

Historic Structure Report: Architectural Data
Pipe Spring National Monument
Fredonia, AZ

Prepared for the National Park Service
January, 2014

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1.0 Executive Summary

Significant for its abundant springs in the otherwise arid landscape of the Arizona Strip, the land and particularly the water of Pipe Spring National Monument have historically been both a necessity and later a source of conflict for the Native American community and monument owners.¹ An early Mormon homestead and tithing ranch of the West, Pipe Spring's forty-acre property presently resides within the Kaibab Band of Paiutes Indian Reservation. Upon its establishment as a cattle ranch in the 1860s, the site expanded by 1872 with the construction of three sandstone structures, erected into the natural slope of the land, while two ponds and a retaining wall were placed just outside the main structure's fortified walls (Figure 1.1). Two cabins flank the main Fort complex (or Winsor Castle), which consists of two parallel buildings enclosed by a large sandstone wall, originally designed to be defensible in anticipation of an Indian attack (Figure 1.2).

During the ensuing years, with the threat of attack subsiding after the 1870 treaty at Fort Defiance, Pipe Spring served as a site for production of goods to support the construction of nearby St. George Temple. Following the temple's 1877 completion, the latter half of the nineteenth century was defined by changes in ownership, size, and function. The numerous owners and residents at this time triggered a series of alterations and the restructuring of the Fort's interior and exterior spaces. What was originally conceived as a fortified structure evolved into a more habitable residence with the removal of the protective gates, insertion of windows and doors, and the reconfiguration of several rooms. This period of alteration was succeeded by a lapse in care of the larger site during the early twentieth century. By the time the National Park

¹ Kathleen L. McKoy, *Cultures at a Crossroads: An Administrative History of Pipe Spring National Monument*, U.S. Department of the Interior, National Park Service Intermountain Region (Denver: Colorado, 2000), 189.

Service acquired the land and its buildings in 1923 for its inclusion as a national monument, extensive deterioration to the cabins and Fort had been sustained.

The first few decades of the park's ownership were characterized by heavy restoration efforts to partially reconstruct both cabins and reinstate the Fort to its original appearance. By 1930 the cabins had been reroofed with a system of pine stringers and cedar poles covered with cedar bark and soil, and several structural and secondary components of the Fort's exterior had been replaced, with significant interior work awaiting restoration. By 1959, however, the final phase of NPS's rehabilitation plan had been completed, and the Fort's interior and exterior was definitively reverted back to what was believed to be its early ranching appearance. Once the physical restoration of the buildings ceased, the park entered into a maintenance phase that has continued to the present day with the goal of preserving and interpreting the site's historic structures and landscape.

Part of this preservation and interpretation effort includes the continued research and investigation of the site's history and physical fabric. Although the circuitous route of the Fort's construction and adaptation to its restoration was generally well documented following the park's acquisition of the property, records prior to this period of ownership remain sparse. Personal recollections, journals, and memoirs provide few written descriptions of the interior room configurations and accounts of several early alterations. Even with a large body of research already undertaken since the initial HABS survey and including the historic data section of a historic structures report, archaeological survey, cultural landscape inventory, and administrative history, the fragmented documentation of the site's earliest period has prevented the compilation of a holistic record of the buildings' evolution.

This current phase of research supplements primary and secondary written and graphic sources relevant to the site's history. Through onsite investigations of the physical fabric conducted by the Architectural Conservation Laboratory (ACL) of the University of Pennsylvania's School of Design, a more accurate account of original construction methods, areas and periods of alteration, and extent of restoration has been established. Presented in the body of this research and outlined in the management summary below are the products of these investigations and include: ortho-rectified elevation photographs; plan, section, and elevation drawings; condition survey and assessment; construction and mortar survey; door and window schedule; annotations of construction details; and nail and molding typologies. The synthesis of these historical and physical investigations has resulted in the development of a highly detailed chronology of the site's evolution which comprises this Architectural Data Section of the Pipe Spring Historic Structures Report.

2.0 Description of Structures

2.1 Fort

Completed in 1872 under the direction of Brigham Young, President of the Church of Jesus Christ of Latter-day Saints, the Fort was sited over one of the region's much sought after springs to provide its residents with a continual source of water within the desert landscape. Built into the slope of a hill, it also created a strongly defensible structure to protect its early Mormon occupants (Figure 2.1). Local red sandstone brought to the site on a juniper log sledge driven by oxen was laid in a lime mortar to create substantial walls approximately thirty inches in

thickness.² In plan, two buildings with shake roofs and wooden balconies flank a central courtyard, with large stone walls and heavy timber gates enclosing the central space (Figures 2.2 and 2.3). The two-story north (or upper) building was constructed with its lower level largely below grade at the north. While the spring flowed under the upper building, it fed into the west room of the two-story south (or lower) building and continued through the Fort complex to two retaining ponds.

On the interior, two rooms comprised the lower level of both buildings. In the lower building, solid masonry walls defined the spaces, and these rooms functioned as cool areas for food storage and production (Figure 2.4). The original design included exposed joists and flooring above with a trapdoor providing access from the lower to upper level, plaster finishes on the walls, and (likely) dirt flooring in the cheese room and stone slabs comprising the spring room floor. Three windows provide light into the space from the north, and one door within the spring room opens to the courtyard, while a second door offers access to the cheese room. The door casings are simple and unadorned, and the windows lack any decorative element. Similarly, a fireplace in the cheese room functioned for cooking and heat.

Upstairs, two partition walls created three identical spaces that served as bedrooms and a telegraph office (Figure 2.5). As all other upper level rooms, gun ports face outward for defense (Figure 2.6), and windows open inward to the courtyard balcony. A central doorway affords access from the courtyard balcony to the middle room, where entry to the other rooms is granted through passageways in the east and west walls. The plaster and lath partition walls and plastered exterior masonry walls are finished with baseboards, picture moldings on the courtyard and partition walls, and door and window casings. The lower building lacks many of the moldings

² A Berle Clemensen, Historic Structure Report – History Data Section, Pipe Spring National Monument (Denver, CO: Department of the Interior, National Park Service, Denver Service Center, 1980, unpublished draft): 9.

common to its northern counterpart (such as first floor baseboards, picture moldings, and window casings), and its overall detailing is much more simplistic in design. The upper level window casings, however, contain a distinctively delicate beading, similar to those of the northwest bedroom.

The upper building exhibits greater uniformity in its moldings throughout its first and second floors, although the structure's formal space contains more extensive woodwork. In the Fort's public areas for dining and entertainment, the builders present greater efforts and workmanship in the cabinets and fireplace surrounds. These original features within the parlor and kitchen demonstrate a higher degree of craftsmanship in their hand planing and pegged construction than any other features in the Fort complex. In these rooms, as well as the upper level, the additional decoration from beveled backbands adorns the window and door casings. Each room opens to the courtyard to create symmetry with the rooms above. A passageway through the interior masonry wall provides access between rooms and, through its large, hand-planed and chamfered reveals, demonstrates a similar detailing characteristic of the Fort's original moldings. With much of the rooms remaining below grade, two windows in each room serve as the light source.

The early addition of the kitchen stair increased circulation through the building to supplement access to the upper level previously gained only through use of the courtyard balconies. Hand-planed beadboard planks extend the length of the opening in the meeting room, and a pegged post provides connection to the railing. Additional exterior access was also provided in the Fort's earliest years through the adjacent doorway in the north wall. As is typical of all rooms within the upper building, the meeting room and northwest bedroom contain picture moldings on the partition and courtyard walls and baseboards that extend around each wall as

well as the stairway. The moldings of the northwest bedroom, however, are smaller in scale and atypical of other rooms within the Fort. Three windows in the meeting room and one in the northwest bedroom allow light to enter the spaces from the courtyard, while gun ports originally offered defensibility along the north, west, and east walls.

2.2 Cabins

With designs to establish a fortified settlement just south of the Utah border where the presence of several springs created a habitable environment within the rocky, barren landscape, Mormon settlers began construction on their ancillary buildings that would temporarily house builders and serve as blacksmithing space during the construction of the site's primary feature—the Fort.

These two cabins, simple in plan and technology, were begun in 1868 with a modest one-room structure containing two south-facing windows and a door, with one fireplace along the east wall. Built of native sandstone blocks and lime mortar, the early structure carved out the hillside and was situated in the slope with its north wall serving as a retaining wall. The log frame roof of the cabins was capped with timber beams and earth, and its floors consisted of dirt. By 1870 a south room, similar in plan and construction, was erected just west of the existing cabin with an alcove connecting the two rooms (Figures 2.7 and 2.8). In the same year, a second two-room cabin was completed to the west of the site to further function as housing for workers (Figure 2.9). This West Cabin consisted of two adjacent rooms with a central fireplace, three south-facing windows and two doors (Figure 2.10). One window faced east and, as at the East Cabin, the north wall served as a retainer for the sloping earth behind.

3.0 Methods of Investigation

The Architectural Conservation Laboratory (ACL) of the University of Pennsylvania's School of Design commenced a program of recording and survey of Winsor Castle (the Fort) and the East and West Cabins in August 2009 that has resulted in a detailed analysis of the buildings' structural and material modifications, as well as the integrity of interior and exterior features.³ In this study, the buildings' development of use has been defined by three periods of significance in order to correlate extant material and the approximate time of creation/modification/alteration ranging from structural to decorative elements. These periods of significance are characterized by the site's ownership and major restoration campaigns, outlined as follows (and expanded below):

- Original Construction and Historic Alterations, Pre-NPS, 1868 to 1922
- NPS Ownership and Early Restoration, 1923 to 1959
- Contemporary NPS Maintenance and Interpretation: 1960 to Present

The methods of investigation relied heavily on previous graphic and written documentation, which were compiled and expanded to create a holistic timeline of change as well as detailed photographic and architectural representations of construction, alterations, and conditions of the structures. Specifically, the HABS documentation of 1940 served as the basis for the current

³ Four field visits were required to document and investigate the fort and cabins. The two initial visits were made to graphically document the structures and occurred July 18-25, 2010 and October 11-23, 2010. John Hinchman, Lauren Drapala, and Yaritza Hernandez were the primary investigators for this phase. A third visit April 18-20, 2011 was made by Frank Matero, John Hinchman, Meredith Keller, Alex Lim, and Yaritza Hernandez to field check the drawing set and conditions and mortar surveys. During the July 2-13 visit by Frank Matero, Meredith Keller, and Kasey Diserens, material investigations of the fort were conducted.

drawing set, with minor revisions required to reflect several changes that have occurred during the sixty-year period. Ortho-rectified photographs of the building exterior and Fort interior elevations were simultaneously completed to provide a more comprehensive resource for survey. From these elevation photographs and updated plan, section, and elevation drawings, and condition, construction, and mortar surveys of the Fort and cabins were conducted and digitized.

Written documentation ranging from personal journals to NPS completion reports supported in-field investigations conducted to measure building use and material change. These investigations established original room configurations; traced the evolution of features such as staircases, interior and exterior doorways, interior molding details, and the removal and erection of partition walls; and led to the production of a series of architectural and material typologies, including a door and window schedule and nail and molding typologies. All graphic and written documentation has been synthesized and is presented in this report to comprehensively confirm and expand the previously established construction history.

3.1 Ortho-Rectified Photography: Fort and Cabins

Orthogonal photographs of each exterior building elevation were captured for use in conjunction with the elevation drawings of the Fort and cabins and as a base document for survey. After establishing a grid with preselected points, each section of the grid was photographed and the points were measured using a total station. The points collected during the survey were imported into AutoCAD, flattened to represent the wall plane, and scaled to actual size. The points were then exported into Adobe Photoshop where each photograph comprising a section of the grid was placed accordingly and rectified to the wall plane. The completed montage was exported for use as the underlying layer in the elevation drawings. The image was also divided into equal

sections, printed, and annotated in the field during the interior and exterior condition, construction, and mortar surveys.

3.2 Plan, Section, and Elevation Drawings: Fort and Cabins

Appendix E

HABS-level documentation was conducted at the Fort and East and West Cabins in order to produce a revised set of plan, section, and elevation drawings. The original HABS drawing set reflects the configuration of the buildings in 1940. Alterations to the Fort made during the various restoration campaigns were captured in the revised set and included the change in elevation between the spring and cheese rooms (*see page 93*); the modification to the courtyard steps leading to the spring room (*see page 56*); the increase in the number of supporting posts of the balconies and catwalk (*see pages 56–57*); the removal of the partition wall in the north building's upper level (*see page 79*); and the closure of the lower building's windows and door added to the south façade in the late nineteenth-century (*see pages 54*). Measurements for the drawings were recorded using a total station, and increased accuracy over the 1940 survey was achieved. The use of the ortho-rectified photographs also allowed the ACL to create an accurate representation of each stone unit and the mortar joints.

3.3 Conditions Survey: Fort and Cabins

Appendix F

Exterior and interior surveys of the Fort and cabins were performed to record conditions affecting the stone and mortar system of all structures, as well as the interior finishes and woodwork of the Fort. Masonry conditions leading to material attrition such as delamination,

differential erosion, alveolar erosion, and loss were noted, as were additive conditions including efflorescence, biogrowth, moisture, crystallization, staining, and overspill of mortar. Instances of cracking and displacement were recorded in individual units (if localized) and within the masonry system to denote structural movement.

With these exterior masonry conditions annotated on field images, the data was drawn onto the elevation drawings in AutoCAD and exported into the ArcGIS-PISP base drawings where a graphic system was designed to best display the information. A system of layers and patterns had been assigned to each condition mapped during the survey. Condition color, line weights, and the underlying ortho-rectified photographs were adjusted to produce a standard for all survey data created for this study and future NPS assessments.

Further conditions were recorded on the interior elevation images and were categorized by material. Efflorescence, surface erosion, soiling, delamination, and pitting were identified in the masonry (specifically in the masonry of the parlor and kitchen fireplaces and stone floor of the spring and cheese rooms). Surface conditions included flaking, staining, blistering, and loss. Animal deposits and damage were found on plaster surfaces and within wood elements, and repaired areas of all materials were noted. As in the exterior survey, localized and structural cracking and displacement were identified.

The ortho-rectified interior elevation images were used for base recording in the field. These images were imported into Adobe InDesign, and simple graphic annotations were overlaid onto the area of condition. Due to continued maintenance practices within the Fort, conditions are minimal and typically localized; consequently, the interior elevations received a coding and symbol system rather than the extensive digitized layering system developed for the exterior masonry walls.

3.4 Construction and Mortar Survey: Fort and Cabins

Appendix F

Drawings of the buildings' morphological evolution and archeological investigations were generated with the same methods used to produce the ArcGIS condition graphics. The construction drawings contain annotations of any documented changes in the building's history as well as general timelines that provide annotations based on archival documents as well as physical investigation (above-ground archaeology). The purpose of these drawings (plans and elevations) is to assemble and identify the most important alterations, additions, and modifications including restoration (further visible in the various mortar campaigns) to the buildings under study in order to supplement this study's written component and allow a comprehensive and easily accessed visual record for park use.

3.5 Door and Window Schedule: Fort and Cabins

Appendix C

A full door and window schedule of the Fort and cabins with measured drawings and photographic documentation of each opening and corresponding hardware has been created. The door and window types have been numbered and classified for quick identification. The schedule includes—in addition to plan, section, and elevation drawings—a written description, variations to the opening type, and any references to the opening found in historic records.

3.6 Onsite Investigations of the Fort

Onsite investigations were conducted in the Fort building after the recording phase. Historic documentation was condensed into a timeline format and used in conjunction with all drawings and ortho-rectified photographs. From these sources, investigations were focused on areas known to be original, areas known to be altered, and areas of possible change. After identifying areas of possible change, the surrounding material was further inspected for evidence of alteration. The nails, molding profiles, and structural systems were compared with original and altered material of various periods to establish possible periods of change. Several features previously believed to be alterations were confirmed and other alterations previously identified as original were established.

These specific changes found through targeted probing included the partition doorway in the lower building's lower level, the upper building stair, and the meeting room moldings and north exterior doorway. All alterations were determined to be of approximately the same period, early in the Fort's history (1875-1895). In the lower building, an investigation of the doorway between the spring and cheese rooms revealed both early and replacement elements (*see Section 7.1.2*). Thought to be an early addition to allow access between rooms where no doorway previously existed, the evidence uncovered in the investigation supports this theory.

Modifications to the floor—specifically changes in flooring and grade—and high moisture levels have caused some of the wooden elements to deteriorate. Replacement pieces were incorporated into the casings, reveals, and soffits, and some early members were moved and reused in the framing.

Of the upper building alterations, the stair is not mentioned as a later addition in historic or contemporary documentation. The investigation of this area confirmed that the original floor

joists had been cut and modified for the installation of the stair early in the Fort's history (*see Section 6.1.3*). At this same time, the adjacent exterior doorway was also installed and has been identified in past records as a possible alteration; the investigations of the exterior masonry and craftsmanship confirmed this possibility (*see Section 6.2*). The picture moldings in this room have been adapted to reflect the change in function (*see Molding Typology below*).

The investigation also confirmed areas of original material. Written records offer some indication of repair and replacement to the Fort's woodwork; however, these records are often vague and lack the detail necessary to identify areas of restoration. Further observations of individual features were recorded to supplement these written histories and distinguish original, early, and recent material (*see below, Annotations of Construction Details*).

3.7 Annotations of Fort Construction Details

Appendix G

During the onsite investigations of the Fort buildings, details within each architectural feature were examined to determine the integrity of the element and to identify change over time. Hand-worked characteristics such as joinery, planing, and finishing were specifically studied for their indication of the element's period of installation. Moldings were inspected for variations in the size and shape of the beads and quirks (full study below), and fasteners were similarly considered for the use of historic cut and modern wire nails (study also below). These characteristics have been annotated on the ortho-rectified elevation photographs and, where possible, the feature's period of significance has been identified. These annotated photographs provide a compilation of data recorded through the nail and molding studies and aid in distinguishing original material from that installed during periods of restoration. Certain features,

however, could not be positively identified and have no attributes noted—an indication that a specific feature requires further investigation.⁴

3.8 Nail Typology: Fort

Appendix H

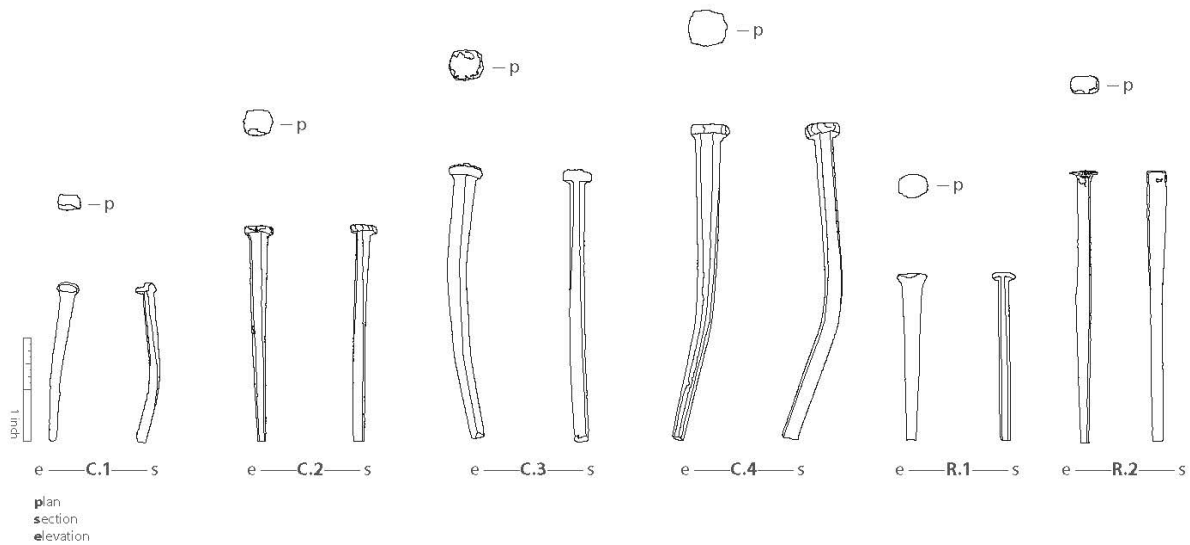
The nails sampled during the onsite analysis of the Fort buildings have been placed into three primary categories: cut, wire, and reproduction. Within these categories, the nails have been further classified according to distinguishing characteristics found on the head and shaft. From this examination, historic cut nails were differentiated from reproduction nails. Although both nail types contain a pinched face, historic nails (fabricated before 1900) are defined by more subtle pinching, slight tapering of the head's underside at the shaft connection, and a curve or beveling of the shaft. Reproduction nails, by contrast, contain a very flat and much less substantial head, distinctive face pinching, and a uniformly flat shaft.

Nails were sampled from moldings and casings believed to be original, altered, and more recently installed or repaired for a range of types and use. Cut nails used in the original construction and early alterations (pre-1900) show no differences in their identifying features and are assumed to be of the same fabrication period. Square cut nails of these original (and presumably early) installations have been identified as being produced by the carpenter and blacksmith Joe Hopkins.⁵ In this typology, early cut nails are further characterized by the size

⁴ The lower building's upper level door casings, in particular, require further research and investigation. Although the partition wall door casings were likely installed during the walls' construction in 1930, the casings may have been salvaged from other areas of the site, reused from a building offsite, or newly fabricated in 1930. Likewise, the casings on the exterior door may not correspond to the original date of the doorway.

⁵ Paul R. Franke, Memorandum to Acting Superintendent, Pipe Spring National Monument, "Furnishing Plan for Pipe Spring Fort," July 10, 1959. United States Department of the Interior.

and shape of the head and size and shape of the shaft. Of the thirteen cut nails sampled, six categories were identified.



