------|
| AS14CS 112 | Lower Fox Creek school site |
| AS14CS 113 | Railroad spur/stockyard site |
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| AS14CS 405 | |
| AS14CS 406 | |
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Appendix G: Class B Cost Estimate

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Appendix H: Kansas Geological Survey Report

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