CUT NAILS			
Type	Length (inches)	Period	Use
C.1	1.5	Original	103: fireplace molding, beveled backband on door casings
C.2	2	Early Installation (pre-1900)	102: stair risers; 202: baseboards
C.3	2.5-2.63	Early Installation (pre-1900)	102: stair treads; 104: door casings
C.4	3	Early Installation (pre-1900)	104: door casings; 202: altered floorboard; 204: baseboards
R.1	1.5	Unknown	102: beadboard door; 103: Dutchman repair
R.2	2.5	Unknown	204: baseboards

Although the typologies are based solely on length and identifiable features, further evidence of their periods of use and function emerge from their location within the Fort buildings. Comparisons of types are made across elements of the same period, which have been established by the molding profile analysis (below), historic documentation, and onsite investigations. The samples corroborate the periods of construction and show that certain nail

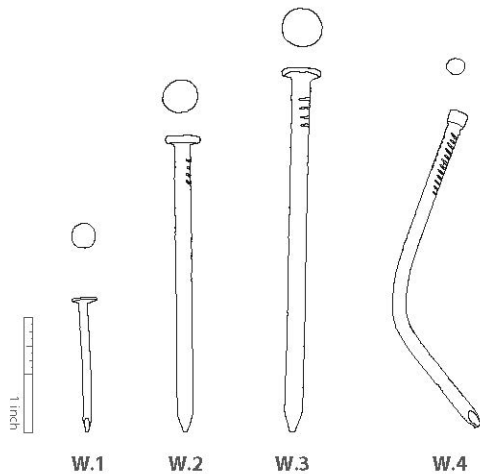
types were used only in original features while other types were also used in early alterations. Reproduction nails do not appear to be restricted to moldings and casings fabricated during the restoration period. These reproduction nails were likely used in minor repair work, such as reattaching loose or temporarily removed moldings, as well as Dutchman repairs (i.e., partial replacement) of the woodwork.

An examination of the nail locations supports the installation dates of various features and suggests that certain alterations were likely contemporary. Type C.1 nails are found within the parlor fireplace surround and applied beveled backband to the door casing on the partition wall—both believed to be original features with no alterations (although these moldings may have been removed for repair with the original nails used in the reattachment). More sampling would be necessary to confirm whether this specific type was used exclusively in original moldings. It is possible that they were not used in any of the early alterations, since their use is generally limited to more delicate or ornamental moldings. No cut finishing nails were observed in the lower building.

The remaining sampled nails—types C.2, C.3, and C.4—were found in features altered at the end of the nineteenth century. These nails, all similar in their characteristics but of variable overall size, were used extensively in the meeting room stair risers, treads, and surrounding baseboards and adjacent floorboard. The doorway between the spring and cheese rooms—probably installed at the same period as the upper building staircase—contains door casings fastened with the larger nail types. These historic cut nails were not identified in any known restoration elements.

Because reproduction nails are found intermixed with cut nails in historic elements, their presence does not definitively indicate areas of restoration or heavy repair of a feature. These

nail types, R.1 and R.2, appear to be less frequently used and, consequently, a specific period of use cannot be ascertained. First use of these nails has been approximated to the later Fort restorations, although no specific date has been established for any of the three samples. The extensive use of wire nails during the earliest restorations reduces the likelihood of these nail types being incorporated into work done prior to 1930. Their appearance possibly coincides with the 1959 restoration, or even later work. Sampled from a Dutchman repair, a historic baseboard, and the kitchen beadboard, there also seems to be no apparent consistency to their locations within the Fort buildings.



WIRE NAILS			
Type	Length (inches)	Period	Use
W.1	1	Early Restoration (1930)	204: lath
W.2	2.5	Early Restoration (1929/1930)	204: floor; 205: baseboards, floor
W.3	3	Early Restoration (1929/1930)	204: baseboards; 205: floor
W.4	3	Early Restoration (Post-1923)	204: baseboard

Wire nails, found in both the upper and lower buildings, were used in restoration campaigns and localized repair work of historic and replacement material. The change from cut

to wire nails occurred when the site became a national monument and NPS commenced a full restoration program. At this time, cut nails were no longer used (although extant nails were reused), and the large-scale renovations within the lower building's upper floor were completed using wire nails. These earlier projects—dating to 1929 and 1930—included the doubling of the floorboards in this upper space and the erection of the two partition walls, which created three equally sized rooms. Three of the sampled wire nail types are found in these early renovations. Type W.1 was removed from the wood lath of the partition wall between the southeast bedroom and middle room, and dates to the wall's 1930 installation. No other lath nails were sampled, but circular sawn lath and wire nails were observed in the northwest bedroom, which is the only other plaster and lath wall system aside from the two lower building's 1929 partition walls. Nail types W.2 and W.3 are similar in their head and shaft characteristics but differ slightly in size. Both types were used extensively in the 1929 floor installation, but were also used, likely immediately following the floor installation and/or wall construction, to resecure historic baseboards and fasten new moldings to the walls. The last type sampled, W.4, was removed from a southeast bedroom baseboard with extensive nailing and is possibly a later addition used to strengthen the connection to adjoining baseboards.

Although not sampled, wire nails were recorded in upper building door casings, baseboards, and picture moldings. In these instances, wire nails were used to supplement historic cut nails and were not the primary type of fastener. Based on the sampled set, it seems evident that wire nails were used exclusively in the earliest NPS restoration efforts, ranging from 1923 through the 1930s and possibly later. Locations of sampled nails are recorded in the *Annotations of Fort Construction Details, Appendix G*.

3.9 Molding Typology: Fort

Appendix I

During the initial onsite investigations, various molding profiles were examined for anomalies in planing, beading, and overall shape. Preliminary periods of fabrication were assigned to each molding based on written documentation, particularly when dates of installation are known, as well as the characteristics of the moldings' beads and quirks. Through this investigation, types were established and recorded photographically and with a profile gauge. These field drawings were then digitized in AutoCAD and refined in Adobe Illustrator for further analysis.

Although the molding types are represented in the annotated photographs of construction details, the profile drawings and typology supplement the images and provide greater detail of the bead and quirk—the most distinctive features used in defining the types. Moldings have been classified according to these characteristics, which are indicative of their period of installation and help confirm areas of alteration and restoration from original fabric.

Molding Profiles				
Type	Bead	Quirk	Period	Use
M.1	Narrow, round	Wide, curved	Original (1872)	203: picture moldings 204, 205, 206: window casings
M.2	Large, round	Wide, curved	Original	102, 103, 202, 203: window and door casings 102, 103, 202: picture moldings 202, 203: baseboards
M.3	Large, round	Wide, sloped	Early Alteration (1875-1895)	202, 204, 205, 206: baseboards
M.4	Large, flat	Wide	Restoration (circa 1930-1959)	102, 103, 204, 205, 206: baseboards
M.5	Large/cut, round	Narrow, shallow	Restoration (circa 1959)	102, 103, 204, 205, 206: picture moldings

While the bead and quirk characteristics are period-specific, they are found across moldings of various functions. Type M.1—defined by a narrow bead measuring only about 1/8 inch in diameter—is found in picture moldings and window casings of the upper-level rooms of both buildings. These moldings contain slight variability in the size of the bead and shape of the quirk. Examples of moldings with delicate bead details include the picture molding throughout the northwest bedroom as well as the window casings of the lower building’s three upper rooms. These moldings are distinguished from later reproductions by a wider, deeper quirk.

The original moldings of the upper building, type M.2, are characterized by their large, rounded beads and wide, curved quirks. A molding of this type was uncovered below the meeting room floorboard adjacent to the stair and served as a nailer. This molding, probably a remnant from a door or window casing or baseboard confirms that this type was installed by the time of the alteration (and likely predates the stair). The minor variation in the quirk indicates that there are two early fabrication dates. The location of type M.2 moldings suggests that they are original, while the placement of type M.3 moldings makes them slightly later. Type M.2 moldings are found in all rooms of the upper building and are characteristic of the door and window casings on both the upper and lower levels. Additionally, these original moldings are found in the baseboards of the northwest bedroom and, though more limited, in the baseboards and picture moldings of the meeting room as well as the lower-level picture moldings.

Type M.3 moldings, similar in appearance to M.2, were likely fabricated soon after the Fort’s construction to replicate the original aesthetic. These slightly later moldings differ only in the shape of the quirk, which slopes from the bead to the quirk interior—a feature not readily apparent in elevation. These moldings have been identified in areas of alteration in the meeting room and the upper rooms of the lower building. They are indicative of the stair alteration, found

in the baseboards surrounding the stair opening, and the changes in room configuration of the upper level of the lower building where they were identified along the courtyard and east exterior walls.⁶ Limited only to baseboards, this molding type does not appear in window and door casings or picture moldings.

Type M.4 moldings are defined, due to their location and profile, as later reproductions from the 1930 and 1959 restorations and later repairs. Characteristic features include a large, flat bead and wide quirk. This type is found in upper-level baseboards within both buildings. Based on written and photographic documentation, fabrication seems to have occurred primarily in 1930 when baseboards were produced for the lower building's second floor partition walls, which were erected the same year. The parlor and kitchen baseboards show some variation in their profile from those of the lower building. The flatness of the bead is even more accentuated, and the quirk is highly defined. The variations in profile suggest that these moldings have a different, likely later fabrication date than those of the lower building.

Contemporary to type M.4 molding, type M.5 moldings have a fabrication date of 1959. These moldings are characteristic of the picture railings installed in 1959 in the lower building's upper rooms along the interior and courtyard walls. With a more rounded bead and narrow, shallow quirk, they generally contain few paint layers and a grainy appearance from being machined. During the restoration efforts, Heaton made many replacements throughout the Fort using M.5 moldings. These mass-produced pieces were not sized according to location within the Fort, but were crudely cut to replace moldings in the meeting room where the beads appear truncated; however, the same shallow and narrow quirk is visible.

⁶ No profile was taken of the west wall. Further investigation of these baseboards should be made to confirm their period of installation. It is possible that these baseboards could be original, since no change would have necessitated their replacement.

Although reproduction moldings are easily identified in areas of reconstruction or heavy replacement, most rooms within the lower building which contain primarily original or early picture moldings have several sections where reproductions have replaced historic moldings. Limited in their use, these replacements appear in areas where frequent removal and reattachment would have been necessary (such as those moldings adjacent to the kitchen and parlor cabinets), areas of probable damage, and areas of greater change (such as the conversion of space within the second level of the upper building).

After identifying the characteristics of reproduction and original moldings, each type was located throughout the Fort to determine if their placement confirmed areas of change and supported areas believed to be original. No discrepancies were found, and further conclusions were drawn. The meeting room's original configuration, however, remains less known, since two distinct picture molding types (M.2 and M.5) were identified, with M.5 being dominant. Only one section east of the courtyard door reflects the moldings of the rooms below, and all other moldings appear to be replacements from the early restoration period. The large-scale changes in the room likely account for the loss of original material, although the size of the moldings probably remains unaltered. It is not known whether the moldings would have contained a large bead to define the public meeting space or a small bead to support the change in function to private bedrooms. Regardless of the loss of information within the meeting room, the size of the bead does dictate function in other spaces throughout the Fort: the more delicate detailing, seen in the northwest bedroom picture moldings and lower building window casings, appears to be indicative of the Fort's private space, while the large, round bead delineates the formal and public spaces of the upper building's lower level.

4.0 Development of Use and Campaigns of Restoration and Repair

Three periods have been created to define the Fort's development, habitation, conversion to a national monument, and restoration. Using these categories to catalog important people, events, and alterations to the physical fabric, a chronology of the buildings' evolution and those who have impacted change has been established. The first period, Original Construction and Historic Alterations: 1868 to 1922, maps the construction and early alterations prior to the park's acquisition of the property. The next period was identified to map the initial restoration efforts. NPS Ownership and Early Restoration: 1923 to 1959 chronicles the early decisions regarding interpretation that influenced the current configuration of the Fort buildings and cabins. The last period, Contemporary Park Maintenance and Interpretation: 1960 to Present, describes the current preservation philosophy and practices of the National Park Service. Each period is further reflected in the annotated construction details as well as the nail and molding typologies.

4.1 Original Construction and Historic Alterations, Pre-park, 1868 to 1922

Some of the first stone laid in creation of the site's structures were those of the cabins. With one room of the East Cabin constructed by 1868, the expansion of the building to its two-room plan occurred two years later with the simultaneous erection of the West Cabin. After their construction, the cabins remained unchanged in plan. During this initial period, however, their function was adapted periodically to serve the varying needs of the site's residents: to house the

Anson Winsor and John Young families during Fort construction; to serve as a chicken coop and stable; and to provide space for the residents' cows and pigs.⁷

With a design originally intended to offer protection to its inhabitants and the threat of attack from Native Americans quickly subsiding after construction, the Fort became subject to many adaptations in its earliest years. These first plans for the defensive structure included two solid masonry two-story buildings, facing inward to a central courtyard which was enclosed by stone walls. Two wooden gates at opposite ends offered access to the central space, and only one door on the south face of the south building granted additional entry. Access was intentionally restricted into the defensive structure, and ease of circulation within each building was limited. Stairways between floors existed only through the south balcony, with a catwalk leading to the second floor of the north building. While the upper building consisted of more private space, the lower building contained several bedrooms, including the telegraph room, the spring for food storage, and a self-contained space (the lower east room), with outside access to provide shelter for cowboys.⁸

The segregated and utilitarian space evolved quickly during the first twenty years since the Fort's construction in order to better accommodate differing needs of its earliest inhabitants. Ownership changed frequently, and short-term guests outnumbered permanent residents during the years of the Mormon raids. The earliest documented change occurred between 1876 and 1885 to the second level of the upper building. Here, brief mention of dividing the large upper

⁷ Haecker, Archeological Testing Within the North and South Rooms of the East Cabin. National Park Service, Inter-Mountain Cultural Resource Center: PISP-01, 1997; Pipe Spring Historic District: Pipe Spring National Monument. National Park Service Cultural Landscape Inventory, 2006.

⁸ Florence Snow Woolley, *In Two Worlds: The Recollections of Florence Snow Woolley, a Pioneer Daughter of Utah's Dixie*, 62.

space (the meeting room) is found in Charles Pulsipher's brief biography⁹; the north exterior doorway, an addition concurrent with the partitioning of the room, is evident in the 1885 Albert Tissandier illustration of the Fort.¹⁰ One further alteration, that of the stair, has no extant record but its purpose, placement, and materials corroborate the likelihood that it too belongs to the same series of alterations (*see Section 6.1.3*).

These upper building changes to facilitate circulation were quickly followed by alterations to the lower building and courtyard to provide a sense of openness and increase the amount of daylight entering the rooms. Pipe Spring resident Florence Snow Woolley ordered the removal of the two large courtyard gates and the opening of three windows and a second-story doorway on the lower building's south façade upon her arrival in 1886.¹¹ Later that century, the two partition walls in the upper level were also removed.¹² These changes remained in place throughout the period of private ownership.

Although certain alterations are attributed to specific residents and have known (even if approximate) dates, several modified features either lack written documentation and no date can be ascertained, or conflicting accounts of the feature preclude the certainty of their original composition or later modification. The doorway between the spring and cheese rooms, though modified prior to the acquisition of the site by NPS, has no specific record of change. Based on physical evidence, it seems like that this addition occurred prior to 1900. Although not definitive, oral histories by Pipe Spring residents suggest that the cheese room originally contained a dirt

⁹ Edna Cunningham, "A Short History of Charles Pulsipher," N.D.

¹⁰ Albert Tissandier, drawing, 1885.

¹¹ Florence Snow Woolley and Elizabeth Woolley, *In Two Worlds: The Recollections of Florence Snow Woolley, a Pioneer Daughter of Utah's Dixie*, 56

¹² A. Berle Clemensen, Historic Structure Report – History Data Section, Pipe Spring National Monument (Denver, CO: Department of the Interior, National Park Service, Denver Service Center, 1980, unpublished draft): 19.

floor, followed by wood and, during the early NPS period, stone. (*For further discussion, refer to Section 7.1.2 on the spring and cheese room doorway.*)

The later years of this first period were further marked by extensive deterioration of both the upper and lower buildings. By the time NPS acquired the property, the south balcony had been completely removed, the north balcony was dilapidated, the roofing was in need of replacement, glass was missing from windows, the upper building's lower-level flooring showed significant decay, and the lower building's upper rooms were deemed uninhabitable. By 1923, the Fort had deteriorated for more than a decade with little or no intervention.¹³

Significant Figures

(Elijah) Averett Family: master stone masons, builders of Winsor Castle (October 1870 – April 1872);

Winsor Family: Bishop A.P. Winsor began building the Fort in 1870 and became the first superintendent of the ranch;

Charles Pulsipher: superintendent of the tithing ranch at Pipe Spring 1877-1879;

Albert Tissandier: a Frenchman, sketched the first recorded image of Winsor Castle at Pipe Spring in 1885;

Edwin Dilworth Woolley, Jr.: a manager of the Pipe Spring ranch. Woolley brought his second wife, Flora and her children to Pipe Spring in 1886. They stayed to the early 1890s, the anti-polygamy raid years;

¹³ The condition of the fort at its establishment as a national monument is described in the correspondence between Superintendent Frank Pinkley and site custodian Leonard Heaton. These letters, dated January 1926 through April 1927 and held in the Washington, D.C. National Archives, are cited throughout this report and include NPS's restoration efforts to remedy the buildings' extensive deterioration.

Florence Snow Woolley – Dilworth Woolley, Jr.’s second wife, arrived at Pipe Spring in 1886, dictated “In Two Worlds: The Recollections of Florence Snow Woolley” to her daughter; Charles Heaton: Son of Jonathan Heaton, bought the Pipe Spring property in 1909 in a co-partnership with his father and six brothers (called the Pipe Springs Land & Live Stock Company). Father of site custodian Leonard Heaton.

Source Documents

Journals, Letters, Memoranda:

Florence Snow Woolley: *In Two Worlds: The Recollections of Florence Snow Woolley, a Pioneer Daughter of Utah’s Dixie* (n.d.)

Edna Cunningham: “A Short History of Charles Pulsipher” (n.d.).

Historic Images:

Albert Tissandier drawing, Pipe Spring Fort, 1885

White Family photos (PISP archives) (1922)

Photographs, PISP archives (1913-1915)

Construction Attributes

Mortise and tenon connections, pegged: doors and cabinets

Hand planing: Baseboards, cabinets, door and window casings and reveals, window soffits and sills;

Reciprocal sawn (and hand planed): Baseboards, cabinets;

Circular sawn: cabinets, stair, flooring

Historic graffiti Doors, door casings;

Fastened with cut nails: All woodwork.

Woodwork with large, rounded beads and wide quirks: Baseboards, picture moldings

Woodwork with small beads and wide quirks: Picture moldings

4.2 NPS Ownership and Early Restoration, 1923 to 1959

Once NPS acquired the site in 1923 and created Pipe Spring National Monument, NPS officials adopted an early restoration plan carried out in phases throughout this 26-year period as funding became available. NPS Ownership and Early Restoration is largely defined by Superintendent Frank Pinkley’s vision for the site and acting custodian Leonard Heaton’s implementation of those plans. In the earliest years of NPS ownership, correspondence between Pinkley and Heaton illustrate the motivation behind the restoration efforts. Pinkley writes of wanting to “restore the house so it will be as perfect an example as is possible to get of the early Mormon period in that part of the country.”¹⁴ The desire to achieve this perfect example informed most of Pinkley’s decisions, but practicality also pervaded.

Areas in most need of restoration were prioritized and included the Fort exterior—particularly the roof, which was replaced with wood shakes, the balconies, and the courtyard gates—and the lower building’s interior rooms.¹⁵ In the lower building, Pinkley vacillated between honoring the original materials of the Fort and providing a looser interpretation for

¹⁴ Frank Pinkley, letter to Leonard Heaton, January 20, 1926, National Monuments, Pipe Spring File, August 12, 1925-September 24, 1926; *Southwestern Monuments Monthly Report* (Pipe Spring), January 1933, quoted in Clemensen, *Historic Structure Report*, 25.

¹⁵ Leonard Heaton, letter to Frank Pinkley, April 29, 1927.

pragmatic reasons.¹⁶ Through his own investigations into the original configuration and materials of the rooms, Pinkley concluded that the ceilings were always exposed, the doorway between the spring and cheese rooms was a later addition, and the cheese room floor was either wood or more likely dirt. His restoration program, however, included maintaining the exposed ceiling and added doorway, but replastering the walls and laying a stone floor over the dirt floor of the cheese room to prevent excessive dust from entering the rooms of the lower building. For this same reason and to strengthen the system, the second-level flooring was doubled, and the reinstatement of the three rooms soon followed with the erection of the two partition walls that were removed at the end of the nineteenth century.¹⁷

Other areas of the Fort were met with the same preservation philosophy: the actual or probable appearance should be maintained, while some liberties to improve interpretation or mitigate potential issues would be taken. Once Heaton completed the most essential replacements in the lower building, he focused efforts on maintaining the upper building. Less extensive replacement was necessary in the upper half of the Fort, with the exception of the flooring in the parlor and kitchen. Heaton's journal and monthly reports document his progress in restoring both buildings, and give specific detail on his struggle to reduce the moisture damage to the upper building's lower level.¹⁸ During this period, Heaton writes of frequent floor replacements and his attempts, with the Civilian Conservation Corps (CCC), to modify the

¹⁶ Frank Pinkley, letter to Leonard Heaton, March 31, 1926, Washington, D.C. National Archives. National Monuments. Pipe Spring File; August 12, 1925–September 24, 1926, Record Group 79, Records of the National Park Service.

¹⁷ Frank Pinkley, letter to Leonard Heaton, January 20, 1926, Washington, D.C. National Archives. National Monuments. Pipe Spring File; August 12, 1925–September 24, 1926, Record Group 79, Records of the National Park Service.

¹⁸ Leonard Heaton, *Journal*, 1928, 1935–63.

foundation and create vents for moisture to escape. At the same time, Heaton and the CCC worked to stabilize the bulging southwest corner of the Fort.

As work progressed at the Fort, Pinkley also addressed the dilapidated condition of the cabins. By 1923 the cabins showed signs of heavy deterioration—even more extensive than that of the Fort—with missing roofs and walls. The restoration philosophy adopted at the Fort was also implemented at the site’s ancillary structures: reconstruct the cabins to their original appearance. Early in the restoration effort, Pinkley instructed John White and Leonard Heaton to start work on the cabins by gathering native materials (especially stone for missing areas of the walls). With the materials in hand, the men began restoring the masonry walls to their original heights and constructing a cedar pole roof over the West Cabin.¹⁹ By 1937, as the restoration program neared completion, the cabins served both public and private functions for the duration of this period. The West Cabin initially operated as a map room and office for the Grazing Service’s range survey crew, then as a photography darkroom before being used as an exhibit area for Bishop Hopkins’s blacksmith tools.²⁰ The East Cabin, however, functioned as a space for public interpretation since restoration. Over the next two decades, the cabins required periodic roof repairs to maintain the wood and earthen components.²¹ Both cabins developed structural problems resembling the issues that plagued the Fort’s southwest corner and similarly required intervention: the East Cabin underwent foundation strengthening, while West Cabin exhibited a sinking southwest corner that was addressed by creating a concrete trench adjacent to the foundation and embedding posts to prevent the outward rotation of the walls.²²

¹⁹ Kathleen L. McKoy, *Cultures at a Crossroads: An Administrative History of Pipe Spring National Monument*, U.S. Department of the Interior, National Park Service Intermountain Region (Denver: Colorado, 2000).155.

²⁰ Leonard Heaton, Journal, December 27, 1937, cited in McKoy, *Cultures at a Crossroads*, 277.

²¹ McKoy, *Cultures at a Crossroads*, 166.

²² Heaton, Journal, November 25, 1946 and May 1950.

By the end of the period, after attempting to mitigate the structural needs of the cabins and Fort, Heaton embarked on another large restoration program to complete the conversion of the Fort back to its former appearance. Heaton worked with his primary staff—Ray Mose, Clair Ford, and Sherwin Heaton—to close the three windows and one door opening in the south façade of the lower building. He also dismantled the meeting room partition wall and enlarged the stair slightly to better accommodate visitors and staff.²³ The wall removal and stair enlargement necessitated the installation of beadboard around the eastern section of the stair opening. A new rail was installed and baseboards and picture moldings were likely reused from the dismantled wall. In other areas, Heaton fabricated picture moldings for installation on the lower building's upper level, and completed what was believed at the time to be the full restoration of the Fort buildings.

Significant Figures

Arno B. Cammerer: Director of the National Park Service from 1933–40;

Frank Pinkley: Superintendent of the Southwestern National Monuments from 1924 until his death in 1940;

Leonard Heaton: Custodian, 1923–63;

Stephen Mather: First director of the National Park Service (1917–29);

HABS: Historic American Building Survey, documented Pipe Spring in 1940;

The Civilian Conservation Corps (CCC), November 1935 to October 1939: established work camps;

²³ Leonard Heaton, "Record of Work on Restoration of Fort & Furniture," Pipe Spring National Monument, January 1959; Leonard Heaton, Journal, February 4, 1959.

Frank R. Oberhansley: Superintendent of Zion National Park (1960–65) and administered Pipe Spring National Monument from 1963–69;

Ray Mose: laborer;

Clair Ford: laborer;

Sherwin Heaton: worker, son of Leonard Heaton.

Source Documents

Journals, Letters, Memoranda

Southwestern Monuments Monthly Reports (1933)

“Notes of C. Leonard Heaton on Pipe Springs National Monument” [Heaton Journal]

Letters from Frank Pinkley to Leonard Heaton (1926)

Letters from Leonard Heaton to Frank Pinkley (1926)

Letter from Frank Pinkley to Stephen Mather (1926)

Letters from Dilworth Woolley to H.E. Woolley, Jr. (1943)

Letters from Leonard Heaton to Judge Dilworth Woolley (1944)

Superintendent's Monthly Reports

Ruins stabilization record sheet (Leonard Heaton) (1947)

Memorandum from A.E. Demaray to Newton Drury (1943)

Memorandum from Paul R. Franke to Acting Superintendent (1959)

Memorandum from Leonard Heaton to Regional Architect, Region Three (1959)

Report of Rehabilitation (Heaton) (1951)

Recommended Work on Historic Pipe Spring Building by Regional Architect Saunders and Regional Archeologist Steen (58-59)

Project Construction Program (Heaton) (1941)

“Record of Work on Restoration of Fort & Furniture” (Heaton) (1959)

Completion Report for Work Completed in 1959 (Frank R. Oberhansley) (1961)

“Notes from Correspondence of Dilworth and Bert [Woolley] on Pipe Springs”

HABS documentation: measured drawings and photographs

Historic Images

Library of Congress, Prints and Photographs Division, “HABS ARIZ,8-MOC.V,1-(sheet 1 - 14)
(1940)

Library of Congress, Prints and Photographs Division, HABS ARIZ,8-MOC.V,1—11 (1940)

PISP archives (after 1959)

Construction Attributes

Angle iron reinforcement: Balconies;

Dutchman repairs: Cabinets, door casings;

Wire nails: Flooring, baseboards;

Woodwork with large, rounded beads and narrow, shallow quirk: Picture moldings

Woodwork with large, flatted beads and wide quirks: Baseboards

4.3 Contemporary Park Maintenance and Interpretation: 1960 to Present

This last period is defined by the shift from large-scale restoration implemented to return the Fort to its earliest appearance to new programs and policies of historic preservation through cyclical maintenance. Permanent solutions to recurring problems, especially the extensive and frequent

damage due to moisture at the Fort, were also sought during this time, and a more pronounced phase of historic research, study, and interpretation was undertaken. Beginning with Heaton's retirement in 1963, no further full-scale renovations or alterations occur within the period, and a permanent maintenance program is established. On a federal level, NPS also moved toward more professionalization, which meant the expansion of the monument's human resources. With more staff at the monument and a greater national focus on historic preservation, Pipe Spring benefited from historic resource consultants hired to address the causes of the site's most damaging agents.

The first programmatic change occurred with the creation of a living history installation where personnel recreated the typical late-nineteenth-century routines of the site's pioneer residents.²⁴ As material restoration subsided, interpretation increased. Visitors were introduced to weaving and cheese making in the rooms of the Fort, and the East Cabin served as a chicken coop. However, the restoration efforts never permanently resolved the Fort's ongoing moisture issues, and focus would eventually shift back to addressing the extensive damage to the upper building's lower-level floors.

By the late 1970s, historic architects and engineers arrived at Pipe Spring to inspect the extent and cause of the building's damage and to develop a long-term solution to eliminate the high humidity levels of the lower level. While Heaton's changes to grade and installation of vents allowed some moisture to escape from below the floors, it did not prevent moisture from entering the building. Historical Architect Rodd L. Wheaton and others drafted plans to excavate behind the north wall and install a proper drainage system that would provide a barrier and

²⁴ McKoy, *Cultures at a Crossroads*, 587.

prevent the north wall of the Fort from serving as a retaining wall.²⁵ Completed in 1980, the solution has minimized the impact of moisture on the upper building's interior rooms and exterior masonry.

A similar endeavor to lessen the impact of moisture on the spring room plaster was attempted just a few years later. Heavy and frequent replastering of the lower building's lower-level rooms was problematic, and a longer-term solution was sought. In the spring room, the high moisture content continually weakened the bond between the plaster and substrate (typically masonry), so a stainless steel metal lath system was installed to maintain strength between the scratch coat and lath.²⁶ Although cracking continues, loose plaster has been reduced.

Further consultations and partnerships developed around the same time to conduct research and develop a fuller history of the site, beginning with the site's 1966 National Register listing.²⁷ Through researching historic archives, photographs, drawings, Heaton's journals, and conducting personal interviews, Berle Clemenson compiled the first historic structures report in 1980 to delineate the social and architectural history of Pipe Spring.²⁸ Two decades later, Kathleen McKoy wrote the highly detailed administrative history to expand on Clemenson's earlier work.²⁹ Physical studies were simultaneously conducted to complement the written histories. In March 1981, the firm Conron and Muths Restoration Architects concluded an

²⁵ Emergency Stabilization Conference (Wheaton, Heyder, Tracy, Muths); Rodd L. Wheaton, "Trip Report," November 15-16, 1976; Rodd L. Wheaton, "Trip Report," November 30, 1976; Rodd L. Wheaton, "Memorandum to the Superintendent," Zion National Park, United States Department of the Interior, November 8, 1977.

²⁶ C. Douglas Dewitz, Completion Report Contract, "Replaster Ceiling/Walls," May 1984.

²⁷ Susan A. Tenney, "Pipe Spring National Monument National Register of Historic Places Inventory – Nomination Form," U.S. Department of the Interior, National Park Service (September 28, 1984).

²⁸ Clemenson, "Historic Structure Report."

²⁹ McKoy, *Cultures at a Crossroads*.

investigation of architectural surface finishes within the Fort to uncover earlier paint schemes used to inform NPS in its repainting program.³⁰

Although most management efforts were focused on the Fort during the first few decades of this period, the cabins received interpretative investigations and cyclic maintenance by the late 1980s. Archaeological investigations were conducted at the West Cabin to uncover the original floor during replacement.³¹ In the years that followed, common repairs included roof replacement, wood preservation, and extensive repointing of the cabins' masonry walls.

Although restoration of structural components, original room configurations, and missing features ceased during this period, material replacement continued through NPS's maintenance program. Specifically, in recent decades frequent maintenance of plaster and mortar has resulted in almost yearly repair. While focus continues to be placed on the preservation of original features, a practice of material replacement is used to maintain the Fort's aesthetic and prevent even minor deterioration of plaster, wood, and structural members.

Significant Figures

Rodd L. Wheaton: Historical architect, Rocky Mountain Region;

Leonard Heaton: Custodian, 1923-1963;

C. Douglas Dewitz: Maintenance Mechanic at PISP, consulted on water mitigation in upper building;

³⁰ Conron & Muths Restoration Architects, "Original Woodwork Paint/Finish Color Study," (Jackson, Wyoming and Santa Fe, New Mexico, March 1981).

³¹ William J. Hunt, "Investigation of an Interior Earthen Floor, West Cabin, East Room, Pipe Spring National Monument, Arizona," Rocky Mountain Region Archeological Project Report, National Park Service (Lincoln, Neb.: Midwest Archeological Center, October 2, 1989).

Richard Cronenberger: Historical architect and curatorial collections specialist in Intermountain Regional Office;

Conron and Muths Restoration Architects: Conducted emergency inspection to examine the extent of damage (visible and latent) to the upper building's north masonry wall and lower level rooms. Also concluded an investigation of architectural surface finishes within the Fort to uncover earlier paint schemes;

Bernard G. Tracy: Superintendent of Pipe Spring N.M. from 1971 to 1979;

William M. Herr: Superintendent of Pipe Spring N.M. from 1979 to 1989;

Terry Strong: Facility Manager from 1992 to 2010;

John Hiscock: Superintendent of Pipe Spring N.M. from 1994 to present;

Andrea Bornemeier: Chief of Interpretation and Resource Management from 1995 to present;

Bryce Preservation Crew: 1989, 1995, 1996, 2012;

Santa Fe Preservation Crew: 1996, 1997, 1998, 1999.

Source Documents

Letters, Memoranda, Reports

Trip Report (Rodd L. Wheaton) (1976)

Memorandum from Rodd L. Wheaton to the Superintendent, Zion National Park (1977)

Superintendent's Annual Report (1978)

Memorandum from Bernard G. Tracy to Richard A. Borjes (1980)

Notice from William Slemmer (1980)

Historic Structure Report (Berle Clemenson) (1980)

Memorandum from Historic Architect to Superintendent, Zion National Park (1982)

Completion Report (William M. Herr) (1982)

Trip Report (Richard Cronenberger) (1983)

Richard Cronenberger, October 18, 1989, "Porch Decking."

Memorandum from Doug Dewitz to Rod Wheaton (1985)

Trip Report (Richard Cronenberger) (1989)

Correspondence from Kelly Shakespear to the PISP Superintendent (1991)

Assessment Of Actions Having an Effect on Cultural Resources in Arizona

Richard Cronenberger, Notes, March 14, 1995

Stabilization Project Completion Report (1997)

Historic Preservation Maintenance Completion Reports (1997)

Kathleen L. McKoy, *Cultures at a Crossroads: An Administrative History of Pipe Spring*

National Monument (2000)

Historic Images

Photographs (PISP archives) (1960, 1961, 1965, 1980, 1982, 1984, 1995)

Oral histories:

Interview of Leonard Heaton by Berle Clemensen (1980)

Interview of Leonard Heaton by Robert Keller,

On site interview with Curtis Rintz (2012)

Construction Attributes

Wire nails: Repairs

Reproduction nails: Baseboards, repairs (more extensive use possible)

Woodwork with large, flattened bead: Baseboards

5.0 Description and Investigations of the Fort Exterior

The following sections detail the construction chronologies of the Fort's exterior elevations, interior spaces, and courtyard. These chronologies were completed through a synthesis and analysis of historic written and photographic records, onsite investigations and observations, the development of material typologies, and comparisons of change evident through an examination of all past and current documentation. The findings presented below confirm and challenge previously held knowledge of the Fort's evolution and distinguish its material and alterations by three major periods of change and ownership.

5.1 Exterior of Winsor Castle and Courtyard Gates: Elevations 301, 303, 305, and 306

Following the Fort's initial construction, residents and visitors gained access only through the courtyard gates or the single exterior doorway in the lower building's south façade which provided entry into an enclosed space with no further access to the Fort, except through a trapdoor in the room's ceiling (*see Section 7.1: Spring and Cheese Rooms*). Of the earliest alterations to the Fort buildings—since the threat of Indian attack had already subsided—were windows and doorways created in the exterior walls to improve access and interior lighting. Carried out within two decades of the Fort's construction, the exterior opening in the upper building's north elevation was created, followed by the removal of the courtyard gates as well as the insertion of three windows and a second-story door into the lower building's south façade.

The addition of the upper building's north exterior door lacks any record dating its installation but is visible in the 1885 Albert Tissandier drawing (Figure 5.1). Likely installed as part of a series of alterations to the meeting room (*see Section 7.1: Upper Building, Meeting Room*), the probability of the door's installation following the Fort's initial construction is evident in the materials and workmanship of the doorway and its surround, which differ from the original south façade opening or those of the courtyard. The Fort's builders installed heavy stone lintels above the windows and doors of both the north and south buildings. All similar in dimension, these original lintels contain characteristic quarry marks and tooling (*see Plan, Section, and Elevation Drawings, Appendix E*). The lintel above the upper building's north doorway, anomalous in construction, consists of rough cut wood, not tooled or finished, suggesting that it was not part of the original Fort design nor was it an addition contemporary with the lower building's alterations which featured six- by six-inch milled pine lintels (Figure 5.2).³² Further indications that the opening breached a once solid wall are found in the orientation of the stone blocks framing the doorway. The deliberate placement of alternating wide and narrow blocks is not atypical; however, the narrow stones were placed with their bedding oriented vertically—a detail not found elsewhere in the Fort's masonry and which suggests an alteration was made.

Within a few years of the meeting room alterations that resulted in the addition of the exterior doorway, Pipe Spring resident Florence Woolley ordered the creation of two second floor windows and one door (intended to open onto a balcony that was never constructed) as well

³² Leonard Heaton, "Letter to Judge Dilworth Woolley," January 14, 1944, Pipe Spring National Monument Integrated Resource Management System Document Archive, 1936-1953 Pipe Spring Correspondence, 7.

as one lower level window (Figure 5.3).³³ The openings were created soon after Woolley's arrival to the site in 1886 and remained in place for more than seventy years. During this time, the courtyard gates were removed to further open the building and convert it from Fort to residence (Figure 5.4).³⁴

Once the National Park Service acquired the property, maintenance issues were prioritized based on need. On the exterior, the heavily deteriorated roof, missing south balcony, and removed gates were identified as high-priority projects for restoration in the 1920s (Figure 5.5). While Pinkley sought to restore the Fort to as close to its original state as possible, he delayed the south façade restoration in the monument's earliest years. Although NPS and Heaton identified these openings as later changes, Heaton described the materials and workmanship of the north door as being original. He noted that the hewn cedar lintel and stonework around the north door were characteristic of the Fort construction, and no plan to close the upper doorway was created.³⁵

By the 1940s, however, NPS drafted a proposal to restore the south façade to its original appearance, and the 1940 HABS drawings reflected the intended reversal of these early

³³ Florence Snow Woolley and Elizabeth Woolley, *In Two Worlds: The Recollections of Florence Snow Woolley, a Pioneer Daughter of Utah's Dixie*, 56; Kathleen L. McKoy, *Cultures at a Crossroads: An Administrative History of Pipe Spring National Monument*, U.S. Department of the Interior, national Park Service Intermountain Region (Denver: Colorado, 2000), 158. McKoy includes "Notes from Correspondence of Dilworth and Bert [Woolley] on Pipe Springs" that identifies Erastus Snow and Edwin D. Woolley, Jr. as conferring on changes made to the building. She also cites a letter from Dilworth Woolley to his brother H. E. Woolley on August 21, 1943 which discusses the changes. These sources are cited in McKoy, *Cultures at a Crossroads* as: Dilworth Woolley, letter to H. E. Woolley, August 21, 1943 (attached to a memorandum from A. E. Demaray to Newton Drury, dated September 15, 1943). Unsigned letter dated April 14, 1916, Woolley/Snow Family Collection, op. cit.

³⁴ Florence Snow Woolley and Elizabeth Woolley, *In Two Worlds: The Recollections of Florence Snow Woolley, a Pioneer Daughter of Utah's Dixie*, 56

³⁵ Leonard Heaton, "Letter to Judge Dilworth Woolley," January 14, 1944, Pipe Spring National Monument Integrated Resource Management System Document Archive, 1936-1953 Pipe Spring Correspondence, 7.

alterations (*see HABS Drawings, Appendix L*).³⁶ At the time, NPS also included a design to close the interior doorway between the spring and cheese rooms.³⁷ None of the changes occurred immediately after the plans were drafted, and while the plans for closing the interior doorway were never realized, the south façade window and door closures were not completed until 1959. During the restoration, Clair Ford, Ray Mose, and Sherwin Heaton installed stone to mimic the coursing of the building and recreated the gun ports that previously existed in the wall (Figures 5.6 and 5.7).³⁸

Aside from an interpretive restoration program, NPS focused further efforts on the south elevation of the lower building in order to address structural issues that had developed by the 1930s. The southwest corner starting bulging and had been braced, and by 1938 Heaton detected further movement.³⁹ Three years later, Heaton wrote that further stabilization was necessary, because the settlement caused cracking on the inside plaster and exterior masonry.⁴⁰ Not until 1957 was any stabilization actually implemented, and it was at this time that steel and concrete reinforcement was installed.⁴¹ The stability measure failed to prevent further bulging, and in 1979, the southwest corner was again inspected for potential treatment.⁴²

³⁶ Library of Congress, Prints and Photographs Division, Historic American Buildings Survey, Historic American Engineering Record or Historic American Landscapes Survey, Reproduction Number: "HABS ARIZ,8-MOC.V,1-(sheet 1 - 14)."

³⁷ Leonard Heaton, Project Construction Program, NM-PS-M-1, 1941.

³⁸ Leonard Heaton, "Record of Work on Restoration of Fort & Furniture," Pipe Spring National Monument, January 1959.

³⁹ Leonard Heaton, "Notes of C. Leonard Heaton on Pipe Springs National Monument" [Heaton Journal], August 8, 1938.

⁴⁰ Leonard Heaton, July 1941, Project Construction Program, NM-PS-M-1.

⁴¹ Leonard Heaton, Journal, April 2, 1957.

⁴² Intermountain Cultural Resource Center Conservation Program. Pipe Spring National Monument FY96 Stabilization Project Completion Report, Vol. 1. Santa Fe, March, 1997, 2.

Although the southwest corner likely bulged from persistent moisture issues, other elevations required intervention to mitigate moisture damage as well. With the upper building constructed partly below grade, the north masonry wall acted as a retaining wall and experienced significant moisture passing through the stone and mortared joints into the lower interior rooms. In 1980, NPS devised a plan to create a primary retaining wall and drainage system to relieve backfill pressure and limit moisture ingress. The system included excavation behind the upper building's north wall and within the courtyard where six- and eight-inch PVC drainage pipe was laid (Figure 5.8). The deteriorated masonry was selectively replaced, joints repointed, and wall plastered from the bottom of the trench to grade, with gravel and bentonite (a high-swelling granular clay) placed as fill within the trench.⁴³ Since installing the drainage system, less moisture has traveled through the exterior wall and material replacement—specifically floor replacement—within the lower rooms has been minimized.

5.2 Courtyard, Gates, Balconies, and Roofs: Area 101; Sections V-V, X-X, and Y-Y

Photographic and written records confirm that extensive material loss and replacement of both the lower and upper balconies has occurred. Images dating from the late nineteenth century and into the mid-twentieth century very visibly display the decline of these features from the time of the Fort's initial construction until the courtyard restoration in 1927 (Figures 5.9, 5.10, and 5.11). In these photographs, the south balcony gradually loses its wooden elements, destabilizes, and is

⁴³ Bernard G. Tracy, Memorandum to Richard A. Borjes, Rocky Mountain Region, "Pipe Spring Restoration Project Progress Report." June 16, 1980. And William Slemmer: Notice to Proceed to Hall Brothers. Contract CX-1200-0-B016.

later missing entirely.⁴⁴ The upper balcony shows a similar but less extensive progression of loss, with missing balusters representing most of the damage sustained on the north side.⁴⁵

The earliest restoration occurred in 1927 when Heaton replaced the south balcony and restored missing elements on the north side.⁴⁶ In the following two decades, only routine maintenance such as painting was noted, although Heaton extended the subgrade stair leading to the spring room farther into the courtyard. According to the first floor HABS plan, the extended stairs began approximately two feet behind the roofline and included six risers (*see corresponding HABS drawing in Appendix L*). The stairs' close proximity to the roofline and lack of gutters or other drainage caused water to channel into the spring room—a moisture issue which was not addressed for several decades.⁴⁷

Because little change to the balconies was documented in Heaton's journals and reports from 1927 until 1950, it can be assumed that no significant restoration continued between these dates. Consequently, at the time the HABS photographs were taken in 1940, all elements of the south balcony and the north balusters had been installed during the 1927 restoration. At the north balcony, however, some elements could have survived from the original construction. Although restoration and replacement recommenced in 1950 and periodically thereafter, a comparison of the 1940 photographs shows that the lower north balcony posts visible in the HABS image remain in place. These posts are distinguished by several characteristic markings present in both

⁴⁴ Photographs: c. 1913-1915; c. 1915, Pipe Spring National Monument archives.

⁴⁵ "Pipe Spring Fort," photograph, White Family photos, c. 1922.

⁴⁶ Leonard Heaton, letter to Frank Pinkley, April 29, 1927.

⁴⁷ Doug Dewitz, memorandum to Rod Wheaton, January 21, 1985. This memo identifies the extension of the courtyard stair as having occurred in the late 1920s or the early 1930s, with no exact date. This was, however, completed by 1940 and is documented at this extent in the HABS plans. In the memo, Wheaton identifies Heaton's early stair extension as continuing to be problematic. No second extension is documented, but it must have occurred after 1985 when Wheaton writes of the issues.

the historic and current photographs (Figures 5.12, 5.13, 5.14, and 5.15). Footings are visible in the historic image and supported the posts at grade in 1940, leaving them susceptible to rot at the base. Heaton wrote in 1951 that new concrete footings were secured into the ground, and the existing posts were then pinned into place.⁴⁸ Because the footings have been raised above the 1940 level (not entirely due to changes in grade), it appears that at the time of the footing replacement, several inches of decayed wood were removed from the base and the footings were slightly elevated to compensate for the loss. In successive decades, further repair was necessary to arrest decay in the western post (located in front of the parlor door), and through an in kind Dutchman repair in 1995, approximately one foot of rotted wood was removed and replaced from the south face of the post (Figure 5.16).⁴⁹

At the time the concrete footings were installed, concerns over the safety of the balconies were raised due to the heavy deterioration of the supporting members. Heaton worked to replace some of the broken and termite damaged wood decking and structural supports, and addressed the rot found in the upper balcony joists by sistering them with new 2- x 6-inch boards. He also bolted angle iron to the floor stringers for increased support and added bridging between stringers to stiffen the joists.⁵⁰ The same process was completed at the lower balcony, with the addition of a new post bolted to an extant member for reinforcement. Because Heaton specifies the reinforcement of the existing joists and stringers, it seems likely that the south balcony joists

⁴⁸ Leonard Heaton, "Rehabilitation of the fort buildings," Report of Rehabilitation, Pipe Spring National Monument, May – June 1951.

⁴⁹ "Kirby Matthew repairing rotten wood in one of the Fort courtyard posts," photograph, c. 1995, Pipe Spring Archives: PostRepair.pdf.

⁵⁰ Leonard Heaton, Journal, October 18, 1950; Heaton, "Rehabilitation of the fort buildings, May – June 1951," Report of Rehabilitation, Pipe Spring National Monument.

date to the 1927 reconstruction, while the north balcony joists and stringers probably predate NPS's acquisition of the site.

The structural modifications completed in 1951 have been followed by several campaigns of replacement of secondary elements—such as the decking and baluster railings—as well as several iterations of the catwalk, following the initial 1959 reconstruction, for reasons related to visitor safety and access.⁵¹ The rate of material replacement within the courtyard increased significantly at the end of the twentieth century, and in 1982 another restoration of the south balcony resulted in total replacement of the baluster railing, four upper posts, and the catwalk (Figure 5.17).⁵² Deteriorated decking was selectively replaced in the following years⁵³ and fully replaced on both the lower and upper balconies in 1997.⁵⁴ In 2000 the north balcony decking was again replaced.⁵⁵ Two years later, the park restored much of the catwalk, with seventy-five percent replacement of the structure, and in 2009 the entire south balcony decking was again

⁵¹ Frank R. Oberhansley, "Completion Report for Work Completed in 1959," July 25, 1961; "Also in March 1961 some reconstruction was made on the catwalk over the west big gate for safety purposes to allow [sic] visitors to go from one building to another." During this reconstruction of the catwalk, the incline of the stair was lessened from the previous installation.

⁵² "1982 south balcony restoration," photograph, c. 1982, PISP collection.; William M. Herr, "Remove Old, Rebuild New Catwalk," Completion Report, November 10, 1982. "The old and unsafe catwalk and adjacent railings were removed. New framing, spindles, [stanchions], tread and facings were constructed and installed."

⁵³ Richard Cronenberger, October 18, 1989, "Porch Decking." Complete replacement of the decking was suggested, but Cronenberger recommended selective replacement of only the deteriorated boards. Although the entire deck had been replaced previously, Cronenberger argued that the replacement fabric matched the original and that they "should still apply good preservation practices to all [their] maintenance projects."

⁵⁴ "1997 repair and replace the north and south porch decking at Winsor Castle," Historic Preservation Maintenance Completion Report, March 1997

⁵⁵ "2000 replace and repair north porch decking on Winsor Castle," Historic Preservation Maintenance Completion Report.

replaced.⁵⁶ Substantial rot on the floorboards below the roofline was noted during the replacements.

The aggressive wood replacement of the balconies over the past several decades has been further reflected in modifications and restorations of the facades and roofs. With moisture causing persistent problems within the interior rooms as well as the buildings' exterior, NPS sought to minimize the amount of rainwater entering the courtyard, which caused masonry deterioration and damage to interior finishes within the lower level of the south building. In 1996 gutters and downspouts were placed along the roofline and drained into barrels within the courtyard.⁵⁷ While the addition of the system altered the appearance of the Fort buildings, it redirected water away from the masonry walls and interior spaces and reduced backsplash. A new copper system was installed in 2012 (*see Figures 5.13 and 5.15*).

Like the upper balcony which retains some of its historic structural components but has been subject to regular decking replacement, the upper building's roof maintains much of its historic framing material, although the shingles underwent frequent replacement. The roof sheathing contains evidence of previous nailing, suggesting that they supported past shingles that have since been lifted and replaced (Figures 5.18 and 5.19). Their period of installation is unknown, but current staining patterns on the sheathing and rafters are visible in the 1940s HABS photograph, indicating that they predate the HABS survey and would likely have been

⁵⁶ "2002 Replace Deteriorated Section of Winsor Castle's Catwalk," Historic Preservation Maintenance Completion Report, and "2009 Repair of Winsor Castle North and South Building Porch Floor Boards," Historic Preservation Maintenance Completion Report. PISP-2009-002

⁵⁷ "1996 Installation of Gutters and Downspouts on Winsor Castle." Historic Preservation Maintenance Completion Report.

installed in the 1926 NPS reroofing program or earlier.⁵⁸ Although the lower building's rafters and sheathing are not visible in the corresponding HABS photograph, they are comparable in appearance to those of the upper building and likely date to the same period of installation. The shingles, however, have been replaced numerous times since NPS acquired the site—most recently in 2012.⁵⁹

The park's mission to interpret the site as a Mormon ranch from the pre-1900s era has further influenced decisions that both impact the Fort's aesthetic and reverse alterations made by early Pipe Spring residents. These reversals included removing the brick chimney extensions that had been constructed at the end of the nineteenth century⁶⁰, rebuilding the "crow's nest" or cupola atop the north building, and refabricating and hanging the large wooden gates to reinstate the courtyard. Although the brick chimney extensions remained until 1959, the other features were addressed immediately with the crow's nest being restored by 1927 (after only having been removed a decade before).

The gates enclosing the courtyard, removed in 1886 by order of Pipe Spring resident Florence Woolley⁶¹, had to be refabricated during the initial 1928 restoration and required another successive iteration in an attempt to match what was believed to be the original design

⁵⁸ Frank Pinkley, letter to Stephen Mather, August 14, 1926. Pinkley writes of reroofing the fort buildings with hand split shingles, but does not describe the extent of replacement. It is possible that the reroofing program only included the shingles and not the underlying framing.

⁵⁹ Meredith Keller and Kasey Diserens, interview with Curtis Rintz, July 2012.

⁶⁰ The lower building's west chimney was likely erected for purely aesthetic reasons—to maintain the symmetry between buildings where three functioning fireplaces (in the kitchen and parlor of the upper building and cheese room of the lower building) were positioned along the east or west outer wall of their respective rooms. The lower building's west chimney sits above the spring room, which historically served as a cool food storage facility and where a fireplace would not have been desired.

⁶¹ Florence Snow Woolley, *In Two Worlds*, 56.

(Figures 5.20, 5.21, 5.22, and 5.23).⁶² The first restoration of the gates involved rebuilding the frame and sandstone blocks above the opening of both the east and west gateways.⁶³ Heaton located the original blocks stacked near the Fort and reincorporated them into the framing.⁶⁴ These gates remained in place until Heaton began work in 1948 on a new design. In removing the old gates, Heaton found rot within the frame and sill, prompting replacement of the east sill and treatment of the frame and west sill with preservative before hanging the new gate doors.⁶⁵

In 2007 many structural components of the east gate were identified as being severely deteriorated and in need of emergency stabilization to address sagging of the gate and supporting members and to stabilize areas under compression from the masonry courses above. The work involved the replacement of the east gate lintel with two steel members encased in wood, as well as the in kind replacement of the door jambs and threshold (Figures 5.24 and 5.25).⁶⁶ The 1948 gates were examined for damage and rehung on both the east and west ends of the courtyard.

⁶² Heaton fabricated the gates based on what he believed was the original design, but no source for this basis has been located. Kathleen L. McKoy, *Cultures at a Crossroads: An Administrative History of Pipe Spring National Monument*, U.S. Department of the Interior, National Park Service Intermountain Region, Denver: Colorado, 2000: Kathleen L. McKoy, *Cultures at a Crossroads*, endnote 1425, page 743.

⁶³ Leonard Heaton, Journal, February through April 1928.

⁶⁴ *Southwestern Monuments Monthly Reports* (Pipe Spring), February 1, 1927, April 1 and September 5, 1928, quoted in Clemensen, Historic Structure Report.

⁶⁵ Leonard Heaton, Journal, April through June 1949.

⁶⁶ "Emergency Stabilization of East Gateway of Winsor Castle (HS-01)," Historic Preservation Maintenance Completion Report, 2007.

6.0 Description and Investigations of the Upper Building

6.1 Kitchen and Parlor: Rooms 102 and 103

The upper building's parlor and kitchen contain evidence of significant, repeated material replacements of the wood floorboards and plaster since the early NPS era; however, less modification has occurred to the decorative woodwork surrounding the rooms' doorways, windows, and fireplaces, where original, hand-planed elements have required only periodic repair. The replacement of the floorboards, joists, and other wood elements—particularly the baseboards—correlates to persistent moisture damage which also resulted in repeated plaster and cabinetry repairs. Replacements could also be due to the lack of proper maintenance prior to NPS's restoration efforts or from structural displacement acutely visible in the partition and courtyard walls. Generally more protected from moisture damage than the floorboards, joists, or even baseboards due to protective coatings and location, the rooms' decorative woodwork (window and door casings and picture moldings) provides evidence of some repair and replacement history. The deterioration of these materials had been accelerated by the rooms' high humidity levels, although documentary records largely omit the methods of repair and even the specific type or location of woodwork undergoing treatment. Heaton supplied a partial record of work in these rooms through his daily journal, but the frequency and extent of these repairs remains ambiguous. At the rooms' openings, the reveals, soffits, sills, and casings appear to largely maintain their original integrity, evidenced by visible planing and the shape of their integral beads.

During the maintenance efforts at the end of the 1940s, Heaton briefly commented on tending to the moldings in the upper building's lower rooms. In 1948 he wrote of searching for a

beading plane to “match the old wood work.”⁶⁷ Once obtained, Heaton completed the repairs in the parlor (and presumably the kitchen) by hand planing the new pieces and commented that “an effort was made to preserve all woo[d] work as original, [and] replaced wood was made to conform to as near as the original.”⁶⁸ One year later, in 1949, Heaton further noted that the woodwork “had become loose from walls due to age and plaster falling off,”⁶⁹ an indication that damage had either progressed where Heaton had not previously worked, or the areas repaired in 1948 required more work. Although the floorboards and joists had rotted and required replacement just three years earlier, it is assumed that at the time of the floor replacement the window and door casings and picture moldings were not addressed. The baseboards, however, were repaired (or, less likely, refabricated) and installed following the placement of new floorboards.

Replacements of picture molding—sections of which, according to Heaton, were missing in 1928⁷⁰—may have been made at this time, in addition to the likely Dutchman repairs of door and window casings (*see Condition Survey, Appendix F*) that were created with a similar beading plane. The restoration program during the initial NPS era required the replication of original profiles. These pre-1959 repairs lack such visible variations in the size and shape of the bead and quirk that differentiate original from replicated wood in the later years of the restoration period. The Dutchman repairs of the interior door casement (Door No. 9, *see Door and Window Schedule, Appendix C*), which have a bead and quirk virtually indiscernible from the original

⁶⁷ Leonard Heaton, Journal, February 18, 1948: “Have the kitchen room finished up as far as I can til I get a [b]eading plane to match the old wood work.”

⁶⁸ Leonard Heaton, “Room 3 (parlor), Repair to floor and wood work,” January 31, 1949.

⁶⁹ Leonard Heaton, “Room 3 (parlor), Repair to floor and wood work,” January 31, 1949.

⁷⁰ Leonard Heaton, “Room 3 (parlor), Repair to floor and wood work,” January 31, 1949.

woodwork, suggest that Heaton completed the work on these sections of replacement wood with the beading plane he wrote of obtaining.

On the south wall of both rooms, moldings with the distinct uniformity and machined appearance typical of the 1959 reproductions are found abutting the cabinets of the adjacent walls. The original picture moldings in these locations, positioned in the narrow space between the south windows and east and west cabinets, were likely lost or damaged during the cabinetry repairs. On this south wall, the molding adjoining the kitchen's courtyard door (at east) has been replaced, possibly due to the replacement of the adjacent door frame. The high humidity, frequent replastering, and occasional cabinet repairs have largely contributed to the periodic replacement in these lower rooms.

6.1.1 Cabinets

The four floor-to-ceiling wall cabinets show similar inconsistencies indicating deterioration and repair throughout the early NPS period. In 1928 Heaton noted that both cabinets showed signs of rot and termite damage,⁷¹ but no work was recorded. The first record of their removal and repair does not appear until 1947. Although not well documented, the repairs have included the removal of the cabinets from the walls—corresponding to dates of floor replacement—and plastering of the walls behind the cabinets. Their condition and extent of repairs went largely unrecorded, including any replacement of the wood. Prior to commencing work on the cabinets, Heaton wrote that they remained in acceptable condition but were “comming [*sic*] to pieces,” which likely described problems not with material integrity but with their alignment and

⁷¹ Leonard Heaton, Journal, February 5, 1948.

connections.⁷² It was in December of 1947 that Heaton first wrote of removing the cupboards in the kitchen.⁷³ No specific repair work was noted, but it is unlikely that the connection and alignment issues would have been ignored upon reinstallation.⁷⁴ The kitchen cupboards in particular show greater evidence of their repair history, racking, and connections, issues visible from larger gaps between the doors and center rail and stile, as well as beads that have been planed to accommodate misaligned cabinet doors (mostly of the north cabinet).

The 1959 floor replacement required the second documented removal of all cabinets in both the parlor and kitchen, and the work during this restoration campaign was more directly addressed. Heaton commented on the need for the cabinets to be “repaired and treated with a wood preservative [*sic*].”⁷⁵ In successive months, work continued on the cabinets with the plastering of the back wall of the cabinet interiors (implying plastering of the masonry wall behind the backboards currently installed)⁷⁶, repairs to and/or replacements of the metal locks and hinges, and unspecified repairs to the disassembled cabinets, which likely included Dutchman repairs to the doors and possible planing of the framing (especially visible at the center rail where the bead has been significantly planed).⁷⁷

A comparison of the HABS drawings and the current installation indicates that while the cabinets have been subject to restoration including hardware changes and wood repairs, they

⁷² Leonard Heaton, “Ruins stabilization record sheet, 1947.”

⁷³ Although Heaton specifically mentions the removal of the kitchen cabinets, the lack of mention of the parlor cabinets does not preclude their repair as well, since the floorboards were replaced in both rooms.

⁷⁴ Leonard Heaton, Journal, December 4, 1947.

⁷⁵ Leonard Heaton, “Memorandum to Regional Architect, Region Three, January 9, 1959,” 1959.

⁷⁶ Leonard Heaton, Journal, March 27, 1959. “Finished the steps from room 2 into court years [*sic*] looks good. Ford plastered up the wall back of the 4 cupboards in room 3-4.”

⁷⁷ Leonard Heaton, Journal, April 3, 1959; Heaton, Journal, April 6-9, 1959. “Ford working in rooms 4, 3. Has the cupboards repaired, ready to put back into place.” “Recommended Work on Historic Pipe Spring Building by Regional Architect Saunders and Regional Archeologist Steen – High Priority, FY 58-59.”

have substantially maintained their integrity (*see HABS Drawings, Appendix L and Plan, Section, and Elevation Drawings, Appendix E*). The HABS drawings suggest that in 1940 (prior to any record of the cabinets being removed or repaired) the doors and frames maintained comparatively uniform dimensions, including the heights of the frames, which showed no variation between the north and south cabinets of the same room. It is likely that the cabinets had not been dismantled for the 1910 or 1928 floor replacements, since Heaton discovered original flooring inside the kitchen cabinets in 1947. The frames, therefore, would probably have remained unaltered, even with the increase in floor height during the 1928 installation.⁷⁸ The modifications to the foundation and reinstallation of the floorboards in 1948 resulted in a slight drop in the floor height, which consequently affected the height of the cabinets. To compensate for this change, an additional strip of wood was installed at the top of the south parlor cabinet frame (in place before 1960⁷⁹), and Dutchman repairs have been made to the bottom of several cabinet frames. The narrow top and bottom rails of the kitchen cabinets illustrated in the HABS drawings have been replaced with wider boards to compensate for the height change.

All cabinets would have been removed during the March 1959 restoration when the walls behind the backboards were replastered.⁸⁰ Aside from this record, no clear documentation exists on the repairs completed, or what original material remained. An inspection of the extant

⁷⁸ Heaton, Journal, 1928: floors raised 1.5 inches; and December 3, 1947: "Finished cleaning out the kitchen rooms of the fort found a small section of the original floor boards they are 1 full inch thick, 4 ½, 5, 5 ½ and 6 inches wide and tongued and grooved, nailed with the old square cut nails to a 2x6." The current floorboards found in the cabinet have been cut and are an earlier installation than those of the current floor; however, it is not likely that they are the original floorboards. The most probable assumption is that they date to the 1959 installation when the floors were lowered to their current height. During the 1980 replacement, the floors within the cupboards would have been retained, causing the different in flooring.

⁷⁹ Pipe Spring National Monument, "Fort Building No. 50," photograph, c. July 5, 1960. Living room furnishing acquired and restored during rehabilitation work.

⁸⁰ Heaton, Journal, March 27, 1959.

woodwork does indicate that much of the cabinet interiors are circular and reciprocal sawn and hand planed (Figures 6.1 and 6.2). Because several areas of replacement boards are clearly discernible from the cabinets' hand-planed wood, it is assumed that much of the shelving and backboards remain original. Only the shelves and two lower backboard planks of the kitchen's south cupboard are circular sawn with no hand-planed detailing. It is likely that these replacements occurred during the 1959 restoration, when Heaton explicitly stated that work was done to the cupboards.⁸¹ By the time of this later restoration, hand planing does not appear in replacement woodwork.

6.1.2 Fireplaces

The condition of the parlor fireplace in the 1940 HABS photograph⁸² is likely very close to its original appearance, since alterations and repairs to the fireplaces appear to have occurred in response to the floor replacements and cabinet repairs beginning in 1947. In the parlor, a single piece of mantel molding is nailed to the north cabinet frame, while the opposite end contains three cut pieces. All have clearly been detached from the mantel to allow for the removal of the cabinets. The HABS image shows that the fireplace in 1940 was, however, somewhat deteriorated at the plinth, plaster surround, hearth, and within the firebox.⁸³ At the time the photograph was taken, replacement wood is visible at the bottom of the right jamb and on the

⁸¹ Heaton, Journal, March 27, 1959.

⁸² There is no HABS image of the kitchen fireplace.

⁸³ Library of Congress, Prints and Photographs Division, Historic American Buildings Survey, Historic American Engineering Record or Historic American Landscapes Survey, Reproduction Number: "HABS ARIZ,8-MOC.V,1—8."

adjacent plinth⁸⁴; the base molding of both plinths is missing and assumed to now be a replacement (Figures 6.3 and 6.4). The remaining components of the pilasters and jambs exhibit hand-planed detailing and are probably original, as are the mantel and header. Heaton writes of repairing the woodwork around the fireplace in a 1948 journal entry, although he never directly addresses the repairs to the plaster surround or pointing of the firebox masonry which had both been completed by the early 1960s.⁸⁵ The plaster on the upper stones of the firebox was either manually removed during a restoration campaign or further deteriorated in successive years and is no longer extant. The severely cracked (north) hearthstone shown in the 1940 HABS photograph was likely replaced (without documentation) during the floor installation in either 1948 or 1959, since a new stone was in place by 1960.⁸⁶

Without a photographic record prior to the 1940s and 1950s restorations, less conclusive evidence exists to delineate repairs to the kitchen fireplace. The wood of the mantel, header, jambs, and pilasters shows the hand-planed details characteristic of the original woodwork found elsewhere in the Fort, including the parlor fireplace (Figure 6.5). Some minor replacements of molding are possible on the right pilaster, evident by their clear definition (implying a more recent fabrication with less paint) and slight variation in shape. The fireplace also shows the same pieced molding around the mantel at the north cabinet, which again indicates that the mantelpiece was disturbed to allow for the removal of the cabinet. A more explicit record of the mantelpiece removal is found in Heaton's journal where he states that he "put back mantel over

⁸⁴ Heaton writes in his journal on October 29, 1936 that he started work on the fireplaces, but he does not specify what the work entailed. It could have involved the Dutchman repairs and minor wood replacements that are still visible in 1940, since no further repairs to either fireplace were made until 1948 when Heaton modified the foundation and installed new floors. Heaton Journal, October 29, 1936; Heaton Journal, January 16, 1948.

⁸⁵ Photographs from 1961 and 1965 of the parlor fireplace showing repairs to the plaster surround and pointing of the firebox masonry, Pipe Spring National Monument Archives.

⁸⁶ Photograph from 1960 of the parlor fireplace, Pipe Spring National Monument Archives.

fireplace in kitchen.”⁸⁷ This may have also included the removal and reinstallation of the header, which shows signs of disturbance.

A comparison with the parlor fireplace offers further possibilities of repair work completed within the kitchen. Since both rooms sustained moist environments for decades that greatly compromised the floors and plaster, it is likely that the kitchen fireplace was in the same state of deterioration in 1940 and received repairs to the plaster surround and mortar of the firebox masonry, similar to those completed in the parlor. The floor replacement of the building’s lower level also affected the foundation of the hearth, and some concrete is visible on the hearthstones, but any replacement of these stones is indeterminable.

6.1.3 Stairs

Few records of any construction or maintenance work completed on the stairs exist in Heaton’s journal or elsewhere, such as earlier diaries and personal accounts of Pipe Spring residents or later maintenance reports by NPS staff. Based on the physical investigation of the stairs’ material and assembly, it was found that this feature was installed after the initial construction of the building (although the stairs were in place within one or two decades of the Fort’s 1872 completion date). From the upper building’s first level, little evidence of the room’s original configuration is apparent. Originally an open space, the enclosed area below the stairs, now forming a storage closet, provides some indication of modifications to the staircase over time, but does not give definitive evidence that the stair was a later addition. From below the stair, circular saw marks can be identified on the treads and risers, and cut nails serve as the primary

⁸⁷ Leonard Heaton, Heaton Journal, March 11, 1948. An effort was made to preserve all woo[d] work as original, replaced wood was made to conform to as near as the original, blocks of 2x3x7in. were set in the walls with cement to nail base board and cupboards mantle piece [sic], door frames to; Leonard Heaton, Jan. 31, 1949.

fasteners (although wire nails have also been added to secure the system). The center stringer, likely installed by Heaton, dates to a later period of restoration, and was probably introduced to shore the system to accommodate the monument's increasing tourist industry (Figures 6.6 and 6.7).⁸⁸

From within the stairwell, the construction sequence offers some indication that the stairs were added at a later date. The typical building methods of the Fort buildings (revealed through physical investigation) historically included installation of the woodwork followed by plastering of the walls. The reverse is found within the stairwell where the stringer abuts a finished wall. The plaster between the stringer and masonry appears to date to the earlier years of the Fort and differs from the current application. Had the stairs been original, the stringer would have been installed prior to applying a plaster coating to the walls. Further evidence substantiating the time of stair installation can be found within the meeting room (see *6.2 Meeting Room*).

6.1.4 Floors

From 1910 to 1980, the floorboards in both the kitchen and parlor had been replaced on average every fifteen to twenty years.⁸⁹ The joists were replaced less frequently—the first new installation occurring in 1928 with subsequent installations in 1947 and 1959.⁹⁰ Persistently high

⁸⁸ Leonard Heaton, Heaton Journal, January 5, 1948.

⁸⁹ Leonard Heaton, "Ruins Stabilization Record Sheet," 1947. "Some time while the fort was still in privit [sic] hands the floor was relaid with 1x12 inch rough boards; and 1928 the floor was again replaces with 1x3 T&G laid on 2x8 joyce."; Leonard Heaton, Journal, November-December 1947; Frank R. Oberhansley, "Completion Report, July 25, 1961 for work completed in 1959"; "Pipe Spring Fort Restoration," 1980.

⁹⁰ Leonard Heaton, "Ruins Stabilization Record Sheet," 1947. "Some time while the fort was still in privit hands the floor was relaid with 1x12 inch rough boards; and 1928 the floor was again replaces with 1x3 T&G laid on 2x8 joyce." Leonard Heaton, "Notes of Leonard Heaton, 11/26/1947 – 12/4/1947;" the joists were at least partially replaced at this time. Heaton writes of taking up the kitchen floor and finding half the joists rotted; he also mentions

humidity levels in the Fort's lower rooms contributed to the short lifespan of the flooring and the need for constant maintenance. Various treatments, system configurations, and alterations to mitigate the recurring moisture issue were attempted during most floor replacements. In the winter of 1947 to 1948 Leonard Heaton implemented several changes to the foundation to elevate the joists off grade and prevent moisture from saturating and rotting the structural components. In his journal, Heaton details the process of removing rock from the foundation and setting forms at the north wall and around the fireplace; concrete footers were then installed which, after lowering grade from the rock removal, caused a slight drop in the height of the floor. The new joists were set on the concrete footers and (along with the floorboards) received a coat of paint to seal the wood. At this time, one ventilation hole was created through the southeast masonry wall, leading to the courtyard, to increase air circulation below the floorboards.⁹¹

In the superintendent's report referencing the last recorded date of joist replacement (1959), the lumber ordered for installation was pressure treated fir.⁹² At the same time, several more subfloor vent holes were drilled through the south stone wall to encourage moisture egress to the courtyard.⁹³ The moisture problems persisted, however, and although the joists have not been replaced since 1959⁹⁴, emergency measures to address the water source causing such

setting pegs to determine the joist placement and height, as well as pouring a concrete foundation on which to rest the joists. Although there is no explicit mention of joist replacement, it can be assumed that rotten members were not reset onto the new concrete foundation. There is no mention of joist replacement during the 1976 floor removal or the 1980 installation.

⁹¹ Leonard Heaton, Heaton Journal, December 23, 1947.

⁹² Superintendent's Report, February 1959; "Rehabilitation of Fort," February, 1959, Monthly Narrative Report, Pipe Spring National Monument.

⁹³ Leonard Heaton, Journal, January 1959; Leonard Heaton, Journal, February 26, 1959.

⁹⁴ There are no records indicating that the joists were replaced in the subsequent floor installations of 1976 or 1980, so it is assumed that the joists date to the 1959 floor replacement.

frequent damage led to the removal of the floorboards in 1976 and their final replacement, with significant alterations to the building envelope, in 1980.

For the first century since the Fort's completion, repair methods were implemented as a reaction to damage but failed to address the cause. By the mid-1970s, the superficial treatments to the woodwork, frequent floor replacements, and occasional building modifications to improve ventilation were deemed insufficient to counter the effects of ongoing moisture damage. In 1976 NPS historical architect for the Rocky Mountain Region, Rodd L. Wheaton, met with the architecture firm Conron and Muths for an emergency inspection to examine the extent of damage (visible and latent) to the upper building's north masonry wall and lower level rooms. During this investigation the team found that, from the interior, the soft sandstone units ranged in condition from friable to solid.⁹⁵ The disparity in the condition of units was partially due to the use of Portland cement as a repair mortar. The original lime and sand mortar allowed moisture to escape through the joints, but the Portland cement rerouted water through the softer sandstone blocks and began the process of attrition (Figure 6.8).⁹⁶ Although the environment had not been greatly altered over time, the efforts to repair the moisture-damaged material within the rooms had inadvertently caused the deteriorative process to expand from wood and mortar to also include the structural stone.

The 1976 inspection resulted in the removal of the floors from both lower level rooms and the complete removal of the two-inch thick Embeco concrete finish, originally applied in 1949⁹⁷, from the north wall (Figure 6.9).⁹⁸ The mitigation project required extensive work on the

⁹⁵ Rodd L. Wheaton, "Trip Report," November 30, 1976.

⁹⁶ Rodd L. Wheaton, "Memorandum to the Superintendent," Zion National Park, United States Department of the Interior, November 8, 1977.

⁹⁷ Ruins Stabilization Record Sheet, "Repair to floor and wood work," Pipe Spring National Monument, January 31, 1949. Embeco plaster installed in 1949.

exterior wall—including excavation of a drainage trench to prevent the flow of water from entering through the north wall—and would be completed in phases over several years (Figures 6.10 and 6.11). During the interim, the first floor remained closed to visitors⁹⁹ with the display furniture held in storage until, in 1980, new tongue and groove floors and baseboards were installed under Phase I of the stabilization project.¹⁰⁰ The north wall remained unplastered to allow for a yearlong moisture monitoring program, but furniture was returned to the rooms to allow for the reopening of the parlor and kitchen to visitors.¹⁰¹

The project significantly decreased the amount of moisture entering the building and subsequently lowered humidity levels of the interior rooms. Because of the reduction in moisture, no major modifications or replacements have been made to the woodwork, flooring, or plasterwork since the completion of the masonry stabilization program in 1980, although maintenance such as plaster repairs and painting of woodwork has continued during the past three decades.

6.1.5 Baseboards

The baseboards in these lower level rooms contain varied characteristics from reciprocal saw marks that have been hand planed to indeterminable finishing (possible sawing, sanding, and/or

⁹⁸ Emergency Stabilization Conference (Wheaton, Heyder, Tracy, Muths); Rodd L. Wheaton, “Trip Report,” November 15-16, 1976.

⁹⁹ Pipe Spring National Monument, “Superintendent’s Annual Report,” 1978, 34. “The ground floor of the north wing of the Fort remains closed. We hope that the restoration work scheduled for 1979 will correct the water seepage problem.”

¹⁰⁰ Raymond D. Pollock, “Pipe Spring Fort Restoration,” no date.; Narrative: Pipe Spring Fort Restoration: “The subfloor and finished floor [were] replaced in rooms three and four. Filler and stain was applied to finish the tongue and groove flooring and base boards were installed.” Summer 1980

¹⁰¹ “SL0865 Reconstruction of fort walls interior north and west wall of kitchen,” photograph, c. June 1980.

planing). Multiple nail holes and nail types indicate the reuse of the boards, although their removal and reinstallation does not suggest that they are original to the room, due to the frequency of removal during the many floor replacements. The lack of uniformity in finishing further indicates that they may have been installed during different repair campaigns.

Although the dates of the baseboards are not conclusive, the diverse characteristics of their finishing and nailing indicate that they have all been removed and reinstalled, possibly at different dates. One shared characteristic, however, is the flatted bead distinctive of the 1959 reproduction moldings (Figure 6.12). Archival photographs from the last floor replacement in 1980 show the baseboards along the north wall in situ after being stripped of paint and prior to refinishing; the baseboards along the east partition wall appear not to have been removed or refinished during this treatment (Figure 6.13). The images confirm that the baseboards were either reused or not removed at this date. Given the flattened bead typical of the NPS restoration period and the previous floor replacement in 1959, it is highly probable that most baseboards hold a 1959 fabrication date.

6.2 Meeting Room: Room 202

In the years following the Fort's construction, the habitation by Pipe Spring's earliest residents and evolving needs led to a series of structural alterations affecting the functionality and accessibility of the upper-level space. The best documented of these alterations was the division of the meeting room, constructed as a large, open space presumably for family and business meetings, into two private rooms. The directive for this change came not from Pipe Spring residents but from Mormon leader Brigham Young. In 1876 Charles Pulsipher recorded in his journal that Young instructed him to "divide off that large upper room into bedrooms so that

when the Brethren come along [Pulsipher could] make them comfortable.”¹⁰² With numerous guests in these early years, more lodging space was required, and an added wall would not only increase the number of guests the Fort could accommodate but it could better serve the families residing there throughout the years Pipe Spring would spend in private hands.

The room’s two other major alterations—the addition of the north exterior door and the installation of a staircase leading to the first floor kitchen—lack any record indicating the exact date of change. The single source of evidence for the door addition is found by examining the Tissandier drawing, which offers a clear depiction of the door in 1885 (further physical evidence suggesting that the door was an early addition is found on the exterior wall and is discussed in *5.1 Exterior of Winsor Castle and Courtyard Gates*).¹⁰³ The staircase has no mention in historic documentation, although physical evidence strongly indicates that it was not original to the building. In considering the orientation and purpose of each feature, it is likely that the three alterations were planned and implemented concurrently, between 1876 and 1885, to increase both privacy and access to each room. In other words, the changes were not haphazardly completed in separate stages years apart but were meticulously planned and executed in tandem, despite Young’s single request to divide the space in two.

This more comprehensive renovation probably commenced soon after Young’s 1876 order to partition the large upper room, with the actual division of the space likely coming last in the sequence of the three alterations. Although no definitive evidence confirms which alteration occurred first, it is plausible that the exterior masonry wall was cut for a doorway while the meeting room’s floorboards remained intact. Without the stairs or partition wall, workers would have had greater access and stability to create the opening and rework the surrounding masonry.

¹⁰² Edna Cunningham, “A Short History of Charles Pulsipher,” N.D.

¹⁰³ Albert Tissandier drawing, drawing, 1885.

Inside the Fort, a dearth of physical evidence survives to indicate the early door construction. It is the configuration of the exterior masonry that suggests the doorway is not original.

With more physical constraints in constructing the stair, the location and orientation seem apparent. The kitchen's north wall—situated below grade and lacking any windows, doors, or cabinets—provided builders with a workable span in which to build the stairs at a moderate pitch and to support the stringers on the masonry partition wall that separates the two lower-level rooms. On the second level, the stairs did not obstruct any existing windows or doors; however, one gun port is centered high on the wall above the center of the staircase. The arrangement renders the gun port unusable, although its necessity in the defensibility of the Fort had waned soon after construction on the Fort began.¹⁰⁴

In examining the construction of the staircase, it becomes apparent that the board adjacent to the opening is anomalous in width and length in comparison to the surrounding floor, with cut nails larger than those used in the surrounding flooring fastening it to the framing below. Significantly wider than surrounding floorboards, the board spans only the length of the stair opening and was undoubtedly installed prior to the erection of the interior partition wall. Like the neighboring floorboards extending south to the courtyard wall, this anomalous floorboard exhibits clear evidence of the location of the partition wall and the threshold of the doorway (the 1940 HABS floor plan shows that the threshold would have started near the center of the board's width¹⁰⁵).

Selective probes around the staircase yielded further evidence of the feature being an early alteration, with the removal of the floorboard revealing a series of modifications to the

¹⁰⁴ Kathleen L. McKoy, *Cultures at a Crossroads: An Administrative History of Pipe Spring National Monument*, U.S. Department of the Interior, national Park Service Intermountain Region (Denver: Colorado, 2000), 33.

¹⁰⁵ The floor boards are not delineated in the HABS drawing; however, using the drawing to find the location of the threshold and examining the floorboard provides evidence to show the exact location of the wall and doorway.

flooring system. The six joists uncovered below the floorboard, believed to be original to the structure and which extend from the masonry wall of the courtyard and terminate on the south end of the staircase, are 2- x 10-inch circular sawn boards spaced approximately 21 inches on center. Exposure of the joists provided evidence to suggest that they had been modified from their original orientation. The lack of uniformity in the length of the joists and the imprecision of the cut strongly indicate that they had been sawn in place and once extended several feet beyond their current location and engaged in the exterior masonry wall (Figure 6.14). After being cut to serve as tail joists for the stairway, the joists were affixed to a 2- x 9-inch circular sawn trimmer, nailed from the stair opening. At the juncture between the tail joists and trimmer, the variability in length and the irregularity of the cuts are greatly visible. The eastern joist proved to be an exception. Not cut at the trimmer, the joist appears to now end several inches north of the trimmer and abuts the beadboard wall (Figure 6.15). At the time of the alterations, the joist, situated only a few inches east of the partition wall, would most probably have distributed the weight of this wall to the two exterior masonry walls where the joist once engaged. In its current configuration, the joist cantilevers from the south courtyard wall and, although it is tied into the stair trimmer, the weight of the partition wall would have greatly stressed the joist and potentially contributed to the current sagging visible in the floor.

At the time of the alteration, the floorboards (which extend east to west) were also cut to accommodate the staircase. Because the floorboards were nailed to the outer tail joists during the alteration, nailers were fastened to each of these joists to support the wide floorboard inserted along the length of the stair to create a butted connection between boards (Figures 6.16 and 6.17). Both nailers exhibited signs of age: the nailer at the head of the stairs had an early pencil doodle depicting a man's head on a fish body (likely drawn and installed at the time of the

alteration), and the nailer to the east matched the building's historic molding profiles with a large bead planed into the wood block. Each nailer was fastened with cut nails and dates to the alteration.

The materials used in the stairwell, beadboard railing, and architectural moldings contain details characteristic of the original workmanship, suggesting that the alteration would have most likely occurred soon after the building's initial construction. Within the stairwell, the risers and treads show significant signs of wear and no indication of replacement (Figure 6.18). Cut nails are visible at the outer edges of the treads, while wire nails are found in the center to secure the later addition of a third stringer underneath (see *6.1 Upper Building, Kitchen and Parlor* for further information on the addition of the center stringer). The beadboard wall is circular sawn with a hand-planed finished face and is comprised of variable width tongue and groove wood members, fastened with cut nails, extending from the floor of the kitchen to waist-height in the meeting room; the workmanship suggests that many of these boards likely date to the installation of the stairs.

The alterations likely concluded with the installation of the partition wall, which extended from the courtyard doorway, abutting the beadboard wall and continuing along the eastern end of the stair opening to end just west of the newly created exterior doorway. Although no photographic documentation exists to definitively show the wall's construction and detailing, it can be assumed that, because the wall was erected soon after the Fort's construction, it was most likely built in the same manner as the room's other partition wall that separated the meeting room from the northwest bedroom: a plaster and lath assembly with wood casings surrounding the door, baseboards, and picture molding. The door was positioned not at the center of the wall to reflect the centered door of the opposing partition wall but was adjacent to the staircase.

Of the three historic alterations to the room, only the insertion of the partition wall was reversed in later renovations, although the room remained divided during the first few decades of the site's existence as a national monument. The HABS drawings of 1940 show the upper floor of the upper building as having three distinct rooms (numbers 8, 9, and 10 on the HABS second floor plan¹⁰⁶, see *Appendix L: HABS Drawings*), with the dividing wall extending from just west of the courtyard door to just west of the north exterior door, and enclosing the back of a slightly shorter stairwell opening. The wall remained in place until NPS administration mandated that the monument revert back to what was believed to be its original form when it served as a Mormon homestead and tithing ranch. During the 1959 restoration to reinstate the site to its historic appearance, workers removed the wall and the space was converted back to a single, open room. The reversal and renovations had several implications on the other features—particularly the stairway.¹⁰⁷

The removal of the wall in 1959 instigated several new modifications to the staircase to both recreate what was believed to be the original stair and increase visitor safety and comfort. The wall removal necessitated the railing system to be extended around the stair back. Rather than simply enclosing the area, NPS modified the stair by elongating the opening by several inches to provide more clearance within the stairwell. This elongation is clearly visible with an examination of the floorboards, which exhibit a darkened line where the partition wall once stood (Figure 6.19). The line now terminates within the stair opening, rather than extending across the floorboards east of the stair, as it would have without further alteration to the stair

¹⁰⁶ Library of Congress, Prints and Photographs Division, Historic American Buildings Survey, Historic American Engineering Record or Historic American Landscapes Survey, Reproduction Number: "HABS ARIZ,8-MOC.V,1-(sheet 3 of 14)."

¹⁰⁷ Leonard Heaton, Journal, February 4, 1959. "Mose & [S.] Heaton digging out spring area & took down the partition wall room 9,10 which was put in about 1880 and not part of the original building in 1870."

following the wall's removal. No longer needing to distribute the weight of the partition wall, the joist at the stair header was likely cut at this time to terminate at the beadboard wall in order to accommodate the lengthening of the opening.

The dismantling of the wall and extension of the opening created a need to enclose the stairwell on both the southeast and east ends. Like material was used to replicate the existing wall and maintain continuity with added beadboard planks, replacement baseboard, and longer railing. Evidence suggests that in the 1959 restoration campaign, material added during the modification was both (newly) fabricated to look historic and reused from other features within the Fort. The lack of documentation—particularly the lack of period interior photographs—required a careful examination of the material and configuration to discern what had been modified and/or newly fabricated from what was installed at the time of the historic alteration.

An inspection of the beading and workmanship of all beadboards, in consideration of the room configuration prior to the wall removal, revealed the extent of the restoration and the juncture of new and old planks. On the north elevation, the third board from the eastern end is hand planed but has no bead. This board would have abutted the partition wall and was possibly trimmed (losing its bead) to create a flush connection against the wall when erected in the late nineteenth century. The boards extending west of this plank exhibit hand-planed detail and probably date to the stair installation, unlike the two remaining boards on the north elevation and those enclosing the stair back (see Figure 6.15). While these additional beadboards placed after the wall removal contain a comparable bead and are random width tongue and groove planks—similar to those at the opposite end—they contain a smooth, machined appearance and lack the hand-worked characteristics of the historic boards.

The other elements of the railing system—specifically the handrail and baseboard—contain historic qualities, but because they continuously span both the historic and modified portions of the stair opening (with no cuts to indicate an extension piece), they would have been either newly fabricated in 1959 or reused from another location within the Fort. With no other comparable handrail in the Fort, it seems probable that this longer rail was produced during the restoration. However, slight variations were found between the longer handrail spanning east to west and the railing extending along the stair back from north to south. The shorter handrail along the stair back measures 1/8 inch less in height, and the two rails share a poor connection at the mitered corner where they meet. A difference in the period of fabrication could account for the variation in size; had the handrail been fabricated at one time, it seems unlikely that the two sections would differ in size. With no conclusive evidence to support the date of construction of either handrail, the greater distress of the shorter railing indicates that it could predate the adjoining piece.

The banister post at the head of the stairs likely escaped modification during the restoration efforts. With no visible alterations to the beadboard planks adjoining the post, the only modification affecting the element would have been the replacement of the handrail, which was mortise and tenoned into the post. It is unclear whether the new rail is pegged into the post, or if it simply abuts the post.

The dismantling of the room's partition wall provided workers with late-nineteenth-century moldings, including door casings, baseboards, and (probably) picture molding in which to incorporate into the restoration projects. Rather than reproducing the beading and planing of the baseboards, reuse of those found along the partition wall would have been a less costly and labor intensive option. Although not identical to the moldings assumed to be original in the

room, the baseboard spanning the stair railing exhibits similar characteristics: a rounded bead and deep quirk; circular saw marks; hand-planed boards; beveling at the floor; and fastened with cut nails. The bead, however, slopes slightly toward the quirk, unlike the more rounded beads and quirks of other baseboards within the room (Figures 6.20 and 6.21). Because the baseboard potentially originates from the partition wall, the minor difference in bead orientation could be due to the slightly later fabrication date (approximately 1876-1885, or possibly later) that would have resulted from the installation of the wall and moldings following the Fort's initial construction. Since the door was placed adjacent to the staircase and not centered within the room, the section of wall south of the door would have provided sufficient material for the span of baseboard required to finish the north elevation of the stair railing. The section enclosing the stair back could have come from the smaller section of partition wall that abutted the north exterior wall or from the long section of baseboard opposite that used to trim the north elevation. Reuse is also more likely than reproduction because the baseboards fabricated during other restoration campaigns (specifically of the lower building's 1930 partition wall installation on the upper level) exhibit a large and somewhat flattened bead, easily distinguishable from the rounded beads of the historic moldings.

Documentary evidence of the room and its features dates only to the post-1959 restoration and shows the current configuration with the elongated stair opening, added beadboard planks, reproduction railing, and modified baseboard. Images taken soon after the deinstallation of the partition wall also depict a strong line in the plaster delineating where the wall stood; successive replastering campaigns have eliminated this demarcation from the walls

and ceiling (Figure 6.22).¹⁰⁸ Other historic images provide an indication of the repair history of various materials: the beadboard planks were stripped and refinished, the walls and ceiling have been replastered, and the floors have been restrained (Figures 6.23, 6.24, 6.25, and 6.26). While the sparse collection of interior images proves that the material has remained in situ since sometime prior to 1970, it does not contain sufficient evidence to confirm that any particular element is original to the construction of either the building or period of alteration. Rather, the images support the likelihood that no further large-scale material replacement of woodwork has occurred in the meeting room since 1959; the ceilings, walls, and floors, however, have been subject to various degrees of material change, including replastering and the more recent Dutchman floor repairs.¹⁰⁹

6.2.1 Floors

On the north building's upper floor, humidity levels have periodically risen and impacted the wood features (and the floors specifically), but the moisture has not had the same detrimental effects as it had on the lower floor. Elevated above grade (and above the underlying spring), moisture damage has developed intermittently, causing warping and sagging, although the

¹⁰⁸ Image of the meeting room, photograph, undated, Pipe Spring National Monument archives, Interior Room Inventories. Undated, but after the 1959 restoration to remove the partition wall and restore the room to what was believed to be its original appearance. Likely 1960s/1970s.

¹⁰⁹ Historical Architect - Rocky Mountain Region, memorandum to Superintendent of Zion National Park, "Repair of windows, moldings and door frames at Pipe Spring National Monument," December 14, 1982. Although replastering erased critical evidence of the wall placement from the walls and ceiling, the methods of this type of repair changed in the 1980s in order to better preserve extant building material: "When replacing original plaster on the walls and ceilings in the upper rooms, the original wood lath will be retained and the new plaster keyed onto it. This will be more labor intensive, but the integrity of the repaired wall will be greater."

relatively minimal impact has precluded total replacement and allowed for localized repairs of the room's floorboards.

Aside from being cut several inches at the stair back immediately following the removal of the partition wall, the floorboards contain no visible alterations prior to and immediately following the 1959 restoration effort. The evidence of the partition wall that remains on the floorboards confirms that the floor predates the wall installation of c. 1876–1885. Impossible to pinpoint the exact period of fabrication, it is unlikely that the flooring would have been replaced prior to the partition wall erection, which suggests that the floorboards likely date to the Fort's 1872 construction. The floorboards were clearly installed for the larger meeting space (not two divided rooms), since they spanned continuously beneath the added partition wall. The boards do, however, terminate under the western partition wall that separates the meeting room from the northwest bedroom, indicating that these rooms comprised the original configuration of the upper floor.

While the flooring escaped outright replacement since prior to the late-nineteenth-century alterations, it has been susceptible to cupping, cracking, and splitting due largely to the fluctuating humidity levels (Figure 6.27). Additionally, structural changes from the stair, the weight of the partition wall currently separating the two rooms (unsupported from below), and decades of increased foot traffic from staff and visitors have likely caused the sagging in the room's central floorboards. The conditions resulting from moisture were addressed in 2008 and 2009 to mitigate visitor safety issues arising from the uneven flooring. Although the repair targeted decayed wood and retained sound boards, there was partial replacement of numerous floorboards. Treatments included routing out damaged sections and inlaying and hand planing in-kind material; using epoxy injections to prevent further cracking; complete in-kind

replacement of several floorboards; and lifting more severely damaged boards, removing decayed areas, and splicing in-kind wood onto the remaining sound floorboard (Figure 6.28).¹¹⁰ A wood filler was used between boards and the repaired floor was stained (though not sanded).

6.2.2 Molding

The meeting room's door and window moldings provide continuity throughout the building with similar characteristics and workmanship as those of the lower level. Soffits and sills are hand planed (Figures 6.29 and 6.30), and the door and window casings and aprons exhibit the same integral bead and deep quirk (Figure 6.31). With the exception of the partition wall door casings and those of the north exterior door, all window and door casings contain the applied beveled backband common throughout the upper building. These beveled backbands appear to date to the original molding installation, since they were affixed with historic cut finishing nails (*see Nail Typology, Appendix H*). The doorways in the room lacking the added element show no evidence of nail holes where the backband would have been applied or were likely unadorned.

Unlike the lower level where multiple floor replacements and moisture damage necessitated frequent removal, repair, refinishing, and occasional refabrication of the baseboards, the meeting room maintains its historic flooring and, subsequently, many of its historic baseboards. All of the room's baseboards are fastened with historic cut nails; only several sections are supplemented with wire nails, suggesting that the baseboards were detached and reattached, or that they required additional fastening after separating from the wall base. The wide-scale and uniform use

¹¹⁰ Pipe Spring National Monument, "2008 and 2009 preservation of Winsor Castle Meeting Room floors," Historic Preservation Maintenance Completion Report.

of historic cut nails confirms that, while there may have been some repair, the baseboards fabricated early in the Fort's history have generally remained in the space.

The room's stair and wall alterations caused the creation and installation of new baseboards at the end of the nineteenth century. Characteristic to these baseboards is a more sloped bead, and this quality is found extensively on the baseboards enclosing the stair. Representative of the alteration period, two-inch historic cut nails, a type also used to secure the risers, largely served as fasteners of the stair baseboards. Along the south courtyard wall, two pieces were joined to create the span of baseboard from the partition wall to the courtyard door. Some modification would have been necessary to this area when the partition wall was first installed at the end of the nineteenth century and again upon removal of the wall in 1959. Both sections of baseboard show early qualities with a large, rounded bead and wide quirk, and a profile of the western section shows the sharply curved bead and deep quirk indicative of the earliest planing. While some modification to this area occurred following the 1959 removal of the partition wall, it is unclear how the compensation for the missing eastern section (where the partition wall adjoined the south wall) was completed. Because the butted sections of baseboard are visually similar, hand planed, and fastened with cut nails, it is probable that, as for the baseboard spanning the stair railing, a section from the dismantled partition wall was repurposed for the south wall.

Variations in the picture moldings indicate that replacement and repair have occurred in the meeting room, likely in 1959, following the restoration of the room's original configuration. It is probable that the room originally contained moldings with the earliest profile as found in the door and window casings and baseboards, and which survives in a minor section along the courtyard wall. When two rooms were created in the formerly open space, the second level

transformed from public to exclusively private rooms. During this conversion—which would have necessitated the fabrication of picture moldings and baseboards for the newly erected wall—it is possible (though now impossible to confirm) that the new picture moldings were not duplications of the large beaded moldings of the floors below, but were more a reflection of the private space with more delicate detailing through smaller beads. The current size of the moldings suggests that this theory is possible, but the large-scale replacement of moldings in this room precludes a firm conclusion. The small beaded molding currently in place is the typical reproduction molding found extensively throughout the upper floor of the lower building. In its use in the meeting room, the molding has been cut several millimeters above the quirk to truncate the bead and scale down the molding (Figure 6.32).

6.3 Northwest Bedroom: Room 203

Because the room remained private for many years while the site served as a Mormon homestead and later when Leonard Heaton and his family resided in the upper building¹¹¹, the room had not experienced the same potential for deterioration as either the lower level or the meeting room.¹¹² After moving from the upper building to the rooms of the lower building in February 1930, Heaton used the northwest bedroom for storage—likely leaving it unchanged for the duration it served this function. Following the family’s move, the upper building opened to the public, but most visitor traffic had been directed through the meeting room to the courtyard without allowing direct access to the northwest bedroom. The lack of heavy use has largely prevented

¹¹¹ Robert Keller, Interview with Leonard Heaton, 18.

¹¹² A. Berle Clemensen, “Interview with Leonard Heaton,” January 24, 1980, quoted in Clemensen, *Historic Structure Report*, 29. In this interview, Heaton mentions that the floors and wall plaster were original in the meeting room and northwest bedroom and that extensive restoration was not necessary; the room was cleaned at the time NPS acquired the site, but no other work was required.

major repairs and alterations to the woodwork, flooring, and room configuration. Although very little documentation of work to the room exists, the scarcity of records more likely indicates the infrequency of repairs and alterations rather than undocumented change.

Routine maintenance such as replastering and repainting of the walls and woodwork find mention in Heaton's journals throughout the decades he served as park custodian.¹¹³ The repair methods generally remain undocumented; however, in a 1946 journal entry Heaton expands on the replastering of the room by noting that the lath were spaced too far apart for the fresh plaster to easily adhere. Consequently, Heaton continued to work with the existing lath without replacement at the time.¹¹⁴ In subsequent years, the room sustained further deterioration of the plaster ceilings and walls, with severe cracking and detachment noted.¹¹⁵ Although written records only confirm that repairs were made to the walls and ceiling, a limited investigation into the partition wall showed a lath and plaster system typical of a later period than the nineteenth-century plastering that would have originally covered the wall. This system consisted of circular sawn lath, wire nails (*see Sample W.1 in the Nail Typology, Appendix H*), and a uniform scratch and finish coat of plaster.

The northwest bedroom affirms that room function dictated molding size during the initial construction of the Fort and early alterations. The room—the only truly private space initially planned in the upper building—contains scaled-down moldings with similar beading

¹¹³ Leonard Heaton, Journal, February 1952.

¹¹⁴ Leonard Heaton, Journal, June 24-27, 1946: "Did some patchwork in the fort today, the old plaster in west room, upstairs of north buildings is very loose & about to fall off, a hard job to get the plaster to stick as the lath are too far apart."; June 26: "Worked at plastering up the broken places, had all the work done the other day come off, plaster must be too old to work right."; June 27: "Worked at cleaning up the fort after the plastering job, have one room cleaned."

¹¹⁵ Richard Cronenberger, Regional Historical Architect, Trip Report—Pipe Spring National Monument, June 3, 1983. Notes typed March 14, 1995.

details on baseboards that reach only 5 3/8" in height (in contrast to the meeting room baseboards which reach 6 3/4" in height) (Figure 6.33). The northwest bedroom's picture moldings exhibit more delicate beading as well as scaling similar to the baseboards with overall smaller dimensions (Figure 6.34). These features can be attributed to the public/private divide of the space. The bead of the picture molding, though smaller, maintains the same wide, deep quirk as the other moldings with larger beads believed to be original to the structure. The picture molding, like the height of the baseboard, is scaled-down in size and measures 2 1/4 inches less than the picture molding of the lower level.

Near-matched tongue and groove floorboards are sized between 4 1/2 and 7 inches.¹¹⁶ The boards are fastened with cut nails in the tongue and span the length of the room (east to west), terminating beneath the meeting room partition wall. In fair condition, the floors show less extensive conditions in comparison to the meeting room floors, with some shrinkage but no cupping or warping. The floorboards do, however, contain numerous in-kind wood repairs and areas of wood filler. Although the repairs are found throughout the room, they are more localized in nature (many are less than four square inches). Because the room sustained less moisture and mechanical damage, it is likely that the floors of the northwest bedroom—like those of the meeting room—are original to the building's construction.

¹¹⁶ It could be possible that these boards, which measure approximately the same dimensions as the random width tongue and groove original flooring discovered by Heaton during the 1926 floor replacement of the lower level floors. He recorded the dimensions of these boards as 4 1/2 to 6 inches in width and one inch in height.

7.0 Description and Investigations of the Lower Building

7.1 Spring and Cheese Rooms: Rooms 104 and 105

Although the spatial configuration of the lower building's lower level has remained unchanged since the Fort's construction, access between the spaces has been modified to increase circulation through the building. Material replacement of the floors and walls has occurred within the lower room as well. The impetus behind the repairs and alterations resonate with the changes of the upper building, including minor modifications to grade and new material and designs to increase the longevity of plaster on the walls, all due to substantial and recurring moisture issues. The spring has been channeled through the western end of the spring room since the Fort was completed, maintaining a cool microclimate for the safe storage and production of food, while creating a highly deteriorative environment for the spring and cheese rooms' architectural finishes and flooring.

Based on correspondence between Pinkley and Heaton, the rooms fell into disrepair prior to NPS's acquisition of the site. The materials of the floors, walls, and windows were in poor condition. Any previous flooring that may have existed in the cheese room was torn out and the spring room slabs were incomplete, plaster on the walls was crumbling (or as Pinkley writes, "so nearly destroyed" that it could not be saved), and the windows lacked glass.¹¹⁷ While Pinkley chose in kind replacements of these materials in to reinstate the rooms' pioneer era aesthetics, he could not quite reconcile the lack of evidence to indicate the original material of the cheese room floor.

¹¹⁷ Frank Pinkley, letter to Leonard Heaton, January 20, 1926, Washington, D.C. National Archives. National Monuments. Pipe Spring File, August 12, 1925-September 24, 1926, Record Group 79, Records of the National Park Service.

Upon acquisition of the site by NPS, the cheese room floors were dirt and were believed to be in an altered state. No definitive documentation existed to confirm the material of the floors, but early personal accounts by Pipe Spring residents supported the possibility of dirt floors being the earliest material, with wood floors installed for at least several years prior to 1923.¹¹⁸ While the cheese room floors possibly changed from primitive dirt to wood and back to dirt, stone slabs covered the spring room floors and remained partially in place by the time of NPS's restoration planning phase of the mid-1920s.

Without firm knowledge of the original flooring, Heaton investigated the cheese room floor in 1926 and reported to Pinkley that it appeared to only be dirt. During the investigation Heaton excavated near the south wall and found "a row of rocks that extend[ed] out six inches in the room and [were situated] about two inches above the present level of the floor."¹¹⁹ The floor abutting the north wall contained only one rock that extended four or five inches. Heaton believed these rocks indicated an early stone floor¹²⁰; however, the few rocks Heaton found could have been placed along the north and south walls as part of a sill for the joists that supported a wood floor.

¹¹⁸ Frank Pinkley, letter to Leonard Heaton, January 20, 1926, Washington, D.C. National Archives. National Monuments. Pipe Spring File, August 12, 1925-September 24, 1926, Record Group 79, Records of the National Park Service.

¹¹⁹ Leonard Heaton, letter to Frank Pinkley, March 19, 1926, Washington, D.C. National Archives. National Monuments. Pipe Spring File, August 12, 1925-September 24, 1926, Record Group 79, Records of the National Park Service.

¹²⁰ Leonard Heaton, letter to Frank Pinkley, March 19, 1926, Washington, D.C. National Archives. National Monuments. Pipe Spring File, August 12, 1925-September 24, 1926, Record Group 79, Records of the National Park

Service. "It is possible there was a rock floor in the first place, but those people who I thought could remember said it was a dirt floor when they first went there."

Obviously dissatisfied with the lack of evidence, Pinkley did not strongly commit to a material (although he believed there was a possibility that the floors were originally stone). He directed Heaton to temporarily extend the spring room flooring into the cheese room, which he felt would “be in keeping with the construction of the lower house,” regardless of whether or not the room previously contained stone slabs.¹²¹ However, Pinkley did not wholly subscribe to the idea of installing stone as a long-term solution, since in his March 1926 letter to Heaton he wrote: “You might try it [installing stone] and see and it will be easy enough to take it up again in a year or so if we should decide to put in a lumber floor.”¹²² The following year, Heaton and his father installed stone slabs obtained from Bullrush wash, and this floor remained in place for several decades.¹²³

Repair work has been recorded in the years since the Heatons installed the stone slab floor (in 1944, 1953, 2003, and 2007), but these repairs have been noted as partial replacements of weathered stones and more extensive replacement of mortar joints.¹²⁴ According to the 1940s

¹²¹ Frank Pinkley, letter to Leonard Heaton, March 31, 1926, Washington, D.C. National Archives. National Monuments. Pipe Spring File, August 12, 1925-September 24, 1926, Record Group 79, Records of the National Park Service.

¹²² Frank Pinkley, letter to Leonard Heaton, March 31, 1926, Washington, D.C. National Archives. National Monuments. Pipe Spring File; August 12, 1925-September 24, 1926, Record Group 79, Records of the National Park Service.

¹²³ Leonard Heaton, letter to Frank Pinkley, April 7, 1927, Washington, D.C. National Archives. National Monuments. Pipe Spring File, August 12, 1925-September 24, 1926, Record Group 79, Records of the National Park Service.

¹²⁴ “Superintendent’s Monthly Reports for April and May 1944, National Monuments,” Pipe Spring General, Central Classified File 1933-1949, quoted in Clemensen, Historic Structure Report, 25; Leonard Heaton, Heaton Journal, June 1953; Pipe Spring National Monument, “Assessment Of Actions Having an Effect on Cultural Resources in Arizona, Cyclic Repointing of Masonry on Winsor Castle (HS-01) and East Cabin (HS-02) at PISP & Repair of Cracked Plaster & Whitewash Walls in Winsor Castle (HS-01),” June 25, 2003; and “2006 and 2007 repair damage

HABS plans, however, the spring room floor was elevated three inches above the adjacent cheese room floor (*see HABS Drawings, Appendix L*). No grade change is currently found between rooms (Figure 7.1). This degree of change would have either resulted from an unrecorded complete replacement of the stone flooring in the cheese room, although none of the four noted repairs included total replacement, an unlikely error in the HABS documentation, or a gradual change in the slope of the floors during past repairs. No physical evidence survives to identify a change in grade or confirm the total replacement of the cheese room floor.

7.1.1 Plaster

Perhaps the most aggressive interior cyclical maintenance program was the frequent repair of the Fort's plaster walls since the earliest NPS years. With the spring flowing into the west room of the lower building, the lower level suffered from exceptionally high moisture rates which caused persistent damage to the plaster walls. Repair and replacement occurred regularly, often completed by Leonard Heaton, the Civilian Conservation Corps (CCC), and later park staff. At the time of the first campaign in 1926, Pinkley felt that the plaster was beyond repair and would need to be replaced.¹²⁵ It was plausible that Heaton partially replaced the plaster in the two rooms without total replacement during this first replastering. Rapid deterioration followed by

to Spring Room in Winsor Castle," Historic Preservation Maintenance Completion Report, 2007, PMIS Number PISP-2006-04.

¹²⁵ Frank Pinkley, letter to Leonard Heaton, January 20, 1926, Washington, D.C. National Archives. National Monuments. Pipe Spring File, August 12, 1925-September 24, 1926, Record Group 79, Records of the National Park Service: "It will be all right to plaster the room, for the present plaster is so nearly destroyed that I do not see how we can save it."

successive repairs and replacements every few years since the initial 1926 replastering have all but eliminated evidence of early or original material on these lower levels.¹²⁶

In 1950 Heaton moved away from traditional plaster and changed to one with a cement base believed to be better suited to the spring room's high-humidity environment.¹²⁷ The use of a cement-based plaster follows the 1949 application of such a plaster (Embeco concrete) on the north wall of the upper building's parlor and kitchen (*see 6.1 Kitchen and Parlor*). Used in the upper building to discourage moisture movement through the subgrade masonry wall, Heaton similarly likely hoped to reduce the recurring moisture damage within the lower building. Although not specified, the cement plaster applied at this time in the spring room was likely the same material.

Like the north wall of the upper building, the cement-based plaster proved susceptible to high relative humidity and required periodic repair. In these lower rooms, it seems that the plaster maintained a five-year lifespan with no absolute solution. By the 1980s a more permanent solution was desired, following the apparent success of the alteration to the upper building's microenvironment that provided separation between the exterior masonry wall and soil abutting it to the north. Although the spring room sits partially below grade at the north, moisture did not seep through the walls and floors in the quantity experienced in the upper building; it did, however, accelerate plaster deterioration at these subgrade areas¹²⁸. Here, the spring was directed

¹²⁶ Leonard Heaton, Journal, July 1939 and May and July 1950; Notes on Material as found in Superintendent's Annual Report, July 1, 1941 to June 30, 1942, Pipe Spring General Correspondence, 55-A-269, RG 79, Records of the National Park Service, Regional Archives, Denver, Colorado; Superintendent's Monthly Report for May 1944, National Monuments, Pipe Spring General, Central Classified File 1933-1949; Memorandum to Zion National Park Superintendent from Leonard Heaton, July 22, 1959, Pipe Spring National Monument Files.

¹²⁷ Leonard Heaton, Journal, May 1950.

¹²⁸ Richard Cronenberger, "Notes," March 14, 1995: "The courtyard wall is in severe condition, especially below the courtyard grade."

into the trough from the north, traveled parallel to the west wall, and exited through the room to the south. The constant presence of the spring created an overall moist environment that was hard to regulate. Rather than eliminating the spring or implementing other measures to lower humidity levels, NPS redesigned the wall coating system.¹²⁹

An assessment of the spring and cheese room walls in 1995 noted differing rates of plaster deterioration; the exterior walls of both rooms were found to be in good condition, while the courtyard and partition walls were significantly worse (particularly in the spring room). The chicken wire lath previously installed had rusted, and the plaster had “expanded and pulled away from the wall.”¹³⁰ Although the coating system was not entirely reconceptualized in the new design, the materials were modified to prevent rusting of the lath and also limit detachment of both lath and plaster. In 1999 the “extant non-historic inappropriately applied structo-gauge, gypsolite, and cement-lime plasters, including scratch, base, and finish coats,” were removed from the walls.¹³¹ The new system consisted of a zinc lath secured with stainless steel fasteners (to prevent rusting) inserted into mortar joints in areas where the plaster could not be keyed into the wall. Over the zinc lath was applied a lime-based plaster and limewash to give the walls a historic appearance.¹³² The system has remained in place since 1999 with some cracking

¹²⁹ In his 1989 trip report, Richard Cronenberger visited Pipe Spring to assess the fort plastering completed in 1985. In the spring room he noted that there was “extensive cracking on the walls very similar to the original cracking,” which he assumed was a product of “the high moisture content of the rooms as a result of the open spring.” Richard Cronenberger, “1989 Trip Report,” Pipe Spring National Monument Archives, July 1989.

¹³⁰ Richard Cronenberger, “Notes,” March 14, 1995.

¹³¹ Pipe Spring National Monument, “1999 repair plaster surfaces of Winsor Castle’s Cheese Room and Spring Room,” PISP Preservation Maintenance Completion Report, 1999.

¹³² Pipe Spring National Monument, “1999 repair plaster surfaces of Winsor Castle’s Cheese Room and Spring Room,” PISP Preservation Maintenance Completion Report, 1999. The plaster consisted of “3:1 lime (Type S Ivory – lime) plaster with a small amount of white Portland Type III, and animal hair. Historic lime-wash finish coat was

requiring localized repairs, indicating that moisture still presents issues to the plaster and floors, and is especially concentrated around the spring where more significant repairs have been required (Figure 7.2).¹³³

7.1.2 Doorway

The origin of the passageway between the lower rooms remains somewhat ambiguous and seems to be dependent on the intended use of the east (cheese) room. Although several documents noted that the doorway was an early alteration and not original to the rooms, no date of installation—exact or approximate—is on record.¹³⁴ The trap door in the cheese room ceiling (an original feature¹³⁵) suggests a lack of entry into the Fort from elsewhere in the room, indicating that no entry to the spring room at the time of construction (Figure 7.3). However, the room contains two windows facing the interior courtyard, so while the east room was plausibly constructed as a bare and isolated room with a fireplace and dirt floors for traveling cowhands, it

replicated after proper curing of repaired plaster. Lime wash replicated the existing lime wash in appearance, matte finish, and tooling (was applied with a brush).”

¹³³ Pipe Spring National Monument, “2006 and 2007 repair damage to Spring Room in Winsor Castle,” Historic Preservation Maintenance Completion Report, April 4, 2007.

¹³⁴ Frank Pinkley, letter to Leonard Heaton, January 20, 1926. “When the place was first built there was no doorway between the lower rooms in the lower house as there is at present. The only entrance to the east room on the ground floor was the front door. Naturally they didn’t want to go outside to get into the rest of the house when they were besieged by Indians, so they made the trap door leading into the upper story and could get into other parts of the house through that in times of trouble.” There is no documentation to confirm that the doorway between rooms was not original or when it was installed, but Pinkley’s assessment seems plausible. The trapdoor in the ceiling of the cheese room would serve little purpose had the doorway always existed.

¹³⁵ Because the flooring of the upper level, visible from the cheese and spring rooms, dates to the Fort’s construction, the trapdoor would have been an original feature to allow residents to access the upper level from the lower east room. The framing contains the same lumber as that of the ceiling (all circular sawn) and is fastened with large cut nails. The headers are tenoned and also spiked with cut nails.

seems less probable that, with two easily breachable windows, early occupants intended to use it for defensive purposes.

Flora Woolley wrote in her memoir that, in the 1880s, the lower east room was “used as a camp house for ‘cow punchers.’”¹³⁶ Woolley makes no reference to the presence of a doorway on this lower level, but identifies the east room’s specific use. The doorway, if not original to the configuration of the lower level, was most likely installed once residents altered its use from offering refuge to cowboys to serving as a lower kitchen (or cheese room) in the late nineteenth century.¹³⁷

The reveals, soffit, and casings provide evidence of the doorway’s age as well as modifications in past decades. The only woodwork not modified since installation appears to be the reveal boards—two full-length, hand-planed flush boards line each side with historic carved and written graffiti. Wire and cut nails fasten these boards to the walls, and, with evidence of nails being pulled through the boards, they have likely been removed and repositioned. Similar evidence is found in the soffit board adjacent to the spring room, although the abutting board of the cheese room has been replaced.

The casings show indications of both replacement and modification, with those surrounding the cheese room door being a more recent installation fastened with wire nails. The

¹³⁶ Florence Snow Woolley, *In Two Worlds: The Recollections of Florence Snow Woolley, a Pioneer Daughter of Utah’s Dixie*, 62.

¹³⁷ During the large-scale replastering of the spring and cheese rooms in 1999, the door casings were temporarily removed and the existing plaster stripped from the walls to expose the underlying structural masonry. At this time, in a discussion with Andrea Bornemeier (Chief of Interpretation and Resource Management, Pipe Spring National Monument), project leader Jeff Brown examined the doorway’s masonry construction for any indication of an alteration. Using the upper building’s north exterior door (a later addition) as a source of comparison, Brown noted distinctly different construction methods in the two doorways and concluded that the interior doorway of the spring and cheese rooms is likely original to the Fort.

door casings in the spring room, however, contain numerous nail holes and are joined to the reveals with cut nails. While the degree of nailing could indicate that the boards have been removed and repositioned, notches found on the bottom three inches of the boards suggest that the casings were moved from the opposite side of the entryway where, through at least 1940, grade was three inches lower and the room contained a step up to the spring room passageway (Figures 7.4 and 7.5). The casings were likely removed from the cheese room doorway when the floor was leveled and used to replace the probably heavily deteriorated members of the spring room.

The casings of courtyard door of the spring room and exterior door of the cheese room exhibit similar qualities as the woodwork of the interior passageway. In the spring room, some graffiti is found on the casing, which also includes a hand-planed trimboard and header with comparable fasteners and patterns of nailing as the historic casing of the interior door. The cheese room's exterior doorway, although the door itself was replaced in 2006¹³⁸, retains its historic casings. These wood members show extensive carving, much of which likely dates to the years the room served to shelter cowboys. Heavy graffiti similarly litters the woodwork of the room's fireplace, an original installation that retains its historic mantel and apron.

7.2 Upper Floor

Three rooms originally comprised the lower building's upper level, two of which functioned as bedrooms for various residents while the western space housed the Deseret Telegraph and its operator. In the years after the site served as a refuge for plural wives and their families,

¹³⁸ Pipe Spring National Monument, "2006 Replicate Historic Cheese Room Door," Historic Preservation Maintenance Completion Report. PIMS Number 116844A, Winsor Castle HS-1, May 13, 2006.

significant damage was sustained to the three rooms in addition to a major alteration: the partition walls were removed at the end of the nineteenth century; areas of the floors warped; and plaster separated from the walls. Although the state of deterioration of the upper level was severe by 1923, most repairs to the space were delayed in order to direct funds toward the restoration of the upper building and other critical needs. In the decade that followed, Heaton slowly made repairs to the woodwork, floors, and plaster, and ultimately rebuilt the partition walls.

The first repair to the upper level was ordered in 1926 by Pinkley to address the poor condition of the flooring. Upon inspecting the floor the previous year, Pinkley found he could salvage the existing boards by relaying them to eliminate warping and bulging. He then recommended that new floorboards be installed over the old to make the flooring “dust tight.”¹³⁹ Pinkley consciously avoided total replacement since the original floorboards were visible from the spring and cheese rooms below, and he suggested that the new floorboards be stained to appear aged.¹⁴⁰ Heaton completed the work in 1929 by first removing and replacing several damaged floorboards along the north side of the building, and then following Pinkley’s directions to overlay and stain new flooring.¹⁴¹

Heaton’s 1929 flooring installation remains in place, with the underlying historic floorboards still visible from the first level. From below in the spring and cheese rooms, these

¹³⁹ Frank Pinkley, letter to Leonard Heaton, January 20, 1926, Washington, D.C. National Archives. National Monuments. Pipe Spring File, August 12, 1925-September 24, 1926, Record Group 79, Records of the National Park Service.

¹⁴⁰ Frank Pinkley, letter to Leonard Heaton, January 20, 1926, Washington, D.C. National Archives. National Monuments. Pipe Spring File, August 12, 1925-September 24, 1926, Record Group 79, Records of the National Park Service: Pinkley’s decision “would make no change in the appearance from the under side and [Heaton] can stain or color the new boards on the upper side to take the newness off.”

¹⁴¹ *Southwestern Monuments Monthly Reports* (Pipe Spring), December 3, 1929 and February 10, 1930, quoted in Clemensen, Historic Structure Report, 28; interview of Leonard Heaton by Berle Clemensen, January 24, 1980.

floorboards show evidence of different positioning on the joists, which confirms that certain boards had been lifted and relaid during the early renovation. These boards are circular sawn, tongue and groove, and close matched, resembling the floorboards of the northwest bedroom. The joists, as the floorboards, also likely date to the construction of the building and consist of 2- x 10-inch circular sawn members (similar to those uncovered in the meeting room). Bridging fastened with cut nails spans the building between joists from east to west. The additional support of a girder rests on the masonry partition wall and appears to be adzed. Within the flooring visible from the cheese room, the hatchway to the upper level is framed with lumber consistent to the wood of the joists and is fastened with large cut nails. The headers are tenoned and also spiked with cut nails. Because Heaton installed the upper floorboards with modern wire nails, the cut nails used in the hatch framing below were likely those used in the original design with no visible modifications made to the framing prior to the later floor installation.

From the second level, it is evident that the boards were laid when the upper story was a single, open space. This top floor consists of five-inch matched tongue and groove floorboards fastened into place with modern wire nails; no historic or reproduction cut nails were used to secure the floorboards. The nails sampled from the middle room included 2.5- to 3-inch wire nails, and nails of both lengths were also found securing areas of baseboards in the rooms (further correlations are drawn below). With the new flooring installed, Heaton worked that year to plaster the walls to prepare the space for NPS's restoration program that would begin with reinstating the partition walls the following year.¹⁴²

Once the three rooms were restored, Heaton moved his family to the upper level of the lower building, using it as a private residence, so more rooms of the upper building could be

¹⁴² *Southwestern Monuments Monthly Reports* (Pipe Spring), December 3, 1929 and February 10, 1930, quoted in Clemensen, Historic Structure Report, 28.

opened to visitors. Only basic maintenance continued in the lower building's upper rooms during the next three decades (1930s to 1950s) and included intermittent plaster repairs to the ceilings and walls.¹⁴³ By 1959, further rehabilitation efforts returned the rooms closer to their original appearance with the fabrication of missing woodwork—especially picture moldings and to a lesser degree baseboards—and further plaster maintenance. At this time, Heaton's team removed all existing plaster from the south wall in three upper rooms and applied a new coat.¹⁴⁴ Loose plaster was also removed from the other exterior walls and partitions; the exterior masonry walls received a cement-based plaster while the partitions were plastered with gypsum and lime.¹⁴⁵ The restoration progressed with the removal of plaster where new picture molding would be installed.¹⁴⁶

The 1959 plastering remained in place for more than twenty years, but by 1983 heavy deterioration was noted. The cement-based plaster applied to the south wall generally remained sound in the three rooms, although it cracked and separated from the courtyard and east walls. The partition walls and ceilings with gypsum and lime-based plaster sustained the most extensive damage, and recommendations were made to replaster most of the walls.¹⁴⁷ Deterioration was again noted in 2003, and repairs were made with a hydrated lime, salt, and water mixture.¹⁴⁸

¹⁴³ Leonard Heaton, Journal, June 1940; Journal, September 1948; Journal, January 1952.

¹⁴⁴ Leonard Heaton, Journal, January and February 1959.

¹⁴⁵ Frank R. Oberhansley, "Completion Report, July 25, 1961 for work completed in 1959."

¹⁴⁶ Leonard Heaton, Journal, January 12, 1959.

¹⁴⁷ Richard Cronenberger, "Trip Report—Pipe Spring National Monument, June 3, 1983," notes typed March 14, 1995.

¹⁴⁸ "Cyclic Repointing of Masonry on Winsor Castle (HS-01)," Historic Preservation Maintenance Completion Report, November 2000.; "East Cabin (HS-02) at PISP & Repair of Cracked Plaster & Whitewash Walls in Windsor Castle (HS-01)," June 25, 2003.

7.2.1 Woodwork

In the upper three rooms of the lower building, picture molding was placed on the north exterior wall (facing the courtyard) and along the partition walls. Unlike the picture molding in the upper building which exhibits disparate pieces suggesting installation at various periods of the Fort's history, the picture molding decorating the three upper rooms of the lower building maintain uniformity in the size and shape of the bead and the size of the quirk. This uniformity implies that all sections of picture molding were installed at the same time, and no historic pieces had survived by the time the Park Service acquired the site in 1923.

The picture molding installed in these upper rooms in 1959 consists of circular sawn boards with a large, flattened bead and narrow quirk, similar to several sections of replacement molding identified in the upper building (Figure 7.6). These moldings, fabricated in the mid-twentieth century, do not appear to have hand-worked details—lacking any planing. Clearly machine produced, the moldings also contain fewer paint layers and are not heavily sanded, allowing for the exposure of wood grain that is not typical in any historic moldings. By this more advanced period of restoration, however, workers began using cut nails to secure the moldings and give the illusion of a historic installation.¹⁴⁹ Based on the restoration of these upper rooms (and in comparison to other localized restorations throughout the Fort), it seems most likely that NPS introduced newly fabricated as well as recycled historic cut nails in their repair and replacement efforts by 1959. In the upper building, cut nails were not found in the restored woodwork of the 1930s, although reuse of historic cut nails has been found in moldings that were temporarily removed and subsequently reattached.

¹⁴⁹ Nails in these 1959 picture moldings were not sampled. Samples should be taken in the future and identified in according to the nail typology.

With no extant records of the historic picture molding, it is impossible to confirm the profile of the original elements. However, based on surviving moldings found throughout the Fort (and in consideration of a room's particular function), it can be assumed that the upper-level rooms would have initially contained picture moldings similar to the upper building's northwest bedroom. As private spaces within the Fort, these rooms display scaled down moldings reflected in either the size and/or height of the moldings or the size of the beads planed into the woodwork (*see 6.3 Northwest Bedroom*). In the three upper bedrooms, the delicate beading of the window casings provides evidence to support the likelihood of the walls echoing similarly scaled down detailing in the picture molding (Figure 7.7).

In these rooms subjected to extensive deterioration and restoration, the four windows spaced along the courtyard wall largely maintain their original soffits, sills, and casings with minimal replacement. The soffits and chamfered sills are all hand planed—some with heavy distress that has obscured the detail. Simple and subdued in design, the casings have a thin bead along the inner edge, while the apron below is flat with no beading (*see Door and Window Schedule, Appendix C*). Although not identical to any other beaded moldings in the Fort, the window casings exhibit the same deep, relatively wide quirk as other historic moldings, rather than the narrow quirk distinctive in replacement moldings.

The upper level's two interior doorways were added during the 1930 restoration of the partition walls, but the door casings of these openings and the courtyard door show little consistency in their beading, making a comparative analysis difficult. It is probable that most casings would have been either newly fabricated or salvaged from elsewhere (possibly not within the Fort) and installed immediately following the reinstatement of the partition walls. No casings

likely survived from the previous partition wall openings that were removed at the end of the nineteenth century.

The upper level's construction and restoration history is legible through the fabrication and configuration of the baseboards. The baseboards spanning the exterior walls exhibit qualities consistent with other historic moldings, and the baseboards located along the 1930 partition walls show distinct differences in their fabrication (with large, flattened beads) and nailing patterns (Figures 7.8 and 7.9). Beyond an examination of nails, saw marks, and beading, the baseboards further trace the room's structural changes. The baseboards spanning the north and south exterior walls would have been installed following the conversion of the space from three rooms to one a few decades after the Fort's construction. While these baseboards would have been removed and reinstalled to accommodate the added flooring in 1929, they were not replaced. Instead, Heaton constructed the new partition walls in 1930 over the existing late-nineteenth-century baseboards. These baseboards extend through the partition walls, continuing across the entire length of the north and south walls to verify that the upper level once contained a single, open room.

With necessary replacements occurring along the north and south walls early in the Fort's history and along the newly erected partition walls several decades later, it is possible that the baseboards spanning the east and west exterior walls are original. A comparison of profiles presents minor differences in the bead and quirk between the east/west and north/south exterior walls. The baseboards of the north/south walls exhibit a sloping quirk, like that of the baseboard abutting the meeting room staircase—another late-nineteenth-century addition (*see Molding Typology, Appendix I*). They are also circular sawn and hand planed. The quirk of the baseboards along the east/west walls curves sharply, more closely resembling the profile of the baseboards found in the northwest bedroom; these boards are also hand planed but are reciprocal sawn rather

than circular sawn. The minor variation in fabrication denotes the possibility of differing dates of construction.

The types and locations of nails offer further evidence of installation periods. Although the baseboards spanning the north and south walls contain mostly cut nails, in several areas (though not universally) wire finishing nails have been inserted as secondary reinforcement. Similarly, the historic baseboards adjacent to the east and west exterior walls have been fastened with cut nails and supplemented with modern wire nails. On the east wall, samples removed from the central section of baseboard show that the modern wire nails match those used to fasten the floorboards (*see Nail Typology, Appendix H*). Their presence provides strong evidence that these baseboards were repositioned with modern nails following the 1929 floor installation.

The more modern fabrication of the baseboards situated against the partition walls confirms that no woodwork survived from the original construction, prior to the removal of the walls. These baseboards, all with a flattened bead, were created and installed during the early restoration efforts of 1930. While these baseboards are circular sawn and exhibit some planing detail, the planing is crude and obscured—not distinctly hand finished as in the room’s historic woodwork. The boards are exclusively fastened with wire nails, both 2.5 and 3 inches in length, which again match the nails found in the 1929 floorboards. No evidence in the nail types suggests that cut nails were used in the restoration program of the late 1920s and early 1930s, which further distinguishes the historic baseboards from those installed during the room’s first major restoration.

8.0 Condition Assessment and Treatment Recommendations

The survey of current conditions conducted in 2010 as part of this study established a record of observed physical deterioration for the interior and exterior of the East and West Cabins and Windsor Fort. Masonry conditions for these three buildings were digitized in as elevations in AutoCAD and graphically represented in ArcGIS, providing a complete map of conditions including the various repointing campaigns applied over time. The survey of interior conditions was created using the ortho-rectified elevation images. In this case, due to the extensive restoration and replacement of architectural fabric during the twentieth century, general areas of damage and replacement have been labeled using notation format.

For this assessment, both surveys of interior and exterior conditions are compared to past damage reports, restoration work from the early and current periods of park ownership, and recurring areas of deterioration. Factors contributing to major past damage and past treatment are summarized below to reveal areas of possible latent conditions and recurring issues that may require further evaluation. The recommendations outlined in this report include a methodology for prevention and diagnosis of damage and the underlying causes.

8.1 Major Past Damage and Areas of Recurring Deterioration

For a century, moisture in the form of rising damp greatly impacted the condition of structural and decorative materials on the lower levels of the Fort buildings. Wood floors, plaster, mortars, and other wood elements (such as cabinetry and baseboards) were highly susceptible to the elevated moisture content of the interior spaces. Throughout this time, the high rate of deterioration caused frequent replacement of these components to counteract the constant cracking of plasters and warping and cupping of floorboards. Although NPS and site workers

intervened midcentury to minimize the impact of water by allowing moisture to escape through subgrade vents, deterioration persisted and continued to cause material replacement. However, the approach to resolving the moisture problem changed to prevention in the 1970s with the installation of a barrier wall and drainage system north of the Fort's upper building. This treatment, though it appears to have diverted water and prevented moisture ingress through the north wall since 1980, has not been formally evaluated within the interior rooms of either the upper or lower building. The consequences of substantial moisture damage for such an extended period of time are currently visible through the age of the flooring and plaster as well as the many Dutchman repairs to other ground-level woodwork.

Replacements were not wholly due to moisture damage, however. Early in the Fort's history, deferred maintenance of the building's interiors and exteriors caused significant loss, particularly to the wood members of the balconies and the lower building's interior woodwork. Just prior to NPS's acquisition of the site in 1923, the south balcony had been removed and balusters were also missing on the north balcony. Inside the lower building, the upper floor partition walls were dismantled and the picture moldings had been removed. Although other woodwork, such as baseboards and window casings survived, the south structure suffered the greatest deterioration of the two Fort buildings at the turn of the twentieth century and was subject of a large-scale restoration effort after the site's inclusion in National Park system. Although neglect had been an isolated occurrence, the extent of maintenance and restoration and the adoption of a beneficial maintenance plan remain important issues for preserving extant material while minimizing environmental and mechanical damage.

With massive masonry walls, the Fort has generally remained structurally sound. Displacement in the southwest exterior wall of the lower building, however, emerged during

Leonard Heaton's tenure as site custodian. He periodically addressed the problem with bracing and repointing of the exterior wall, as well as frequent replastering of the spring room where the movement caused cracking within the walls. These efforts to stabilize the corner provided little support and bulging worsened in successive decades. Under the plans to establish better drainage to prevent moisture from entering the north wall of the upper building, NPS inspected the instability of the southwest corner. In 1979, a plan to install steel columns to brace the bulging area was considered but never implemented.¹⁵⁰ Without further treatment of the bulge, the recurring structural issues and moisture problems should be periodically assessed, especially since underlying issues such as moisture from the spring may continue to cause the out of plane displacement.

8.2 Treatment Evaluation and Monitoring

The site's early interventions during the first renovation phases show that reactive measures had largely been taken to replace damaged material. Only since the latter half of the twentieth century have efforts been focused on understanding the causes of deterioration and addressing these agents. Since mitigating the site's most aggressive deteriorative factors, such as moisture ingress at the north wall of the upper building and the bulging of the southwest corner of the lower structure, replacement of plasters, mortars, and elements of the building envelope has continued to maintain the aesthetic of the Fort complex. Current practices should be studied for their necessity and impact on the buildings' material integrity. Ultimately, prevention rather than replacement should be prioritized.

¹⁵⁰ Intermountain Cultural Resource Center Conservation Program. Pipe Spring National Monument FY96 Stabilization Project Completion Report, Vol. 1. Santa Fe, March, 1997, 2.

Although preservation practices have shifted from the heavy restoration efforts of the early NPS era to moisture mitigation and stabilization, past treatments need to be evaluated for their efficacy and appropriateness. These treatments include the rerouting of moisture away from the upper building's north wall, the stabilization of the lower building's southwest corner, the extensive repointing of the Fort and cabin walls, and the installation of the east gate system. Any treatments that may produce compatibility issues should also be monitored, such as the routing of rotten and broken wood from the meeting room floorboards, and the addition of pine replacement strips. For each treatment evaluation, a monitoring effort should be made to confirm that the agents of deterioration previously affecting the material, feature, or room have been mitigated. Specifically, areas affected by high moisture levels should be measured for fluctuations and the seasonal influence of relative humidity. Structural and material displacement should be further assessed through the use of crack monitors. Conditions in each of these areas should be recorded yearly to detect any active or accelerated deterioration. Evaluations for each location are outlined below:

- *Upper building north wall:* Active analysis of temperature/relative humidity data collector in parlor or kitchen; visual/photographic monitoring of plaster cracking on lower level interior walls (particularly north wall); crack gauge as needed; yearly condition comparison/mapping of plaster cracking using ortho-rectified elevation photographs;
- *Lower building southwest corner:* Active analysis of temperature/relative humidity data collected in spring room; visual/photographic monitoring of exterior masonry and mortars and interior plaster cracking in spring room; yearly condition

comparison/mapping if any change is detected in exterior masonry or mortars and/or interior spring room plaster at the southwest corner using AutoCAD/ArcGIS drawings; crack gauge on exterior masonry or interior plaster as needed;

- *Fort and cabin repointing*: Visual inspection of mortar and adjacent stone for cracking, efflorescence, delamination, and friability of stone; replacement only if the mortar affects adjacent masonry or if deteriorated; continuation of mortar mapping using AutoCAD/ArcGIS;
- *Fort east gate*: Seasonal measurements for displacement and/or separation of wood veneer; Photographic monitoring of wood veneer for warping, cupping, and shrinkage; begin program of monitoring 1948 west gate frame;
- *Upper building meeting room floor*: regular visual inspections to determine material compatibility and the impact of environmental factors and visitor traffic.

In evaluating past conditions, it is important to note that the frequent repair of plaster may be concealing recurring and persistent moisture damage and should cease for the duration of monitoring. A control area should be established where a comparison can be made and a standard rate of deterioration determined. In the case of the upper building's north wall, the control area may be the north wall of the second level. For the plasters of the spring room, a control may be established in the neighboring cheese room. Because the meeting room and northwest bedroom floors are original to the structure, it is important to evaluate and measure the material compatibility and visual integrity of the 2009 treatment prior to further replacement within the meeting room or adoption of the same methods should similar conditions emerge in the northwest bedroom or elsewhere within the Fort buildings. It is recommended that a one-year

monitoring and evaluation period follow all treatments through a formal evaluation process, which should complement the Historic Preservation Maintenance Completion Reports currently filed by Pipe Spring staff members prior to intervention.

In addition to areas of past treatment, monitoring and evaluation should be incorporated into treatment planning for other materials requiring maintenance or repair within the Fort or cabins. In general, a one-year monitoring program is recommended prior to intervention. Types of monitoring should be determined based on the assumed cause of deterioration and extent of the condition. In areas susceptible to elevated moisture content, temperature and relative humidity dataloggers should be installed, and repeated photographic or other recording should be conducted regularly. Displacement or large-scale movement should be monitored in consultation with an engineer specializing in historic structures.

For materials that require regular maintenance, a set of standards for acceptable levels of deterioration should be established to determine when maintenance or treatment is necessary. These materials include nonstructural elements such as interior plasters, paint and surface finishes, and mortars. In developing these standards, humidity levels, temperature, and relative humidity should be monitored to determine their effect on each material's rate of deterioration.¹⁵¹ This procedure is recommended to decrease the current frequency of repair and introduce preventive maintenance practices.

While dataloggers currently chart temperature and relative humidity levels within the rooms of the Fort, the program should be expanded to include the cabins. The interior spaces of

¹⁵¹ The current monitoring program incorporates PEM2 data loggers and eClimate Notebook software to record temperature and relative humidity levels within each room of the Fort's upper and lower buildings. Although the impetus behind the installation of these data loggers was to monitor environmental conditions affecting the museum collections, the data should also serve to similarly inform staff of potential mechanisms of deterioration to structural or finish material due to fluctuations in temperature or relative humidity levels.

these buildings are more susceptible to leaks caused by localized failures in the earthen roofs or moisture migration from the north walls, which serve as retaining walls against the northern slope. Although the cabins lack the interior finishes of the Fort buildings, any sudden increase in moisture should be identified and its cause mitigated. Active moisture ingress will damage interior mortars and stone and place the wooden elements at risk to insect and fungal threats.

8.3 General Masonry Conditions and Recommendations

8.3.1 The Fort

The sandstone masonry of Winsor Castle is in remarkably good condition given its age and early years of deferred maintenance, and the region's extreme weather cycling. Delamination and differential surface erosion are found along most of the basal stone courses and especially on the south end of the northeast and southwest elevations. This deterioration is in association with efflorescence, clearly indicating active rising damp from ground moisture. This condition is to be expected given the downward slope of the surrounding grade and, judging from the soundness of the current mortar joints, the majority of this deterioration may have occurred prior to restoration.

The only other area of anomalous stone masonry deterioration is found along the top of the gate and along the north side of the northeast wall. These areas also display open joints, numerous repointing, block displacement, and efflorescence. Clearly falling damp is activating these conditions which may be due to runoff detailing from the upper building porch drainage and possibly aggravated by the intersection of the original wall masonry with the 1923 infill restoration.

The masonry of the courtyard elevations of the upper and lower buildings is in good condition with the exception of basal deterioration from rising damp on the lower sandstone courses. The exterior woodwork including the porch details, windows, and gates are in fair condition, having all been replaced during the restoration and continually upgraded by cyclical maintenance campaigns. Localized areas of rot, paint failure, and loss are to be expected and should be treated using the policy favoring maintenance over repair over replacement.

The sandstone deterioration does not appear to require any treatment at this time. The conditions will stabilize if an active maintenance program is instituted that ensures a positive slope and drainage away from the wall base. Should ground moisture problems persist, subsurface (French) drains should be checked or enhanced—in association with archaeology around the perimeter of the building. Vegetation should also be kept clear of the masonry base. The roof was not inspected but appears to be in fair to good condition given the lack of leaks visible on the interior.

8.3.2 East Cabin

The East Cabin displays similar deterioration patterns of stone delamination and friability in association with efflorescence along the basal masonry courses. This problem is especially pronounced on the west interior walls and on the east ends of the north and south side walls of both cabin rooms due to the buried context of the rear (west) wall set into the hillside.

The sandstone deterioration does not appear to require any treatment at this time. The conditions will stabilize if an active maintenance program is instituted that ensures a positive slope and drainage away from the wall base. Should ground moisture problems persist,

subsurface (French) drains should be installed in association with archaeology around the perimeter of the building. Vegetation should also be kept clear of the masonry base.

The modified earthen roof appears to be functioning with minimal leakage; however, a slight modification of the edge details may be in order to retain the soil. Water-related soil wash on the interior mostly appears to be old damage prior to the roof replacement/repairs. All soil washes should be removed as a low-cost method of water intrusion monitoring. Every effort should be made to retain modified sod/earthen roofs on these buildings and their design could be improved to allow them to function as green roofs but appear as historic sod roofs. This has been done at Bar BC at Grand Tetons National Park with success.

8.3.3 West Cabin

The West Cabin displays similar deterioration patterns of stone delamination and friability in association with efflorescence along the basal masonry courses as the East Cabin. This problem is especially pronounced on the north interior walls due to the buried context of the rear (north) wall set into the hillside.

The sandstone deterioration does not appear to require any treatment at this time. The conditions will stabilize if an active maintenance program is instituted that ensures a positive slope and drainage away from the wall base. Should ground moisture problems persist, subsurface (French) drains could be installed—if they have not been already—in association with archaeology around the perimeter of the building. Vegetation should also be kept clear of the masonry base.

The modified earthen roof appears to be functioning with minimal leakage; however, a slight modification of the edge details may be in order to retain the soil. Water-related soil wash

on the interior mostly appears to be old damage prior to the roof replacement/repairs. All soil washes should be removed as a low-cost method of water intrusion monitoring. Every effort should be made to retain modified sod/earthen roofs on these buildings and their design could be improved to allow them to function as green roofs but appear as historic sod roofs. This has been done at Bar BC at Grand Tetons National Park with success.

8.3.4 General Comment Regarding Repointing

The ability of the architecture to set the historical scene at Pipe Spring National Monument is very much dependent on the veracity of the materials used for repair. Due to the conditions of the masonry before the first major restoration in 1928, replacement was necessary in the form of repointing and masonry infill. This work correctly attempted to reestablish the original building practices by using traditional/local materials. Over the years, successive maintenance programs have moved away from this tradition toward commercial modern substitutes employing pigments in lime/cement mixes which look and weather very different from the original or even early restorations.

It is recommended that management return to traditional materials to reinstate the site to its nineteenth-century appearance. The high upkeep of earthen mortars is of concern and modified mortars should be considered and tested without the use of pigments. Formulas cannot be given at this time until local soil analysis is run to determine the best amendments to use (e.g., cement or acrylic emulsions). In addition, past practices of applying red and yellow washes over the masonry to blend the wide variety of mortar campaigns should be avoided and the washes removed if possible.

8.3.5 Replacement and Maintenance

Although it is recommended to minimize the frequency of repairs and replacements, materials of the Fort and cabins will continue to deteriorate and some future replacement will be necessary. Specifically, elements of the building envelope such as the Fort's roof shakes and the cabin's clay and timber roof system are subject to UV degradation, moisture ingress, and larger temperature variations. These elements require more frequent inspection and maintenance to prevent consequential damage within the interior spaces. In these areas, the park's current practice of in kind replacement should be continued.

The condition mapping presented in this report shows areas of efflorescence on several Fort and cabin elevations. A standard treatment methodology to remove salts from the masonry walls should be established and implemented by park staff. Past methods of treatment included acid washing to remove salts on the surface of the east courtyard wall. This condition can be mitigated through nonabrasive action, and it is recommended that poulticing with water and paper pulp be practiced. Additionally, any treatments applied to the Fort or cabins should be documented and mapped onto the condition drawings to create a record of intervention.

8.4 Preservation Plan for Pipe Spring's Historic Structures

The Historic Structures Report is the primary written and graphic record of the buildings from the site's construction to its present condition and chronicles major changes over time. Within this report, material condition, alteration, use, unique and recurring problems, past damage, and historic appearance are documented. Specific areas of material change and deterioration are identified, and subsequent guidelines for treatments broadly address these overarching issues.

Ultimately, however, this report serves as the foundation for a detailed preservation plan of the site's historic structures.

A separate and distinct document drawing on the historical and investigative research of the Historic Structures Report, a preservation plan outlines the park's interpretive and preservation goals and provides focused recommendations for treatment based on priority; treatment recommendations presented within the preservation plan adhere to the aesthetics and use requirements stated in the park's mission. The plan distinguishes between emergency or high-priority treatment, routine repair, and preventive maintenance. This document further explicates conservation practices by presenting treatment schedules and practices for specific materials and methods of stabilization and preventive care. Because a graphic and narrative record of each historic structure's evolution and current material integrity has been created, it is recommended that these documents be supplemented by the subsequent development of a comprehensive preservation master plan.

8.5 Recommendations for Further Research

Several areas of the Fort's upper and lower buildings would benefit from further examination to clarify the construction chronology of certain elements. In most cases, these studies require specialized methods of investigation and analysis beyond the targeted probes of the current study, which were broadly used to develop periods of significance and confirm installation dates of numerous features based on archival evidence. A more focused analysis of the paint finishes, including stratigraphy and wood species, and construction technique would verify the relative installation dates of features such as the Fort's moldings; the door casings in the lower building's upper level; the doorway between the spring and cheese rooms; and the upper building's

staircase. Paint analysis for each room and exterior would also allow for more nuanced interpretation of the appearance of the buildings at specific times as well as aid in dating fabric changes.

A summary typology was established to determine the period of fabrication and installation of the Fort's baseboards, picture moldings, and door and window casings. Although this typology encompasses five types which have been assigned to one of three periods of significance, further study could facilitate the classification (and clarification) of all moldings. Areas containing some ambiguity in either their installation or fabrication date include the upper building's lower level baseboards, the lower building's upper level door casings, and the meeting room's picture moldings and baseboards.

While a type and period have been assigned to the kitchen and parlor baseboards, the exact date of their installation remains unclear but, as described in Section 6.1, they likely correspond to the 1959 floor replacement. Recommendations to definitively determine the installation date include further research into Pipe Spring's archival photograph collection and comparison with exposures on areas of the baseboards to reveal the extent of the pre-1980 paint stratigraphy. It should be noted, however, that even with this level of investigation, it may not be possible to distinguish between an installation date of 1947 and 1959.

Although numerous molding profiles were recorded to classify baseboards, picture moldings, and door casings, several elements fell outside the established typology. The ambiguity of the lower building's upper level door casings was created by the lack of comparable molding profiles. In this highly altered upper space, it is known from historic records that the current partition walls were installed in 1930, providing a firm date of installation. However, because the profiles lack consistency—indicating possible reuse from other

buildings—the actual fabrication date of the casings is unclear. A finishes analysis of each door casing is recommended to assist in the identification of any pre-1930 finish layers, which would indicate previous use.

The three early alterations—construction of a partition wall, staircase, and exterior door—confirmed in the upper building’s meeting room have also contributed to some uncertainty of the installation and fabrication dates of the existing moldings. Further study is recommended to both determine the hypothesized reuse of the picture moldings and baseboards during the 1959 restoration (as described in Section 6.2) and to identify a more concise date of the three probably concurrent alterations to this upper level. Assuming the meeting room woodwork retains its accumulated layers of paint, a finishes comparison of original moldings with baseboards and picture moldings in altered sections (e.g., west of the courtyard door and, for baseboards, adjacent to the beadboard wall of the stair) could confirm that the elements were initially installed during the late-nineteenth-century and reused during the 1959 restoration.

An approximation of the three major alterations based on archival research places the changes between 1876 (from Charles Pulsipher’s journal entry) and 1885 (when Albert Tissandier sketched the Fort with a visible north exterior doorway). To gain a more precise timeline of the modifications, dendrochronology of selective wood elements is recommended. Samples should be obtained from woodwork conclusively installed during the modification of the each altered area and potentially include: the beadboard wall (at west where original planks remain); the baseboard adjacent to the stair (assumed to be removed from the partition wall); the exterior door casing and/or reveal; and the door lintel; and the floorboard spanning the stair.

Of further ambiguity is the doorway between the spring and cheese rooms. Historic documents allude to the function and material installation (particularly of the flooring) of the

lower building's spring and cheese rooms, but these records lack any mention of the opening prior to Frank Pinkley's 1920s inquiry into the Fort's original configuration. Although Pinkley believed that the rooms lacked the current passageway due to the presence of the trapdoor in the cheese room, no concrete evidence supports his early theory.¹⁵² Temporary removal of the door casings and surrounding plaster will allow for an archaeological investigation of the underlying masonry to determine whether an alteration has been made. Any variances in construction methods (as visible in the upper building's north exterior door) could indicate an early modification to the first floor space. Comparisons of construction technique in this space should be made with original openings and the known alteration of the upper building. Historic graffiti etched into the woodwork of these lower level door casings should be conserved, and extreme caution should be exercised during any removal for investigative purposes.

8.6 Use of the Historic Structures Report

The HSR encompasses many supplemental resources: plan, section, and elevation drawings; a door and window schedule; molding and nail typologies; a database of historic events and changes; construction and conditions surveys; a conditions glossary; and historic and contemporary images. The park should view all of these resources as working documents to be adapted and expanded. Although specific recommendations have identified the drawings as documents to be used to further recording efforts, each component of the HSR should reflect the current and growing knowledge of the site and its structures.

¹⁵² Frank Pinkley, letter to Leonard Heaton, January 20, 1926, Washington, D.C. National Archives. National Monuments. Pipe Spring File; August 12, 1925–September 24, 1926, Record Group 79, Records of the National Park Service.

Native files have been submitted to allow management and staff to expand all aspects of the HSR and keep a working record of change over time. As mentioned in the above treatment recommendations, the elevation/plan drawings and photographs should be updated during any condition surveying or treatment implementation to reflect developing conditions, repairs, and replacements. Specifically, these documents should be used in conjunction with the historic preservation maintenance reports filed by staff following any repairs or alterations, and the native files (e.g., CAD or InDesign) should be maintained to reflect change. The graphic component will more precisely represent completed work and will complement the current narrative and photographic system. Continued use of these documents will ensure the prolonged accuracy of the data.

Similarly, data management practices should be developed in order to create new records as research is undertaken that both contributes new knowledge to the HSR and expands on existing sections. New investigations such as paint analyses or dendrochronology studies should be integrated rather than separated from the current body of research. Existing sections of the Architectural Data Section with potential for further investigation include the nail and molding typologies and Fort construction. Any subsequent studies of these areas should be fully integrated into the documents of the established typologies or systems.

A Microsoft Access database has been developed and populated with historic records of the Fort, cabins, and ponds. Additional information should be contributed to this database to increase the scope of records available and incorporate all of the monument's structures and features, which will present a holistic timeline from the site's founding to its present state. The material collection maintained in the park archive—such as historic photographs, journals, and

other documents—should be entered into the system. These additional entries will provide better access and searchability of the library.

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